Information in financial and banking crises - 1973-2008



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Table of Contents

Preface & Acknowledgements 1

Table of Contents 2

List of figures and tables 4

List of abbreviations 7

Abstract 9

Long Abstract 10

Chapter 1 – Introduction 16

Chapter 2 – A theoretical framework of information and crises 30

1. 'Information' in finance – types, channels, diffusion 32

Information in finance 32

Information types, channels, and diffusion 36

2. Financial crises and information 54

Chapter 3 – The market for information and its role in financial and banking crises 60

1. The modern market for financial information – Reuters MMR and the crises of 1973/74 68

Political turmoil and international financial realignment in the crises of 1973/74 69

The Reuters Monitor Money Rates in 1973/74 75

From news agency to financial information firm – Reuters transformation 88

2. Growth, doubts, and diversification – The stock market crash of 1987 96

Expansion, competition, and consolidation in the market for financial information 100

Uncertainty amid consistency - The market for financial information and the 1987 crash 106

3. Emerging duopoly, and crisis realignment – The burst of the dotcom bubble 1999/00 115

From start-up to hegemon – the rise of Bloomberg and the new duopoly 117

The burst of the dotcom bubble – realignment in the information market's duopoly 130

4. Restructuring, mergers, and persistence – The global financial crisis of 2007/08 141

Restructuring, consolidation, growth – the market for financial information up to 2007/08 144

Adapting to the global financial crisis 2007/08 and beyond 149

5. Chapter Conclusion – The market for financial information in financial and banking crises 158

Chapter 4 – Central banks' information strategy in financial and banking crises 163

1. Situating central banks' information strategy during financial and banking crises 168

2. Central banks and information during the financial and banking crises of 1973/74 173

The BoE during the secondary banking crisis – the Lifeboat's information strategy 178

Intermediate conclusion – the secondary banking crisis and the BoE's information strategy 202

3. The global financial crises – information strategy amid 'paradigm shifts' 203

Central bank information strategy at the height of the global financial crisis 205

Intermediate conclusion – information gathering and broadcasting during the GFC 233

4. Chapter Conclusion – central banks' crisis information strategy between 1973 and 2008 235

Chapter 5 – Credit ratings, CRA's and the 'use of information' in financial crises 238

1. Credit ratings and credit rating agencies 244

Historiography of credit ratings and credit rating agencies 244

The informational value of credit ratings 250

2. The changing landscape of credit ratings and CRAs – 1970s to 2010 252

Market expansion and the centrality of regulation – 1970s to 2010 252

Moody's corporation and Moody's Investor Services 259

Beyond the 'Big-three' – rigidity, competition, and evolution in the CRA business 264

3. Financial crises and credit ratings – Asian Financial Crisis, Enron, and the GFC 270

4. Information for investors during times of distress – the Lehman collapse 288

Hypotheses, dataset and descriptive statistics 288

Analysis and results 292

Discussion 295

5. Chapter conclusion 298

Chapter 6 – Conclusion 302

Appendix 313

Bibliography 321

List of figures, tables, and exhibits

Figures

Figure 1: The role of 'information' in banking & financial markets. 35

Figure 2: Dimensions and implications of soft & hard information. 42

Figure 3: Stylised overview – Soft & hard, public & private info in Banking & Financial Markets. 44

Figure 4: Stylised process of information flow and processing steps. 48

Figure 5: Finance, Insurance and Real Estate (FIRE) output ($bn) as percentage of US GDP. 50

Figure 6: Financial sector mergers and acquisitions with values greater than USD 1 billion, G10. 51

Figure 7: Investor confidence index – crash beliefs 57

Figure 8: A conceptualisation of the market for financial information. 62

Figure 9: CPI for US, UK, and Germany, 1967-1979 71

Figure 10: US nominal interest rate, 1960-1980. 72

Figure 11: Real interest rates, UK & US, 1967-1979. 72

Figure 12: USD/European currencies daily spot exchange rate, indexed 1971=100. 73

Figure 13: Daily %-changes in spot exchange rate, USD/DM, USD/GBP, USD/SF, Jan. '71 – Dec. '74. 74

Figure 14: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1960-2007. 90

Figure 15: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1960-1980. 90

Figure 16: Introduction of new services and information on the Reuters Monitor system. 91

Figure 17: Reuters revenue & Global ForEx turnover, triannual, 1986-2007. 92

Figure 18: Reuters user accesses development, 1973-1980. 93

Figure 19: Reuters user accesses development & growth rates, 1973-2007. 93

Figure 20: Reuters share price ($), daily closing prices, 1984-1989. 98

Figure 21: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1981-2007. 102

Figure 22: Major Reuters Acquisitions between 1985 and 1987 104

Figure 23: Share indices US & UK, rebased (start of January 1987 = 100), 1987-1988. 108

Figure 24: Cyclically adjusted price-earnings ratio (CAPE, S&P 500), 1984-1987. 108

Figure 25: Market share in financial data market, 1991-1999. 116

Figure 26: Bloomberg user accesses (terminals), total yearly. 125

Figure 27: Bloomberg user accesses yearly growth rate (%), 1991-2010. 125

Figure 28: S&P 500 share index, 1995 – 2001, USD. 131

Figure 29: S&P 500 share index & CAPE, 1995 – 2001, USD. 132

Figure 30: S&P 500 & NASDAQ stock indices, 1995-2001, USD. 133

Figure 31: FTSE100 share index, 1995-2001, USD. 133
Figure 32: Reuters share price ($), daily closing prices, 1984-2007. 136
Figure 33: Information strategy of central banks during times of distress. 166
Figure 34: Lifeboat funds outstanding in million GBP, 03/1974 – 03/1978. 176
Figure 35: Yearly term frequency in FT articles for selected popular Lifeboat terms, 1971-1979. 187
Figure 36: TED spreads in %, overall (spread 3-month LIBOR & 3-month Treasury Bills), 1987-2010. 207
Figure 37: TED spreads in %, during different crises, 1987-2010. 207
Figure 38: LIBOR and Federal Funds Rate, January 2007 to December 2009, USD based. 208
Figure 39: Focus points for central banks' information strategy during the GFC, 2007-2008. 209
Figure 40: Development of outstanding US bonds and MIS revenue. 255
Figure 41: Development of outstanding US bonds and example of MIS revenue by segment. 257
Figure 42: Total number of all ratings per NRSRO in US, 2007 – 2011. 258
Figure 43: Number of ratings by NRSRO per SEC segmentation, 2007 – 2011. 258
Figure 44: Moody's overall financials & MIS revenue per rating segment, 1998 – 2011. 260
Figure 45: MIS share of revenue and revenue growth per rating segment, 2000 – 2011. 262
Figure 46: Moody's stock price development and Inter-day volatility (%-changes), 2000 – 2011. 262
Figure 47: MIS analysts, employees, & revenues; revenues per rating in each segment, 2000 – 2011. 263
Figure 48: Big-3 total ratings per rating class and %-changes, 2007 – 2011. 265
Figure 49: "Small" rating firms' development and ratings per segment, 2007 – 2011. 267
Figure 50: Sovereign ratings by MIS & S&P for countries during the Asian financial crisis of 1997. 275
Figure 51: Sovereign ratings by MIS & S&P for emerging market economies during 1990s crises. 276
Figure 52: Enron stock price development and major rating events in 2001. 279
Figure 53: Enron MIS & S&P rating development in 2001. 279

Tables

Table 1: Financial information market, global spending. 151
Table 2: Growth in financial information market, by segment. 151
Table 3: MIS & A.M. Best Insurance ratings, ratings distribution & 10-year performance. 270
Table 4: Descriptive Statistics – GFC dataset. 291
Table 5: Simple OLS – Unsolicited vs. solicited ratings effect on stock price changes and volatility. 293
Table 6: OLS – Unsolicited vs. solicited ratings effect on traded volume and value. 293
Table 7: OLS – Number of analysts effect on price changes and volatility (incl. controls) 295

Exhibit

Exhibit 1: Reuters first ad for the Reuters Monitor Money Rates; Financial Times, 24.05.73. 81

Exhibit 2: Hill Samuel dealing room announcement with Reuter MMR; Financial Times, 21.01.74. 86

Exhibit 3: Chase Manhattan's dealing room ad for the Reuter Monitor; Financial Times, 10.11.76. 87

Exhibit 4: Samuel Montagu ad for the Reuter Monitor; Financial Times, 11.03.77. 88

Exhibit 5: Reuters ad for the Reuters Money Dealing Service; Financial Times, 23.02.82..... 94

Exhibit 6: Reuters Monitor Money Rates; Financial Times, 18.06.74..... 95

List of abbreviations

ABS	Asset-Backed Security
AFP	Agence France-Presse
AP	Associated Press
BBA	British Bankers' Association
BIS	Bank for International Settlements
BHC	Bank Holding Company
BoE	Bank of England
CAGR	Compound Annual Growth Rate
CAPE	Cyclically Adjusted Price-Earnings
CCC	Competition and Credit Control
CDO	Collateralized Debt Obligation
CDS	Credit Default Swap
CEO	Chief Executive Officer
CFTC	Commodity Futures Trading Commission
CLCB	Committee of London Clearing Bankers
CPI	Consumer Price Index
CRA	Credit Rating Agency
DM	Deutsche Mark
ECB	European Central Bank
FDIC	Federal Deposit Insurance Corporation
FCIC	Financial Crisis Inquiry Commission
FED	Federal Reserve System
FIRE	Finance, Insurance, Real Estate
FNFC	First National Finance Corporation
FOMC	Federal Open Market Committee
FT	Financial Times
FX	Foreign Exchange
G10	Group of 10
GDP	Gross Domestic Product
GFC	Global Financial Crisis
GSE	Government Sponsored Enterprise
HBOS	Halifax Bank of Scotland
IBB	Israeli British Bank
IMF	International Monetary Fund
LOLR	Lender-of-Last-Resort
L&C	London & County Securities

MBS	Mortgage-Backed Securities
MIS	Moody's Investor Service
MMR	Reuters Monitor Money Rates
M&A	Merger & Acquisition
NASDAQ	National Association of Securities Dealers Automated Quotations
NRSRO	Nationally Recognized Statistical Rating Organization
OCC	Office of the Comptroller of the Currency
OECD	Organization for Economic Cooperation and Development
OPEC	Organization of Petroleum Exporting Countries
OTC	Over-the-Counter
OTS	Office of Thrift Supervision
PDCF	Primary Dealer Credit Facility
P/E	Price-to-Earnings
RBS	Royal Bank of Scotland
RES	Reuters Economic Services
SCAP	Supervisory Capital Assessment Program
SEC	United States Securities and Exchange Commission
SF	Swiss Franc
SIFI	Systemically Important Financial Institution
S&P	Standard & Poor's
TAF	Term Auction Facility
TARP	Troubled Asset Relief Program
UK	United Kingdom
US	United States (of America)
USD	United States Dollar
WSJ	Wall Street Journal

Abstract

This dissertation investigates the evolving role and nature of information in financial and banking crises from 1973 to 2008. It develops a theoretical framework to understand various information types (public vs. private, soft vs. hard), channels, and processes in financial and banking markets, including their alteration in periods of heightened uncertainty and volatility (Chapter 2). The thesis first examines the market for financial information from its formation in the late 1960s and 1970s, tracking its evolution from regional and asset-class monopolies to a centralised, duopolistic structure. This analysis includes the impact of crises such as the turmoil in FX markets following the 1973 Arab-Israeli war, the 1987 stock market crash, the Dotcom bubble burst in 1999/2000, and the GFC (Chapter 3). The project then focuses on central banks' information strategies, entailing both information acquisition and broadcasting during crises. It examines the BoE during the 1973-74 secondary banking crisis and the Fed during the 2008 GFC, revealing changes and continuities in central bank information strategies across different environments (Chapter 4). Additionally, the thesis delves into credit ratings as an information source for investors, exploring the role of ratings and rating agencies, and their impact during significant crises including the Asian Financial Crisis, Enron's collapse, and the GFC (Chapter 5). Adopting a transnational and comparative approach, the dissertation highlights key informational elements in these case studies, contextualised within their unique regulatory, social, and economic settings. The research is grounded in a diverse array of sources, combining novel and established qualitative and quantitative archival materials from private and public institutions. This archival evidence is complemented by other sources such as court cases, newspapers, oral history interviews, and publicly accessible databases to allow for detailed analysis of the respective research questions.

Long Abstract

Information is at the centre of finance and banking. Core models in modern finance and banking rely fundamentally on 'information' as a concept for analysis, such as the efficient market hypothesis assuming that all available, relevant information is reflected in market prices, or concepts of information asymmetry in banking markets explaining the deposit and loan operations of banks. Furthermore, information is at the core of prudential supervision by central banks and regulators, in order to fulfil their financial stability mandate. However, besides this central position of information in the academic debate and everyday reality in financial markets, a detailed study of its influence and diffusion within the context of modern financial and banking crises, looking into different kinds of information, its sources and channels, as well as their constitution and interrelation over time and especially between normal times and times of distress in financial and banking markets is yet outstanding. Thus, this thesis is focused on these themes in the context of the fast-changing period in modern finance between 1973 and 2008. It looks in detail into several case studies, such as the financial and banking crises of 1973/74, the stock market crash of October 1987, the burst of the Dotcom bubble in 1999/2000, and the global financial crisis of 2007/08.

This thesis investigates core questions of the role of information in modern financial and banking crises: What 'forms' of information (public v. private, soft v. hard etc.) do actors in financial markets seek out, and use for decision-making? How does this change during a crisis, or why might we observe persistence in the informational intake and processing? How persistent are changes to this informational process after a particular crisis has been resolved? If we conceptualise a market for information in finance and banking, what are the key drivers that affect supply and demand for information, both during normal times and during times of distress? By first reviewing the current literature and debates relating to 'information' in the context of finance and banking from various corners of economics, as well as from historical perspectives, this thesis develops a theoretical framework to guide the primary source analysis.

At the core of the framework is the process of information, defined along the lines of information acquisition, information processing, and decision-making as conceptually separate, yet highly interrelated steps in this process. Various distinctions are drawn between sources, channels, and forms of information, that emphasize the complex interplay of these dimensions, which are often only subsumed as a single idea of information. Based on the established academic literature and the conceptualisation in the theoretical framework, special attention is given to the nature of this information process during times of increased volatility and uncertainty in financial crises. Several working hypotheses are derived from the theoretical framework, which are discussed in the light of the empirical evidence provided in the main analysis.

The developed theoretical framework is then used as a basis for analysis of the role and changing nature of information along the information process, by looking at the period between 1973 and 2008 from three different perspectives. The first part looks at the supply side of information in finance, by focusing on the development of the market for financial information over the research period and within four case studies. Using new primary archival sources from the Reuters archive, oral history interviews, and further evidence from newspapers, court cases, and official public inquiries, this first part traces the development of the modern market for financial information from its transformation in the 1970s as a market structured along geographical and asset class information monopolies, through a phase of consolidation in the late 1980s and early 1990s, to the emergence of the defining market duopoly between the incumbent British firm Reuters and the fast-growing and later dominating Bloomberg in the late 1990s and early 2000s.

The four case studies and individual crises had varying, yet more idiosyncratic influences on the firms supplying information to financial and banking companies than the theoretical assumption of the importance of fast and reliable provision of information during times of increased uncertainty would suggest, with the crises often acting more as catalysts that amplified developments that could already be observed before the times of distress. The examples of Reuters and Bloomberg show that these information providers do change their interaction with their

customers in financial markets during times of distress, in the short term by adapting their sales and go-to-market strategy, and in the medium term by restructuring and adapting their product portfolios and organisational setup. Thereby, the respective competitive environment and structure of the market for financial information appears to play a central role influencing these adaptations, as well as the respective impact of the crises on the demand side of the market, namely financial firms, which adapt their informational demand with different speed to the shocks.

The second part of the analysis focuses on the information strategy of central banks during times of distress, especially in banking markets. Central banks' information strategy is conceptualised encompassing two core elements to fulfil their financial stability mandate: the gathering or acquisition side of information, and the broadcasting and signalling of information towards external stakeholders. The first part of this is focused on information acquisition and (internal-)diffusion of that information: What information do central banks gather, how do they do it, and why and how might this change during banking crises? The second part of the concept is concerned with the broadcasting and (external-)diffusion of information by central banks: Which information do central banks release and why, how do they broadcast it towards different stakeholders, and again, does this change during banking crises? The analysis is based on archival primary sources from the Bank of England archive, further private archives, memoirs by central bankers and policymakers, newspapers, evidence submitted to official public inquiries such as the Financial Crisis Inquiry Commission or the Wilson Committee, and court cases such as Bloomberg v. Federal Reserve Board of Governors.

This second analytical chapter emphasizes the profound importance of central banks' information strategy as part of their crisis response, looking in detail into the height of the secondary banking crisis in the UK in 1973/74 and the global financial crisis in 2007/08. The actions of the Bank of England during the secondary banking crisis in late 1973 and early 1974 emphasize the changing information strategy of the BoE during the crisis, dependent on the respective 'information environment'. The BoE tried to walk a narrow line between reassuring the financial

and banking system on the one hand, and opting for opacity about its individual support on the other hand, while relying heavily on the Lifeboat consortium for its information acquisition and processing. In contrast, the actions especially of the Federal Reserve during the height of the global financial crisis occurred after significant changes to central banks' general communication towards and engagement with stakeholders such as financial markets, legislators, and the wider public. Yet, several central elements in the central banks' information strategy are highly comparable to the BoE's approach four decades earlier: the emphasis on soft information acquisition at the height of the crisis, the reliance on and support of private companies in this regard, as well as the changing emphasis on partial transparency over obscurity, highlighted on the publication of methods and results of stress tests to overcome remaining uncertainty in financial markets. Although in both cases the experience of inadequate information led central banks and legislators to advocate and ultimately implement profound changes to the supervisory function regarding information acquisition and provision to central banks, the comparison between the two crises occurring in distinctively different political, institutional, and economic environments shows remarkable persistence in several areas.

The third analytical chapter focuses on the use of information by investors between 1973 and 2008 in the context of credit ratings and the institutions that provide them. This analysis draws out the historical development of the CRA market and discusses ratings as sources of information for investors within their changing regulatory context in the latter half of the 20th century. By exploring novel data and sources from official inquiries, rating agencies, court cases, the SEC, the BIS and other institutions, this chapter traces the discussions surrounding the CRA market with its Big-3 hegemony and its interrelation with the purpose of ratings as information products over time and during different crises such as the Asian Financial crisis, the collapse of Enron and the GFC. By collecting and analysing a new dataset on solicited and unsolicited ratings for firms in the US, UK, and Germany during the GFC, the value investors place on the implied different informational value of these rating categories during a crisis is further examined.

This third part of the analysis highlights the limitations in the academic debate about credit ratings and the historical understanding of the evolution of CRAs and ratings as quasi-regulatory tools, especially regarding their informational value for investors. It shows how ratings became integrated first into SEC regulation and subsequently in US federal and international regulation initially as a by-product of a harmonisation process for net-capital rules by the SEC modelled on the general adoption of the NYSE rule book between 1972 and 1975. The subsequent expansion of the NRSRO concept in the US obscured exact assessments of the additional informational value investors might derive from ratings over other market-based indicators. The structure of the CRA market in the US, with the prevailing narrative of the Big-3 agencies' hegemony, could partially be affirmed, yet a closer look at different segments of the rating market shows that there are significant movements of smaller and international CRAs especially in the 1990s and early 2000s entering and exiting the market in sub-sectors. These smaller agencies focused their business model on the parts of the rating business where hard, scalable information are the key components in their rating methodology, such as ratings for insurance companies and financial institutions. The Asian Financial crisis, the Enron collapse, and the GFC all represented decisive inflection points in the development of this market and in the use of ratings by investors, leading ultimately to considerable changes such as the Credit Rating Agency Reform Act of 2006 in the US and the rating provisions in the Dodd-Frank Act. Testing for different information values of ratings by using a new dataset of unsolicited (only public information) and solicited (private and public information) ratings during the collapse of Lehman Brothers in September 2008, the analysis did not find a significant relationship with outcomes such as stock price volatility or traded volume, indicating investors did not value the additional private information derived from solicited ratings. However, other indicators of information level on a firm basis, such as sell-side analyst coverage, provided statistically significant results, indicating investor reliance on other indicators than ratings during times of increased volatility.

As highlighted throughout this dissertation, especially the continuum between different types of information, namely public and private, and soft and hard information, plays a central role in all three analytical chapters and binds them together. These elements can be found for example in the recurring tendency by information providers such as Bloomberg and Reuters to add private attributes to public information through proprietary information provision in certain markets (FX, fixed income etc.); in the importance placed by central banks on soft information gathering during banking crises, while balancing dynamically in their broadcasting between publicizing support operations (public) and remaining opaque on core elements of their support (private); and in the structuring effect played by different types of information focused on in sub-sectors of the CRA market, while the regulatory entanglement of CRAs since the 1970s limited the informational value of credit ratings for investors.

Chapter 1 – Introduction

Information has always been at the core of financial and banking markets because it is the underlying resource required to overcome the barriers of time and space between borrowers and lenders enabling transactions. Fundamental models in modern finance and banking rely on 'information' as a concept for analysis. For example, the efficient market hypothesis assumes that all available, relevant information is reflected in market prices (see e.g., Delcey 2018, Niroomand, Metghalchi et al. 2020). The concept of information asymmetry in banking markets remains fundamental to explain the deposit and loan operations of banks, as well as the emergence and prevalence of information intermediaries such as investment banks or credit rating agencies (see e.g., Reinhart 2002, Sylla 2002, Ivashina 2009). Furthermore, information acquisition is central to prudential supervision by central banks and regulators in order to fulfil their financial stability mandate, and developments such as inflation-targeting and increased transparency in central bank decision-making rely on efficient and open information dissemination (see e.g., Woodford 2013, Stenfors 2014). Information supply to financial and banking markets, analyzed in detail in chapter 3 to 5 of this dissertation, plays a central role in the efficient working of these markets, as Frank Knight pointed out already in 1921:

> "The collection, digestion, and dissemination in usable form of economic information is one of the staggering problems connected with our modern large-scale social organization. It goes without saying that no very satisfactory solution of this problem has been achieved (…) But all these specialized agencies for the supply of information help to bridge the wide gap between what the individual business manager knows or can find out by the use of his own resources and what he would have to know to conduct his business in a perfectly intelligent fashion. Their output increases the value of the intuitive 'judgments' on the basis of which his decisions are finally made after all, and greatly extends the scope of the environment in relation to which he can more or less intelligently react." (Knight 1921)

The emphasis on what might be called hard information in Knight's quote, as well as the importance he ascribes to soft information in other circumstances is a recurring feature throughout this thesis, along with the continuum (or spectrum) of other information types such as public and private information (see chapter 2). How financial and banking institutions acquire, process, and

use different types and channels of information as a basis for decision-making has significantly evolved between the 1970s and 2000s. A piece in *The Economist* from 2019 summarized these changes with regard to information and communication technologies (ICT) using a graphic example: "Even by the 1980s, reading the Wall Street Journal on your way into work, a television on the trading floor and a ticker tape offered a significant information advantage. Since then, the role humans play in trading has diminished rapidly".[1] Besides significant advances in ICT, other developments had a major impact on the role and use of information in finance and banking, such as changing national and international regulatory frameworks, financial innovation, globalisation, and financialisation.

Information is often incorporated in economics and finance as a passive, exogenous variable. Studies for example use news releases, or announcements about macroeconomic (e.g., interest rate changes, unemployment figures) or firm-specific fundamentals (e.g., quarterly and annual statements) to estimate the impact of the respective information on security prices or other outcome variables (see e.g., Admati and Pfleiderer 1988, DeGennaro and Shrieves 1997, Berger and Davies 1998, Hellwig 2004, Fraiberger, Lee et al. 2018). However, research on information from an *active* perspective, incorporating the entire information process along the lines of information acquisition, processing and decision-making, is sparse at best (for some recent examples of this active treatment see e.g., Tetlock 2014, Calomiris and Mamaysky 2019, Bai, Boyson et al. 2023). Recent studies in economic and financial history have more broadly engaged with information in its different social and economic context. In her exploration of J. P. Morgan, Susie Pak for example considered information sharing and transmission within business and social networks a key component in explaining the formation and dominance of Morgan's bank (Pak 2013). In his history of the Bank of England (BoE) between 1979 and 2003, Harold James focused at length on the changes to transparency and communication that the central bank undertook in this period (James 2020). Other historical studies especially for the 19th and early 20th century consider information as

[1] The Economist, '*March of the machines*', unknown author, 05.10.19.

an essential part in their respective narratives, for example in Niall Ferguson's history of international bond markets prior to the First World War, or in the work by Flandreau *et al.* on underwriters' reputation in 19th and 20th century bond markets (Ferguson 2006, Flandreau, Flores et al. 2010). These are just a few examples of this treatment by historians and economists of information in financial and banking markets. Yet, many aspects of the information process in financial and banking markets, and its changes in the second half of the 20th century from an active perspective (such as information types, channels, processing etc.), are still under-researched.

At the same time, information is a fundamental aspect of financial and banking crises. Economists and economic historians have produced an enormous body of work on crucial aspects of financial crises such as contagion or explanatory and preventive factors, best represented by the work of Charles Kindleberger or Hyman Minsky (Kindleberger 1978, Kindleberger and Laffargue 1982, Minsky 1992, Rosser, Rosser et al. 2012). Due to its severity and longevity, especially the sub-prime crisis in the US, the resulting Global Financial Crisis (GFC), and European sovereign debt crisis starting in 2008/2010 have sparked a further increase in academic and public attention on financial crises, as Barry Eichengreen's *Hall of Mirrors* or *Crashed* by Adam Tooze show in exemplary ways (Eichengreen 2015, Tooze 2018). But the changing nature and role of information within financial crises has rarely been focused on (a notable exception represents for example the work by Gorton et al., see Gorton 2015, Dang, Gorton et al. 2020). In short, increased volatility and uncertainty in financial and banking markets during times of distress expose institutions in these markets to increased potential for gains and losses. The risk-return assessment of institutions and individuals require repeated re-evaluation under these changed circumstances. Thus, the acquisition and processing of reliable and timely information as a basis for decision-making becomes more valuable and important – chapter 2 addresses this at length.

This thesis project combines both an active perspective on information along the information process from acquisition, to processing, and to decision-making over the period from 1973 to 2008/09, with a focus on financial and banking crises. Several underexplored questions

about the role of information in modern financial and banking crises stand at the core of this investigation. What forms or types of information (public v. private, soft v. hard etc.) do actors in financial markets seek out, and rely on for decision-making? How does this change during a crisis, or why might we observe persistence in the informational intake and processing? How persistent are changes to this informational process after a particular crisis has been resolved? How and why might we observe organisational and procedural changes or persistence of financial institutions with regard to the information process? Each of the main chapters of this thesis explores these overarching themes by asking questions about specific aspects of information in financial markets. The focus for each chapter can be summarized in the following questions that are detailed in the respective sections. If we conceptualise a market for information in finance and banking, why and how does supply (by information suppliers such as Reuters and Bloomberg) and demand (from banks, broker-dealers etc.) for information change during normal times and during times of distress (chapter 3)? How do central banks react to distress in financial and banking markets regarding information gathering and broadcasting (adapt their information strategy) from and to different stakeholders (chapter 4)? And how does the role of information intermediaries such as credit rating agencies (CRAs) and the use of their service by financial institutions change over this period and within different crises (chapter 5)?

The structure of this thesis aims to shed light on these questions from several distinct perspectives, which are connected through the common thread of information from an active perspective. The project adopts a transnational approach to these questions, focusing in particular on the UK and the US, but also considers developments in other advanced economies such as Germany. As many of the aspects and themes investigated are at their core transnational (such as the evolution of the market for financial information or the role of information intermediaries), this structure also allows drawing broader comparisons across time and space. It spans a period of financial and banking crises from the turmoil in capital, foreign exchange, and banking markets in 1973/74 in the US and UK, to the GFC of 2007/08.

By first reviewing the literature and debates relating to information in the context of finance and banking from various corners of economics and from diverse historical perspectives, this thesis develops a theoretical framework to guide the primary source analysis (chapter 2). At the core of the framework is the process of information, defined along the lines of information acquisition, information processing, and decision-making as conceptually separate, but highly interrelated steps. Various distinctions are explored between sources, channels, and types of information that emphasize the complex interplay of these dimensions often only subsumed as a single idea of information. Based on the established academic literature and the conceptualisation in the theoretical framework, special attention is given to the nature of this information process during times of increased volatility and uncertainty in financial and banking crises. The theoretical framework is picked up and discussed in light of the empirical evidence provided in the analytical chapters 3-5. Each chapter expands on the overall theoretical framework by extending it further regarding the subjects focused upon in the respective chapter (the market for financial information in chapter 3; central banks' information strategies in chapter 4; and credit ratings and CRAs as information sources and information intermediaries for investors in chapter 5).

The first analytical chapter looks at the supply and demand of information in financial and banking markets, by focusing on the development of the market for financial information from the early 1970s to 2008/09 (chapter 3). It traces the development of the modern market for financial information, which supplies basic and proprietary price information, journalistic news, and information processing capabilities directly to customers in financial markets through the means of ICT. To date, there is at best sparse historical engagement with this market.[2] Most of the existing accounts are written from journalistic perspectives (see e.g., Tunstall and Palmer 1991, Bartram 2003), or consist of memoirs and autobiographies of former executives from this markets' leading firms (see e.g., Mooney and Simpson 2003, Jessop 2008, Bloomberg 2019). A dedicated account,

[2] Donald Read's official company history of Reuters posing one notable example, yet it primarily focuses solely on Reuters company history, does not focus on financial or banking crises, and was written almost a quarter-century ago (see Read 1999).

focusing on the changing interrelation of this market for financial information with its clients in the financial industry especially during times of distress, is lacking.

Chapter 3 shows a profound transformation of this market from the 1970s, when its modern form emerged as a market structured along geographical and asset class information monopolies. It went through a phase of consolidation in the late 1980s and early 1990s, leading to the emergence of a duopoly between incumbent British firm Reuters and the fast-growing (and later predominant) US company Bloomberg in the late 1990s and early 2000s. In conjunction with this overall market development, four case studies of financial crashes and crises are investigated in detail: The turmoil in foreign exchange markets following the breakdown of the Bretton Woods regime and the outbreak of the Arab-Israeli war in late 1973; the short-lived yet severe crash in equity prices surrounding the October 19, 1987 crash; the burst of the Dotcom bubble and the adjunct decline in US stock markets around the turn of the millennium; and the GFC.

The four case studies and individual crises had a varying, yet more idiosyncratic effect on the firms supplying information to financial and banking companies than the theoretical assumption of the importance of fast and reliable provision of information during times of increased uncertainty might suggest. In fact, the crises often acted more as catalysts, amplifying developments that were already ongoing before the crises. These analyses can tell us both about the supply of information (through firms such as Reuters and Bloomberg) in financial crises, as well as the demand for information products by financial professionals and investors.

The history of Reuters and Bloomberg show that these information suppliers do change their interaction with their customers in financial markets during times of distress, in the short-term by adapting their sales and go-to-market strategy, and in the medium-term by restructuring and adapting their product portfolios and organisational setup. Thereby, the respective competitive environment and structure of the market for financial information appeared to play a central role influencing these adaptations. The turmoil in FX markets starting in October 1973 occurred just months after Reuters had launched a new revolutionary product, the Reuters Monitor

Market Rates (MMR), to bring more transparency and more timely price information into a market that used to operate on a bilateral basis. Yet, inertia by financial institutions in the adoption of the new information system, connected with lacking network effects at the launch of the MMR that depended on the contribution of financial institutions for its information provision, almost caused the endeavour to fail. However, after the immediate collapse was averted and subscriptions to the MMR took up in the following months, the Monitor developed into an information system that revolutionized first foreign exchange markets and subsequently information supply in many other asset markets.

The respective impact of the crises on the demand side of the market (financial institutions), which adapted their informational demand with different speed to the various shocks, was another central element to explain the varying impact on the information suppliers. The collapse in technology stocks within the burst of the Dotcom bubble for example brought an end to the long-standing hegemony of Reuters in this market for financial information. It occurred in an environment where basic price information on esp. exchange-traded assets such as stock price information had become largely commodified through low-cost internet suppliers, while esp. Bloomberg cemented a leading position in the high-end of the market. Demand for Reuters products by financial firms dropped perceptively during and after the crisis at the turn of the millennium. Financial institutions restructured their information acquisition strategies during the crisis to the disadvantage of Reuters, which left the supplier that had led the transformation of this information market in the 1970s and 1980s severely damaged (chapter 3).

The second analytical chapter focuses on the information strategy of central banks during times of distress, especially in banking markets (chapter 4). Central banks' information strategy is conceptualised as encompassing two core elements to fulfil their financial stability mandate: The gathering side of information, and the broadcasting of information to external stakeholders. The first part of this is focused on information acquisition and (internal) diffusion of that information: What information do central banks gather, how do they do it, and why and how might this change

during banking crises? How do they cooperate in information sharing with other authorities (other national or international regulators) and how might this change during times of distress? The second part of the concept is concerned with the broadcasting and (external) diffusion of information by central banks: Which information do central banks release and why, how do they broadcast it towards different stakeholders, and again how and why does this change during banking crises?

Economists and historians have been increasingly paying attention to changes in central bank communication in the latter half of the 20th century (see e.g., Capie 2010, James 2020). This went along with a multitude of studies focused on particularities of central bank communication such as forward-guidance and central bank stigma (see e.g., Woodford 2013, Armantier, Ghysels et al. 2015, Abreu and Lopes 2022), and central bank engagement with the increased importance of their communication during financial and banking crises as part of their policy response (see e.g., Cieslak and Schrimpf 2018, Unsal and Garbers 2020). Yet, a historical analysis comparing different cases of banking crises over the time of fundamental changes in central bank communication since the 1970s, including both the gathering and broadcasting side of central banks‘ information strategies and their role in crisis response and resolution, is yet outstanding.

This chapter emphasizes the profound importance of central banks' information strategies as part of their crisis response, looking in detail at the height of the secondary banking crisis in the UK in 1973/74 and the GFC in 2007/08. The actions of the Bank of England during the secondary banking crisis in late 1973 and early 1974 emphasize the changing information strategy of the BoE during the crisis, dependent on the respective information environment. The BoE tried constantly to achieve a balance between reassuring the financial and banking system on the one hand, and opting for opacity about its individual support on the other hand, while relying heavily on the Lifeboat consortium for its information acquisition and processing. In contrast, the actions especially of the Federal Reserve during the height of the GFC occurred after significant changes to central banks' general communication toward and engagement with stakeholders such as financial

markets, legislators, and the wider public. Yet, several core elements in the central banks' information strategy are highly comparable to the BoE's approach four decades earlier: the emphasis on acquiring soft information at the height of the crisis; the profound reliance in the short-term on (and support of) private companies in this regard; and the reassessments and shifts between transparency and opacity in information broadcasting based on the respective information environment as the crises developed. The dynamic changes in information environments during these crises might be best highlighted for example by the publication of detailed stress tests to overcome remaining uncertainty in financial markets in 2009, which stood in stark contrast to the opacity under which the Fed operated in its support for banks and financial institutions throughout most of 2008. Although in both cases the experience of inadequate information led central banks and legislators to advocate and ultimately implement profound changes to the supervisory function regarding information acquisition and provision to central banks, the comparison between the two crises occurring in distinctly different political, institutional, and economic environments shows remarkable persistence in several of these areas.

Chapter 5 focuses on the changing role of CRAs and the service they provide as information intermediaries in capital markets (chapter 5). As in chapters 3 and 4, the different types of information along the lines of public and private, and soft and hard information as drawn out in chapter 2 play a central role. Information suppliers such as Reuters and Bloomberg repeatedly tried to add more private (proprietary) attributes to the services and products they provide (chapter 3). The analysis of central banks' information strategy in financial and banking crises highlights the importance placed on soft information in their information gathering strategy (due to the advantage of timely provision of this information), while balancing repeatedly between publicizing and remaining opaque about their support measures in a dynamic information environment (chapter 4). Chapter 5 emphasizes the effect of the choice for different information types in the ratings process of different agencies on the structural setup of the CRA market. Smaller agencies especially focused sub-sectors of the market in which hard, scalable information could be employed

in the ratings process (insurance, financial institutions), while they stayed away from the sovereign rating sector, in which soft information characteristics have to be included in the rating process. At the same time, the increasing regulatory entanglement of CRAs since the 1970s diminished the informational value investors could derive from ratings, emphasizing the key difference of these information intermediaries for example to their precursors in the late 19th and early 20th century such as Henry Poor's 'Manual' or Lloyd's register, but also to information suppliers such as Reuters or Bloomberg.

CRAs have increasingly developed into a defining feature of modern capital markets through the regulatorily increased use of their assessments of creditworthiness of bond issuers and individual issues by investors and regulators. From the perspective of information, CRAs provide a service to investors by assessing different kinds of information (soft & hard, public & private etc.) and condensing these into an easy-to-use numerical score signaling relative creditworthiness, which is monitored and updated by CRAs (Majnoni, Levich et al. 2002). At the same time, they provide a service to regulators using these assessments as a short-cut and outsourcing of credit assessment in regulation to guard financial stability (White 2006). This aspect has grown in importance, especially since the increased use of credit ratings in US federal legislation from the 1970s onwards, and the subsequent spread of ratings as a tool in other national and international regulatory frameworks such as in the Basel II process (Reinhart 2002). Partially driven by this regulatory entanglement, the informational value investors derive from credit ratings both during normal times and times of distress remains unclear and disputed (Partnoy 2002, Wilson 2011). Financial institutions and regulators at various times criticized CRAs as both being too slow to adjust their ratings when other market indicators had already moved, and too fast to adjust them and thus precipitating a crisis in the first place (Ferri, Liu et al. 1999, Sylla 2002, Smith and Wright 2021).

This chapter expands the prevailing narratives about CRAs, often focused on the Big-3 agencies dominating the market, by looking closely at the different segments of the credit rating market and its regulatory interrelations. The CRA market developed primarily in the US, with its

regulatory interrelation and special status as quasi-regulatory agencies introduced by NRSRO status for some agencies designated by the SEC resulting out of historical path-dependency. The prevailing narrative regarding the Big-3 agencies dominating the rating market in a rigid, regulatory-interlinked system could partially be affirmed, yet the CRA market also shows more dynamic developments in some sub-sectors (esp. in ratings for insurers and financial institutions). New market entries appeared more frequently than often claimed in these sub-sectors, and showed a distinct concentration in areas where the rating methodology could rely more on scalable, hard information for rating methodologies (in comparison to more soft information, for example in sovereign ratings). The chapter then explores three crises and collapses with major implications for CRAs, their regulatory interlinking, and the informational value of their ratings to investors: the Asian financial crisis, the collapse of Enron, and the GFC. The three crises had major implications for the development of CRAs regarding their regulatory role and thus the informational value of their ratings. The crises acted as triggers and major inflection points, promoting and establishing reforms circling around ideas that had lingered around the US regulatory spectrum at least since the 1990s. For US regulators and legislators, the primary concern was to increase transparency, abolish entry-barriers into the CRA market, and ultimately restore the informational value of credit ratings. But it took the three consecutive crises to push-through the respective reforms, culminating in the Credit Rating Reform Act of 2006 and the respective provisions of the Dodd-Frank Act.

Finally, by compiling a new dataset in the context of the Lehman failure of 2008 on two distinct rating categories (unsolicited and solicited), which are characterised by distinct information fundamentals used in the rating process, the informational value of different rating categories for investors is tested in crisis circumstances. Firms with solicited ratings, which in theory convey additional private information about the firm to investors over unsolicited ratings based solely on publicly available information, did not experience significantly different outcomes regarding variables such as stock price volatility, or traded stock volume. However, other indicators of firm-

level informativeness such as analyst-coverage did have a significant effect on these outcomes, in line with previous findings regarding investor behaviour in periods of increased uncertainty and volatility (Loh and Stulz 2018). Yet, the different informational value of either rating category does not seem to have influenced investors' decisions.

This dissertation project approaches the overarching research questions, and specific questions in each of the main chapters, by engaging with a wide range of quantitative and qualitative sources. The historical analysis of archival primary sources forms the cornerstone of the analysis. They were collected from a variety of private and public institutions such as the Bank of England (BoE), the Federal Reserve (Fed), the British Bankers Association (BBA), the Committee of London Clearing Banks (CLCB), the SEC, the UK and US Treasury, the British National Archives, Reuters archive, Barclays Bank archive, and Barings Bank archive. Due to the focus of the project on the period of post-1973, not all archival sources are already declassified and open for investigation. Thus, the archival sources are supplemented by other source material released through public and parliamentary inquiries (such as the Financial Crisis Inquiry Commission (FCIC) in the US and the Wilson Committee in the UK), court cases and judicial investigations (such as *Bloomberg L.P. v Board of Governors of the Federal Reserve System*), and newspaper archives with a focus on the financial press (such as *Financial Times*, *Wall Street Journal*, and *The Economist*). On top of new quantitative data gathered from archival primary sources, further historical financial data is leveraged from financial information providers and platforms such as *CapitalIQ* or *WRDS* for descriptive statistics and regression analysis. Further, five in-depth oral history interviews with experts on the market for financial information have been undertaken for this project (chapter 3). They were conducted with former company directors, financial journalists, and heads of information technology at large international banking corporations, using the same standardised questionnaire to guide the interviews.[3]

[3] Central University Research Ethics Committee (CUREC) approval reference: R81369/RE001; Transcripts of the interviews have been created and approved by all participants. It is currently envisioned to deposit

Each individual source material has its limitations. Archival sources are bound to be limited by preservation bias in what information is being kept in the respective archives. Memoirs and public testimonies or enquiries are bound to present information with time-lags and might be influenced by a positivity bias of the authors or witnesses to absolve themselves. Newspapers are written by journalists with their own subjective perception and personal networks as sources, that might be captured or influenced one way or another. This dissertation addresses these short-comings and limitations by using a wider variety of different source materials and combining these in the analytical chapters. Where possible, archival sources, memoirs and testimonies are put into perspective by sources from different archives, judicial reviews or court cases. Quantitative information is collected and used wherever possible to bring additional data points into the discussion. For newspapers, most articles used and cited are from financial papers that were widespread and read by investors and bankers in London and New York, such as the Financial Times and the Wall Street Journal, to get an overview of market sentiment and external perception on the subjects discussed. As for the oral history interviews, the interviewees were questioned primarily not about their own achievements, but about their perception of developments within their organisations and the larger market for financial information, to avoid producing accounts that are too positively influenced.

By using a mix of qualitative and quantitative sources and analyses, the described overall approach enables the broad investigation of the research questions from several perspectives regarding the role of information within financial and banking crises between 1973 and 2008. However, it is important to acknowledge that not all aspects of information in financial and banking markets during times of distress can be focused upon in this dissertation. For example, banks continuously perform internal credit and risk assessments, which is a fundamental source of private information for bank decision-making (see e.g., Ghodrati and Taghizad 2014, Agarwal and Ben-

them with the Reuters Archive in London for future research use and public accessibility, after finalising this dissertation project.

David 2018). Studies, for example by Marron, and Leyshon and Thrift, have engaged with credit scoring systems for consumer credit from a historical point of view, another fundamental source of information for the operation of retail banks (Leyshon and Thrift 1999, Leyshon and Thrift 2007, Marron 2007). Further examples of aspects of information outside the scope of this thesis in financial markets can be found in research from brokers (see e.g., Maggio, Franzoni et al. 2019), the research and information provided by firms such as consulting companies (McKenna 2006), or the internationalisation and centralisation of monitoring in financial markets through institutional investors and mutual funds (see e.g., Coffee 1991, Chung, Firth et al. 2002). The empirical analysis in chapters 3-5 cannot resolve these aspects, as only a focused approach allows for detailed historical discussion of the presented evidence in the context of the theoretical concept developed in this thesis.

Chapter 2 – A theoretical framework of information and crises

Research in economics and finance has engaged with conceptions of information from various perspectives, such as the study of asymmetric information pioneered by Akerlof, Grossman and Stiglitz, or through the spectrum between hard and soft information (Akerlof 1970, Grossman and Stiglitz 1980, Liberti and Petersen 2018). In his 1921 dissertation, Frank Knight for example highlighted the importance soft information (in his words "other men's opinions and capabilities") plays in informing economic decision-making as the largest influence "on which any individual makes decisions in his own life" (Knight 1921). Conversely, Keynes discussion of the prevalence of different liquidity preferences in society employs the concept of "mass psychology" and the opposite "speculative motive" in an uncertain environment to explain economic decisions resulting in differences in savings and investment rates. The professional investor, in his famous "beauty contest" example, is in Keynes' opinion most concerned not with fundamental (hard information) and analysis, but with beating "mass psychology" and "foreseeing changes in the conventional basis of valuation a short time ahead of the general public (…) [and] thus is forced to concern himself with the anticipation of impending changes, in the news or in the atmosphere" (Keynes 1936).

Within these frameworks, the concept of information is often looked at in conjunction with related analytical models. For example, the close connection of the concepts of networks and soft information transmission in finance stands at the core of research by Shiller and Pound. In a survey study after the October 1987 crash, they found that one-third to one-half of US institutional investors stated that they were significantly influenced by either a contact's (friend, business associate) information about a stock or by their behaviour in buying the stock (Shiller and Pound 1989). However, what exactly constitutes *information*? What different types of information exist on an empirical level, and what might explain choices for one type over another at different times? How are these types of information acquired, transmitted, and processed, and why and how might this change over time? And how do crises influence these developments and processes compared to normal times? A growing body of research in economics, finance and financial history is

determined to address these critical questions (see e.g. Tetlock 2014, Goetzmann, Kim et al. 2016, Xu 2020, Zhang and Zhang 2020).

By first developing a framework based on empirical and theoretical findings on the aspects of information both in normal times and during financial crises, this project builds the conceptual basis for the analysis in chapter 3-5 for the period from 1973 to 2008. These 35 years witnessed fast-changing settings of business relations and processes with respect to the interrelation of financial institutions and information, heavily influenced by several macro-developments. Technological progress, especially in the field of ICT, enabled the application of ever faster information integration and processing into decision-making (Farrell, Green et al. 2018). The rise of high-frequency trading and passively managed index funds pose only two prominent examples of this development (Legg 1991, Frame and White 2012). Regulatory changes in the financial sphere, with May Day in the US (1975) and Big Bang in the UK (1986) as prime examples, opened up competition and innovation with a profound impact on information integration (Schenk 2014, Schenk 2020). These changes in the regulatory setup combined with fast technological advances amalgamated to spur financial innovation. Securitisation represents one example with its effects on dispersing information about risk and leverage of individual firms by taking them off traditional balance sheets (Flynn, Ghent et al. 2020). The extraordinary changes in consumer finance in the US in the late 20th century can be seen as another example of this combination between regulatory changes and technological advances (Vanatta 2016). As chapter 3 explores in detail, globalisation as another underlying trend increased demand from financial institutions for basic and proprietary price information, journalistic news, and analyses to support decision-making beyond traditionally focused upon geographies and asset classes (see chapter 3).

First, this chapter summarizes and explores the concept of information as used in finance and economics from various angles, focusing on analytically different types, channels, and processes of information diffusion. It then discusses information in financial crises, and changes or persistence in the information process compared to normal times. The elements of this theoretical

framework serve as the basis for the analysis of the empirical evidence provided in the main chapters (chapters 3-5).

1. Information in finance – types, channels, diffusion

Information in finance and banking

The study of asymmetric information evolved since the fundamental work by Akerlof or Grossmann and Stiglitz, and became a powerful explanation for inherent obstacles of financial markets and banking alike, implicating adverse selection, moral hazard or monitoring costs (Akerlof 1970, Grossman and Stiglitz 1980). In banking, asymmetric information manifests as borrowers have more information than lenders about intended projects, the setup and allocation of funds (Bebczuk 2003). Thus, to assess creditworthiness and efficiently price associated credit risk, lenders rely on information provided by borrowers (cash flow statements, business plans, collateral). The flipside of informational asymmetry in banking materialises as depositors cannot effectively observe the solvency of financial institutions, which is why effective regulators need to supervise these institutions (Diamond and Kashyap 2016).

Information in financial markets and banking can be defined on an individual actor (or institution) level as any fact or string of data that affects the assets under management of the financial actor, or the financial actor's economic fundamentals themselves. This assumes two general types of information in banking and financial markets: public and private. Yet, this definition requires further detailing. The essential components for a working framework of information from an active perspective can be based in the acquisition, processing and decision-making on different types of information (see Figure 1 and Figure 4). One important aspect to keep in mind is that information has a special character as an economic good. It basically has "a fixed cost of discovery and a near-zero cost of replication" (Veldkamp 2006). Thus, as demand rises for information, the individual user price for that information may decline as providers exploit volume for revenue. Chapter 3 explores this characteristic further in the context of information suppliers such as Reuters or Bloomberg. The underlying economics of the information industry significantly

shaped the historical development of these information suppliers from the 1970s to the GFC (see chapter 3).

Considering the cost and value of information, the area of finance takes a special position. The value of acquired information in finance is difficult to grasp, as financial products are fundamentally different in their informational value from consumer products. They are not bought for final consumption and are less expandable in scaling than consumption goods, as quantity often negatively influences quality (value) of financial products (Zhang and Zhang 2020). Additionally, the quality of information in finance is often (though not always) relative or relational. Quality often depends not only on someone's own knowledge, but whether this knowledge is shared by others. For example, assuming one might know the 'true value' of a security, there is no advantage in this knowledge as long as everyone else believes otherwise – only when more actors than oneself alone converge in their assessment can this become valuable (Zhang and Zhang 2020). Thus, a concept of the value of information must be per definition highly subjective to consumers of information. It often needs to provide an enhanced understanding of the subject at hand, its implications for the consumer's strategic choices, and must be shared at least in its fundamentals at some point in time by a wider audience. Social relations and networks are thus not only a fundamental channel for information dissemination, but also for the identification of the value of information.

Several types of information in financial markets and banking might be differentiated. As already pointed out, two fundamental types of information can be classified as 'public' and 'private' (Hellwig 2004). Public information is observable by all market actors and readily available. Private information is proprietary knowledge of individual actors or institutions that is not generally known to all market participants. As shown in Figure 1, the handling and processing of both these information types is central to the business models of banks and in financial markets, with implications for different kinds of information sources, processing, and disclosure. Both public and private information are leveraged to create a competitive advantage by banks and financial institutions in their respective markets. Yet, banking and financial markets differ in their level of

engagement with public and private information and where in their business model they rely on each category. In commercial banking, e.g., private information is the cornerstone on the asset side of the business (such as details on business plans, budgets, projections, strategy, cash-flows, customers etc.). On the liability side, public information is primarily shared between borrowers and lenders (e.g., through disclosure of balance sheets, quarterly and annual reporting etc.). In financial markets, price discovery through tradeable assets allows for the flow of public information between asset holders. Private information (e.g., through research departments, private networks etc.) becomes public over time through the same process of price discovery. However, developments in the banking and financial sector have blurred the distinction between banking and financial services institutions. On a converging trend in the latter half of the 20th century, many international banks and financial service providers started to offer both banking and financial services, leading to the formation of "financial conglomerates" (Van den Berghe and Verweire 2000). Thus, the overview in Figure 1 must be considered more as a continuum or spectrum, rather than a binary distinction.

Figure 1: The role of 'information' in banking & financial markets.

	Information in banking	**Information in financial markets**
Actors	– Commercial banks – Investment banks – Universal banks	– Brokers – Traders – Funds (Mutual funds, MMF, Hedge funds, Index funds etc.)
Business model focus	– Deposit intermediation (com. banks) – Underwriting & financial services (invest. banks) – Hybrid/combination (universal banks)	– Customer fees for financial services – Rent extraction through investments in financial market financed by shareholder system
Information in business model	– Deposit intermediation (matching of borrowers and lenders), rent extraction based on information about risk/creditworthiness of both parties – Underwriting and financial services, proprietary information about creditworthiness and financing options through personal connections	– Fees for financial services, provision of information on (financial) assets to customers – Investments in financial markets, rent extraction through proprietary information, market/business analyses and/or trading strategies
Sources of information	***Private:*** – Proprietary customer info. (cash flows, credit history, business plans etc.) – Private network & relations, esp. for business loans & transactions ***Public:*** – Rating agencies – Disclosure (e.g., Quarterly statements) – News & micro- and macro announcements	***Private:*** – Research departments – Proprietary information (e.g., personal networks, direct link to company C-Levels, expert networks) ***Public:*** – Rating agencies – Disclosure (e.g., Quarterly statements) – News & micro- and macro announcements
Disclosure	– Disclosure requirements (e.g., pillar 3 of Basel accord) on credit risk, operational risk, leverage ratio, risk-weighted assets & internal risk management / prudential metrics	– Continuous (semi-annual / quarterly) disclosure on portfolio investments to regulatory authority (e.g., SEC), as well as requirement to comply to regulatory guidelines on compliance

Information types, channels, and diffusion

As alluded to in the introduction, economic literature often deals with information as an exogeneous factor. Yet, this passive approach to information falls short in central aspects of the real world, mainly in engaging with the information process; from information acquisition, to processing, and decision-making based on various kinds of information (Figure 4). A more 'active' perspective in economics has been taken in recent years especially by Tetlock, Mamaysky and Glasserman (Tetlock 2011, Calomiris and Mamaysky 2019). The primarily theoretical economic literature treating information as a passive factor assumes in various ways that actors learn about information through observed events (such as price movements) in the market (Veldkamp 2011). Yet, "while such models clarify the role of information in aggregate outcomes, they do not tell us what information we may or may not observe" (Veldkamp 2011). So, taking this more active approach, what then are the essential channels and processes through which different types of information are transmitted in markets?

Public information

For public information, several channels and their effect on the financial market are well studied. Besides the 'passive' information entailed and derived in the process of price discovery (Baker and Kiymaz 2013, Füss, Mager et al. 2018), three main channels for an active concept of public information can be differentiated: general media, announcements/information by public institutions, and announcements/ information by private institutions. A rich literature in economics and finance has looked into effects of public announcements on different kinds of financial markets and assets (Tetlock 2014). The standard capital asset pricing model, for example, assumes that all market participants possess the same information (Levy 2012). But in reality, different market participants hold different information or interpret the same kind of information differently. Most of these studies follow a common methodological approach. They define an exogenous information event (good/bad news, scheduled announcements), which then are encoded on a timescale

(directly, summarized in weeks), and regressed on variables of interest (stocks, bonds, FX). For example, Elmendorf *et al.* look at the effect of qualitative news on bond prices in the UK (1900-1920), finding that important news can only explain a small portion of observed bond price movements (Elmendorf, Hirschfeld et al. 1996). However, Balduzzi *et al.* claim a strong explanatory power of public news releases and scheduled macroeconomic announcements by public institutions on bond prices, trading volume and bid-ask spreads for the US treasury market (Balduzzi, Elton et al. 2001). McQueen and Roley assert these findings for the stock market (McQueen and Roley 1993). Ederington *et al.* find a strong explanatory capacity of scheduled macroeconomic announcements by public institutions on volatility patterns of interest rate and foreign exchange future markets (Ederington and Lee 1993). Brunnermeier applies these findings to the impact of asset pricing and asymmetric information onto bank herding behaviour, stock market crashes and bank runs (Brunnermeier 2001).

The other studies considering public information focus to a large degree either on an empirical analysis of specialised issues, strategic decisions by institutional actors, or a mixture of both. Shapiro and Skeie for example look at announcements of public regulators in banking crises about potential actions concerning bailouts (Shapiro and Skeie 2013). They find two main audiences observing these announcements: depositors at other banks and the other banks themselves, as regulators consider the trade-off between preventing bank-runs and inducing moral hazard. More concerned with the strategic aspect of public information provided by private banking institutions, De Young *et al.* find empirical evidence that banks generally tend to disclose good news regularly but hold back on bad news later revealed by bank examinations (DeYoung, Flannery et al. 1998). Building on these findings, Bouvard *et al.* assert the disclosure strategy that transparency is better in bad times and opacity in good times (Bouvard, Chaigneau et al. 2015).

Private information

Private information on the other side poses a more difficult problem for research on information channels, diffusion, and decision-making, as (by definition) it is not readily observable from the outside. Yet, actors in financial markets and banking base their actions not only on the information conveyed by prices and publicly available information, but on their private information (Brunnermeier 2001). Thus, there is strong evidence that institutional and individual actors are influenced by private information such as "word-of-mouth" within their social network (Shiller and Pound 1989) or derived from their own research and firm-internal information, such as default rates and probabilities for bank loans. The business model of banks relies on effectively and efficiently evaluating and pricing credit risk, based on all available public *and* private information, thus playing an integral part of established and new business models in banking (Ghodrati and Taghizad 2014).

Due to a lack of available data, studies considering private information commonly focus on theoretical modelling or proxy variables for asset markets, while esp. archival research on bank credit scoring has looked more directly on the private information components in loan issuing (see e.g., Wixforth and Ziegler 1994, Ugolini 2018). While the following part considers primarily asset markets, banks' private information is taken into consideration in more detail in chapters 3 and 4. Based on a market model of information leakage, Brunnermeier shows that private information is not equally distributed in financial markets, as "some agents like corporate insiders and their favoured analysts can receive signals about this information before it is disclosed to the general public". Trading strategies derived from these facts (for example a two-stage strategy with (i) sell/buy on the rumour and then (ii) sell/buy on the news [depending on positive/negative news]) seem to be observable in asset markets, as the New York Times summarized already in 1993: "Sell on the rumour, buy on the news. That's Wall Street's advice for individual investors. But the pros have a different refrain: sell when company officials tell you the news, buy when they tell everyone

else" (Brunnermeier 2005). This demonstrates the interaction between public and private information in financial markets.

However, some studies try to extend the theoretical modelling approach by inferring insights on private information from proxy variables for financial markets. Based on foreign exchange markets, Moore *et al.* demonstrate inferred advantages on private information from "traders on larger trading floors (…) to those located on smaller floors", hinting at superior private information based on the size of a financial institution due to "larger chunks of customer order-flow and (…) better developed research capabilities" (Moore and Payne 2011). Besides these hard themes of private information, another dimension of private information has to be considered thinking about its channels and transmission: the softer social aspect of financial actors. Shiller *et al.* state "Investors spend a substantial part of their leisure time discussing investments, reading about investments, or gossiping about others' successes or failures in investing. It is thus plausible that investors' behavior (…) would be influenced by social movements" (Shiller, Fischer et al. 1984). In another recent example on the information content of investor calls, Bai, Boyson *et al.* study the informativeness of answers given by corporate executives compared to the predictive answers of large language models (LLMs). The answers by CEOs and CFOs convey additional private, yet soft information, over the predicted answers by LLMs relying on purely public information. As they find, the greater the soft/private additional information conveyed by executives, the bigger is the positive/negative impact on outcome variables such as stock price volatility and total abnormal returns, emphasizing that investors in financial markets do value this information (Bai, Boyson et al. 2023). Yet, these softer concepts of information channelling and diffusion are generally not as well studied as the 'harder' literature mentioned above and need further detailing.

Soft and hard information

Another common differentiation in economic and financial research is represented in the concepts of hard and soft information. As stressed by Petersen and Liberti in their meta-assessment

of the general theoretical and empirical literature, this dichotomy has to be taken as more of a continuum rather than a clear-cut differentiation (Liberti and Petersen 2018). In its basic form, the distinction is best characterised when thinking about hard information as being easily processed and understood without further context in numerical form (for example, a standardised balance sheet by a public company). Soft information then "is difficult to completely summarize in a numeric score, (…) requires a knowledge of its context to fully understand, and (…) becomes less useful when separated from the environment in which it was collected" (Liberti and Petersen 2018), so for example the reputation of a CEO for creditworthiness obtained through repeated interaction with a bank. Besides this basic characterisation of this framework, there are multiple aspects highlighted by this distinction which are fruitful to explore in the context of this thesis project.

As can be seen in Figure 2, aspects and developments over time such as in the importance of context, the separation of information acquisition and decision-making, the durability of information, the geographical span, and the organisational design of firms can be fruitfully analysed along these lines. Regarding the importance of context, hard information (thinking for example about the profit margin of a company, its annual sales, or the unemployment level of a country's economy) can be understood and interpreted without deep understanding of the context of its collection. Soft information (thinking for example about the assessment of creditworthiness by a loan officer for a long-standing business client) needs to be assessed based on the context in which it was collected, in this case the relationship between the loan officer and the client. This distinction then has implications again looking at the separation between information acquisition and decision-making. For hard information, these steps (and the step of information processing) can be separated from each other. For soft information, there might occur information losses when separating these steps (or when scaling it up to larger groups). Increasing information losses of soft information with increasing scales of organisations is also often referenced in the wider economic and social literature (Ogilvie 2011). This loss of information holds true at least to a certain degree for 'seemingly hardened' information. Hard information is not necessarily more reliable than soft

information, and separating information from its context can lead to negative outcomes for actors. The reliance on numerical ratings of collateralized debt obligations (CDOs) and mortgage-backed securities (MBS) emphasized this information loss during the financial crisis of 2007/08. These outlines then have implications for example for the geographical span and the organizational focus of individual institutions in financial and banking markets, as well as on the systemic level. Smaller, less hierarchical, and local firms can rely more on soft information for their information acquisition, processing and decision-making. Larger, more hierarchical, and globalized firms operating in several distinct geographies focus on hard information for their information process. The increasing globalization and financialisation in advanced economies over the 30 to 40 years since the early 1970s is reflected in the increased demand for hard information that is more easily standardized both in production and consumption and more easily communicated, as well as the increasing size and diversification of financial institutions and banks operating in these markets. Chapter 3 argues that the demand by financial institutions for price information and data from diverse geographies and asset markets from the 1980s onwards, accelerated by these developments, was a central element in shaping consolidation of information suppliers such as Bloomberg and Reuters.

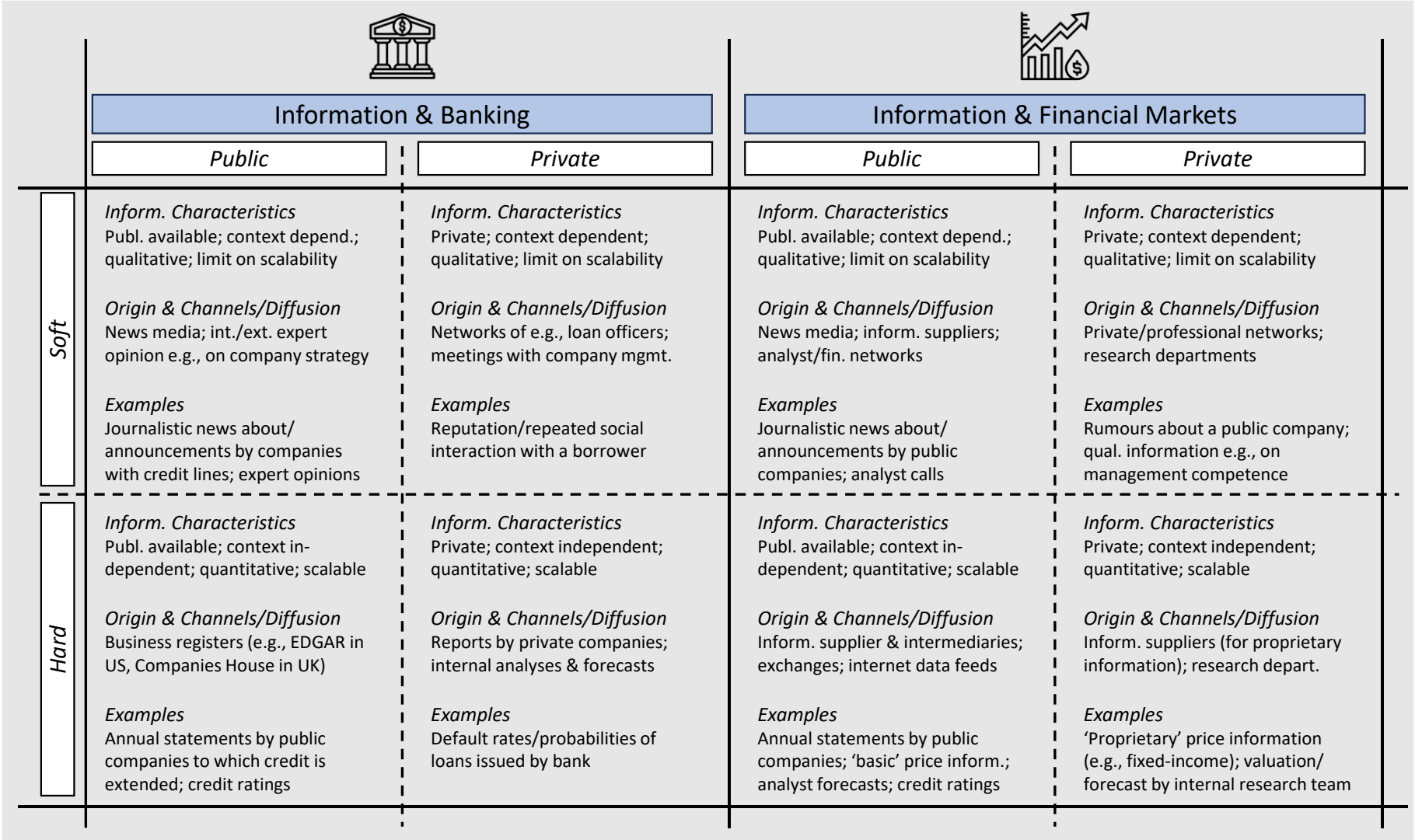
The dichotomy of hard and soft information is interlinked with the concept of public and private information. For example, as Petersen and Liberti point out, “once information is systemized and easy to communicate (hard), it also becomes more difficult to contain” (Liberti and Petersen 2018), and by implication its value for individual actors changes. This shows how formerly private information can more easily diffuse into the public sphere, influencing the competitive structure of the respective markets in which these shifts in the reliance on soft and hard information occur. Organizational changes such as an increase of larger, more hierarchical firms influence specialization in the information process, e.g., of banks on private information collected through their customer network compared to the public credit markets (Ogilvie 2011).

Figure 2: Dimensions and implications of soft & hard information.

	Hard information	**Soft information**
Record characteristic	– Mostly recorded & communicated in numerical form – Can easily be collected, stored & transmitted (electronically) – Technological progress since 1970s mainly increased usage of hard information	– Mostly recorded & communicated in textual form – Harder & more costly/time-consuming to collect, store & transmit – Can be "hardened" through conversion of textual to numerical data (e.g., ratings), yet caveat of information losses
Importance of context	– Context of info. collection unimportant for interpretation and understanding of hard information	– Context of info. collection & collector crucial for interpretation and understanding of soft information – Interdependence between collection and use of information
Information acquisition & decision-making	– Possible to separate collection of hard information from the processing and decision-making – Acquisition can be delegated, automated or outsourced	– Separation of decision-making form information collection results in info. loss, thus collector and decision-maker often same person (e.g., loan officer in bank)
Geographical focus	– Reliance on hard information widens geographical reach and focus – Competitive impact on existing suppliers with increased geographical competition	– Geographical focus on local level due to limitations on scalability of soft info. processes
Durability of information	– Hard info easily storable (electronically), low costs of maintenance and input for future decision-making – Frees decision-making process from constraints of space and time	– Less durable as reliance on context of information acquisition make storage more expensive and time consuming
Firms organisat. design	– Larger, hierarchical firms spanning different locations more prone to use hard info. as basis for decision-making – Potential of hard info. to bridge hierarchical and organisational gaps without losses in original info. transmitted	– Smaller, less hierarchical and local firms more prone to use soft info. as basis for decision-making – Decentralized decision-making as a potential solution to increase firm size

As seen in Figure 1 and Figure 3, the distinction between market-based systems and banking-based systems remains subtle yet perceptible at its theoretical core. As pointed out by Carlos and Neal in their study of Amsterdam and London as financial centers, banking systems rely more on the internalization of private information to generate profits, while market-based systems focus more on public information, which is made readily available to investors through regulatory disclosure requirements (Carlos and Neal 2011). However, both types of information, and the different reliance on soft & hard information by various institutions in their respective market segments, do play a role both for banking and financial markets. For example, even though financial markets through impersonal exchange tend to focus more on hard information, studies indicate that investors also incorporate soft information in their decision-making, shown e.g., by Matsumoto *et al.* in their analysis of investor and analyst calls, or Robert Shiller's assessment of herd behaviour in equity markets driven by investors' sentiment and the soft information conveyed and received about market sentiment (Matsumoto 2011, Shiller 2000, Shiller 2019). As chapter 3 explores, financial information suppliers in the latter half of the 20th century partially privatized and resold information in financial markets, while chapter 5 focuses on CRAs as information intermediaries that base their publicly available ratings on both public and private information derived from credit issuers.

Figure 3: Stylised overview – Soft & hard, public & private info in Banking & Financial Markets.



Petersen and Liberti, as along with a large body of further work in economics and history, assert a change in finance over the period from the late 1960s/early 1970s to the 2000s and beyond regarding the reliance and importance of hard over soft information for institutions in financial and banking markets (see e.g., Kynaston 2015, Liberti and Petersen 2018). Following this view, there has been an increasing reliance over this period on hard or 'hardened' information compared to the traditional importance of soft information in lending and trading. Accordingly, the increased use of derivatives, collateralized securities (e.g., CDS prices as an indicator of the underlying asset/company), indices, and credit ratings in the form of numerical scores, as well as the technological advancements in processing power and faster communication channels enabling these developments are just some features pointing towards this interpretation (Morrison and Wilhelm 2007, Agarwal and Ben-David 2018, Liberti and Petersen 2018). These points are picked up especially in chapters 3 and 5. However, as this thesis project argues, there are two important caveats to this interpretation. First, as can be seen in the resulting conundrum caused by the reliance of the financial and banking system on numerical credit ratings before the GFC, the increase in reliance on hard information at least in some instances represents rather a reliance on 'hardened' information. Hence, information losses to decision-makers can occur due to the soft nature of the fundamentally underlying information (such as CRAs transforming soft & hard information gathered into single hard indicators for their customers, but the use of this hardened information did not reflect the dual soft and hard nature of the underlying information). Second, even if we accept the general trend from the 1970s towards an increased reliance on hard over soft information by individual financial institutions and the system in general, the actions and processes in banking and financial markets during times of crisis present a dynamic situation in this context. They require close scrutiny in light of these theoretical concepts over this period, as changes in the 'information environment' (Gorton 2015) during financial crises might offset the choice for one kind of information over another – this aspect is discussed in detail in chapter 4.

Actors and information processing

Two further aspects must be considered thinking about the *diffusion* of information in an active concept of information: actors and the processing of information. Keynes identified in his general theory the effect of different information processing of investors of the same information as one of the key reasons for differences in economic outcomes in financial markets:

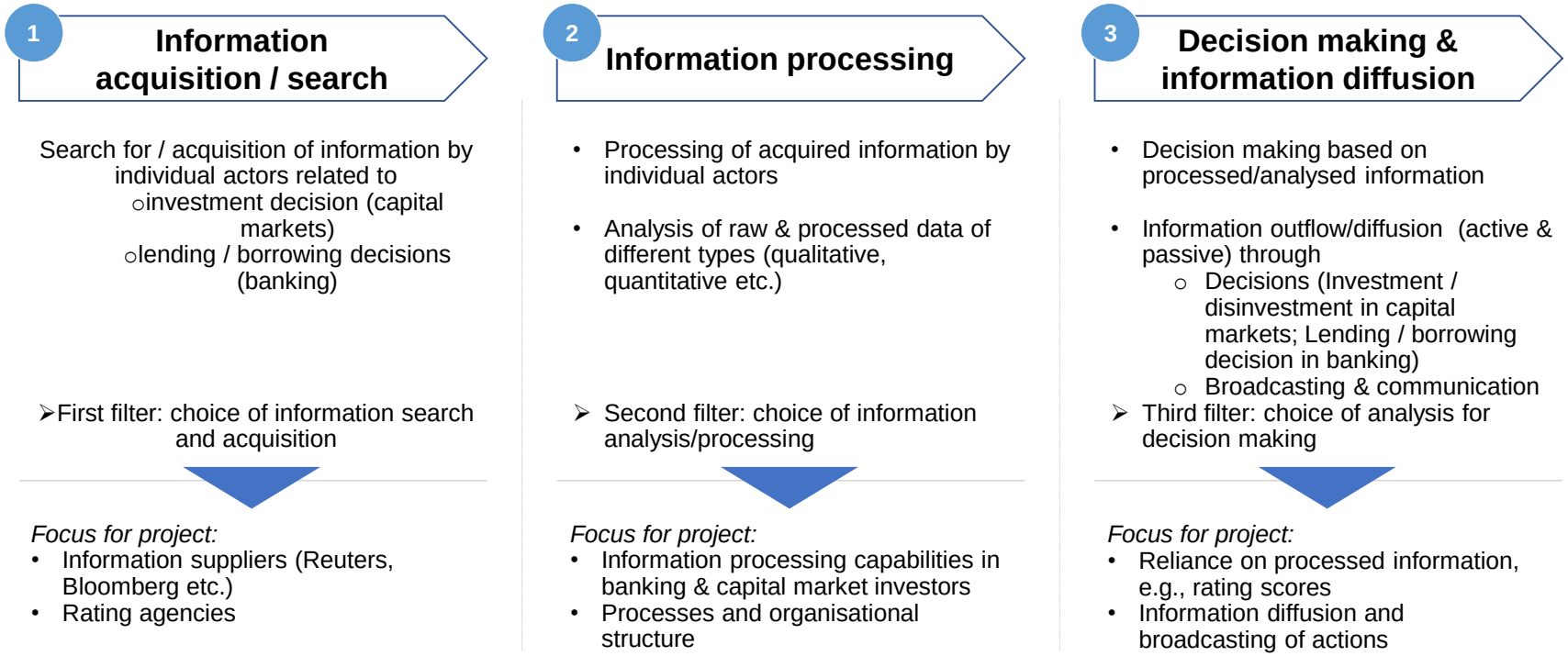
> "a change in circumstances or expectations will cause some realignment in individual holdings of money; since, in fact, a change will influence the ideas of different individuals differently by reasons partly of differences in environment (…) and partly of differences in knowledge and interpretation of the new situation" (Keynes 1936).

To understand the way information influences behaviour, one has to differentiate between actors in financial markets and banking. In financial markets, institutional investors and 'smart money' investors acquire and process information differently than 'ordinary' individual investors, with implications for the formation of prices and decision-making on an individual and macro level (Shiller, Fischer et al. 1984). Sims makes the case for the lagged effect of information processing due to rational inattention, not only on an individual micro-level, but even on a macro level: "To a considerable extent, people's needs for coding are similar, so they rely on common sources of coded information. The result is that a considerable part of the erratic response arising from information capacity constraints is common across individuals" (Sims 2003). Information constraints hold true for bankers and banking institutions as well, yet the lagged effects of information processing are less relevant there as decision-making (e.g., in traditional deposit taking and loan issuing) usually presents itself as less time sensitive as dealing in asset markets.

The volume of information is another perspective when focusing on these two elements. Psychology and behavioural economics suggest that both individuals and institutions can suffer from "informational overload" (too much available information on a given topic, thus a decreased level of information processing), or from "over-optimism" or "over-pessimism" and an increased reliance on the given information if only a limited amount of information is available (Stocks and Harrell 1995, Roetzel 2019). As pointed out by Todd and Giegerenzer in their experimental work,

actors choose a “satisfising” strategy that suits their individual heuristic level of information requirements rather than acquiring and distilling all relevant information (Todd and Gigerenzer 2000). Especially within the intersection of the individual and institutional level, Stocks and Harrell find in experimental settings a better processing of information and decision-making among groups of people compared to individual decision-making processes (Stocks and Harrell 1995). These considerations can be organised for the purpose of this project along a stylised process of information flow that has been alluded to at various points already. This stylised process can be summarized along three interrelated steps, starting with (1) information acquisition, to (2) information processing, and finally (3) the decisions taken up by actors (Figure 4). This process entails steps which are by definition not mutually exclusive and clear-cut, but still offer a framework to think about the role of individuals and institutions in an active concept of information, as well as focus points for the analysis in chapters 3-5 (as highlighted in Figure 4).

Figure 4: Stylised process of information flow and processing steps.

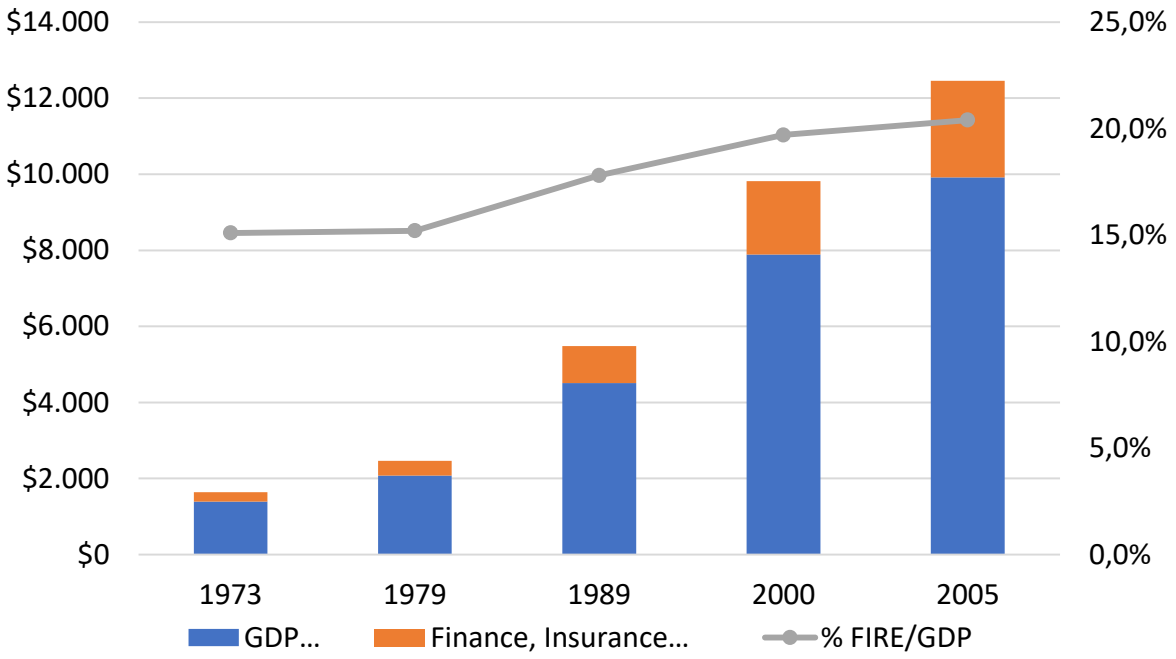


Financial networks & the information process

A fundamental channel especially for soft and private information (see Figure 3) can be found in financial networks. Network studies have gained increasing attention in recent years from researchers in economics, finance, and history (see e.g., Jackson, Rogers et al. 2017, Elliott, Georg et al. 2020, Jackson and Pernoud 2021). Networks can be understood along their two main features – nodes and links. Nodes are actors within the network that can be characterised by their "connectedness" (degree), "influence" ([eigenvector] centrality) or overall "spread" (diameter). The links between the nodes represent the characteristics of connections between nodes, such as directed (unilateral) or undirected (reciprocal) links, as well as weighted linkages based on defined attributes. Networks in finance pose an interesting yet complex research topic. They enable fresh perspectives on critical issues such as contagion, systemic risk, and externalities. Yet, their analysis has been limited by the availability of relevant data such as counterparty identities of transfers and linkages (Elliott, Georg et al. 2020).

Yet, generally speaking, two trends have been highlighted by research over the past decades regarding financial networks. First, an increase in integration (densification of international networks), and second an ongoing consolidation (nodes becoming fewer and bigger). "Financialisation" (increasing importance of finance as driver of economic activity) plays a crucial role in this context, especially regarding densification, as shown below (Figure 5). For example, the growth of the FIRE sector as part of the US economy has markedly outpaced the overall GDP growth over the period from 1973 to 2005.

Figure 5: Finance, Insurance and Real Estate (FIRE) output ($bn) as percentage of US GDP.

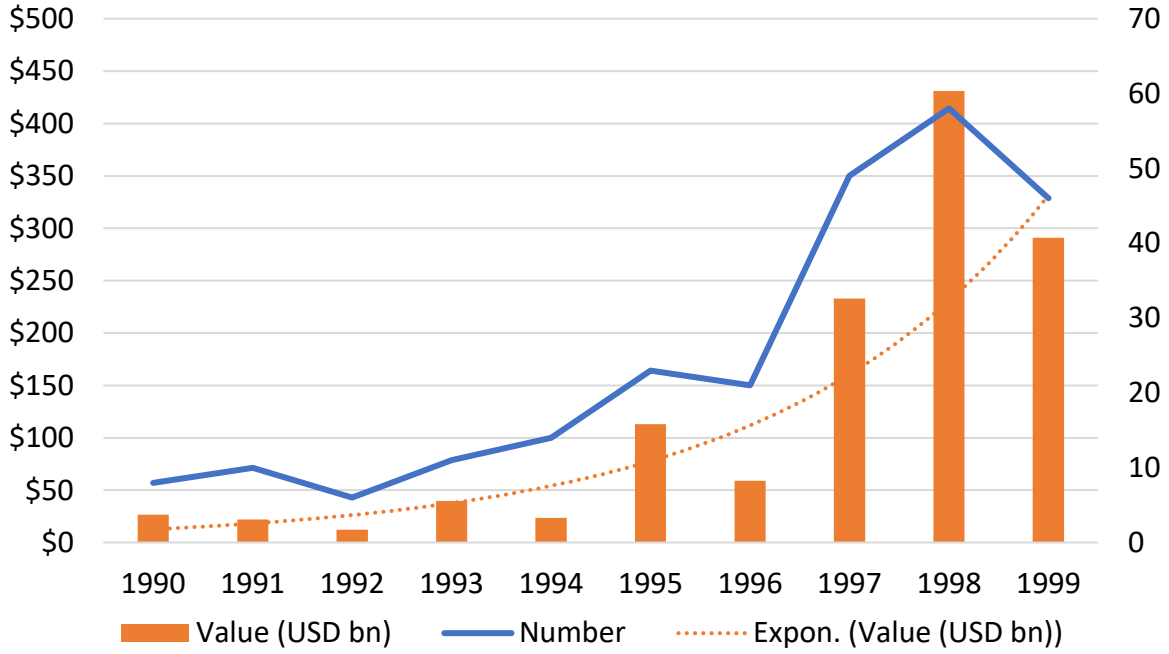


Source: Thomas I. Palley, The Levy Economics Institute, Working Paper No. 525, 2007.

A prime example of consolidation in financial networks is expressed by the M&A waves of the 1990s and 2000s. The Bank for International Settlement (BIS) examined this trend in 13 developed countries. As Figure 6 shows, the number of large M&A deals increased from the beginning of the 1990s to the end by a factor of five, while the overall value of the deals increased by a factor greater than ten. This development was mainly driven by value-maximizing strategies and environmental factors such as relaxed regulatory barriers, technological advances and globalisation.[4]

[4] Bank for International Settlements, '*Report on consolidation in the financial sector*', January 2001; available online: *https://www.bis.org/publ/gten05.pdf.*

Figure 6: Financial sector mergers and acquisitions with values greater than USD 1 billion, G10.



Source: Bank for International Settlement, Report on Consolidation in the Financial Sector, Chapter I: Patterns of Consolidation, January 2001.

Research on financial networks at the aggregate/institutional level has seen a significant increase in recent years, focusing primarily on elements such as contagion and systemic risks within the financial sector. By analysing Bundesbank data on bilateral interbank exposures for German banks, Craig and von Peter for example developed a tiering model for the German banking market, which is significantly different from standard random networks (Erdös-Rényi networks). They show in a core-periphery model the intermediation happening between banks in the financial market to form an integrated banking market, a feature seldom acknowledged in the literature (Craig and von Peter 2014). These findings are supported by Soramäki *et al.*, who, by examining data from the Fedwire interbank payment system, show the reliance on a few highly connected banks at the core of the United States banking system, to which most other banks in the market are connected (Soramäki, Bech et al. 2007). Various other studies in this research area point towards systemic risk and contagion, derived from network structures (Jackson, Rogers et al. 2017, Elliott, Georg et al. 2020) or resulting from network behaviour such as highly correlated cross-holdings of bank assets that increase contagion risks (Jackson and Pernoud 2021).

On the individual level, formalised network analysis has been scarce so far, both because of limitations on data availability and modelling barriers for heterogeneous actors. However, financial networks have been central to economic and historical research. For example, accounts of banking dynasties and investment professionals prominently featured their social and economic networks as an integral part of these investigations (see for example Ferguson 1999, Chernow 2003, Hutchings 2005, Pak 2013, Nützenadel, Plumpe et al. 2020). These accounts typically trace the business and social connections of bankers within their respective financial, economic and political environment through archival research, and place information dissemination as one of the network's prime functions.

Information diffusion and transmission along social and economic networks are a special case. During recent years, information structures have grown in volume and complexity, "as a landscape with a few purveyors of high-quality information (publishers, news organisations, the academy) has become crowded with an array of information sources of wildly varying perspectives, reliabilities and motivating intentions" (Easley and Kleinberg 2010). Information within network theory has been analysed on various occasions and from varying perspectives. Banerjee *et al.* show that boundedly-rational individuals can "simply by tracking sources of gossip, identify those who are most central in a network according to 'diffusion centrality' (…) we find that respondent accurately nominate those who are diffusion central [not just those with many friends]" (Banerjee, Chandrasekhar et al. 2014). Yet, in the realm of finance, the combination of these two aspects is under-researched. Robert Shiller's work stands out in this regard. In *Narrative Economics,* Shiller shows the explanatory power of "contagious narratives" as a form of information spreading through networks in populations (modelled through epidemiological SIS-models) during times of economic and political unrest such as the Great Depression of the 1930s and the Great Recession of 2008/09 (Shiller 2017, Shiller 2019).

It is also important to consider potential disadvantages and negative social and economic outcomes of network effects when thinking about the spread of information and narratives through

networks. The economic literature points towards several potential disadvantages in this area. Social networks can suffer from information cascades or echo effects. Information cascades refer to failures in economic decision-making driven by a proportional over-reliance on others' information in a social network compared to someone's own empirical experiences and information (Bikhchandani, Hirshleifer et al. 2021). Echo effects emphasize the amplification of overly positive or negative beliefs in a closed social network due to feedback loops among nodes in the network, creating distortions in the perception and assessment of the network's members (Burt 2001). Furthermore, social institutions and organisational forms such as information brokers or guilds, clubs, and associations can also have detrimental effects on information acquisition and processing, as they for example might amplify echo effects or information cascades through exclusive membership, as well as through diseconomies of scale leading to information losses (Ogilvie 2011). In this context, it is also important to acknowledge the general detrimental effect that can be caused by the spread of unsolicited information and rumours through these mechanisms, as cross-checks and detrimental personal information is submerged and might lead to economic failures in decision-making. The increasing prevalence of one or a few information suppliers explored in chapter 3, as well as information intermediaries such as CRAs focused upon in chapter 5, could thus also entail negative economic consequences for many institutions relying on the same information supply and information processing capabilities. This theoretical outcome is further discussed in light of the empirical evidence provided in the conclusion to this thesis.

One final point that needs to be taken into account on this matter is the importance of key individuals or institutions in the social networks through which information and narratives spread. Long known tropes, especially in the field of marketing, also apply to this strain of thought as pointed out by Shiller: "It must be the case, that attention-getting narratives drive (…) decisions, often with an assist from celebrities or trusted figures" (Shiller 2019). Network theory describes this aspect and relates to either some central "super-connectors" (David and Westerhuis 2014), diffusion central or high eigenvector-central nodes (Banerjee, Chandrasekhar et al. 2014, Jackson,

Rogers et al. 2017). Social psychology shows that people adapt their views and behaviour in accordance to trusted experts (Bikhchandani, Hirshleifer et al. 2021). The impact of public statements of high-impact figures such as, for example, central bankers become obvious when thinking about the widely perceived importance of Mario Draghi's infamous "whatever it takes" remarks during the Euro crisis in 2012 (Alcaraz, Claessens et al. 2019). Chapter 4 engages in detail with two case studies of such central nodes, focusing on the BoE's and the Fed's 'information strategy'. This information strategy entails both information gathering and broadcasting (so the entire information process from acquisition, through processing, to decision-making and information diffusion) during times of distress and is discussed at length in that chapter. This leads to the last point of this chapter, the role of information during financial and banking crises, and what changes or persistence one might expect to find regarding financial institutions adaptations to the information process.

2. Financial crises and information

As noted in chapter one, the underlying structural changes in financial markets between 1973 and 2008 had an enormous impact on their operations, and especially on how information was acquired, processed and acted upon. Marquez, for example, shows from a theoretical point of view "with more competing banks, borrower-specific information becomes more dispersed, as each bank becomes informed about a smaller pool of borrowers" (Marquez 2015). The advances in ICT over the period represent another more specific example, as these helped financial actors to increase access to information, reduced costs of information, and allowed for more efficient processing of large-scale information (Legg 1991). The observation of an increased reliance on hard information compared to soft information in financial and banking markets since the early 1970s has been acknowledged on various occasions (Liberti and Petersen 2018). Financial innovation such as increased securitisation led to a surge of "dispersed" information about interconnections within the financial system and thus about risk on the institutional and systemic level, exemplified best by

the importance of over-the-counter (OTC) derivatives during the GFC (Aliber and Zoega 2019). These trends on the side of the information process have to be looked at in conjunction with the impact of crises on the information process.

Financial crises such as stock market collapses or turmoil in FX markets, and crises within the banking system directly affect the diffusion and valuation of information by institutions and individuals. Decision-making in the suddenly uncertain environment becomes vital for institutions that are faced with increased potential for losses (or gains). Speed in reaction to an increasing volume of information (of difficult to judge quality) as events unfold becomes more important, as volatility and uncertainty increase. Reliable and timely supply of information is increasingly central for this decision-making, as Warren Buffett put it in an interview with the *Wall Street Journal* commemorating the tenth anniversary of the GFC in 2018: "People talk about a fog of war, but there's a fog of panic too, and during that panic, you're getting inaccurate information, you're hearing rumors. If you wait until you know everything, it's too late".[5]

Regarding information channels and networks, research suggests that the additional value of private information over public information increases in times of distress. Under increased volatility, first-mover advantages are likely to be more significant, while soft private information can be generated faster (e.g., through networks) than hard public information. Shiller *et al.*, for example, illustrate the importance of private information derived from social interactions for investors' decisions in the 1987 stock market crash over purely public information (Shiller and Pound 1989). During crises, the value of proprietary knowledge, both soft and hard, tends to further increase over public information, as increased uncertainty in the market opens the opportunity for increased earnings (or to protect from losses). Shiller shows in *Narrative Economics* how popular and contagious stories spread virally through word-of-mouth. Especially during financial and banking crises narratives have an increased impact, as they either directly (e.g. bank actions on the

[5] Warren Buffett, 'Warren Buffett Explains the 2008 Financial Crisis', *Wall Street Journal*, interview by Nicole Friedman, 06.09.2018; available online: *https://www.wsj.com/video/warren-buffett-explains-the-2008-financial-crisis/35156277-3523-4B2C-B783-3CA790CF20EC.html*.

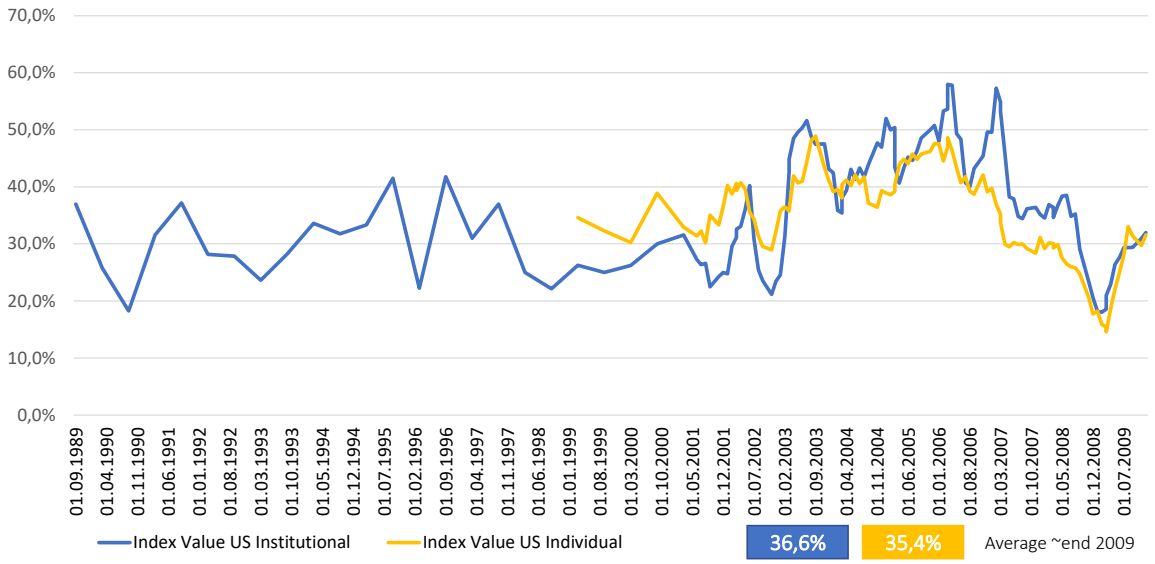
rumour of business insolvency) or indirectly (by framing the economic, financial and social context in which decisions are taken) influence decisions (Shiller 2019).

Regarding information *acquisition*, theoretical and empirical research suggests an expansion and adaptions by financial institutions and individuals during times of distress. Accounts of participants in the financial or banking market frenetically trying to call their trusted colleagues and business partners when the market environment within a crisis starts to deteriorate are plentiful for various crises (see e.g., Shiller, Fischer et al. 1984, Bernanke, Geithner et al. 2019). This behaviour within uncertain environments hints at a broader tendency of actors to widen their informational horizon, especially through private networks. The timely acquisition of reliable information about fast-moving events when actors cannot afford to lose time (as emphasized in Warren Buffett's quote) during times of distress can result in increased value for the organisation. At the same time, the spread of narratives as soft information in crises must be kept in mind, as these tendencies might amplify the spread of positive as well as negative narratives and information through the network channels discussed above (Ogilvie 2005). However, it can be assumed that not only the demand for proprietary information gained through private networks would increase in a crisis, but also the breadth and depth of acquired public information as organisations want to incorporate as much relevant information as soon as possible into their analyses and decision-making. Information acquisition within financial crises stands at the centre of chapter 3, which looks at the supply of information to financial institutions by information suppliers during crises in different asset markets between 1973 and 2008 (see chapter 3).

Based on Shiller's questionnaire on crash beliefs of individual and institutional investors, Goetzmann *et al.* show the difference in information *processing* during crises compared to "normal times", driven by the events themselves but also by the contextualisation of these shocks. As shown in Figure 7, investor beliefs about a single day crash (the perceived likelihood of such an event) equivalent to two large one-day drops are significantly higher than their statistical probabilities. Using sentiment analysis, they state that one driver of these crash beliefs are "adverse market

events" picked up by the financial press, which mediates investor crash beliefs (and does so asymmetrically, as "negative sentiment are associated with higher crash probability assessments following market downturns, but articles with positive sentiment have no effect") (Goetzmann, Kim et al. 2016).

Figure 7: Investor confidence index – crash beliefs.



Note: Phrasing of the question: "What do you think is the probability of a catastrophic stock market crash in the US, like that of October 28, 1929 or October 19, 1987, in the next six months, including the case that a crash occurred in the other countries and spreads to the U. S.?"
Source: Goetzmann, William; Kim, Dasol; Shiller, Robert: Crash Beliefs From Investor Surveys. National Bureau of Economic Research, 2016.

Further theoretical and empirical work affirms the limitations on information processing by financial professionals and institutions. For example, Kendall shows that in times of financial 'panics' and 'frenzies' information losses occur in the equilibrium, implying a trade-off taken by actors between better information and reduced earnings due to competition (Kendall 2020). Literature on informational overload from psychology and behavioural economics underlines this point, as, for example, Tuttle and Burton show in experimental environments

> "when time is constrained, increasing incentives may not help people process more information. Clearly many important decisions exist in which time is sometimes arbitrarily limited. In these cases and if better judgments are wanted, more time rather than more incentive may be required" (Tuttle and Burton 1999).

Increased volatility of asset prices during financial panics are a more general hint to increased uncertainty and an increased higher potential value of reliable information, as potential earnings increase with volatility. Garcia shows that the tonality of news transmitted in newspapers has a greater impact on asset prices during a recession than otherwise, suggesting increased scrutiny and changing behaviour towards the information processed by market actors in crises (García 2013). Loh and Stulz argue along the same lines, showing increased investor attention towards analyst forecasts as an information source (expressed through a higher stock price impact) during 'bad times' compared to 'normal times' (Loh and Stulz 2018). Chapter 5 explores in detail the use of information by investors in financial markets by examining credit ratings as another information source and its informativeness for investors during the GFC.

As crises require actors to keep up with market developments and new information is generated and diffused faster within financial markets, decision-making processes and organisational structures within institutions have to adapt to the distressed environment. One example of this altered process in decision-making is implied in the value key players such as Timothy Geithner or Ben Bernanke put on central bank staff that previously experienced crises or that had in-depth knowledge through their previous studies (Bernanke, Geithner et al. 2020). Chapter 4 takes up this point by looking closely at the altered organisational and procedural setup of the BoE and Fed during the 1973/74 secondary banking crisis in the UK and the GFC.

Overall, both theoretical and empirical work suggest a profound difference regarding information acquisition, processing, and decision-making by financial institutions during times of distress compared to normal times. The empirical evidence presented in the following three analytical chapters investigates some or all of these aspects from the respective focus taken in each chapter. The conceptual threads drawn out in this chapter in the spectrum of information types (e.g., public & private, soft & hard) and information channels (e.g., information suppliers, networks) along the information process (from acquisition, to processing, and decision-making) in both financial and banking markets during normal times and crises are picked up throughout the

analysis. The last concluding chapter to this thesis then discusses the presented empirical evidence along the theoretical outline, in order to present answers to the overarching research questions of this project.

Chapter 3 – Reuters, Bloomberg and the market for information

Scholars of economics and financial history have dealt with a multitude of aspects of financial and banking crises (see chapter 2). Yet, this project argues that a more *active* focus on information and its changing nature in these crises is lacking. One prime example of this missing attention is that the changing structure of what might be called the 'market for financial information' within different financial crises has yet to be explored in detail. This represents a profound shortcoming considering the fundamental change in the capabilities and use of information technology in financial and banking markets since the 1970s (Greenwood and Jovanovic 1999, Bátiz-Lazo and Wardley 2007, Pardo-Guerra 2019). We are looking back at this market that supplies price information, information processing capabilities, analyses, and journalistic news directly to financial institutions from a time of high-frequency trading, instant notifications, and complaints about 'information overload'. This retrospective view can obscure the historical development of the market for information, which at its modern evolution in the 1970s still advertised with press cuttings to be clipped and sent back by mail to gain traction for new products (see Exhibit 1, Exhibit 5, and Exhibit 6).

Physical information terminals are one of the most common and consistent features of modern banking and financial markets. Terminals such as today's well-known 'Bloomberg Terminal' are used to retrieve and monitor market data, stay up-to-date on economic and political events, and provide analytical functions for information processing. The Bloomberg system developed into such a systemically important part of the financial world that an outage in April 2015 "effectively shut down some parts of the capital markets" (Peters 2015). Yet, this chapter shows that the evolution of these terminals (and the companies that supply them) into a critical part of the modern financial world's infrastructure was far more idiosyncratic and nuanced than the often-perpetuated narratives concerning the supply side of the market for financial information stressing the competitive advantage of one firm over its competition would suggest. This evolutionary process was closely coupled and influenced by underlying trends on the demand side of this market, such

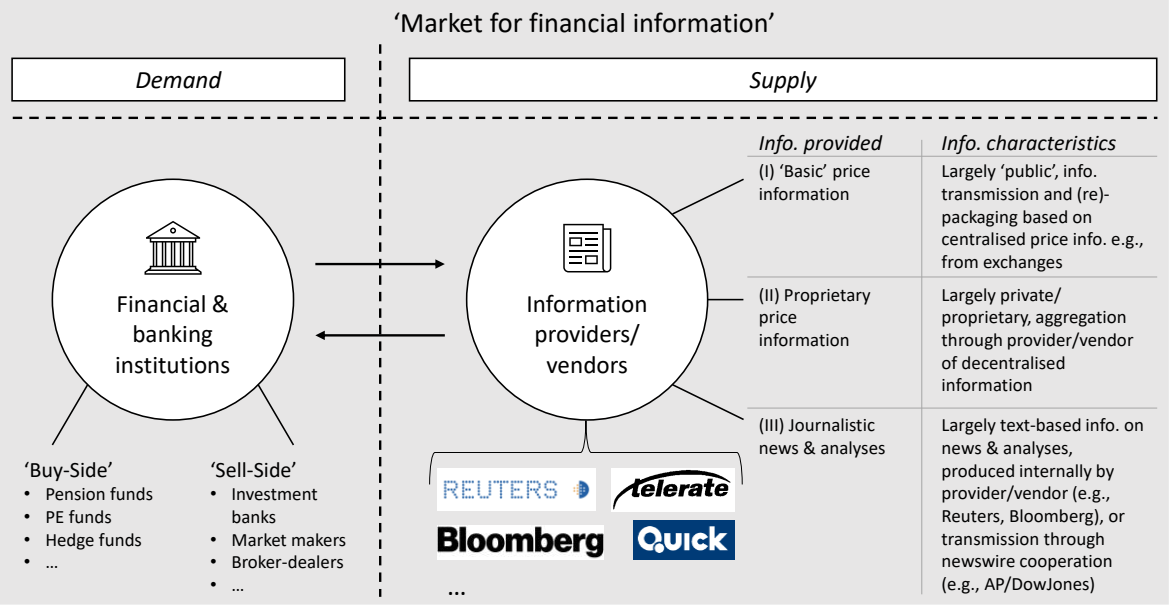
as globalization, financialisation, and regulatory changes especially between the 1970s and 2000s (Bloomberg 2019, Palmer 2019). This chapter focuses on exactly this aspect, analysing this transformation of the supply (by information providers) and demand (from financial institutions) for financial information, its changes over time since the early 1970s, and its role in four financial crises and crashes. The analysis does not primarily focus on the underlying technology itself, but on the changes in the information process. However, key technological developments are addressed to better understand the context of these changes in the information process.

First, what exactly is this market, and how can it be conceptualized for a historically analytical level of understanding? As discussed in chapter 2, information is an essential part of price discovery and thus contributes to the efficient function of markets. Demand by banks and financial institutions for timely and reliable information (public and private) creates a market for financial information. The market conforms to certain characteristics such as public, standardised, and timely discoverable data (e.g., on prices), as well as private, proprietorial information to gain an advantage over competition. Thus, the supply (in addition to the more labour-and capital-intensive and thus more costly creation or compilation of this information in-house by individual institutions) of data and information about market prices, economic news, and general information by banks and financial institutions is facilitated by information suppliers. The nature of information creation and information as a good are important aspects here, which fundamentally determine the structure of the market for financial information (Zhang and Zhang 2020). High up-front costs, coupled with low marginal costs in the production of information (for example in compiling prices on OTC securities) creates a significant cost advantage for firms to purchase such information rather than creating or compiling this information themselves. This feature along with globally integrated markets then also favours a market structure of one or a few large institutions providing this information due to the resulting advantages to scale for general information, rather than many institutions offering the same service (see e.g., West 1998). At the same time, the continuum between private and public information can be observed thinking about the nature of information

as a good in this market. As pointed out by Arrow, privatizing information is limited as there are multiple channels through which information becomes public again: piracy (or illegal reproduction), duplication/emulation, knowledge transfer through human capital movement & interactions, and of course price discovery (Arrow 1984). As discussed throughout this chapter and in the conclusion to this chapter and thesis, information suppliers such as Reuters and Bloomberg tried continuously to generate information with more private (or at least proprietary) attributes, to increase their prizing power in these market segments.

Figure 8 depicts a stylised conceptualisation of the market for financial information as used in this chapter. The supply side in this market can be segmented roughly into three categories, containing distinct 'types' and characteristics of the information provided in each of them. Firms on the supply side might supply one, two, or all three of the information segments drawn out.

Figure 8: A conceptualisation of the market for financial information.



First, the supply of 'basic' financial and economic data (I) for example on market prices or macroeconomic indicators (Read 1999, Bartram 2003). This type of information is quantitative and usually centralised, for example, through exchanges, thus largely publicly available. Firms supplying this information act as an intermediary by transmitting it in a standardised format from the

information sources directly to financial institutions. The provision of timely and accurate price information is important for well-functioning financial markets. Yet, as argued in this chapter, with advances in ICT especially in the late 1980s and 1990s and increasing competition and consolidation on the supply side of the market for financial information, the compilation and selling of publicly available and centralised data became increasingly commodified. Increasingly, substitutable products based on easier transmission of this information from its sources to its end-users removed pricing power of firms focused solely on the supply of this 'basic' price information.

Second, firms supply standardised proprietorial price information (II). This information is largely quantitative and decentralised, for example, on FX or OTC securities which are not traded on an exchange or other centralised marketplaces. Thus, information suppliers need to collect, compile, and standardise it to supply it to financial institutions. This need for collection and compilation of data is connected to high upfront costs for information providers, either for technology or labour (or both). Information providers in effect create a network, or marketplace, through the centralisation and supply of this information on their systems, which often further developed by enabling direct dealing in these assets. The development of Reuters MMR for FX in 1973, and the subsequent expansion towards direct dealing through Reuters Monitor Dealing in 1981, are prime examples of this process and discussed at length in this chapter.[6] Reuters system supplanted a former bilateral market based on telephone and telex communication with a multilateral system. The information provided was 'proprietary', as it was for some time only provided by Reuters, and in the long-run institutions using the new technology could obtain price information faster and more reliable than FX dealers that relied on incumbent processes. But it was not 'unique', as every institution could subscribe freely to the service to obtain the same information. Thus, the argument can be made that Reuters and later Bloomberg tried (if not to privatize public information as institutions could subscribe to their services freely) to add more

[6] Note: Throughout this thesis, 'Reuters' is referred to according to the company's reference guideline for its name, which excludes apostrophes in the possessive form.

private attributes to public information, which was time sensitive. Due to the characteristic of the upfront costs associated in supplying this information, this segment of the information market did not become commodified to the same extent as the first segment, resulting in a higher pricing power of firms supplying this kind of information. These dynamics are picked up on several places in this chapter and discussed further in the conclusion.

The third segment entails the collection and provision of mainly qualitative information in the form of journalistic news, as well as in-depth research and analysis on financial, economic, political, or social events and developments (Alleyne 1997, Read 1999, Machin and Niblock 2010). This is primarily supplied by large news organisations (such as Reuters, Bloomberg, AP, and AFP), which either directly supply their own newswires to financial institutions (e.g., Reuters, Bloomberg) or partner with information suppliers that run the newswire on their systems to inform financial firms directly (e.g., the long partnership between AP and DowJones). The high labour costs associated with running an international journalism network acted prohibitive for many suppliers of this information to produce it in-house. Thus, the model of partnerships between information suppliers, individually focused on subsets of the market for financial information, has been more common. However, the two firms that came to dominate this market in terms of market share, Reuters and Bloomberg, both opted for in-house production and dissemination of this segment (albeit for different reasons).[7] Although this chapter does not focus on them, there are other firms specialised in the provision of highly technical information and research often commissioned by banks and financial institutions on specific questions to support decision-making such as the work of consulting companies and investment advisories (see e.g., Kipping and Engwall 2002).

Beyond these three segments, this chapter also shows that the supply of 'information processing capabilities' became increasingly a defining factor shaping demand and supply in the

[7] As shown in this chapter, Reuters reason was historical path-dependency. The supply of information from the first two segments of the information market was added to an established international news organisation. For Bloomberg, it was the reverse. The company first focused on the supply of information in the fixed-income segment (part II of the information market), and then took the strategic choice to build a large news organisation on top.

information market from the 1980s onwards. Information processing capabilities were on the one hand analytical tools provided by suppliers to end-users of their terminals in order to assist the analysis of provided information towards fast and reliable decision-making. But on the other hand, this also entailed the supply of information in a format (for example standardised, digital, real-time data streams and historical databases) that could easily be implemented in financial firms' internal systems for individual manipulation and analysis. Trends in financial institutions towards, for example, automated or algorithmic trading further increased the demand for these capabilities.

This reflects naturally only a rough conceptualisation. Some elements of financial and economic information or information suppliers might fit into several of these categories, for example, Bloomberg's and Reuters provision of both 'basic' and 'proprietorial' price information, as well as journalistic information (Palmer 2019). Or they might change over time and space, for example, the changing business of credit rating agencies moving from provision of soft information/news on economic actors and instruments to data providers (Flandreau, Gaillard et al. 2011, White 2013, Liberti and Petersen 2018).

Using a variety of archival primary source material, newspapers, biographies, corporate reports, and oral history expert interviews, this chapter draws out several themes in the development of the market for financial information overall and its particularities during financial and banking crises. Contrary to expectations, the development of the market for financial information and its role during financial crises is not a straightforward narrative. As Douglas Taylor, founder of Burton-Taylor International Consulting,[8] who has been inside this market since 1986, summarized in an oral history interview for this project:

> "With your investment, you have a much higher risk of failure in that bad market time, because of that information and the tools to analyse information and make decisions is more important because (…) your margin for error is much smaller, so your decision-making has to be much better to keep you in

[8] Burton-Taylor International Consulting LLC, founded in 2006, is one of the few firms providing research on the market for financial information (such as market shares, growth rates, and technology trends) to investors and competitors in the industry.

> some reasonable level of risk (…) A client should be buying more information frankly, rather than less, because they need it to manage the risk".[9]

Yet, as this chapter shows, the overall evolution and reaction to financial crises of both the demand (financial institutions) and supply (information suppliers) side in this market for financial information are much more idiosyncratic and need a detailed review. Acceptance of new technologies, organisational and managerial structures within firms, as well as the competitive landscape of information suppliers and the overall environment in the market for financial information are key elements to understand its evolution and the impact of financial crises on the demand and supply side.

The introduction of previous information technologies such as the telegraph, telephone, or stock-tickers had respectively transformed interactions and structures of information supply in financial markets in the second half of the 19th century. They significantly increased speed and reliability of information transmission (Brock 2003). Yet, these technologies were either bilateral in character (e.g., telephone), or non-interactive (e.g., stock-tickers and newspapers). This chapter focuses on the evolution of the modern form of information supply in financial markets, defined as the supply of information about prices and journalistic news *directly* to financial institutions through modern information and communications technology. This supply is both multilateral (i.e. every node in the network could access, so retrieve and add information such as price quotations), and interactive (i.e. it gave the possibility to inquire and to retrieve at any point prices and transactions in respective asset classes and geographies). Through the spread of computational capabilities and advances in digital instead of analogue technology, new elements were added to this modern market for financial information, such as information storage (databases on top of 'real-time' display of information) and information processing capabilities (manipulation of quantitative data based on e.g., spreadsheet capabilities or integrated analytical tools).

[9] Douglas Taylor, '*Expert interview - The development of the market for financial information*', interview transcript by Raphael Heim [online], 08.06.22, p. 9.

It is not surprising then that the market for financial information in the 1970s emerged in a fragmented manner, as understood by the markets' modern form of specialised firms supplying price information directly to the financial industry on various asset classes, as well as financially and economically important news and information through modern communications technology. On the one hand, there were established news providers such as Associated Press (AP), Agence France Press (AFP), or Reuters, delivering contextual news on political, social, and economic events. On the other hand, information vendors such as Telerate, Quotron, or Reuters supplied price quotations to financial institutions (Read 1999, Palmer 2019). Especially in the 1970s and 1980s, the first and second part of this market supplying 'basic' and 'proprietary' price information was highly fragmented along two major lines: by geography, and by financial asset classes. Dennis Waters, who founded Waters Information Services in 1984 as the first publication specifically dedicated to research on the market for financial information for investors and competitors, summarized the fragmentation during this period in the following way:

> "This market was split along two main lines. On the one hand it was split geographically – there were firms only focused on the US like Quotron, or only focused on other geographical regions such as Quick in Japan. If you wanted to have access to equity quotations from the Tokyo Stock Exchange, you would have had to use the Quick system, as it was for some time the only one that supplied this information. On the other hand, this market was also split by financial instruments, where each market segment had their own services. Reuters for example dominated in foreign exchange, Quotron in US equities and Bloomberg later on in US bonds. This was the main reason for the fragmentation in this market from my point of view".[10]

Considering the importance of information providers during financial and banking crises, there is a lack of attention on this specific issue in the academic discourse. Although historians such as Read or Palmer, and journalists such as Mooney and Simpson, peripherally touch upon crises on some occasions, as during the financial crises of 1973/74 and 2000 (Read 1999, Mooney and Simpson 2003, Palmer 2019), an analysis focused on this subject is lacking. Thus, there are several

[10] Dennis Waters, '*Expert interview - The development of the market for financial information*', interview transcript by Raphael Heim [online], 06.06.22, p. 2.

central questions that the treatment of this area by subjects such as history or finance have yet to answer. How does the supply side of this market (represented by key firms such as Reuters or Bloomberg) react to financial crises and downturns? How do they interact with the demand side from financial institutions during these times? What challenges do they face regarding timeliness and reliability especially of financial and economic news during these times of distress? What are the consistencies as well as changes in terms of their interaction with their customers in the financial industry? And how do they adapt during and after these crises in their sourcing and distribution of financial data and information in comparison to pre-crises organisation and processes? This chapter looks at the evolution of this market and its key players, especially the history of two central firms, Reuters and Bloomberg, between 1973 and 2008. It provides insights into these fundamental questions to advance our understanding of the 'market for information' in finance, as well as its role for actors in financial and banking markets during times of distress. Furthermore, the continuum between private and public, and soft and hard information characteristics is a feature followed throughout this chapter and is discussed in the conclusion.

1. The modern market for financial information – Reuters MMR and the crises of 1973/74

The history of one central firm is especially illuminating regarding the role of the market for financial information in times of distress in financial markets: Reuters. Paul Julius Reuter, who founded Reuters in 1851, initially focused on speeding up information transmission between Berlin and Paris (and particularly their stock exchanges) through carrier pigeons in Aachen to fill a gap in the transnational telegraph network (Read 1999). The firm subsequently established itself as the predominant British news provider through an international journalistic network, supplying news stories to local, regional, and national newspapers around the world and competing with institutions such as AP and AFP (Storey 1951). The 1960s and 1970s saw the transformation of Reuters from a respected, yet financially struggling journalistic organisation to the leading firm on the supply side of the international market for financial information dominating the ensuing two

decades. This first section focuses on this transformation and analyses the introduction of one of this markets' most successful and revolutionary products, the Reuters Monitor Money Rates (MMR). The MMR, introduced in June 1973, was a product initially designed to bring transparency and faster price information into foreign exchange markets by substituting bilateral telephone and telex contact between FX dealers with a multilateral, retrievable information system. The start of this innovation, with its initial launch in June 1973, happened just when FX and stock markets plunged into turmoil after the outbreak of the Arab-Israeli war in October 1973 and the first oil-price shock. This section argues that the introduction of Reuters MMR was in fact initially not appreciated by foreign exchange traders. It lacked network effects in essentially a platform system that relied on participants' contributions for its information supply among an initially too small user base. The MMR suffered due to an unfamiliar technology not yet fully accepted by established traders. Instead, FX traders relied at least in the first months of the turmoil more on "the old ways of doing business" by phone while being "too busy to use a new instrument".[11] This case highlights two key aspects in the market for information: the importance of network externalities and inertia among market participants, which interacted to initially inhibit the subsequently successful innovation.

Political turmoil and international financial realignment in the crises of 1973/74

The transformation of the market for financial information in the early 1970s and the introduction of Reuters MMR system must be interpreted in the context of the international economic and financial circumstances of this time, especially in FX markets. The early 1970s witnessed various banking and financial crises with stock market crashes in several advanced economies at a time of international financial realignment with the end of the Bretton Woods system of fixed exchange rates. These developments, coupled with political and economic crises

[11] Michael Nelson, '*Michael Nelson on the development of Reuters, 1952-1989*', Science Museum Interview, interviewed by Roger Bridgman and Donald Read, 03.07.89, p. 25, LN935, Reuters Group Archive, London.

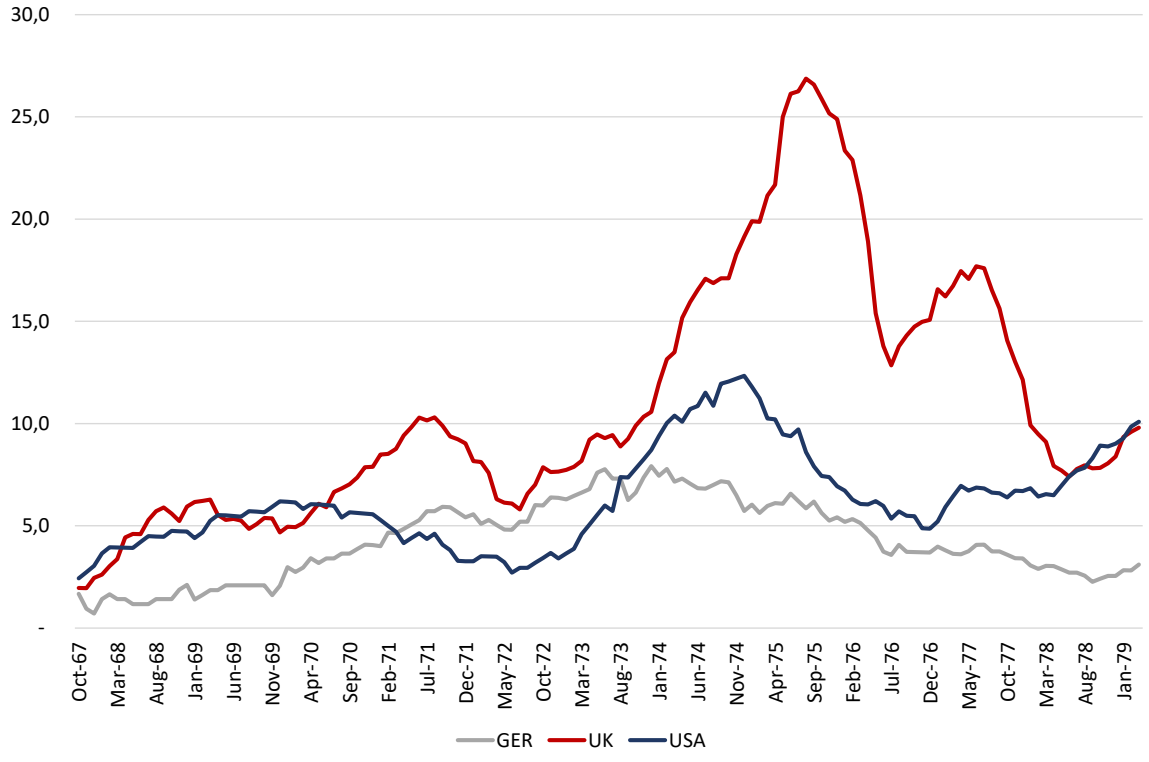
such as the oil price shock in the wake of the Arab-Israeli war and the oil embargo by OPEC, led to a severe economic recession and advancing inflation in economies such as the US and the UK (Hammes and Wills 2005, Capie 2010, Goodhart 2011, Gowa 2019). This market turmoil hit an international financial system that had to learn to deal with flexible exchange rates, and the removal of exchange and capital controls for the first time since the introduction of the Bretton Woods system after the second world war. Foreign exchange traders were confronted with a "volatile and unfamiliar environment", with exchange rates that moved and reversed rapidly and significantly, as, for example, "in June 1973 (…) sharp speculative pressure led some European currencies to appreciate against the dollar by as much as 4 percent on a single day, and by as much as 10 percent in little more than a week" (Spero 1980).

The Bretton Woods pegged exchange rate regime supported the convertibility of the leading currency, the USD, to gold and simultaneously pegging other major national currencies to the dollar (Gowa 2019). Loose monetary policy in the US in the 1960s combined with high government spending to finance the Vietnam War, the Great Society programmes, and a monetisation of the government deficits by the Federal Reserve led to rising domestic price inflation and falling real interest rates (see e.g., Eichengreen 2007, James 2022). Rising nominal interest rates were outpaced by the inflationary pressure, as well as accumulating dollar reserves outside the United States (Hammes and Wills 2005, Fukumoto 2011).[12] Figure 9 shows the rise of consumer price inflation in the United States, the United Kingdom and Germany from 1967 to 1979, highlighting the increasing inflationary pressure especially at the beginning and middle of the 1970s. Figure 10 plots the development of US nominal interest rates from 1960 to 1980, while Figure 11 emphasizes the falling real interest rates in the US and the UK in the late 1960s and early 1970s.

[12] This only represents a very brief working summary of the complex causes and different explanations that have been employed by academics for the demise of the Bretton Woods regime. For further discussion on the causes see for example Eichengreen (2007) and James (2022).

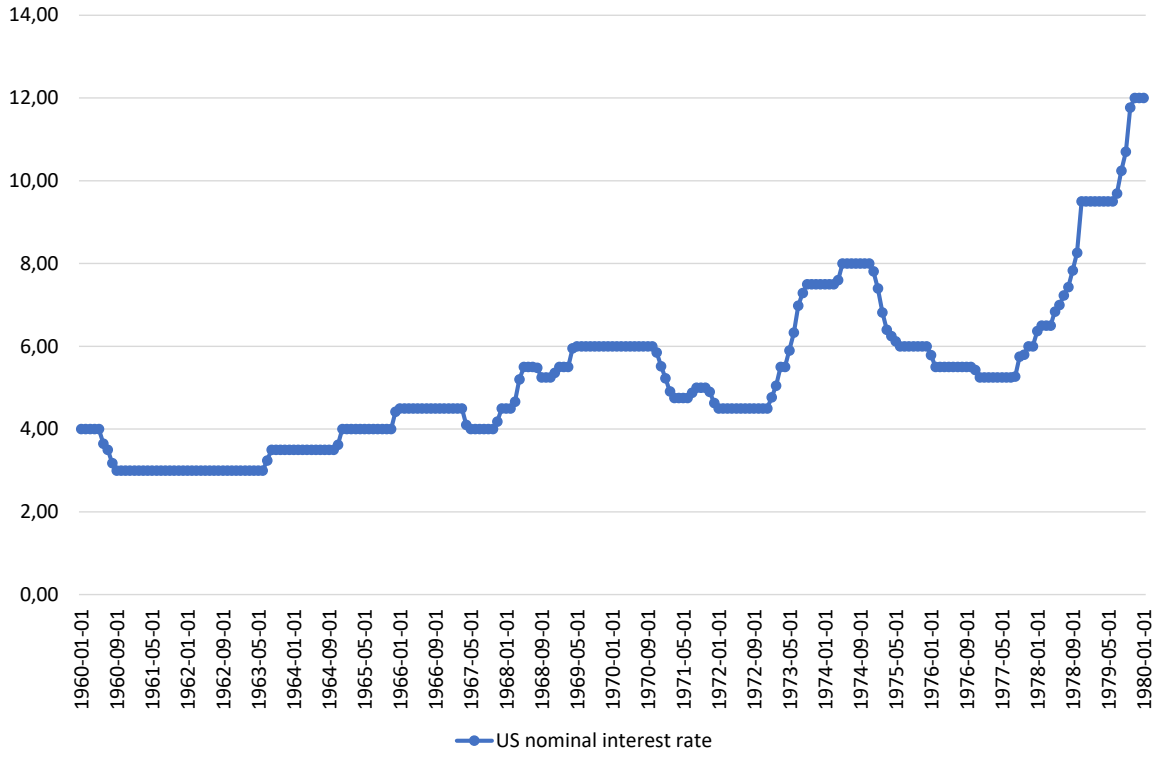
The cracks in the Bretton Woods system became overwhelming in the summer of 1971, when gold convertibility of the USD was temporarily suspended in August, the infamous 'Nixon shock', arguably driven as a response to speculative pressure on the Dollar and "Nixon's (…) preference for open capital flows and stimulative monetary policy" (Butkiewicz and Ohlmacher 2021). The reformed framework at the Smithsonian conference in December of that year proved to be short-lived, leading to the float of Sterling in the summer of 1972, and thus increasing pressure on the system (Schenk 2014). The pegged rate system effectively came to an end from March 1973 onwards as the Japanese Yen and most European currencies were floating against the USD (Schenk 2014).

Figure 9: CPI for US, UK, and Germany, 1967-1979.



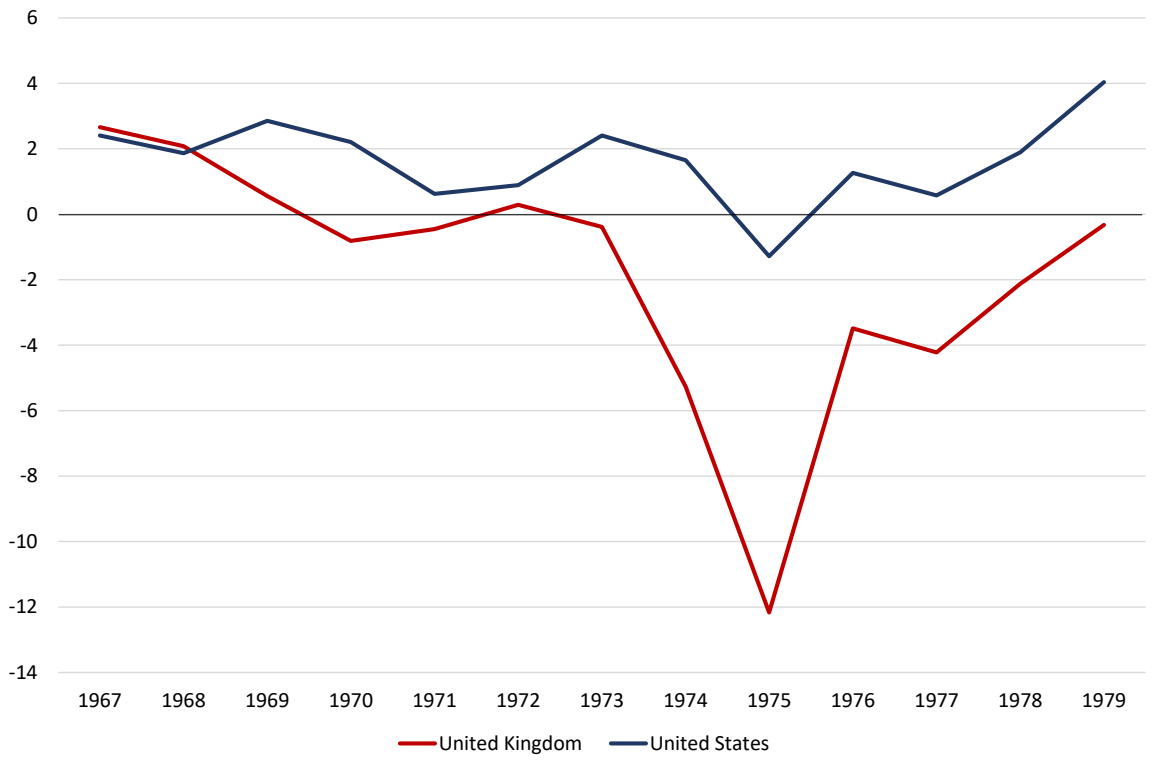
Source: Data from OECD, Inflation (CPI Indicator), doi: 10.1787/eee82e6e-en.

Figure 10: US nominal interest rate, 1960-1980.



Source: Data for US nominal interest rate retrieved from FRED, Federal Reserve Bank of St. Louis.

Figure 11: Real interest rates, UK & US, 1967-1979.



Source: Data from International Monetary Fund, International Financial statistics and data files using World Bank data on the GDP deflator.

Plenty of qualitative and anecdotal evidence by traders emphasizes that FX transaction volume picked up markedly after the outbreak of the Arab-Israeli war and the ensuing oil embargo (Artus and Young 1979, Spero 1980). Volatility in exchange rates as measured in terms of US Dollars remained high for major international currencies such as the German Mark, the Swiss Franc, or the British Pound especially in 1973 and 1974. The increase in volatility is even more pronounced in contrast to the relative stability of the preceding years (see Figure 12 for an indexed development of spot foreign exchange rates for major international currencies against the dollar and Figure 13 for daily percentage changes), before volatility decreased in the mid-1970s (Artus and Young 1979). After the outbreak of the Arab-Israeli war in October 1973, the US Dollar spot rate gained significantly until January 1974 in comparison to the leading continental European currencies. This trend was driven by the widespread assumption that the US was in a better position to compensate the oil price shock, yet reversed rapidly in January 1974 and declined significantly until May (see Figure 12 and Figure 13).

Figure 12: USD/European currencies daily spot exchange rate, indexed 1971=100.

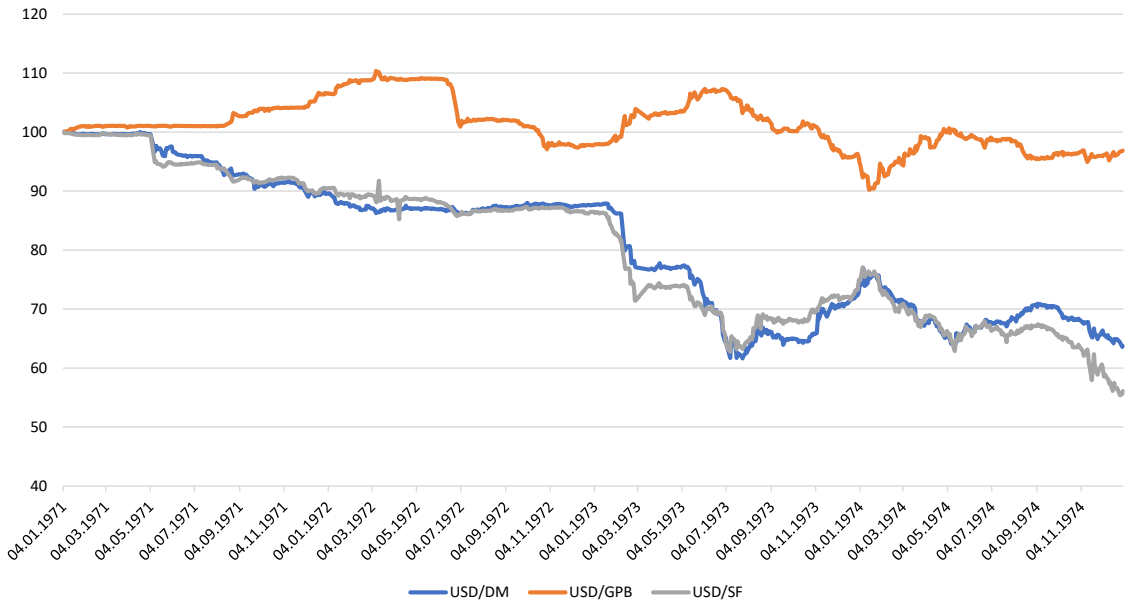
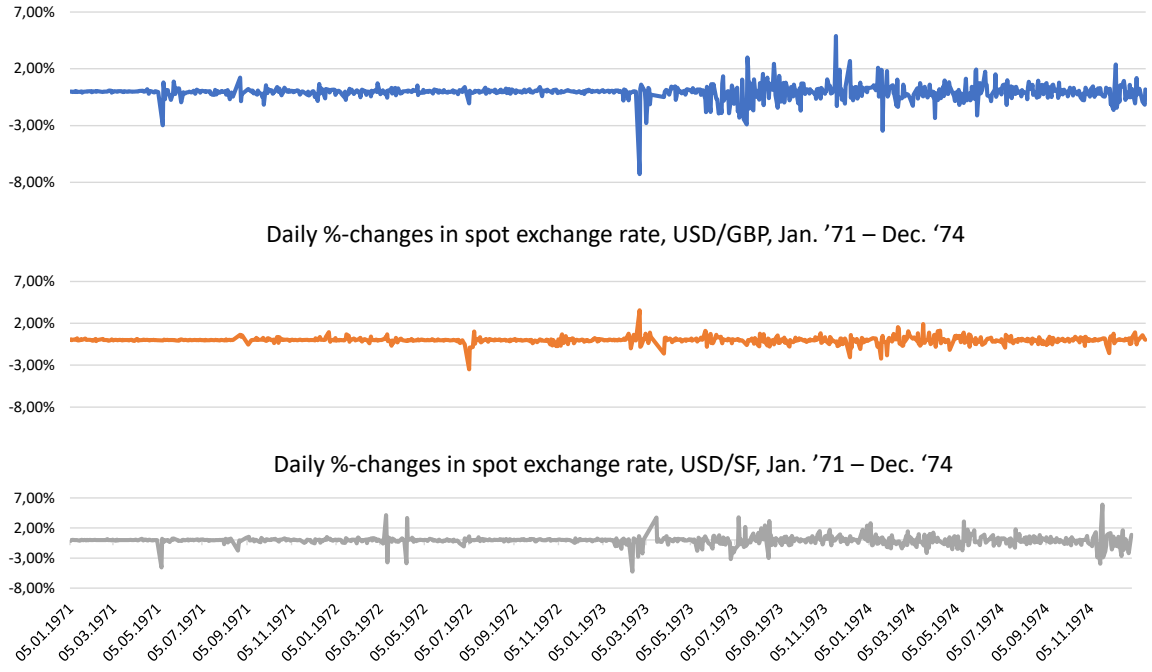


Figure 13: Daily %-changes in spot exchange rate, USD/DM, USD/GBP, USD/SF, Jan. '71 – Dec. '74.



Sources Figure 12 and Figure 13: Daily rates in FX spot market, Archival Federal Reserve Economic Data, U.S. Dollars to U.K. Pound Sterling Spot Exchange Rate [DEXUSUK_20221128], retrieved from ALFRED, Federal Reserve Bank of St. Louis; https://alfred.stlouisfed.org/series?seid=DEXUSUK, Archival Federal Reserve Economic Data, Swiss Francs/ U.S. Foreign Exchange Rate [DEXSZUS_20221128], retrieved from ALFRED, Federal Reserve Bank of St. Louis; https://alfred.stlouisfed.org/series?seid=DEXSZUS, Deutsche Bundesbank, US Dollar to Deutschmark Spot Exchange Rate on Frankfurt exchange [BBEX3.D.USD.DEM.AA.AC.000], retrieved from Bundesbank, https://www.bundesbank.de/dynamic/action/en/statistics/time-series-databases/time-series-databases/759784/759784?listId=www_sdks_b01011_3, 09.05.22.

Additionally, the banking crises of 1973/74 exposed the extent of risk in the foreign exchange market: The collapse of the German Bankhaus Herstatt in June 1974 revealed the risk of international settlement not only in the forward foreign exchange market, but also in the spot market (Mourlon-Druol 2015). In the US, the failure of Franklin National Bank (with $1.44 billion in deposits) happened after an increase in Franklin's net foreign exchange short position had risen from just $5.2 million in December 1972 to $62.6 million in November 1973 and to over $232.6 million by May 14, 1974 (Spero 1980). As discussed, this happened in a FX market that was characterised by significant swings and reversals in exchange rate in late 1973 and 1974 (Artus and Young 1979), combined with foreign exchange traders that were "inexperienced in dealing with the new world of floats and the unpredictable exchange market behavior" (Spero 1980). Thus, the supply of timely and reliable information in the FX market became increasingly important in the

early 1970s. It is important to remember that these developments occurred in the context of a highly fragmented market of regional and asset class monopolies of information suppliers. As described in Dennis Waters' quote at the beginning of this chapter, the direct supply of even 'basic' price information in some asset classes or regions was coupled to exclusive contracts between exchanges and individual firms, such as Quick for Japanese equities, or Quotron for US stock price information. Competition was thus limited to, for example, among journalistic news providers (AP, AFP, Reuters etc.) and in some assets. These differences in the competitive ecosystem of information suppliers were markedly different in 1973/74 than in the other cases studies, with respectively different outcomes and behaviours during the crisis, as this chapter explores in detail.

The Reuters Monitor Money Rates in 1973/74

In a special report published by Reuters in 1981 in its internal company journal ('Reuters World') to celebrate the tenth anniversary of the development start of its Monitor service, the company specifically highlighted the critical international political and financial circumstances under which the project for a "Forex system" was launched in 1973. It stated that "Reuters timing was fortunate since exchange rate movements became wilder than ever in the wake of the 1973 Arab-Israeli war".[13] The idea of moving into the foreign exchange market through a "money rates service" had been floating around since 1971, when Andre Villeneuve and other managers in Reuters Economic Service (RES) identified the need for more sophisticated information in the fast-changing forex market with the looming breakdown of the Bretton Woods system. The first proposal for this "Forex system" was submitted in February 1972. In terms of overall revenue and profit generated over the following years, the system that became Reuters MMR certainly proved a remarkable success, with a contribution to Reuters profit of £200 million between 1973-1983.

[13] Reuters World, '*Ten years on – and the Monitor revolution keeps on spreading*', November 1981, pp. 1-5, LN1226, Reuters Group Archive, London.

Between 1977-81, Monitor profits exceeded Reuters overall company profit, implying that "all other products combined made a loss".[14]

Yet, the positive take on the crises and turbulences of 1973 and the launch of this critical product for Reuters has to be put into perspective and questioned by looking at contemporary sources. This section argues that the introduction of the service in 1973 nearly collapsed and failed, due to a lack of contributing participants to the system during the turmoil in FX markets, as inertia by financial institutions and backlogs in hardware installations initially prevented the formation of a critical mass needed for positive network effects of the system. Only subsequently did the MMR turn into a success in 1974, when it gained the momentum that would transform dealing rooms (both metaphorically and physically) and revolutionise the market for financial information. As the business model for the new product relied on market participants as both customers and for information input, this subsequent success was only possible through a critical mass connected through the system.

Starting in the 1960s, advances in computer and communications technology, fundamentally changed the business model and organisation of Reuters. Donald Read, author of the last official company history of Reuters, summarized the profound changes along the new technologies introduced by Reuters:

> "The International Financial Printer had introduced dissemination of information directly to subscribers. Stockmaster had made computerized stock market information available by retrieval internationally, and in seconds. (…) Monitor Money Rates had brought contributed data within a computerized marketplace.[15] And finally, Monitor Dealing had drawn Reuters into the very process of trading" (Read 1999).

These new products changed information dissemination in the market for financial information by making information supply direct (from suppliers to all subscribed institutions as

[14] Typescript, correspondence from J. C. Parcell to D. G. Ure, '*Monitor Profit, 1973-1983*', 06.06.83, LN1124, Reuters Group Archive, London.

[15] 'Contributed data' in this context means that subscribers to the service were able to put in their own bid/ask quotes into the system, which then became available for other subscribers to the Monitor, thereby creating in effect a platform for FX.

with journalistic news through the International Financial Printer) and interactive (as 'Stockmaster' could be asked to display the latest quotes by putting in a specific code, rather than waiting for ticker tapes or telephone inquiries). Yet, it was the MMR that first combined these two elements of direct supply and the ability to interact, at its introduction first in FX and as shown in Figure 16 subsequently expanded to information on other asset classes and journalistic news. Thus, the MMR covered eventually all three segments of the market for financial information. It also introduced the concept of contributed data, which, as this section shows, was a decisive factor in its success with the positive network externalities this kind of information supply entailed. However, in the crisis of late 1973, this initial reliance on contributed data almost led to the failure of the system.

The 1972 proposal, devised and promoted within Reuters by managers Andre Villeneuve and John Ransom under the guidance of RES chief Michael Nelson and Reuters CEO Gerald Long, was designed to "fill an information gap". Villeneuve and Ransom observed that "industrial and commercial entities are forced to devote far closer attention to foreign exchange and money market operations" with the looming end to the Bretton Woods system of fixed exchange rates.[16] As Michael Nelson explained, the need to branch out into other financial assets as well as targeting corporate treasury clients which needed new information sources in the foreign exchange market (Strange and Watson 2015), was a deliberate move by Reuters. Stock market information, which Reuters had focused on in the late 1960s through the financially successful 'Stockmaster', became a more competitive field on the supply side with other regional suppliers popping up and stock exchanges themselves moving into direct distribution of their stock price information:

> "it was quite apparent in the late 60s that if we were going to grow we'd got to grow in areas other than stock markets, and also competition was increasing in that area. The stock exchanges themselves, particularly the Swiss, were beginning to go into that field. So we'd got to do something different".[17]

[16] Typescript, correspondence from A. Villeneuve and J. Ransom to M. Nelson, 25.02.72, LN1227, Reuters Group Archive, London.
[17] Nelson, *Science Museum Interview*, p. 15.

The system would fundamentally change banking operations in the growing foreign exchange market: "Before the advent of Monitor, banks had to maintain almost continuous telex and telephone contact with each other simply to keep track of market fluctuations".[18] This bilateral 'telex and telephone' communication of information could be replaced by a new multilateral system, in which Reuters would supply the hardware and communication infrastructure through Monitor terminals directly installed at its customer locations. Information about foreign exchange rates would be inserted by subscribers to the service, enabling faster and more reliable dealing.[19]

The Monitor system thus became at its inception a vehicle for price information generated by Reuters' customers, that would be collected, repackaged, and sold on through the system, creating a central marketplace for foreign exchange price information. But this could only succeed if the system would manage to gain enough contributors so that the information supplied would be more valuable and more easily accessible than the previous bilateral dealer-to-dealer communication between institutions.

Before the introduction of Reuters Monitor Dealing service in 1981 (see next section), this information provision was focused solely on the display of the bid/ask quotes from participating institutions. There was no matching of sellers and buyers, nor was direct trading on the Monitor system yet possible (Read 1999). However, even this limited ability of the new system was revolutionary at the time, as Douglas Taylor emphasized: "The Monitor service for foreign exchange prices literally changed the world and the financial markets because it brought immediate transparency to the FX pricing".[20] As described in Donald Read's quote on the development of Reuters revolution of technology in information provision, the new service was seen by observers of the market for financial information as a bold, yet coherent extension of Reuters earlier products:

[18] Reuters World, *Monitor revolution*, p. 4.
[19] Villeneuve and Ransom to Nelson, 25.02.72.
[20] Taylor, *Expert interview*, p. 3.

> "It was the introduction of the first Reuters electronic display, the Ultronic [Note: 'Stockmaster'], in 1964, that revolutionised Reuters business, for it allowed the customer to choose the information he wanted rather than wait for it to come up on a tape – it was, in short, 'an information retrieval system'. Nine years later Reuters introduced the Monitor. This gave each customer a computer rather than a passive terminal and it allowed him [sic] to insert his [sic] own price quotations into the system as easily as he [sic] could extract price quotations".[21]

The market potential for the new system, difficult to assess due to its unconventional nature, was tested with potential customers mainly in London, Western Europe, and North America already in the spring of 1971. This was several months before the Nixon shock of August 1971 and the Smithsonian Agreement of December 1971, emphasizing the early anticipated need to fill the identified "information gap" in the money market. With ruptures in the Bretton Woods system becoming apparent and leading, for example, to the float of the DM already in 1969 (Gray 2007), these trends were already observed by contemporaries, yet Reuters managed to get a head start through its close market research prior to the development of the system:

> "Nelson (…) sent Andre Villeneuve on a three-month visit to banks in Europe, New York, and Chicago, to assess the potential of what he saw as a growth market (…) Nelson said. 'The idea of having clients put their own information into your system, and getting them to pay for the privilege, was new on the scale we were proposing. But Monitor wasn't just plucked out of the blue — It was the result of a careful market survey'".[22]

In their talks with potential customers, Villeneuve and Ransom realised that brokers in the London marketplace were at the beginning not particularly interested in the new service. But several leading banks (esp. the large clearing banks in the UK) had expressed interest, so the product was "designed to suit the banking community".[23] This reflected the structure of the FX market, as the system provided the potential for more business for banks trading in foreign exchange by advertising their rates on top of faster and more efficient price discovery. Members of the London Foreign Exchange Brokers Association did not order the Monitor service until as late as 1977, for fears of losing business if the service became dominant in the market (Read 1999). As

[21] Nicolas Colchester, '*The news agency battle for the market place*', Financial Times, 13.09.78.
[22] Reuters World, *Monitor revolution*, p. 2.
[23] Villeneuve and Ransom to Nelson, 25.02.72.

there was not yet a direct dealing function established until the introduction of Monitor Dealing in 1981, this fear was in the first years primarily driven by the revolutionary nature of the new Reuters Monitor as it was difficult to assess in which direction the system would further develop.

Even though the support by RES director Michael Nelson and Reuters General Manager Gerald Long proved to be crucial, the concept of the MMR in having both suppliers and recipients of information connected to the same system with both paying for being on it was essentially Villeneuve's idea. In 1971 and 1972, Villeneuve was primarily influenced by the lack of coordination and the hurdles for information dissemination in the FX market, that had just started to take off:

> "[Villeneuve] came up with the brilliant concept of the Reuter Monitor (…) There was no formal trading floor for this market [note: FX] as there was with stock prices; therefore, the problem was, how do you capture this information? You can't telephone people and say 'What's the dollar/sterling rate?' because by the time they've told you and you've transmitted it into your systems the price has changed. And therefore he had the idea that you gave a computer terminal to the dealer or the dealing room, and he would transmit the prices at which he was doing business or was prepared to do business into your [i.e. Reuters] system, and you then sell that information to other banks and also other business houses".[24]

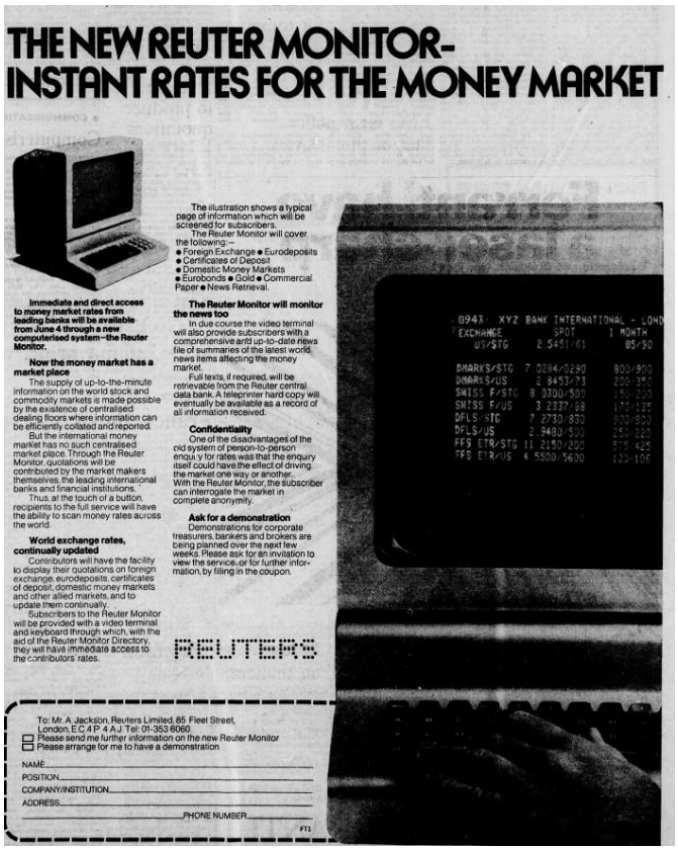
Thus, the new concept of 'contributed data' became central for the MMR. Dealers had an incentive to submit their rates into the Monitor service and participate not only because of faster and more efficient information about forex market rates, but they also got the benefit of advertising their rates to all subscribers. This could help them boost their business if a sufficient number of FX market participants were to subscribe to the service. In this sense, the Monitor system did not only provide information to one target group (recipients-only) but also gave a platform for signalling to the market (for contributors).

When Reuters launched the new Monitor service in June 1973, it was the costliest development project in the history of the company, funded through a Eurocurrency facility of £800,000 provided by the Bank of Scotland (Read 1999). From the complex hardware development to picking the design of the new monitors, created by the renowned British designer Kenneth

[24] Nelson, *Science Museum Interview*, pp. 22-23.

Grange specifically to highlight the transformative nature of the new system, Gerald Long personally involved himself with the project and tied his success as general manager to the service.[25] Accordingly, the company advertised the service more widely than any other system previously introduced. Exhibit 1 shows the initial advertisement Reuters took out in May 1973, which was run every two to four weeks in major outlets such as the *Financial Times* or *The Economist* for the following months. The ad not only emphasizes the tangible facts about the product in the accompanying text, but also depicts the relatively small size of the Monitor to sit on a trader's desk and gives a graphic close-up of the screen, besides the already mentioned clip-off coupon to register interest at the bottom.

Exhibit 1: Reuters first ad for the Reuters Monitor Money Rates; Financial Times, 24.05.73.[26]



[25] Joe Manser, '*Design in every corner*', Financial Times, 11.11.74.
[26] The same advertisement ran in two-to-four-week intervals in business newspapers such as the *Financial Times* & *The Economist* until September 1973.

However, despite this public advertising effort to attract customers to the new service, the uptake at the launch in June 1973 was slow – and driven primarily by word-of-mouth and personal relationships of senior managers of Reuters Economic Services (RES):

> "Monitor was launched, in the words of one Reuter manager, 'on a flood of lunches.' A key role was played by the late Fred Taylor, who worked in the UK Sales Department. He used his extensive banking contacts to lobby for support".[27]

Subscribers to the new service could choose between becoming a contributor *and* recipient of price information, or only a recipient. Pricing for the new system differed significantly between the two options. It cost £525 per month for contributor-recipients, and £190 for recipients-only [about £4,600 and £1,670 in 2021 terms respectively], as contributors could hope for additional FX business by advertising their rates on the system.[28]

At its formal launch on June 5, 1973, Reuters Monitor service had just five contributor-recipients (among them the UK clearing bank Barclays) and 10 recipients-only to the system. The low uptake was partly due to a lack of installation capability that would continue to inhibit growth of the system in its early years, but more so due to questions about the functioning and benefit of the service in the banking market.[29] Ten years after its official launch, Michael Nelson gave an anniversary speech to the few "early contributors of rates to the Reuter Monitor". The speech needs to be interpreted as a promotional exercise, but it was also critical of the system's origins. Keeping this caveat in mind, Nelson emphasized the importance of the first subscribers, which were crucial in bringing additional value through faster and more reliable (and transparent) price information since the MMR relied on a critical mass of contributors and recipients in its network:

> "Without your support and confidence in the early days of the planning and the introduction of the service we would never have had the success, which I think,

[27] Reuters World, *Monitor revolution*, p.3; see also Nelson, *Science Museum Interview*, pp. 24-26.
[28] Anthony Robinson, '*Metamorphosis in the media'*, Financial Times, 18.11.77.
[29] Reuters World, *Monitor revolution*, p.1.

> in all modesty, we can now claim. I can assure you that there were many opponents and doubters, which made your support doubly important to us".[30]

In the same speech, Nelson stressed the widespread doubts about this technological innovation further by quoting several of the typical reactions Reuters encountered when trying to generate subscribers to the service before its launch in 1973:

> "The Foreign Exchange Manager of a leading Acceptance House: 'He said he could not see any application for his bank because: (I) they have as much business as they can handle; (II) rates are too sensitive to be inserted on screens".[31]

In this sense, the MMR was a prime example of technological innovation as discussed by business historians (Langlois and Robertson 1992, Robertson and Langlois 1995, Godin 2008). The initial inertia by market participants was the prime obstacle to overcome for Reuters, and would play a decisive role in the crisis of 1973, as the MMR depended fundamentally for FX markets on the contribution of information by its users. Acceptance and diffusion, as the final sequential step of technological innovation (Utterback 1974, Godin 2008), was the decisive and biggest hurdle for the MMR as the first product combining multilateral information dissemination with interactive features.

At a meeting in September 1973, three months after its launch, Gerald Long informed the Reuters board that the system had 15 contributor-recipients and 15 recipients-only subscribed to its service, among them leading institutions such as the UK's Barclays Bank.[32] However, the system still relied for its success on a critical mass of contributors and the resulting network effects. With more subscribers to the system there would be more rates put in faster by contributors, thus making the market more transparent and efficient. More subscribers also meant increased value for contributors in using the service as an information and marketing channel at the same time, thus further attracting more subscribers.[33]

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[30] Typescript, speech by M. Nelson, '*Reuter Monitor Tenth Anniversary*', 07.06.83, LN1169, Reuters Group Archive, London.
[31] Ibid.
[32] Reuters Board Meeting Minutes, 12.09.73, LN1027, Reuters Group Archive, London.
[33] Nelson, *Science Museum Interview*, p. 22.

With only 30 institutions subscribed to the system, this critical mass had not yet been reached when the war and subsequent oil price shock hit in October and increased volatility shook foreign exchange markets at the end of 1973. Expectations (and the description in *Reuters World* a decade later) that customers would even more actively seek-out reliable and up-to-date price information to successfully manoeuvre in distressed markets (with an increased earnings potential or at least the avoidance of losses during higher volatility) were initially proven wrong. When oil prices increased dramatically after the outbreak of the Arab-Israeli war in October and foreign exchange markets fluctuated significantly, contributors to the new system were 'swept up with dealing' instead of putting their forex rates into the system and providing reliable information to the market. 16 years later, Michael Nelson summarized it thus:

> "I think that the Reuter Monitor very nearly failed, and the reason it very nearly failed was, paradoxically, because the markets were so active that people were too busy to put information in (…) Digital [Reuter's hardware contractor] were very bad in the delivery of the equipment, so we couldn't get the equipment out into the field, and so people were not interested in putting the information in because there was nobody to read the information, or few people".[34]

Although there is no source left in the Reuters Group Archive to reveal the full extent of this failure to put information into the system, both Reuters internal and external subscribers perceived this to be an existential threat for the Monitor service. Expectations about an imminent collapse could be observed in the reaction and feedback of one senior executive of Barclay's bank, one of the first movers into the system, who told RES chief Michael Nelson that they were "expecting Monitor to breakdown" in late 1973 due to the insufficient number of active contributors.[35]

However, the complete suspension and breakdown of the system was averted in 1973. Faced with the breakdown, Reuters actively encouraged contributors to add and update quotes within the new system through the promise to increase outreach by faster installations in the

[34] Nelson, *Science Museum Interview*, p. 25.
[35] Ibid. pp. 25-26; see also Michael Neale, '*The Reuter monitor - the first ten years*', internal discussion version of press release, 03.06.83, LN1169, Reuters Group Archive, London.

backlogged delivery of the Monitor hardware.[36] The firm managed to bring new businesses to the system by switching hardware suppliers and increased the network of contributors until January 1974 to 52, with 25 contributors. This tenacity in the first six months was at least partially due to CEO Gerald Long, who would not abandon the project after the considerable development and advertising costs for Reuters.[37] These efforts stabilised the system and after delivery and installation difficulties in Reuters supply chain were overcome at the beginning of 1974, the initial issues subsided. Reuters consistently added new subscribers to the service in the first half of 1974. By June 1974, it had managed to secure 246 subscribers (split almost evenly between the UK and rest of Europe as the two markets focused upon at its introduction), with 52 contributors and 192 recipients-only.[38] To put this number in perspective: When the service launched, Reuters had calculated the maximum number of subscribers to the service to be around 230 by 1976.[39]

The addition of this significant number of new subscribers, and especially contributors, changed the outlook for the system entirely, giving it the necessary critical mass to be perceived as an invaluable tool for information provision in the fragile and volatile FX environment in 1974. It kickstarted the hoped for virtuous cycle of more subscribers, contributors, and thus "more and better" information, or, more precisely, more transparency in the FX market through faster and comparable price information.[40] Thus, when for example Franklin National Bank in the US and Bankhaus Herstatt in Germany collapsed in June 1974, plunging foreign exchange markets again into turmoil, the Monitor system had established itself as a source of reliable and fast information in FX markets, and was widely used by traders dealing in the uncertain environment.[41]

[36] This move resembled, on a less enforcing scale, the actions taken by the CHIPS clearing house during the height of the Herstatt crisis in late June 1974, when the clearing house sent out instructions to its members to release their transactions into the system that would be settled under an adapted process to accommodate the insecurity of market participants about counterparty risks (Schenk 2021).
[37] Nelson, *Science Museum Interview*, p. 26.
[38] Parcell, *Monitor Profit*, p. 2.
[39] Neale, *Monitor*, p. 1.
[40] Nelson, *Science Museum Interview*, p. 28.
[41] Ibid. pp. 26-28.

The introduction of the Reuters MMR in the crises of 1973/74 had a lasting impact not only on how banks and other financial institutions acquired and processed data and information that might affect the market and their trading position, but on the whole procedural and organisational setup of companies and their dealings in the market. Several advertisements both by banks, broker-dealers, and Reuters itself in 1973 and subsequent years featured as central theme the new information system as the centrepiece of any "up-to-date" trading room. In a *Financial Times* advertisement from 1974, merchant bank Hill Samuel depicted its updated FX trading room, emphasizing the increased dealing capacity through new direct telephone and telex lines, but also highlighted that the next step for the firm would be to get Reuters MMR to offer faster quotations to subscribers to the service (see Exhibit 2).

Exhibit 2: Hill Samuel dealing room announcement with Reuter MMR; Financial Times, 21.01.74.



New foreign exchange room at Hill Samuel

Terry Kirk

The new Hill Samuel foreign exchange dealing room came into operation at the merchant bankers' head office in Wood Street, London, E.C., at the end of last week. The room is 50 per cent. larger than the old Forex location, and has 14 dealing positions, compared with nine previously. There are 120 direct lines to customers, brokers and banks, against a former 80 lines. The dealers' next step is membership of the new Reuter Monitor Service, which enables them to offer Hill Samuel currency quotations to other subscribers via a press-button video system.

Chase Manhattan, and Samuel Montagu were respectively featured in two Reuters advertisements in 1976 and 1977, Exhibit 3 depicts Chase's new dealing room. Being previously constructed around telephone and telex machinery, the new Reuters system gradually replaced these installations as the centre of the trading room, even more so after direct dealing through the system was made possible in 1981 with the Reuters Monitor Dealing. The perceived ease of the new Reuters system is depicted in the Samuel Montagu ad in Exhibit 4 by getting information just through the easy push of a button.

Exhibit 3: Chase Manhattan's dealing room ad for the Reuter Monitor; Financial Times, 10.11.76.



Chase Manhattan Bank's new treasury dealing room has been specifically designed to incorporate the Reuter Monitor Service.

Dealers sit at custom-built octagonal trading desks with Reuter Monitor screens suspended from the ceiling to give them easy reference to rates and news flashes.

The Chase Foreign Exchange input page CMBX carries forward and spot rates for five major currencies, and was interrogated 56,830 times per week in September by subscribers throughout the system.

In light of the success of this foreign exchange page, Chase has recently expanded the Reuter Monitor Service to include a sterling page CMBS.

Like more than 1200 organisations, it recognises that the Reuter Monitor service has now become an integral part of the international money and foreign exchange markets.

Wouldn't it be a benefit to your organisation?

REUTERS

Reuters Limited, 85 Fleet Street, London EC4P 4AJ. Telephone: 01-353 6060.

Chase Manhattan's new dealing room is designed round the Reuter Monitor

Exhibit 4: Samuel Montagu ad for the Reuter Monitor; Financial Times, 11.03.77.



These points relate directly to organisational and procedural changes implemented by banks and financial institutions regarding their sourcing strategy and processing of financial information. Yet, these changes and developments did not occur overnight: the Samuel Montagu advertisement in Exhibit 4 still highlights the possibility for the MMR customers to get a "hard copy printout" of any inquired information in March 1977. But the subsequent success of the MMR also changed the trajectory of Reuters general business, transforming the established news organisation into the predominant supplier of financial information in the following decades.

From news agency to financial information firm – Reuters transformation

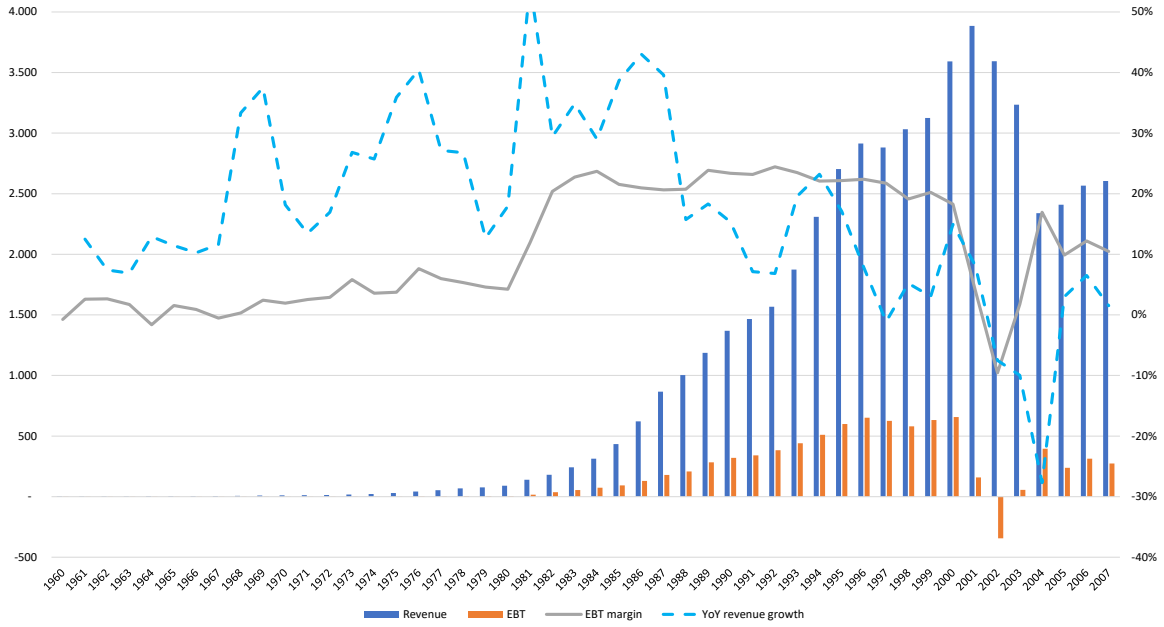
The international political, economic, and financial crises of 1973/74 came at a time of accelerating change in the market for financial information and news, driven by regulatory changes, technological innovations, and the internationalisation of financial institutions. Reuters was fundamentally transformed from the early 1960s onwards under the leadership of general

managers and CEOs Gerald Long (1963-1981), Glen Renfrew (1981-1991) and Peter Job (1991-2001). The institution entered the second half of the 20th century with a business model that essentially still resembled the firm that Julius Reuter founded a century earlier, focused on providing financial, economic, political, and social news to customers on long-term contracts primarily to large newspapers (Storey 1951, Palmer 2019). The organisation of the company was generally unchanged in the 20th century, with Reuters Global News providing news, reports and information about political and social events on a global scale and Reuters Economic Services (RES) focused on selling economic and financial news and stock exchange information (Palmer 2019).

The introduction of MMR and the subsequent Monitor Dealing service set a profound transformation in motion. This technological, organisational, and procedural transformation allowed Reuters to build its operations on a solid financial basis for two decades. At its beginning, Reuters made operational losses during several years in the 1960s. Two decades later, the firm reported hundreds of million pounds in annual profits during the 1980s and 1990s, especially after the company went public in 1984 (Read 1999, Bartram 2003). Figure 14 and Figure 15 show the development of Reuters' revenue and profit margin for the years commencing in 1960, emphasizing the exponential growth (in nominal terms) both in revenues and profits that took hold after the introduction of the technological innovations in the 1970s.[42]

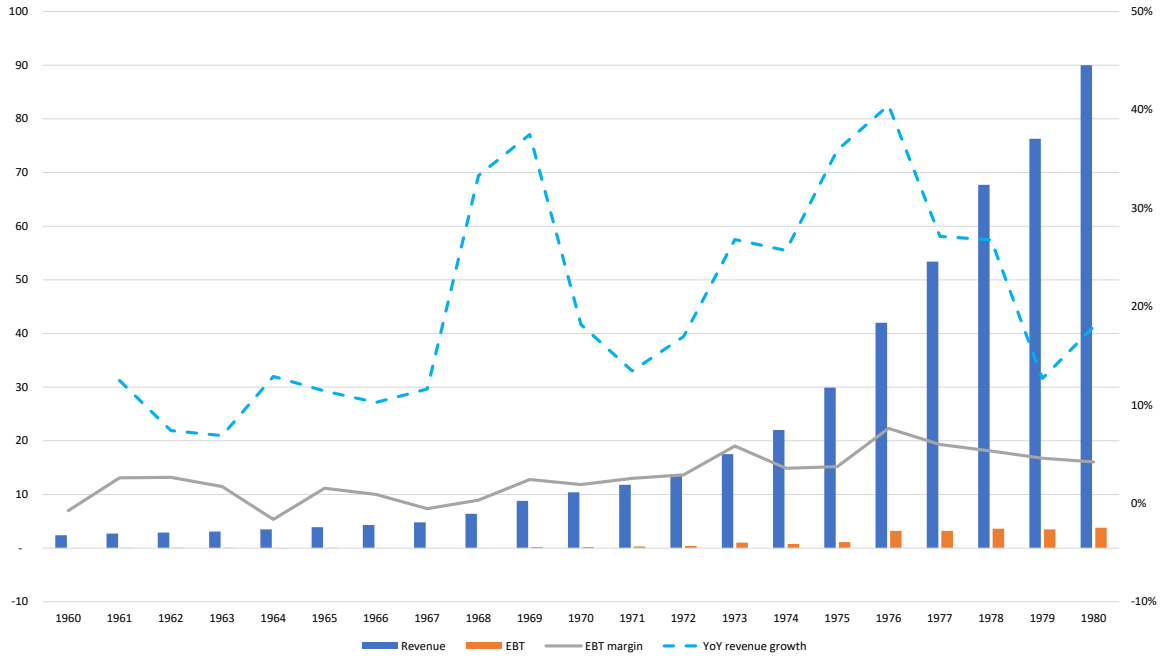
[42] A separate split for Reuters revenue and profit along geographical and product lines emphasizes remarkable geographic consistency over time, yet also the importance of the new information products for Reuters business model from the 1980s to 2007. The traditional business of supplying journalistic news to large newspaper subscribers accounted for less than 10% of the company's revenues after the success of the MMR and Monitor Dealing, even though it remained a popular association of Reuters as a primarily media company (see Appendix 1, Appendix 2, Appendix 3, and Appendix 4).

Figure 14: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1960-2007.



Source: Pre-1984, Reuters archive, annual company statistics; post 1984, Reuters corporation annual reports.

Figure 15: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1960-1980.



Source: Pre-1984, Reuters archive, annual company statistics; post 1984, Reuters corporation annual reports.

There is an upward trend, yet initially a volatile rise in Reuters profit margin and revenues from 1964 onwards. The upward trend was mainly driven by the introduction of the "International Financial Printer" and Reuters "Stockmaster" services in the 1960s. However, it was three

interlocking developments that quadrupled Reuters operating profit margin to around 20%, combined with a compound annual growth rate in revenues of almost 19% for the following 20 years (15.6% in real terms).[43] First, the introduction of the MMR service for FX rates in 1973. Second, its subsequent expansion to incorporate news services as well as information on other markets in the following years (esp. commodities, equities, and journalistic news, see Figure 16). And third, giving banks and brokers the possibility to deal directly through the Monitor Dealing system in 1981. Reuters thus established itself as the first firm covering all three segments of the market for financial information (see Figure 8).

Figure 16: Introduction of new services and information on the Reuters Monitor system.

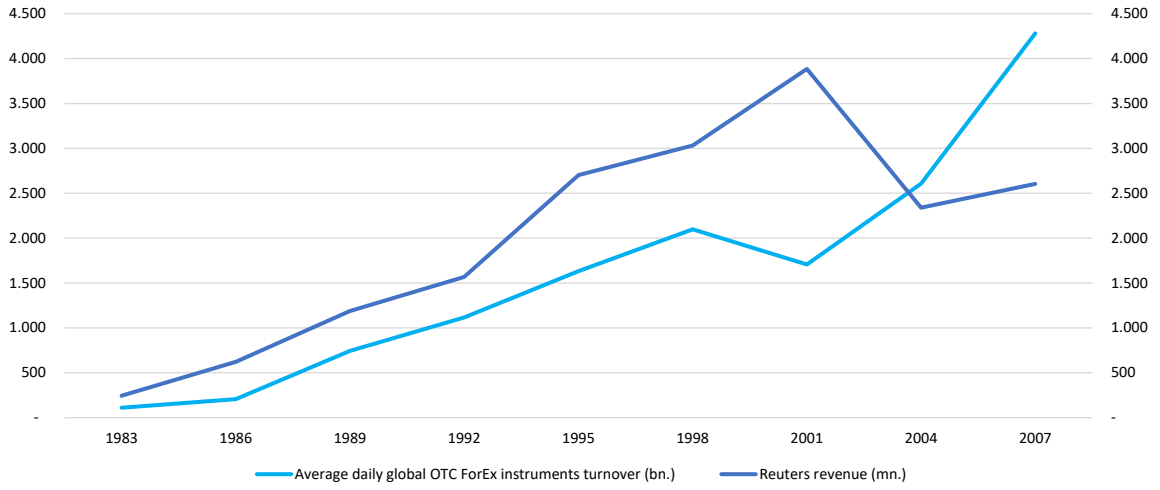
Year	Info. added on Monitor	Description
1973	Foreign Exchange	Start of the Reuters Monitor System in 1973, providing information put into system by subscribers on bid/ask prices in foreign exchange market
1975	News	August 1975 start of "money-news retrieval service", providing updated headline pages for Monitor subscribers promised from its introduction on
1975	Bonds	Addition of Monitor Bonds service providing bond price information mainly for European markets, US Government securities information added in '78
1977	Commodities	Addition of commodity price information pages on the Monitor system
1978	Equities	Monitor Equities went live in 1978, focused on European stock markets, competition to Stock exchange information systems (e.g., LSE TOPIC)

There was a strong relationship between the expanding trade in foreign exchange dealing and Reuters' revenue, as Reuters held an almost monopolistic position in selling FX quotes to subscribers through the Monitor system. Reuters gained an advantage through network externalities in supplying this market, with financial firms needing to participate in the Reuters

[43] Revenue growth in real terms based on IMF, World Bank, and OECD inflation CPI indicator for the UK between 1973 (revenue of £9.19 million in real terms) to 1993 (revenue of £166.91 million in real terms); Revenue data from Reuters archive and annual company reports from 1984; CPI data from *https://www.worlddata.info/europe/united-kingdom/inflation-rates.php*.

system especially in the 1980s if they wanted to remain competitive and deal in FX.[44] The significant connection between Reuters' revenue growth (based on the MMR services and later the provision of direct dealing through the Reuters Monitor Dealing from 1981) and foreign exchange market activity can be seen in Figure 17. If only looked at the period before 2001, the correlation between the expanding turnover in the foreign exchange market and Reuters' revenue from 1983 onwards stands at 0.99. However, if the following years up to 2007 are included, this correlation reduces to 0.65, a development discussed in detail in the penultimate section of this chapter.

Figure 17: Reuters revenue & Global ForEx turnover, triennial, 1986-2007.

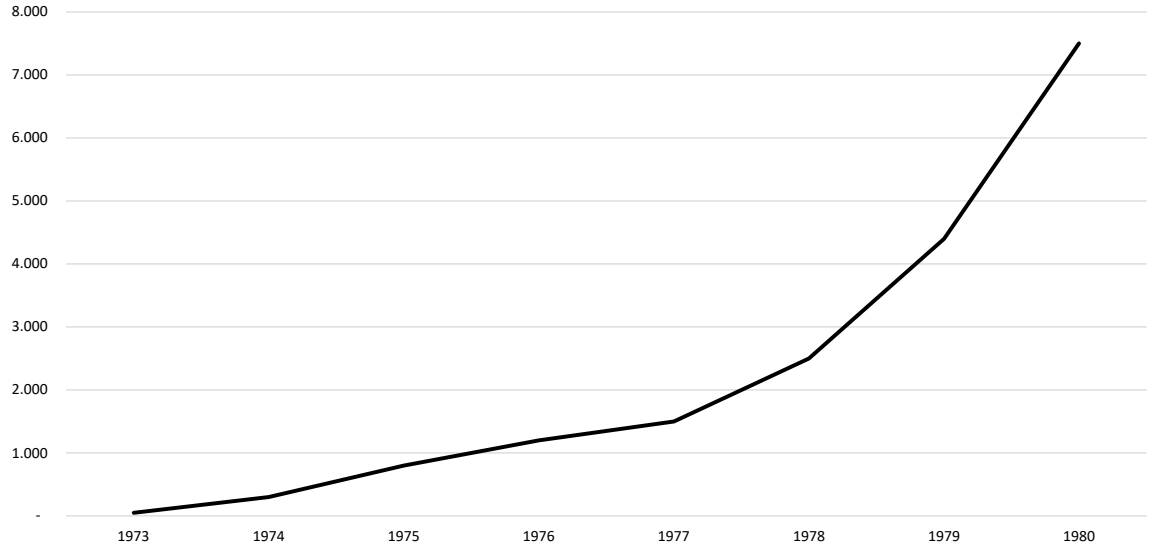


Source: Data on Global ForEx turnover from BIS triennial survey, turnover of all OTC foreign exchange instruments, total overall reported countries in $bn., available online: https://stats.bis.org/statx/srs/table/d11.2.

The central determinant for Reuters business success was the number of total users (proxied by 'user accesses', the discrete number of users measured by Reuters e.g., through installed Monitor terminals), which rose exponentially from 1973 to the late 1980s. They experienced steady growth to the peak in 2001, from just a few dozen in 1973 to almost 600,000 in 2001, as well as a sharp drop after the burst of the dotcom bubble in the early 2000s (see Figure 18 and Figure 19). Again, the quasi-exponential growth in its user base is highly related to the network externalities created by the Reuters system especially in markets such as FX.

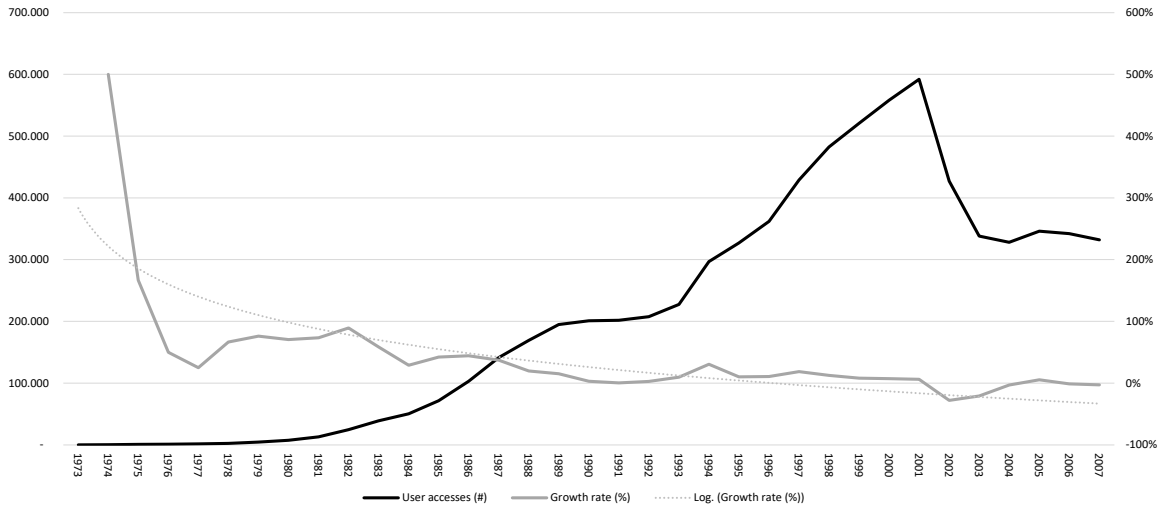
[44] Waters, *Expert interview*, p. 2.

Figure 18: Reuters user accesses development, 1973-1980.



Source: Reuters archive annual sales statistics for Monitor system.

Figure 19: Reuters user accesses development & growth rates, 1973-2007.



Source: Pre-1984 Reuters archive annual sales statistics for Monitor system; Post 1984 Reuters corporation annual reports.

The introduction of Reuters Monitor Dealing in 1981 represented another significant change both for the financial industry and Reuters as a firm. It emphasized in essence the divergence from Reuters classic business as purely a supplier of information, to an institution that would "facilitate the *use* of such information" (Read 1999). Reuters biggest selling point for the new systems was speed and timeliness of information. The advertisements for the Reuters Monitor Dealing Service in the *Financial Times* in Exhibit 5 portrays this emphasis on speed in providing and

processing information, as well as dealing through the Reuters system. In the newspaper advertisement, a visibly stressed man with a finger in one ear (presumably in a loud dealing room) and a telephone close to the other ear is depicted next to the headline "30 seconds is a long time in a dealing room" when using telephone or telex, emphasizing the superior speed of the Reuters Dealing system with only four seconds needed. The large numbers in white depict the 18 basis points that a deal might have moved in the interval, while the user base is mainly depicted as being located in European and American financial centres with "Middle East and Far East" to come.

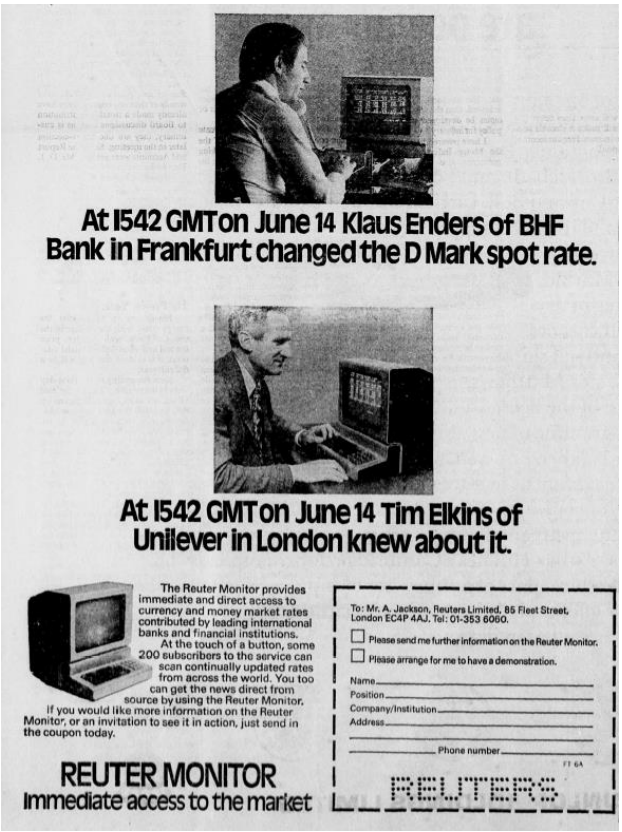
Exhibit 5: Reuters ad for the Reuters Money Dealing Service; Financial Times, 23.02.82.



Yet, besides the need for timely information, this development was also highly connected to larger changes on the demand side of the market for financial information. The MMR would not only target foreign exchange traders in banks and later brokers, but also the increasingly important treasury departments of corporate clients which started to engage more actively in the foreign

exchange market (Strange and Watson 2015). The advertisement in Exhibit 6 depicts just this target group: one of the largest German banks at the time operating in foreign exchange markets is changing the DM spot rate (one of the most important exchange rates and as seen in Figure 13 very volatile in FX markets in the early 1970s) with the targeted recipient being identified as Tim Elkins of Unilever, a British multinational consumer goods corporation (see Exhibit 6).

Exhibit 6: Reuters Monitor Money Rates; Financial Times, 18.06.74.



Yet, both the demand and supply side of the market for financial information were about to change markedly from the 1970s onward. Within the underlying processes of financialisation and globalisation, financial institutions on the demand side expanded into new geographies and asset classes, as well as new service offerings. This went along with increased demand for information from all three segments of the information market in these new areas. Financial institutions, which once focused only on a limited geographical scope or asset classes, became

more diversified and "were in need of more data from different markets. This started when the market for financial information was still very fragmented and no one was able to supply everything, so the firms had to adapt".[45] The supply side responded to these developments, as can be seen by the subsequent expansion of information provided on the MMR system, but also by Reuters leveraging its international journalistic network and global footprint for distribution of its products. Led by Reuters through organic growth of its increasingly profitable business, and inorganic growth by acquiring regional competitors, the once fragmented market started on a trajectory of consolidation. As Dennis Waters put it:

> "The consolidation that later happened was driven by capital, certainly in the case of Reuters, which for some time was the best capitalised of these players in the 80s and 90s. It also had the global distribution, linked to its journalist network, that was also hugely important. Reuters managed to acquire many of its competitors and through these acquisitions expanded into new markets, both geographically and regarding the financial instruments they covered".[46]

The introduction of the MMR system amid the turmoil in FX markets in late 1973, and its subsequent expansion highlighted the importance of network externalities in the market for financial information, as well as the initial inertia by financial institutions to adopt the new technology. Its subsequent expansion and success showed the trend towards an extended and diversified supply of information on all three segments of the information market. Following demand by financial institutions towards increasingly diversified and globalised footprints, the market for financial information started on a trajectory of consolidation and competition that would become its central market dynamic in the 1980s.

2. Growth, doubts, and diversification – The stock market crash of 1987

While the previous section focused on FX markets, this section explores another market segment of the market for financial information and a financial crash during which rapid and reliable price discovery were crucial: the stock market crash of 1987. This short-lived yet stark drop

[45] Waters, *Expert interview*, pp. 2-3.
[46] Waters, *Expert interview*, p. 2.

in major stock markets was markedly different from the previous episode, and happened in a more competitive and consolidated information market on the supply side. But as this chapter shows, it can teach us more about the adaptation strategies of both financial institutions on the demand side and information providers on the supply side to a significant shock within this market environment characterised by diversification and consolidation.

Reuters and other information suppliers such as Telerate or Bridge Information Systems[47] had established themselves as central building blocks enabling the transformation of financial institutions throughout the 1970s and 1980s by expanding their communication and information capabilities. But their interrelations with financial markets and institutions were yet poorly understood when stock markets in the US and other advanced economies crashed around October 19, 1987. The markets' uncertainty about this interrelation might best be encapsulated by fluctuations in Reuters share price, which can be tracked after the company's decision to go public in 1984. Between its IPO and October 1987, Reuters stock price quadrupled from $5 to over $20, just to lose 50% of its value in a matter of days around October 19, 1987, and not regaining this level until 2 years later (see Figure 20). This drop in Reuters valuation amid increasing growth in both revenues and profits throughout the 1980s (see Figure 14 and Figure 21) seems puzzling on first sight.

[47] Telerate was founded in 1969 by Neil Hirsch, and with backing by Cantor Fitzgerald and Merrill Lynch established itself before the arrival of Bloomberg as the major provider of price information on US Treasury bonds, while also expanding its information supply subsequently into other asset markets (e.g., FX) and journalistic news (through a joint venture with Dow Jones and AP). Bridge Information Systems was founded in 1974, and focused at the start primarily on the provision of US equity price information. But just as Reuters and Telerate, it expanded into other asset classes, the supply of newswires, and information processing. Both Telerate and Bridge were subsequently acquired by Reuters in 1998/2005 (see Read 1999 and Jessop 2008).

Figure 20: Reuters share price ($), daily closing prices, 1984-1989.



Source: Data on Reuters historical stock price performance from Reuters investor relations, available online: https://ir.thomsonreuters.com/stock-information/stock-price-performance.

Yet, this chapter argues that it was on the one hand insufficient knowledge by investors about the interrelation of the market for financial information with the wider financial industry. As Taylor recalled:

> "Another fundamental in the (…) information business is that during a crisis, during bad market conditions, information is more valuable. So it's possible that pundits and analysts looking at stock performance kind of (…) lump Reuters into the financial market industry (…) without understanding that their segment of the market reacts differently than a financial institution would during a crisis".[48]

On the other hand, there was a perceptible *internal* insecurity about the effects of a significant stock market crash on Reuters business development after its rapid rise throughout the 1980s driven by extension of products and acquisitions, which led to doubts about Reuters potential for future growth of its business model.

The stock market crash around October 19, 1987 (until the Covid crash of March 2020 the most severe single day drop in US equity prices with ripple effects in many advanced global economies) has to be seen as a decisive moment for the wider market for financial information. As

[48] Taylor, *Expert interview*, p. 8.

this section explores in detail, the prominent role of ICT in precipitating and aggravating the crash through backlogged order systems at the NYSE and algorithmic trading strategies from institutional investors led to concerns about excessive reliance on computers in financial markets, especially in the UK after Big Bang in 1986 (Preston, Kandiah et al. 1999). The crash was not a turning point in the sense that it fundamentally changed the information market's previous trajectory, but rather a catalyst that accelerated trends and tendencies already under way: "The industry was already moving in the direction that it was going with the consolidation (…) they got accelerated by the crash".[49] The market had changed perceptively from the fragmented landscape of smaller monopolies in geographies and asset classes when it emerged amid the revolutions in communication technology in the 1970s. It moved slowly yet steadily towards increased competition and consolidation. A rare article in *The Economist* on the financial information market that was widely circulated within Reuters top management stated in 1988:

> "A market that did not exist 15 years ago is today worth $3 billion a year worldwide (…) Electronic financial information is booming, thanks to the (continuing) deregulation of the world's financial markets, and the ability of computers to process billions of bits of information quickly and cheaply (…) So the markets for electronic information are teeming with firms competing on price as well as service? No. In the two biggest markets – foreign exchange and money markets – there is still a virtual, and highly profitable, duopoly [note: Reuters and Telerate]".[50]

Despite the focus on FX and money markets in this article, Reuters as the emerging dominant firm internationally had already moved to supply data and information not only in FX markets, but also in equities, commodities, and bonds through its Monitor system (Figure 16). In the 1980s it continued on this diversification path delivering specialised new products for certain markets such as 'Equities 2000' or 'Commodities 2000', introduced in May 1987 (Tunstall and Palmer 1991). At the same time, Reuters main competitors as information suppliers to the financial industry moved along similar lines. Telerate, previously focused on the provision of information on

[49] Waters, *Expert interview*, p. 3.
[50] Copy of *The Economist* issue July 23, 1988, '*From foreign desk to foreign exchange*', circulated across Reuters management board, LN1227, Reuters Group Archive, London, UK.

US government securities through its partnership with brokerage firm Cantor Fitzgerald, or Quotron, a major supplier of stock market information that was subsequently acquired by Citicorp in 1986, tried to expand into the Reuters dominated foreign exchange market by launching their own FX information and dealing services in the late 1980s.[51] Furthermore, consolidation in the market was driven by several acquisitions, especially by Reuters, the "best capitalised of these players" after its IPO in 1984.[52] As a report by investment analysts from BNP Paribas summarized in 1988:

> "Reuters has embarked on a two-pronged strategy, making significant acquisitions since 1985 and also developing very advanced terminals and network facilities. Reuters invested close to £100mn. from 1985 to 1987 in twelve acquisitions".[53]

To put into context and understand the events surrounding the stock market crash of October 1987, the general trends and developments in the market for financial information throughout the late 1970s and 1980s first need to be explored in more detail. Based on this, the events surrounding October 19, 1987, emphasize the ignorance and uncertainties about the financial information market and its interrelation with the larger financial industry as it grew in unprecedented ways over the previous decade.

Expansion, competition, and consolidation in the market for financial information

The rapid changes and revolution in information supply witnessed in the market for financial information in the 1970s, in a still very fragmented market, experienced significant shifts throughout the 1980s. On the one hand, established players such as Telerate, Reuters, Quotron, Bridge Information Systems, Dow Jones or McGraw Hill increasingly competed with one another in the supply of financial information by expanding their reach to different geographies and asset classes. On the other hand, still new firms (as for example Bloomberg in 1982) started up and gained

[51] Barnaby Feder, '*Telerate: A Burden for Dow Jones*', The New York Times, 01.11.90.
[52] Waters, *Expert interview*, p. 2.
[53] S. Blacker, D. Owen, B-K. Ducam, '*International Equity Research – Reuters Holdings*', BNP Paribas Equity Research, 08.06.88, p. 2, LN1226, Reuters Group Archive, London, UK.

market share by supplying information on yet not catered-to areas such as in the fixed-income market (Tunstall and Palmer 1991).[54] However, the expansion and competition not only in the 1980s but also in the following decades has to be put into perspective regarding the demand side of the market for financial information by financial institutions. Competition was increasing in easily substitutable information products, mainly 'basic' price information on exchange-traded assets, as this segment was supplied by exchanges such as the NYSE or the LSE. Competition also increased for financial and journalistic news, which were based on journalist networks competing on time over public news stories. Actual competition was much more difficult in the provision of 'proprietary' price information that was characterised by the network effects discussed in the previous section. Peter Esler, former global head of market data for UBS, Bear Stearns, and Citigroup, described this differentiation thus:

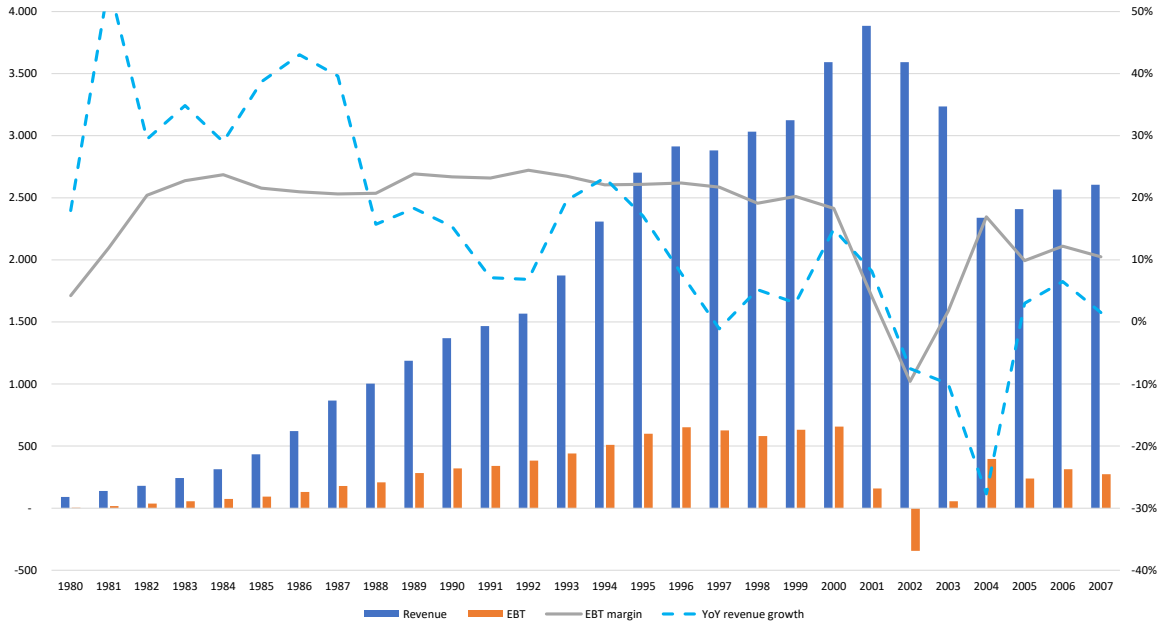
> "Telerate was one who completely owned the fixed income business in the US. I mean you would not even think about going to a floor in fixed income and offer them a Reuters terminal or Reuters data. They'd say it's Telerate, and it was entrenched in agreements between the primary banks and the interdealer brokers (…) However (…) if I went down to the equity floor, I could make an argument (…) I could make the argument and say 'hey, look, you know, your equity data comes across as Stock Exchange data, right?'".[55]

This feature of the market has to be kept in mind, as it determined the substitutability of information products by financial institutions during crises and depended on the competitive environment of the market for financial information. For Reuters, the first part of the "two-pronged strategy" in the 1980s is emphasized by the subsequent introduction of the Monitor Dealing service in February 1981, which set the course for rapid growth of its business (see Figure 21). The service not only supplied data and information in the market for financial information, but actually enabled companies to directly fulfil deals on the new trading system. This further increased the speed

[54] See also Waters, *Expert interview*, p. 4.
[55] Peter Esler, '*Expert interview - The development of the market for financial information*', Interview transcript by Raphael Heim [online], 09.06.22, pp. 6-8.

advantage of the FX information supplied by Reuters, as dealers did not have to switch to other systems or telephones in order to make a trade.

Figure 21: Reuters Group revenue, EBT & EBT margin, mn. GBP, 1981-2007.



Source: Pre 1984, Reuters archive, annual company statistics; post 1984, Reuters corporation annual reports.

Contrary to the introduction of the original MMR terminal, Dealing only went live after there were already 145 customers subscribed, emphasizing again the need for positive network externalities in these systems. As former Reuters employees Brian Mooney and Barry Simpson summarized: “Reuters worked closely with potential customers to develop a dealing system, and a decision was taken that it would be launched only if a critical mass of banks would agree to sign up in advance” (Mooney and Simpson 2003). Michael Nelson, as head of RES still responsible for the extended system, drew direct learnings from the introduction of the Reuters MMR in this, regarding the acceptance of new information products and technologies shown in the previous section:

> “Certainly from a technical point of view it [note: Monitor Money Rates] didn't have the same problems that the Dealing product had, which we launched in February 1981, which, because it was a very complex project, was beset by many software problems. And we were determined that we were not going to launch it until it was very reliable, because we could see that it was such a revolutionary device anyway, if people expected to transact dealings

> themselves as dealers using a video terminal rather than a telephone, that if the thing didn't work properly they would throw it out and wouldn't use it".[56]

The release of the new Dealing system was delayed several times, leading to what Michael Nelson described as uncomfortable tensions between Reuters top management and its board due to the high investment in the development of the new system:

> "It was a very difficult time, because month after month I had to sit in front of the Reuters board and tell them that it's not ready yet, and of course every month that it was not ready you were still carrying the costs and you weren't bringing in any revenue. And Reuters didn't have much money in those days, and they were some pretty uncomfortable months. But I am quite convinced that we were absolutely right to insist that the service had got to have a very high degree of reliability before we could bring it out".[57]

The new system, technically challenging to get going, had to overcome several obstacles such as the aversion of risk of Reuters being liable for "broken trades". These occurred when a potential system failure might leave one trader thinking a deal was fulfilled while his counterpart believed the trade to not being completed (Mooney and Simpson 2003). However, the development of the dealing function on the new system was seen as an integral part to stay ahead of the competition in the growing, yet increasingly consolidating market for financial information: "Nelson (…) saw that there was nothing to stop a competitor such as Telerate launching such a system, which would have threatened the survival of Monitor, now vital to Reuters" (Mooney and Simpson 2003). In the end, the new product gained traction in foreign exchange markets. In February 1983, the subscriber base had more than doubled to around 400 subscribers, and had "thirty-seven of the world's top banks" participating (Read 1999). With 'Dealing' in addition to MMR, Reuters established what Brian Mooney referred to as an "extraordinary monopoly that Reuters enjoyed for basically two decades" in the market for FX information, as well as branching out into further information segments.[58] Profits from these products enabled Reuters to develop several new products during the 1980s. Products such as the Advanced Reuters Terminal (ART)

[56] Nelson, *Science Museum Interview*, 03.06.89, p. 25.
[57] Ibid. p. 26.
[58] Brian Mooney, '*Expert interview - The development of the market for financial information*', Interview transcript by Raphael Heim [online], 15.07.22, p. 2.

launched in 1986 represented at the time impressive technological advancements in information supply, combining e.g., "Monitor data with news, graphics and eventually spreadsheet capabilities" (Mooney and Simpson 2003).

The second part of Reuters two-pronged strategy, especially in the latter half of the 1980s, consisted in the acquisition of competitors and firms offering new content or technological capabilities. The inorganic growth was fuelled by the capital generated through its successful positioning in FX markets, its expansion into further geographies and information on other asset classes, and its commercially successful IPO in 1984. Figure 22 provides an overview of major acquisitions undertaken by Reuters between 1985 and 1987, highlighting the information capabilities acquired:

Figure 22: Major Reuters Acquisitions between 1985 and 1987.

Year	Examples of Major Acquisitions by Reuters	Description
1985	Rich Inc. (~$60mn.)	US manufacturer of video switching systems; technology enabled feeds to hubs installed at client sites, to which individual desks and dealers could then be connected; in 1987 introd. Of TRIARCH, digital switching system.
1986	Instinet (~$100mn.)	US equities trading service; allowed buyers and sellers such as fund managers to trade blocks of shares 'off market' and anonymously, important e.g., to rebalance books w/o distorting equity prices & price discovery.
1986	Finsbury Data (~$10mn.)	London-based provider of textual databases; foundation of Reuters historical news retrieval in connection with historical quantitative data provided by e.g., IP Sharp.
1987	IP Sharp (~$30mn.)	Toronto-based database of market data; Reuters move towards historical data on top of real-time data for several markets on IP Sharp network IPSANET; technologically hard to integrate with Reuters IDN network.
1987	Schwartzatron (~$7mn.)	System designed by Steve Schwartz, former options trader, to evaluate different strategies in US options market (analytics tool); proved difficult to integrate with Reuters data structure.

In their 1991 journalistic account *Media Moguls*, Tunstall and Palmer correctly identified Reuters "buying spree" in this period, yet optimistically gave the impression that all of these acquisitions contributed positively to Reuters expansion:

> "Reuters 'bought companies like most people bought shirts'. It acquired ten companies between 1985 and 1987 which deal in what it terms 'trading tools' and 'intelligence'. Each acquisition contributes to the aim of offering deeper databases – information that can be shaped into whatever form the customer

> wants – and systems that handle transactions and automatically record details. Information, once enriched and refined, becomes 'intelligence'" (Tunstall and Palmer 1991).

With the benefit of hindsight over a decade on, Mooney and Simpson undertook a more balanced assessment of Reuters acquisition wave. There were indeed examples of phenomenal success for Reuters in the market for financial information enhancing its capabilities. For example, the acquisition of Rich Inc. in 1985, providing video-switching capabilities with large economies of scale as "its technology enabled Reuters to provide feeds to hubs installed at its major client sites, to which individual desks and dealers could then be connected (…) and, at the same time, giving customers a cheaper 'multi-keystation'". Or the acquisition and integration of Instinet in 1986, a US equities trading system that "allowed buyers and sellers such as fund managers to trade blocks of shares 'off market' and anonymously", in order not to distort prices when traders rebalanced their books (Mooney and Simpson 2003). These acquisitions also enabled Reuters to move further into the delivery of digital data and feeds, away from the primarily analogue or video-based systems it had employed for the Monitor and Dealing system, which allowed its "users to manipulate more data at faster speeds on their own workstation or keyboard".[59] This fit well with Reuters own product developments, as it launched for example 'Equities 2000' in May 1987 to deliver trading data and news on 100,000 equities globally. The system used for the first time Reuters Integrated Data Network (IDN), the company's digital 'pipeline' to provide its information services to clients.[60] The introduction and supply of digital data would become crucial, as digital data could be processed faster and in different ways. Digital information could be manipulated easily, uploaded into spreadsheets for analysis, and laid the ground for faster decision-making processes. Douglas Taylor explained the advantage of digital over the incumbent analogue data provision at the time:

> "You'd have to collect this [analogue] data by hand and (…) you didn't have a spreadsheet at the time (…) but you'd have to have people manipulate this data and come up with some sort of decision process which was time-consuming and

[59] J. McConville, '*Reuters Holdings PLC*', Wertheim Schroder analyst report, 06.04.88, p. 6, LN1226, Reuters Group Archive, London, UK.
[60] Ibid. p. 11.

> meant people could easily be behind markets, because they couldn't make decisions fast enough or information couldn't be distributed fast enough (…) it was necessary for that data to automatically be loaded into a spreadsheet or calculations made so that the computer could begin to make decisions for you and speed up your decision-making process or even alert you".[61]

This process can be seen as an upward integration in the information value chain described in chapter 2. Reuters and other suppliers of financial information started to move away from the pure 'display' of data and information, towards giving their clients tools to manipulate (process) this data. The development towards increased processing capabilities made the supplied information more valuable for financial institutions, as can be seen by one exemplary feature: "the Monitor Abacus provide[d] instant cross-rates and broken data and arbitrageur calculations based on real-time process" (Tunstall and Palmer 1991).

However, not all of Reuters acquisitions in the 1980s turned out as successful and a good fit as Rich or Instinet. Hovland Business Systems for example, which Reuters acquired for a position-keeping system "allowing foreign exchange traders to keep an automated record of their transactions and outstanding positions through a touch-pad 'tablet' on their desks", failed to gain traction with Reuters clients and was subsequently abandoned (Mooney and Simpson 2003). The events surrounding the stock market crash of October 1987 thus hit an industry and its predominant firms at a time of comfortable and steady growth, yet also of continuous diversification and consolidation in the fragmented market of small monopolies or duopolies.

Uncertainty amid consistency - The market for financial information and the 1987 crash

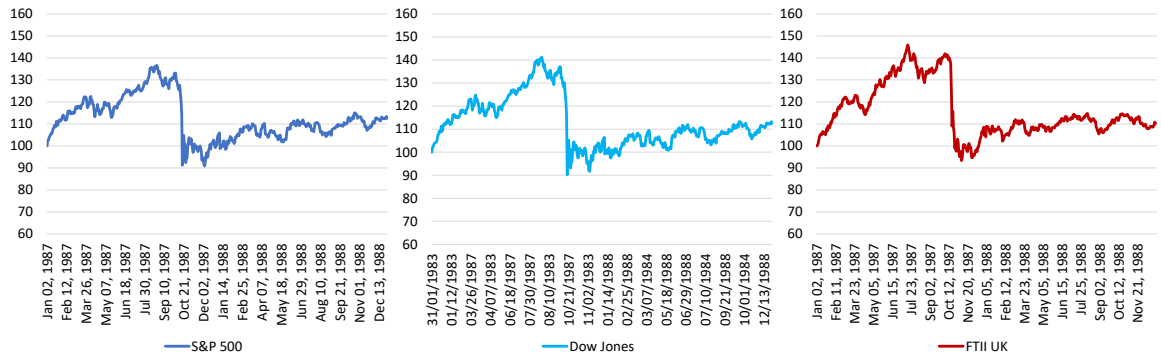
Global stock markets rallied in 1987, with the Dow Jones gaining almost 40% from January to August and similar developments in the UK and other advanced economies (see Figure 23). Price-earnings ratios (P/E-ratios) had been steadily increasing as well in the previous years and were rising fast in 1987. From 1984 to its height in August 1987, the S&P500's cyclically adjusted price earnings ratio (CAPE) almost doubled from around 10 to over 18, as Figure 24 shows. Equity prices

[61] Taylor, *Expert interview*, pp. 3-4.

were boosted both by new investors (e.g. pension funds) in the stock market, and favourable regulation regarding tax deductibility of interests on debts for corporate takeovers (Katzenbach 1987, Mitchell and Netter 1989, Carlson 2006). Yet, this rally came to an abrupt end on October 19, 1987, with a severe, fast, yet also short-lived crash. Figure 23 shows the stark drop in share prices in real terms represented by the S&P500 and the Dow Jones Industrial Average for the US, and the FTII share index for the UK. The S&P500 dropped almost 60 points (20.5%), the Dow Jones over 500 points (22.6%) and the FTII almost 200 points (11.7%). These drops were preceded by already substantial losses in the week before 'Black Monday' from October 12 to October 16,[62] and another significant decline in many international share indices followed on October 20. As other stock exchanges had already closed either fully or did not have a full day of trading when the NYSE opened on Monday, some indices such as the Japanese Nikkei experienced their major drops on October 20, when they were catching up with the developments in the US (Shiller, Kon-Ya et al. 1991). Yet, as pointed out in an article for BBC by Michael Hughes, former chief investment officer at Barings Asset Management, "the share index, the main measure of stock market value, ended the year higher than it had started. So anyone who had sat on their hands during the crash saw the value of their investments recover swiftly" (Hughes 2012).

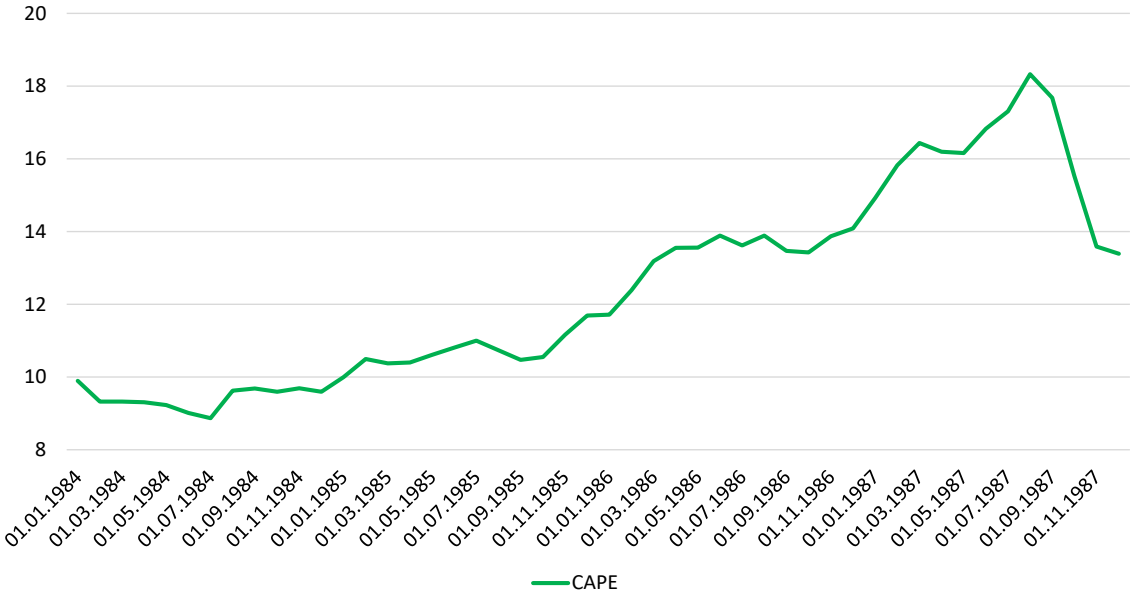
[62] On Friday the 16th of October, a storm hit London so that most trading on the LSE had to be suspended as employees couldn't get to their offices (see Hughes 2012).

Figure 23: Share indices US & UK, rebased (start of January 1987 = 100), 1987-1988.



Source: Daily historical stock market data from yahoo finance (S&P500), marketwatch (DowJones), and investing.com (FTII UK).

Figure 24: Cyclically adjusted price-earnings ratio (CAPE, S&P 500), 1984-1987.



Source: Cyclically adjusted price-earnings ratio data from Robert Shiller, Stock Market Data used in 'Irrational Exuberance', Princeton University Press, 2000 (2015 updated).

In finance and economics, an active debate about the exact causes of the crash has been going on almost since it erupted in October 1987 (see e.g., Mitchell and Netter 1989, Shiller and Pound 1989, Bernanke 1990, Carlson 2006). Explanations for the severity and speed of the crash have focused on mainly three aspects, or combinations of them. First, some scholars stressed an accumulation of negative economic news in the weeks prior to October 19 (Mitchell and Netter 1989, McKeon and Netter 2009). Second, especially the Brady Commission blamed new trading

strategies such as 'portfolio insurance', a strategy employing the same rationale as momentum investment, in combination with the increased use of derivatives in financial markets.[63] And third, academics have emphasized social elements of investment professionals and financial networks such as 'cascades' and 'herding' in the absence of obvious changes in economic fundamentals (Shiller 1988, Shiller and Pound 1989, Bernanke 1990, King and Wadhwani 1990, Shiller, Kon-Ya et al. 1991).

As Mark Carlson stated regarding the 1987 crash and the Fed's response in 2006: "One notable problem was the difficulty gathering information in the rapidly changing and chaotic environment. (…) Uncertainty about information likely contributed to a pull back by investors from the market" (Carlson 2006). Information and information acquisition by investors were arguably at the core of the 1987 crash, yet little is known about information suppliers' performance and actions during this episode. Analysing reports of leading investment analysts at the time of the crash can shed light both on the performance of Reuters and its competitors during and after the crash. They also highlight investor sentiment of how information suppliers might deal with the crash and its consequences. Victoria Butcher, a leading analyst of the market for financial information in the 1980s, summarized the investor perspective on the financial information market comprehensively in her analyst report half a year after the crash in May 1988: "There is much investor concern about the earnings growth rates of Reuters and Telerate during the current period of weakness in the financial services industry".[64]

This concern was driven by ignorance regarding the interconnection of the market for financial information and the wider financial industry, emphasizing the uncertainty about the October 1987 crash on demand for information products: "The share prices of both Reuters and Telerate dropped significantly last year because of concern about the impact of the 'market crash'

[63] Brady Commission, '*Report of the Presidential Task Force on Market Mechanism*', January 1988, pp. 5-7; 55-58.
[64] Victoria Butcher, '*Investment Outlook – the media and information industry*', Rothschild investment research, 24.05.88, p. 1, LN1226, Reuters Group Archive, London, UK.

on spending for financial information".[65] Tunstall and Palmer stated in 1991, after stock prices had recovered, that "in volatile financial markets, the need for global information and trading services becomes ever more critical" (Tunstall and Palmer 1991). Yet looking at the crash and its aftermath closely, this generalisation has to be scrutinized and put into the context of the supply and demand factors underlying this market, especially the adaption of information demand and sourcing by financial and banking firms.

There are several differences between the 1987 crash and the crises of 1973/74 for the market for financial information. The different maturity and competitive landscape on the supply side of this market have been explored in the previous section. However, it is important to reiterate that the 1987 crash was an event that despite its severity was concentrated in international equity markets and did not spill over and cause a general economic downturn or recession (Bernanke 1990, Hughes 2012). Basic equity price information (provided by exchanges) and financial news represented some of the most competitive parts of the market for financial information, as opportunities for differentiation were limited in these segments. Thus, one might assume equity traders had substitutable options to re-evaluate their information strategy and acquisition. However, information suppliers' exposure to this part of the market was often limited. For example, although Reuters introduced its new 'Equities 2000' product just months before the crash, it still generated more than half of its business and profits from foreign exchange and money markets in 1987.[66] Considering this, the severe drop in information suppliers' market capitalisation around the October crash highlights even clearer the limited general knowledge and uncertainty about this market's business and its operations.

Another feature of the 1987 crash put the need for timely and reliable information into plain sight of financial professionals, especially during increasingly volatile markets. As the dealing volume on the NYSE reached extraordinary new heights in October, the dealing infrastructure

[65] Ibid. p. 2.
[66] See Reuters Holdings PLC, '*Annual Report 1987*', pp. 8-10.

employed by the stock exchange was unable to cope with these increases anymore. This led to a situation in which "prices were delayed by hours", as a 30-year anniversary piece by Reuters recalling the crash stated.[67] As Dennis Waters explained:

> "The computer systems employed by the NYSE were basically the same systems they had installed in the mid-1960s (…) the NYSE at the time employed essentially two feeds coming out (…) and both got extremely jammed up. This added a lot to the fear amongst traders, they feared to place trades as there was no reliable information coming through, with prices being 30 to 45 minutes late".[68]

So when stock market conditions deteriorated at the beginning of October 1987 and in the following weeks, how were information suppliers affected by the crash and its aftermath? And what can we observe as reactions, persistence, and changes by both financial professionals on the demand side of the market for financial information and information suppliers? On the demand side, brokers and dealers largely reconsidered decisions taken during the previous bull market to expand their spending for financial information systems and products in the immediate circumstances of the October crash. As a Wertheim Schroder's report stated exemplary: "the October crash led to subsequent changes in expansion plans [note: on information services] by brokers and dealers".[69] These considerations have to be put in context of the general trends on the demand side of the information market. Douglas Taylor described the different impact of market downturns on the demand by both the 'buy-side' (for example hedge funds or private equity funds) and 'sell-side' (for example investment banks and brokerages) in the financial industry:

> "On the buy side, portfolio managers and the researchers that support those portfolio managers generally have deeper pockets. They can weather an economic storm, because assets under management and the fees generated from those are supporting those institutions and they can weather a storm (…) much better than some other areas (…) there's a lag time between a market crash and when you might see a reaction in demand [note: for information products] from buy side firms (…) on the sell side, deal volumes is your proxy for the investment banking side of the industry. If deal volumes are increasing regionally or globally, the demand for market data and tools from the

[67] Chuck Mikolajczak, '*Thirty years ago this week, Wall Street slid into the abyss*', Reuters Business News, 19.10.17.
[68] Waters, *Expert interview*, p. 3.
[69] McConville, *Reuters Holdings*, p. 13.

> investment banking side of the business will also increase (…) investment banking, and often the sales and trading side, reacts more quickly to market downturns because there are layoffs or closures and that revenue hits Reuters or Bloomberg".[70]

With the stock market mainly affected and uncertainty about the mid- and long-term impact of the crash, the immediate reaction on the demand side targeted towards cost-cutting originated mainly from sell-side institutions. These institutions expected a sustained downturn in business and thus reductions in head counts – and as a result a need for fewer information terminals. However, the immediate reactions were mainly driven by uncertainty about future stock market development within the unprecedented downturn. When stock markets started to rise again and even managed to close positively at the end of the year, these immediate considerations were shelved. According to a survey by the Securities Industries Association in the US at the beginning of 1988, "66% of securities industry planning executives expected to spend 18% more this year on new or improved [information] technologies".[71] The investment by the financial information industry in new products and technological capabilities appeared to pay off, especially with advances in the realm of information processing during the years prior to the crash:

> "There is a high degree of interest in systems that enhance information and data recovery, and information processing. In a recent New York Times article, reference was made to a decision by Paine Webber to move ahead on a decision to install a new system that will provide brokers with keyboard access not only to quotes but to word processing, graphics, and spreadsheets as well".[72]

On the supply side of the market, the picture is just as diverse as on the demand side. The already hinted at general uncertainty, attested by external experts and analysts,[73] was mirrored within Reuters. The senior management, since 1981 under the leadership of new CEO Glen Renfrew, who took over from Gerald Long and set out the company on its expansionary and diversifying strategy, responded by introducing short-term cost-cutting measures and pay freezes

[70] Taylor, *Expert interview*, pp. 10-11.
[71] Survey quoted in McConville, *Reuters Holdings*, p. 13.
[72] Ibid. p. 11.
[73] See e.g., Butcher, *Investment Outlook*, pp. 2-4; and McConville, *Reuters Holdings*, pp. 6-11.

in the direct aftermath of the stock market crash. These measures were only lifted 6 months later.[74] Despite the retraction of these measures, the internal Reuters position remained even half a year after the crash that it was "still too early to measure the effects of the October crash on the Company's long-term business", as banks and financial institutions especially in Reuters key markets in Europe and North America realigned themselves.[75] Yet, it became clear to Glen Renfrew quite soon after the crash in October that Reuters product offering was sufficiently diversified across investment classes and geographies. Stable growth was maintained in the most important FX market, which could compensate for the hit taken in equities information products assuming continued strong activity in esp. foreign exchange and commodity markets.[76] As the Reuters management disclosed in analyst calls in February 1988:

> "Since October, there has been no slackening in the rate of installations of terminals and backlogs were described as 'substantial' at the investor's meeting in February. Management maintains that the stock market crash conclusively proved that up-to-the-second news, information and data are vital to the financial markets".[77]

Reuters, as the predominant information supplier with its 140,000 terminals in 1988 against Quotron's 90,000, and Telerate's and ADP's 60,000 respectively,[78] was also the most geographically diversified. Whereas other suppliers were almost exclusively operating in one or two geographies, by the late 1980s Reuters already generated ~40% of its revenue outside its home market in Europe (see Appendix 2). It was able to compensate for short-term order stops in the immediate uncertainty in North America and Europe after October 1987 with a further push into the Asian market: "the main emphasis of effort is likely now to move towards Japan, where revenues increased by 60% last year to 14bn. Yen".[79] Reuters managed to use its newly introduced

[74] Letter by M. Cooling to G. Renfrew, '*Salary Announcement, Salary Q & A, company outlook*', 25.03.88, pp. 1-2, LN1227, Reuters Group Archive, London, UK.
[75] Ibid. p. 1.
[76] Transcript of interview with G. Renfrew, '*Financial World tonight*', BBC Radio Four, unknown interviewer, 10.02.1988, LN1227, Reuters Group Archive, London, UK.
[77] McConville, *Reuters Holdings*, p. 15.
[78] Blacker *et al.*, *Equity Research*, p. 2.
[79] Ibid. p. 3.

products such as Equities 2000 to its advantage. It framed them successfully as the fastest and most reliable source of information for a volatile market environment, but also stressed features beyond 'basic' price information. This entailed combining price quotations with news and information processing capabilities, helping Reuters to further gain market share from its main competitors:

> "Reuters currently has an installed base of 8,000 Equities 2000 keystations. The client base consists of clients trading up from older Reuter Monitor terminals, new clients, and those switching from Quotron (a division of Citicorp) or Automatic Data Processing (ADP) systems".[80]

In terms of the use of its products during the market crash, it turned out that activity on the Reuters Monitor system did not decrease during the last quarter of 1987. New orders for the system remained stable in the crisis. Customer demand in the financial industry (except for equity traders) remained at a high level and did not decrease, as many internal and external experts had feared during October 1987. The demand for up-to-date information and Reuters financial news was indeed pushed up in the aftermath of the crisis and remained high.[81] As Glen Renfrew, portraying confidence, announced in a BBC interview in February 1988:

> "subscriber terminal count world-wide rose by 10,000 terminals [note: in November & December 1987]. We didn't have a setback; it rose by 10,000 terminals to around 140,000. (…) our new orders, apart from one or two patchy markets, are on the whole excellent (…) they're better than they were twelve months ago and very much better than they were two years ago".[82]

However, despite these positive assessments by the Reuters management and securities analysts, the stock market crash of October 1987 did have more long-lasting implications for its competitors and the market for financial information overall. As already pointed out above, it accelerated trends of diversification and consolidation in the information industry, as a *New York Times* assessment of Reuters main competitor Telerate emphasized:

> "flaws [note: at Telerate] were largely hidden until consumers of financial data began to rein in their spending after the stock market crash of 1987. Since then, thousands of customers have turned to the less expensive Knight-Ridder

[80] McConville, *Reuters Holdings*, p. 11.
[81] M. Cooling, '*Investor Relations Briefing - internal notes*', 25.07.1988, LN1227, Reuters Group Archive, London.
[82] Renfrew, *Financial World tonight*, 10.02.1988.

> Money-Center system, which uses any I.B.M.-compatible personal computer. Others, who wanted sophisticated programs that analyzed bond data in addition to delivering it, turned to Bloomberg".[83]

This intensified competition during a financial crash acting as a 'catalyst' points to a development that plays a central theme in the following two sections. The upward integration in the 'information value chain' towards supplying additional information processing capabilities became an increasingly important differentiating factor for information suppliers, with the gradual commodification of 'basic' price information in the internet age. Further, this section has emphasized the trends towards consolidation, increased competition, and diversification on the supply side of the market for financial information. These trends followed demand from increasingly global and diversified financial institutions, which needed timely and reliable information as well as information processing capabilities supporting decision-making. The next section shows the further development of this trajectory in the subsequent years, leading to the formation of virtually a global duopoly in the supply of financial information.

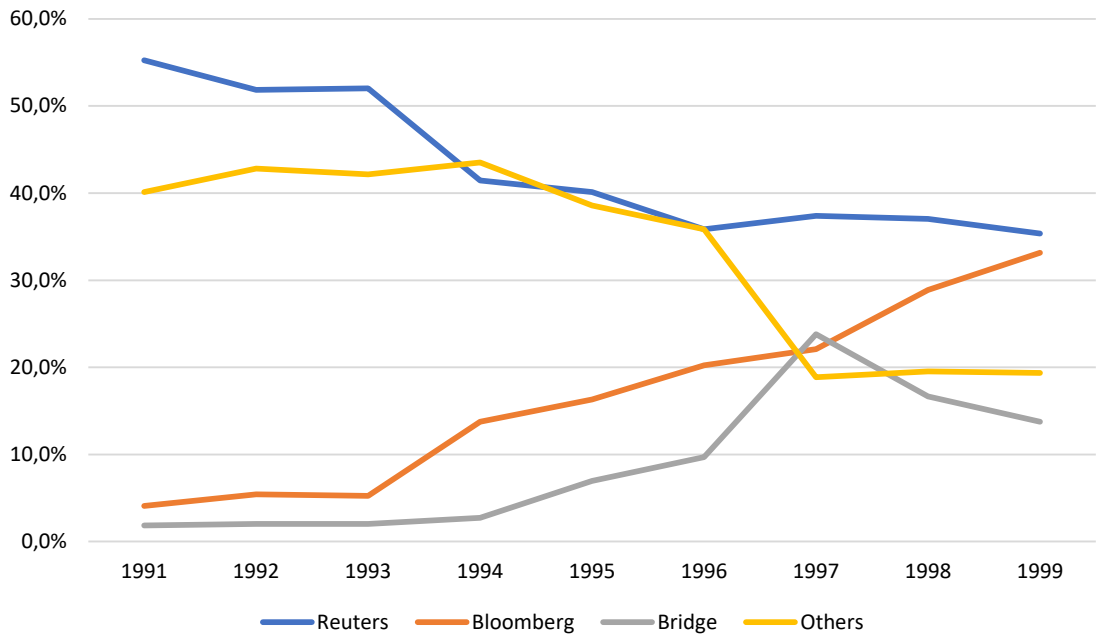
3. Emerging duopoly, and crisis realignment – The burst of the dotcom bubble 1999/00

The introduction of Reuters MMR, amid the breakdown of Bretton Woods, highlighted emerging changes in the financial information market. It emphasized direct dissemination, retrieval, and contribution of information, necessitating acceptance of transformative technologies and a critical mass of users and contributors. The 1987 stock market crash accelerated ongoing developments, shifting the industry from regional & asset class monopolies to diversification, expansion, competition, and consolidation. The following decade continued these trends, leading to a new duopoly. Reuters faced competition from a rising competitor, Bloomberg, which eventually overtook them in the early 2000s to become the leading supplier of financial information today.

[83] Feder, *Telerate*, 01.11.90.

Originally published in the *Financial Times* as one of the rare examples of publicly available information on members' market share, Figure 25 emphasizes this trend until the financial and economic turmoil around the burst of the Dotcom bubble in 2000. Reuters started the decade accounting for over half of the global market share by revenue in the "financial data market". Bloomberg, founded only in 1982, accounted for a mere 5%. However, by the end of the decade, Reuters and Bloomberg's share of the market were almost equal, with 37% and 34% respectively. This would manifest a duopoly that extended way into the 2000s, with the two companies taking up over 70% of the global market supply in financial information (Palmer 2019).

Figure 25: Market share in financial data market, 1991-1999.



Source: Data based on 'Inside Market Data Reference' figures, reported in Financial Times, 17.10.02.

This thesis argues that the ensuing burst of the Dotcom bubble again had a catalysing effect that propelled Bloomberg to the top of the pack. It accelerated Reuters decline as the formerly predominant firm in a market that quickly expanded with growing needs for *global* financial information and especially advanced information processing capabilities for an increasingly globalised financial industry. Bloomberg's success was built on focusing on the supply of initially

‘proprietary’ price information in combination with easy-to-use information processing at the centre of its strategy. At first, it aimed at an undersupplied market segment of the information market (fixed-income), gradually expanding its supply of information to other segments and setting up its own news service. Its "one-product" strategy delivered all available information through one-size-fits-all terminals, enabling fast integration of customer feedback. It also connected financial professionals through its pioneering internal messenger system in 1992 and continuously improved analytical tools for information processing of financial institutions. In contrast, Reuters faced severe challenges under new CEO Peter Job in the 1990s. Its products were perceived as less competitive than Bloomberg's high-end offerings and faced pressure from new low-cost suppliers. Despite further pursuing acquisitions and internal product developments, Reuters lost focus and competitiveness, offering thousands of overlapping products compared to Bloomberg's unified solution. This shift, along with the burst of the Dotcom bubble, led to changes in the financial information market as sharply downsizing financial institutions favoured either Bloomberg or new low-cost suppliers of ‘basic’ price information over Reuters complex product offering.

From start-up to hegemon – the rise of Bloomberg and the new duopoly

If only focused on Reuters official business results and its external perception represented in its stock price development, the 1990s would appear as another successful decade for the hegemon among information suppliers. Both revenues and profits grew steadily through the 1990s, with a stable profit margin up to its 2000 company report at around 20% (see Figure 21). Its user accesses (the amount of information products and terminals) grew even faster than in the previous decade. When at the end of 1987 Reuters had 140,000 terminals installed around the world, this quadrupled to its peak in 2000 to almost 600,000 globally (see Figure 19). The rise was fuelled by rising demand from a growing financial industry in many advanced economies and the takeover of

large competitors such as Quotron in 1994 and Bridge in 2001.[84] The overall market for financial information expanded accordingly, as global revenues more than doubled from around $3bn. in 1987 to about $6.5bn. in 2000.[85]

However, the majority of contemporary commentators in the press, the financial industry, and in the information industry drew a very different picture of Reuters in the 1990s. As Douglas Taylor, himself a long-time Reuters employee, summarized:

> "all of these various products were being launched (…) within Reuters, the business groups were fighting for investment. They all had their own strategy for the products that they wanted to build for their markets, for the equity markets, for the fixed income markets, for the foreign exchange markets, whatever it happened to be (…) And this revolving door of investment resulted in very few finished products coming out the door in the 90s".[86]

Reuters was perceived as a company without a clear strategy during another transformative period for demand and supply in the information market with the increasing spread and importance of the internet. A company that failed both to integrate and enhance its acquisitions, and to successfully deliver new technologically advanced products that could match its emerging main competitor Bloomberg in information processing capabilities. And a company that was ridden with bureaucracy and infighting among its business divisions and geographies. As the former Reuters employees Brian Mooney and Barry Simpson attested retrospectively, the 1990s were indeed a decade that already rung the bell on Reuters gradual decline:

> "The reality is that there were two Reuters in the 1990s. Viewed from outside, Reuters ruled the world with a powerful brand that meant trust, impartiality, and reliability (…) Its screens were bolted to the desks of the world's major banks, financial institutions and corporate treasury departments (…) But inside Reuters things looked decidedly different. It had developed a product no one was using [note: Dealing 3000] (…) Reuters had failed first to notice and then to head off the challenge of a new competitor, Bloomberg. As the Internet age arrived, Reuters found itself without any clear strategy, uncertain whether it was a technology or information company or a bit of both" (Mooney and Simpson 2003).

[84] Reuters would ultimately also take over Telerate in 2005, thus taking over the last of its former main competitors throughout the 1980s and 1990s (see Jessop 2008).
[85] Nicholas Denton, '*New rivals in the screen wars*', Financial Times, 14.03.97.
[86] Taylor, *Expert interview*, pp. 7-8.

The financial journalist John Gapper covered the market for financial information for the *Financial Times* throughout the 1990s and early 2000s. Trying to shed light on a fast-growing yet publicly little-known and even less understood area of modern finance, Gapper concurred with this assessment in an oral history interview for this project:

> "It [Reuters] had structural problems (…) at the time it was being run by a sort of British managerial class (…) run by a bunch of ex British journalists who I think had no real sense of financial markets at their heart (…) that didn't understand what was going on in the market instinctively".[87]

The expansion of the 1980s, and especially the acquisitions of the 1990s, put Reuters on an increasingly unfavourable technological trajectory against its rising competitor Bloomberg. As Douglas Taylor explained, integration of the different systems acquired and developed by Reuters was not followed through. This resulted in production cycles and updates becoming longer and more complicated:

> "There was a time in the late 90s when Devin Wenig took over running the business side [at Reuters] (…) they had literally over 1000 products on their price list (…) if they wanted to make an enhancement to a product, add a new calculator or new capability, that had to be built and tested for Monitor, it had to be built and tested for Equities 2000, it had to be built and tested for Quotron [note: although all three report on equities]. So all of these products meant that the production cycle was much longer and much more expensive and took many more people to get them out the door, for one little enhancement. Whereas at Bloomberg, they had one product, the terminal. So if they wanted to make an enhancement, they could make that change. And all 100,000 users, or however many they had at the time, received it that day".[88]

Reuters did initiate efforts to overcome these challenges by delivering an entirely new product platform for state-of-the-art information provision and processing. But these efforts were undermined from the beginning by Reuters focus on its legacy technologies, its bureaucratic decision structure, and by an approach that didn't focus on what end-customers in financial markets demanded, but rather on what Reuters could deliver. Brian Mooney expanded on this view, emphasizing the failure of new Reuters products to deliver on their technological targets,

[87] John Gapper, '*Expert interview - The development of the market for financial information*', Interview transcript by Raphael Heim [online], 27.06.22, p. 2; see also Mooney, *Expert interview*, pp. 2-3.
[88] Taylor, *Expert interview*, p. 8.

while Reuters also failed from a strategy perspective to capture the end-user focus on investors, traders, and bankers, that stood at the core of Bloomberg's success:

> "The 'Bloomberg killer' [Armstrong] never really worked. We always tried to play catchup. I sometimes think that Bloomberg kind of won because he had a couple of features for which there was really no escape (…) It had features that traders wanted, that traders felt they couldn't live without".[89]

Thus, most of these products such as Reuters 3000 series never lived up to their initial promise and market expectations. At the same time, though Reuters acquired new companies in the 1990s, it was reluctant to expand significantly into new markets and to take bold steps. At a strategy presentation to the management board in 1995, the limited possibilities for further inorganic growth in the financial information market was highlighted. Potential targets either had already been acquired, were closely privately held, or Reuters was reluctant to take up a stake (see Appendix 5).

Yet, the most important technological revolution in the market for financial information in the 1990s must be seen with the advent of commercial and widely available use of the internet. The entrance of new competitors in highly commodified information segments such as 'basic' public information on exchange-traded assets was precisely what increasingly occurred in the market for financial information through the increasing spread of the internet. The public bid to supply information terminals for equities to Lehman Brothers in 1997, one of the investment banking industry giants and a major client on the 'sell-side', can be seen as exemplary. Besides the usual providers in the equity information market at the time (Reuters and Telerate), there was a new serious contender: NYQuotes, an eleven-person firm that barely started out a year before:

> "Companies such as NYQuotes can offer such low prices [note: $35 per user per month] because, instead of delivering financial information via dedicated cabling and terminals, they use the Internet, the public network to which the staff of most international investment banks are now connected".[90]

[89] Brian Mooney, *Expert interview*, p. 5.
[90] Denton, *New rivals*, 14.03.97.

The increasing competitive pressure at the end of the 1990s in substitutable information segments was seen only to become more intense: "once customers of Reuters, Bloomberg and Dow Jones start to use their full services over the net, it will be easier for customers to switch services than it is today, when some users still have dedicated terminals and others have dedicated high-speed lines".[91] This again led to an increased importance of proprietary content and information processing, as the commodification of 'basic' publicly available price information (such as in exchange-traded markets) and later also news was accelerated through the internet. This increased the competitive advantage of firms such as Bloomberg that dominated the proprietary fixed-income information supply with analytical tools and databases over twice the size (and perceived as more reliable) than its closest competitor:

> "[Michael Bloomberg] says that what is important about Bloomberg is the content - how information in the public domain is sifted, cleaned and packaged. If someone else offered the same content it would be a threat, but the mere presence of financial information on the net is not a problem".[92]

With new competition that decreased switching costs for the demand side of the market especially for commodified information products, this would directly impact the fate of information providers during and after the downturn followed by the burst of the Dotcom bubble.

If the coverage within the academic discourse of Reuters' impact on information supply within financial and banking markets can be described as lacking in focus and depth, then the treatment and discussion in the case of Bloomberg appears to be quasi non-existent. The considerable impact of the services Bloomberg started to supply to customers in financial and banking markets from the 1980s onwards features regularly in newspaper articles, industry magazines, and some academic publications, typically from a journalistic point of view (Wines 1995, Quarrels 2002, Bartram 2003, Peters 2015, Palmer 2019). History, and especially business and financial history, have yet to contribute and enrich this debate. Considering that Bloomberg LP has

[91] Kola Shillingford, '*Expansion of financial services on the Internet*', Financial Times, 02.07.97.
[92] Ibid.

attained a “systemically important” position in financial markets (Peters 2015), this lack of attention seems ever more conspicuous.

The history of Bloomberg as described by Michael Bloomberg in his autobiography is illustrious and laden with anecdotes. It features the typical American success story of a small business starting off with a ‘clever idea’ and through arduous work and commitment toppling the goliaths of the industry (Bloomberg 2019). To succinctly go beyond this basic narrative, one has to read between the lines and put these stories into perspective. The fundamental idea Michael Bloomberg brought to the table when founding Bloomberg, after being sacked by Salomon Brothers in 1981, was to make the supply of financial information and data more ‘user-friendly’ by providing the tools for basic processing and analysis of the supplied information to every end-user. In his words “our product would be the first in the investment business where normal people without specialized training could sit down, hit a key, and get an answer to financial questions” (Bloomberg 2019).

Similar to Reuters with the MMR in 1973, experts almost unanimously agree that Bloomberg’s focus on the specific needs of the end-customer, the ‘people on the trading floor’ rather than executives or IT departments, has been at the core of its business success – a principle other firms had lost over time. It was this focus that helped to establish Bloomberg’s product not only as a useful tool for information acquisition and processing by financial institutions, but also a social status symbol. The Bloomberg system became an “environment” in which financial professionals spend considerable time of their professional and social life from its first introduction in business schools around the globe to the trading floors of the world’s leading financial institutions. As Peter Esler described the difference between Bloomberg and its competitors such as Reuters from his perspective as ‘Head of Market Data’ handling the interaction with information suppliers for several leading financial institutions:

> “Bloomberg is literally an environment you live in. I mean, when you were inside that environment, you're communicating with your clients, they're communicating with you, you're shooting them everything from trading ideas

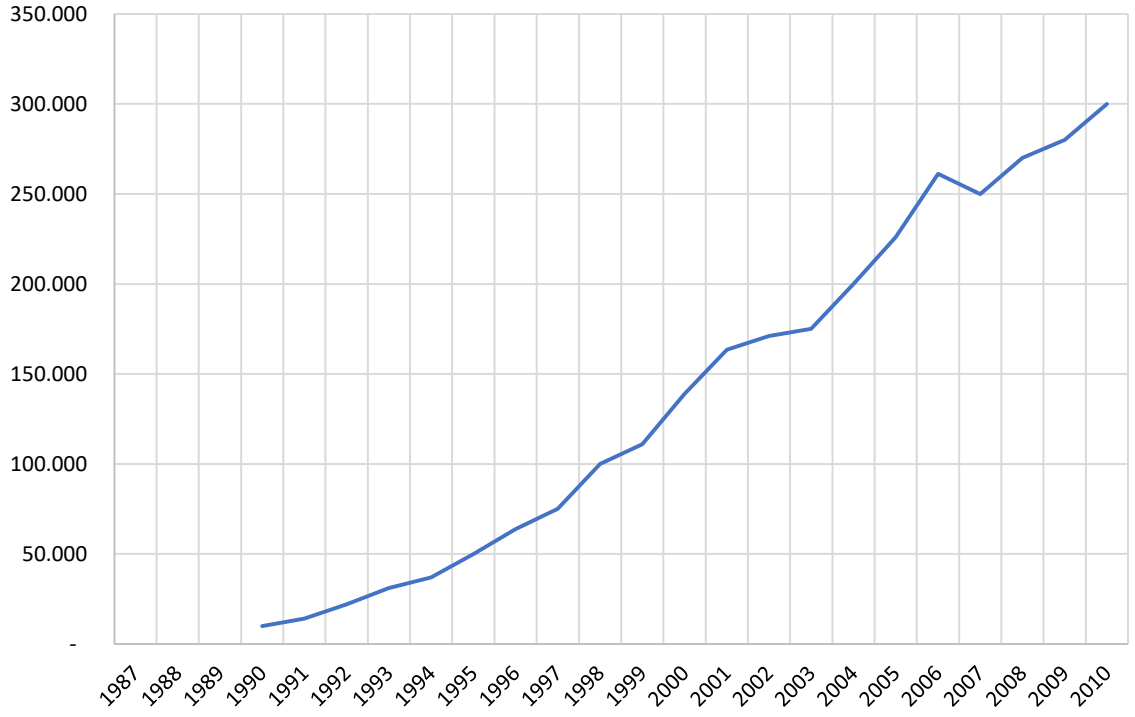
> to gossip, information, talking about your sports. You are in a social environment (…) [Michael] Bloomberg never dealt with a guy like me. He would go around me and go to the head of the equity business. He would go around me and go to the head of the fixed income business (…) he would penetrate each one of these asset classes and say 'what exactly are you looking for that your IT group or your corporation is not providing you?' And he would build these little applications. And in doing so, he built this incredible affiliation with the terminal. The traders, they're invested in the application".[93]

Bloomberg started off with the provision of two dozen terminals ordered by Merrill Lynch in 1983. It was in effect a multi-user PC focused on the fixed-income market that could give a "yield curve analysis updated throughout the day", compare the futures market to cash, graph it, and keep track of trader's transactions (Bloomberg 2019). So, from the very beginning of the company, it was not only the supply of 'proprietary' price information, but the supply of capabilities to process this information too. What sounds simple today was perceived as a 'revolution' in the early 1980s. Several long-established actors in the financial world were quickly drawn to the new product. The Bank of England was supplied with its first Bloomberg terminal in 1985, a couple of years later the "World Bank, the Bank for International Settlements, and every Federal Reserve Bank all became Bloomberg clients" (Bloomberg 2019). The timing of Bloomberg's market entry was fortunate, as demand for more complex tools and information for traders increased with the securitisation boom of the 1980s. Through a direct subscriber and pay-per-user system, Bloomberg secured itself a steady stream of cashflow as long as its clients would continue to have its terminals on their desks. New features and rapid integration of demand for new services, tools, and analysis through the terminal were constantly integrated, always under the axioms of close market-tested betterment and user-friendliness (Bartram 2003, Bloomberg 2019, Palmer 2019). The business then expanded quickly under these conditions. By 1990 Bloomberg had about 10,000 subscribers worldwide [paying an average of around $1,200/month], by 1999 already 87,500, and by 2018 about 325,000 [paying an average of around $2,000/month] (Bloomberg 2019).

[93] Esler, *Expert interview*, pp. 8-9.

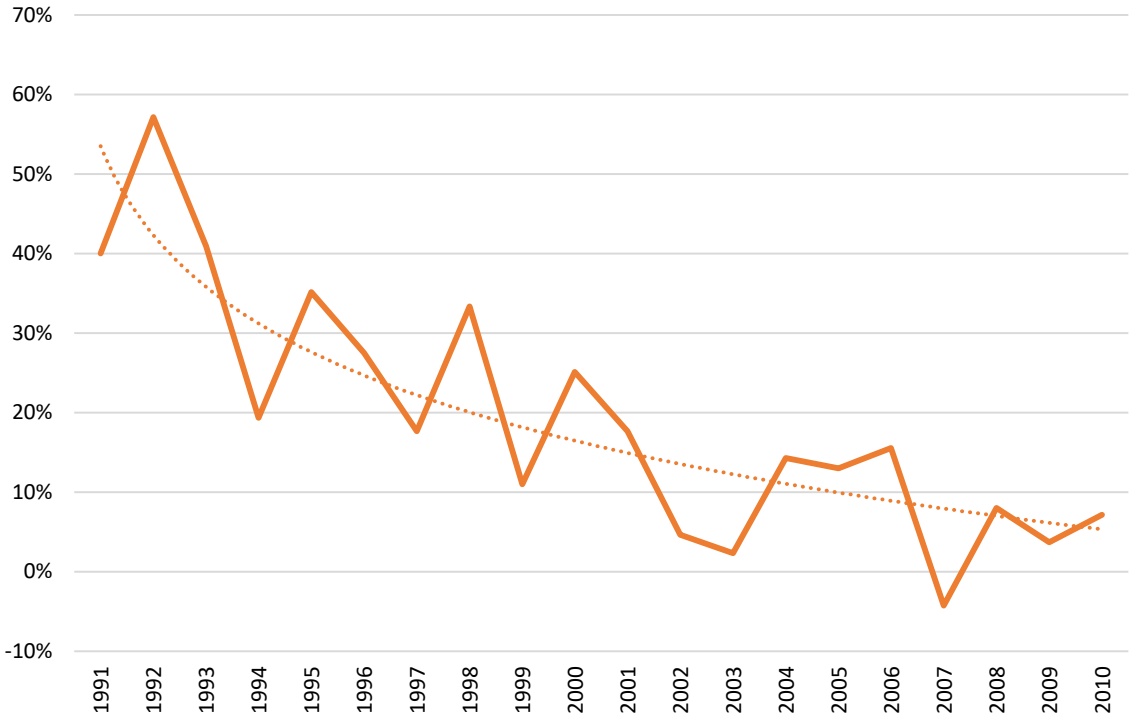
Although as a privately held company Bloomberg is notoriously reluctant to disclose financial and company information, Figure 26 and Figure 27 show this rapid expansion from the 5,000 installed Bloomberg terminals in 1987. Compiled through press releases, newspaper articles, and biographical sources, the figures plot Bloomberg's growth in user accesses (terminals) from 1990 onwards, averaging a compound annual growth rate of almost 30% throughout the 1990s. Although growth slowed down in the 2000s, the company still managed to gain a significant part of the market for financial information and grew its customer basis by an industry-beating CAGR of 18.6% between 1987 and 2010. Even though no consistent data can be obtained on revenues and profits, it can be expected that they have grown even more rapidly in light of Bloomberg's practice of annual price increases of ~5%. When Merrill Lynch sold its minority passive equity stake in Bloomberg during the global financial crisis in 2008, the implied company valuation was around $22 billion, 25 years after selling its first terminal (Palmer 2019).

Figure 26: Bloomberg user accesses (terminals), total yearly.



Source: Data on Bloomberg terminal numbers collected from public corporate announcements and newspaper archives (Financial Times & Wall Street Journal) 1990-2010.

Figure 27: Bloomberg user accesses yearly growth rate (%), 1991-2010.



Source: Data on Bloomberg terminal numbers collected from public corporate announcements and newspaper archives (Financial Times & Wall Street Journal) 1990-2010.

Figure 25 shows the development of Bloomberg's and Reuters market share in comparison throughout the 1990s. Although Bloomberg focused first on fixed-income markets, it gradually started to compete with Reuters in supplying information on most asset classes, from FX to equities and commodities, as well as its growing news service.[94] The significant step for Bloomberg to start an in-house news service was decisive, in order to add to the provision of financial data and information also the provision of general economic news that the incumbent players already offered. Michael Bloomberg chose to provide news stories and analyses directly, rather than going on carrying newswires of major agencies such as AP. He saw both reputational and business advantages to creating this content in-house, a strategy that paid-off as John Gapper affirmed: "Bloomberg's news and media information on top of data does have some advantages. I mean it's clearly useful in terms of branding and image".[95] Matthew Winkler, a former *Wall Street Journal* journalist who was convinced by Michael Bloomberg in 1990 to build the Bloomberg News segment, managed to establish *Bloomberg News* as an international news agency with a particular focus on global coverage and "utmost objectivity" (Winkler and Sondag 2014, Bloomberg 2019). For Bloomberg, the provision of journalistic news was initially another channel to promote the company brand and drum up more traffic for the terminal sales. However, over time, the business segment grew to a financially viable standalone feature and a respected news agency (Bloomberg 2019, Palmer 2019).

Why then did Bloomberg, in a considerably brief period of time, come to dominate the supply of not only financial information, but also of relating news on economic, social, and political events, to such an extent that it became 'systemically important'? Already in a 1997 piece in the *Columbia Journalism Review*, Daniel Kadlec summarized Bloomberg's predominant position in the market for financial information and news as

[94] Tim Burt, '*Reuters set out to take on rivals with bond trading system*', Financial Times, 18.11.04; see also Andrew Edgecliffe-Johnson, '*Bloomberg to expand in spite of threat to sales of data terminals*', Financial Times, 27.04.09.
[95] Gapper, *Expert interview*, p. 4.

> "There's never been anything like the Bloomberg. For depth and breadth of information and ease of use, it blows away the old Quotron and Telerate services. The Reuters business terminals in some newsrooms now collect dust, if they're even still there" (Kadlec 1997).

Machin and Niblock emphasize again from a journalistic point of view the specialities about Bloomberg's information supply in the news segment. This is characterised as being non-localized and globally understandable without prior knowledge, entailing a focus on a "clearer, fact-based, multi-sourced" approach in reporting (Machin and Niblock 2010). This point of view contains at least a part of the explanation for Bloomberg's success, as the published Bloomberg Writing Guide by former editor-in-chief Matthew Winkler and Michael Bloomberg's autobiography underline in their self-assessment (Winkler and Sondag 2014, Bloomberg 2019). However, taking the informational point of view developed in this thesis, the most fitting explanation for Bloomberg's business success can be found along three major lines: technology, focus on 'end-user' demands, and network effects.

In his autobiography, Michael Bloomberg repeatedly stressed the importance of "superior" technology provision for his customers, both regarding timeliness and extent of the kind of information that can be easily retrieved. For example, regarding the superiority of the Bloomberg system in money markets over the previously popular Telerate service by Dow Jones, Bloomberg explained for the early days of its introduction in the 1980s:

> "What was worse for Dow Jones, Telerate couldn't show, the way Bloomberg did, yield calculations based on many varied reinvestment assumptions – a function money managers coveted because it helped them do their job better" (Bloomberg 2019).

The integration of not only information supply, but also tools to support information processing, a direction Bloomberg's competitors followed on subsequently as shown above, had been from the beginning at the core of Bloomberg's technological development. Furthermore, the one-system-fits-all approach gave Bloomberg the advantage of fast updates and additions in its information environment for all its users simultaneously, without having to develop these for a set

of various products with different underlying technologies.[96] Lastly, Bloomberg was at a technological advantage, as it had built a historical database and continuously added its real-time information to it (first through its link with Merrill Lynch in fixed income, and subsequently in other asset classes). This became a competitive advantage that other providers of real-time information had to build up over longer periods, as for example Reuters showed real-time information and 'threw them away' afterwards (Mooney and Simpson 2003).

This leads to the second major point relating to the services provided by Bloomberg from the point of view of information supply and processing for the 'end-users' of the terminal. A considerable advantage of the Bloomberg terminal was the ability given to financial professionals not only to acquire data and information about market prices and information on different asset classes, but also that the stage of information processing was serviced to a considerable extent. Making analyses part of Bloomberg's service offering reduced the work needed to be undertaken by analysts, brokers, and bankers in evaluating the data that was provided. This opened up the opportunity for its clients to increase profit potentials through faster decision-making (Bloomberg 2019). As Bartram summarized it in a paper for *Journalism Studies* in 2003:

> "no one has yet matched the ability of Bloomberg's box to allow its clients to manipulate financial data vital to their market operations in a relatively simple way. The Bloomberg (…) provided from an early stage a yield curve (…) updated throughout the day as markets moved, it tracked the futures market versus cash, graphed these developments as they changed, stored all the details of every trader's transactions in real time and marked their positions instantly" (Bartram 2003).

In stark contrast to the Reuters focus on putting out only finished products, Bloomberg developed its information processing tools iteratively through the market. This approach resulted not only in fast dissemination but also loyalty of customers essential in developing and upgrading

[96] Taylor, *Expert interview*, p. 8.

these tools. Douglas Taylor used the example of the 'strip yield calculator' to illustrate this point, developed specifically for banks dealing with 'Brady bonds':[97]

> "[Bloomberg] worked very closely with a handful of Latin American banks. And the banks said we'd like to have a [strip yield] calculator that did this and numbers that would show that. And they quickly turned it around and put it on their terminal, even though it didn't necessarily work completely right (…) And they would let the market correct it. So they put it on the terminal and they let people say this is wrong, that's not right, this should be changed. And very quickly they changed it. And all of a sudden, they had a strip yield calculator. But what they also had was loyalty from their users because their users had helped build the product and felt like they had skin in the game as a user. They'd say this was built for me. They tell their friends I built that calculation on the Bloomberg terminal. So do you think they're ever going to get rid of their Bloomberg machine?".[98]

This example leads to the third point in this explanation, relating to the network effect of the Bloomberg terminal. Network effects in the information market can be seen both on an economic and social level. On the economic level, the more people subscribed to Bloomberg, the more attractive it became for other institutions in financial markets to join once the Bloomberg system was further developed to facilitate transactions. These effects were at the core of Reuters success in the 1970s and 1980s. But Bloomberg also included the social level in its product strategy. Bloomberg catered to the social side of investment and financial professionals as for example from early on (1992) it incorporated the possibility to send direct messages to other Bloomberg terminal users. Michael Bloomberg framed it in 2019 as "before the phrase 'social network' came to be, we had created one for the financial service industry" (Bloomberg 2019). This example of a popular social component (with still about 20 million instant messages *daily* in 2019, so ~83 messages per terminal per day) was completely missed by Reuters and took them almost a decade to catch up on:

[97] 'Brady bonds' are bonds issued primarily by developing countries in Latin America, denominated in USD and the principal being backed by US Treasury bonds, an innovation first announced in 1989 through the Brady plan; see e.g., Ivailo Izvorski, '*Brady Bonds and Default Probabilities*', IMF Working Paper, WP/98/16, February 1998, p. 4; available online: *https://www.imf.org/external/pubs/ft/wp/wp9816.pdf*.
[98] Taylor, *Expert interview*, p. 7.

> "Reuters for years thought, 'Well, the problem we're losing this business is we don't have messaging in our terminal'. And they scrambled for years, they need messaging (…) What they failed to realize was it was beyond messaging".[99]

This is one of the essential parts through which Bloomberg managed to create a business *and* social network, what Peter Esler and John Gapper described as a 'unique business and social environment', leading to exceedingly high perceived switching costs and lock-in effects as the network reached a critical scale.

The burst of the Dotcom bubble thus hit a supply side of a market in which 'basic' price information had become increasingly commodified, with competition in this segment from new low-cost suppliers through the internet. A market in which not only the supply of timely and reliable information was important, but exceedingly also the supply of capabilities and tools to process and *use* this information. And a market in which consolidation and competition had created a virtual duopoly between Reuters and Bloomberg.

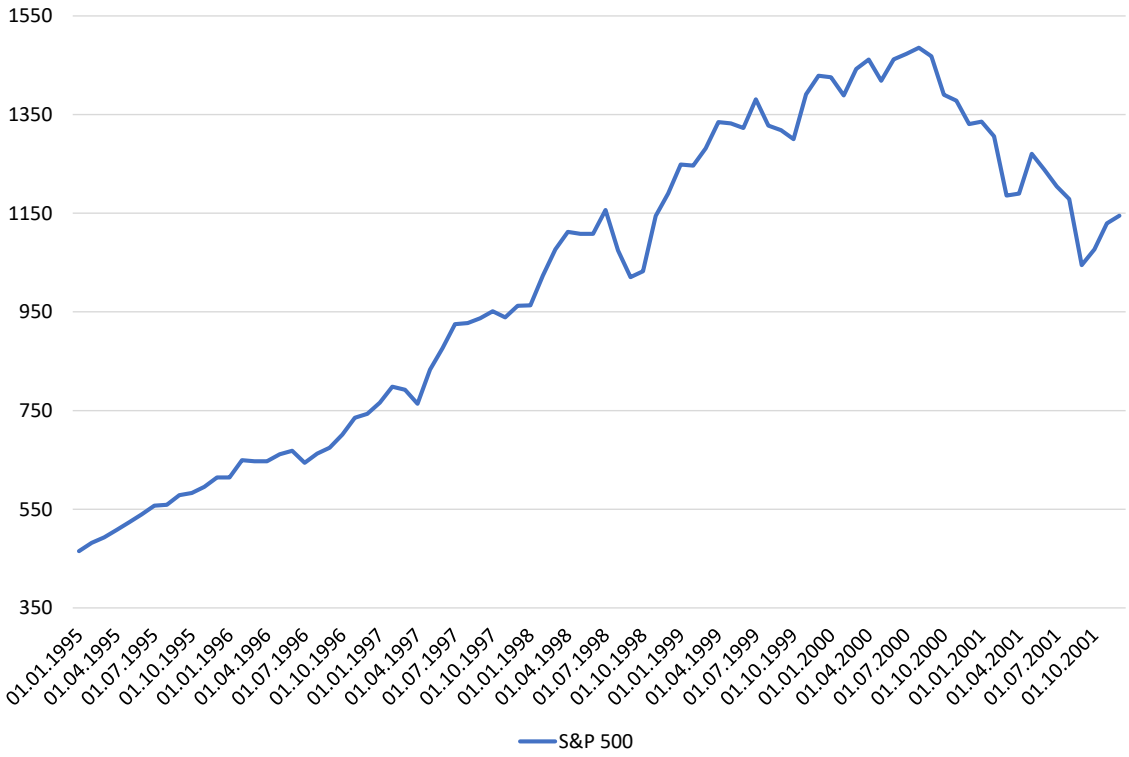
The burst of the dotcom bubble – realignment in the information market's duopoly

The exact timing of the dotcom bubble in its build-up and ultimate implosion has seen several different interpretations and time horizons, such as Leone and de Medeiros pointing to July 1995 based on time-series stock analyses. Goodnight and Green, in a narrative approach, highlighted the earlier 1990s with an increase in respective legislative initiatives and news coverage (Goodnight and Green 2010, Leone and de Medeiros 2015). However one determines the exact start of the dotcom bubble, its main characteristic was a prolonged and extraordinary increase in stock prices of primarily high-tech internet ("dotcom") stocks, which coincided with a continued economic expansion in the United States from the beginning of the 1990s onwards. Figure 28 plots the development of the S&P500 in the United States from the beginning of 1995 to the end of 2001. It shows the increase from about 465 points in January 1995 to its height of 1.485 points in August 2000 and the subsequent decline to around 1150 points at the end of 2001. Figure 29 plots the

[99] Esler, *Expert interview*, p. 9.

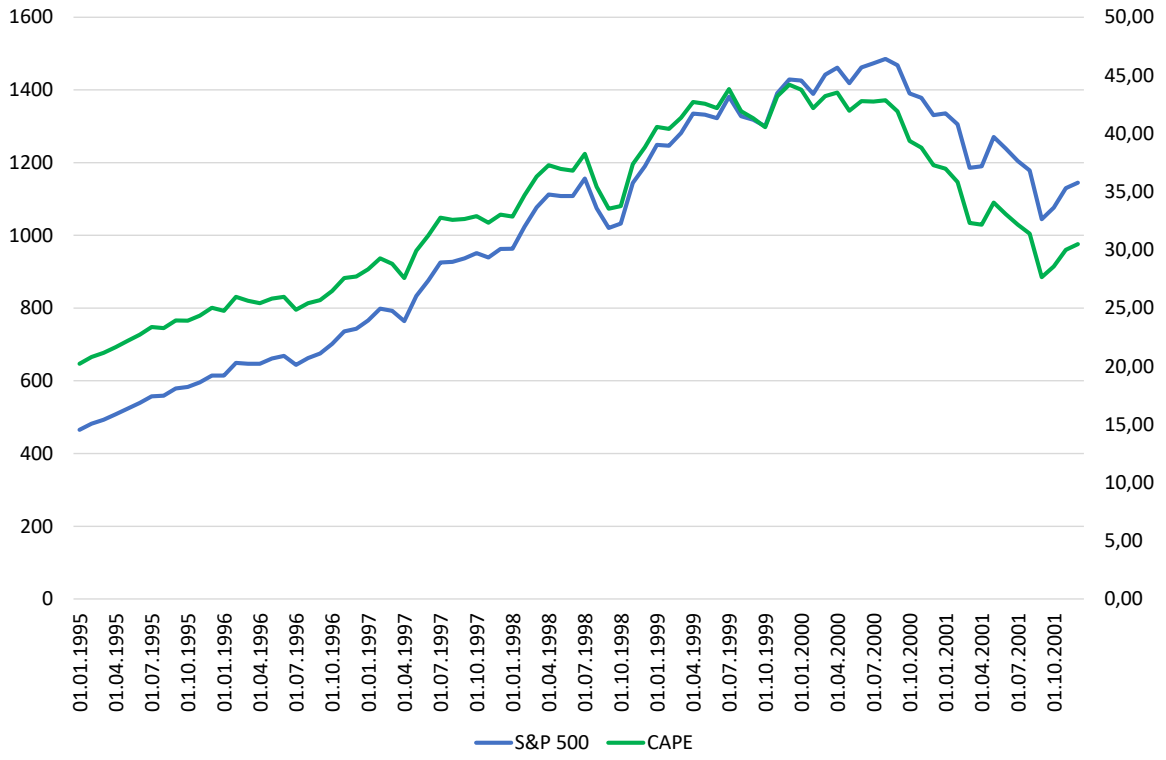
adjunct CAPE for the same time period. The CAPE more than doubled over this timeframe from 20 points at the beginning of 1995 and peaking at an all-time high in December 1999 of about 44, before falling subsequently to just about 30.

Figure 28: S&P 500 share index, 1995 – 2001, USD.



Source: Data from Robert Shiller, Stock Market Data used in 'Irrational Exuberance', Princeton University Press, 2000 (2015 updated).

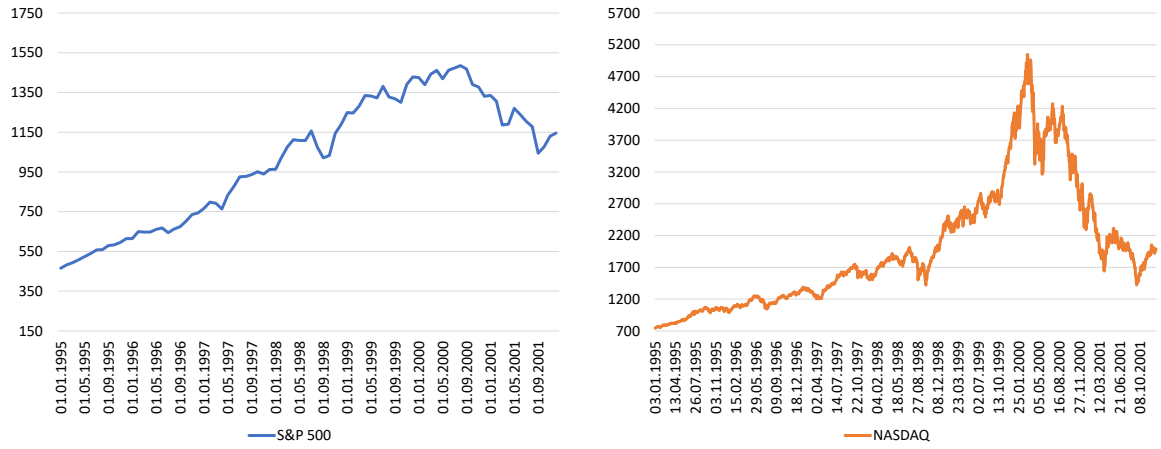
Figure 29: S&P 500 share index & CAPE, 1995 – 2001, USD.



Source: Data from Robert Shiller, Stock Market Data used in 'Irrational Exuberance', Princeton University Press, 2000 (2015 updated).

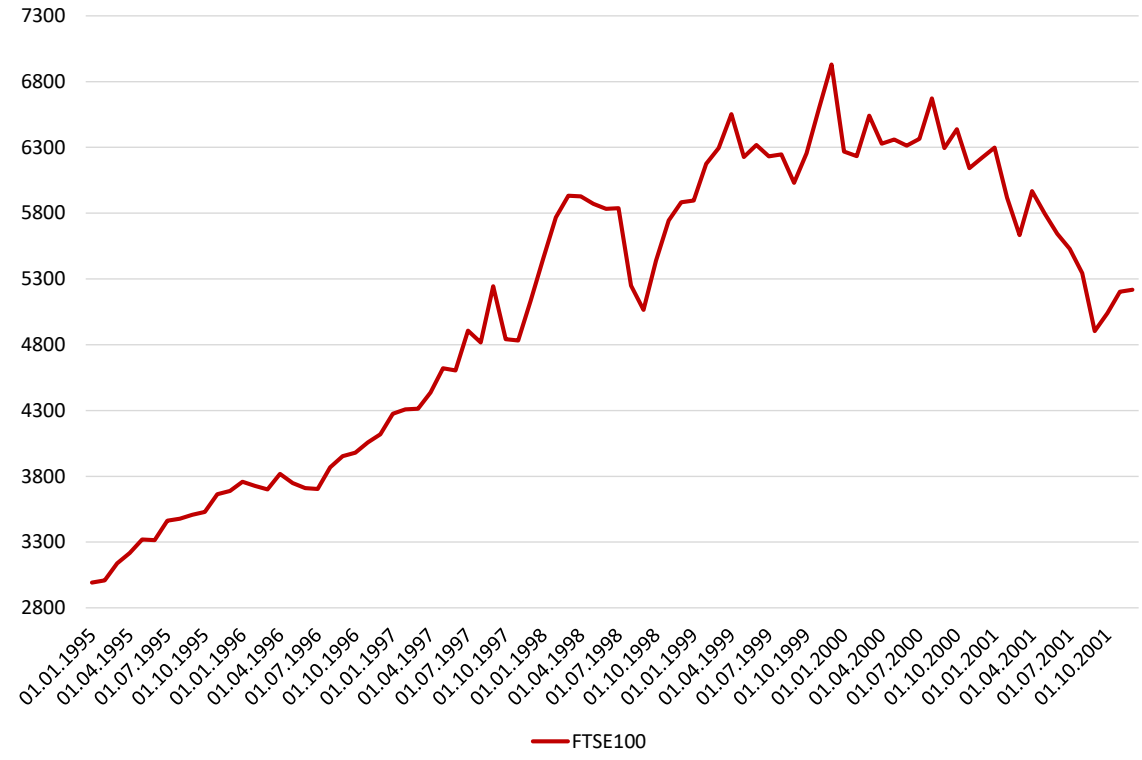
Figure 30 emphasizes the importance of technology stocks in the bull market of the 1990s by comparing the S&P500 development to the increase in the technology-heavy NASDAQ composite index over the same time period. Both the increase and subsequent decline in equity values that has already been shown in the S&P500 is visible in an intensified form in the NASDAQ, as the greater weight on high-tech stocks and internet firms exacerbated the volatile impact of the dotcom bubble. Starting at ~700 points in 1995, the NASDAQ increased to ~5000 points at the beginning of March 2000 (the peak of the bubble) and a subsequent decline to ~1900 points at the end of 2001. As Figure 31 highlights at the example of the FTSE share index in the UK, this expansion and subsequent implosion had similar ripple effects on equity prices in other advanced economies.

Figure 30: S&P 500 & NASDAQ stock indices, 1995-2001, USD.



Source: Data from Robert Shiller, Stock Market Data used in 'Irrational Exuberance', Princeton University Press, 2000 (2015 updated).

Figure 31: FTSE100 share index, 1995-2001, USD.



Source: Wall Street Journal FTSE100 Index historical prices.

Academics have broadly focused on one of two categories to discern the proximate and ultimate causes of the crash. Either systemic problems in the financial system itself such as regulatory or social constraints on short-selling (Cochrane 2002, Ofek and Richardson 2003,

Brunnermeier and Nagel 2004). Others blame some form of 'irrational' behaviour in the form of over-optimism and herd behaviour, driven by narratives about the 'new economy' and extensive new media coverage (Shiller 2000, Cooper, Dimitrov et al. 2001, Lamont and Thaler 2003).

John Jessop, formerly a Reuters employee and later CEO of Telerate, succinctly described Reuters struggle to stay competitive after the dotcom bubble due to the underlying build-up of inefficiencies during the 1990s in his memoir:

> "When, in the early years of the new century, stock markets around the world fell into one of their periodic swoons, belt-tightening resumed with a vengeance. In the Internet age, the cost-effectiveness of complex dealing room infrastructure, much of it hard-wired in outmoded technology, became the subject of intense review by financial institutions. Many turned to Reuters for solutions and were disappointed, even shocked, when few were forthcoming. This failure to respond exposed Reuters hitherto hidden problems" (Jessop 2008).

Other than in the 1987 crash, the end of the dotcom bubble and the subsequent economic turmoil led to significant reductions in staff number of financial institutions. Especially from the 'sell side', in brokerages and investment banks, this reduction swiftly impacted the business of information providers, as by the end of 2002, it "was estimated that 100,000 hobs (…) had gone" (Mooney and Simpson 2003). The reduction of these 100,000 alone would decrease the market potential for information providers, as Douglas Taylor explained:

> "How many eyeballs are looking at this [financial information products]? So if these financial institutions start to reduce their eyeballs, then whether they recognize that your data is important to them or not, if they have fewer desktops, fewer people, fewer eyeballs (…) that will impact it".[100]

Yet, the competitive landscape and circumstances of the burst of the dotcom bubble for the market for financial information was markedly different from the previous two sections. The market was much more consolidated with Reuters and Bloomberg's duopoly at the turn of the millennium, while it also witnessed the entrance of new low-cost competitors leveraging information dissemination through the internet and thus commodifying the 'basic' information

[100] Taylor, *Expert interview*, p. 8.

segment. These changed circumstances led to a perceptibly different impact on the demand and supply of the market for financial information during and after the dotcom crash compared to the 1987 crash and the crises of 1973/74. Driven by substantial cost-cutting needs combined with more choices in their information suppliers both in terms of 'quality' (Bloomberg's advanced information processing) and price (new low-cost competitors), financial institutions realigned their information acquisition strategies. Reuters thus lost both customers and market share due to its decreased competitiveness and the structural problems outlined above.

In 2005, Gautam Malkani summarized in the *Financial Times* the situation for Reuters after the collapse of the dotcom bubble:

> "Four years ago, Reuters came spectacularly close to collapse (…) it was hit by the economic downturn and suffered a dramatic loss of market share to Bloomberg, its privately owned US rival, in its core business of supplying information and data terminals to banks, fund managers and other financial service companies".[101]

Just how dramatic these developments were, can be seen in Figure 32. Reuters market capitalization and share price dropped significantly in the wake of the crisis. Yet, other than in 1987, this time more profoundly and on a persistent downward trend for several years. This was the result of a significant collapse in revenues and profits for Reuters (see Figure 14), that resulted out of a sharp drop in user accesses (see Figure 19).[102]

[101] Gautam Malkani, '*Reuters set to burnish its brand*', Financial Times, 11.01.05.
[102] The time lag between the drop in revenues, user accesses and Reuters share price can be explained by the structure of Reuters' contracts for its products, that usually ran on a 2-year basis.

Figure 32: Reuters share price ($), daily closing prices, 1984-2007.



Source: Data on historical stock price performance from Thomson Reuters investor relations, available online: https://ir.thomsonreuters.com/stock-information/stock-price-performance.

To a certain extent, the drop in user accesses can be explained through efforts by the Reuters senior management to consolidate its product offering in a reorganisation effort starting in 1999. The reorganisation was at least partially aimed at fighting-off new low-cost competitors which were leveraging the growing internet as a platform for the provision of financial information.[103] However, the more important driver for this structural break was the realignment and cost-cutting efforts on the demand side of the market for financial information. Until the early 2000s, banks and other financial institutions had regularly retained multiple information systems from several different suppliers as a fail-safe. Douglas Taylor explained:

> "As the markets grew in the 90s, more and more financial institutions had deep enough pockets to have multiple vendors, so many of them would have Reuters and Dow Jones News. So if that news story[104] had happened in the late 90s on Reuters, they would have seen it, and if it happened on Dow Jones and Reuters didn't have it, they would have seen it because they had deep pockets and they had both vendors. Many had Reuters and Bloomberg on their desk, multiple vendors. What happened then, when the market crashed is in some cases, budgets are being cut. So instead of having both Reuters and Bloomberg or both Reuters and Dow Jones, I'll have just one. That's the way I'll manage my budget.

[103] Peter Job, '*Reuter Group PLC - Presentation to Analysts - Interim Results for the six months ended 30 June 2000*', 25.07.00, LN1176, Reuters Group Archive, London.
[104] The invasion of Kuwait by Saddam Hussein, which was reported on Reuters terminals in 1990 around 7 minutes faster than on major competitor products; see Taylor, *Expert interview*, p. 3.

> Instead of having Reuters as my primary and Bloomberg is my backup or whatever, I'll just have Reuters as my primary. That reduces my budget".[105]

The squeeze in the wake of the bubble burst and its aftermath affected Reuters more than its main competitor Bloomberg, which did not experience a reduction in its client base (see Figure 26). John Gapper already foreshadowed this development in a prescient article in the Financial Times in 1998, underlining the competitive advantage gained by Bloomberg through its focus on supplying 'proprietary' price information, advanced information processing capabilities, and easy-to-use analytical tools for its end-users:

> "Mr Bloomberg admits he is 'trying to raise the bar by convincing customers they need more sophisticated things'. The Reuters and Bridge approach does carry risks. Instead of gaining customers from Bloomberg, or attracting people who have not subscribed to any financial network, they could find their existing customers trading down. Mr Bloomberg believes the mid-market of brokers and corporate executives is unattractive because cheaper services are being undercut by free distribution of basic data. 'The guys in trouble are the ones that supply $100 or $200 terminals because the difference between that and what you get free on Yahoo.com is very small".[106]

Mooney and Simpson summarized the view of many external and internal commentators and market experts at the time of the crash:

> "While Reuters pointed to a 'fundamental change' in its markets, not all of the decline was down to market shrinkage. Reuters was facing increasing competition at the bottom end of the market from rivals such as Canadian-based Thomson Financial and Web-savvy upstarts such as Caplin Systems in the UK, Amsterdam-based MarketXS and Moneyline Telerate with cheap Internet-based offerings, while Bloomberg continued to lure clients away from Reuters overly-complex, high-tech terminals higher up the market" (Mooney and Simpson 2003).

With Reuters exposed position in the market for financial information, financial newspapers continued commenting on its rapid decline in a concurring fashion. In an extensive analysis, Charles Goldsmith and Kay Larsen in the *Wall Street Journal* described this changed positioning of Reuters accelerated by the burst of the dotcom bubble:

> "In the 1970s and 1980s (…) many traders simply couldn't have done their jobs without a Reuters terminal. But the Internet made it easier for start-ups to

[105] Taylor, *Expert interview*, p. 11.
[106] John Gapper, '*What price information*', Financial Times, 20.07.98.

> gather and repackage data on the cheap. Their arrival split the data market in two: the high end, dominated by Bloomberg with its fancy technology and instant messaging; and the commodity business, served by low-cost suppliers. Reuters, bureaucratic and riven into fiefdoms, was left floundering in the middle".[107]

The preferences on the demand side of the market for financial information was overwhelmingly in favour of Bloomberg in many firms, as the following example of dealers in the London stock market emphasized:

> "More worryingly, traders who used to have the luxury of both Bloomberg and Reuters were now being routinely asked to choose one or the other as banks pared costs. Whereas in the past they would hang on the Reuters 'come hell or high water', now invariably they kept their Bloombergs. One leading analyst in London said he would regularly take straw polls among dealers and the 'vote' was running 4-1 in favour of Bloomberg" (Mooney and Simpson 2003).

This macro trend can be observed on the micro level by one typical example on the 'sell-side', the British brokerage firm Teather & Greenwood Ltd.:

> "To cut costs, the firm removed most of the 50 computer screens that once provided financial data from Reuters Group PLC. It kept its 20-plus screens from Bloomberg LP, for bond prices and instant messaging. But for stock prices, it installed more than 30 machines from an upstart company. Information from that service isn't as comprehensive as what Reuters offers, says Nick Stagg, the brokerage's chief operating officer, 'but it fits our needs at about one-fifth of the price'".[108]

This example of Teather & Greenwood illustrates the importance of Bloomberg's 'proprietary' information in the fixed income segment and the power of its network on the economic and social level. But it also emphasizes the commodification and substitution that happened especially in 'basic' price information supply on exchange traded asset classes. On the macro level, this switch away from Reuters in the aftermath of the burst of the dotcom bubble (as seen in Figure 19, Figure 21, and Figure 26) can be observed in a similar fashion as leading securities analysts continuously downgraded their forecasts for Reuters even 18 months after the burst of the Dotcom bubble, due to

[107] Charles Goldsmith and Kay Larsen, '*Squeezed by Rivals, Reuters Is Facing Its Own Bad News*', Wall Street Journal, 18.02.03.
[108] Ibid.

> "a loss in market share to Bloomberg, Reuters' privately owned rival, and cuts in spending on Reuters systems by banks (…) In its report, UBS Warburg estimated that Reuters had lost 9 per cent of its subscriber base over the past six months and could lose a further 14 per cent by the end of 2003. Among top price terminals, Bloomberg has overtaken Reuters as the global leader with about 40 per cent of market revenues, it says. Reuters' market share has slipped back from 36 per cent to 32 per cent".[109]

As turmoil in financial markets continued for longer than after the 1987 crash, even the 'deeper-pocketed' buy-side customers came under increasing pressure. Doug Jeffrey, European Managing Director at Telerate, described openly in a *Financial Times* interview in 2002:

> "'Virtually every global investment bank is doing a market data rationalisation. They're cutting terminals. Up to now, it has been on the sell-side, but some of the buy-side customers that I visited are preparing for cutbacks, too. That affects us all but Reuters has 10 times the terminals, so it feels 10 times the pain' (…) Investment bank managers admit they are increasingly asking staff on and off trading floors to choose between Reuters and Bloomberg terminals. And as one global market data manager says: 'What is clear is that Bloomberg has not been impacted anything like as seriously as Reuters during the downturn. Bloomberg is still growing'".[110]

Faced with increased pressure from subscribers switching services, Reuters did try to counteract these developments and stop the drain on its business, both by introducing new products and features and trying to compete on price in the high-class segment against Bloomberg. A decade after Bloomberg's introduction of its original service, Reuters for example launched an instant messaging service on its terminals in October 2002. Yet, the new product never got the traction of Bloomberg's. Reuters clients were highly critical of the new service, as it was assessed "by some clients as 'too little, too late'".[111] In the view of Peter Esler, this was symptomatic of Reuters failure to understand the advantage of Bloomberg's 'environment' approach. It showed why Reuters main competitor was trusted more than its own products, besides the hard advantage of 'proprietary' information in some markets such as fixed income:

> "What they [Reuters] failed to realize was it was beyond messaging. Bloomberg has these guys involved and invested in the application, saying 'I don't want to

[109] Carlos Grande, '*How a media organisation famed for being first with the news is struggling to keep pace with the market'*, Financial Times, 17.10.02.
[110] Carlos Grande, '*Reuters Share Fall to lowest since 1991'*, Financial Times, 11.10.02.
[111] Ibid.

> just talk to Bob. I'm going to show Bob why I think this is a good idea to trade with me'".[112]

This left Reuters the option of price competition against Bloomberg amid and after the crash. Douglas Taylor, then Reuters global director of product management and marketing, attested to the changed strategy in selling Reuters information products to its customers:

> "Your strategy does change, of course you do try to reinforce the story about how important information is, especially in these critical times when there's higher risk (…) if I know the budget is at risk with this financial institution, then how do I ensure that I get my share of that budget, and you begin to become more competitive. So you begin to encourage people to keep your Reuters machine and reduce your Bloomberg exposure, and that's the way you manage your budget. You begin to make special offers, if you will, in pricing to get people to either keep the terminals on their desk or to expand the terminals. 'You know what? Bloomberg costs $2000 a month. Get rid of 10 of your Bloombergs and I'll give you 10 more of my Reuters than half that price and all your people still have information, but you reduced your budget.' This becomes a much bigger sales pitch during this time when you know that budgets are an issue for your client base".[113]

Yet, all these efforts could not cover the competitive disadvantage in which Reuters had manoeuvred itself at the beginning of the new millennium. Bloomberg's user-friendly, one-size-fits all approach with its advantages in information processing and its entrenchment with loyal end-users, as outlined above by Peter Esler, turned out to be crucial:

> "Bloomberg kept his focus on the traders, the actual users. While Reuters technical solution people were talking to the IT departments, Bloomberg's attractive [sic], young staff - often themselves with a markets background - were out on the trading floors talking to the people who would decide, when the crunch came in the financial meltdown in 2001-2003, which of the two systems they would keep. When the choice came (…) it was more often than not Bloomberg rather than Reuters" (Mooney and Simpson 2003).

One must keep in mind however that the magnitude of the downturn after the burst of the dotcom bubble for Reuters was also partially driven by a higher exposure of Reuters in the equities segment of the market for financial information. As Bloomberg still had its largest client base in the fixed income business, this would naturally affect its operating performance and pressure on its

[112] Esler, *Expert interview*, p. 9.
[113] Taylor, *Expert interview*, p. 12.

information supply less, due to the nature of the crisis in equity markets. However, as the next section shows, this would have a different impact in the GFC that originated in credit markets and impacted most asset markets in Western economies:

> "In past downturns cuts have been accompanied by lower spending on data terminals provided by Reuters, Thomson Financial and Bloomberg. In the last downturn [note: after the dotcom bubble], when traders were asked to choose between two terminals at their desk Bloomberg usually won. 'Last time there was a downturn, they were best placed in [the stronger areas of] fixed income and hedge funds', Mr. Glocer said".[114]

The burst of the Dotcom bubble and its aftermath thus saw a significant realignment on the demand and supply side of the market for financial information. The underlying trajectory of a commodification of 'basic' price information and increased importance of 'proprietary' price information and advanced information processing capabilities was catalysed by the crash. The competitive landscape of information suppliers, already before the crisis moving towards a duopoly between Reuters and Bloomberg, was further consolidated. Financial institutions were switching away from Reuters to either low-cost suppliers of 'basic' price information or Bloomberg's high-end product, leaving the former predominant Reuters in financial trouble. These features would be defining in the following years and in the build-up to the global financial crisis.

4. Restructuring, mergers, and persistence – The global financial crisis of 2007/08

The GFC, which began with its first precursors in 2007 and sent financial markets and most advanced economies into their worst downturn since the Great Depression, was primed to lead to significant turmoil in the market for financial information. As Douglas Taylor summarized it for investment banking on the demand side of the financial information market, which was hit severely with the existential crisis faced by several of the world's largest investment banks:

> "In 2008, the investment banking segment (…) of the market data industry, shrunk a third. A full third in one year (…) And it's because in the investment banking industry deal volumes dried up globally. And the smaller boutique firms went out of business. Bigger firms could lay off a few people, investment

[114] Andrew Edgecliffe-Johnson and Ben White, '*Terminal Choice*', Financial Times, 02.05.08.

> bankers or junior bankers, and still keep their business open. But the small boutique firms, one or two people that were doing deals like crazy in 2006 and 2007, were just gone in one day, so that was revenue that stopped for Bloomberg or Thomson Reuters in a day. It didn't matter if you have a two-year contract, they're out of business, they're gone".[115]

While the burst of the dotcom bubble and the ensuing market downturn led to 100,000 jobs being cut in the financial services industry in the early 2000s, in 2008 "the industry [note: financial services] has contracted by 300,000 jobs around the world, or about 8 per cent".[116] And yet, as reports on the financial information industry by Burton-Taylor International Consulting stated for the years between 2007 and 2010, global spending on financial information stayed flat in 2008. After the worst shocks of the financial crisis had rippled through the financial industry at the end of 2009, global spending on financial information was 'merely' down by 1.46% for 2009, on track to recover in 2010 by 4.23%.[117] However, these macro datapoints do not tell the whole story. The market for financial information essentially mirrored the fate of the global financial industry, leading to severe regional disparities in its development with global demand for financial information "continuing to move from West to East, as the Americas will contract almost 5% while Asia expands 6.5%" in 2009.[118]

Reuters and Bloomberg had become the predominant firms in the global financial information industry, cementing a duopoly in the late 1990s and early 2000s (see Figure 25) that would be the main source of competition and the defining feature in information supply. However, as this section shows, their fates in the aftermath of the early years of the millennium and leading up to the GFC were just as divergent as during the previous market crash. Bloomberg started out in the more favourable position, weathering the storm of the burst of the dotcom bubble well and extending its lead in market share over Reuters. It continued its one-product terminal

[115] Taylor, *Expert interview*, p. 10.
[116] Edgecliffe-Johnson, '*Bloomberg to expand'*, 27.04.09.
[117] Burton-Taylor International Consulting LLC, '*Annual report on global spending on financial information market*', 2008 to 2010 respectively; available online: *https://www.bobsguide.com/2009/02/17/burton-taylor-data-indicates-challenging-year-for-thomson-reuters-bloomberg-and-financial-information-analysis-market/*; and here: *https://tpicap.com/burtontaylor/reports*.
[118] Ibid.

'environment' strategy, adding consistently new features, market information, and subscribers to its business, as well as expanding its global footprint especially in Asia.[119] Reuters embarked on a fundamental restructuring programme ('Fast Forward') introduced by its new CEO Tom Glocer to consolidate the business operations, product offering, and making the company competitive again in the fast-evolving market for financial information.[120] Yet, despite gradual success in these efforts and a market that would finally start to recover and grow again in 2004, the Reuters board (with approval from its shareholders) ultimately accepted a $17bn. acquisition offer (~9.5% above the market price) by Canadian information giant Thomson Corporation in 2007, just as the GFC hit. The new corporation, Thomson Reuters, took up its joint operations the following year under the leadership of former Reuters CEO Tom Glocer.[121] 146 years as an independent company were over.

There are several similarities with the previous section. The supply side of the market for financial information responded to these developments by focusing on diversification, both in terms of information and capabilities supplied and geographies covered. It followed the fundamental trends previously observed in the wider financial services industry, with a geographical shift towards Asian markets to compensate for the severe drop in revenues from developed markets in Europe and especially North America. This mitigated the impact of the demand fall in the top and bottom line of the two leading firms. Financial information suppliers again reacted by actively changing their sales strategy towards the struggling demand side. Suppliers increasingly competed with each other in a more substitutable and consolidated market on price and services. Yet, in contrast to the burst of the dotcom bubble and its aftermath, firms in the financial industry did not switch their information providers to the same extent. This suggested a certain saturation in financial firms' information acquisition strategy, and low perceived advantages to switching suppliers. The GFC again did not precipitate these trends that were already

[119] Tim Burt, '*Bloomberg's Vision for Victory*', Financial Times, 12.01.05.
[120] Jane Fuller, '*Press fast forward to the euphoria master*', Financial Times, 19.07.03.
[121] Edgecliffe-Johnson and White, *Terminal Choice*, 02.05.08.

under way, but was fundamentally a 'catalyst' when credit, equity, property, and derivatives markets were plunged into uncertainty.

Restructuring, consolidation, growth – the market for financial information up to 2007/08

When Tom Glocer became CEO of Reuters in July 2001, taking over from Peter Job during the worst downturn in Reuters company history, the need for reform in the established global information provider was laid bare. Presciently, when Glocer was interviewed by the Reuters board for the role of chief executive in November 2000 when the decision for him as successor of Peter Job was about to be made, he noted on the current business and reporting structure inside Reuters:

> "As CEO, I would put in place a structure with far fewer reports with a view to spending my time on the things that matter (…) we must achieve greater cost effectiveness (…) & counter the competition from below".[122]

Only two years later, in April 2003, this need for continued reform was apparent to the larger public. Bloomberg took for the first time a bigger share of the global market for financial information, accounting for 42% of the $6.5 billion market compared to Reuters 39%, as "Bloomberg was better weathering the storm" (Mooney and Simpson 2003). Reuters market value was more than halved from £21 billion to £8.5 billion between 2001 and 2002, and the bottom floor had not yet been reached (see Figure 32). Total subscriber and terminal numbers continued to fall. Tom Glocer set out to reform the organisation. But, according to the former Reuters employees Mooney and Simpson, his early efforts in restructuring the firm were not the breakthrough initially hoped for, as the many shifts and reorganizations left "both staff and customers confused" (Mooney and Simpson 2003).

It would take Reuters until 2004 to recover at least partially from this shock and to stop the drain on its business, when the company reported for its third quarter (for the first time since

[122] Tom Glocer, '*Meeting with Reuters Board Succession Committee*', Handwritten personal notes, 13.11.2000, LN1176, Reuters Group Archive, London.

Q1/2001) that "demand for new terminals outweighed cancellations".[123] This was at least partially the result of Tom Glocer's reform program "Fast Forward", which was implemented between 2001 and 2004. The program was focused on cutting costs by initially reducing 3,000 jobs of Reuters then 18,000. It consolidated Reuters operations by selling 'non-core' business (for example through the IPO of Instinet in 2001 when Reuters retained 62% of the firm before selling the remaining stake to NASDAQ in 2005), and by reducing its product offering:

> "it [Fast Forward] is reducing the number of Reuters' products from 1,300 to about 50, consolidating its global operations around regional hubs and raising more than £490m from the sale of non-core business".[124]

Besides these internal efforts, the potentially more important factor for Reuters recovery was the increasing demand for financial information products after the turmoil of the early years of the millennium had subsided and financial institutions started to expand again in 2004:

> "Both companies [Reuters and Bloomberg] are fighting for financial services customers amid signs that demand is on the increase after four years of volatile sales and heavy job losses among clients in the financial centers of New York, London, Tokyo and elsewhere".[125]

Yet, besides those signs of recovery, the turmoil of the early 2000s had clearly taken a toll on the once proud predominant firm. The job cuts amounted to almost 6,000 rather than the initial target of 3,000, thus shedding a third of Reuters workforce by 2004 (Palmer 2019). In this situation, the information supplier was seen as a desirable target for acquisition by several large media and information companies. Glocer focused on the potential advantages regarding the decisive factor of scale in the market for financial information that such a move could provide. Early on in 2003 he favoured a bid by Canadian media firm Thomson Corporation, the parent of ascending competitor Thomson Financial (Palmer 2019). Thomson Financial had made increasing gains on the supply side of the information market and established itself as the third-largest competitor at the time. But with about 11% of market share the firm was still considerably behind Bloomberg and Reuters in

[123] Burt, *Reuters rivals*, 18.11.04.
[124] Fuller, *Fast forward*, 19.07.03; see also Malkani, *Reuters*, 11.01.05.
[125] Burt, *Reuters rivals*, 18.11.04.

2007.[126] After years of feeling the water and negotiations the final agreement between the two companies was accepted by both companies' shareholders on May 15, 2007. The combined dual-listed company, Thomson Reuters Corporation, was created by a take-over of $17bn. by Thomson in 2008.[127] Commenting in *The New York Times* on the new company's competitive position in its lead article on the takeover, Ian Austen stated:

> "The new company, which will be called Thomson Reuters, will own 34 percent of the market for financial data, putting Thomson in direct competition with Bloomberg L.P. (…) The deal also comes in the middle of an information revolution as easy distribution over the Internet has turned news and data into a commodity".[128]

The deal, which would see Tom Glocer becoming CEO of the combined company, came into effect on April 17, 2008. It established the new firm when financial markets already felt the outset of what would culminate in the worst financial crisis in almost eight decades, and already overshadowed the market debut of Thomson Reuters:

> "The market debut last month of Thomson Reuters was clouded by concerns about its exposure to Wall Street and the City, as banks make deep cuts in personnel to match sharp declines in revenues".[129]

Bloomberg's development leading up to the global financial crisis plots a stark contrast to Reuters downturn, its restructuring efforts, and finally its acquisition by Thomson corporation. After the election of Michael Bloomberg to the office of mayor of New York City and his departure as chief executive of the company in 2001, the new leader in supplying financial information continued its operations seamlessly by following its recipe for success built around its one-product strategy. Bloomberg weathered the economic and financial turmoil of the early 2000s considerably better than its main competitor: "Bloomberg saw its screen count rise by almost 10 per cent in 2002 and 2003, even though the market declined" (see also Figure 27).[130] This trend had continued

[126] Andrew Edgecliffe-Johnson and Aline van Duyn, '*Reuters a good fit for Thomson*', Financial Times, 05.05.07.
[127] Reuters Group PLC, *Annual Report 2007*, pp. 4-5.
[128] Ian Austen, '*Thomson Adds Reuters in $17 Billion Bid to Be Giant*', The New York Times, 16.05.07.
[129] Edgecliffe-Johnson and White, *Terminal Choice*, 02.05.08.
[130] Burt, *Bloomberg's Vision*, 12.01.05.

on its positive trajectory when the market for financial information started to grow overall again with increased spending and expansion in the wider financial industry from 2004 onwards. The company managed to add both new subscribers to its business and continuously increased the price for its terminals:

> "Bloomberg's revenues for 2004 are thought to have exceeded the $3.3bn made in the previous year. This has been achieved not least because it has defied the industry trend by pushing through price increases of about 5 per cent a year".[131]

Even in 2006, before financial markets felt the first wave of uncertainty about future outlooks in 2007, Bloomberg outperformed its main competitors: "Bloomberg has seen the strongest growth of the big three in recent years, expanding by an estimated 15 per cent last year compared with Reuters 9 per cent and Thomson's 5 per cent".[132] This successful growth was driven by increased expansion into new fields within the core financial sector and previously uncovered industries. As journalists covering Bloomberg in the mid-2000s put it, Bloomberg continued to expand in terrain such as foreign exchange, and in the data feed business for automated trading following demand by the financial firms and adjunct industries:

> "Bloomberg has aggressively pursued sales in industries beyond the financial sector, including shipping, commodities and legal services. Mr. Fenwick says that if leading companies in those industries are using Bloomberg terminal for data feeds and analytical information, analysts, investment bankers and brokers covering those companies will need the same information (…) But even in the core financial services sector, the appetite for data and high-speed technology is accelerating rapidly. Increasingly, trading is reliant on automated programs, where brokers generate quotes using computer systems".[133]

At the same time, Bloomberg continued to expand its existing services such as its news organisation, aiming to increase its staff by 10% from 2,300 to over 2,500 on the back of reported 2006 revenues of $4.7bn and margins of 30%. It focused its geographical expansion on the fast-growing Asian market.[134] Bloomberg's growth in the aftermath of the burst of the dotcom bubble

[131] Ibid.
[132] Edgecliffe-Johnson and van Duyn, *Reuters Thomson*, 05.05.07.
[133] Burt, *Bloomberg's Vision*, 12.01.05.
[134] Aline van Duyn, '*Bloomberg plans to boost reporting team*', *Financial Times*, 21.06.07.

was also driven by directly attacking former domains of its competitors. In 2003, Bloomberg moved significantly into the FX information and dealing space, where Reuters had been the decades-long hegemon. Bloomberg partnered with EBS (Electronic Broking Services), a partnership set up by large FX dealing banks to challenge Reuters monopoly in the 1990s, including Citigroup, ABN Amro, UBS, and Credit Suisse (Mooney and Simpson 2003).

This was just one example of another larger trend, as financial institutions on the demand side had over time occasionally tried to break the monopolistic structure of information suppliers in certain asset markets. Dennis Waters described this development at the example of Reuters and Telerate's foreign exchange business in the late 1990s:

> "The major banks in the 90s realized that the business model under which Reuters operated, having them on their system paying to insert their quotes, repackaging them, and selling them back again wasn't that attractive for them. So, the major banks really pushed for competition in this area, they tried to prop up Telerate especially. Telerate thus developed a new keyboard, that would let traders put in their quotations simultaneously into the Reuters and Telerate system, when before that they would first put it in the Reuters system and then into the Telerate system, which mattered a lot in this fast-moving market. After several court cases, Telerate managed to secure this new system".[135]

Yet, this trend continued well beyond foreign exchange and the 1990s. Goldman Sachs for example would set up its 'Symphony' system in a direct challenge to information suppliers (especially Bloomberg) in 2015. Yet, as John Gapper explained, most of the time these efforts had only limited success when driven by the demand side:

> "A piece about Symphony I wrote in 2015, about Goldman trying to start up a competitor to Bloomberg. Well, Goldman is a very well-run organization, but it just couldn't make an impact."[136]

As a direct answer to Bloomberg's attack on Reuters core business in FX in 2003, Reuters, again with the backing of several large international banking institutions, countered the following year by moving into the Bloomberg-dominated fixed-income space. Reuters started to not only

[135] Waters, *Expert interview*, p. 3.
[136] Gapper, *Expert interview*, p. 4.

supply information, but also enabled direct trading on its fixed-income systems, as Tim Burt reported in an extended piece in the *Financial Times*:

> "The move follows months of talks with financial services groups including Bank of America, Deutsche Bank, JPMorgan, Goldman Sachs and UBS, which will supply prices on instruments for trading. The banks are said to welcome the prospect of Reuters bringing more competition to the fixed income trading market (…) The initiative follows intensifying competition between Reuters and Bloomberg, which last year moved into foreign exchange trading - traditionally a Reuters stronghold".[137]

The increased consolidation and competition between information suppliers had started out slowly in the 1980s, accelerated throughout the 1990s, and culminated in the duopoly of Bloomberg and Reuters in the early 2000s. Competition had increased as 'basic' price information on more and more markets became commodified, and substitutable products for 'proprietary' price information and information processing were either developed or acquired by the two market leaders. This significantly changed the industry's dynamic and outlook during downturns in financial crises.

Adapting to the global financial crisis 2007/08 and beyond

Michael Bloomberg, reflecting on the GFC and its impact on the business of information supply for financial markets, stated in his memoir boldly that Bloomberg

> "managed to grow the business during the worst economic recession in decades. As most of our customers (those that survived anyway) slashed their payrolls, we found new markets by offering new services" (Bloomberg 2019).

However, this might be an overly simplified and glorified narrative upon close analysis. The up-to-then continuously successful Bloomberg did indeed face major competitive threats during the GFC, while the newly established Thomson Reuters fared better (after immediate pressures had subsided) than most commentators had expected.

[137] Burt, *Reuters rivals*, 18.11.04.

The general impact of the global financial crisis on the market for financial information was by any measure a significant shock on the demand side, especially in 2008 and 2009. Yet, most market segments globally returned to growth already in 2010.[138] The downturn affected different market segments and geographies to varying degrees. Revenues of information suppliers continuously grew in Asian markets between 2008-2010 (see Table 1), as a result of growth in the financial services sector propping up demand and information suppliers actively pushing into the market.[139] Revenues in the European, Middle East, and Africa region (EMEA) did well in 2008, yet growth slowed down reportedly in 2009 (although to an unknown extent), and was only gradually up again in 2010. Revenues in the Americas region as one of the largest markets contracted heavily in 2008 and to a lesser degree in 2009, before starting to recover in 2010 (see Table 1).

Although there is limited evidence on revenue development in different sectors of the demand from financial institutions, Table 2 shows the steep decline especially in investment banking demand, contracting by -29.5% in 2008. Demand from equity sales and trading also contracted in 2008 (-3.0%) and 2009 (-5.3%) during the GFC, before it started to recover the following year. Although there is no exact data, a similar development is reported for the FX & Treasury segment in those years, leading to investment management overtaking this segment with the biggest share of revenues in the financial information market.[140] Financial markets in most advanced economies were shaken to their core by the GFC, but demand for financial information did not drop to the same extent. This disconnect was arguably driven by the continued need for reliable and timely information by financial institutions, the advantages of advanced information processing capabilities provided, and the diversification strategies employed by both Bloomberg and Reuters as the two firms controlling two-thirds of the global market share.

[138] Burton-Taylor, *Global Spending*, 2010, p. 1.
[139] See Burton-Taylor, *Global Spending,* reports for 2008-2010 respectively for market shares.
[140] Ibid.

Table 1: Financial information market, global spending.

Table 1: Growth in financial information markets, global spending, 2008-2010			
	2008	*2009*	*2010*
Americas	-10.0%	-5.0%	3.2%
EMEA	7.0%	-	3.6%
Asia	20.3%	6.5%	9.8%
Global	0.0%	-1.5%	4.2%

Source: Burton-Taylor International Consulting LLC, 'Annual report on global spending on financial information market', 2008 to 2010 respectively.

Table 2: Growth in financial information market, by segment.

Table 2: Growth in financial information markets, growth by segment, 2008-2010			
	2008	*2009*	*2010*
Investment Mgmt.	5.0%	9.2%	3.3%
Equity Sales & Trading	-3.0%	-5.3%	-
FX/Treasury	-	-	-
Investment Banking	-29.5%	-	8.0%
Commodity & Energy	-	-	11.3%

Source: Burton-Taylor International Consulting LLC, 'Annual report on global spending on financial information market', 2008 to 2010 respectively.

The stagnation and fall in demand by financial institutions in the wake of the GFC was markedly different in its origin and its impact on the leading firms. In May 2008, Tom Glocer emphasized confidence in Thomson Reuters as a broadly diversified company that was fit to meet the challenge of the market downturn:

> "Tom Glocer, chief executive, was at pains to emphasize yesterday that the group was diversified across more resilient sectors and that its markets division's fortunes were no longer in step with banks' headcount".[141]

With the origin of the crisis coming primarily from credit markets, Glocer stated optimistically in April 2009 that "this time around, to date the much stronger markets have been the ones Reuters was in and ones we steered Reuters into".[142] As John Gapper explained, the different focus of the two companies was a pressing factor for market insiders on how the two

[141] Edgecliffe-Johnson and White, *Terminal Choice*, 02.05.08.
[142] Edgecliffe-Johnson, '*Bloomberg to expand*', 27.04.09.

leading firms would deal with the mounting troubles in financial markets. Although both were more diversified than in earlier crises, they still maintained dominance in respective sub-sectors of the market for financial information,[143] with "its [Bloomberg's] origins in the bond and the credit markets as opposed to, for example, Reuters origins in foreign exchange and then into equities".[144] Andrew Edgecliffe-Johnson, the foremost journalist covering the financial information market for the *Financial Times* during the GFC, concluded on public statements about expansion plans by Bloomberg's CEO Peter Grauer in April 2009: "the comments (…) run counter to many analysts perceptions that it [Bloomberg] is exposed to more vulnerable sectors of the financial services than rivals".[145]

Tom Glocer was convinced that to answer the challenges during and after the GFC, Thomson Reuters had to go further down the path of "intelligent" information. This concept can be seen as in essence the extended integration of advanced 'information processing' directly into services to customers. He explained his conviction publicly on his blog in May 2008:

> "Intelligent information has never been more valuable. Professionals will pay for just the right information delivered at just the right time and place in their workflow (…) financial markets will pay to be given less information – but precisely the right information that helps them make better decisions faster".[146]

Thomson Reuters sought to deliver on these convictions with its headship product, the 'Reuters 3000Xtra'. The 3000Xtra made up over half of the company's terminals worldwide at the end of 2008, providing customers in financial markets with what Reuters called a "combination of deep, global, cross-asset news and content combined with sophisticated pre-trade decision-making, analytics and trade connectivity tools".[147] The 3000Xtra was developed out of Reuters '3000 line'. This line was launched in the second half of the 1990s in an effort to rebuild the

[143] In 2009, Bloomberg controlled 46% of the global spend on fixed-income information, while Thomson Reuters was leading in foreign exchange with ~70% market share, see Burton-Taylor, *Global Spending*, 2009.
[144] Gapper, *Expert interview*, p. 2.
[145] Edgecliffe-Johnson, *Bloomberg to expand*, 27.04.09.
[146] Tom Glocer, '*Intelligent Information Comes of Age*', Tom Glocer's Blog, 02.05.08; available online: *http://www.tomglocer.com/2008/05/02/intelligent-information-comes-of-age-3/*.
[147] Thomson Reuters, *Annual report 2008*, p. 2.

company around a technologically new platform and product that would not suffer from the old legacy infrastructure at the core of Reuters loss of competitiveness in these years.[148] Yet, it was only until further development and Glocer's move to a more "organised approach to providing banks, fund managers and other financial institutions with market information" that the 3000Xtra would become "Reuters' number one product".[149] The 3000Xtra became a product that could at least technologically compete with Bloomberg's offering, although the latter still enjoyed the benefits of its higher dissemination and its 'environment' approach. Thus equipped, Thomson Reuters indeed managed to weather the turmoil ensuing in financial markets better than anticipated by market analysts. The new firm gained further from the merger of previously separate businesses, leading to cost savings and greater outreach among financial clients from the two companies' previous customers. As stated by Edgecliffe-Johnson in the *Financial Times*:

> "Without predicting a crisis of such severity, its [Thomson's] thesis was that Thomson Financial, a smaller rival to Reuters and Bloomberg, would have struggled in such downturns, and that a combination with Reuters would provide several years' worth of cost savings and revenue benefits. Thomson also believed that professional information such as financial data and specialised news would retain its value even as consumers became increasingly unwilling to pay for media content on digital platforms".[150]

Faced with mounting attacks from both the bottom and high-end of the market, the renewed focus on supplying mainly advanced tools for information processing that were received well in the market and the operational benefits of the merger paid off for Thomson Reuters. It weathered the turmoil of the global financial crisis considerably better than one would have expected based on the reduction in employment in the financial sector globally, with sentiment already cautiously improving in early 2009. Edgecliff-Johnson reported that:

> "Among Thomson Reuters core banking customers, the revival in sentiment that has generated political outrage about profits and bonuses has lifted his [Tom Glocer's] hopes about the company's near-term prospects".[151]

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[148] Christopher Price, '*Reuters ups the stakes in high-tech race*', Financial Times, 17.07.96.
[149] Malkani, *Reuters*, 11.01.05.
[150] Andrew Edgecliffe-Johnson, '*Bloomberg broadens its portfolio*', Financial Times, 27.04.09.
[151] Edgecliffe-Johnson, *Bloomberg portfolio*, 27.04.09.

With new low-cost firms supplying more commodified 'basic' price information, both Thomson Reuters and Bloomberg faced challenges increasingly from the bottom-end of the market, as financial institutions were teased away by the necessity to cut costs. Douglas Taylor explained this development along the example of FactSet in 2007/08:

> "And they [FactSet] went to every Reuters client and they were offering literally up to five for one pricing if you replace your Reuters machines. So in the case of FactSet they don't do it very often, but in this case, they recognized (…) that this was an opportunity for them to steal business. And they were willing to discount dramatically, frankly, their pricing to get those machines off the desk and replace them with FactSet machines. So there's a time when internally absolutely the strategy changed".[152]

This strategic shift to gain market share in the financial turmoil was threatening for the established firms. Clients once lost would be difficult to regain later on, due to a "90% retention rate either in revenue or clients or both (…) All you're doing is fighting over that 10% churn, the 10% of the people that aren't renewing their contracts".[153] Both Bloomberg and Reuters tried to respond to this new competitive threat and the increase in competition in the market downturn along similar lines. On the one hand, they emphasized their advantage for financial institutions as providers of superior services in terms of "intelligent information" with their capabilities in information processing. On the other hand, both further diversified and pushed to gain a foothold in new markets and geographies:

> "it became more competitive. And the companies (…) recognized that I can't grow within my industry (…) so I have to look outside my industry. I move horizontally within this industry. If I'm not in the automated electronic trading business, can I move into electronic trading to find new revenue? If I'm not in the fixed income side, can I add fixed income information to try and move there, or can I acquire unique information or unique capabilities?".[154]

However, this increased competitive pressure and change of strategy could not only be observed at the bottom-end of the market. In early 2009, before the first signs of recovery were felt in financial markets, prospects for Bloomberg compared to Thomson Reuters were worsening.

[152] Taylor, *Expert interview*, pp. 12-13.
[153] Ibid.
[154] Taylor, *Expert interview*, p. 13.

The supplier was "more exposed to harder-hit fixed-income and asset-backed securities traders and hedge funds", leading Bloomberg to what one analyst described euphemistically as "an 'aggressively proactive' approach to persuading customers to keep their terminals".[155] As Bloomberg faced for the first time in its 27-year history a reduction in its subscriber base in 2008 and 2009, this change of strategy in interacting towards its main customers in the financial industry might not be surprising. Yet, it clearly highlighted the extraordinary pressure the predominant firm faced in handling competition from its main rival Thomson Reuters and the growing low-cost suppliers.

It is important to keep in mind one aspect about the decision-making process of financial institutions regarding their selection of information suppliers and changes to this during times of financial turmoil. Institutions are never homogeneous entities, but different departments or hierarchies might have different preferences for their optimal informational intake. There can be a disconnect during financial crises between the decision to cut costs coming from a managerial point of view, and the demand for information and processing capabilities on the operational side based on different incentives and assessments on the decision to maintain or switch information suppliers. This is confirmed by oral history testimony:

> "The financial institution may not recognize that the information is more valuable to them in these times, they could be inexperienced, they may not have been through a crash before. Maybe the management team of the institution has a little bit of tunnel vision and they think 'we've got to reduce our costs. In these bad financial times, we've got to focus on our bottom line' and end up reducing their financial information, which is actually increasing their risk".[156]

John Gapper concurred with Douglas Taylor on this point, as

> "managerially, there were just different interests (…) when a firm is trying to cut its costs. The chief executive, department head, or whatever, will try to look across the board and cut costs and these things are expensive. (…) I think it's a

[155] Andrew Edgecliffe-Johnson, '*Thomson Reuters' bet paying off against all odds*', Financial Times, 07.08.09.
[156] Taylor, *Expert interview*, pp. 10-11.

> sort of classic case of where different elements within the firm have different incentives".[157]

Considering this, the decision by one institution to change information suppliers might not represent the operational team's preference for this move. It could simply represent a different management emphasis on cutting costs, which becomes even more prevalent in such extreme circumstances as during the GFC. Particularly in a crisis, as the first case study of the MMR in 1973/74 showed, operators can be likely to keep with what they know to navigate the uncertain environment.

As discussed, Bloomberg stemmed itself against the approaching fall in information demand by diversifying both geographically and in new markets. The acquisition of BusinessWeek, announced in October 2009, was an unusual break with the company's previous focus on organic growth. The decision stood emblematic for Bloomberg's aim to expand counter-cyclically in media and information markets less tightly connected with the fate of the core financial industry:

> "For the last decade, Bloomberg has barely bothered to venture outside the realm of high finance; its news was produced to help subscribers to its terminals make more money for themselves. With BusinessWeek, likely to be renamed Bloomberg BusinessWeek, the company is setting its sights on a much broader audience. That includes Main Street readers and, much more important for Bloomberg, senior executives, government leaders and other global movers and shakers".[158]

Despite falling terminal subscribers, the move was accompanied by a continuous expansion and investment in its existing journalist staff and news organisation. As Andrew Edgecliffe-Johnson pointed out in April 2009:

> "Bloomberg is planning a sustained investment in its technology and news operations, arguing that it can gain market share even as sweeping changes in financial markets pose the biggest threat to sales of its data terminals in its 27-year history (…) it had seen a fall of just over 2.5 per cent in terminal numbers (…) from a subscriber base of about 300,000 (…) figures displayed on screens around its New York offices show that net monthly installations of terminals are running about 13 per cent behind last year's rate and Mr Grauer said he

[157] Gapper, *Expert interview*, p. 7.
[158] Stephanie Clifford and Julie Cresswell, '*At Bloomberg, Modest Strategy to Rule the World*', The New York Times, 15.11.09.

> expected further falls (…) However, Mr Grauer said the group would add 950 staff this year, including about 100 in its news operations".[159]

These uncharacteristic moves by Bloomberg were enabled by the large profits and free cash flow the company had accumulated in previous years. Yet, they paid off subsequently. Bloomberg resumed on a growth course from 2010 onwards after its initial downturn in 2008 and 2009, outperforming Thomson Reuters in 2010.[160]

As Douglas Taylor foreshadowed in Burton-Taylor's 2008 annual report on the market for financial information, the impact of the GFC would be difficult to assess on information suppliers. The crisis' impact was highly dependent on the contraction in different sub-sectors of the financial industry and information suppliers' response to these challenges, seen here at the example of the investment banking segment:

> "The 'new world' of Investment Banking (IB) will be an interesting evolution in 2009 (…) Deals will continue to be done, and the need for quality decision-making tools will continue to exist. The uncertainty will be around the changes in information that might be required and the workflows of the participants as their roles evolve. Certainly boutique firms look to do well as they raise the quality of their teams by hiring the cream from the Street. The function of IB within the commercial banking sector, and more specifically the number of participants within the sector, will ultimately define the financial impact this segment has on global vendor revenue".[161]

In summary, the GFC saw a profound reduction in information demand coupled with the downturn in financial markets in many advanced economies. The drop in demand was directly linked to the lay-offs especially in investment banking (see Table 2) and the retreat of complex OTC securities products, which are discussed in detail in chapter 5 regarding their entanglement with CRAs. The duopoly on the supply side was competing on more equal footing after Reuters had regained competitiveness against Bloomberg through its merger with Thomson Corporation and advances in its high-end information processing capabilities. Hit harder by the downturn in its core market segments, Bloomberg had to suffer losses in its subscriber base for the first time, yet

[159] Edgecliffe-Johnson, '*Bloomberg to expand'*, 27.04.09.
[160] See Burton-Taylor, *Global Spending*, 2010, pp. 1-2.
[161] See Burton-Taylor, *Global spending,* 2008, p. 1.

managed to weather the storm and even expand its business shortly after by drawing on its substantial resources built-up in prior years. Both firms responded along similar lines. They diversified among new market segments within the financial industry and adjunct industries, and geographically especially towards Asia. The analysis of the GFC showed again the necessity to understand the respective competitive environment on the supply side of the financial information market. Only this understanding enables a comprehensive assessment of the impact of a financial crisis on information suppliers and to put the actions of these firms into their appropriate context.

5. Chapter Conclusion – The market for financial information in financial and banking crises

Influenced by the rapid transformation taking place on the supply side of the market for financial information led initially by Reuters, in 1977 *The Economist* reported on the introduction and subsequent expansion of the Reuters MMR and its predecessors:

> "This investment has brought changes over the past 10 years more dramatic than those over the previous 100. By 1990, the Reuters headquarters at 85 Fleet Street could look more like the Houston space centre than a newsroom".[162]

Although this prediction might have exaggerated the target picture of future information suppliers, it nevertheless emphasizes the perception of the fundamental change and success that the introduction and expansion of the MMR proved to be for the financial information market and Reuters as a company. It also highlights the fundamental changes in the 'market for financial information' in the period from the early 1970s to 2008. Technological innovations and services such as retrievable information, direct distribution, 'contributed data', and the supply of information processing capabilities fundamentally transformed the way how financial institutions and their information suppliers operated and interacted. As emphasized throughout this chapter, information suppliers continuously tried to integrate more private elements into the public information they were supplying especially in the non-exchanged traded, proprietary information segment of this market for example in FX for Reuters in the 70s and 80s, or fixed income for

[162] The Economist, '*Business Brief - The news from Reuters*', unknown author, 29.10.77.

Bloomberg in the 80s and 90s. Yet, this could only ever be temporary and not fully privatized, as access to their systems was not discriminatory and, as emphasized by Arrow, the private character of information products is difficult to maintain considering the many possibilities how this information can become public (Arrow 1984). Yet, proprietary information as a strategic focus for the two dominating firms at least enabled a higher pricing power and a certain level of differentiation towards institutional investors in asset markets that relied on timely, aggregated, and pre-processed information such as FX, fixed income, or other OTC markets. At the same time, a further differentiating strategy regarding the soft information provided through their journalist networks was another crucial element for Reuters and Bloomberg – especially considering that the two firms that came to dominate this market either evolved out of this segment (Reuters) or deliberately chose to invest in building up significant resources in this area later on (Bloomberg).

This chapter has focused on the supply and demand for the three fundamental segments of the information market along the lines of information acquisition, processing, and decision-making over time and within specific crisis periods. The supply side of this market was fundamentally transformed, highlighted along the lines of market fragmentation, consolidation, and the emerging Reuters and Bloomberg duopoly, and the different impact of the financial crises and crashes of 1973/74, 1987, 1999/00, and 2007/08 within the respective competitive environment among information suppliers.

The introduction of Reuters Monitor system proved to be a technological revolution for the way financial institutions acquired and processed financial data and information, but even more on how they interacted with each other and information suppliers as a whole. By including and combining concepts such as direct supply, retrievable information, and 'contributed data', the MMR terminals set a technological standard that would gradually replace incumbent technologies and processes of information supply. Although the system first set out to transform FX markets and subsequently the markets for almost every major asset class and journalistic news supply, its introduction in 1973/74 turned out to be more difficult than expected. It was heavily challenged by

the turmoil in foreign exchange markets after the outbreak of the Arab-Israeli war in October 1973. Insufficient numbers of contributors to the system (lacking critical mass and thus network effects) and traders not prioritising its use in the crisis (not yet being familiar with the newly introduced system) almost led to the failure of the MMR.

The 1987 stock market crash occurred not only in a different segment of financial markets, but even more importantly in a profoundly different competitive environment among information suppliers than the 1973 crisis. While in 1973/74 information suppliers were fragmented along geographical and asset class monopolies focusing primarily on the supply of 'basic' price information, the market for financial information became more concentrated and competitive. Information suppliers competed increasingly on 'basic' price information and differentiated themselves through 'proprietary' price information and information processing capabilities. Both the stock market crash of 1987 and the burst of the Dotcom bubble of 1999/2000 thus worked as 'catalysts' for trends already en route on the supply side of the financial information market, albeit to varying degrees. The 1987 crash left Reuters as the leading company at the time largely unscathed despite considerable external and internal uncertainty and ignorance regarding information suppliers' interrelation with the wider financial industry.

The burst of the dotcom bubble and its aftermath further laid bare the dynamics on the supply side of the market for financial information. The accelerated rise of Bloomberg over the 1990s happened in a market in which 'basic' price information became increasingly commodified through low-cost internet suppliers. The Dotcom crash led to a significant re-assessment by financial firms on the demand side of the financial information market, driven by cost-cutting needs and the availability of substitutable products for 'basic' information. 'Proprietary' price information and an upward integration in the information value chain towards information processing became essential competitive advantages, which together with the one-product and 'environment' strategy were at the core of Bloomberg's success. Reuters fundamental operational flaws in this period, such as its legacy technologies as first mover in the market, its overextended and confusing product

portfolio, and its old-fashioned managerial and organisational structure, led to a slow adaptation to this new competitive landscape. It almost ended fatal for the former hegemon, ultimately leading into a merger with Thomson Corporation to regain competitiveness against Bloomberg. This cemented Reuters and Bloomberg's duopoly at the top of the market.

Finally, the GFC saw once more a profoundly changed competitive environment. Reuters reforms, restructuring, and ultimately merger with Thomson Corporation gave Thomson Reuters an essential boost in scale just when financial markets and the market for financial information faced the worst downturn in living memory. Yet despite an initial downturn and increased competition among more substitutable and commodified segments (basic price information), the two leading suppliers Bloomberg and Thomson Reuters fared better than expected by most industry experts. Both firms focused their response on geographical diversification and the further development of information processing capabilities to fight off the competition from the lower end of the market. But competition between the two information suppliers also intensified in previously proprietary price information segments such as FX and fixed-income, with the two firms respectively moving into each-others' former domains.

Information suppliers in financial markets, as in every other competitive market, depend fundamentally on demand for their products. They want to gain an advantage over their competition by supplying either information their competitors cannot easily replicate (for example, Reuters MMR in FX markets) or proprietorial information processing capabilities (for example Bloomberg's stripped yield calculator). Other differentiating factors such as leveraging new technologies for faster or cheaper dissemination of information (for example the new low-cost suppliers of 'basic' price information through the internet) are further possibilities, yet they usually entail more competition and thus lower pricing power. At the same time, suppliers rely on their customers' ability to afford their services. Managerial structures of financial institutions can lead firms on the demand side to narrowly focus on information suppliers as another option for cost-cutting in market downturns, especially if substitutable products are available. When the financial

industry is thriving and operating costs are not under strain, suppliers of financial information can expand their business with the expanding market on aggregate. If they have a competitive advantage over their competitors, they might even gain additional business. Paradoxically, when reliable and timely information is of essence during periods of higher volatility and thus increased potential for gains and losses, cost-cutting and re-evaluation of business operations can lead to actors in financial markets changing their model for information acquisition by dropping or changing their supplier.

However, the effect of network externalities is another important aspect in this regard. With Reuters introduction of 'contributed data' and a quasi-monopolistic structure in FX markets, as well as for Bloomberg's 'walled-garden' approach appealing also to the social network of trading, these effects can have a significant impact on decisions for one supplier over another. Thus, the continuous upward integration by information suppliers to focus not only on the provision of price quotations and data, but rather on 'proprietary' information (such as Reuters in FX and Bloomberg in fixed-income) or information processing capabilities (such as Bloomberg's evolving analytical tools or Reuters 3000Xtra) became a defining feature of this market over its development from 1973 to 2008.

Chapter 4 – Central banks' information strategy in financial and banking crises

The previous chapter explored information suppliers in the market for financial information, and highlighted, among other features, the continuum of public and private information, as well as soft and hard information characteristics in the products and services they provide to financial and banking markets. As shown in this chapter, central banks information intake and diffusion to financial and banking markets also relies on the full spectrum of these information types. Yet, there are distinct patterns evolving throughout the analysis of two key central banks and crises they are facing, as for example soft information plays a central role in their crisis response towards information gathering, while the publicizing of information about support operations is a recurring feature in their decision-making procedure regarding central bank information diffusion in changing financial and economic environments.

Central banks play a key role in the resolution of modern financial and banking crises, fulfilling their financial stability mandate through monetary policy intervention and as lender-of-last-resort. The changing supervisory structure, internal organisation, and interaction of central banks with their outside stakeholders since the latter half of the 20th century has been acknowledged widely in the historical and economic literature (see e.g., Capie 2010, Goodhart 2011, Kynaston 2015, James 2020), but also from policymakers and central bankers themselves (see e.g., Bernanke 2015, King 2016). In relation to information from an active perspective as described in the theoretical framework in chapter 2, two key aspects stand out, what this chapter calls central banks' information strategy: adaptations and persistence in information gathering and internal diffusion by central banks, and the changing role of broadcasting information to markets (and other external stakeholders) during financial crises.

Both the gathering and broadcasting sides of this information strategy represent core elements of central banks' reactions to financial and banking crises. A large body of literature has engaged with aspects such as central bank forward guidance, inflation-targeting and transparency (see e.g., Woodford 2013, Stenfors 2014, Cole 2021, Abreu and Lopes 2022), and in particular crisis

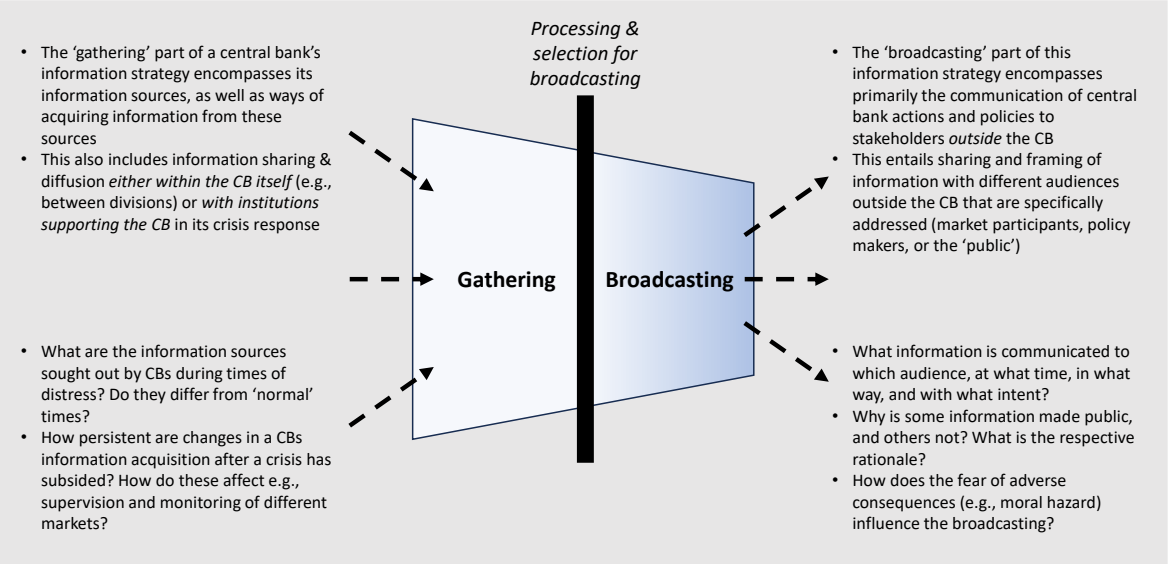
communication by central banks. This last aspect is often framed both as a fundamental aspect of crisis response, and as significantly different from communication during 'normal' times with increased attention by external stakeholders to both policy decisions and the framing of communication (see e.g., Cieslak and Schrimpf 2018, Contavarria Checkley and Piris 2020, Unsal and Garbers 2020). However, despite the increased interest in this area, a comprehensive and comparative historical analysis of central banks' information strategy, including both the gathering and broadcasting of information during financial crises, is yet outstanding.

Regarding the gathering and internal diffusion of information by central banks and their change or persistence during times of distress, a comprehensive analysis must look in detail at the information sources and channels used by central banks to support their decision-making under increased volatility and uncertainty. This also entails information sharing and internal diffusion among other regulators and institutions involved in the crisis response. In the most fundamental way, the challenges for information broadcasting by central banks during times of crises can be summarized as: (I) how to react to market distress, (II) how to broadcast these reactions, and (III) how markets will perceive these reactions and their broadcasting. All three of these elements influence each other, as for example central banks or regulators might not be able to employ a certain action based on the expected market perception of these actions or need to provide special conditions for their assistance. One widely discussed example of this can be found in the debates about 'central bank stigma', when the fear of appearing weak by drawing on central bank lending facilities prevents banks from accessing these sources of liquidity in a crisis and seeking out other, more costly alternative funding sources (Bernanke 2015, Anbil 2018, Ennis 2019). Empirical evidence such as provided by Armantier *et al.*, suggests this effect might result in a premium of 44 basis points (or 126 basis points at the height of the crisis after the collapse of Lehman Brothers on September 15, 2008) that banks were willing to pay to remain unidentified during the GFC, so the effect was very much economically perceptible (Armantier, Ghysels et al. 2015). As a direct consequence, many of the new lending facilities employed by the Federal Reserve during the GFC

were designed to be drawn upon anonymously, which was at the forefront of many discussions in the FOMC as this section shows.

Several questions arise in the context of this central bank information strategy, and its potential changes or persistence during times of increased uncertainty: How do central banks adapt their informational acquisition during times of distress, from information sources, to processing, and organisational structures? What information do they broadcast to different stakeholders (policymakers, financial and banking markets, the wider public), in what way, and why? Can we observe changes to these developments during different stages of the crisis for central banks and, if so, why? In this context it is important to keep in mind that central banks are public institutions, which are sometimes state-owned, but have become increasingly independent over the last 30 years. Thus, they rely on close relations with their constituency in financial markets to fulfil their supervisory function, as well as the financial stability mandate and to conduct effective monetary policy. For example, the flow of market sensitive information from their constituents requires a significant level of trust in confidentiality and close relations between central banks and their constituency (see e.g., Capie 2010, James 2020). This naturally frames both sides of their information strategy in normal times, and during crises. The stylized Figure 33 below gives an overview of this analytical framework with the core themes and questions for the study of central banks' information strategy.

Figure 33: Information strategy of central banks during times of distress.



This chapter focuses on these questions within the context of the Secondary Banking crisis in the UK in late 1973/74, as well as the GFC of 2007/08, in particular on the actions and deliberations of the BoE and the Fed, leveraging a large corpus of archival primary sources to provide new avenues for answering them. It uses novel evidence from the archive of the Bank of England (BoE), the UK Treasury, the archives of the BBA, the FOMC, and the FCIC, as well as reassessing existing work and sources based on the aspect of central bank information strategy. Combining further evidence from public inquiries, court cases, newspapers, and institutions such as the Committee of London Clearing Banks (CLCB), as well as autobiographical accounts of central bankers and policymakers, this chapter shows that there are indeed profound organisational and structural changes to central banks' information strategy in the context of the BoE during the height of the Secondary Banking crisis, as well as for the Fed during the GFC. By limiting the analysis to the 1973/74 and 2007/08 crises, this opens up the space for more detailed analysis and engagement with the debates and key decisions, changes, and persistence regarding the two sides of central banks' information strategy. Furthermore, both crises are defined by large central bank support programmes for banking institutions (rather than calming stock markets in the wake of the 1987 and 1999/2000 crashes) amidst economic and financial turmoil, thus making them ideal

comparative case studies that emphasize many of the key themes of this chapter over time. It is important to keep in mind that the BoE and the Fed operate and have operated in distinctive (and dynamic) institutional and organisational frameworks, with the Fed for example being embedded in the structure of the Federal Reserve system and subject to scrutiny by Congress, while the BoE's institutional and organisational framework is comparatively more unitary (Lepper and Sterne 2002, Hasan and Mester 2008, Lewkowicz, Woźniak et al. 2021). However, in the realm of their information strategy, both central banks are largely independent and have been so despite changes to their organisational and institutional frameworks in the latter half of the 20th century. For example, as shown in section 2, the BoE under George Blunden and Jasper Hollom, even though formally not independent, operated with de facto independence during the secondary banking crisis, and kept information flow to the Treasury to a minimum (see section 2).

Each individual source and category of sources has their limitations. For example, memoirs and official hearings (such as before the FCIC) are produced with time lags, and rarely portray a completely accurate picture of considerations and actions, since they are at least partially intended to be absolving or to be portrayed in a certain (usually more positive) light. Other sources might already be limited in their scope due to the implication that they will become public (such as the regularly published FOMC meetings). This chapter thus aims to combine a wide variety of source material to prevent an over-reliance on intentionally positive views.

There are several overarching themes and questions addressed in the different historical and economic circumstances of these crises: the debates within the different case studies show that central banks are continuously concerned not only with the question of what kind of interventions are appropriate as a crisis response, and what their magnitude should be in order to stabilise the financial and/or banking system, but that the *perception* by the financial industry of these interventions and support actions is a central point for the design and broadcasting of interventions. The decision by central banks about what to communicate publicly and to whom is a key element in their strategic response, emphasizing the complex interplay in the spectrum

between financial stability and public transparency during distress in financial markets from the perspective of central banks. These considerations are highly dependent on the respective 'information environment' during a crisis (Gorton 2015), showing a repeated re-evaluation by central banks regarding openness and opaqueness based on the changing crisis circumstances. Concerns about moral hazard and central bank stigma repeatedly resurface as examples of this complex interplay.

At the same time, central banks' information gathering experienced both organisational and regulatory changes during these crises (as is shown at the example of the Discount Office of the BoE and its provision of market intelligence during the fringe banking crisis in the UK), which culminated in adapted supervisory procedures and regulation based on these changes. The question of what kind of information (hard v. soft, public v. private etc.) central banks seek out during these crises and how this might change with their experience of the events themselves is another critical point of the analysis in this chapter, and archival evidence both during the fringe banking crisis in the UK and the Fed's reaction to the global financial crisis suggests the importance these institutions not only place on hard quantifiable evidence in crises, but also on more soft information on troubled institutions and the market in general, such as managerial competence and personal communication in order to build confidence.

1. Situating central banks' information strategy during financial and banking crises

As shown in Figure 33, there are two fundamental parts through which one can conceptualise central banks' information strategy during financial and banking crises, namely the information gathering and broadcasting aspects, respectively focused on information acquisition and (internal-) diffusion, and the communication and (external-) diffusion of information about support policies and emergency interventions. Policymakers and central bankers in recent years have repeatedly emphasized the importance of the broadcasting side, with a 2018 speech by former president of the German Bundesbank Jens Weidmann aptly titled 'Central bank

communication as an instrument of monetary policy'.[163] Recent historical and economic research in these areas of central banks' policies and crisis response has engaged with several aspects of these two sides, such as central banks' changing approach towards transparency and open communication of their decision-making and rationale (Capie 2010, James 2020). However, they are rarely analysed specifically together, nor in a structured comparison regarding central banks' information strategy between different modern crises.

Historical accounts of central banks and supervisory institutions have recently focused not only on matters such as organisational and personal changes, or developments in central bank policy formulation and implementation over time in their respective economic, political, and financial environment, but also increasingly on aspects relating to central banks' broadcasting, their changing interaction with market participants and lately also the wider public, as well as their system of information sharing and diffusion (see e.g., Aliber and Zoega 2019, Gorton and Tallman 2019, Conti-Brown and Vanatta 2021). Harold James, in his history of the BoE between the late 1970s up to 2000, stated clearly:

> "Accounts of how central bank independence affected market decisions rested crucially on how market participants reacted to their perceptions of central bank actions. In consequence, central banks needed to change the way they dealt with their audiences" (James 2020).

This historiographical development paying attention to these aspects of central banks' information strategies went along with fundamental changes to central banks' communication strategy between the later part of the second half of the 20th century and the early 21st century, with increasing efforts to communicate monetary policy decisions and the rationale for their actions more openly towards institutions in financial and banking markets, as well as towards the wider public:

> "At the outset, the Bank – and central banks in general – were secretive and functioned behind multiple veils: of language, of statistics, even of location (…)

[163] Jens Weidmann, '*Central bank communication as an instrument of monetary policy*', speech at the Centre for European Economic Research, Mannheim, 02.05.18; available online: *https://www.bis.org/review/r180511a.pdf*.

> communication in particular became the central concern of the new philosophy of central banking" (James 2020).

In their biographical accounts and public statements, policymakers and central bankers concurred with the analysis of these trends, as Mervyn King summarizes:

> "Plain speaking is now very much the order of the day, with central bank governors giving press conferences, testifying regularly before Congress or Parliament, and appearing on television (…) in the build-up to the crisis that started in 2007, central banks had come out of the shadows into the sunlight. They were embarking on a journey from mystery and mystique to transparency and openness" (King 2016).

However, policymakers in their own accounts often focus on the critical times of their respective tenure, and assert even more importance of these changes in broadcasting during crisis periods in financial and banking markets. Bernanke, Geithner *et al.* emphasized their thoughts after receiving public and political backlash in the wake of the rescue of Bear Stearns in March 2008: "We were realizing that we faced a dual challenge: figuring out the right thing to do, and explaining why it was the right thing to do" (Bernanke, Geithner et al. 2019). However, despite observable efforts by central banks towards more transparency and clearly formulated communication strategies to institutional and individual investors, the picture is less clear for central banks' crisis communication strategy, especially when the public communication of support for individual institutions through standing facilities or newly established programs might be detrimental to their intended purpose of stabilising the institutions in trouble (as for example in the case of central bank stigma).

Besides the discussed extensive literature on forward guidance and general central bank communication, economic research has primarily engaged with information broadcasting of central banks during periods of crises regarding the concept of central bank stigma. Recent papers addressed the topic mainly from either an empirical or theoretical angle. The highlighted empirical work by Armantier *et al.* on this matter, using data on the Fed's TAF program as a direct comparison to the central bank's discount window (Armantier, Ghysels et al. 2015), was preceded by Furfine's work on the Fed's decision to change the discount window into a standing facility in 2003, which

found strong evidence for the existence of discount window stigma after the policy change (Furfine 2003). Although the reliability of Furfine's data and identification strategy for interbank loans were questioned by subsequent studies (Armantier and Copeland 2015), the general findings regarding discount window stigma were confirmed by Armantier *et al.* (Armantier, Ghysels et al. 2015).

These findings have been further confirmed by empirical work on other historical crises, with studies focusing especially on the Great Depression and the Reconstruction Finance Corporation (RFC), which was established in early 1932 as a government-sponsored "rescue program to reduce the incidence of bank failures" in the US (Vossmeyer 2019). The program provided liquidity to troubled banks initially on an anonymous basis, yet the House of Representatives mandated the public release of the names of supported institutions and the amounts lent in July 1932. This revelation of borrower information undermined the initially positive impact of the RFC based on the negative market perception of borrowing institutions (Butkiewicz 1995, Calomiris, Mason et al. 2012, Anbil 2018, Vossmeyer 2019).

On the theoretical side of economic research into central bank stigma, several models are employed to explore the nature of this phenomenon: La'O investigates stigma in the context of predatory trading, showing the positive effect of a publicly non-disclosed auction facility such as the TAF during times of financial distress in providing anonymous liquidity to troubled institutions, while emphasizing that this effect might be detrimental and lead to 'cream-skimming' during normal times (La'O 2014). Philippon and Skreta develop a model of optimal government intervention in financial markets affected by adverse selection during times of distress (Philippon and Skreta 2012), which is expanded on by Ennis, who adopts the model to investigate 'on-equilibrium' outcomes of the model regarding discount window stigma, showing that under the equilibrium assumptions "borrowing from the discount window can be considered a signal of poor financial conditions" (Ennis 2019), thus theoretically affirming the findings of the empirical studies.

In summary, the work both from historical and economic research, as well as personal accounts by policymakers within central banks' crisis response, suggests that central banks face a

strategic choice when it comes to their crisis response regarding both the gathering and broadcasting side of their information strategy. Looking at broadcasting, central banks are trying to restore confidence in the marketplace during a crisis, both through their LOLR-role and in some instances through the coordination and participation in rescue operations for individual firms that appear too-big-to-fail, while being aware of potential 'moral hazard' implications such actions might foster. This results in continuous deliberations about what can and should be communicated to participants in financial markets (and other audiences such as the public at large or legislators), as especially individual support operations can have - analogous to central bank stigma - detrimental consequences for market confidence not only in the assisted institution, but the wider market. One prominent example that is discussed in detail in this chapter is the dichotomy regarding the Fed's emphasis on anonymity in its new lending programs such as TAF or PDCF on the one hand in 2008, while specifically advocating for increased transparency with the Supervisory Capital Assessment Program (SCAP, commonly referred to as 'stress tests') and deliberately publicising information on banks' capital to ease uncertainty in financial markets (see e.g., Morgan, Peristiani et al. 2010, Gorton 2015). These deliberations, over time increasingly situated also in the spectrum of conflicting central bank objectives between financial stability and public accountability and transparency, represent a focal point of this analysis and are shown to be prevalent both in the crisis of 1973/74 and the GFC in 2007/08.

Regarding the information gathering side of central banks' information strategy, a further strategic choice is prevalent during periods of increased uncertainty and volatility in financial and banking markets. Central banks are tasked to respond to pressures on the financial system, yet the magnitude and extent of their response must be appropriate to the challenges faced by financial markets – and correctly identifying what appropriate policies would be, becomes harder as events unfold on a short timescale. Adequate information on the financial sectors' health, the resilience and short-term outlook of individual institutions can be difficult to come by using traditional methods of monitoring and prudential supervision frameworks – and changes to these strategies

and processes during crises might be expected. Yet, just what kind of information is sought out and relied-upon by central bankers in their decision-making under these circumstances, as well as the persistence of these changes, for example through their permanent inclusion into revised monitoring and supervisory frameworks, represent a further focus point for the analysis in this chapter, and the importance of these questions and their answer are key points of the BoE's reaction to the 1973/74 fringe banking crisis and the Fed's response to the GFC in 2007/08.

2. Central banks and information during the financial and banking crises of 1973/74

As seen in chapter 3, the early 1970s in international finance were characterized by several financial crises and banking failures which resulted out of the changed international financial landscape after the end of the Bretton Woods fixed exchange rate system, the oil price shock of late 1973 and early 1974 with an overall quadrupling in the price of oil, and specific national characteristics such as outstanding inflationary and economically stagnating tendencies, or regulatory changes such as the introduction of competition and credit control (CCC) in the UK (Capie 2010, Kynaston 2015, Needham 2015). As summarized by Busch and Busch, "at the beginning of the 1970s, major shifts took place in the global financial system as a result of increasing internationalization and decentralization. Yet along with these general challenges, many countries had to deal with problems that had more to do with their own specific development" (Busch and Busch 2008).

The Secondary Banking crisis provides a useful example to investigate potential changes and persistence in central banks' information strategy: the crisis was the first significant and systemic disruption of the London banking market after a prolonged period of stability, and until the Global Financial Crisis (GFC) would remain the pre-eminent modern example of BoE intervention and action to stabilise the financial and banking system (Capie 2010). In the end, the crisis would shape the BoE's path towards the Banking Act of 1979 that put the Bank's supervisory function on a statutory basis (Reid 1982, Schenk 2014). As is discussed in detail in this section, the

crisis resulted essentially out of a mixture of weak regulation and imprudent lending in the "fringe" banking sector outside of the BoE's oversight, in which newly formed deposit-taking institutions were borrowing in the wholesale money market (short-term) and to finance loans in the property sector (long-term) (Moran 1984, Capie 2010). When the economic environment deteriorated in late 1973, this led essentially first to a liquidity crisis, as secondary (fringe) banks could no longer roll-over their short-term borrowing, but when property prices started to decline it became even more a matter of solvency for many of these institutions (Reid 1982).

In late 1973, the fringe banking crisis put further pressure on the UK's financial and banking sector already struggling with the effects of the oil price shock, stagnating economic growth and increasing inflationary pressure (Capie 2010). The BoE set out to establish what would become known as the 'Lifeboat' operation, a joint committee between the BoE and the London and Scottish clearing banks to deal with troubled fringe banks by providing liquidity and finding viable solutions for these institutions in order to avoid a spillover into the banking sector proper. As it turned out, both the gathering and broadcasting elements of the BoE's and the newly established controlling committee's information strategy would be a defining (and contentious) feature right from the beginning. The following quotation from a private discussion in late December 1973 between Gordon Richardson (newly appointed Governor of the BoE in June 1973) and the chairmen of the clearing banks emphasizes that the information broadcasting of the scheme was in fact contested fright from the beginning:

> "The Governor said that he had not felt that details of the provision of funds for the rescue operation was a matter which need be disclosed but the chairmen emphasized that they felt it would be very difficult for them not to make some general statement if challenged. In addition, financial journalists were likely to ask penetrating questions about the details (…) It was then agreed that no further statement would be made to the press about the rescue operations at this stage but that the Governor understood the situation of bank chairmen"[164]

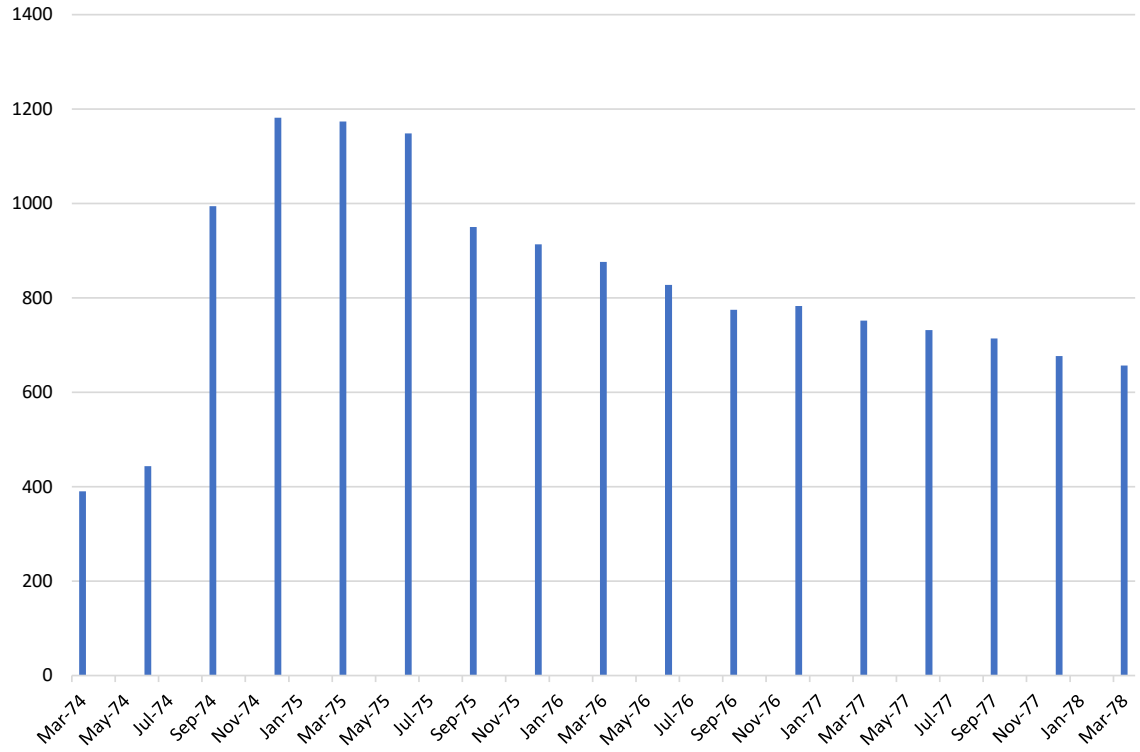
[164] Informal note of a meeting held at the Bank of England between the chairmen and CEOs of the London and Scottish Clearing Banks and the Governors, 27.12.73, G1/542, Archive of the Bank of England, London.

The next subsection explores the different priorities, incentives, and discussions on this aspect of the BoE's and the Lifeboat's information broadcasting in detail.

As can be seen in Figure 34, the Lifeboat's support funds rose to a total of £400 million between its inception in December 1973 to June 1974, before jumping to the in August 1974 agreed upon limit of the joint operation of £1,200 million (which at the time amounted to about 40% 'of the estimated aggregate total of the capital and reserves of the clearing banks') at the end of 1974,[165] before slowly declining over the subsequent years when either solutions such as takeovers or mergers were agreed for rescued institutions, or they went into receivership.

[165] Evidence submitted by the Bank of England to the Committee to Review the Functioning of Financial Institutions, '*The Secondary banking crisis and the bank of England's support operations*', April 1978, 1A179/22, Archive of the Bank of England, London.

Figure 34: Lifeboat funds outstanding in million GBP, 03/1974 – 03/1978.



Source: Confidential treasury minute, K J Jordan to Mr Bridgeman, 'Progress on the Lifeboat', T233/2842, Treasury, National Archives Kew, London.

For Governor Richardson, as his oral evidence submitted to the Wilson Committee in late 1977 suggests, the market perception of troubled institutions and potential rescue measures by the BoE were critical, as "very often, when companies get into difficulties they are frequently not apt to tell people about it, because as soon as you start saying you are in difficulties your difficulties immediately get worse".[166] In accordance with the literature on central bank stigma, this section shows that the BoE opted for a course of 'deliberate opaqueness' about its individual support for troubled institutions, revealing little detail about the functioning of the operation and support for individual troubled institutions out of fear of adverse effects, while communicating the existence of the rescue operation in general to calm markets at the height of the crisis.

[166] Committee to Review the Functioning of financial institutions: Note of a meeting held at the Guildhall, oral evidence submitted by the Bank of England, 06.12.77, 1A179/14, Archive of the Bank of England, London.

At the same time, another defining feature of the crisis management for the BoE and the clearing banks regarding their information strategy was the question of acquisition and internal distribution of reliable information on the current situation of fringe banks that might need support, as these banks had developed largely outside the traditional banking system in the UK and thus outside the control of the BoE. Gathering and sharing information on the individual support cases with the BoE and other clearing banks, while at the same time limiting information flow to interested government institutions such as the Treasury or the Department of Trade, was a pressing issue right from the beginning. One way the BoE, in cooperation with the Lifeboat members, addressed the issue of gathering reliable information quickly under crisis circumstances was through a newly established network of bankers reporting on the state of individual fringe banks back to the Discount Office from December 1973 onwards, which would oversee these efforts:

> "Mr. Faulkner [chairman of Lloyds and CLCB] said that they had agreed that each of the clearing banks would appoint a named person to provide information on the state of fringe banks known to them. It was agreed that the information centre should be in the Discount Office".[167]

Both the considerations regarding the public vs. private nature of the support operation and the related broadcasting strategy by the BoE, as well as the process of information acquisition and distribution among members of the support group for the fringe banks were central elements to understand the BoE's actions during the fringe banking crisis and are explored in detail in this section. This section argues that the BoE was from the very beginning of the secondary banking crisis concerned with information broadcasting as an essential part of its crisis response and its information strategy, through which the Bank tried to tread the narrow path between reassuring markets that help for troubled institutions would be secure, and not exposing the names of individual institutions that sought the support of the Lifeboat or details about the support. Furthermore, the secondary banking crisis fundamentally changed the BoE's approach to

[167] Record of a meeting between the Governors and the Chairmen and C.E.O.s of the Clearing Banks, 14.12.73, G1/542, Archive of the Bank of England, London.

information acquisition, not only regarding fringe banks but also in the banking sector proper, which was expressed through significant procedural and organisational changes and adaptation within the BoE.

Yet, the fringe banking crisis represents a UK focused event – international banking markets were largely spared from the turmoil caused in Britain by the secondary banking sector. Other crises in the course of 1974 would put information sharing and the information broadcasting among central banks on the international level into plain sight, such as the rogue trading scandal in Lloyd Bank's Lugano office (Schenk 2017), the collapse of Franklin National Bank in the US (Spero 1980), and the failure of Bankhaus Herstatt in Germany in June 1974 (Mourlon-Druol 2015). The Herstatt failure saw on the national level the establishment of the Liquiditäts-Konsortialbank GmbH ('LiKo bank') in Germany, a quasi-permanent Lifeboat providing if needed liquidity to financial institutions through joint funding by the Bundesbank, commercial and savings banks, and credit cooperatives (Roth 1994). The implications of the secondary banking crisis and the BoE's information strategy within the context of the international aspects of these crises during 1974, as well as the consequences for its supervising and monitoring approach are discussed at the end of this section.

The BoE during the secondary banking crisis – the Lifeboat's information strategy

There are several extensive journalistic and historical accounts published in the two decades following the secondary banking crisis, chronicling the support operation launched by the BoE in conjunction with the London and Scottish Clearing banks in December 1973 that came to be dubbed the 'Lifeboat' (Reid 1982, Moran 1984, Gordon 1993). Yet, due to the unavailability of declassified sources by the BoE (until Forest Capie's investigation, see Capie 2010) and especially the UK Treasury at the time of their writing, the role of two defining features for the operation are only occasionally engaged with and not addressed to the full extent regarding their significance for the decision-making taking place especially in the early stage of the support operation at the height of market tensions: the broadcasting towards the market and wider public, and the role of

information acquisition and distribution among the members of the operation and other relevant governmental institutions such as the Treasury.

Margaret Reid, during the crisis in late 1973 and 1974 the foremost journalist covering the events in the secondary banking market, had close relationships with the senior management of the BoE. Several years later she wrote the most comprehensive account of the crisis, noting that: "In view of the limited published information about my subject, I have had to rely a great deal on discussion with many of the people who had knowledge of it from various viewpoints" (Reid 1982). In fact, exploring the internal sources by the members of the support operation that were declassified years later and combining them with the existing accounts and public information available from official statements, speeches and newspaper enquiries, emphasizes the central element information gathering and broadcasting played for the BoE right from the very beginning of the crisis when troubles at the fringe bank London & County Securities (L&C) became publicly known in late November 1973. This section focuses on what the BoE during the Wilson committee review in 1978 termed the first of three "distinct stages of development" of the secondary banking crisis from November 1973 to the end of March 1974. This phase represented the publicly most critical part of the secondary banking crisis. There was deeply felt uncertainty in banking markets and large withdrawals of deposits and liquidity from the fringe banking sector. This first stage already saw the extension of Lifeboat liquidity support to 21 institutions "representing four-fifths of the total number of companies eventually approved for support". This stage can thus be seen also as the most critical in terms of information gathering and broadcasting by the BoE towards these institutions and the wider banking market.[168]

On December 1, 1973, the *Financial Times* ran the headline "Institutions seeking ways to rescue London and County" on its cover page describing the loss of confidence by depositors in the fringe institution, which had been building up over the institutions dealings in the property market

[168] Evidence submitted by the Bank of England to the Committee to Review the Functioning of Financial Institutions (Wilson Committee), '*The Secondary banking crisis and the Bank of England's support operations*', April 1978, 1A179/18, Archive of the Bank of England, London.

and was pushed over the edge by the resignation of Donald Bardsley on November 22, a "respected City figure" who had joined L&C only a few months earlier.[169] With the disclosure of the departure of Mr. Bardsley four days later, speculation and rumours about L&C's business position and management spread rapidly in the already tense economic climate, leading to a drain on its liquidity as deposits were withdrawn and its share price plunged by more than half in just four days and was subsequently suspended (Moran 1984). The Bank of England and Deputy Governor Jasper Hollom moved swiftly and yet secretly to orchestrate a rescue for L&C, so the loss of confidence in one secondary banking institution and the flight of deposits would not spread throughout the whole secondary system and reach the banking system proper. Together with L&C's largest institutional shareholders as well as National Westminster (the company's primary bank) and Keyser Ullman (the company's merchant bank), the BoE organised an injection of capital by the shareholders to secure L&C's ~£80m in deposits, and ultimately prepare for a take-over by First National Finance Corporation, the largest of the fringe bank institutions, that was announced another four days after suspension of L&C's shares on November 29 (Reid 1982).[170]

The BoE had previously distanced itself from responsibility of oversight over the secondary banking market, since these institutions had not obtained 'proper' section 127 banking charters but section 123 certificates issued by the Department of Trade – a decisive point, as the BoE would highlight the supervisory grey area between itself and the DoT before the Wilson Committee in 1978 as a reason why it didn't have appropriate information on the secondary banks at the beginning of the crisis.[171] This regulatory grey area became one of the key focus points for reform after the crisis, which ultimately resulted in a new definition of 'banks' and an extension of the BoE's supervisory function to all such institutions under the Banking Act of 1979 (Capie 2010).

The Bank's senior management dreaded a contagious effect of a collapse in the dire economic environment and tried to ensure that L&C's collapse was avoided while not revealing the

[169] Nicholas Owen, *'Institutions seeking ways to rescue London and County'*, Financial Times, 01.12.73.
[170] See also Owen, *Institutions*, 01.12.73.
[171] Wilson Committee, *Support Operation*, April 1978.

BoE's involvement. No mention of the BoE's role in coordinating the rescue efforts was made in the initial public statements and newspapers covering the rescue, and the bank's efforts in coordinating the rescue was only mentioned on December 6, 1973.[172] Yet, the rescue of L&C did not have the hoped-for effect on calming markets down, but rather triggered a further outflow of deposits from the secondary banking sector, in which many institutions had become vulnerable due to intensive reliance on short-term borrowing and carrying extensive assets tied up in the collapsing property sector, towards the save haven of clearing banks:

> "The destruction of an insignificant fringe bank was the immediate cause of a greater crisis. During the first three weeks of December 1973 nervous depositors withdrew funds from fringe banks into the security of clearing banks" (Moran 1984).

On December 21, another rescue operation made headlines in the financial press after its public reveal the day before, as the secondary bank Cedar Holdings had to be supported in a £80m rescue move from its four major institutional shareholders and Barclays bank: "A major £80m rescue operation was announced yesterday by five City institutions, with Bank of England blessing, for Cedar Holdings, the banking and second mortgage group".[173] Again the Bank of England played a crucial role in coordinating these efforts, although the extent to its involvement had not yet fully transpired, as can be observed in the public coverage of the operation:

> "The aid operation for Cedar announced early yesterday followed prolonged and secret talks (…) It is believed that the Bank of England was close to the discussions, and acted as something of a catalyst in the latest move".[174]

This description of the BoE as acting as a 'catalyst' was, with the benefit of hindsight, not giving appropriate credit to the central role the BoE played in orchestrating this rescue, as it was in fact the BoE that had assembled the board of Cedar Holdings and representatives of major institutional shareholders together to assess the situation and conceive a plan for action in a marathon meeting at the BoE starting Wednesday, December 19 at 9 a.m. and which was only

[172] Michael Blanden, '*When flexibility in the banking system can be a weakness*', Financial Times, 06.12.73.
[173] Margaret Reid, '*Institutions in £80m. rescue move for Cedar Holdings*', Financial Times, 21.12.73.
[174] Ibid.

concluded at 3 a.m. the following morning after an agreement was reached under substantial urging by BoE Governor Gordon Richardson and Deputy Governor Jasper Hollom (Reid 1982, Kynaston 2015).

Evidence from the BoE archive in fact shows that the Bank was already, in the weeks between the rescue for L&C and the much-publicised rescue of Cedar Holdings, in urgent communication with the chairmen of the London clearing banks. But considerations about detrimental market reactions to a public intervention by the BoE in the secondary banking market after the L&C failure prevented the Bank from taking action at first. The record of a meeting between the Governor and the chairmen of the clearing banks from December 13, 1973 emphasizes this aspect:

> "The Governor said that the bank was aware of one, or two, further cases of a fringe bank in difficulties. But if the Bank should require them to undertake various prudential steps at this juncture, it would only precipitate a crisis".[175]

The same argument was made on the following day at another meeting between the clearing banks' chairmen and chief executives by Deputy Governor Jasper Hollom, who cautioned against public announcement of support measures by the BoE, also considering the moral hazard implications such an announcement might entail, as "it was difficult for us to influence their [note: secondary banks] actions without appearing to give guarantees".[176] Yet, the BoE was already concerned about the limited amount of information it had on the secondary banking sector and institutions in trouble, which made potential support measures even harder to assess and implement:

> "The options open to the Bank were made more limited by the very short notice of such cases which we normally received. There was a need for more information on such developments".[177]

[175] Record of a meeting between the Governors and the Chairmen of the Clearing Banks, 13.12.73, G1/542, Archive of the Bank of England, London.
[176] BoE, *Meeting*, 14.12.73, G1/542.
[177] BoE, *Meeting*, 13.12.73, G1/542.

The proposed solution agreed at a meeting the following day was for the clearing banks to "nominate a senior man to report on cases of potential danger".[178] These "senior men" should report to the Discount Office of the BoE, which was "agreed [to be] the information centre" to control the flow of information from the banks to the BoE and between the clearing banks.[179] The BoE thus used the clearing banks' networks to gather information fast, with a focus on soft information. As will be shown in the next section, a similar strategy was employed by leading figures such as Ben Bernanke and Timothy Geithner at the Federal Reserve during the height of the GFC. The advantage of soft information acquisition was that it could be readily and fast produced through private and business networks. The factor time was of the essence for the BoE's senior leadership to better assess the situation. Hard information, which is usually produced with a time-lag, was sought out too (as will be discussed further below at the example of the BoE's overhauled supervisory structure and requirements in June 1974), yet soft information was the first available through the established and trusted networks.

At the same time, there was also discussion about additional measures to acquire more information about fringe banks and their respective commercial situation, such as drawing up a comprehensive list of "all Section 123 banks [secondary banks]" including their liquidity situation and "names of [their] shareholders and depositors", yet these were not agreed on as far as the archival evidence suggests.[180] Although the Lifeboat started out as a way to 're-cycle deposits' and thus providing *liquidity* support for secondary banks, the outspoken goal of the BoE and clearing banks, the strong connection between liquidity and solvency issues, especially during a crisis with limited information and shortened timescales for decision-making based on higher uncertainty, was evident from the start of the operation. Information about problems such as liquidity issues becoming publicised might turn into bigger problems and solvency concerns, as Eric Faulkner

[178] Ibid.
[179] BoE, *Meeting*, 14.12.73, G1/542.
[180] Ibid.

(chairman of Lloyds Bank and chairman of the CLCB at the time) framed it in the meeting on December 13:

> "The subsequent discussion concentrated on two related issues, how to improve the monitoring of the fringe banks, and how to deal with such banks if, and when, they did get into difficulties. On the first issue Mr. Faulkner raised the problem of confidentiality. The problem here was not when their customer was in real difficulties but at an earlier stage when he was worried but not totally illiquid".[181]

Trust among Lifeboat members and discretion of the clearing banks were thus seen as essential elements of the information gathering and internal diffusion from the very beginning of the operation, as is discussed later. The subsequent suspension of trading in Cedar's shares on December 21, coupled with the public announcement of the rescue operation again did not calm markets, and the outflow of deposits from the secondary banking sector continued. This led the BoE to reverse its course of dealing with individual cases one-at-a-time to set up a "machinery" to support troubled institutions in the secondary banking sector: the 'Lifeboat' (Reid 1982). The setup of the "support group", as the 'Lifeboat' committee was formally known, was a marked change from the BoE's previous stance that Gordon Richardson had only reassured at the meeting on December 13:

> "The Bank would want to have a look at each case, but that we would give no promise, no undertaking, about participating in the rescue operation. There was no alternative to looking at each situation independently on a case-by-case basis. This was generally agreed".[182]

However, contrary to prevailing historical accounts written a decade after the events (Reid 1982, Moran 1984), the outline of the Lifeboat's operation was already clearly distinguishable in the meeting at the Bank of England on December 14, *before* the rescue for Cedar Holdings was devised, although not yet formally implemented:

> "On the second question of how to respond to a case of distress Mr. Faulkner said that as any special situation developed the bank principally concerned would act as coordinator (…) The Governor said that it could be the duty of a clearing bank to provide support, even when it would not do so when using

[181] BoE, *Meeting*, 13.12.73, G1/542.
[182] Ibid.

> commercial judgment as ordinarily applied, if there was a possibility of a chain reaction. (…) It was agreed that the final decisions, in individual cases, should be taken by the banks concerned, in consultation with the Bank in the light of recommendations made by a working group of officials from the clearing banks and the Bank".[183]

The setup and organisational framework of the Lifeboat are important aspects to understand the BoE's information strategy in the crisis, for example in its interaction with the clearing banks and Treasury later on. On December 21, the day after the announcement of Cedar's rescue, the Governor and Deputy Governor arranged for another meeting with the chairmen of the London clearing banks to formalise the outlines of the support operation.[184] As the crisis at this point was considered to relate to the drain of liquidity from the secondary banks, the fundamental idea was for a "re-cycling" of deposits, which had been withdrawn from secondary banks and deposited with the clearing banks, on a shared basis by the clearing banks and the Bank of England, which would also commit funds to the operation although at this stage the extent of the BoE's share was not yet determined.[185] Yet, as the crisis continued over the course of 1974 and the property sector declined further, the situation for several companies in the secondary banking sector developed towards fundamental troubles in their business model rather than mere illiquidity (Reid 1982, Moran 1984). However, at the outset of the crisis in December 1973 and during its height of public attention until spring 1974, the focus of the operation remained on assisting illiquid businesses and, where necessary due to solvency concerns, to find suitable companies that could take over troubled institutions in the secondary banking sector. The question of how much the BoE should contribute to the shared support was seen as central by the participating clearing banks, not only from a business perspective, but also for how they could communicate this element to their respective shareholders and the wider public. In the chairman's view, only with a 'sizeable contribution' by the BoE to the scheme could they credibly claim an air of official approval and

[183] BoE, *Meeting*, 14.12.73, G1/542.
[184] Record of a meeting between the Governors and the Chairmen of the Clearing Banks, 21.12.73, G1/542, Archive of the Bank of England, London.
[185] Ibid.

restore confidence. The clearing banks advocated for an increased commitment by the BoE of 10% rather than the initially proposed 7.5% by the BoE so they could reasonably announce "substantial amounts provided by the Bank of England" to the operation if questioned by their shareholders, which was subsequently agreed to by Richardson and Hollom on this basis.[186] Though this seems limited on first sight, it amounted to 120 million pounds (considering the later agreed limit of 1,200 millions for the entire support operation), and was regarded by the clearing bank chairmen as substantial since the BoE (other than the clearers) had no direct connections with most of the fringe institutions targeted.

Thus, the public communication of the setup of the 'Lifeboat', which was carefully worded and agreed upon in the meeting on December 21, was limited in the scope of information to be made public to the market, as the BoE released only a six-sentence statement:

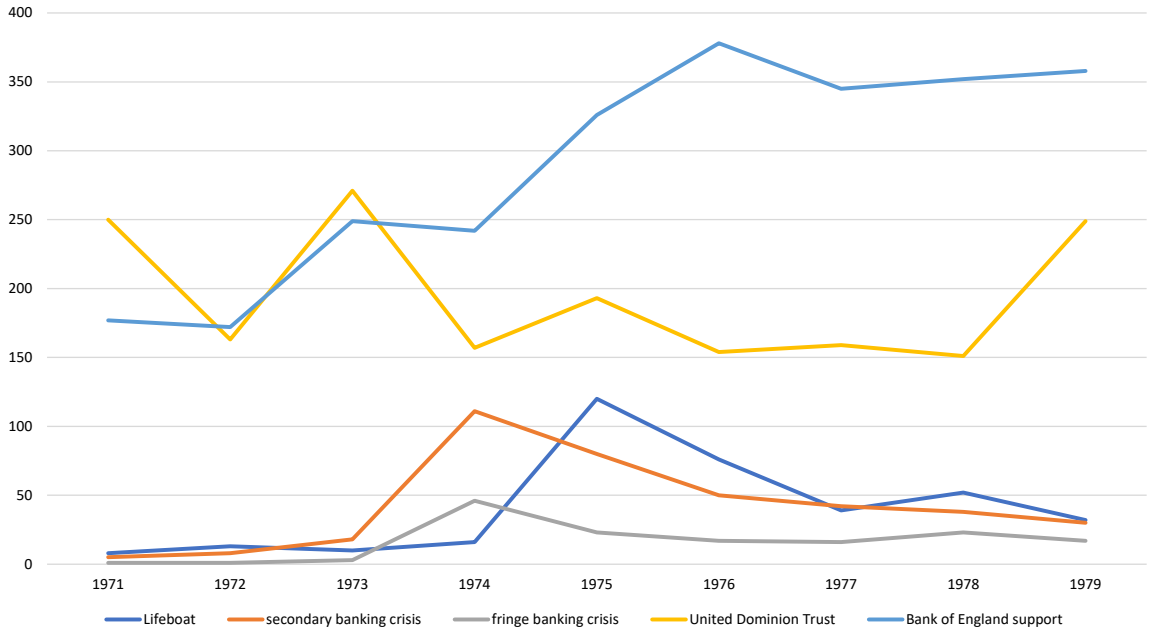
> "In recent weeks a number of so-called 'fringe banks' have experienced a withdrawal of deposits obtained through the money markets. The resulting pressure on their liquidity has been severe and normal standby facilities have had to be used (…) In response to these developments, the Bank of England in cooperation with the London clearing banks established a machinery, whereby such cases could be considered and the situation as a whole left under continuous review. This machinery, which is working well, is being further strengthened and cases where additional support is shown to be necessary and justified, arrangements for reinforcing liquidity of the deposit-taking companies concerned have been and will be made in order to protect depositors".[187]

This limited communication at the beginning of the crisis and up to the end of 1974, focused on providing liquidity to the fringe banking sector to reassure markets, was a deliberate strategic decision by the BoE, and a recurring feature of the crisis based on the respective 'information environment' in which the BoE chose to broadcast its actions. The statement specifically did not mention the names of supported institutions, the amounts lent, under what conditions, or which institutions might qualify for support. Figure 35 shows the frequency of selected terms relating to the fringe banking crisis and the BoE's involvement in the *Financial Times*, the outlet most closely

[186] BoE, *Meeting*, 27.12.73, G1/542.
[187] Note on a 'Statement by the Bank of England' regarding the support operation for secondary banks, 21.12.1973, G1/542, Archive of the Bank of England, London.

reporting on the crisis. As can be seen even by employing this broad measure, references to Bank of England support or more specifically to the Lifeboat only started rising significantly with a lag in late 1974 and 1975 compared to the spike in references of the fringe or secondary banking crisis in 1973/74 (see Figure 35), consistent with the BoE's strategy of deliberate opaqueness and limited public communication on its operation at the beginning of the crisis.

Figure 35: Yearly term frequency in FT articles for selected popular Lifeboat terms, 1971-1979.



Source: FT historical archive, GALE primary sources, frequency for 'Lifeboat', 'secondary banking crisis', 'fringe banking crisis', 'United Dominion Trust', and 'Bank of England support' between 1971 and 1979.

Despite Governor Richardson mentioning the 'well-working machinery' of the Lifeboat, the details of the support group's operation were only finalised in the days following the December 21, 1973 announcement. Under the leadership of Deputy Governor Jasper Hollom and Eric Faulkner, chairman of the CLCB, heads of agreement were agreed upon between the BoE Governors and chairmen of the clearing banks in the first meeting after Christmas on December 27, from which point on the group would start the next day its almost daily meetings for the following months.[188] The negotiated heads of agreement already outlined several important features regarding both

[188] BoE, *Meeting*, 27.12.73, G1/542.

information acquisition and sharing between the BoE and the clearing banks in the "Controlling Committee" set-up to organise the rescue operation. On the one hand, all members of the operation should be kept updated about all cases of trouble in the secondary banking market, even if some of the clearing banks were to provide assistance outside the formalised lifeboat: "All cases of difficulty known to members will be brought to the notice of the Committee, even if group assistance is not being sought".[189] On the other hand, a 'related' bank was installed for each case, typically the clearing bank that was the most involved with the troubled fringe bank; the related bank was then

> "responsible for gathering as much data as possible on the applicant's position to present to the Committee; and unless agreed otherwise in any particular case, will also be responsible for any further investigation thought to be necessary".[190]

This outsourcing of information acquisition about fringe banks in trouble by the BoE was an essential step in the operations of the Lifeboat, since the Discount Office with its staff of only about 14 did not have the capacity to fulfil this task to the necessary degree by itself, as Richardson, Hollom, and Blunden would state during the public inquiry (the 'Wilson Committee') into the secondary banking crisis in 1977/78.[191] The fact that the BoE compensated in the short-term for this lack of operational capability in information gathering through the clearing banks might be expected. Yet, the degree to which the Bank relied upon this arrangement as an interim solution until it would restructure its organisational and operational setup for information gathering in mid-1974 appears remarkable. The BoE used a similar strategy of calling on the clearing banks to provide essential information, as the Bank on January 9, 1974 also requested the clearing banks to provide information on the 'energy crisis' that ensued after the rapid increase in oil prices after October 1973 and its impact on industry through their branch network, and reiterated that claim in

[189] Rescue Operation Heads of Agreement, 27.12.1973, G1/542, Archive of the Bank of England, London.
[190] Ibid.
[191] Evidence submitted by the Bank of England to the Committee to Review the Functioning of Financial Institutions (Wilson Committee) in Connection with stage two of their enquiry, July 1978, 1A179/22, Archive of the Bank of England, London.

subsequent meetings.[192] The BoE's senior leadership had relied on clearing banks for information acquisition on various issues before, having established regular meetings with the clearing banks for this purpose (before 1972 quarterly formal meetings, and afterwards 8 formal meetings and 4 informal lunches per year from the beginning of 1973).[193] But the almost daily Lifeboat meetings and weekly meetings with CEOs and chairmen of the clearing banks at the height of the crisis, and the emphasis on information gathering in these meetings gave this setup a newly intensified character.

In setting up the Lifeboat and establishing the operational outlines, the Bank's senior management acted largely on its own without involvement by the Treasury or the Department of Trade, which had issued the chapter 123 charters for fringe banks in the first place. Especially considering the aspect of information gathering, previous historical accounts have highlighted that "the Treasury was kept informed by the Bank of England, but the dramatic events and the issues involved seem to have made little sharp impact at the highest levels" (Reid 1982), and that "the Treasury was content" with the BoE handling the crisis (Capie 2010). Yet, the internal minutes and notes by the BoE and Treasury paint a different picture regarding information gathering, sharing, and broadcasting, as well as the Treasury's assessment of the crisis. The Treasury was in fact *not* kept informed by the BoE on the setup and operation of the Lifeboat for some time, and from its inception in late 1973 to the end of 1974 the information flow to the Treasury was limited to the minimum, for the BoE to act quickly and independently if needed and to prevent information leaks about the support operation: critical information such as the names of supported institutions, the limit of the Lifeboat's funds, and the exposure of the BoE all remained unknown to the Treasury

[192] Record of the meeting at the Bank of England between the Chairmen of the London Clearing Banks and the Governors, 09.01.74, G1/543, Archive of the Bank of England, London; see also Record of the meeting at the Bank of England between the Chairmen of the London Clearing Banks and the Governors, 14.01.74, G1/543, Archive of the Bank of England, London.

[193] See A. P. Atkins (BoE), '*C.L.C.B. Meetings proposal and schedule*', 21.11.72, G1/543, Archive of the Bank of England, London.

until November 1974.[194] Crucial pieces of information (such as the limit of the Lifeboat's funds) was only revealed to senior Treasury officials through the financial press when they became public knowledge with resurfacing coverage in November and December 1974,[195] from which point onwards complaints about the limited information flow from the BoE were repeated, both within the Treasury and towards the Bank:

> "The Bank have not kept us fully informed on developments. The only information we normally get is as a result of our own enquiries to the Bank. The Bank sent us a written report on the general situation earlier this week but this only came after a formal approach in writing from Mr Airey. We still find it difficult to assess the gravity of the situation".[196]

This limit on information sharing towards the Treasury went so far, that senior Treasury officials had on their own prepared "certain contingency plans for dealing with a deterioration in the situation" in November 1974, a potential government 'bailout', as public speculation about the Lifeboat's limits and the BoE's further willingness and ability to support institutions on top of the limit of the support operation were taken up inside the Treasury.[197] From December 1974 onward, George Blunden (later head of supervision, executive director and deputy governor of the BoE, as well as first chairman of the Basel Committee on Banking Supervision) met regularly with his counterpart at the Treasury, Assistant Secretary Brian Unwin. Although these meetings were scheduled to discuss the continued Lifeboat support and to gradually increase information sharing with the Treasury, this remained largely on a need-to-know basis until public and parliamentary inquiries into the secondary banking crisis started to manifest in 1977.[198] The gradual widening of

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[194] See for example Confidential Treasury minute, I L Smith to Mr Seebohm and Mr Unwin, '*Bank of England: Fringe Support Arrangements*', 01.10.74, T171/1053, National Archives Kew, London; and Confidential letter, L Airey to J S Fforde (BoE), 26.11.74, T233/2842, National Archives Kew, London.
[195] Margaret Reid, '*Rougher seas, a heavier load for the big banks' lifeboat*', Financial Times, 02.12.74.
[196] Confidential Treasury minute by J Unwin, sent to Mr Downey (cc Principal Private Secretary), *'Chancellor's dinner with Governor: Banking sector'*, 03.12.74, T233/2842; for repeated similar complaints, see for example Confidential Treasury minute by J B Unwin, sent to Mr Downey (cc Mr Folger, Mr Airey, Mr Middleton, Mr Bridgeman, Mr Seebohm, Mr Cooper D/Trade), '*London and County Securities*', 09.12.74, T233/2842; and Secret Treasury minute by G S Downey, sent to Mr Airey (cc Mr Unwin, Mr Seebohm), '*Banking Support Operation*', 11.12.74, T233/2842, all National Archives Kew, London.
[197] Confidential letter, L Airey to J S Fforde (BoE), 26.11.74, T233/2842, National Archives Kew, London.
[198] Confidential Treasury minute by J B Unwin, sent to Assistant PS/Chancellor of the Exchequer, '*Secondary Banks: Bank of England Support operation*', 26.11.74, T233/2842, National Archives Kew, London.

this information channel also went along with increased coordination regarding information broadcasting among the BoE and the Treasury, emphasizing the close interaction between these two elements of the Bank's information strategy.[199] George Blunden coordinated the public stance with Brian Unwin at the Treasury following press and parliamentary inquiries at the end of 1974, highlighting the BoE's continued balance between openness and opaqueness on issues such as the limits to the Lifeboat's support funds, focused on calming markets by insisting that BoE support would continue even if the limit of the support operation should be reached:

> "I have discussed the position with Mr Blunden at the Bank. He suggests that, if necessary, the following line should be taken: 'It is true that a ceiling to the support operation was fixed by the clearing banks when the operation was originally set up. It is ***not*** [sic] true, however, that the ceiling has been reached. Indeed, it is impossible to say whether the ceiling will ever be reached. If it were, however, the Bank of England would ensure that the support operation continued"[200]

Even though the operation of the Lifeboat and its support for several institutions in the fringe banking sector would subsequently become known over the course of the crisis, even in February 1974 Governor Richardson referred to the operation publicly only as a "necessary machinery to monitor the developing situation and to provide where appropriate financial support to replace the money market funds which were being withdrawn (…) to prevent a further spread of mistrust".[201] These rare public statements, as with the initial announcement of December 21, did not give or confirm details on the institutions supported or the working of the Lifeboat, which was speculated about in financial circles. But besides rumours, the public coverage and information on the support operation were scarce at best in late 1973 and early January 1974. Details such as identities of supported institutions, the amount of financial support, and the exact workings of the

[199] Confidential Treasury minute by G S Downey, sent to Mr Airey (cc Mr Unwin), 26.11.74, T233/2842, National Archives Kew, London.
[200] Confidential Treasury minute by J B Unwin, sent to Mr Middleton (cc Mr Folger, Mr Airey, Mr Downey, Mr Bridgeman, Mr Seebohm), '*Secondary Banks: Support Operation*', 05.12.74, T233/2842, National Archives Kew, London.
[201] Gordon Richardson, '*Speech by Governor G. Richardson given at the diner of the Institute of Bankers at Bristol*', 05.02.74, Bank of England Quarterly Bulletin Q1 1974, p. 54, Archive of the Bank of England, London.

Lifeboat remained estimates and patchwork for years after the height of the secondary banking crisis (Reid 1982). The extent of limited information transpiring about the operation can be seen again in an article by Margaret Reid on January 11, 1974, in which the support by the BoE was acknowledged, yet the level of commitment and working of the 'machinery' remained sketchy:

> "The top-level City support arrangements have been notable for the active role played, along with that of the top banks, by the Bank of England itself, which is believed to have participated financially, as well as with its authority and advice in the stabilising system".[202]

And yet, the crisis did draw public attention and coverage, although with the caveat of little officially confirmed information on the BoE's involvement. As Governor Richardson remarked in a public statement in mid-January, the BoE's involvement had become public knowledge to ease the pressure on the fringe banking sector, although the extent was not yet known in a calculated move:

> "these problems [of the fringe banks] and the action taken to deal with them have been written up extensively in the Press, so that I do not think I need describe the situation in much detail (…) the Bank kept very close to this situation throughout, though at first we preferred to work unseen (lest we should get into the position of seeming to guarantee all such troubled concerns irrespective of their merits). When it became clear, however, that the situation could not be contained along these lines, we moved to establish, with the London and Scottish Clearing Banks, a supportive syndicate which could take in hand any situation where help seemed justified. As a result of this move, I think it can now be said that the situation is being brought under control and that the crumbling of confidence which at one time appeared to be developing has been halted, and indeed reversed".[203]

With the benefit of hindsight, this early statement of the success of the operation either has to be considered premature, given the continued troubles in the secondary banking market throughout 1974 and even in subsequent years, or a calculated move by the Governor to further reassure markets at the height of doubt and uncertainty in the fringe banking crisis. The latter seems to be the more probable scenario, as the Bank was in fact already in January worried about the stability of further institutions, central among them First National Finance Corporation (FNFC),

[202] Margaret Reid, '*Move to strengthen secondary banks achieves success*', Financial Times, 11.01.74.
[203] Fringe Bank Speaking Notes for the Governor, 16.01.1974, G1/543, Archive of the Bank of England, London.

the largest of the secondary banks that in fact was granted a 'proper' section 127 charter by the BoE only in November 1973 and key in the rescue of L&C.[204]

Yet, before FNFC dominated the public discourse and coverage, it was Margaret Reid that published the first extensive account of the Lifeboat operation at the end of January 1974 in the *Financial Times*, shedding light publicly for the first time on the fundamental operating principles of the Lifeboat and showing good knowledge of the operation such as the share of the BoE's commitment, the 're-cycling' principle, and meeting schedules.[205] In her extensive analysis, Reid emphasized the limited public communication by the Lifeboat participants on their efforts as a central aspect of the operation:

> "The big banks together with the Bank of England, have acted as secretly as possible in the past two months to control the dangerous upheaval touched off by the crisis in early December of the London and County Securities financial group (…) So secretly has the support machinery been working that the only public reference to it has been the Bank of England's brief statement on December 21 that the big banks jointly were assisting fringe banks in temporary liquidity difficulties where such action was necessary and justified. That announcement came on the morrow of news of the £80m rescue operation for the Cedar Holdings second mortgage concern, in which Barclays Bank and a range of institutions played a leading role".[206]

In her article, Reid drew on the public announcements of individual support arrangements for secondary banks such as L&C, Cedar, but also cases that came to the front of attention in January such as P&O's offer to acquire Bovis building group that owned Twentieth Century Bank, or Cannon Street Investment:

> "Although little has been said publicly of the support machinery and its various actions, some glimpses have emerged. Cannon Street Investments, for instance, has disclosed that it has arranged £20m of standby credit facilities from National

[204] Again, contrary to most accounts (see Reid 1982, Gordon 1993) which place the Lifeboat's focus on FNFC with the emerging property crisis in March 1974 onwards, the documents in the BoE archive show clearly that from January onwards troubles at FNFC were a dominating feature in the Lifeboat's operation and discussions; see the speaking notes for '*Meeting Between the Chairmen and CEOs of the London Clearing Banks and representatives of the Scottish Clearing Banks and the Governors*', Friday 25.01.74, G1/543, Archive of the Bank of England, London.
[205] Margaret Reid, '*How the 'Bankers Lifeboat' came to the rescue*', Financial Times, 29.01.74.
[206] Reid, *Banker's Lifeboat*, 29.01.74.

> Westminster Bank against the danger of withdrawal of deposits in the wake of the London and County crisis".[207]

Yet, these 'glimpses' would remain a patchwork for the time being, and speculation and rumours about further support for larger companies kept on recurring:

> "It is also clear that even the larger of the secondary banking concerns have inevitably suffered some difficulties in the recent upheaval, and at least some of them have been or are being supported to a greater or lesser extent under the big bank syndicate's support arrangements".[208]

As mentioned above, the sheer size of FNFC compared to other fringe institutions was of great concern to the members of the Lifeboat committee at the beginning of January and the most pressing issue for the clearing banks,[209] as well as the lack of information they had on FNFC's health regarding first its liquidity needs, and subsequently the solvency of its business, which would continue to be unsatisfactory for the clearing banks and BoE for several months. The handling of FNFC would not only dominate in the Lifeboat's discussions in 1974, but also exemplified the central characteristics of its handling of information gathering, sharing, and broadcasting at the height of the crisis. Again, sharing information about supporting such a large institution with their shareholders was a key concern for the clearing banks: "The clearing banks were concerned about the extent to which they should take on support commitments in relation to their reserves and without telling their shareholders".[210]

For the BoE and the clearing banks it was even more worrying that the system of information sharing between the members of the Lifeboat was yet to work to the satisfaction of all parties involved, as became obvious in the case of FNFC and what became a recurrent claim in the beginning months of the operation: "the discussion had revealed that there were misapprehensions and real anxieties over the sharing of information and security between the

[207] Ibid.
[208] Ibid.
[209] The support for FNFC would ultimately total at £350m, making up over a quarter of the Lifeboat's total of £1,200 (Reid 1982).
[210] BoE, *Meeting*, 09.01.74, G1/543.

related bank and the pool".[211] In subsequent meetings in January, the clearing banks pressed for an independent third-party inquiry into FNFC to establish relevant information on its business so that the Lifeboat could make decisions on its continued support or other potential routes on a solid basis:

> "the Governor said that it appeared to him that what the clearing banks sought was a means whereby the results of investigations undertaken by 'related banks' could be independently confirmed (or not) from a professional source to complete satisfaction of all the banks".[212]

This claim was met by the Governor who implemented independent auditors to assess FNFC's business and assets, yet this process was considerably slower than expected and led to continued complaints by the clearing banks throughout February 1974 as the banks "were not at all aware of the up-to-date position of the company; they were guessing at its viability, and differences of opinion existed about the value of some of the assets",[213] and even by March basic information on FNFC was still outstanding: "they [the clearing banks] were still not in possession of all the facts; for example, there were no notes to the balance sheet, nor was there a list of depositors, nor a breakdown of advances".[214]

One of the most striking features in the Lifeboat discussions surrounding FNFC was directly related to the BoE's general response to the crisis in terms of its information broadcasting strategy. Rather than continuing on the path of selected support operated under a guise of offering little public information while trying to restore confidence in the banking sector, the clearing banks wanted the BoE to offer support publicly to all Section 127 banks and ensure their business, "whereupon the clearing banks would agree to regard lending to these banks as risk-free".[215] The BoE's senior management was clearly opposed to this broad approach and it is worth quoting the

[211] Ibid.
[212] BoE, *Meeting*, 14.01.74, G1/543.
[213] Information note of discussion at the Special Meeting of the Committee held at the Bank of England, 14.02.74, G1/543, Archive of the Bank of England, London.
[214] Record of the meeting at the Bank of England between the Chairmen of the London Clearing Banks and the Governors, 12.03.74, G1/543, Archive of the Bank of England, London.
[215] BoE, *Meeting*, 25.01.74, G1/543.

rationale for the rejection and the BoE's counterproposal at length, as this highlights the BoE's central understanding of broadcasting during the height of the secondary banking crisis in the words of Governor Gordon Richardson:

> "One can readily accept that the [credit] risk of guaranteeing the London and Scottish Clearing banks need to be regarded as a very high one; but equally the fact that we had done so would surely appear rather odd [in response to only one Section 127 bank's troubled position] if it was made public or became public. And, of course, Section 127 goes a good deal wider than the clearing and Scottish banks. But one needs to be something of an enthusiast for guarantees to approach the problem of a single bank [FNFC] (…) by undertaking to guarantee some 70 institutions. We felt strongly that were to become known at all that it had been thought necessary for us to guarantee such a wide range of substantial banks this would be best calculated to produce very considerable alarm (…) What we propose to do is to seek to bring together a group of institutional investors of first-class standing who would be prepared to bring a substantial amount of fresh money to First National Finance (…) but a much more potent effect should be the rehabilitation of First National Finance as a borrower in the eyes of the money market. This, of course, would require that the group providing this additional support should be of impressive weight and quality; but we propose to head it ourselves and, from enquiries so far made, do not believe that we should have undue difficulty in assembling a suitable grouping (…) We believe that as soon as this new grouping can be brought together and announced it will transform the market image of First National Finance".[216]

The BoE thus was not averse to the idea of a public commitment to reassure markets in the case of FNFC; however, it was not prepared to expand its support umbrella indifferently to the whole banking system proper, but preferred a focused effort on a single institution, also to not alarm markets by the sweeping acceptance of responsibility of all Section 127 banks. By highlighting the dichotomy between short-term liquidity support and a potential negative perception by markets of exactly these support actions, this statement summarizes not only the 'stigma' problem [and one can also assume moral hazard concerns by the BoE that they did not communicate to the clearing banks] in the case of FNFC, but also the deep-routed concern for market perception by the BoE during the height of the secondary banking crisis that represented a crucial element in framing the central bank's policy. It is this context in which the continued focus on a 'guided' public

[216] BoE, *Meeting*, 25.01.74, G1/543.

broadcasting strategy must be understood, which was continuously emphasized by the BoE and remarks by Governor Richardson about public restraint by members of the Lifeboat such as during the January 25th meeting were a common feature in the first phase of the Lifeboat operation: "he [Richardson] emphasized the importance of keeping one's nerve and of avoiding unhelpful press comment. He drew attention to reports in the press of the anxieties felt by the Clearing Banks".[217]

The principles outlined in this section at the height of the secondary banking crisis in its 'first stage' remained dominant features throughout the later stages of the crisis throughout 1974, even as the focus of the crisis shifted with falling property prices and further international shocks from liquidity support to questions about the solvency of many of the fringe banks (Reid 1982, Moran 1984). As Margaret Reid summarized for the whole Lifeboat operation and the BoE's stance regarding the communication of further measures in another extensive piece a year after troubles in the secondary banking sector started becoming publicly known and plunging the sector into crisis:

> "Although the principle of secrecy which has guided the whole 'lifeboat' operation means that no announcement is expected, the Bank of England is certain to shoulder the costs of the support consortium beyond the £1.3bn. figure itself".[218]

How far this 'principle of secrecy' while assisting secondary institutions to pre-empt negative market perceptions would go, is best emphasized by looking at the discussions regarding lifeboat support for United Dominion Trust (UDT) in June 1974, where this was going so far as to support UDT while enabling them to publicly deny this support. In discussions with the chairmen of the clearing banks, Jasper Hollom asserted that he

> "hoped that a way might be found of assisting this company while making it possible for it to deny publicly that it was under the umbrella of the Support Group. The danger was that if it became known that the Support Group had taken it on board the group might find itself having to finance the whole of the company's book, instead of topping it up as necessary, and would probably also

[217] Ibid.
[218] Reid, *Rougher seas*, 02.12.74.

> be faced with the need to put up funds for other companies of similar standing who would be caught in the backwash".[219]

However, there are two aspects that need further attention: the supervisory and monitoring changes as consequences of the secondary banking crisis in regard to the BoE's information gathering, as well as the international dimension of the BoE's information broadcasting strategy regarding the turmoil in financial and banking markets after the failure of Bankhaus Herstatt in Germany and the troubles at Franklin National Bank in the US in 1974. As described in this section, during the height of the secondary banking crisis in the short-term the BoE found itself reliant on the provision of additional information through the clearing banks and their branch network, and suffered in its decision-making and response to the crisis from a consistent lack of fundamental business information from troubled institutions as could be seen at the example of FNFC. Under George Blunden, this led to a comprehensive change of the BoE's information acquisition strategy across the banking sector, which would ultimately lay the grounds for its revised supervision structure in the Banking Act of 1979 (Reid 1982). That the fringe banking crisis and the BoE's experience would have a significant impact on its approach to information acquisition and supervision in the banking sector could already be seen early on, as Governor Richardson publicly hinted in February 1974 at "the degree of prudential regulation and supervision which authorities should exercise over deposit-taking institutions" which in his view urged the "conclusion that we shall have to extend our present arrangements".[220] The BoE started by issuing requests for returns from across the banking sector in mid-1974

> "called for from some 120 banks throughout the system and disclosing much more detailed information about their borrowings, lendings, credit lines, larger deals and transactions with subsidiaries and associates. One or two concerns have been asked to submit yet more frequent particulars for monitoring".[221]

[219] Record of the meeting at the Bank of England between the Chairmen of the London Clearing Banks and the Governors, 11.06.1974, G1/543, Archive of the Bank of England, London.
[220] Richardson, '*Bristol speech*', 05.02.74; BoE Quarterly Bulletin Q1 1974, p. 54.
[221] Reid, *Rougher seas*, 02.12.74.

Yet, as the Bank's senior management testified to the Wilson Committee in 1978, this was but the beginning of a more comprehensive overhaul of its information acquisition strategy in the banking sector to advance its monitoring and supervising capabilities:

> "Deposit-taking institutions which a year or two earlier might have resisted any intrusion by the Bank into their affairs now positively welcomed it. The Bank was therefore able to bring them (…) within an enlarged and intensified supervisory system inaugurated in the summer of 1974".[222]

The new system, overseen by a newly established Money Market Supervision Division in which the Discount Office was integrated into and thoroughly expanded from the 14 employees of the Discount Office to 70 employees, would require all deposit-taking institutions to submit quarterly (previously annual) statements on a wide range of business information, in order to "break down the balance sheet into its components" and

> "display the maturity structure of liabilities and assets both in sterling and in other currencies, provide details of large deposits and loans (together with those made by or to others with who the company or its directors have a connexion) and of bad loan provisions, and provide a breakdown of the purposes and country destinations of loans. In addition, information on profitability is received on a regular basis".[223]

Through this re-organisation in 1974, the BoE managed "an enhancement of existing practices", increasing the frequency and timeliness of information, as well as deepening and widening the information it sought out.[224] However, the BoE remained true to its tradition of putting emphasis on its close connection to the City, and in addition to these quantitative, hard information requirements, the new division also conducted regular interviews with the institutions under its supervision to gather a better picture based on soft information, which remained "the cornerstone of the Bank's system of supervision".[225] The BoE did put significant weight on the results of the interviews and the soft information gathered through them as an 'early-warning

[222] BoE, *Wilson Committee*, July 1978, 1A179/22.
[223] Ibid.
[224] Secret note, sent by J B Unwin to George Blunden (BoE), '*Banking Support Operation*', 13.12.74, T233/2842, National Archives Kew, London.
[225] BoE, *Wilson Committee*, July 1978, 1A179/22.

system', which was frequently referenced in discussions with Lifeboat members or the Treasury.[226] The further emphasis on the qualitative part of "management competence", as the trouble in several of the institutions that the BoE came to support was seen as managerial failures, can also be seen as a direct consequence of the Bank's experience in the secondary banking crisis:

> "The prime aims of the interview are to build up within the Bank an intimate picture of the institution, its business and its objectives, and to assess the capabilities of its management to control the business and fulfil the objectives. This emphasis on qualitative assessment has been born of experience, as management problems and inadequacies have typically provided the first sign of difficulty".[227]

On the second aspect of the international dimension of the fringe banking crisis and the BoE's information broadcasting strategy, this must be interpreted in the wider context of reform movements in international bank supervision in 1974/75. As shown for example by Schenk, several episodes of bank failures in the summer of 1974, such as the failure of Bankhaus Herstatt, the rogue trading scandal at Lloyd Bank's Lugano office, or the failure of the Israeli-British Bank and its London subsidiary, led to discussions and proposals (with limited success) within the G10 group of central banks for an 'early warning system' and information sharing between banking regulators on an international level, and ultimately to the establishment of the Basel Committee on Banking Supervision (Schenk 2014).[228] Yet, the initial goal of international sharing of information between national supervisory authorities would remain a contentious topic for several decades after, without a clear conclusion reached on the subject (Goodhart 2011, Schenk 2014).

As Margaret Reid pointed out, the international dimension to the BoE's domestic support operation during the fringe banking crisis are closely related, as

> "It can also be argued that, by taking early action, British banks staved off the shocks to confidence set off by the collapse of the I.D. Herstatt bank in West

[226] See for example Confidential letter, John Fforde (BoE) to Lawrence Airey (Treasury), 29.11.74, T233/2842, National Archives Kew, London.
[227] BoE, *Wilson Committee*, July 1978, 1A179/22.
[228] Contrary to previous accounts, Schenk shows the initial discussions under the leadership of the BoE's George Blunden were not as much focused on the causes of the failure of Bankhaus Herstatt (Schenk 2014).

> Germany in the summer and the initial uncertainties generated in the US by the troubles of Franklin National Bank".[229]

As the BoE asserted in its testimony to the Wilson Committee, there was a palpable fear of spillover both from foreign bank failures into the domestic banking market, and from British bank failures resulting in an "international chain reaction", and compared the international reaction to the failure of Herstatt to the British experience during the beginning of the secondary banking crisis:

> "The reaction of international bankers was in many ways similar to that of UK institutional depositors in December 1973 - lines to smaller banks were drastically reduced or withdrawn (…) Even though the international financial community had recognised and welcomed the general success of the lifeboat operation and the original fear of major failures had receded, there was still a significant risk that an isolated default by a UK bank, in the highly charged atmosphere of the time, might have triggered a chain reaction".[230]

Regarding the BoE's adapted supervisory system of information gathering and sharing on the domestic level, the Wilson Committee evidence suggests a direct link between not only the impact of the many international crises in the summer of 1974 (specifically named are Herstatt, Franklin National Bank, IBB, and Lloyd's Lugano office), but also its experience during the secondary banking crisis:

> "Domestically the bank has greatly extended the scope and intensity of their supervisory arrangements; internationally, comparable advances have been made in a number of countries and machinery for close international cooperation between supervisory agencies has been established and put into operation".[231]

Although the success of this "machinery" of information sharing and acquisition on an international supervisory level has to be questioned regarding the limited acceptance of the BoE's proposals in the context of the Basel committee meetings in establishing such a system (Schenk 2014), this exemplifies the wider implications of the secondary banking crisis and the BoE's approach towards its information gathering and broadcasting strategy in shaping its policy response not only on a national, but also on an international level.

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[229] Reid, *Rougher seas*, 02.12.74.
[230] BoE, *Wilson Committee*, July 1978, 1A179/18.
[231] Ibid.

Intermediate conclusion – the secondary banking crisis and the BoE's information strategy

Whereas chapter 3 shows how information suppliers such as Reuters and Bloomberg tried to push towards more private attributes in their information provision for financial markets and differentiate themselves on this and their additional (soft) information provision through news and analyses, this section emphasized the key role played by concerns regarding the public perception of support measures for troubled institutions and how these concerns significantly shaped the information broadcasting strategy employed by the BoE in the setup and operation of the Lifeboat. From the outset, the BoE tried to balance between reassuring financial markets through committing to financial support of troubled institutions (public), while keeping details of the operation and especially the identities of borrowers and the extent of support as opaque as possible (private). This was thus also a careful balance between transparency on the one hand, and efforts to stabilise market conditions on the other hand – a dichotomy even more prevalent in the next section. The timing of the crisis, and perceived uncertainty about the viability of institutions in the secondary banking sector, played a key role in the broadcasting of the BoE's support, as with the 'changed information environment' the BoE adapted from keeping its involvement out of sight of the wider public to gradually revealing the setup of its 'support machinery'. The changes to the 'information environment' (Gorton 2015) during a financial crisis and resulting adaptation of central banks' policy response and information strategy is one central point that is also prevalent during the GFC and is discussed in more detail in the chapter conclusion.

During the height of the crisis, targeted support remained the BoE's preferred option, as proposals by the large clearing banks for a 'blank cheque', essentially backstopping all institutions in the 'banking sector proper', were decisively rejected by the BoE. Furthermore, there is a significant degree of reliance from the BoE with respect to information acquisition on the capabilities and resources of the private sector, especially the large clearing banks implicated in the Lifeboat support. To that end, the BoE also actively encouraged and emphasized the importance of

internal information diffusion among members of the Lifeboat, even if they were not directly involved, to establish a joint information basis for action and decision-making. However, information sharing was not indiscriminate, as the limited and closely controlled information flow towards the Treasury emphasized. This represented an explicitly chosen strategy for information sharing and broadcasting by the BoE's senior management, which was repeatedly adapted over the course of the secondary banking crisis depending on the respective information environment.

Finally, the section shows the persistence of changes to the regulatory and supervisory framework of the BoE regarding its information acquisition and information diffusion after the crisis, both on the national and international level. On the one hand, there is remarkable consistency in the emphasis on soft information gathered from banking institutions as the central aspect of supervision, while also extending the range and frequency of gathered hard information on bank lending and viability. On the other hand, the BoE's efforts in information sharing between central banks and regulators in the context of the Basel Committee was also directly influenced by its experience during the secondary banking crisis, in conjunction with the wider international crises and bank failures frequently mentioned in the literature.

3. The global financial crises – information strategy amid 'paradigm shifts'

The GFC poses an interesting yet challenging case study regarding central bank information gathering and broadcasting during the crisis. On the one hand, broadcasting was an ever more crucial part in the crisis response by central banks such as the Fed, the BoE, or the European Central Bank (ECB) to calm markets during the worst financial crisis in over seven decades, threatening the core institutions of the global financial markets. As shown above, academics and policymakers have over the past years repeatedly alluded both to the increased efforts by central banks to communicate their decisions more widely and to explain their rationale behind those actions starting in the 1990s, as well as the increased scrutiny by market participants towards this communication (see e.g., King 2016, James 2020). As Ben Bernanke described in his memoir,

greater transparency and accountability of central banks' monetary policy decisions were still at the top of his mind even in late 2007: "In the October FOMC meeting we also discussed the first substantial step towards *my most cherished pre-crisis priority* [italics added for emphasis] – making the Fed's monetary policy process more transparent and systematic" (Bernanke 2015). And indeed, Charles Plosser, president of the Philadelphia Fed and member of the FOMC at the time, did advocate for openness regarding the Fed's broadcasting in the FOMC meeting on October 30, 2007, emphasizing the importance of "commitment, credibility, and transparency" in the Fed's monetary policy decisions, as well as other interventions.[232] This was decisively not intended to presage monetary policy for market participants or to give more hard information about the Fed's future policy, but to broadcast openly and consistently to calm markets.

As Bernanke's statement above emphasizes on close inspection of primary source evidence, autobiographical sources must be taken with a salt of grain and need proper critical assessment especially when concerned with controversial topics. In this example, Bernanke's ex-post autobiographical commitment to transparency and openness has to be squared with his statements in the very same FOMC meeting, when he complained, as he would in fact throughout the crisis, about internal Fed deliberations being reported upon in the financial press, and the sustained need in the building uncertainty for clear and guided communication and opaqueness of the Fed:

> "I have the less pleasant duty of reminding everybody about the Wall Street Journal article on our communications policy that appeared some time ago (…) I think it is obviously bad for our institution when our internal deliberations become public, and so let me just ask everyone, please, to be especially careful about maintaining confidentiality"[233]

[232] Charles Plosser, '*Transcript of the Federal Open Market Committee Meeting*', 30-31.10.07, p. 99; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20071031meeting.pdf*.
[233] Ben Bernanke, '*Transcript of the Federal Open Market Committee Meeting*', 30-31.10.07, p. 4; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20071031meeting.pdf*; for more examples of these complaints see Ben Bernanke, '*Transcript of the Federal Open Market Committee Conference Call*', 07.02.09, pp. 3-5, available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20090207confcall.pdf*.

On the other hand, the global financial crisis is still a fairly recent event on the larger timescale historians tend to apply – and traditional historical primary sources such as documentation on internal deliberations by the Fed are to a certain extent still closed,[234] rendering internal analysis in respect to the Fed's information strategy difficult. Yet, many insights can be extracted using material made available by congressional and parliamentary testimonies or public inquiries such as the FCIC, the FOMC transcripts and meeting minutes, court cases such as Bloomberg L.P. v. Board of Governors of the Federal Reserve System, or personal memoirs and biographies by key figures, which, as the example of Bernanke's memoir shows, can be illuminating yet need critical assessment and situating within the other primary source material (see e.g., Paulson 2011, Geithner 2014, Bernanke 2015, King 2016, Bernanke, Geithner et al. 2019, Bernanke, Geithner et al. 2020). This section focuses its main analysis of these sources in detail on the latter part of 2008 and early 2009, which saw the height of uncertainty in financial and banking markets with the collapse of Lehman Brothers in the US and the bailout of Royal Bank of Scotland (RBS) in the UK, with large-scale recapitalization and support efforts launched in their wake, yet also considers earlier events and developments where appropriate and useful for the understanding of central banks' information strategy during the GFC.

Central bank information strategy at the height of the global financial crisis

Due to the severity of the initial shock and ensuing downturn, many academic studies, political investigations, as well as public and journalistic accounts have engaged with the events surrounding the global financial crisis (see e.g., Eichengreen 2015, King 2016, Tooze 2018). The work on the crisis might be summarized into three main categories, either exploring (i) causes of the crisis, such as the increased securitization in financial markets, excessive and predatory lending in the property sector, bank reliance on short-term (runnable) debt funding, or decreasing long-

[234] With the exception of the FOMC meeting minutes and transcripts, which give a detailed view of the deliberations by key members of the Fed during the GFC, and usually become publicly available a few weeks after the meetings to provide some accountability and transparency.

term interest rates (see e.g., Brunnermeier 2009, Eichengreen and O'Rourke 2010, Aliber and Zoega 2019); (ii) consequences of the crisis, such as the revised national and international regulation in the financial sector, or adapted supervisory and monitoring frameworks by central banks and other regulators (see e.g., Wojcik 2013, Cassis and Van Helten 2021, Schenk 2021); or (iii) the effectiveness and efficiency of the crisis response, such as old and newly established emergency lending facilities by central banks, or the fiscal response by governments to the financial and economic shock (see e.g., Gorton and Metrick 2010, Acharya, Drechsler et al. 2014, Armantier, Ghysels et al. 2015). This section contributes primarily to the second and third points, yet from the angle of central banks' information gathering and broadcasting strategy during the crisis. These aspects need further exploration as they are often mentioned, yet not fully explored in many statements by key policymakers such as for example in the biographical accounts of Fed chairman Ben Bernanke, and US Treasury Secretaries Henry Paulson and Timothy Geithner:

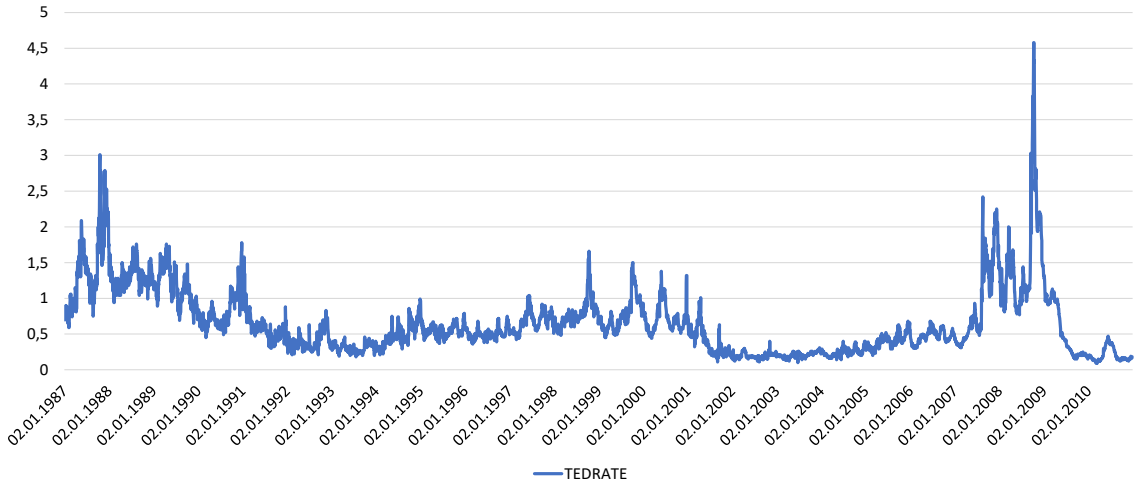
> "we constantly struggled to communicate what we were doing and why (…) the Fed's come-and-get-it message did not attract banks to the discount window. The loans are supposed to be confidential, but banks were afraid they'd look weak and desperate if the market got wind that they had paid a penalty rate" (Bernanke, Geithner et al. 2019).

Contemporary sources as well as biographical accounts by policymakers emphasize the extraordinary turn of events in the GFC with the collapse of Lehman Brothers on September 15, 2008, although the "system staggered on for a year" before these events (King 2016). In the words of Federal Reserve chairman Bernanke, describing the transformative events in September 2008 for the US financial system, "Lehman weekend, which ultimately became Lehman-AIG week, transformed a year-old crisis, already exceptionally severe, into the worst financial panic in our nation's history" (Bernanke 2015). Uncertainty in the banking system reached new heights, regarding the sharp increase in rates in the interbank-lending market after the collapse of Lehman, as a comparison of TED spreads[235] during the crisis and in the context with other crashes show.

[235] Spread between 3-month LIBOR & 'safe' 3-month US Treasury bills.

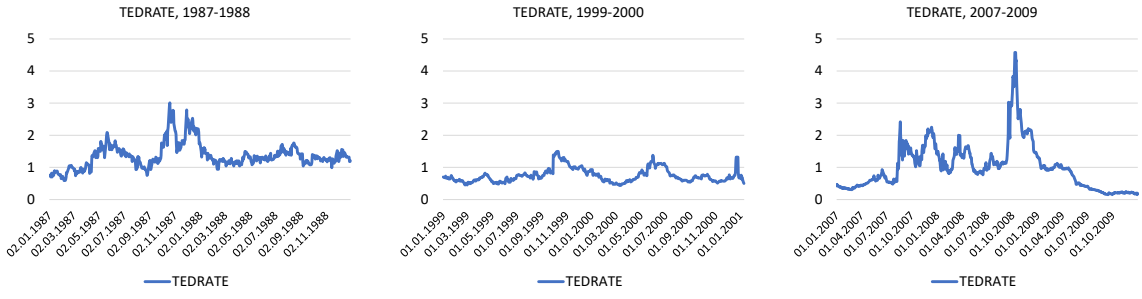
As highlighted in Figure 36, Figure 37, and Figure 38, interbank lending rates spiked in early August 2007 after the announcement by BNP Paribas to stop further redemptions from three of its funds invested in asset-backed securities, as banks started to focus on liquidity and retain cash. As Figure 37 emphasizes in comparison to other crises in this project, this initial spark in interbank lending rates was already significant on a historical scale, yet the worst was still to come with a significant spike in TED spreads after 'Lehman-AIG' week and at the same time an increasing divergence between LIBOR and the Federal funds rate (Figure 38).

Figure 36: TED spreads in %, overall (spread 3-month LIBOR & 3-month Treasury Bills), 1987-2010.



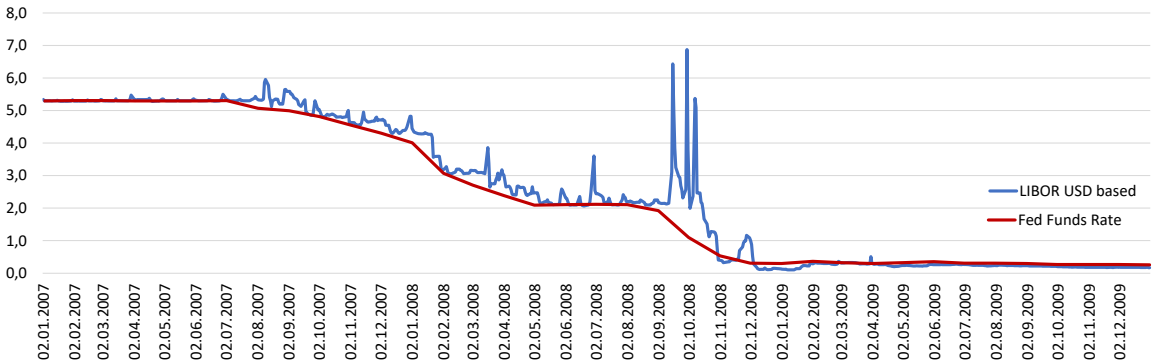
Source: Data from Federal Reserve Bank of St. Louis, TED Spread [TEDRATE], retrieved from FRED, https://fred.stlouisfed.org/series/TEDRATE.

Figure 37: TED spreads in %, during different crises, 1987-2010.



Source: Data from Federal Reserve Bank of St. Louis, TED Spread [TEDRATE], retrieved from FRED, https://fred.stlouisfed.org/series/TEDRATE.

Figure 38: LIBOR and Federal Funds Rate, January 2007 to December 2009, USD based.



Source: CE Benchmark Administration Limited (IBA), Overnight London Interbank Offered Rate (LIBOR), based on U.S. Dollar [USDONTD156N], Board of Governors of the Federal Reserve System (US), Effective Federal Funds Rate [FEDFUNDS], retrieved from FRED, Federal Reserve Bank of St. Louis: https://fred.stlouisfed.org/series/USDONTD156N.

This unprecedented uncertainty and financial panic spread through the interconnected global financial system, leading to further failures and government and central bank interventions, as Mervyn King described for the UK:

> "In early October 2008, two UK banks – the Royal Bank of Scotland (RBS) and Halifax Bank of Scotland (HBoS) – found themselves unable to get to the end of the day. The Bank of England lent £60 billion to the two banks to avoid a collapse of the banking system. (…) Other central banks took similar action with their own banks. The Great Panic lasted less than a month from the failure of Lehman Brothers to the announcement of the recapitalisation of the banks – twenty-eight days that shook the world" (King 2016).

The efforts by governments to recapitalise the banking system, for example through TARP in the US and the recapitalisation and nationalisation in the UK, enabled regulators credibly to fight the panic in financial markets. Yet, most observers point to the release of the results of the banking 'stress tests' in the US in May 2009 as ultimately providing the basis to end the panic and uncertainty in the banking system: "The banking crisis itself could be said to have ended when the US Treasury and Federal Reserve announced on 7 May 2009 the results of the stress tests carried out on US banks" (King 2016). It might thus be argued that it was not only the 'overwhelming force' of government and central bank intervention that ended the crisis, but the shift towards open and transparent release of information on banks' solvency and liquidity needs, further underlining the

importance of central banks' information strategy during the GFC, which was however reliant on the respective 'information environment' (Gorton 2015).

This analysis looks in detail on four key characteristics and themes of both the information gathering and broadcasting side of the central banks' information strategies during the GFC, that have in part already been touched upon in the previous section. Figure 39 details these focal themes for the analysis in this section, that are put into perspective to the analysis regarding the BoE's information strategy in the secondary banking crisis in the chapter conclusion.

Figure 39: Focus points for central banks' information strategy during the GFC, 2007-2008.

	Gathering	Broadcasting
Key themes and focus	1 Changes to information gathering by central banks relating to newly established support measures; 2 Importance of personal connections and contacts in crisis management and finding workable solutions for individual institutions; 3 Regulatory interlocking of information on institutions and the fin. system in general; 4 Persistence of supervisory/monitoring changes after crisis.	1 Dichotomy re anonymity of individual institutions vs. public diffusion of information (e.g., TAF v stress tests); 2 Broadcasting towards stakeholders (general public, lawmakers etc.) within context of increasing transparency & signaling effect; 3 Broadcasting of new support facilities, 'blank cheque' vs. targeted support; 4 Managing market broadcasting on an international level (e.g., G-7).

Central bank information broadcasting during the GFC

First, the dichotomy between the anonymity of liquidity support and other individual support measures through the discount window or other newly established facilities, and the release of new, private information to markets such as the equity needs of large financial institutions through the publication of the 'stress test' methodology and results (the Supervisory Capital Assessment Program, SCAP) in early 2009, is a recurring feature of the GFC. This dichotomy was brought up already for example by Gorton, who summarized the main point concisely:

> "maintaining the secrecy of borrower identities seems paramount during crises. During the crisis of 2007-08, the new Federal Reserve lending programs that

> were introduced were carefully designed to avoid stigma. The identities of borrowers were kept secret. But, the stress tests introduced during the crisis had exactly the opposite goal: find and publicly reveal the weak banks" (Gorton 2015).

As Gorton suggests, one main priority of the Fed during the height of the banking crisis in 2007/08 was to prevent the leak of information about discount window or special facility borrowing in order to avoid public knowledge of individual institutions and their potential fragility, thus encouraging banks to draw on these facilities under the premise of anonymity. These efforts extended so far that after two Freedom of Information requests by Bloomberg journalists in April and May 2008, seeking detailed information on Fed lending including, among other information, the loan amounts, maturity, and names of counterparties, the Fed had to defend their policy in federal court after a lawsuit by Bloomberg brought forward in November 2008.[236] In these legal proceedings, senior Fed employees such as Brian Madigan, director of the Fed's 'Monetary Affairs' division, and Susan McLaughlin, senior vice president in the Fed's 'Markets Group', testified to the importance for financial stability in keeping information about borrowers from the Fed's lending programs anonymous:

> "If the name of an institution that borrowed from the [DW] were to be made public, there is a real concern that market participants, including financial analysts, customers, and competitors of the borrowing institution, would draw adverse conclusions about the borrowing depository institution that were based on conjecture and speculation".[237]

Indeed, 'stigma' concerns were top of mind in the design of many of the Fed's lending programs, as Bill Dudley, manager of the Fed's System Open Market Account, emphasized in explaining the details about the setup of the PDCF in a FOMC meeting on March 18, 2008:

> "It is all bid through the New York District, so the total primary dealer borrowing will be shown in that release. The stigma issue is a legitimate issue, and that is

[236] See '*Decision by chief judge Loretta A. Preska*', in Bloomberg L.P. v Board of Governors of the Federal Reserve system, United States District Court for the Second District of New York, 24.08.09, pp. 3-5; and '*Decision by chief judge Dennis Jacobs*', in Bloomberg L.P. v Board of Governors of the Federal Reserve system, United States Court of Appeals for the Second Circuit, 19.03.10, pp. 4-5.
[237] See '*Declaration of Susan McLaughlin*', in Bloomberg L.P. v Board of Governors of the Federal Reserve System, pp. 7-8; and '*Declaration of Brian Madigan*', in Bloomberg L.P. v Board of Governors of the Federal Reserve System, pp. 10-11.

> why we have to be very careful about how we talk about this and take tremendous care not to disclose who or even what type of institution uses it".[238]

These concerns were often accompanied by general worries about potential market perception of Fed actions and the various newly established facilities. In discussions about the collateral acceptable for the new PDCF for example, extending Fed emergency lending to broker-dealers to include investment banks, Tim Geithner addressed concerns about market perception if collateral posted by a primary dealer would not be acceptable to the New York Fed:

> "This [the PDCF] is voluntary like the TAF. In that sense, it is equivalent. But you are right; it would be a consequential act for us to say to a primary dealer, "We are going to restrict you to X" or "We are not going to consider you eligible any more to bid." It would not be, we would hope, a visible act. But, of course, in taking the action we would be responsible, in some sense, for contributing to the failure of that institution".[239]

Even in the deployment of the Troubled Asset Relief Program (TARP), which was approved after the Lehman collapse in September 2008 by Congress and giving the US Treasury the means to buy troubled assets and inject capital through the acquisition of equity into the banking system, these considerations played a critical role to generate acceptance in the financial industry for the program. To overcome the stigma problem, on October 13, 2008, Paulson, Bernanke, and Geithner in collaboration with Sheila Bair, head of the FDIC and John Dugan, Comptroller of the Currency, first convinced the CEOs of nine of the biggest financial institutions in the US to participate by accepting "equivalent of 3 percent of their risk-weighted assets, a total of $125 billion in TARP investments". In order to relieve the hurdles of participating in the program for smaller and potentially weaker institutions "we would then make another $125 billion available to smaller banks, which wouldn't have to worry about stigma with the first nine on board" (Bernanke, Geithner et al. 2019). However, even with this strategy employed, concerns remained for senior officials about the acceptance of TARP funds and the market perception of institutions accepting

[238] Bill Dudley, '*FOMC Meeting Transcript*', 18.03.08, p. 13; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080318meeting.pdf*.
[239] Timothy Geithner, '*FOMC Conference Call Transcript*', 10.03.08, p. 19; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080310confcall.pdf*.

or seeking out funds, as Fed Governor Randall Kroszner emphasized in the FOMC meeting on October 29, 2008:

> "I think there is also a lot of uncertainty about who will get TARP funding and who is qualified for TARP funding. As information comes out about people not being qualified or markets being concerned that individual institutions are not going to be qualified, that could put on a lot of pressure".[240]

These efforts were not only a purely American phenomenon, as Mervyn King describes for the support by the BoE for RBS and HBoS in October 2008:

> "In an effort to overcome the problem of stigma, central banks have traditionally been reluctant to publish details of institutions benefiting from access to special lending (…) For example, in 2008, the details of the support for Royal Bank of Scotland and HBoS, although approved by the Chancellor of the Exchequer, were not revealed publicly until many months later when there was no longer any need for such secrecy" (King 2016).

These actions by central banks contrast sharply with the perceived effect of the mentioned 'stress tests', which in the words of Tim Geithner "sounded more like analysis than action", conducted in the US in early 2009, in order to alleviate remaining uncertainty in the financial system about banks' viability (Geithner 2014). Under the leadership of Tim Geithner (whose memoir of the GFC is aptly titled 'Stress Test'), at this point successor to Hank Paulson as Treasury Secretary in the Obama administration, the US Treasury in collaboration with the Fed and other regulators (mainly the FDIC and OCC) announced the 'stress tests' as a key policy instrument to restore confidence on February 10, 2009:

> "We're going to require banking institutions to go through a carefully designed comprehensive stress test, to use the medical term. We want their balance sheets cleaner, and stronger (…) To do this, we are going to bring together the government agencies with authority over our nation's major banks and initiate a more consistent, realistic, and forward-looking assessment about the risk on balance sheets, and we're going to introduce new measures to improve disclosure".[241]

[240] Randall Kroszner, '*FOMC Meeting Transcript*', 28-29.10.08, p. 105; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20081029meeting.pdf*.
[241] Timothy Geithner, '*Secretary Geithner introduces Financial Stability Plan*', US Treasury press release, 10.02.09; available online: *https://home.treasury.gov/news/press-releases/tg18*.

Briefing the FOMC and the Fed board in a conference call on February 7, 2009, Ben Bernanke highlighted the core element of the stress test to the board and committee members, embracing the principle of transparency about bank's capital needs to remove the remaining uncertainty in the financial system through the publicising of private information:

> "The first element of the stabilization plan is summarized as enhanced transparency about asset valuations and capital needs. So there's a principle here that I believe to be very important: The more disclosure and clarity there is, the less uncertainty there is and the better the chance that we'll come to some kind of stability (…) We're going to require enhanced disclosure so that there will be as much information as possible, with as much consistency as possible, about the balance sheets of the banks".[242]

This focus on transparency, and making private information public in order to remove uncertainty from financial markets, went hand-in-hand with a focus on how the stress tests should be broadcasted, as Bernanke emphasized that "the language of the presentation will be something along the lines that we want to be sure that (…) all of those banks are going to be resilient, even in the case of a very bad macroeconomic outcome".[243] With a poor initial public reaction, the Dow Jones dropping 4% on the day of Geithner's announcement and an overall negative perception by financial institutions of the stress tests due to little detail being given in February and fears of 'overly harsh' assumptions and methodologies being used,[244] the broadcasting element of the SCAP continued to play an essential role up to the release of the results in May 2009.

Already in May 2008, after the Bear Stearns rescue, the Fed had performed a "stress test" for the remaining US investment banks, to assess under two scenarios if they could survive a Bear-like run, and if not, how much liquidity they would need to raise. However, contrary to the stress tests performed through the SCAP, the methodology and results were in fact not published, but used only internally, and they were neither accompanied by the availability of TARP funds that

[242] Bernanke, *FOMC Conference Call*, p. 6.
[243] Ibid. p. 7.
[244] See for example Joe Nocera, '*A Stress Test for the Latest Bailout Plan*', New York Times, 13.02.09; Roy Smith and Ingo Walter, '*Two Cheers For The Stress Tests*', Forbes, 04.05.09; John Marshall, '*US bank stress tests*', UK House of Commons Library, Standard Note, SN/BT/05066, 15.06.09, p. 9; available online: *https://researchbriefings.files.parliament.uk/documents/SN05066/SN05066.pdf*.

could credibly backstop capital needs of these institutions if they could not be met through private sources, nor accompanied by the open broadcasting the Fed, Treasury and other regulators opted for in the case of the 2009 stress tests, emphasizing the importance of transparency and information diffusion played in the success of the SCAP (Bernanke 2015).[245] However, the broadcasting of information about the SCAP remained a balancing act for regulators, and as Bernanke put it in the February FOMC call in a discussion with Governor Elisabeth Duke, who raised concerns about market perceptions of the new program: "the communication is a huge problem (…) we need to think very hard about contingency plans and about our communications".[246] The employed methodology of the tests had to be conservative enough to lend public credibility to results that banks with adequate capital could withstand further severe shocks, while the application of an overly conservative methodology, revealing large gaps in banks' capital needs, could weaken their commercial position and lead to a loss of confidence.[247]

Upon close examination, one important element regarding the (non-)publication of information on individual institutions such as individual support or equity needs, was timing: the stress test announcement in February 2009 and publication of results in May 2009 was late in the banking crisis, whereas the Fed's policy choice of anonymity regarding discount window and special program lending (such as TAF, PDCF) was followed for most of 2007/2008, and especially so during the height of uncertainty after September 2008 (Geithner 2014, Bernanke 2015). As Gorton stated with regard to the timing of transparency versus opacity as an effective information strategy for central banks to reaffirm market confidence:

> "The information environment [note: and changes therein] during a crisis deserves careful study (…) would the stress tests have worked just after the Lehman bankruptcy or, say, the month before Lehman? Clearly we do not know

[245] See also Mark Zandi, '*FCIC Hearing Day 1 – Official Transcript*', 13.01.10, p. 217; available online: *https://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/2010-0113-Transcript.pdf.*
[246] Bernanke, *FOMC Conference Call*, p. 30.
[247] See Nocera, *Stress Test*, 13.02.09; see also Richard Fisher, '*Transcript of the Federal Open Market Committee Conference Call*', 07.02.09, p. 31, available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20090207confcall.pdf*.

> (…) It may be that *at that point* [sic] in the crisis, the tests served to eliminate any remaining uncertainty" (Gorton 2015).

As the first case study showed, in a different 'stage' of the banking crisis, central banks opted for either increased opacity or transparency – a feature that is discussed further in the conclusion.

Second, central banks and regulators during the GFC leveraged the signalling effect of their broadcasting extensively in order to calm financial markets, on several occasions even without revealing new fundamental information but rather through non-consequential actions to reassure market participants of their conviction. As Treasury Secretary Hank Paulson described, when the Fed asked the US Treasury to indemnify them for loans made to Fannie Mae and Freddie Mac in early September 2008 to prevent the two GSEs from failing and plunging the US housing market into complete disorder with potentially catastrophic consequences for the financial system:

> "I assumed we could find some power we could creatively use, and on Sunday, my general counsel, Bob Hoyt (…) came back to me and said there were no powers for Treasury to (…) indemnify the Fed on their emergency loan as I had promised Ben and Tim. He had worked with the Justice Department, and undertaken an exhaustive review. So I had to call Ben and Tim and say there ain't no powers, and so I finally wrote an indemnification that I jokingly called the "all dollars are green" letter, saying that as Treasury Secretary, I recognize that if you guarantee this and lose money, we'll get less money in the Treasury".[248]

Even though, as Bernanke, Geithner and Paulson described in their joint memoir a decade after the crisis, "it didn't mean much legally (…) it did implicate the Treasury and the executive branch in the Fed's momentous decision", emphasizing in retrospect the importance of the signalling effect of this step: "We wanted everyone to know we were in this together" (Bernanke, Geithner et al. 2019). The three top-level policymakers and regulators placed a similar emphasis on the application of both Goldman Sachs and Morgan Stanley, the best capitalized yet still vulnerable investment banks after the Lehman collapse on September 15, 2008, to the Fed to convert to bank

[248] Hank Paulson, '*Interview with Henry Paulson – Final Transcript*', George W. Bush Oral History Project, 11.03.13, p. 19; available online: *https://s3.amazonaws.com/web.poh.transcripts/Paulson_Henry.archive.pdf*.

holding companies.[249] The Fed subsequently agreed to this conversion on September 21, primarily for its perception by markets, as the altered legal status in the short-term only changed their respective primary supervisor, yet given the support programmes already in place (esp. the PDCF), it did not affect the amount or conditions of borrowing from the Fed: "The bank holding company designation by the Fed was vaguely reassuring to the market, but in reality it had few substantial implications" (Bernanke, Geithner et al. 2019).

Even the first design of TARP, and especially the quoted figure of required funds sent to Congress on September 18, 2008, was to a large degree influenced by the assumed signalling effect this figure would have, as Ben Bernanke testified in front of the US Senate's Committee on Banking, Housing, and Urban Affairs on September 23 regarding the size of the TARP funds:

> "The amounts involved are intended to be enough. We do not want to go in and underwhelm the situation. That might be to suggest more problems down the road. There have been some ways of looking at it. This is about 5 percent of all the mortgages outstanding, for example, $700 billion. But it certainly illustrates the size of these markets and the size of the problem".[250]

As Bernanke, Geithner and Paulson later affirmed in their joint memoir, "the dollar figure [$700 billion] was somewhat arbitrary (…) but the goal was to create the perception and the reality of overwhelming force" (Bernanke, Geithner et al. 2019), highlighting the importance of the signalling effect in the broadcasting of TARP funds as strongly connected to the actual benefit of the recapitalisation itself. In public testimony to Congress, Hank Paulson emphasized this signalling effect for the first support sought for the GSEs in July 2008, regarding his request for an 'unspecified' amount of support funding, which highlights the interplay between not only the implementation of appropriate policies, but also the importance of their perception by financial markets:

[249] See for example press release by Goldman Sachs, '*Goldman Sachs To Become The Fourth largest bank Holding Company*', 21.09.08; available online: *https://www.goldmansachs.com/media-relations/press-releases/archived/2008/bank-holding-co.html*.
[250] Ben Bernanke, '*Turmoil in U.S. Credit Markets*', Testimony before the Senate Committee on Banking, Housing, and Urban Affairs, 23.09.08, p. 31; available online: *https://www.govinfo.gov/content/pkg/CHRG-110shrg50414/html/CHRG-110shrg50414.htm*.

> "if you want to make sure it's used, make it small enough and it'll be a self-fulfilling prophecy (…) if you've got a squirt gun in your pocket, you may have to take it out. If you've got a bazooka, and people know you've got it, you may not have to take it out".[251]

After the collapse of Lehman Brothers in September, Ben Bernanke, referring to Paulson's 'bazooka' approach for the GSEs, asked the FOMC in a similar fashion and to a similar effect to grant him authority to extend the Dollar swap-lines with other major central banks for an unspecified amount, which had previously been extended and raised for specific amounts to individual central banks:

> "there are very significant problems with dollar funding in other jurisdictions—in Europe and elsewhere (…) I would like to put on the table a request for authorization for swap lines. I prefer not to put a limit on it, so I know I've got my own 'bazooka' here (…) we also don't want to communicate to the markets somehow that we have a hard limit that is not going to be changed. That would be potentially bad for confidence".[252]

Besides these ample examples, there appear to be two further features in the Fed's broadcasting style during the GFC and towards its stakeholders. First, the frequency of communication markedly increased, with regular testimony of senior personal before the relevant congressional oversight committees. This was described by one communications' expert as "an all-out campaign", with quarterly news conferences on fundamental Fed balance sheet information and explanations for policy decisions after FOMC meetings, appearances on popular TV shows such as "*60 Minutes*", and "*PBS NewsHour*", Q&A's in front of the National Press Club and at businesses, universities, and local assemblies around the US.[253] Second, there was at the same time remarkable consistency in the primary broadcasting and information diffusion channels sought out by the Fed's senior management, with a strong preference to give regular updates to 'beat reporters' from key

[251] See Hank Paulson testimony in '*Hearing before the Committee on Banking, Housing, and Urban Affairs, United States Senate, 110th Congress, Second Session, on recent developments in U.S. financial markets and regulatory responses to them*', 15.07.08, p. 17; available online: *https://www.govinfo.gov/content/pkg/CHRG-110shrg50410/html/CHRG-110shrg50410.htm*.
[252] Ben Bernanke, '*FOMC Meeting Transcript*', 16.09.08, pp. 3 & 17; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080916meeting.pdf.*
[253] Zachary Goldfarb, '*Michelle Smith, working behind the scenes to shape the Fed's public image*', The Washington Post, 21.01.14.

financial press agencies to relate information about newly established programs and rationale for decision-making to financial markets and the wider public, as "these more specialized reporters were best equipped to understand and then explain what we were doing and why. Other media would pick up on their reporting" (Bernanke 2015).[254] This went so far, that in order to publicly explain and justify their decision-making, in November 2008 Bernanke and several senior Fed officials provided exclusive information about their deliberations in the previous weeks and months to John Cassidy of the *New Yorker* magazine, which would publish an extensive piece on November 23, 2008, revealing the discussions and rationale of top-level Fed decision-making at the height of the crisis.[255]

As the third overarching point in information broadcasting (Figure 39), in order to avoid the perception of a 'blank cheque' for the financial system (as in widespread, undifferentiated support for all troubled institutions what had been demanded during most of the GFC by various financial firms), central banks continuously tried to balance between their financial stability mandate and moral hazard concerns, between re-establishing confidence in the financial system and avoiding their actions and broadcasting thereof becoming perceived as universally absolving. As Bernanke testified to the FCIC regarding the case of Lehman support and the Fed's apparent ambiguity in broadcasting information about potential support to the market before the bankruptcy filing of Lehman Brothers on September 15, 2008:

> "There was some benefit I think in the weeks prior to Lehman to keep our hands, you know, a little bit up to the vest in terms of what we were willing and able to do. That being said, let me just state this as unequivocally as I can. As you know, before I came to the Fed Chairmanship I was an academic, and I studied for many years the Great Depression, financial crises, and this is my bread and butter. And I believed deeply that if Lehman was allowed to fail, or

[254] According to Bernanke, key contacts and outlets included Jon Hilsenrath of the Wall Street Journal, Greg Ip of the Economist, Krishna Guha of the Financial Times, Neil Irwin of the Washington Post, John Berry of Bloomberg, Steve Liesman of CNBC, and Ed Andrews of the New York Times. All of them feature frequently in the respective calendars published for Bernanke and Geithner during 2008 (see *Central bank information gathering during the GFC*).

[255] John Cassidy, '*Anatomy of a Meltdown*', The New Yorker, 23.11.08.

> did fail, that the consequences for the U.S. financial system and the U.S. economy would be catastrophic".[256]

On several occasions during the GFC, these features helped to shape the Fed's policy response: In March 2008, one key concern for Bernanke was that with the Fed's support of the acquisition of Bear Sterns by JPMorgan, and the establishment of the PDCF, this might have "build expectations that we had the will and the means to prevent the failure of the other investment banks" (Bernanke, Geithner et al. 2019). This went so far that Bernanke reportedly reacted to a critique from former Fed chairman Paul Volcker about the Bear Stearns rescue by calling him and reasserting that this operation was exceptional, and would not serve as a template for further 'bailouts' of Wall Street investment banks.[257] In the FOMC meeting on March 18, 2008, Tim Geithner expressed this fundamental balance and his concerns with respect to the tri-party repo market, one of the most important sources of short-term funding:

> "The hardest thing in this balance now is to try to do something that doesn't increase the incentives so that we become the counterparty to everybody. We're trying to make sure that it's a backstop, but not a backstop that's so attractive that they come, and that's going to be a very hard line to walk. I say that Bill, because, just to lower expectations, the necessary cost of the choice we've made is that we're going to take the risk that we end up funding a bunch of stuff like that, and the commitment to do that is the only way this helps. It is very hard to know. Again, even if confidence holds, there is a reasonable probability that some of that stuff is just going to have to move into different forms and other hands, and that could be a delicate transition, particularly if people read into that a broader loss of confidence in this stuff".[258]

While the Fed used the signalling effect of its actions to try to reaffirm its support for the financial system, even in several cases without revealing new fundamental information, it was explicitly conscious of the perception and expectations its policy and support decisions would signal to financial markets. Richard Fuld, CEO of Lehman Brothers, trying to justify his perception that the Fed could have saved Lehman and that it was a conscious decision to force Lehman into bankruptcy,

[256] Ben Bernanke, '*FCIC Official Transcript*', Hearing on 'Too Big to Fail', 02.09.10, p. 22; available online: *https://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/2010-0902-Transcript.pdf*.
[257] Cassidy, *Anatomy*, 23.11.08.
[258] Tim Geithner, '*FOMC Meeting Transcript*', 18.03.08, p. 10; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080318meeting.pdf*.

would state in his testimony before the FCIC in 2010 with regard to the effects of the Fed's intervention in the case of Bear Stearns, the setup of the PDCF, and the expectations this created in financial markets:

> "Still, having acted, the intervention of the federal government set a precedent in the marketplace that impacted liquidity, capital formation and the expectations of creditors and stockholders for at least the next six months. At the same time, the federal government and the individual regulators involved were criticized for using taxpayers' money to rescue a financial company, which then set another precedent of how "not" to handle the next problem".[259]

This phenomenon, already observed in the first case study, is discussed in the concluding section.

As the fourth point regarding information broadcasting, the GFC saw unprecedented levels of coordination in the response of major central banks to the financial (and subsequently economic) downturn. In this context, attention has been given in the academic discourse to the importance of currency swap lines extended by the Fed in order to supply major central banks around the world with USD reserves and prevent a shortage of dollar liquidity (Goldberg, Kennedy et al. 2011, Tooze 2018, Schenk and McCauley 2020). However, these efforts also represented the outcome of increased coordination in central bank information broadcasting, which for the announcement of currency swaps had culminated in discussions within the FOMC in the meeting on September 16, 2008, regarding the best way to a joint broadcasting of the potentially limitless swap lines.[260]

On September 26, 2008, Fed chairman Bernanke called his counterparts Jean-Claude Trichet (ECB) and Mervyn King (BoE) to suggest an unprecedented move to send a united signal to markets railed by the collapse of Lehman Brothers the week before and the near collapse of AIG: a coordinated interest rate cut by the world's major central banks (King 2016). Besides the fundamental information associated with interest rate cuts by central banks, this move was

[259] Richard Fuld, '*Written Statement Of Richard S. Fuld, Jr*', FCIC, 01.09.10, p. 2; available online: *https://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/2010-0901-Fuld.pdf.*
[260] See discussion between Jeffrey Lacker and Bill Dudley, '*FOMC Meeting Transcript*', 16.09.08, pp. 13-15; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080916meeting.pdf*.

decisively also designed as a signal to markets, and required substantial coordination, especially as in the end on its announcement on October 8, the Swiss National Bank, the Bank of Canada, the Sveriges Riksbank and the Bank of Japan had joined in the action.[261] Bernanke's rationale in coordinating the move is described by him very much focused on the signal this action would send to financial markets in the US and around the world, as he briefed the FOMC on October 7, 2008, about the negotiated action and the positive signal this could send to financial markets:

> "We have the opportunity to move jointly with five other major central banks, and I think the coordination and cooperation is a very important element of this proposal. First of all, again, I mentioned before the lurching and the lack of coordination among fiscal authorities and other governments. I think it would be extraordinarily helpful to confidence to show that the world central banks are working closely together, have a similar view of global economic conditions, and are willing to take strong actions to address those conditions".[262]

Responding to Bernanke, Charles Plosser underlined that the action per se, a cut by 50 basis points, would not be a meaningful contribution in the short-term especially for increasingly deteriorating credit markets, and that it "won't be felt in the real economy for some time", but the signal from such a step might still "provide some solace to the markets" and the "coordinated effort might be helpful".[263] A similar coordination on information broadcasting at the height of the banking crisis can be observed only two days later, at the G7 meeting of finance ministers and central bank governors in Washington, DC. Under the leadership of Bernanke, Paulson and Mervyn King, the G7 finance ministers and central bank governors decided against the standard "arcane jargon and diplomatic caveats that characterized most communiqués", and opted for a straightforward and decisively worded statement (King 2016, Bernanke, Geithner et al. 2019). The final document, duly published on October 10, laid out the agreed upon plan in plain wording on half a page, detailing the conviction by the G7 members among other steps of international

[261] See '*FOMC statement: Federal Reserve and other central banks announce reductions in policy interest rates*', 08.10.08, available online: *https://www.federalreserve.gov/newsevents/pressreleases/monetary20081008a.htm.*
[262] Ben Bernanke, *'FOMC Conference Call Transcript'*, 07.10.08, p. 14; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20081007confcall.pdf*.
[263] Charles Plosser, *'FOMC Conference Call Transcript'*, 07.10.08, p. 17; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20081007confcall.pdf*.

cooperation to "use all available tools to support systemically important financial institutions and prevent their failure", as well as "take all necessary steps to unfreeze credit and money markets and ensure that banks and other financial institutions have broad access to liquidity and funding".[264]

Central bank information gathering during the GFC

Regarding the information gathering side of central banks' information strategy during the height of the GFC, both remarkable changes and persistence can be observed. First, there was a clear focus in policymakers' statements on the significant importance of personal relationships and soft information gained through these ties during the uncertainty in financial markets, as is emphasized by Bernanke, Geithner and Paulson in their joint memoir:

> "our Bloomberg terminals didn't have all the information necessary to understand the growing risks in the market. We were on the phone constantly with our counterparts in other agencies and other countries (…) We had to sort through all the confusion and self-interest and decided what was in the public interest" (Bernanke, Geithner et al. 2019).

And indeed, looking for example at the phone logs and calendars published by the US Treasury and the Fed for Bernanke, Geithner and Paulson, and supplemented by FoI requests from *AP* and *The New York Times*, there was, as could be expected, a frenzy of calls and meetings around events such as the Bear Sterns rescue, or the Lehman collapse and AIG rescue.[265] On the staff level, the transcripts of exchanges between New York Fed officials and Barclays bank throughout October 2008, which were publicised in the wake of the LIBOR scandal in 2012, portray exactly the kind of soft information described by Bernanke *et al*.: Officials were inquiring Barclays trading staff not

[264] See '*G7 Finance Ministers and Central Bank Governors Plan of Action*', 10.10.08, Washington DC, available online through the G7 Research Group at the University of Toronto: *http://www.g8.utoronto.ca/finance/fm081010.htm.*

[265] See Ben Bernanke, '*Chairman Bernanke's Schedule - 2008*', FRASER, Federal Reserve Bank of St. Louis; available online: *https://fraser.stlouisfed.org/title/chairman-bernanke-s-schedule-5196?browse=2000s#529144*; see also '*Geithner's Calendar at the New York Fed*', made available through The New York Time; available online: *https://www.nytimes.com/interactive/projects/documents/geithner-schedule-new-york-fed#document/p1*; and Noam Schreiber, '*Explaining Geithner's Call Log*', The New Republic, 09.10.09; available online: *https://newrepublic.com/article/70113/explaining-geithners-call-log*.

about specific issues, but about "market colour", how well funding markets were working in their assessment, and how hard or easy it was to find counterparties for trades.[266]

Yet, policymakers were required to identify the reliable parts of this kind of soft information reported to them through these contacts. Despite all the innovation in information systems, personal contact and the information derived through this channel remained a fundamental necessity for information acquisition during the crisis. For Tim Geithner, during the most critical part of the GFC in late 2008, this meant a marathon of phone calls and meetings, yet with a clear focus not necessarily on the biggest, or most troubled institutions (direct exchanges for example with Wells Fargo or Bank of America are strikingly rare), but with institutions and executives that he had previously established close working relationships with, such as Larry Fink, Robert Rubin, Lloyd Blankfein, and Jamie Dimon.[267] The difficulty of this approach to reliable information acquisition during times of crisis can be observed looking at the case of Lehman Brothers: The phone logs and calendar of Tim Geithner indicate that, as the "Fed's principal contact" (Bernanke 2015) with Lehman CEO Richard Fuld, he spoke with Fuld at least 50 times between April and September 2008, emphasizing the time commitment necessary for only one (albeit systemically important) financial institution, and due to this limit on scalability of information gathering the necessity for selection and focus.[268]

These interchanges at the top executive level between regulators and market participants represent a continuous feature during the height of the GFC, and are supplemented by a large number of stories and anecdotes when critical information was related to central banks through tips and hints from financial analysts, hedge fund managers, and senior banking staff (see e.g.,

[266] See '*Unofficial transcript of a telephone call between Barclays and NY Fed*', NY Fed, 10.10.08, p. 1; available online: *https://www.newyorkfed.org/medialibrary/media/newsevents/news/markets/2012/libor/October_10_2008_transcript.pdf*; '*Unofficial transcript of a telephone call between Barclays and NY Fed*', NY Fed, 24.10.08, pp. 1-3; available online: *https://www.newyorkfed.org/medialibrary/media/newsevents/news/markets/2012/libor/October_24_2008_transcript.pdf*.
[267] See NYT, *Geithner's Calendar*, pp. 546-644; Shahien Nasiripour, '*Geithner has phone friend at BlackRock*', Financial Times, 11.10.12; Schreiber, *Geithner*, 09.10.09.
[268] See NYT, *Geithner's Calendar*, pp. 390-545; Schreiber, *Geithner*, 09.10.09

Geithner 2014, Bernanke 2015, King 2016). This focus on (at least partially) 'trusted' sources of soft information is perceived by policymakers as even more crucial when assessing significant changes to business fundamentals during financial crises, best illustrated at the example of valuing firm assets and solvency during the height of uncertainty in the case of Lehman Brothers. Even at his testimony in front of the FCIC, Lehman CEO Richard Fuld stated repeatedly that "Lehman Brothers was not a bankrupt company", contrary to the Fed's assessment at the time of 'Lehman-weekend', which in his view was based on "flawed information", and Lehman could have stayed in business if the Fed had provided the necessary liquidity, as it had a "strong equity position (…), financeable collateral and solidly performing businesses".[269] In the case of Lehman Brothers bankruptcy, it was the market pressure built-up in the weeks prior to Lehman weekend based on an established "Wall Street consensus" that Lehman Brothers would collapse, which was repeatedly reported to senior Fed staff, that helped to shape the Fed's conviction that a run on Lehman's remaining assets could not be sustained, and therefore any help that the Fed could provide would only result in "lending against a run".[270] However, new research by Laurence Ball suggests that in fact Lehman did have the necessary collateral to warrant a Fed loan for example through the PDCF, which would have been sufficient to cover its liquidity needs, and that, even accounting for inflated asset prices on Lehman's balance sheet, the company was solvent more likely than not (Ball 2018, Chari 2022).

Yet another example of this can be observed a few months later in February 2009, when the FOMC discussed the further parts of the new Obama administration's financial stability plan beyond the SCAP. Ben Bernanke highlighted the feature of this soft information gathering for supervisory purposes as going hand-in-hand with additional measures to gather hard information on bank lending, where soft information was necessary for the Fed to evaluate an 'unknown baseline' for lending:

[269] See '*Written Statement of Richard S. Fuld, Jr. before the Financial Crisis Inquiry Commission*', FCIC, 01.09.10, pp. 1-2; '*Dick Fuld Follow-Up*', FCIC, 14.10.10, p. 1; '*Financial Crisis Inquiry Commission Official Transcript*', FCIC, 01.09.10, pp. 154-156; available online: *http://fcic.law.stanford.edu/*.
[270] See testimony by Ben Bernanke, '*FCIC Official Transcript, Hearing on Too Big to Fail*', 02.09.10, p. 81; available online: *http://fcic.law.stanford.edu/*.

> "[commercial banks & BHCs] would provide detailed information about their lending on a monthly basis, as well as a 'qualitative description of the lending environment.' So this is an attempt to finesse the difficulties of measuring lending against an unknown baseline, but there will be some reporting requirements (...) This is obviously a very difficult issue and one in which the supervisors will have to play a role, because we'll have to help mediate issues about when banks should be lending more and when we think that doing so is not consistent with safety and soundness".[271]

Second, a common feature of central bank support operations during the GFC was the concentration of events and solutions for struggling financial institutions around certain weekends, bringing chief decision-makers from public and private institutions together, such as the 'Lehman' weekend on September 13/14th of September 2008, or the 'Bear' weekend on 15/16th of March 2008. The testimony in front of the FCIC by Scott Alvarez, general counsel to the Board of Governors at the Federal Reserve during the GFC and highly involved in discussions and design of the Fed's interventions during the crisis, emphasizes the short time frame over the Lehman weekend that supervisors and regulators, with assistance from private institutions, had to gather appropriate information and find solutions:

> "Witness Alvarez: So there was no time to write a legal opinion on the Lehman weekend. Everything happened incredibly quickly. In the space of this hearing we were dealing with all of the collapse of Lehman. So there wasn't time for that.
>
> Chairman Angelides: (…) I know that the private consortium went in and obviously was trying to value the assets of Lehman (…) I know that there was valuation, but of course they're doing it in a compressed time frame (…) did the Fed ever do a collateral analysis? Did anyone in the Federal Government? I've never seen a collateral analysis.
>
> Witness Alvarez: I would point out that also for Lehman Brothers, unlike Wachovia, we weren't the supervisor. So we didn't have the access to information or the understanding of the company in the same way we do of Wachovia where we are the supervisor".[272]

[271] Bernanke, *FOMC Conference Call*, 07.02.09, p. 10.

[272] Scott Alvarez, '*FCIC Official Transcript, Hearing on Too Big to Fail*', FCIC, 01.09.10, pp. 41-42; see also further testimonies before the FCIC in same meeting, '*Statement by Thomas C. Baxter Jr. Executive Vice President and General Counsel FRBNY*', FCIC, 01.09.10, p. 5; '*Testimony of Harvey R. Miller*', FCIC, 01.09.10, pp. 4-11; available online: *http://fcic.law.stanford.edu/*.

It can be argued that this phenomenon was driven by the urgency created through institutions that were faced with a bank-run, a drain on their liquidity due to adverse market conditions and increasing concerns about their solvency in a market with plummeting asset values, and thus a solution was more likely to be found over a final weekend as parties to the operation are pressed to make harder choices before markets outside the US opened for trading. But, from the perspective of internal information diffusion during the GFC, there is a point to be made about the effect of these rescue weekends for bringing 'all the facts' about the individual rescues together for a joint information basis. It is telling, that during the Lehman weekend, the sum that was initially indicated to be needed by Lehman to fund its business had, after reviews and independent analyses from different investment bank staff involved, increased significantly to $60-$70 billion.[273] Lehman's reported asset valuation were considered by both Fed staff and private analysts during the weekend leading up to September 15, 2008, as significantly inflated, "even allowing for the likelihood that fire sales and illiquid markets had pushed the values of its assets to artificially low levels" (Geithner 2014, Bernanke 2015).[274]

The flip side of this view, the lack of sufficient information during the height of rescue operations for specific companies, can also be seen in the support negotiations for Citigroup in November 2008, when, in the words of Ben Bernanke in his memoir,

> "Citi was maddeningly slow in responding to our requests for information, further reducing our confidence in the company's management while senior staff from the Fed, Treasury, FDIC were trying to assess Citi's capital needs and the options available for its rescue" (Bernanke 2015).

As Sheila Bair, head of the FDIC, summarized the situation in an e-mail conversation with Bernanke and other senior regulators: "Can't get the info we need. The place is in disarray. How can we guarantee anything if Citi can't even identify the assets?" (Bernanke 2015).

[273] See Thomas Baxter, '*FCIC Official Transcript, Hearing on Too Big to Fail*', FCIC, 01.09.10, pp. 185-186; available online: *http://fcic.law.stanford.edu/*.
[274] For an extensive description of private sector support in gathering and assessing information regarding Lehman Brothers see Bernanke, *FCIC Official Transcript*, 02.09.10, p. 81-83.

Again, as in the case of the BoE during the fringe banking crisis, this short-term reliance on private sector institutions and experts for information gathering and processing is not surprising per se; but the extent and frequency to which major policy choices and interventions were shaped by this workaround seems remarkable. Yet, central banks could also rely on previously established task forces and working groups, bridging the internal information gap between departments, as for example a 'financial-stability working group' was established by Ben Bernanke at the Fed in 2006, comprised of 'economists, finance specialists, bank supervisors, and lawyers' from different internal departments, which would significantly shape the Fed's policy formulation and with which Bernanke 'met frequently' during the height of the crisis.[275]

Third, central banks and regulators especially in the US took significant actions to establish a joint information basis and share information about institutions and developments posing risks for the financial system. The dispersed regulatory framework in the US prior to the GFC has often been cited by academics and policymakers as a contributing factor to the severity of the crisis, primarily as there was no one regulatory agency bundling the individual information gathered by separate regulators such as the Fed, the FDIC, the SEC, the CFTC, the OCC and the OTS, and looking out for systemic risks.[276] However, in several instances it was only after new legislation or programs were established that especially the Fed was able to acquire all necessary and relevant information needed to properly judge a situation, as Ben Bernanke described in his testimony to the FCIC:

> "A lack of statutory authority carried with it a lack of information. Shadow banks that were unregulated were not required to report data that would adequately reveal their risk positions or practices. Moreover, the lack of pre-existing reporting and supervisory relationships hindered systematic gathering of information that might have helped in the early days of the crisis".[277]

In the same testimony, Bernanke further emphasized that it was only well into the crisis, after the rescue of Bear Sterns, "when it was evident that some important financial institutions

[275] Cassidy, *Anatomy*, 23.11.2008.
[276] See '*Final Report of the National Commission on the causes of the Financial and Economic Crisis in the United States*', FCIC, January 2011, Preface, p. xviii; available online: *http://fcic.law.stanford.edu/*.
[277] See '*Statement by Ben S. Bernanke, Chairman Board of Governors of the Federal Reserve System before the Financial Crisis Inquiry Commission*', 02.09.10, p. 13; available online: *http://fcic.law.stanford.edu/*.

were under a lot of stress", yet this triggered a push for cooperation and coordination between agencies to expand information sharing: "the Fed, the Treasury, and to some extent the FDIC and other agencies, were then coming together to try to think about how to address them".[278]

The examples of the PDCF, which allowed Fed staff access to investment bank information when they wanted to borrow from the facility, and the Housing and Recovery Act of 2008, which provided access to the books of Fannie Mae and Freddie Mac, emphasize the critical point of dispersed regulatory information acquisition from the Fed's point of view. Already in the FOMC discussions about the new PDCF in March 2008 between Charles Evans, president of the Chicago Fed, and Tim Geithner, acquiring adequate information about broker-dealers that the Fed would be lending to was raised as a key concern of the operation of the new facility, since even their primary supervisors often had limited information:

> "Mr. Evans: If we decide that there is a broker–dealer that we can't allow to enter into this program and then it ends up not doing very well and going under, is there some type of risk that we are taking on by hastening that in making that determination? Do we have the right information to take that action?
>
> Vice Chairman Geithner: I agree that we face that risk. As many of us have learned over the past six to nine months, even the primary supervisors of these institutions have limits around their capacity to understand in real time what is actually happening".[279]

Yet, there were also perceptible obstacles within the administrative and regulatory bodies regarding information diffusion and sharing between agencies, which would only be resolved through the establishment of clear rules and a mutual understanding of the importance to maintain cooperation of all involved parties. After the Bear Stearns rescue and the establishment of the PDCF, the Fed started to send supervisory staff to the remaining investment banks in April 2008, yet at first the cooperation with the SEC as the primary supervisor "was bumpy", as there was reluctance "to share what they [the Fed staff] learned" to keep the investment banks cooperative (Bernanke 2015). To resolve this, SEC Chairman Christopher Cox and Ben Bernanke negotiated a

[278] Ibid. p. 55.
[279] Charles Evans and Tim Geithner, *'FOMC Conference Call Transcript'*, 10.03.08, p. 18; available online: *https://www.federalreserve.gov/monetarypolicy/files/FOMC20080310confcall.pdf*.

memorandum of understanding that was published on July 7, 2008, emphasizing not only the importance of information sharing between agencies under the changed circumstances of the financial crisis, but also how this became necessary with the "dividing lines between commercial and investment banking" becoming less clear-cut:

> "the SEC and the Board would share information and cooperate across a number of important areas of common interest including (…) bank brokerage activities under the Gramm-Leach-Bliley Act, clearance and settlement in the banking and securities industries, and the regulation of transfer agents (…) It builds on and formalizes the long-standing cooperative arrangements between the SEC and the Board, as well as the more recent cooperation on matters including banking and investment banking capital and liquidity following the Board's emergency opening of credit facilities to primary dealers".[280]

This represents only one example, yet similar arrangements were put in place in the summer of 2008 between the SEC and the CFTC, and the SEC and the US Department of Labor.[281] As James Lockhart, Director of the FHFA, testified in Congress on September 23, 2008, the Fed cooperated in the changing crisis environment after the Bear Stearns rescue with different regulators and government agencies, such as the FHFA, the OCC, and the Treasury, to establish a joint perspective on systemically critical cases such as the GSEs:

> "I shared our growing concerns with Federal Reserve Chairman Bernanke, who was made our consultant in the law you passed in July, and with Secretary Paulson (…) It became apparent during this intense supervisory review that began in July that market conditions were deteriorating much more rapidly than anybody expected. We supplemented our examination team with senior examiners from the Fed and the OCC".[282]

However, even with this new cooperation, information sharing between regulatory agencies remained unsatisfying for some of the involved parties, and some of the testimonies before Congress or the FCIC must be taken with a grain of salt here. Sheila Bair highlighted in an

[280] See SEC & FRB press release, '*Federal Reserve and SEC issue memorandum of understanding to deepen information sharing and cooperation*', 07.07.08; available online: *https://www.sec.gov/news/press/2008/2008-134.htm.*
[281] Ibid.
[282] James Lockhart, '*Statement of James Lockhart III, Director, Federal Housing Finance Agency*', Hearing before the US Senate Committee on Banking, Housing and Urban Affairs, 23.09.08, p. 29.

extensive retrospective interview after departing from the FDIC in July 2011, reflecting on the FDIC and its cooperation especially with the Fed and Treasury during the GFC:

> "They always had the view that the F.D.I.C. was not in the same league as Treasury and the Fed (…) As a result, we were rarely consulted. They would bring me in after they'd made their decision on what needed to be done, and without giving me any information they would say, 'You have to do this or the system will go down.' If I heard that once, I heard it a thousand times. 'Citi is systemic, you have to do this.' No analysis, no meaningful discussion".[283]

Even though she might have had a different experience than her colleagues during the rescue operation and had her own intentions with this extensive retrospective interview, the picture appears less rosy than sometimes drawn. At the same time, internal information diffusion for consensus building within the Fed became a central element in its policy at the height of the crisis, as can be seen by the efforts to coordinate between the Fed Board and the presidents of the individual reserve banks after the Lehman collapse. Michelle Smith, chief of staff and press secretary to Bernanke, suggested to him to brief the FOMC "by videoconference", as the presidents of the individual Federal Reserve Banks had been "asking for more information" and were "besieged by press inquiries", to which Bernanke agreed "to get both useful advice and greater buy-in", yet in his words also "felt a tension" as "during this most intense phase of the crisis (…) the need to move quickly often trumped the benefits of board consultation" (Bernanke 2015). As Scott Alvarez pointed out in his FCIC testimony, the intra- and inter-agency information diffusion would also be a key driver in the establishment of the 'Financial Stability Oversight Council' in the US through the Dodd-Frank reforms, through "a council that brings together regulators of different markets and different institutions so that gaps and systemic implications can be observed, and can be monitored", where previously there was "no regulator in the banking area that [was] granted that kind of authority and oversight".[284]

[283] Joe Nocera, '*Sheila Bair's Bank Shot*', The New York Times, 09.07.11.
[284] Alvarez, *FCIC Official Transcript,* p. 30

Fourth, as the establishment of the FSOC in the US shows, there were several changes to the supervisory structure especially in the US regarding the areas of internal information sharing and diffusion between regulators in the financial system, which persisted or were even implemented after the GFC. Bernanke, Geithner, and Paulson all advocated for the establishment of a joint oversight council, in order to fill the information gap created by the dispersed supervisory framework prior to the GFC, as Ben Bernanke testified in closed session to the FCIC on November 17, 2009, yet still advocated for maintaining the specialised supervisory structure:

> "So I would prefer having a systemic risk council which is responsible for the overall system and looks for emerging risks and coordinates and shares information, et cetera, et cetera. But underneath that, you've got specialists".[285]

With the passing of the Dodd-Frank Wall Street Reform and Consumer Protection Act on July 21, 2010, the new FSOC would be established as a regular vehicle for information sharing and diffusion between regulators and monitoring systemic risks to the financial system.[286] Even further, the new reform specifically gave the Fed the power to gather information about non-banking financial firms, for which the popular metaphor shadow banking already describes their obscurity and limited information available about their business. The Fed got this power in the case that these institutions are considered to pose a threat to financial stability, and if this information could not be obtained by other members of the council, 'discussions with management, and publicly available information'.[287]

However, there are other instances of persistent changes to supervisory frameworks regarding information acquisition after the crisis, as the continued application of 'stress tests' and their release of information highlights (Gorton 2015). After the application of stress tests in the

[285] See '*Financial Crisis Inquiry Commission, Closed Session, Ben Bernanke, Chairman of the Federal Reserve*', 17.11.09, p. 80; available online: *http://fcic.law.stanford.edu/*.
[286] See '*Dodd-Frank Wall Street Reform and Consumer Protection Act*', Public Law 111–203, 21.07.10, available online: *https://www.govinfo.gov/content/pkg/PLAW-111publ203/pdf/PLAW-111publ203.pdf*.
[287] *Dodd-Frank Act*, 21.07.10, Sec. 112.

wake of the Bear Stearns rescue in 2008 by the Fed,[288] and subsequently in early 2009 with the SCAP programme to overcome remaining uncertainty in the financial system about banks' viability, Bernanke emphasized in front of Congress and the FCIC the continuity of the lessons learned from SCAP for further use by the Fed:

> "Building off of the Supervisory Capital Assessment Program (SCAP), the Federal Reserve will conduct periodic supervisory stress tests and scenario analyses across the largest firms to identify the potential impact of possible adverse changes in the economy and financial markets. These efforts will be coordinated with and include participation of other federal banking regulatory agencies, where applicable, and will serve a number of purposes, including identifying firm-specific and financial system vulnerabilities and developing horizontal perspectives on key risk exposures."[289]

Standardized stress tests have become a widespread tool by central bankers in multiple countries to enhance their information acquisition regarding systemic risks in their respective national financial system, with the BIS even setting out specific guidance and support in creating the parameters and methodology of these tests.[290] Although national regulatory agencies and central banks to leverage differing methodologies and either publish only the results of the stress tests or also the parameters applied,[291] this development and the movement towards its standardisation through the Basel committee highlights the perceived importance of this tool in the post-GFC supervisory framework regarding information acquisition and diffusion.

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[288] Stress tests have been used before the GFC already, yet were either non-mandatory, or left to individual institutions to assess their performance under self-selected parameters. A comprehensive, comparable stress test guided and challenged by supervisors was in fact the main differentiating factor to those tests established during the GFC in the US; see e.g., BIS, '*Principles for sound stress testing practices and supervision*', May 2009, pp. 1-5; available online: *https://www.bis.org/publ/bcbs155.pdf*.

[289] Ben Bernanke, '*Bernanke Follow Up*', FCIC, 01.11.10, p. 6; available online: *https://fcic-static.law.stanford.edu/cdn_media/fcic-testimony/TBTF/Chairman%20Bernanke%20Follow%20Up.pdf*.

[290] BIS, *Principles*, p. 8f; see also BIS, '*Basel Committee on Banking Supervision, Supervisory and bank stress testing: range of practices*', December 2017, pp. 4-9; available online: *https://www.bis.org/bcbs/publ/d427.pdf*.

[291] See for example speech by Elizabeth McCaul, Member of the Supervisory Board of the ECB, '*The evolution of stress testing in banking supervision*', Frankfurt a.M., 10.12.21; available online: *https://www.bankingsupervision.europa.eu/press/speeches/date/2021/html/ssm.sp211210~333effaef3.en.html*.

Intermediate conclusion – information gathering and broadcasting during the GFC

Central elements already emphasized in the previous section and chapters feature prominently in the analysis of this section. As in the case of the BoE during the secondary banking crisis, the continued debate about publicizing critical information on support measures to restore confidence (public) while keeping identities and support for individual institutions opaque (private), and the changes over time in this as seen at the example of the stress tests was a key element in the Fed's information strategy. At the same time, the importance of soft information gathering with its advantages regarding timely provision of context has been highlighted along several examples, such as Ben Bernanke's and Timothy Geithner's calendars and phone logs. This section argued that during the GFC, central bank information strategy, both information gathering and broadcasting, by leading Western central banks such as the Fed was a key part of their respective response to contain the almost unprecedented turmoil in financial and banking markets.[292] The analysis of the Fed's information strategy during the GFC reveals central persistent as well as adapted aspects in their crisis response compared to normal times.

In terms of information broadcasting, the Fed's (and BoE's) opacity about crisis support measures for individual institutions was continuously prevalent, which has to be brought into relation with the switch to increased information diffusion and openness to calm markets through the implemented stress tests in early 2009. Timing in the changing information environment of the crisis appeared to be a critical determinant of the (non-)disclosure of information about individual support measures, with opacity and transparency both representing viable policy tools at different stages. At the same time, central banks at the height of the GFC opted for changes in their style of information broadcasting, focusing on trusted communication channels and more frequent communication to impose stability. In this context, announcements with strong signalling effects

[292] The same argument might be made for other central banks such as the ECB, as the FOMC discussions regarding the broadcasting of central bank dollar swap lines in September 2008, and the international coordination of interest rate cuts and their joint announcement, as well as the G7 statement negotiations in October 2008 suggest, even though, due to the limited space of this thesis, this could not be covered extensively.

even without revealing new or fundamental information appear to have been perceived as alleviating uncertainty in financial markets. Regarding the broadcasting of their support for individual institutions and thereby building expectations about similar efforts for other troubled institutions, the Fed's deliberations were very much focused on not creating a 'blank cheque' and raising expectations about universal bailouts. This emphasized the resurfacing moral hazard concerns – even though in the case of Lehman Brothers, leading policymakers repeatedly affirmed ex post that they would have intervened given the legal possibility. The conflicting objectives of re-establishing financial stability while not creating moral hazard or indiscriminate support represented two ends of the spectrum the Fed's senior management continuously tried to balance both in its actions and its broadcasting. Finally, the GFC also propelled international cooperation, and even more the concerted broadcasting of this cooperation and joint efforts by central banks to a new level, as central banks coordinated their actions and communication thereof in unprecedented ways as the joint interest rate cuts, or the changes to the G7-communiqué highlight.

The Fed's approach to Information gathering changed markedly during the GFC. The newly established lending programs (esp. PDCF) allowed the Fed to gather detailed information about the previously unknown capital and liquidity positions of troubled investment banks. Furthermore, there is ample evidence of an intensification of information exchange, both between regulators such as the Fed, the SEC, the Treasury, and the FDIC, as well as with troubled institutions in financial markets at the height of the GFC. The renewed recourse to at least partially soft information gained from personal contacts and trust in counterparties' credibility over purely hard information on measures such as lending or liquidity during the increased uncertainty in financial markets has been emphasized as another central feature. As discussed in chapter 2, since hard information is often produced with a time-lag, soft information has a speed advantage during time of distress, that contributed to its increased use by Fed officials during the GFC. Corresponding to these changes were the central role that personal emergency meetings with key stakeholders played regarding

the rescue of Bear Stearns and AIG, as well as in the attempted rescue of Lehman Brothers in September 2008. These meetings were used not only to expedite decision-making, but also to establish a common information basis and to share information for these purposes, as well as a vehicle to commit credibly to finding solutions for these institutions. The establishment of the Financial Stability Oversight Council must be seen as a direct consequence of the necessity of sharing information between regulatory agencies so prevalent during the crisis, and was established as a persistent new form of government-internal information diffusion and aggregation on the missed-out systemic level.

4. Chapter Conclusion – central banks' crisis information strategy between 1973 and 2008

The two crises analyzed in this chapter, the BoE during the secondary banking crisis of 1973/74 and the Fed during the GFC of 2007/08, are situated in very different financial, economic, political, institutional, and especially 'informational' environments: the changes in central bank transparency and accountability over the period between the two case studies, paired with increased efforts by central banks in leveraging new communication and information channels, emphasize the significant shifts in central banks' information strategies. Yet, there are multiple themes and observations drawn in each crisis, that appear highly related in comparison to the other, especially regarding the characteristics and information types along the continuum of public and private, as well as soft and hard information. In both crises, central banks responded to changes in their 'information environment' through changes in their information broadcasting, i.e. by adopting more transparency regarding the publication of information and its diffusion in financial markets through various channels such as the financial press or personal networks. Both crises have highlighted the importance the BoE and the Fed placed on gathering additional information to supplement their decision-making process, in both instances expanding especially on soft information as a valuable addition to their informational intake. In both crises, central banks can be seen as deliberately choosing a certain information strategy, expressed in what this chapter

referred to as balancing between individual support measures and reassuring the financial system on the macro level without signalling unlimited support ('blank cheque'). Both crises show the persistence of changes made during the height of uncertainty in financial markets to supervisory frameworks regarding central banks' information gathering and broadcasting. And even though in 1973/74 the BoE did not refer to it in that way, the fear of central bank stigma played a decisive factor in shaping both the BoE's and the Fed's information broadcasting during the two crises.

At first glance, the similarities might be perceived as striking, especially considering them against the background of the fundamental changes in the nature of information in financial markets over the period that lies between those crises, with what economists point out as the shift from a system of soft information towards more hard information at the core of financial and banking markets (see chapter 2). There appears to be a remarkable persistence in the tendency of increased importance of soft information acquisition and diffusion by central banks during times of increased uncertainty in this chapter, as can be seen by the value both the BoE and the Fed placed in 1973/74 and 2007/08 on trusted information sources providing market perception and information to them. As this thesis argues, this points towards a pattern of what might be called a move in normal times to gathering more 'seemingly hard' information, that is increasingly questioned and substituted (or at least enhanced) by efforts to gather soft information in times of distress. The extent to which the BoE and the Fed sought outside help in gathering additional information and support in analysing and evaluating this information in an environment of increased volatility further emphasizes this point. For central banks, soft information has the advantage of speed in times of distress, as hard information is usually produced with a time-lag. Yet soft information can also be contradictory and harder to evaluate given the need to understand the context in which it was produced, making it necessary for central bankers to critically evaluate their soft information and factor this into their conclusions drawn from this source.

This chapter has highlighted several points regarding the interrelation between different kinds of information (public and private, soft and hard) and along the information process discussed

in chapter 2, mainly focused on information acquisition and diffusion (broadcasting) as the first and last step in this process (see chapter 2). Several points from this analysis are taken up again in the overall conclusion to this dissertation, discussing them along the theoretical framework of chapter 2. Yet, the analysis in this chapter has also shed closer light on points that have been already mentioned in the broader academic work on central banks' information strategy during banking crises compared to normal times. Despite the development of stress tests as a tool to enhance transparency and reveal additional information in order to remove uncertainty from the financial system in normal times, Gorton pointed out: "While in noncrisis time central banks trended towards increasing transparency, during crises information is suppressed", while also asserting that the release of information through stress tests poses a remarkable conundrum for this observation (Gorton 2015). Close examination of central banks' choices between opacity and transparency in the respective 'information environment' is fundamental to address this conundrum. Timing within the period of high uncertainty appears to be central to the answer and is discussed at length in the final conclusion, taking into account the findings of the other analytical chapters. Previous research on banks' (and central banks') choice for opacity over transparency rarely deal with this dynamic relationship (see e.g., Berger and Davies 1998, Hellwig 2004, Diamond and Kashyap 2016).

Chapter 5 – Credit ratings, CRA's and the 'use of information' in financial crises

Chapter 3 engaged with information suppliers in financial and banking markets, the changing development of this market over time and during crises. One central theme drawn out is the focus of firms such as Reuters and Bloomberg to integrate information in a 'proprietary' way to enhance the private attributes of otherwise public information, even though access remained non-discriminatory and thus not fully private. Chapter 4 analyzed central banks' information strategy at the examples of the Bank of England in 1973/74 and the Fed during the GFC in 2007/08. Again, the continuum of public and private information regarding the broadcasting of information played a central role in this analysis, as did the focus of soft information gathering during episodes of increased uncertainty for these supervisors. Chapter 5 looks at a particular form of information intermediaries, distinct from the firms engaged with in chapter 3 through their regulatory interlinkages and the use of their ratings in standard setting for financial and banking markets: credit rating agencies (CRAs). Several of the themes followed throughout this dissertation are at the core of the analysis in this chapter. For example, information types, especially regarding the dichotomy of soft and hard information, feature prominently as the choice of focus for CRAs in different rating segments for these different archetypes relates directly to the scalability of their operation, and thus to the structure of the rating agency market in sub-sectors. One particular example are financial and insurance ratings, with niche players focused on scalable hard information for their ratings process, compared to sovereign ratings, which include more soft information characteristics in the ratings process. Overall, this chapter sheds light on three core themes related to the theoretical and empirical analysis in chapters 2 to 4: the types of information taken into account by CRAs and the respective impact on the market structure of the credit rating market over time; the impact of regulatory entanglement on the functioning of information intermediaries; and the resulting changes to the informational value of credit ratings investors can derive from them over time and in times of distress.

Credit ratings and the firms that issue them play a fundamental role in today's economy and international financial system: CRAs assess the creditworthiness of institutions, organisations, and default risks for issuers of securities and individual issues themselves (Majnoni, Levich et al. 2002).[293] On the most fundamental theoretical level, credit rating agencies (CRAs) are information intermediaries: by compiling and condensing various information into a letter grade for creditworthiness, and distributing this condensed information to investors, they centralise a function that otherwise can be assumed as less efficient if every investor had to perform a similar analytical process. With regard to the theoretical framework of this project, CRAs gather and analyse hard *and* soft information, as well as public and private information to which they are granted access by the institutions they are rating within the rating process (Cantor and Packer 1994), and produce a comparative variable for the public use by investors. Similar to for example stock market analysts (through investor/analyst calls and management assessments), CRAs transform soft information for investors and (in combination with hard information) provide a seemingly easy-to-understand and use variable (thus scaling up soft information). By monitoring and adjusting their ratings according to new information or changes in the economic or financial circumstances of issuers on a continuous basis, CRAs provide an ongoing service for investors. As CRAs usually conduct analyses of various stress scenarios when assigning a rating, and claim their ratings are a long-term opinion of creditworthiness (Sinclair 2005), one could reasonably assume that from an informational perspective ratings would be of critical importance for investors during crises in financial markets, as ratings could be used as a shortcut to assess creditworthiness (and thus stability) of firms under constrained time to gather and assess information.

However, the informational value of credit ratings, both in normal times and during times of increased volatility and financial crises, is a contentious topic in the academic literature and in

[293] CRAs rate both issuers and issues – an issuer rating commonly refers to the overall creditworthiness of an institution to meet its financial obligations as they come due, while ratings for a specific issue is focused on a specific financial obligation (or class of obligations), taking into account the financial specifics of the issue such as collateral, currency denomination, or subordination.

financial markets. As section 2 of this chapter explores, the additional informational value of credit ratings during normal times over other 'market-based' indicators of creditworthiness, such as spreads on credit default swaps, has frequently been questioned, despite CRAs insisting on their track record in predicting company defaults (Partnoy 2002, Reinhart 2002, White 2002). Even more so, as section 4 of this chapter emphasizes, CRAs have been criticized repeatedly for the lack of additional informational value of ratings for investors during financial crises in the late 20th century and early 21st century. The allegations brought against CRAs range from ratings not conveying accurate information to investors (e.g., GFC), rating changes not being implemented in a timely manner (e.g., Enron), to extraordinary rating changes aggravating pressure in financial markets (e.g., Asian financial crisis). The seemingly contradictory claims of ratings both being too slowly adaptable in financial crises to be of value for investors, and rating changes aggravating these crises, highlight the diffuse debate about the informational value of credit ratings for investors, especially during times of crisis.

This debate has been overshadowed by the entanglement between credit ratings and their increasing use in financial and banking regulation especially since the 1970s. For the precursors of the modern CRAs, such as Henry Poor's famous 'Manual' (see section 1) in the late 19th and early 20th century, information provision for investors on securities was at the core of their business and the informational value of their products. Yet, at least since the changes in the 1970s, CRAs with NRSRO[294] status served a dual purpose. CRAs in theory are information intermediaries that can help alleviate information asymmetries for investors by providing reliable information on creditworthiness to all investors (albeit for a service fee), thus in a sense democratising information – highlighted by their origins in the growing American bond markets around the turn of the 19th to the 20th century (Chandler 2014). Yet since the expansion of the use of CRA's in regulation with the introduction of the NRSRO category in US federal regulation by the SEC in 1975 (see section 2 & 3),

[294] Nationally Recognized Statistical Rating Organization (NRSRO), the legal term for specifically designated CRAs established by the SEC and adopted in further US federal regulation since the 1970s.

they have also become information intermediaries for regulators, who are using their judgement of 'sound' credit to determine investment options for institutional investors. Regulatory requirements for obtaining credit ratings obscure the analysis of their informational value to investors, and create entry barriers into the CRA market (Reinhart 2002).

Institutional investors such as insurance and pension funds or money market funds in many major economies are required by national regulation to hold at least a proportion of their securities with a certain rating by recognised CRAs, commonly referred to as investment grade (Becker and Milbourn 2011). In the prolonged regulatory review process leading up to the design and implementation of Basel II, the BIS conducted several in depth reviews and analyses on the use of credit ratings in national financial and banking supervision, finding that out of 16 reviewed countries (G10 plus six further 'interested countries'), only two (Germany and Mexico) were not relying on CRAs in some form in their national regulation in 2000.[295] The first pillar of the Basel II framework of June 2004 and its revised form for implementation by national regulators of 2006 entailed risk-weights for commercial banks as based on Credit Rating Agencies' assessments ('Standardised Approach') as one of the two fundamental options for regulators to set risk-weighted asset calculations.[296]

This chapter addresses several gaps in the historical and economic literature on the development of credit ratings and credit ratings agencies as information intermediaries and provides substantive novel evidence on credit ratings, CRAs, and the structure of the credit rating market. First, it analyses the development of credit rating agencies and credit ratings since the early 1970s until the GFC, bringing together existing and new qualitative and quantitative evidence from various sources, such as the SEC, the FCIC, the BIS, and newspaper archives, as well as CRAs themselves, to show the fundamental changes in these institutions and the rating products they

[295] For an overview of the different use of NRSROs in national regulation of the G10 and interested countries from the BIS survey in 2000 see Appendix 6; for a partial list of significant credit-ratings based regulation in the US in the 20th century see Appendix 7.

[296] See BIS, '*International Convergence of Capital Measurement and Capital Standards*', revised framework comprehensive version, BIS, June 2006; available online: *https://www.bis.org/publ/bcbs128.htm*.

provide from an informational perspective. Existing literature on credit ratings and CRAs is focused almost exclusively on the story of the Big-3 major rating agencies (Standard & Poor's, Moody's Investor Services, and Fitch Ratings) but during this fast-changing period, the rise and change of smaller competitors, such as LACE Financial Corporation, A.M. Best, or Egan-Jones Rating Company, with contrasting business models and varying focus on niches in the ratings' market, emphasize the evolving dynamics in a market that is often characterized as rigid and lacking competition.

Second, this chapter shows how financial crises, especially the Asian financial crisis, the collapse of Enron, and the GFC at the end of the 1990s and early 2000s, were essential catalysts in shaping the credit rating market and led to profound changes in the role and informational value of credit ratings, and the CRA market, yet the underlying ideas and debates for regulatory reform were already well under way when these crises struck. It was the different financial crises and high-profile collapses that finally triggered action by regulators in the US and internationally, in ways that had already been debated in the 1990s.

Third, this chapter focuses on the different informational value of ratings for market participants and investors during one significant case study, the collapse of Lehman Brothers in 2008. This analysis tests if different forms of ratings ('solicited ratings' implying private information versus 'unsolicited ratings' based solely on public information) are associated with differences in stock price volatility for issuers in a newly constructed dataset for publicly traded companies on the NYSE, the LSE, and the Deutsche Börse in September 2008. By including further data points that might affect the information available on public companies such as stock analyst coverage, this analysis provides insights into the use and reliance upon available information by investors during times of increased uncertainty and volatility.

This informational value of credit ratings and the role of information during times of distress in financial markets is investigated in section 4 of this chapter. A multitude of distinctions exists between different kinds of ratings, such as short-term and long-term ratings, or issuer and issue ratings. One distinction that is frequently drawn in academic and policy debates on the

informational content of ratings concerns 'solicited' and 'unsolicited' ratings: Unsolicited ratings have been introduced at different times from different rating agencies – before the 1970s, when the "issuer-pay" model became dominant with the large credit rating agencies in the USA, all credit ratings were in fact "unsolicited" (Shimoda and Kawai 2007). Standard & Poor's (S&P) introduced the distinction between the two categories in 1996, while Moody's had introduced it already in 1991 (Bannier, Behr et al. 2010), showing the disparity in the rating agencies' approaches to the topic. As Cantor and Packer summarized, the practice of unsolicited ratings might arguably have positive or negative consequences – it might provide a positive check against practices such as rating shopping by issuers (see e.g., Gill 2015) to obtain more favourable ratings (a practice that lowers the informational value of the rating market overall), but unsolicited ratings might be based on incomplete information based on the limited communication between CRAs and issuers (Cantor and Packer 1994). Although there are plenty of studies leveraging the distinction between unsolicited and solicited ratings, the exact difference in their informational content for investors and financial markets is rarely looked at and discussed in detail. The informational distinction in the two rating categories in many of these studies is postulated along the lines of 'solicited ratings have higher informational value as they contain private information in addition to purely public information in unsolicited ratings' (see e.g., Fairchild, Flaherty et al. 2009, Byoun 2014). Behr and Güttler for example state in their study on the informational content of unsolicited ratings: "As unsolicited ratings are not requested by the companies, a particular feature is that they are based on publicly available information only" (Behr and Güttler 2008), without further discussing what this exactly means in terms of information taken into account, and the processes behind it (see also Shimoda and Kawai 2007). This distinction is focused upon in the analysis in section 5, putting the postulated informational distinction in solicited and unsolicited ratings as a central aspect of the analysis during times of distress.

1. Credit ratings and credit rating agencies

Historiography of credit ratings and credit rating agencies

A wide spectrum of studies investigates the various aspects of the ratings process and the predominant institutions involved in it, from discussions about ideal remuneration structure in this market (see e.g., Frost 2007, Bolton, Freixas et al. 2009), to regulatory discussions (see e.g., Hill 2004), to analyses of rating validity and the informational benefit of credit ratings (see e.g., Cantor and Packer 1997, Cantor and Mann 2007, Flandreau, Gaillard et al. 2011). This area of research has been further propelled by the predominant role ratings and rating agencies played during the build-up and events in the global financial crisis of 2007/08 and its aftermath (White 2009, White 2013).

Information intermediaries in general and standard setting institutions more particularly have played a significant part in shaping modern financial markets. For example, 'Lloyd's register of shipping' with their famous classification ('A1 by Lloyd's' denoting highest quality) developed in the late 18th and especially 19th century into the predominant source of information for investors, ship operators and insurers in the maritime industry (Blake 1960, Watson, Jones et al. 2010). Several themes outlined in this chapter regarding the role of these information arbitrators can already be observed in the history of these early institutions: the importance of reputation and quality in their assessments; the effect of competition between intermediaries on the information provided; and the interlinks with regulatory processes, such as in the case of Lloyd's the passage of the UK Merchant Shipping Act of 1890 (Watson, Jones et al. 2010). However, the historical development of credit ratings, and the institutions supplying them to financial markets and investors, especially in the latter half of the 20th century and the early 21st century, has been only marginally covered by academic research and follows established narratives (for two of the few historical engagements with this subject see Sylla 2002, Smith and Wright 2021).

The main argument in this historiography can be summarized by following Richard Sylla's account of the growth of CRAs and credit ratings, first in the United States and then gradually internationally. With the expansion of American credit markets around the turn of the 19th to the

20th century, especially with growing diversity of bond issues from railroad, utility and manufacturing corporations combined with an increase in general wealth broadening the investing population, the quality of borrowers could no longer be adequately assessed by the general financial press or previous intermediary institutions such as investment banks (Sylla 2002).[297] In the more market-oriented US financial system compared to the bank-dominated European markets (Altamura 2016), CRAs as third-party information providers for investors filled this information gap (Wilson 2011). Firms such as John Moody's (founded 1909) and Standard Statistics (1906) thus expanded their business of credit reporting, publishing manuals on bond issuers on a subscription basis to lower information asymmetries in the expanding market (Sylla 2002, White 2002). However, there were precursors to this development already in the 19th century, as Alfred Chandler's extensive analysis of Henry Poor's 'Manual of Railroads of the United States' and the earlier 'American Railroad Journal' highlights (Chandler 2014). Henry Poor started out at the end of the 1840s in gathering information on the increasing American railroad network, first as a mixture of technical railroad information, best practices, and financial information on the companies constructing the individual lines in the network. He gathered this information through questionnaires, extensive travels, and interviews, and published it successfully on a subscription basis in the American Railroad Journal. Yet it was only through the later setup of the 'Manual' in the late 1860s that the focus of the publication became increasingly on provision of financial information about the railroad construction & operating companies' stocks, bonds, and general financial health (Chandler 2014). Even though there was no credit rating element yet implemented, this precursor emphasizes the importance these information intermediaries played in the economic transition to larger scale companies in the US of the late 19th century, providing essential information for to investors and thus helping to expand access to credit markets.

[297] For commercial banks and financial institutions, internal rating systems to assess creditworthiness and default risk had developed within these organizations. New about CRAs and their predecessors was externalising these functions.

The financial and economic crisis in the form of the Great Depression then first brought rating agencies into the regulatory space, showing a similar emphasis that regulators put on these private institutions as in the case of Lloyd's register in the 1890 UK Merchant shipping law. By then, rating agencies had moved from the sole provision of gathered information to the actual rating and classification of creditworthiness based on numerical scores (Sylla 2002). In the wake of reforms to the financial and banking system in the US after the Great Depression, the FDIC, OCC and the Federal Reserve introduced the first regulations regarding credit quality in 1936, prohibiting banks from buying 'speculative securities'; just five years earlier, in September 1931, the OCC had already introduced a partial necessity for ratings when it ruled that higher rated bonds (minimum BBB by two agencies) could be carried on a bank's book at historic costs, while lower rated bonds required write-offs and mark-to-market accounting (Partnoy 2002). Flandreau and Sławatyniec argue that prior to the 1931 regulation by the OCC there already existed what they call a 'legal license', describing the foothold ratings by 'statistical corporations' had gained in the previous decades since their inception in settling court cases on "financial prudence (…) of trustees, bankers, and brokers" (Flandreau and Sławatyniec 2013). With little regulatory changes or other impetus in the ensuing decades, credit ratings and CRAs remained a steady yet primarily US specific phenomenon for the period between the 1940s to the early 1970s (Sinclair 2005). With the national growth of financial markets in the US and the increasing international expansion of financial and especially credit markets from the 1970s onwards, rating agencies grew rapidly with the credit markets (Sylla 2002).

This development was further intensified by the adoption of the NRSRO concept by the SEC in its 1975 net capital rule, effectively limiting entrance into the credit rating business to firms with SEC approval. The new net-capital rule for broker-dealers in its adopted form of 1975 (SEC Rule 15c3-1) would allow the calculation of broker-dealers 'net capital' in relation to their total indebtedness to be based partially on credit ratings, as haircuts (risk-weighting on the face value of

certain assets) should for bonds depend on credit ratings.[298] In one of the few historical studies on CRAs in the latter half of the 20th century, Smith and Wright investigate the SEC's archival sources to answer the question of why the SEC adopted this concept in 1975 (Smith and Wright 2021). Their analysis shows that in the process of harmonising capital rules for broker-dealers across different exchanges that previously set their own rules, the SEC in its proposal followed the rule book of the NYSE, which had in 1971 introduced references to S&P's and MIS's ratings in addition to "any nationally known rating agency recognized by the Exchange" (Smith and Wright 2021). These processes were triggered by concerns about investor protection in the case of broker-dealer insolvency that became more frequent during the late 1960s in the 'back-office-crisis' (Smith and Wright 2021).[299] When the SEC published its first uniform net-capital rule proposal in 1972, SEC Chairman William Casey emphasized that the SEC "had drawn on its own experience during the industry's financial crisis of 1968-70" in designing the proposal.[300] However, including references to CRAs and thus creating the NRSRO category in the new SEC rule were at the time not on top of regulators' or market participants' minds – no reference to them was made in the SEC's 1972 public statement on the proposal,[301] and from the respondents to the market consultation following the SEC's 1972 proposal, only 9 responses out of a total of 151 mentioned CRAs at all (Smith and Wright 2021).[302] Other issues such as the ratio of allowable aggregate indebtedness or minimum capital requirements for market makers drew significantly more attention (Smith and Wright 2021). The overall purpose of the new net-capital rule was the harmonisation across the US financial system,

[298] See Federal Register, '*SEC - Adoption of Uniform Net Capital Rule and an Alternative Net Capital requirement for Certain Brokers and Dealers*', rel. no. 34-11497, vol. 40, no. 137, 16.07.75; available online: *https://www.govinfo.gov/content/pkg/FR-1975-07-16/pdf/FR-1975-07-16.pdf*.

[299] As Smith and Wright report, the NYSE's trust fund for reimbursing customers of broker-dealers in the case of bankruptcy almost failed in 1970, as many smaller broker-dealers could not afford the required investments needed to clear systems and processes for the increasing trading volume (see Smith and Wright 2021).

[300] See SEC, '*New Rules and Rule Proposals – Propose Uniform Net Capital Rule*', SEC News Digest, 05.12.72, p. 1; available online: *https://www.sec.gov/news/digest/1972/dig120572.pdf*.

[301] Ibid.

[302] The ratio of responses by market participants concerned with the incorporation of CRAs into the SEC regulation apparently remained stable over time for further market consultation by the SEC on updated proposals, as in the case of a substantially updated version in 1973 the SEC received 8 responses referring to CRAs, out of a total of 143 (Smith and Wright 2021).

with the SEC focusing on investor protection through requirements of adequate risk-adjusted capital. The use of bond rating agencies for this purpose was brought to the SEC's attention through people "connected with the NYSE", and the SEC adopted the category as a standard tool to harmonise the determination of haircuts on broker-dealer capital (Smith and Wright 2021). It thus appears that the introduction of the NRSRO classification in federal regulation in 1975 was *initially* a by-product of the harmonisation process modelled on the general adoption of the NYSE rule book, yet with significant consequences in the years to come.

The business model of rating agencies is often discussed only within the quasi-regulatory mandate following the adoption of the NRSRO concept in US federal law and subsequently internationally, drawing frequent criticism based on the 'issuer-pay' model implemented by the largest CRAs S&P, MIS and Fitch (Partnoy 2002, White 2002), as compared to the subscription model where investors paid for the rating information, which dominated in the early 20th century and is used by some of today's smaller NRSROs. The criticism of the issuer-pay model centres around the potential conflict of interest for CRAs since the organization they are rating is also their paying customer, thus potentially creating incentives for more positive ratings than under a different business model. The modern fee structure for both MIS and S&P hasn't changed significantly since its introduction, with a minimum fee ($25,000 in 2002) and an additional 3.25 basis points on issues up to $500 million for MIS and S&P, capped at a level ($125,000-130,000 in 2002), but other private terms can be negotiated for frequent debt issuers (White 2002). Even though this business model, and especially the incentive-structure it might create based on the issuer-pay system, has been at the core of academic and public criticism of CRAs for decades, the academic discourse is surprisingly ignorant of its evolution. Lawrence White states for example that "in 1970 Moody's and Fitch began to charge the issuers for the ratings; S&P followed suit a few years later", whereas Sinclair pins the introduction of issuer-pay to 1968 for S&P and 1970 for MIS, which is affirmed by Smith and Wright (White 2002, Sinclair 2005, Smith and Wright 2021). However, these repeated affirmations ignore the fact that 1968 and 1970 was only the period in

which the Big-3 CRAs switched to charge issuers of municipal bonds rather than subscribers to their services. For 'private placements' (corporate bonds), MIS had already introduced an issuer-pay model in 1962, while S&P still hadn't introduced fees for corporate bond ratings by 1970.[303] This gradual implementation of issuer-fees over a longer period and only subsequently within different rating categories starting from the early 1960s, emphasizes that incentives to extract rents based on the 'regulatory licensing' at least at the initial introduction of the issuer-pay model were not the main target of CRAs, but rather a necessity in a consolidating and competitive market in which information products have largely public good characteristics (Sinclair 2005).

Discussion and criticism by participants in financial markets, regulators and academics on the interlinking of credit ratings and national and international financial market and banking regulation remains frequent (see e.g., Partnoy 1999, Reinhart 2002, White 2006, White 2007, White 2016), and is discussed in more detail in the next section along with the importance of regulation and regulatory changes during and after financial and banking crises. However, overall the general historical and economic narrative on credit ratings and CRAs in the expansion from the 1970s onwards describes an artificially rigid market, limiting entry for new firms and methodologies by the quasi-regulatory power conveyed by the SECs NRSRO recognition and international diffusion of this regulation through the Basel process, occasionally marginally adapted by severe blunders from the Big-3 US rating agencies such as during the subprime crisis in the US, which necessitated regulatory response (Sylla 2002, White 2007, White 2009). Yet as section 3 and 4 show, when looked at closely, the dynamics in the CRA business and its relationship to reform over time and especially during financial crises are considerably more idiosyncratic.

[303] The New York Times, '*Moody's to Charge For Bond-Grading, Beginning Oct. 15*', unknown author, 01.10.70, p. 84.

The informational value of credit ratings

One discussion in the academic literature needs further exploration in the context of this project, as it concerns the core of the investigation: the informational value contained in credit ratings for investors and financial markets. CRAs regularly point to their track records regarding default prediction and stability of their ratings when questioned about the informational value of their rating products for investors. In the wake of the Enron collapse, which intensified regulatory scrutiny of CRAs, John Diaz, Managing Director at MIS, stated upon intense questioning before the US Senate Committee on Governmental Affairs in 2002 that

> "as part of Moody's commitment to predictive ratings, we review the relationship between defaults and our ratings. We publish an annual study, (…) which consistently shows that higher-rated bonds default less frequently than lower-rated bonds, although the rates of default may vary over time".[304]

However, besides these assertions by the CRAs themselves, theoretical and empirical answers to the question of additional informational value that credit ratings provide to investors present themselves more conflicted.

Both the public good 'nature' of credit ratings as an information product that once issued becomes publicly available, and the operational model of CRAs have implications for the informational value of ratings for investors, and they represent two aspects frequently discussed in the academic literature (Sinclair 2005). The public good aspect of ratings has been discussed in the previous section with regard to the introduction of the issuer-pay model. Yet, the operational model of CRAs also plays a major role for the informational value of ratings: what kind of information (soft vs. hard, public vs. private, etc.) CRAs use to determine their rating decisions depends critically on the design of the ratings process, as well as on the category of ratings. Increasing transparency in the ratings process over time also might affect how investors perceive this information. For example, ratings for issuers of sovereign or government bonds are more

[304] United States Senate, '*Rating the Raters: Enron and the Credit Rating Agencies*', Committee on Governmental Affairs of the U.S. Senate, 20.03.02, p. 10; available online: *https://www.govinfo.gov/content/pkg/CHRG-107shrg79888/pdf/CHRG-107shrg79888.pdf*.

reliant on soft information as they require more qualitative assessments about political, economic, and fiscal stability, and thus might also be more labour-intensive than ratings leveraging more hard information on financial performance and outlook (Langohr and Langohr 2008, Gill 2015). This again is tightly connected to economies of scale and scope for CRAs. In this, reputation plays a major part, as highlighted by almost every study and report on CRAs in financial markets (see e.g., Smith and Walter 2002, White 2002). Reputational concerns in the CRA market regarding a good that relies on the trustworthiness of the information intermediaries might reasonably be assumed to limit competition between agencies, as investors expect a high degree of quality from ratings. At the same time, these factors favour a few established institutions that can point to a convincing track-record of 'getting it right', thus increasing returns to economies of scale and scope through accumulated reputation & expertise, while limiting competition through the advantages for incumbents (Smith and Walter 2002).

Developing a theoretical model of information content of credit ratings and incentives for CRAs, Byoun finds that for some kinds of ratings (unsolicited) the information content (and therefore the quality of information conveyed to investors) might be low given the availability of other market-based indicators. Yet, he finds that this distinction in information content of different kinds of ratings depends on the remuneration structure of the CRAs (Byoun 2014). Reinhart on the other hand points towards systematic failures of CRAs to predict sovereign and government defaults in emerging markets, and that rating agencies place too little weight on tangible financial indicators such as liquidity and currency mismatch, putting too much weight on factors such as past financial performance and governments' willingness to repay debt – an assessment shared by other empirical studies (see e.g., Mora 2006). Political and economic pressure over changing rating levels in either direction might skew the 'objective' information signalled to investors through ratings (Reinhart 2002). Partnoy further emphasizes this critique by pointing to credit ratings consistently lagging market adjustments and that markets anticipate most rating changes, stating that "the fact that ratings are correlated with actual default does not prove that ratings hold any incremental

value" (Partnoy 2002). For Lawrence White, who conducted some of the most far-ranging and widely cited enquiries into the role and development of credit ratings and CRAs, the informational value of ratings is hard to assess as long as they are entangled in a quasi-regulatory framework. On the one hand, ratings are undoubtedly correlated with default outcomes, on the other hand this might already be signalled through market-based indicators such as credit default swap spreads over safe investments such as Treasuries. In his view, there is further evidence that ratings and rating changes influence outcomes such as stock prices, but again this might not be conclusive, as either markets would have priced this in by themselves upon obtaining new information, or it might be an endogenous development with rated institutions moving closer to regulatory boundaries (such as the BBB junk status barrier), which is priced in by investors in their portfolio (White 2002, White 2016).

The introduction to this chapter has already discussed the distinction between two often focused upon rating types, solicited and unsolicited ratings. Section 5 of this chapter discusses this in more detail and analyses this distinction for one case study during the GFC, highlighting several of the points discussed in this section.

2. The changing landscape of credit ratings and CRAs – 1970s to 2010

Market expansion and the centrality of regulation

The fundamental objective and purpose of CRAs is to provide credit ratings on debt issuers and issues, which can be described as standardised assessments and filters of information to portray a single variable of the medium- to long-term risk to the value of underlying assets. Thus, the expansion of US and international credit markets in the latter half of the 20th century and especially since the 1980s was matched with an increasing demand for credit ratings, and thus more business for the established CRAs. Through the SECs NRSRO categorization introduced in 1975 and gradually expanded in US and international regulation, this established a growing regulatory demand for the work that these agencies perform (section 2). At the same time, transformations in financial markets, such as May Day in the US in 1975 which removed fixed

brokerage commissions and the rise of retail brokers only providing execution rather than research and information to their clients in New York City (Schenk 2020), might have also contributed to investor demand for accessible and standardized credit information products such as ratings, as was the case with products in the market for financial information in the 1970s and 1980s (see chapter 3). The SEC itself acknowledged this two-pronged increase in demand for credit ratings, when in their first annual report to Congress under the CRA reform Act in June 2008 they emphasized, besides the regulatory necessity as one factor, that

> "structural changes in financial markets have increased the number of participants, increased their anonymity, and increased the complexity of their investment strategies. At the same time, financial disintermediation shifted credit from banks to capital markets, leading to the creation of increasingly complex financial instruments through securitization. The increasing complexity likely created additional reliance by investors on NRSRO ratings as they provided a single summary measure of the credit risks of difficult to evaluate financial instruments".[305]

The 1980s rarely feature in the academic literature as a prominent episode in the CRAs development in the latter half of the 20th century, as most accounts from a regulatory point of view focus on the introduction and subsequent expansion of the SEC's NRSRO concept in the 1970s in the US and then on the international expansion during the Basel II process and the role of CRAs in the Asian financial crisis in the 1990s (Partnoy 2002, Sylla 2002, White 2002, Smith and Wright 2021). Yet, one of the most significant developments in financial markets during the 1980s was the rise of the market for high-yield bonds (or 'junk bond'), which was associated with its most prominent supporter Michael Milken of Drexel Burnham Lambert (Yago 1990, Bailey 1991). Despite the controversies about the later bankruptcy of Drexel Burnham Lambert and the indictment of Milken, the junk bond boom and its later decline represented a significant episode for CRAs and credit ratings as a source of information, but also regulation. As both Yago and Sinclair note, one of the key underlying reasons for the popularity of high-yield bonds in the 1980s was the reliance of

[305] See SEC, *'Annual Report on NRSROs as required by Section 6 of the Credit Rating Agency Reform Act of 2006',* June 2008, p. 37.

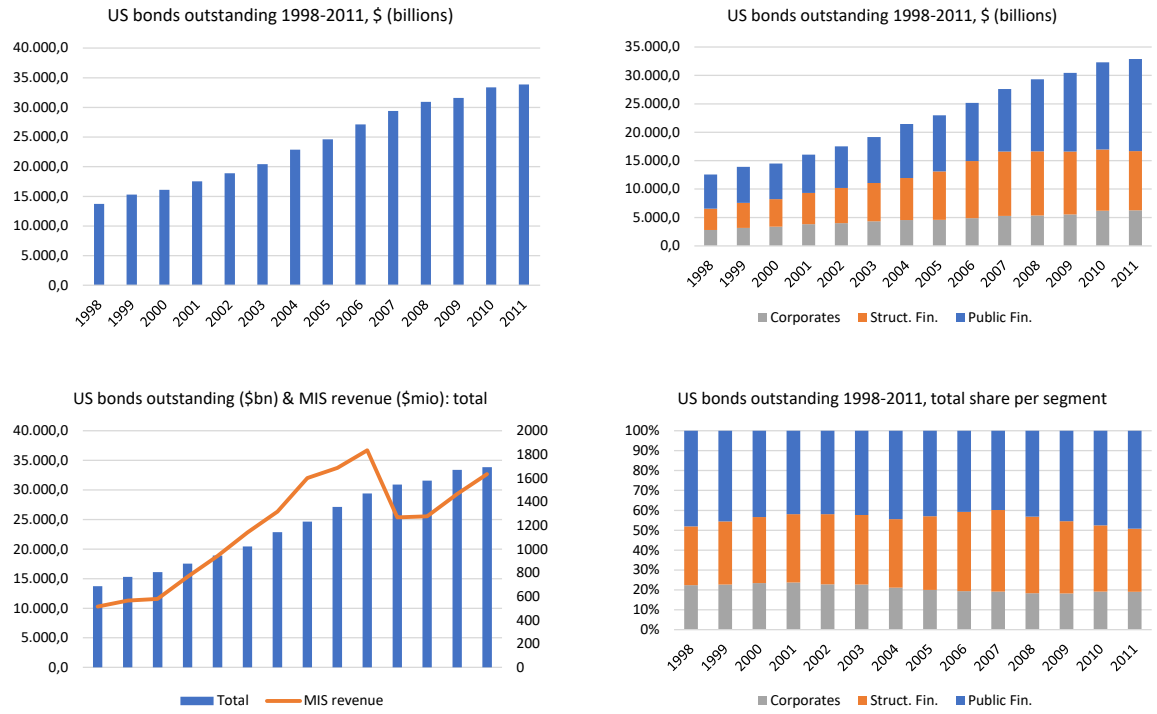
rating agencies in their judgment on past performance, and a focus on financials such as asset and liabilities or debt/equity ratios. Yet, in the logic of the junk-bond boom, future creditworthiness might depend even more on other factors, from hard ones such as cash flows, to soft ones such as innovation and growth potential or management skill (Yago 1990, Sinclair 2005). At the same time, Milken saw the credit market distortion, promulgated by the regulation-induced need for investment grade ratings to enable investments from institutional investors, as an opportunity for private non-institutional investors. The increased demand for investment grade securities had opened opportunities for higher-yield, higher-risk, yet also cheaper junk bonds (Yago 1990). Following this logic, the boom in high-yield bonds in the 1980s enabled promising and innovative companies previously unable to tap into the credit market to finance their operations, rather than relying on other sources of capital such as bank loans or equity. Legislation passed at the state and federal level in the US during the late 1980s restricted the use of junk bonds to finance leveraged buyouts, and contributed to the subsequent collapse of Drexel's high-yield business in 1989/90. The effects of this episode resulted in even higher demand for the CRAs products, as increasing demand for investment graded ratings in the aftermath of the junk-bond boom resulted in greater demand for issuers to get ratings:

> "Although an immediate problem for the agencies, this challenge [the junk bond boom] had much the same effect as the Asian financial crisis: the rating system did not displace centralization but instead increased its reach" (Sinclair 2005).

As reported by Sylla, the growth of the CRAs with the credit markets can best be gauged by the number of issuers and issues they rate: when in 1975 MIS maintained ratings on 5,500 bonds in the US, by 2000 this had increased to 20,000 in the US and another 1,200 non-US bonds (Sylla 2002). The expansion of credit markets is plotted in Figure 40, showing the growth of all outstanding US bonds in billion dollars, which tripled over 15 years from $11,464 billion in 1996 to

$33,863 in 2011.[306] This expansion went across all bond segments, from corporate issuers to public and sovereign issuers and to structured finance issues, although especially the last two grew significantly. The growth in structured finance was checked in 2007 due to the subprime crisis in the US, yet overall there is a relatively steady nominal increase. As can be seen in Figure 40, with this expansion in the credit market came along a steady and highly correlated expansion of revenues from CRAs until 2007, here at the example of Moody's Investor Services (MIS) where revenue fell sharply between 2007 and 2008 by ~28%.

Figure 40: Development of outstanding US bonds and MIS revenue.



Source: Moody's and Dun & Bradstreet annual reports, 1998-2012; US bond data from SIFMA: https://www.sifma.org/Resources/research/fixed-income-chart; MIS: Moody's Investor Services, Moody's corporation's NRSRO/ratings business.

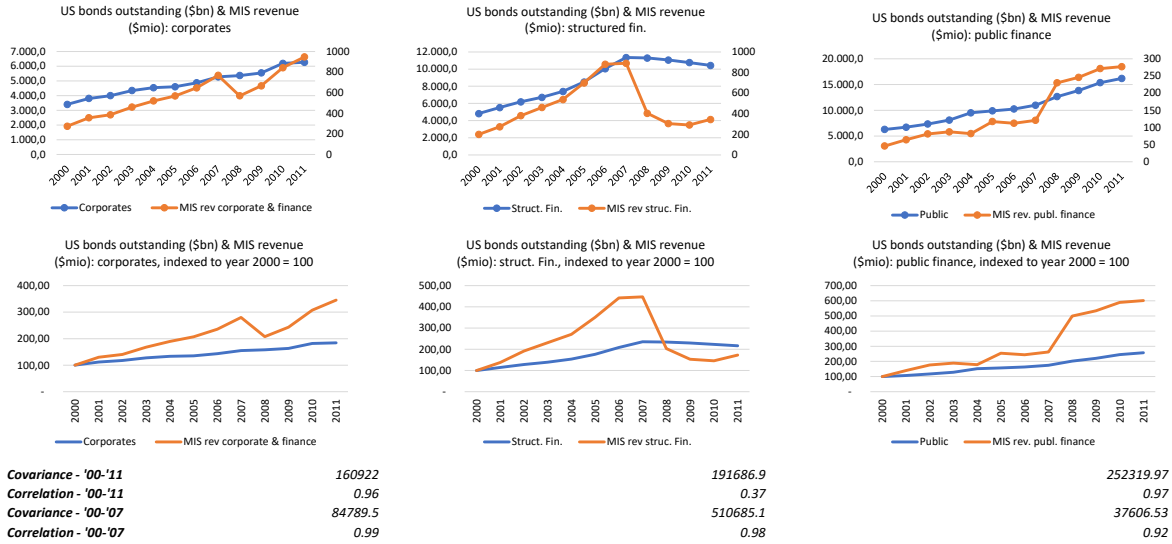
Figure 41 provides a more detailed view of this regulatory link between the expanding credit market and revenues for recognised NRSROs. In all three major segments, corporate issuers, structured finance, and public institutions, there is a very high co-movement between the

[306] The US bond market is used in this figure as it is by far the biggest credit market, entailing for most of the late 20th and early 21st century about a 50% share of all outstanding bonds globally (see Securities Industry and Financial Markets Association, available online: *https://www.sifma.org/*).

expanding credit market and revenues by MIS from these segments between 2000 and 2011, with correlations standing at 0.96, 0.37, and 0.97 respectively (see Figure 41). Structured finance is the outlier due to the effects of the subprime mortgage crisis in the US, leading to the GFC and the upheavals caused in the structured finance sector. If only the period between 2000 and 2007 is considered, the correlation between outstanding structured finance bonds and MIS revenues stands at 0.98, with MIS revenues collapsing significantly thereafter in the context of the GFC. In fact, looking at the pace of growth in Figure 41, MIS revenues in each segment increased faster for most of the 11-year period than the outstanding US bond market – which might point to two possible developments: either MIS gained market share in the US market, or it grew faster in these segments in other international credit markets. As market shares in the CRA market seem to have been fairly stable until the early 2000s, with MIS and S&P maintaining ~40% each and Fitch ~15% of the overall market (White 2002), it is more likely that MIS grew even faster in the international credit markets. This hypothesis is also in line with the development of MIS regional market growth: In 1998, about 80% of its revenue came from within the US, while this share had dropped to 50% by 2011.[307]

[307] See Moody's and Dun & Bradstreet annual reports, 1998 – 2011.

Figure 41: Development of outstanding US bonds and example of MIS revenue by segment.



Covariance - '00-'11	*160922*	*191686.9*	*252319.97*
Correlation - '00-'11	*0.96*	*0.37*	*0.97*
Covariance - '00-'07	*84789.5*	*510685.1*	*37606.53*
Correlation - '00-'07	*0.99*	*0.98*	*0.92*

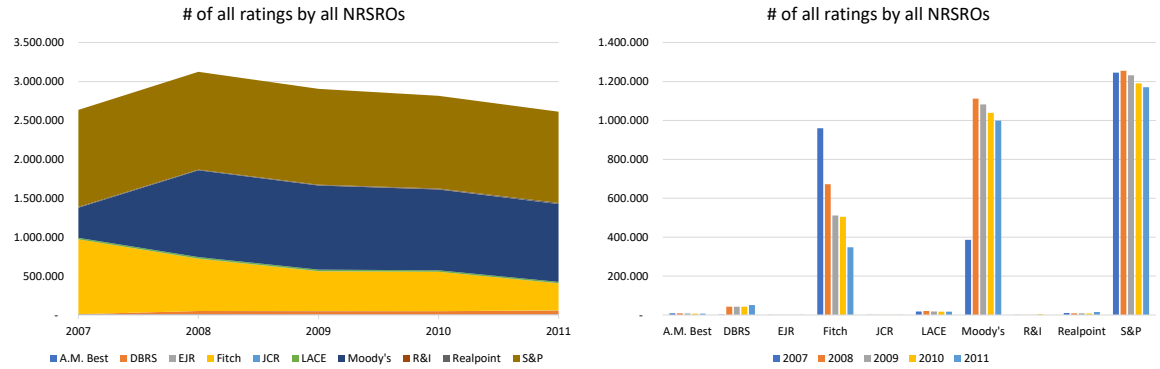
Source: Moody's and Dun & Bradstreet annual reports, 1998-2012; US bond data from SIFMA: https://www.sifma.org/resources/research/fixed-income-chart; MIS: Moody's Investor Services, Moody's corporation's NRSRO/ratings business.

This expansion of the credit rating market is usually portrayed as the story of the Big-3 CRAs, MIS, S&P and Fitch with their dominating market position, shielded against new entrants for most of the period since the NRSRO declaration by the SEC (Partnoy 2002, Sylla 2002). And indeed, when looking at the distribution even of all ratings issued and maintained by NRSROs in the US between 2007 and 2011, this story seems to hold true. Figure 42 summarizes the total ratings issued by all NRSROs in the US, showing a perceptive and consistent dominance of the Big-3 firms.[308] Data for previous years is not available on a comparative level, since the SEC only started to collect this data systematically from CRAs after the Credit Rating Agency Reform Act of 2006 (see next section). However, after a closer look there is more to the story than the pure hegemony of the Big-3. Looking at the individual rating segments in detail (see Figure 43), two findings stand out. First, the dominance in terms of volume of ratings by the Big-3 is skewed as they are the virtually only issuers for public institutions (segment V government and sovereign ratings), which accounts for more than 75% of all credit ratings. Second, in other segments, especially I (Financial

[308] The strong increase of MIS ratings between 2007 and 2008 can be explained by MIS using a different key for counting their ratings of public issues and issuers in 2007, which was corrected for comparability in line with the reporting by other NRSROs in 2008 – see SEC, '*Annual Report on NRSROs*', pp. 34-36.

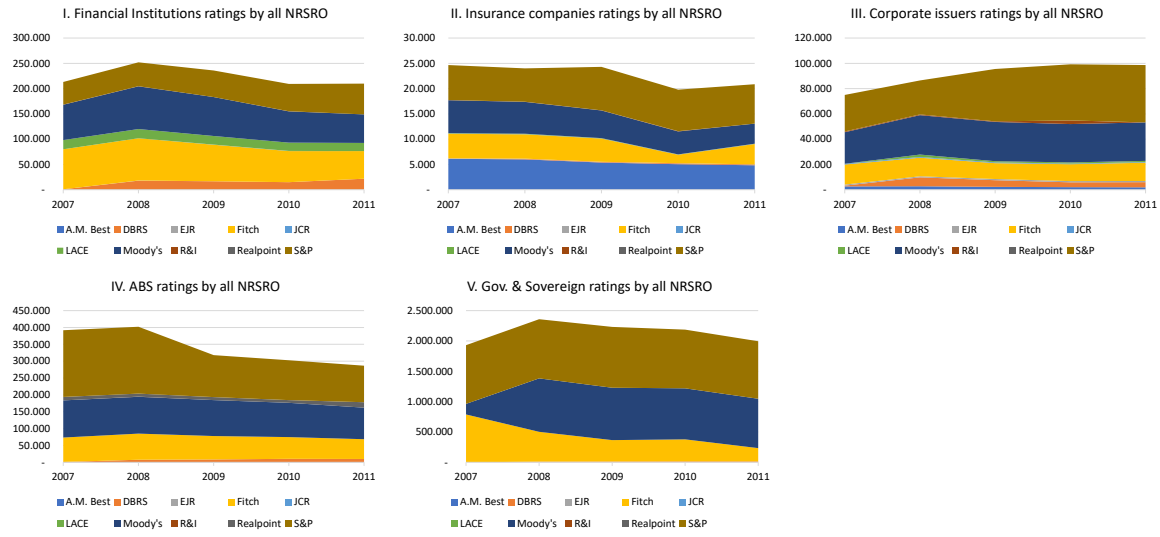
Institutions), II (Insurance companies) and III (corporate issuers), other smaller NRSROs such as A.M. Best, DBRS, and LACE have indeed non-negligible shares of the overall ratings issue, with as much as 20% market share for individual smaller institutions (Insurance companies). Smaller rating agencies, and their successful establishment in niches of the credit rating market has often been neglected by the academic literature and is highly interesting from the perspective of informational contribution and purpose of credit ratings, as is discussed in the last subsection.

Figure 42: Total number of all ratings per NRSRO in US, 2007 – 2011.



Source: SEC filings for NRSRO registration, 'Form NRSRO', 2007-2012.

Figure 43: Number of ratings by NRSRO per SEC segmentation, 2007 – 2011.



Source: SEC filings for NRSRO registration, 'Form NRSRO', 2007-2012.

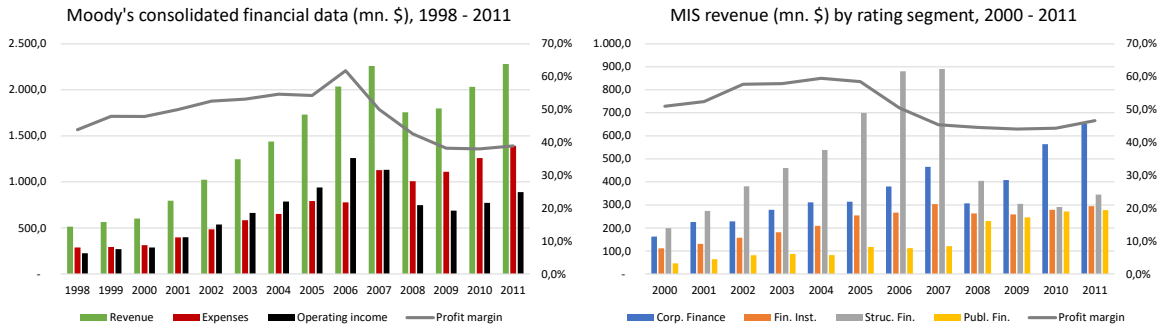
Moody's corporation and Moody's Investor Services

Moody's corporation, which roots go back to the firm John Moody founded in 1909, was acquired by Dun & Bradstreet in 1962 and was part of a larger corporation until the turn of the millennium – as was the case with the other two of the Big-3 CRAs, S&P and Fitch (Sylla 2002). As parts of larger corporations, CRAs benefited both on the operational and on the informational levels. By being embedded in organisations that don't only supply information on creditworthiness but also other information products in financial markets (the well-known S&P indices representing just one popular example), they benefited from both reputational spillover effects [with reputation being the key asset for CRAs] (White 2002) and cross-selling through integrated information product offerings. At the same time, minimal information on business performance and profitability of the rating products specifically needed to be disclosed to competitors, clients, and regulators. Dun & Bradstreet for example was formed after the merger in 1933 of the 1841 established mercantile agency R. G. Dun & Company and its competitor John M. Bradstreet, establishing a company focused on publishing and providing information and standardized ratings on a range of industries including financial markets, teaching and education, and media ratings through the well-known brand Nielsen TV-Ratings [Nielsen Media Research] (Sylla 2002). However, in 1999, Dun & Bradstreet took the decision to spin off the profitable financial credit ratings business into its own publicly listed company. Thus, information about Moody's and especially MIS (the ratings division of the new corporation) is more readily available through its annual reports from the late 1990s onwards, and from 2007 on can be combined with information gathered yearly by the SEC to give a clearer picture of the companies' development as a case study for the other Big-3 agencies.

As shown in Figure 44, Moody's corporate revenues and profit margin grew steadily between 1998 and peaking in 2006/2007, quadrupling its yearly revenue of about ~$500 million in 1998 to ~$2,250 million in 2007, before falling in 2008 in the wake of the company's involvement in the US subprime crisis, with its pre-tax profit margin falling just below 40% for the first time in

2008. The same general trend can be observed looking at MIS alone: Moody's ratings branch accounted for 85% - 95% of Moody's revenue in this period.[309] Partnoy originally suggested that the expected high profitability of CRAs in the late 1990s could be interpreted as a sign of rents being extracted by the Big-3 agencies based on their quasi-regulatory oligopoly (Partnoy 2002) – the data presented here extends this discussion and shows even the increase in profitability right up to the GFC. One important observation here is the less severe drop in MIS profitability than in Moody's overall profitability – hinting at a stronger reduction in Moody's Analytics compared to MIS, and underscoring again the seemingly comfortable stream of revenue the firm relied on due to its quasi-regulatory status even in times of distress in financial markets.

Figure 44: Moody's overall financials & MIS revenue per rating segment, 1998 – 2011.



Source: Moody's and Dun & Bradstreet annual reports, 1998-2012; US bond data from SIFMA: https://www.sifma.org/Resources/research/fixed-income-chart; MIS: Moody's Investor Services, Moody's corporation's NRSRO/ratings business.

Although revenues from all rating segments grew for MIS since the late 1990s, the main factor for MIS profitability up to the US subprime crisis was rating the complex (and opaque) instruments in structured finance (primarily ABS and CDOs) as shown in Figure 45. This is in line with growth in the share of structured finance as a share of the total credit market (see Figure 40, Figure 41, and Figure 45). In 2005, shortly before the subprime crisis in the US and the GFC, the BIS had conducted a thorough review of the role of ratings in structured finance. It found that

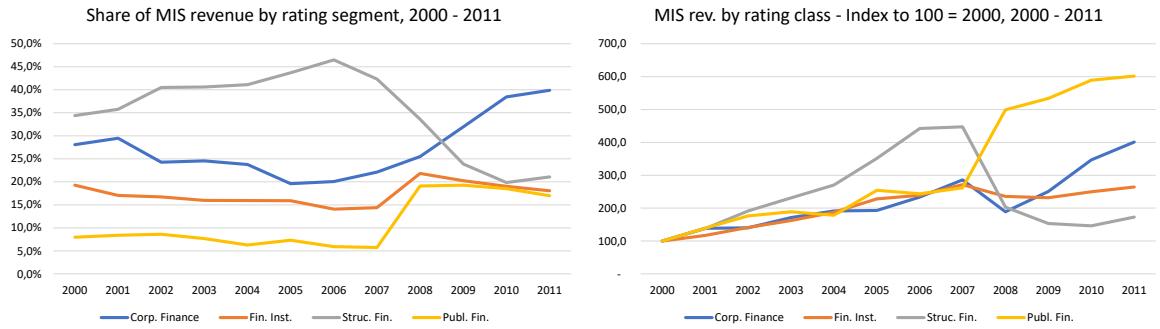
[309] The residual revenue was generated by Moody's various activities offering consultative work under the umbrella of Moody's Analytics, which grew in revenue during these years, but didn't exceed 15% of total revenues by 2011.

structured finance, and especially single tranche CDOs, had been the fastest growing rating segment for the big-3 rating agencies, averaging from 1997 to 2005 30% annual growth. The report also discussed the different role CRAs played in structured finance compared to traditional bond rating. Whereas CRAs in traditional bond rating provided ex post assessments of creditworthiness, when rating structured finance deals CRAs were much more involved in the design of the instruments themselves, for example constructing them from the underlying assets in order to obtain the target rating for the different tranches in a CDO.[310] At the same time, because of the relatively high costs involved for investors to assess "the structure and risk profile of a given instrument [in structured finance] (…) the rating agencies' activities have the potential of being particularly significant", so the informational value provided to investors was greater in structured finance.[311]

However, the BIS survey also found through interviews with institutional investors that ratings were not the sole source of information for investment decisions in structured finance. The report also foreshadowed that "risks associated with structured products may not have been fully grasped by some investors" and that "worst case scenarios relating to mispriced or mismanaged exposures, might thus lead to situations in which extreme market events could have unanticipated systemic consequences".[312] The share of revenues from structured finance ratings for MIS increased by over ten percentage points between 2000 and 2006, from ~35% to ~46%, before structured finance revenues stagnated in 2007 on the level of the previous year and then fell sharply in the following two years. The sharp decline in revenues from the structured finance segment was compensated partially by growth in especially corporate issuer ratings and in revenues from public issuers in 2008.

[310] See BIS, *'The role of ratings in structured finance: issues and implications'*, Committee on the Global Financial System, January 2005, pp. 3, 13-15; available online: *https://www.bis.org/publ/cgfs23.pdf*.
[311] Ibid. p. 3.
[312] Ibid.

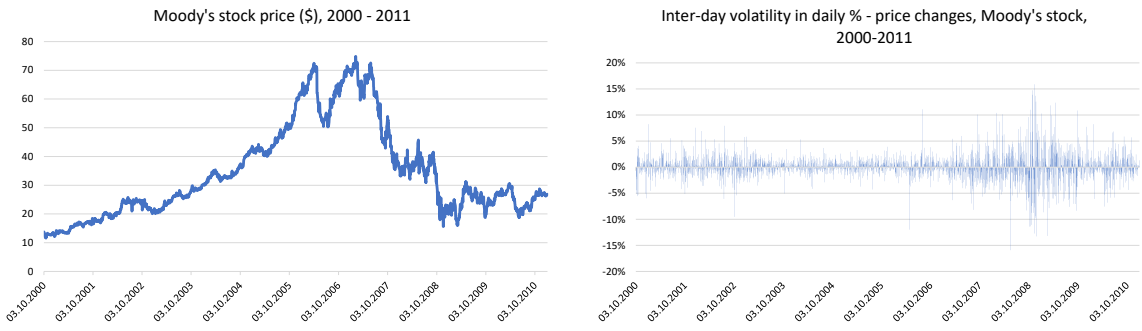
Figure 45: MIS share of revenue and revenue growth per rating segment, 2000 – 2011.



Source: Moody's and Dun & Bradstreet annual reports, 1998-2012; US bond data from SIFMA: https://www.sifma.org/Resources/research/fixed-income-chart; MIS: Moody's Investor Services, Moody's corporation's NRSRO/ratings business.

The positive development of Moody's financial performance in the early 2000s and the perception of the company as one of the Big-3 CRAs in an oligopolistic market can be seen as the main driver for the very positive stock price development it experienced over the same period up to the GFC. Between 2000 and the start of the subprime crisis in 2007, Moody's stock valuation increased by almost 700% (see Figure 46). However, one can also clearly see the negative effects that the GFC and the Enron scandal, resulting in increased regulatory investigation into the NRSROs and the Credit Rating Agency Reform Act of 2006, had on the company's stock price value and its volatility. Moody's stock price suffered a continuous decline mixed with high volatility at the outset and height of the GFC in 2007/08, while the publicised entanglement in Enron's collapse (see section 4) and the increased regulatory scrutiny led to minor declines in its stock price yet spiked in volatility in late 2002.

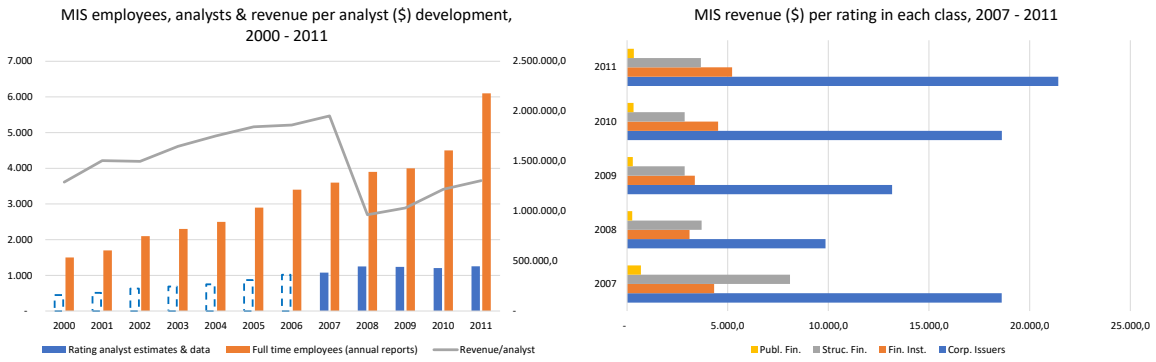
Figure 46: Moody's stock price development and Inter-day volatility (%-changes), 2000 – 2011.



Source: Moody's daily stock price from: https://ir.moodys.com/investor-resources/stock-chart/default.aspx.

To understand these developments for Moody's and MIS in detail, not only the financial side of the business has to be scrutinised, but we also have to ask what this data can tell us about the operational side of the CRA business and the market for credit information. As can be seen in Figure 47 on the left, the ratio of annual revenues per credit rating analyst at MIS increased significantly over the period, rising 51.3% from $1,290,461 in 2000 to its peak of $1,953,067 in 2007, before falling again in the wake of the GFC. There are several potential explanations for this development. It could be the result of significant productivity gains per employee; it could result out of a focus of employees and the company overall on more profitable rating segments; or it could speak to increased economies of scale in producing ratings. The first point seems unlikely, given the sharp decline after 2007 and the slow recovery until 2011. The second point can be partially ruled out, as, seen in Figure 44 and Figure 45, revenues from all rating segments grew, yet with a stronger growth in structured finance. The most likely explanation seems thus the third point, increased economies of scale especially in the expansion of structured finance ratings. At the same time, after the GFC, there is a remarkable drop in revenues per rating from structured finance, public finance, and corporate issuer ratings (Figure 47), although the latter recovers already in 2010 to its previous average and even increases in 2011.

Figure 47: MIS analysts, employees, & revenues; revenues per rating in each segment, 2000 – 2011.



Source: CapitalIQ; Moody's and Dun & Bradstreet annual reports, 1998-2012; SEC filings by Moody's for NRSRO registration, 'Form NRSRO'. Note: Numbers of MIS analysts 2007-2011 from reported 'Form NRSRO', ratio to full time employees extrapolated for 2000-2006.

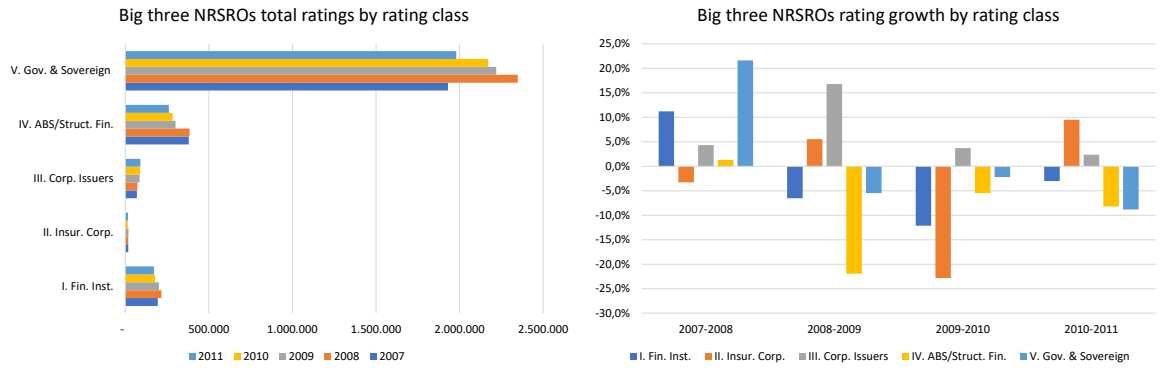
Beyond the Big-3 – rigidity, competition, and evolution in the CRA business

The BIS survey on CRAs conducted in 2000, identified between 130 and 150 CRAs that were active in the global credit markets, with different focus on geographies, industries, and business models.[313] Lawrence White (who has written some of the most extensive accounts on CRAs) mentions the further agencies operating in the US credit ratings market beyond the Big-3, which would in the process of increased regulatory intervention and overhauls in the early 2000s be (partially) granted NRSRO status, only briefly at some instances: "in addition to the three major firms, there are specialized and smaller firms" (White 2002). As shown in the previous sections, this focus in the academic literature on three large CRAs seems reasonable considering their dominating share of the overall rating market by total ratings (see Figure 42 and Figure 43). Yet, as emphasized in Figure 48, there is a wide disparity between different segments of the ratings market in terms of distribution and share of the overall market: public finance ratings account consistently for by far the highest number of total ratings in the credit ratings market,[314] while ratings for insurance companies, financial institutions and corporate issuers account only for a small share of the total number of ratings. Yet as seen in Figure 45, compared to their prevalence, they contribute disproportionally to revenues in the ratings market due to the size of issuers and issues.

[313] See BIS, '*Credit Ratings and Complementary Sources of Credit Quality Information*', BCBS, August 2000, p. 14; available online: *https://www.bis.org/publ/bcbs72a.pdf*.

[314] The high total number of public finance ratings can be explained by the high quantity of issuers (US government, other sovereigns, and municipalities), their frequent use of capital markets for financing, as well as demand by investors based on the difficulties in assessing creditworthiness of public institutions and governments over private institutions (see below).

Figure 48: Big-3 total ratings per rating class and %-changes, 2007 – 2011.



Source: SEC filings for NRSRO registration, 'Form NRSRO', 2007-2012.

To reiterate, the US experience with other CRAs than the Big-3 might be the most illuminating. In 1975, the SEC's NRSRO designation for CRAs in the net capital harmonisation for broker-dealers, which was subsequently taken up in other legislation regulating credit risk management and influencing capital allocation, extended only to MIS, S&P, and Fitch – the first two had already been specifically mentioned in the NYSE rule book that served as a basis for the SEC's proposed harmonised net-capital rule (Smith and Wright 2021).[315] Yet, over the following years and decades the group of NRSROs saw both expansion and contraction: Duff & Phelps gained designation in 1982, McCarthy, Crisanti & Maffei MCM in 1983 [it was subsequently absorbed by Duff & Phelps in 1991 (White 2002)]. Other agencies such as IBCA and Thomson BankWatch attained NRSRO status for individual segments of the ratings market [only for banks and financial institutions, in 1991/1992 respectively] (White 2002). IBCA unsuccessfully tried to expand its designation into other segments, and finally moved to acquire and merge with Fitch in 1997, while foreign CRAs such as Japan Credit Rating Agency (JCR) tried unsuccessfully to attain SEC recognition until a larger expansion of NRSROs happened in the wake of the Enron collapse (White 2016). Between the turmoil of Enron in late 2002 (see next section) and the start of the US subprime crisis, seven more CRAs obtained NRSRO designation by the SEC, bringing the total to 10 NRSROs in 2007,

[315] Until the criteria and processes to apply for NRSRO designation were established in the Credit Rating Agency Reform Act of 2006, designation as NRSRO was granted through no-action letters by the SEC, stating that the SEC would take no legal action against the use of the CRAs ratings.

showing not only the dynamic development underlying what is often perceived as a rigid oligopolistic structure, but also underlines the importance of the experience regarding Enron that poses an inflection point (see next section). Ironically, one of the fears of the proposed harmonisation of CRA accreditation during the Basel II process was the further hurdles and challenges this might pose for smaller agencies and new entrants into the market (Fons 2002).

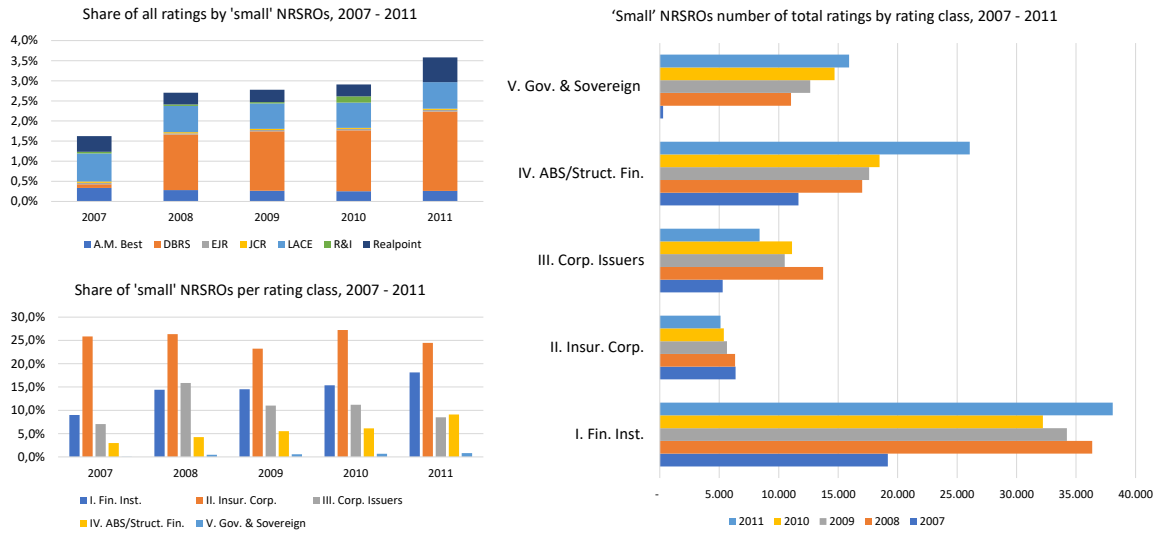
As shown in Figure 49, the overall share of total ratings by small NRSROs for the years from 2007 onwards for which reliable SEC data for the US is available, more than doubled from 2007 (~1.6%) to 2011 (~3.6%), yet remained on a low level overall.[316] There is a remarkable jump in total ratings issued and maintained by smaller NRSROs in almost all rating segments after 2007 – the exception here being in credit ratings for insurance corporations. This might be explained by the already comparatively high prevalence of ratings by small NRSROs in the insurance sector, where the share of small CRAs consistently stayed between 20% - 26% of all ratings between 2007 and 2011. MIS in its annual report in 2005 identified exactly this focus of smaller CRAs and NRSROs on niche products in the rating market as a significant challenge for its business:

> "Moody's faces increasing competition from (…) niche companies that provide ratings for particular types of financial products or issuers (such as A.M. Best Company, Inc., with respect to the insurance industry)".[317]

In addition to insurance companies, there is strong growth in the prevalence of ratings by small NRSROs for financial institutions and structured finance in the wake of the GFC, while public finance ratings for government and sovereign securities, which represent by far the largest part of all credit ratings in terms of total number, are almost not represented before 2008 and remain on a marginal level until 2011. The experience of the GFC, similar to Enron, must be perceived as another inflection point for the development of the NRSRO market regarding the small NRSROs and is discussed in the next section in its regulatory and market implications.

[316] The total number of ratings is used as a proxy here, as revenue or other financial data on smaller NRSROs, which often are operated as private corporations, cannot be obtained systematically.
[317] See Moody's, '*Annual Report*', Fiscal Year Ending 2005, 31.01.06, p. 13.

Figure 49: "Small" rating firms' development and ratings per segment, 2007 – 2011.



Source: SEC filings for NRSRO registration, 'Form NRSRO', 2007-2012.

So how can we account for this more dynamic development of NRSROs especially beyond the Big-3, and their persistence in a market that due to its structure (and regulatory requirements) tends towards a few big suppliers? Langohr and Langohr state that "credit rating is a labor-intensive activity. There are relatively limited economies of scale in the production of ratings" (Langohr and Langohr 2008). If this argument holds true, it would mean that a strategy of fast expansion to gain economies of scale is not attainable. However, the generalization by Langohr and Langohr seems to hold true only for parts of the rating universe. As this chapter argues, if looked at from an informational perspective the development of smaller agencies can be explained when focusing on the business model of these CRAs such as LACE, A.M. Best or DBRS. As shown in Figure 43 and Figure 49, smaller agencies primarily focus on two segments of the market, insurance corporations and financial institutions. Other segments, especially public finance, are rarely rated. Contrary to the argument expressed by Langohr and Langohr, the focus of small rating agencies lies on credit rating segments in which economies of scale can be achieved through the larger reliance on quantitative, hard information based on more transparent underlying assets for organisations in markets such as insurance. This kind of information can more easily be modelled than in areas such

as public finance, where qualitative and soft information play a more crucial part in the rating process (Sinclair 2005). As the BIS review of rating practices summarized in 2000:

> "Rating agencies' economic viability may be enhanced by proprietary systems for transforming information into ratings. In most cases, these include a combination of qualitative and quantitative judgements, although some of the newer subscription-based raters are using methods that are almost entirely quantitative".[318]

Whereas CRAs had for the most part of the 20th century relied on the traditional processes of determining credit ratings, gathering quantitative and qualitative information on an issuer or a specific issue from public and private sources that fed into the decision-making process of a credit rating committee within the CRAs, much as in the market for financial information (see chapter 3) advances in information and computer technology especially in the 1990s and 2000s, as well as developments such as the introduction of IFRS and later the IASV-FASB convergence project to harmonise international accounting standards, opened new avenues for enhancing or even substituting these processes (Anderson 2021). Both information acquisition, through the increased spread of the world wide web and easier access to public information, and information processing, through the use of enhanced spreadsheet and computer-modelling capabilities allowing the manipulation of data (chapter 3), thus enabled the adoption of increasingly scalable credit modelling techniques and processes which relied on the input of hard quantitative information. The smaller CRAs, some of which gained NRSRO status after the reforms catalysed by the Enron collapse (see next section) were seen as thus providing a valuable addition to the informational value of ratings in the markets where quantitative, hard information is most easily accessible and important, as Jenny Wiggins for the *Financial Times* observed in 2004:

> "Investors are turning in greater numbers to new technologies and services that monitor market movements to judge credit risk, posing a challenge to the rating agencies' traditional qualitative methods of analysis.[319] The new-style

[318] See BIS, *Credit Ratings* p. 12.

[319] The Big-3 agencies' methods traditionally involved both quantitative and qualitative features in a comprehensive (and for some rating segments such as sovereign ratings time-consuming and labour-intensive) approach to gauge creditworthiness, in which quantitative aspects focused primarily on assets

> quantitative analysis relies on 'measurable' factors to assess a company's financial condition, including movements in bond prices, equity prices and interest rates".[320]

However, some observers remained cautious as to the informational value of these ratings by smaller agencies, as the BIS review stated in 2000:

> "Based on the data gathered, it appears there is a wide disparity in size among rating agencies, as measured by the number of employees or number of ratings assigned (…) the number of ratings assigned (…) is ambiguous in that it is dependent on whether there is intensive analytical work done on the institution being evaluated, or whether the rating exercise consists of using published data as input to a statistical model".[321]

Despite this different approach regarding information in the ratings process, there appears to be no evidence for 'cream-skimming' by the Big-3, or a significant reduction of the informational content of the ratings by smaller rating agencies as the summary statistics in a sample comparison between MIS and A.M. Best for insurance ratings shows (see Table 3). Both MIS and A.M. Best issued most of their ratings in the investment grade categories with 90% and 98% respectively at the outset in 2011. Out of this initial distribution, 0.1% (MIS) and 0.4% (A.M. Best) of entities issued with an investment grade rating defaulted on their debt obligation, while only 0.7% and 0.4% respectively of the initially rated in the investment grade spectrum were downgraded below investment grade after ten years. In summary, we can observe slightly more investment grade rated companies for A.M. Best, with a slightly higher share of actual defaults out of the companies rated investment grade, yet a lower share of downgrades into non-investment grade. If cream-skimming or significantly reduced information content for the ratings by A.M. Best as one of the smaller agencies was in fact a worry, we might reasonably assume higher shares of actual defaults or downgrades, as well as lower investment grade rated entities.

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and liabilities. The final decision on ratings would be taken by a ratings' committee, which would also consider softer qualitative features, such as in the case of NYC by S&P and MIS described in this section.

[320] Jenny Wiggins, *'Rating Agencies get the Measure of the Markets'*, Financial Times, 28.05.2004.

[321] BIS, *Credit Ratings*, pp. 14-15.

Table 3: MIS & A.M. Best Insurance ratings, ratings distribution & 10-year performance.

	A.M. Best	***MIS***
Total number Insurance ratings in 2011	*3455*	*913*
Total number Investment grade	*3405*	*823*
Total number no Investment grade	*50*	*90*
% Investment grade	*98.6%*	*90%*
Invest. grade default after 10 years	*13*	*1*
% Invest. grade default after 10 years	*0.4%*	*0.1%*
Invest. downgrade to no-invest. 10 years	*15*	*5*
% Invest. downgrade to no-invest. 10 years	*0.4%*	*0.7%*

Source: SEC filing, Form NRSRO, Exhibit 1, 'Credit Ratings Performance Measurement Statistics', MIS and A. M. Best, 10-year ratings performance for Insurance Companies, year 2022.

3. Financial crises and credit ratings – Asian Financial Crisis, Enron, and the GFC

As Sinclair stated, "the most substantial challenge to the agencies' power and authority occurs when there is a failure to predict a sudden financial deterioration", since when agencies 'get it right', as for example in the case of Argentina's sovereign ratings in 2001 when CRAs warned early on about the country's deteriorating finances or the corporate ratings of telecommunications companies in the US in the same year, it is not news-worthy, even though it is valuable for their customers (Sinclair 2005). The experience with NRSROs in the late 1990s and early 2000s with the Asian Financial crisis, Enron, and the US subprime crisis leading to the GFC were inflection points in the development of the CRA market, especially regarding the central part of its regulatory linkages in the US and internationally. Even though the three crises concerned separate segments of the rating market (sovereign ratings in the Asian financial crisis, corporate ratings in the case of Enron, and structured finance ratings during the GFC) and had different focus points in their criticism (e.g., the implications for auditors and audited balance sheets in the ratings process in Enron's case, or the role of CRAs in the issuing process of structured finance ratings), the crises were perceived as very much interlinked as far as CRAs were concerned. *The Guardian* columnist and economics

commentator Aditya Chakrabortty summarized in a column concerned with downgrades of sovereign Eurozone debt issuers in 2012: "In my working life, the credit-rating duopoly has failed to warn investors about the Asian financial crisis, Enron, the subprime crisis, Lehman Brothers", highlighting the significance of the three cases that produced the most public debate about the role of rating agencies in financial markets, the complicated historical ties and interrelation between CRAs and regulators, and the information value of credit ratings.[322]

This chapter argues that it was indeed these cases of financial crises and high-profile collapses that triggered reforms reshaping the CRA market. They resulted in the renewed expansion of NRSRO status to smaller and foreign firms in the early 2000s, and more emphasis on the informational value of credit ratings regarding transparency, the inclusion of 'market data' and openness about rating methodologies. These cases acted as catalysts for longer-standing efforts going back to the 1990s to overhaul the regulatory system for the credit rating market especially in the US. Timeliness and accuracy of information supplied by CRAs were at the core of these debates and crises, as they differ fundamentally between 'normal' times and times of crises and distress. In extreme cases and especially systemic crises, the long-term perspective taken by CRAs was perceived as too slow to adapt to the changes (Sinclair 2005), combined with an overreliance on past performance to predict future creditworthiness, a criticism already prevalent in the 1980s junk bond boom (see e.g., Yago 1990). The answer to these issues by regulators after the experience of the Asian financial crisis and the collapse of Enron was based on two basic principles: increased transparency for investors of the ratings process and methodology to better understand the ratings issued by CRAs, and efforts to increase competition among CRAs by formalising and expanding NRSRO designation, as well as formal oversight through the SEC. This path remained fundamentally the same after the GFC, yet was further intensified.

As Partnoy argues, the use of the NRSRO concept in US federal legislation expanded "dramatically" after 1975 to the early 2000s (Partnoy 2002). At the same time, with the increasing

[322] Aditya Chakrabortty, '*Time to take control of the credit rating agencies*', The Guardian, 16.01.12.

globalisation of credit markets, other national regulators especially in advanced economies adopted similar rules in the 1980s and 1990s (see Appendix 6), with the harmonized standards of Basel II being perceived as the culmination of the internationalisation of using CRAs and their ratings as regulatory tools.[323] The use of CRAs to determine risk-weights in the Basel accord was initially proposed by the US delegation under New York Fed chairman William McDonough, yet faced opposition from the German delegation,[324] emphasizing the different standpoints characterised by the two countries' use of CRAs in national regulation:

> "Because only 175 German companies have obtained ratings from external agencies, they worried German banks would be placed at a disadvantage to their US counterparts, most of whose domestic clients have ratings".[325]

The dispute was settled however by leaving the option for offering the alternative for 'more sophisticated banks' to use their own internal systems of credit assessments if they satisfy the national supervisors' requirements, and from the first consultative paper issued by the Basel committee in June 1999, over its many revisions to the final revised framework in June 2006, the use of CRAs to determine risk-weights had remained as one of the two options.[326] The criteria under the Basel accord to determine eligibility of the Basel equivalent of NRSRO status (ECAI, external credit assessment institution) were modelled closely on the SEC's definition focusing on input criteria such as "Objectivity, Independence, Transparency, Disclosure, Resources, and Credibility".[327] However, these processes were widely criticised on two main issues that are closely related: barriers to entry and competition among CRAs, and the informational value of credit ratings.[328] In fact, throughout the 1990s, the SEC had engaged in a series of investigations and

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[323] BIS, *International Convergence,* June 2006.
[324] See George Graham, '*Supervisors in Accord on Bank Capital*', Financial Times, 03.06.99.
[325] Ibid.
[326] See BIS, '*A New Capital Adequacy Framework*', Consultative paper issued by the Basel Committee on Banking Supervision, Basel, June 1999; available online: *https://www.bis.org/publ/bcbs50.htm*; See also BIS, '*The New Basel Capital Accord, Consultative Document*', Basel, April 2003; available online: *https://www.bis.org/bcbs/bcbscp3.htm;* and BIS, '*International Convergence',* June 2006*.*
[327] BIS, '*New Basel Accord'*, pp. 14-15.
[328] See e.g., Daisuke Kotegawa to Jonathan Katz, '*Rating Agencies and the Use of Credit Ratings under the Federal Securities Laws*', Ministry of Finance of Japan, Comments on proposed SEC release, 28.07.03; available online: *https://www.sec.gov/rules/concept/s71203/dkotegawa072803.htm*.

deliberations about how to improve these aspects of the CRA market.[329] This even led in 1997 to "a rule proposal (…) which among other things, would have defined the term 'NRSRO' in the Net Capital Rule", which had been left ambiguous as to which corporations were eligible for NRSRO designation and a process for adding new entrants to the CRA market; yet "the Commission has not acted upon that rule proposal".[330] As the SEC itself admits in its report to Congress pursuant of the Sarbanes-Oxley Act, many of the proposed regulatory changes such as clear rules for a recognition process of NRSROs to increase competition and increase transparency in the CRA market had already been considered during the 1990s, but were never enacted.[331] Annette Nazareth, the SEC's Director of the Division of Market Regulation, emphasized clearly the importance of the Enron experience in promoting these issues for the SEC and the US Congress in 2003: "the initiation of broad-based Commission and Congressional reviews of credit rating agencies following the collapse of Enron has resulted in the need for a fresh look at these issues".[332]

The Asian financial crisis of 1997 provided a first inflection point for these deliberations and discussions, which in the context of Enron's collapse and the pursuing legislation and regulatory changes would lead to major changes to the CRA market and the informational value of credit ratings. Peter Larsen and Jenny Wiggins, the leading journalists covering CRAs in the 1990s and early 2000s, drew a clear line from the debates about CRAs in the context of the Asian financial crisis and the collapse of Enron: "The agencies have been here before (…) they were also guilty of being over-optimistic about emerging markets before the Asian crisis of the late 1990s".[333] In their assessment, they also highlight the connection between debates about CRA regulation, their

[329] See e.g., SEC, '*Nationally Recognized Statistical Rating Organizations*', Release No. 34-346 16, 31.08.94; available online: *https://www.sec.gov/rules/concept/34-34616.pdf*.
[330] SEC Memorandum, Annette Nazareth to Chairman William Donaldson, '*Letter from Chairman Baker on Issues Relating to Rating Agencies*', 04.06.03, p. 1; available online: *https://www.sec.gov/spotlight/ratingagency/baker060403.pdf*.
[331] See SEC, '*Report on the Role and Function of Credit Rating Agencies in the Operation of the Securities Markets*', January 2003, pp. 10-12; available online: *https://www.sec.gov/news/studies/credratingreport0103.pdf*.
[332] Ibid. p. 2.
[333] Peter Thal Larsen and Jenny Wiggins, '*Wall St berates the ratings agencies*', Financial Times, 14.01.2002

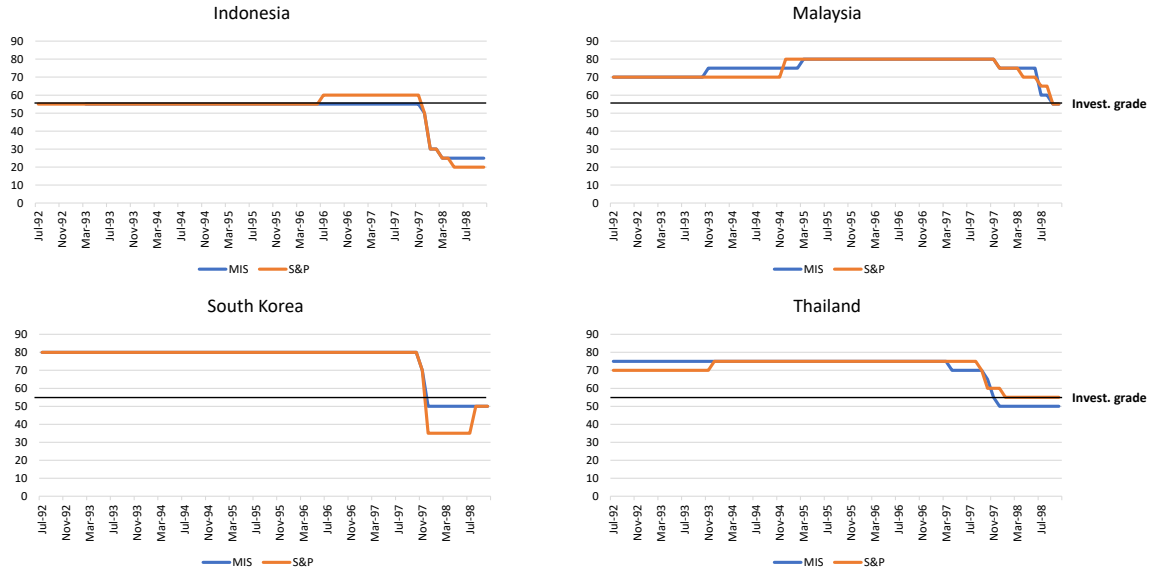
involvement in financial crises and collapses, and the informational value of credit ratings with changes in financial market information acquisition:

> "A more pressing question (…) is whether the agencies are still relevant. As the debt markets have increased in size and complexity, banks and larger bond investors have built large research teams to analyse companies' creditworthiness".[334]

Unlike during the GFC or Enron, in the Asian financial crisis CRAs were criticised by bond investors primarily for their sovereign ratings for emerging Asian economies, even though there also existed ex ante ratings for Asian banks in emerging markets (Mora 2006). The sovereign debt of several Asian economies was sharply downgraded by the big 3 rating agencies in late 1997. MIS for example took drastic measures downgrading Asian sovereign ratings by four (Malaysia) to six (Indonesia and Korea) notches between September to December 1997 after the collapse of the Thai Baht in July (Ferri, Liu et al. 1999). Figure 50 shows the sovereign ratings issued by S&P and MIS for Indonesia, Malaysia, South Korea and Thailand and their downgrades during 1997. As can be seen in the figure, the rating changes were not only significant in their extent, but they were also conducted around the investment grade barrier, thus restricting the potential for investments in the sovereign bonds of these countries by many investors in Western economies during and after the crisis.

[334] Ibid.

Figure 50: Sovereign ratings by MIS & S&P for countries during the Asian financial crisis of 1997.



Sources: Data on MIS & S&P ratings based on Moody's and S&P rating history, tradingeconomics, and Ferri, Liu et al. 1999.[335]

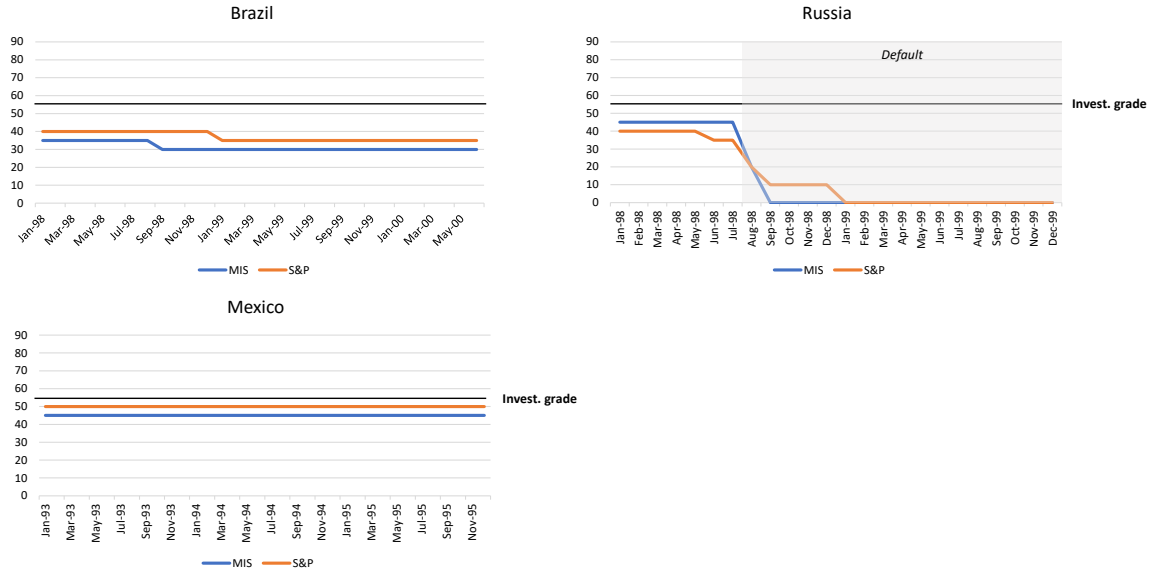
In their assessment, the BIS saw the sharp downgrades by the leading NRSROs as one crucial part in explaining the severity of the crisis for the involved economies.[336] Some commentators suggested the reactions by the large CRAs were "excessively conservative" compared to other instances of crises based on the countries' economic fundamentals, thus unnecessarily aggravating the downturn (Ferri, Liu et al. 1999). This view has been challenged subsequently, as for example Mora argued that sovereign ratings did not act procyclical during the Asian financial crisis (Mora 2006). As Figure 51 shows in comparison to the downgrades for Asian sovereign bonds during late 1997, the sovereign rating adjustments for other emerging market economies such as Brazil or Mexico during other troubling events in the 1990s (such as the Brazilian crisis of 1998/99 or the Mexican Peso crisis of 1994/95) were minor in comparison to the Asian financial crisis. The Russian sovereign default of 1998 on the other hand triggered a significant

[335] Linear alphanumerical transformation of CRAs long-term credit rating scales, with 100 being equal to the highest rating grade for MIS and S&P. Linear transformation might not be representative of the nature of ratings, with e.g., differences around cut-offs such as the investment grade barrier; yet if applied equally and assuming consistency of rating standards, it allows for comparisons between sovereign rating downgrades in emerging market countries.

[336] See BIS, '*68th Annual Report*', 08.06.98, p. 110.

downgrade, which was a coherent reaction to the default. However, all of these rating actions were conducted below the investment grade barrier (Figure 51), which can be assumed to be at least part of the explanation for why investors reacted more strongly to the significant changes in the case of the Asian sovereign downgrades. In a similar way rating changes did not play a major part in Argentina's 2001 financial crisis and subsequent default. For example, the Independent Evaluation Office of the IMF in its extensive review report of the IMF's policy in the Argentinian crisis only mentions rating changes by CRAs once in the context of the Argentinian default.[337]

Figure 51: Sovereign ratings by MIS & S&P for emerging market economies during 1990s crises.



Sources: Data on MIS & S&P ratings based on Moody's and S&P rating history, tradingeconomics, and Ferri, Liu et al. 1999.

This led to a recurring debate, appearing not only in the case of the Asian financial crisis and Enron's collapse, but also on various occasions over the period since 1975 with regard to the informational value of credit ratings during times of distress and CRA actions: if actions (or non-actions) by CRAs such as downgrades (or withheld downgrades) can actually impact market outcomes. As just one early example of many such controversies, already when New York City came under financial pressure in 1975, S&P

[337] See IMF, *'Evaluation Report – The IMF and Argentina, 1991-2001'*, Independent Evaluation Office, 2004, p. 46.

> "suspended the ratings on city debt and was vilified for causing, or at least exacerbating, the subsequent financial chaos (…) Moody's retained its rating (…) the bonds eventually defaulted and investors criticised the relatively safe rating assigned by Moody's".[338]

Yet, other than in the case of the Asian financial crisis and especially Enron, criticism died down quickly after and "the collapse of New York City's finances in the mid- 1970s did not give rise to fundamental change" in the rating market (Sinclair 2005). The episode shows however that debates on the informational value of credit ratings and their role in crises are not limited to the quasi-regulatory status of NRSROs that had not yet come into effect when S&P downgraded NYC bonds in April 1975. It also emphasizes the significance of different rating decisions taken by two different CRAs, evaluating the same set of information on a municipal borrower and judging differently based on soft information such as NYC's "strong legal backing" and "unique position in the American economy".[339] This debate circles around the core of this inquiry, the informational value of credit ratings and their relation to financial crises amid their regulatory entanglement in the 1990s and early 2000s, which can be traced prominently when looking at the example of Enron's collapse. The direct link of quasi-regulatory power of ratings by NRSROs and their informational value was summarized succinctly by Jane Fuller within the CRA reform debate following Enron's collapse:

> "If ratings are 'only an opinion', it is better to have greater diversity, feeding debate. A limited field, with the illusion of proper regulatory oversight, encourages investors to cut corners on research and decision-making".[340]

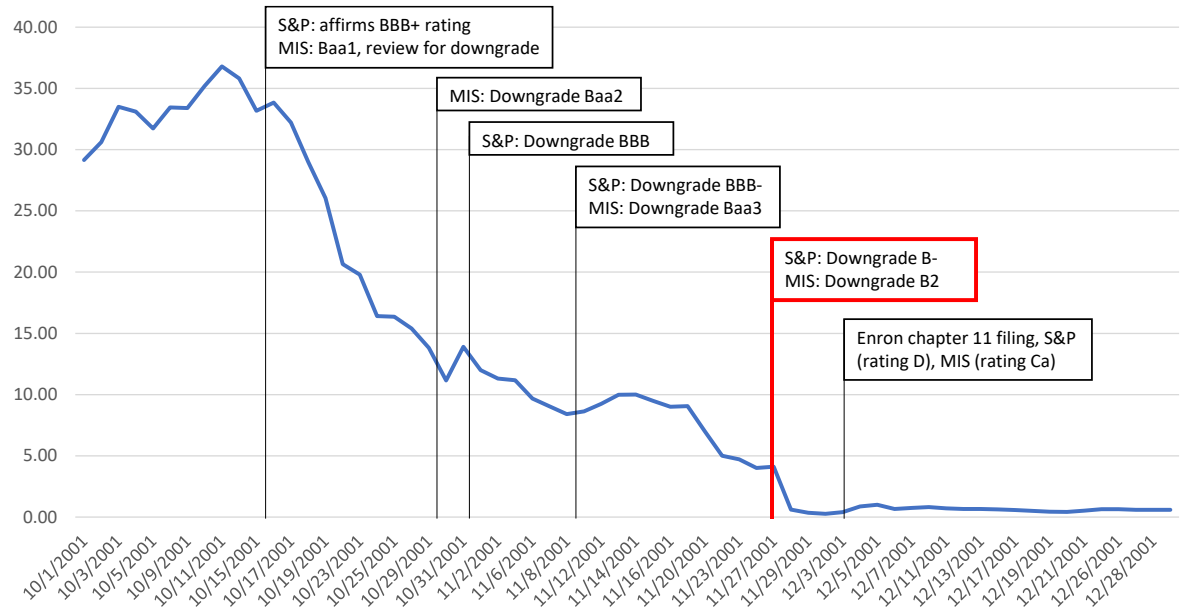
The case of Enron's collapse must be seen as the decisive inflection point in this regard. The particularities of the former energy trader's demise have been reported on and debated in the public and financial press, as well as in congressional and judicial hearings, so they are only roughly sketched out here. Figure 52 plots Enron's stock price development from October to December 2001 and highlights the major rating changes by MIS and S&P in the build-up to the company's

[338] Financial Times, '*Evaluating the Bond-rating Agencies*', unknown author, Mastering Finance series, 27.05.97.
[339] See John Darnton, *'Moody's Keeps 'A' Rating In Endorsing City's Bonds'*, The New York Times, 04.04.75.
[340] Jane Fuller, *'Credit rating groups need greater scrutiny'*, Financial Times, 13.04.2003.

subsequent bankruptcy, while Figure 53 shows in detail Enron's MIS and S&P rating development around the investment grade barrier in 2001. On October 16, 2001, Enron publicised its third quarter results, disclosing an unexpected net loss of $618 million due to after-tax charges of about $1 billion – leading MIS to place the company's rating (at this point at Baa1, three notches above the investment grade threshold) on review for downgrade, while S&P affirmed its BBB+ rating.[341] However, on October 29th and November 1st, first MIS and then S&P downgraded Enron's credit rating by one notch (Baa2 and BBB respectively), before on November 9th both agencies downgraded Enron one further notch just above "junk" status due to concerns about serious misrepresentations by Enron about its profits and previous financial statements.[342] Finally, after a potential acquisition by its competitor Dynergy, backed by ChevronTexaco and facilitated by JPMorgan Chase and Citigroup, was deemed unlikely to materialise by the major NRSROs, MIS and S&P placed Enron below investment grade on November 28th, downgrading its rating to B2 and B- respectively. Enron filed for chapter 11 bankruptcy just four days later on December 3rd, after it was unable to refinance its debt and its stock market value had plummeted from $34 per share on October 16 to below $1 on November 28.[343] As shown in the figures and emphasized in the inquiries conducted into the CRAs actions during the Enron crisis, the downgrade below 'investment grade' (red box in Figure 52) by both agencies occurred only four days before Enron's bankruptcy filing.

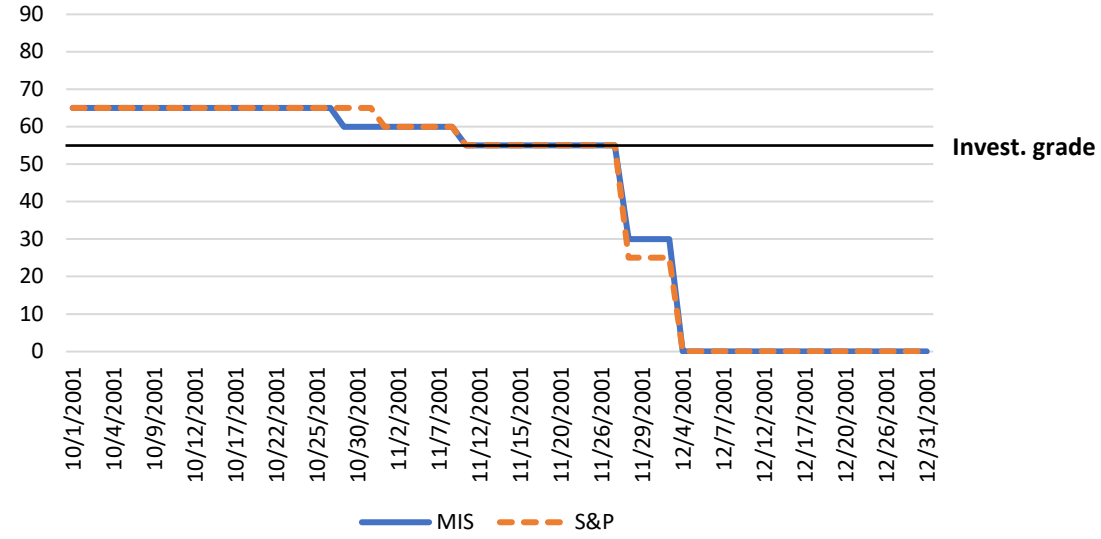
[341] See John Diaz, '*Testimony of John Diaz, Managing Director of MIS before the U.S. Senate Committee on Governmental Affairs*', 20.03.02, pp. 7-8; see also Baron, '*Testimony of Ronald Barone, Managing Director of S&P before the U.S. Senate Committee on Governmental Affairs*', 20.03.02, pp. 30-31; available online: *https://www.govinfo.gov/content/pkg/CHRG-107shrg79888/pdf/CHRG-107shrg79888.pdf*.
[342] See also timeline in Larsen and Wiggins, *Wall St berates*, FT, 14.01.2002.
[343] Larsen and Wiggins, *Wall St berates;* Diaz, *Testimony*, p. 9; Baron, *Testimony*, p. 31.

Figure 52: Enron stock price development and major rating events in 2001.



Sources: Data on MIS & S&P ratings based on Moody's and S&P rating history, data on Enron stock price from enroncorp.com historical price lookup.

Figure 53: Enron MIS & S&P rating development in 2001.



Sources: Data on MIS & S&P ratings based on Moody's and S&P rating history, data on Enron stock price from enroncorp.com historical price lookup.

The public and regulatory debate in the aftermath of Enron shows the preoccupation of regulators and commentators with the informational value of credit ratings in the financial market. One prime example here is the enquiry commissioned by the SEC following the experience of Enron

and the Sarbanes-Oxley Act. Many of the questions posed to investors, CRAs, independent advisers and other stakeholders in credit ratings pointed towards either making greater use of market indicators (such as credit spreads) in determining a regulatory scale for capital allocation, or towards the potential effects of removing NRSRO references in legislation all together – which would be taken up again in the context of the GFC.[344]

Moody's itself identified in discussions with asset management firms three main takeaways for its ratings, out of which two seemed to stand for a basic conundrum between ratings representing on the one hand a "stable signal of medium- to long-term fundamental credit risk" and on the other hand a need for "shorter review periods for reassessing ratings in light of changed company or market circumstances".[345] However, alongside the condemnation by policymakers of the CRAs actions during the Enron collapse based on the allegation of too little scrutiny of Enron's false information and accountability by the CRAs for their alleged too late downgrades,[346] there were also opposing views, questioning the informational value of credit rating during times of increased uncertainty. The timeliness of ratings as an indicator for investors in financial crises had already been an important aspect in the public and regulatory debate following the Asian financial crisis when CRAs undertook fast and drastic sovereign rating cuts, and would resurface as a dominant theme in the wake of Enron's collapse. Under the impression of the regulatory and legislative developments in the ratings' market following Enron's collapse, Sinclair summarized these thoughts as

> "a common criticism (…) that the rating agencies are too 'slow'. They apply the lessons of the past to the present (…) Market participants worry that the ratings they are looking at do not have much to do with the company whose balance sheet can move by billions in either direction, in just a few hours" (Sinclair 2005).

[344] See for example SEC, '*Response to SEC Concept Release: Rating Agencies and Use of Credit Ratings under the Federal Securities Laws*', response by Cantwell & Company, July 22, 2003, pp. 2-4.
[345] See Diaz, *Testimony*, p. 13.
[346] See e.g., statements by Senators Lieberman and Thompson in US Senate, *Rating the Raters*, pp. 3-6.

The *Financial Times'* Lex column in January 2002 distilled this view that ratings in the case of Enron were not a useful tool for investors gaining additional information, as

> "rating agencies do a reasonable job of assessing credit risk in stable times. But during a crisis, their actions tend to be a lagging indicator. This was true in Enron's case. In the final weeks, S&P took cover. Moody's bent over backwards to avoid acknowledging what the market screamed: that Enron was not an investment grade credit".[347]

One important aspect regarding the informational value of credit ratings is further emphasized by looking at the example of Enron: the interaction and incentives of the rated institutions with the CRAs. As had recently been stated by Gill in the case of sovereign ratings, the influence and importance of actions by rated institutions towards CRAs during the ratings process to obtain the most favourable rating outcome has been little acknowledged in the academic discourse on the topic (Gill 2015). In the case of Enron, these efforts by the company to actively obtain a better credit rating were laid out in plain sight during the Congressional inquiries, as Enron throughout 1999 and 2000 tried to improve its S&P and MIS credit ratings by disclosing what Enron referred to as a 'kitchen sink analysis', supposedly giving all the financial and strategic information on the company's performance and plans to the two CRAs.[348] This influence by Enron helped to obtain a one notch upgrade by MIS and S&P in March 2000 to Baa1 and BBB+ respectively, effectively the ratings held until October 2001 (see Figure 53).[349] The two CRAs defended their action by emphasizing that Enron did not in fact as claimed disclose all its dealings, especially with off-balance-sheet vehicles designed to disguise losses in the company's Energy trading division.[350] At the same time, the issue of CRAs information acquisition was put into the spotlight by this line of inquiry – if credit rating agencies had special access to private information and analyses, shouldn't they have been the first to spot that something was amiss with Enron? The repeated defence by CRAs to this was the emphasis on the fraudulent audited accounts of Enron, blaming

[347] Lex column, '*Moody's blues*', Financial Times, 21.01.2002.
[348] See Diaz, *Rating the Raters*, p. 17, and Barone, *Rating the Raters*, p. 9.
[349] See Diaz, *Rating the Raters*, p. 33.
[350] Barone, *Rating the Raters*, pp. 17-19.

the accounting firms responsible and that they had to rely on that information[351] - thus sprouting demands for more transparency about the CRAs rating process and the information taken into account within their decision-making.

As in the previous chapter, speed played a major role in the CRAs assessment and criticism in both the Asian Financial crisis and Enron's collapse. The criticism of the major CRAs' actions during both crises were directed in opposite directions regarding this temporal component. During the Asian Financial crisis, CRAs were criticized for downgrading too early, aggravating the crisis unnecessarily, while in Enron's case the downgrades were perceived as too late. As pointed out in the first section of this chapter, the secondary literature on how CRAs actions impact crises is split about whether their actions actually impact crises significantly based on other (and faster adapting) market-based indicators being readily available. Yet, as shown in this chapter, the primary criticism in the public and regulatory debate on CRAs still centres around the factor of speed and timing of this decision-making and the broadcasting of rating decisions as information events during these crises.

What then were the specific regulatory and market implications following Enron's collapse? As pointed out, the high-profile involvement by the big CRAs in the affair led to voluntary changes in the CRAs approach and rating methodology such as shorter review periods and increased inclusion of liquidity measures in their ratings, yet also led the large CRAs to reconsider their stance on the use of the NRSRO designation in federal legislation. While in 1997 the SEC had introduced its proposed rule for changing the recognition process for NRSROs, the Big-3 had "fought them tooth and nail" and the "rule was never acted upon",[352] the response by MIS in 2003 to a concept release (a standard procedure by the SEC to consult market participants on proposed rule changes) to inquire about alternatives to the current NRSRO designation process advocated for a removal of references to NRSROs in federal securities law, or, alternatively, for a clear

[351] See Diaz and Barone, *Rating the Raters*, pp. 13, 24, 29.
[352] Senator Bunning, *Rating the Raters*, p. 21.

designation process and increased recognition for smaller agencies.[353] This complete reversal of stance towards reform must be seen as a direct consequence of the experience of increased regulatory pressure after the Enron collapse.

The 2003 concept release by the SEC was a direct consequence of the introduction of the Sarbanes-Oxley Act of 2002, which together with the Credit Rating Reform Act of 2006 were the major legislative reforms before the GFC in the US regarding NRSROs. These regulatory processes also coincided with the steep increase in structured finance issues and ratings around 2002 until 2006 (Shapiro and Skeie 2013), a development that entailed a much more active engagement by the rating agencies in the process of designing issues to obtain targeted ratings, which was one of the major criticisms CRAs faced in the aftermath of the GFC (see section 2). The Sarbanes-Oxley Act set out that the SEC should conduct a review of the credit rating business in the United States, with major implications for the informational value of credit ratings: among the focus points for this study should be an evaluation of "any barriers to entry into the business of acting as a credit rating agency", "the importance of that role to investors and the functioning of the securities markets", and "any measures which may be required to improve the dissemination of information".[354] These focus points were subsequently taken up in the inquiry conducted by the SEC, with sections on the "information flow in the credit rating process" and "potential barriers to entry/regulatory treatment" comprising two of the four focus points for the SEC in its evaluation.[355] However, despite efforts by the SEC through a multitude of public hearings, formal and informal discussions with market participants, in its final reports to Congress, several questions remained unanswered from the SEC's point of view, especially if the Commission should take on direct official oversight of CRAs (and if it even had the power under US law to do so), as well as regarding information flow

[353] Raymond McDaniel, '*MIS response regarding Concept Release: Rating Agencies and the Use of Credit Ratings under the Federal Securities Laws*', 28.07.03, pp. 3-5; available online: *https://www.sec.gov/rules/concept/s71203/moodys072803.htm*.
[354] See *Sarbanes-Oxley Act of 2002*, US Public Law 107–204, Sec. 702a, Approved 30.07.02.
[355] See SEC, '*Hearings on the current role and function of the credit rating agencies in the operation of the securities markets*', transcripts of hearings on November 15 and 21, 2002, p. 4; available online: *https://www.sec.gov/news/extra/credrate/credrate112102.txt*.

and transparency of rating decisions (if CRAs should disclose more information about their decision-making and methodology), and barriers to entry (if the SEC should clarify its standards for recognition, the timeline for the recognition process and whether NRSROs should be recognised for only segments of the credit market).[356]

After another 'concept release' by the SEC seeking public comment on these issues in June 2003, where the commission received over 46 extensive comments from accredited NRSROs, other CRAs, academics and financial market participants, these questions finally resulted in the passing by Congress of the Credit Rating Agency Reform Act of 2006.[357] It set out clear criteria for the application and recognition of NRSROs, as well as demanded NRSROs to publish their rating methodologies regularly, submit additional information on their rating quality and distribution to the SEC, and for the SEC to issue a yearly report to Congress.[358] Although this reform was highly influenced by the SECs proposals and reports to Congress, it also deviated from the SECs proposals on important subjects, most notably regarding oversight: the SEC had advocated for a "voluntary oversight framework", with a "strong and effective industry-led regime", yet Congress opted for more direct oversight by the Commission as expressed in the CRA Reform Act.[359] However, the question of oversight would ultimately return during the GFC as one of the central issues of reform regarding CRAs. With this reform, that, as this section showed, had its origins in the deliberations of the SEC in the 1990s and was a direct consequence of the CRAs entanglement in the Enron affair, the number of NRSROs that had grown to 5 by 2006,[360] increased to 8 in September 2007 and then

[356] SEC, *Report on the Role,* pp. 1-2.
[357] See Annette Nazareth, *'Testimony Concerning Credit Rating Agencies'*, Before the Subcommittee on Capital Markets, Insurance and Government Sponsored Enterprises, Committee on Financial Services, April 12, 2005, p. 2; available online: *https://www.sec.gov/news/testimony/ts041205aln.htm*.
[358] See *Credit Rating Agency Reform Act of 2006*, US Public Law 109–291, Sec. 4 & 6, 29.09.06.
[359] Nazareth, *Testimony*, p. 5.
[360] The Big-3, DBRS and AM Best (for the insurance segment of the credit market) which were subsequently recognised in 2003 and 2004 by the SEC, see for example Jeremy Grant, '*Bill seeks added competition for rating agencies*', Financial Times, 14.07.2006.

10 subsequently in February and June 2008, when financial markets were already faced with the US subprime crisis and the start of the GFC.[361]

Due to their exposed role in the build-up to and during the GFC, academic literature has dealt extensively both with the role of CRAs during the crisis (see e.g., Pagano and Volpin 2009, Solow and Lo 2012, White 2016), as well as with the regulatory response and aftermath to the GFC (see e.g., Papaikonomou 2010, Kruck 2011, Ellis, Fairchild et al. 2012), finding evidence for structural issues such as ratings inflation and ratings shopping by issuers, which both contributed to a decreased informational value of credit ratings for investors in the context of the GFC. Policy recommendations frequently included a retreat from (or at least adaptation of) the issuer-pay model, as well as increased transparency of methodologies in the ratings process, and focused on structured finance and the free access of information on the underlying loans or securities (see e.g., Pagano and Volpin 2009). Thus, this section focuses on the implications for the information conveyed to investors in credit ratings, and how this became a resurfacing focal point for regulation efforts in the aftermath of the GFC. Less well recognised in this literature is the way that the fundamental points addressed by the SEC, the FCIC and the US Congress within the context of the GFC were already present in the previous debates on Enron in the early 2000s and consequently reaching back to the 1990s, focusing, in the words of Daniel Gallagher, SEC Co-Director of the Division of Trading and Markets after the collapse of Lehman Brothers in September 2008, on improving the "transparency of the ratings process" and "promote competition among rating agencies".[362] Prior to the proposals by the SEC in the 1990s and 2000s to focus on issues of transparency regarding methodology and the ratings' process itself, as well as competition in (and entry barriers to) the CRA market, the SEC and public debate in the US was more concerned with specialised issues such as split ratings, timing of rating announcements, and the status of solicited

[361] See SEC, *'Report on NRSSROs'*, June 2008, p. 34.
[362] Daniel Gallagher, '*Testimony Concerning 'Reforming Credit Rating Agencies*'', Before the United States House of Representatives Committee on Financial Services and Subcommittee on Capital Markets, Insurance and Government-Sponsored Enterprises, September 30, 2008, p. 1; available online: *https://www.sec.gov/news/testimony/2009/ts093009dmg.htm*.

and unsolicited ratings. It was once more the crisis experience that catalysed a further push towards more fundamental reform, culminating in new rulings by the SEC,[363] as well as structural changes for CRA supervision through the introduction of the Office of Credit Ratings within the SEC and provisions in the Dodd-Frank Act of 2010 in order to remove required references to credit ratings and NRSROs from federal regulation.[364]

The FCIC underlined the central role of CRAs in the build-up to the crisis as "this crisis could not have happened without the rating agencies", with ratings for structured finance products working as a "seal of approval" for investors that were, through this information conveyed by the agencies, lured into a "false sense of optimism" about these financial products.[365] However, in similar fashion to the Asian financial crisis and the Enron collapse, the downgrade of structured finance issues and institutions in financial markets was also criticised as "their downgrades through 2007 and 2008 wreaked havoc across markets and firms".[366] Much of the public and academic discussion regarding the involvement of CRAs in the GFC has focused on the incentive-structure of the issuer-pay business model adopted by the big 3 NRSROs in the 1970s, and potential conflicts of interest this might have created and thus contributed to diluted ratings with no informational value during the GFC.[367] These issues were subsequently addressed in legislation and by SEC rulings, with specific new disclosure requirements of NRSROs such as conflicts of interest, magnitudes thereof, or obtaining 'preliminary ratings' (to prevent "rating-shopping").[368] Yet again, these issues were

[363] See e.g., SEC, *'References to Ratings of Nationally Recognized Statistical Rating Organizations'*, Release No. 34-58070, July 1, 2008; available online: *https://www.sec.gov/rules/proposed/2008/34-58070.pdf*.
[364] See *Dodd-Frank Wall Street Reform and Consumer Protection Act*, Public Law 111–203, July 21, 2010, Sec. 931 – 939.
[365] See FCIC, '*The Financial Crisis Inquiry Report*', FCIC, January 2011, p. XXV.
[366] Ibid.
[367] See e.g., FCIC, *Report*, p. 28; SEC, '*Strengthening Oversight of Credit Rating Agencies - Open Meeting of the Securities and Exchange Commission*', press release, September 17, 2009, p. 2; available online: *https://www.sec.gov/news/press/2009/2009-200-factsheet.htm*.
[368] SEC, *Strengthening*, pp. 2-3.

already addressed during the previous inflection point around Enron's collapse, but only the prominence of the debate in the GFC brought the final push for implementation.[369]

The GFC and its aftermath must be characterised by a flurry of proposals, rulings, reforms and additions regarding CRAs, their rating products and the informational value conveyed by them. However, the most important changes, legislatively adopted in the Dodd-Frank Act, were the final step towards the elimination of many references to NRSROs in federal securities legislation, and the establishment of the Office of Credit Ratings (OCR) within the SEC. As already pointed out, the SEC rulings of 2008/2009, and then the Dodd-Frank-Act had finally removed many references to NRSROs in federal securities law, in order to disentangle the informational value of credit ratings from regulatory and legislative requirements.[370] This went along with a host of new transparency and reporting measures, such as extensive rating methodologies, underlying assumptions of ratings, or "subsequent changes to credit ratings to track performance of an NRSRO's credit ratings",[371] leading to a decisively more transparent status of NRSROs than had been the case before the GFC. However, as the removal of NRSRO status from all federal securities legislation was a fundamental overhaul of some major US legislation (and had in some instances, where it was already introduced, little effect on market structure or use of credit ratings, as other indicators were allowed to compete with credit ratings, but these had been established for decades in the financial system), this is to this day still an ongoing process.[372] The most fundamental reversal of policy after the GFC was with regard to direct SEC oversight of NRSROs: the establishment of the

[369] Even the problem of high complexity and thus hard-to-evaluate ratings within new structured finance products had already been addressed in this instance, but didn't lead to concrete reforms at the time; see FCIC, *Rating the Raters,* pp. 18-19.
[370] See *Dodd-Frank*, Sec. 939; for a complete list of removals proposed by SEC ruling see SEC, '*Rules and Forms at Issue in Removal of References to NRSRO Credit Ratings*', September 17, 2009, pp. 1-3; available online: h*ttp://www.sec.gov/news/press/2009/2009-200-rulesformsaffected.htm.*
[371] SEC, '*2013 Summary Report of Commission Staff's Examinations of Each Nationally Recognized Statistical Rating Organization',* December 2013, p. 4; available online: *https://www.sec.gov/files/nrsro-summary-report-2013.pdf*.
[372] See e.g., SEC, '*Removal of References to Credit Ratings from Regulation M',* proposed rule, March 23, 2022; available online: *https://www.sec.gov/rules/proposed/2022/34-94499.pdf.*

OCR in 2012 following the provisions in the Dodd-Frank Act was aimed to guard the informational value of ratings for investors. The OCRs goal was defined as

> "promoting accuracy in credit ratings issued by NRSROs; and working to ensure that credit ratings are not unduly influenced by conflicts of interest and that NRSROs provide greater transparency and disclosure to investors".[373]

Through the conduct of at least annual examinations of each NRSRO, the publication of these findings of the examination in a summary report, and continued review of NRSROs compliance with the reforms set-out in the Dodd-Frank Act, this would in fact establish the most comprehensive form of oversight the CRA market had ever witnessed – and was far from the 'voluntary framework' led by the ratings industry initially envisaged by the SEC.[374]

Overall, as this section shows, a remarkable continuity can be observed regarding the regulatory interaction between CRAs and the informational value conveyed by them for investors. In reform efforts in the US since the 1990s, the enhancement of the informational value through different policies regarding transparency, disclosure, and competition have been fundamental focal points. The original policy recommendations and strategies surrounding these areas have in fact not changed significantly in their spirit; if anything they changed mainly in the comprehensiveness that they were pursuing these reform goals. However, the critical inflection points of especially Enron and the GFC triggered actual reform.

4. Information for investors during times of distress – the Lehman collapse

Hypotheses, dataset and descriptive statistics

Studies on the changing use of information such as financial indicators by investors during times of increased uncertainty and distress in markets are sparse at best. Yet in one rare, recent example, Loh and Stulz find evidence for increased attention by investors to information conveyed

[373] See SEC, '*Report to Congress on Assigned Credit Ratings*', December 2012, pp. 1-4, 44, 52; see also SEC, '*About the Office of Credit Ratings*', February 2022, available online: *https://www.sec.gov/about/division-offices/office-credit-ratings/about-office-credit-ratings*.
[374] See *Dodd-Frank*, Sec. 932.

by analyst forecasts during times of distress looking at abnormal stock returns, emphasizing the impact of increased volatility on investor behaviour through their increased attention to this kind of information (Loh and Stulz 2018). This section follows this path of inquiry, analysing the potential differential impact of information content conveyed to investors through solicited (public and private information) and unsolicited ratings (solely public information). This analysis of potential differences in firm information levels signalled through the different kinds of ratings is then further supplemented by including other proxy-indicators of firm-level informativeness for investors, especially the number of sell-side analysts covering the respective firms (for a similar connection between information signalled from credit rating and stock analysts see e.g., Ederington and Goh 1998).

In accordance with Byoun et al. (2014), we can assume that ratings not only influence borrowing costs and the debt structure of issuers, but also the stock price of these firms through the additional information conveyed to investors (Byoun, Fulkerson et al. 2014). Thus, it can be assumed that higher rated firms (relative to lower rated firms) and firms for which more information is available to investors (e.g., through additional private information reflected in solicited ratings, versus unsolicited ratings based solely on public information) would be on aggregate less volatile to a shock - such as the collapse of Lehman Brothers during the GFC - than firms for which comparatively less information is available. This should be demonstrated especially by volatile stock prices after the event. If the hypothesis holds that firms that have a solicited rating convey additional private information to the market, we can expect to observe less stock price volatility (controlling for firm and industry characteristics) for these firms after the collapse of Lehman compared to corporations for which only public information through unsolicited ratings is signalled. The effect of the number of sell-side analysts covering each firm, with more analysts signalling a higher level of informativeness on firms, can be assumed to go in the same direction – so the more information there is available on a firm to investors, the less volatile its stock price should behave during and after the event.

To test these hypotheses, I collected a new dataset on a specific high-profile event, the collapse of Lehman Brothers at the height of the GFC on the 15th September 2008, which conventionally is perceived as the peak of the GFC and significantly heightened uncertainty and volatility in financial markets (see e.g., Brunnermeier 2009, Armantier, Ghysels et al. 2015, Gorton 2015). The dataset, based on information from Refinitv and S&P CapitalIQ, entails all public listed companies from four major sectors (TRBC classification: Industrials, Energy, Technology, Financials) traded on three large stock exchanges in advanced economies (NYSE, LSE, Deutsche Börse) for which Moody's Investor Services had issued either solicited or unsolicited issuer ratings at the time of the event.[375] The three exchanges and sectors were selected for data availability and thus comparability along the variables of interest, with a sizeable mix of solicited and unsolicited ratings for all three exchanges and the four sectors. Table 4, and Appendix 8 for more detail, summarize the dataset and provide aggregate descriptive statistics. As one might expect, out of the total of 598 firms, firms with solicited ratings reported on average significantly more revenue ($10,27bn) than firms with unsolicited ratings ($4,09bn) and have a higher market capitalization ($14,09bn vs. $3,21bn). This is consistent with findings in the economic literature that unsolicited ratings are issued by CRAs for either firms that recently went public or represent comparatively smaller institutions in their markets (Gibert 2019). Due to difficulties in identifying and matching unsolicited ratings for debt issuers, especially between different CRAs, previous studies have found various prevalence of unsolicited ratings. Fulghieri et al. (2014) estimate the total number of unsolicited ratings by Standard & Poor's between 2004 and 2011 at 10% (Fulghieri, Strobl et al. 2014), while Poon (2003) reported for S&P ratings from 1998 to 2000 unsolicited ratings for 53% of issuers (Poon 2003), and Bannier *et al.* (2010) estimate unsolicited ratings to account for 20-30% of all international issuer ratings between 2000 and 2005 (Bannier, Behr et al. 2010). The share of firms

[375] The focus on MIS here has several reasons: By only taking one rating scale into account, this eliminates the issue of cross-comparison between different rating scales issued by different CRAs; also, MIS declared which ratings were solicited and which were unsolicited, as well as rating firms in all of the three markets.

with unsolicited ratings in the sample for this study (29.7%) thus ranges in the middle of the larger literature.

Table 4: Descriptive Statistics – GFC dataset – mean & observations.

Descriptive statistics	**Solicited** *Mean*	**Unsolicited** *Mean*	**Overall** *Mean*
Revenue [bn. USD]	10,27	4,09	*8,51*
Company Market Capitalization [bn . USD]	14,09	3,21	*10,88*
Number of sell-side analysts	7,53	4,96	*6,76*
Volume traded 15-17.09.2008 (after) ['000]	3.199,09	859,27	*2.533,96*
Volume traded 11-12.09.2008 (before) ['000]	1.712,94	466,34	*1.355,84*
Change in volume traded before/after - %	86,8%	84,3%	*86,9%*
Price volatility 15.09 - [%]	-3,8%	-4,6%	*-4,0%*
Price volatility 16.09 - [%]	-6,7%	-5,6%	*-6,4%*
Price volatility 17.09 - [%]	-5,2%	-5,7%	*-5,4%*
Price volatility 15-17.09 - [%]	-4,7%	-5,3%	*-4,9%*
Breakdown observations by Country & Industry			
Country - Name of Exchange [n observations]			
DE - Deutsche Börse	75	24	***99***
UK - London Stock Exchange	186	49	***235***
US - New York Stock Exchange	159	105	***264***
Grand Total	***420***	***178***	***598***
Sector - Industry classification [n observations]			
Energy	48	39	***87***
Financials	200	36	***236***
Industrials	100	62	***162***
Technology	72	41	***113***
Grand Total	***420***	***178***	***598***

Analysis and results

As can be seen in Table 4 (and in more detail in Appendix 8), firms with solicited ratings have more analysts covering them (on average 7.53 compared to 4.96 for unsolicited rated firms), and are traded in higher volume both before and after the collapse of Lehman, which is consistent with the observation that these are generally larger firms in terms of revenue and market capitalisation. It can already be observed that the average intra-day stock price volatility for firms with solicited ratings on the day of the event (15.09.2008) and the two days following is lower (4.7%) than for firms with unsolicited ratings (5.3%), which might again be influenced by firm size – a condition that has to be controlled for in the regression analysis.

In a first step, I use a simple OLS regression to test whether a firms' rating status (solicited or unsolicited as a dummy variable) at the time of Lehman's collapse is meaningfully correlated with the absolute extent of stock price changes on the day of the event (PriceChangeT1 & T2), as well as the daily volatility for the day of the event (T0), the two days after the event (T1 & T2), and the average daily volatility for the whole period (T0-T2). As shown in Table 5, there is surprisingly no significant correlation between the rating solicitation status of firms and their perception by investors as expressed by stock price changes and volatility around the time of the event, even without controlling for further firm-level or market characteristics.

Table 5: Simple OLS – Unsolicited vs. solicited ratings effect on stock price changes and volatility.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	PriceChangeT1	PriceChangeT2	DailyVolatilityT0	DailyVolatilityT1	DailyVolatilityT2	AverageVolatilityT012
Unsolicited	-2.594	-2.012	-0.572	-1.682	-1.912	-2.160
	(7.348)	(7.129)	(6.896)	(7.066)	(6.831)	(7.028)
Constant	50.73***	49.28***	47.95***	49.58***	47.44***	48.85***
	(4.011)	(3.891)	(3.764)	(3.857)	(3.728)	(3.836)
Observations	480	480	480	480	480	480
R-squared	0.000	0.000	0.000	0.000	0.000	0.000

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

If this analysis is expanded to investigate a potential correlation between firms' rating solicitation status (and thus in theory the information level on these firms) and further outcome variables such as the volume and value of the traded stocks while controlling for firm characteristics and the outcome variables two months before the collapse of Lehman, as shown in the next Table 6, there appears to be again no significant correlation. These findings are discussed in the following subsection.

Table 6: OLS – Unsolicited vs. solicited ratings effect on traded volume and value.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	VolumeT0	NumAnalysts	NumAnalysts	TradedValueT0	TradedValueT0	VolumeT0	VolumeT1	VolumeT2
Unsolicited	106,754	-3.031***	-3.256***	-1.316e+07*	-1.860e+06	-2.347e+06	-3.111e+06	-2.507e+06
	(151,303)	(0.898)	(1.247)	(7.903e+06)	(2.631e+06)	(1.485e+06)	(2.028e+06)	(1.629e+06)
VolumeT1prior	1.892***							
	(0.171)							
VolumeT2prior	0.0542							
	(0.149)							
RevenueEvent	-5.78e-06**							
	(2.86e-06)							
AvDailyValueTrad			3.03e-08***					
			(9.35e-09)					
Revenue2022			1.15e-10***					
			(0)					
RatingRank			-0.183					
			(0.123)					
TradedValue2MonthBefore					1.638***			
					(0.0264)			
Constant	-370,337***	8.024***	7.695***	2.189e+07***	-895,385	3.078e+06***	4.131e+06***	3.544e+06***
	(85,980)	(0.490)	(1.463)	(4.314e+06)	(1.479e+06)	(792,500)	(1.063e+06)	(856,340)
Observations	102	480	319	480	480	172	171	170
R-squared	0.995	0.023	0.258	0.006	0.891	0.014	0.014	0.014

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The results suggest that the solicitation status of firms does not play a statistically significant role in explaining stock price changes, volatility or traded volume around the collapse of Lehman. What does this tell us about the use of information and firm level informativeness by investors during financial crises? To approach the answer to this question in the following discussion, in line with the theoretical ideas in Ederington and Goh's approach looking holistically at ratings and analyst coverage for information provision to investors (Ederington and Goh 1998), additional data on analyst coverage of firms was collected and the regressions on stock price changes and volatility repeated, controlling for firm level and rating characteristics. Table 7 reports the results testing the number of sell-side analysts covering a firm (as a proxy for firm-level informativeness regarding investors, so with more analysts covering a firm it is assumed there is more and better information available to investors) as an independent variable on stock price changes and volatility during the collapse of Lehman and the two days following. This time, there is a statistically significant negative effect on both stock price changes and stock price volatility, so the more analysts are covering a firms' stock (the higher the level of informativeness on the firm), the lower is that firms' volatility and effects on price changes. For the volatility on the day of the event, one more analyst following a firm decreases the intra-day stock volatility by ~2.7%, for the following day by ~2.2% and two days after still by ~1.7%. As can be expected, this effect is most significant and extensive on the day of the event (T0) and declines over the following days – this declining effect is discussed in the next section. These findings are significant at the 1% level (T0 &1) and at the 5% level (T2) respectively, and robust when controlling for firm-level characteristics such as revenue or the rating issued to a firm, as well as controlling for industry and exchange fixed effects. The table in Appendix 9 repeats the same analysis testing for a logarithmic relationship between the analyst coverage and price changes/volatility, finding the same general direction of effects. However, one could assume that there might be an endogenous effect in both the linear and logarithmic model, as analysts might cover more prominent (and thus resilient) firms in the first place. This cannot be ruled out, and is discussed below.

Table 7: OLS – Number of analysts effect on price changes and volatility (incl. controls).

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	PriceChangeT1	PriceChangeT2	DailyVolatilityT0	DailyVolatilityT1	DailyVolatilityT2	AverageVolatilityT012
NumAnalysts	-2.171***	-1.457*	-2.674***	-2.180***	-1.679**	-2.025**
	(0.791)	(0.779)	(0.742)	(0.770)	(0.744)	(0.789)
Unsolicited	-7.823	5.331	12.38	14.09	7.829	8.749
	(15.79)	(15.55)	(14.80)	(15.36)	(14.85)	(15.75)
RevenueEvent	2.39e-10	4.10e-10	1.99e-10	7.12e-11	-8.63e-11	0
	(2.68e-10)	(2.64e-10)	(2.51e-10)	(2.61e-10)	(2.52e-10)	(2.67e-10)
RatingRank	-4.436***	-0.801	-0.357	-0.916	-0.404	0.0791
	(1.520)	(1.497)	(1.425)	(1.479)	(1.429)	(1.515)
MarketCapT0	-1.99e-10	-2.35e-10	-1.35e-10	-1.49e-10	-8.77e-11	-1.15e-10
	(2.81e-10)	(2.77e-10)	(2.63e-10)	(2.73e-10)	(2.64e-10)	(2.80e-10)
Constant	147.9***	97.82***	117.5***	118.5***	102.5***	109.8***
	(19.62)	(19.32)	(18.39)	(19.09)	(18.44)	(19.56)
Observations	186	186	186	186	186	186
Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.096	0.040	0.110	0.091	0.064	0.070

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Discussion

What do the tests in this section tell us about the informational value of ratings and the use of information by investors during times of financial distress, as in the example of Lehman's collapse? In summary, the analysis of the different informational value of ratings at the collapse of Lehman Brothers shows that the differences between companies with solicited ratings (that supposedly would signal a higher degree of private information to investors over unsolicited ratings based on purely public information) are not a significant determinant for a companies' stock volatility. Thus, the difference in information that fed into the ratings process and conveyed to investors through the assigned firm ratings seems not to be a difference valued by investors in times of distress. However, other measures of available information on the firm-level for investors, especially the extent of security analyst coverage of a firm, seem to be a significant determinant of this volatility, with more coverage and thus higher level of informativeness being negatively associated with stock market volatility. The observations and results must be looked at within the context of the wider literature on the use of information by investors during financial crises.

Even though in theory solicited ratings signal to financial markets more transparency and additional private information through the solicited rating process (so it can be assumed there is a

higher level of informativeness for firms with solicited ratings compared to unsolicited, purely public information ratings), this signal does not appear to influence stock price behaviour during and immediately after the crisis in this example. Various theoretical and empirical studies have attested a 'flight to quality' or 'safety' during financial crises in general (Vayanos 2004, Caballero and Kurlat 2008), and during the GFC in particular (Ahrend and Schwellnus 2013, Marsh and Pfleiderer 2013), with more risk-averse investors readjusting their portfolio to hold 'higher quality' securities to compensate for the changed risk-return environment in times of increased volatility. Informativeness of firms as signalled by the solicited ratings does not seem to be an indicator for quality under these aspects, regarding the debate mentioned in section 2 on the informational value of ratings for market participants: As pointed out e.g., by Partnoy or Reinhart, the additional information conveyed by ratings to investors seems to be limited at best regarding "overwhelming [empirical] evidence that credit ratings hold little informational value" (Partnoy 2002, Reinhart 2002). In this case, investors do not seem to draw additional valuable information from firms that signal a surplus of private information to the market through solicited ratings, with no observable effect of the rating solicitation status even when not controlling for further firm or rating characteristics. This finding further hints at the perceived distinction drawn in the literature of solicited and unsolicited ratings, again described in section 2: although some researchers have attested the additional value of private information in solicited ratings from a theoretical standpoint (Fairchild, Flaherty et al. 2009, Mattarocci 2013), few have engaged with the exact informational distinction between the two, and if investors value this distinction especially during times of distress.

Second, the finding regarding analyst coverage shows a strong and significant relationship between increased analyst coverage and stock price changes and volatility. Firms that had more analyst coverage experienced significantly less volatility and stock price changes during the collapse of Lehman Brothers in September 2008 – in line with the assumption that the more information on firms was provided by sell-side analysts the less uncertainty about its performance during and after

the shock was perceived in the market, which is robust even when controlling for other factors such as liquidity (traded volume). This effect decreases over time on the days following the event, as one would assume with investors gradually adjusting to the new environment. This observation seems to be in line with the findings by Loh and Stulz on the increased importance of information provided by analysts for investors during times of financial distress, with lower negative abnormal returns for firms with high analyst coverage (Loh and Stulz 2018). One cannot completely rule out endogeneity here, as analysts might select themselves into covering firms for which there is already more and better information available to investors. Yet, as the analysis controls for firm characteristics such as revenue and market capitalization, this seems unlikely, as the most 'prominent' firms can usually be assumed to be firms with for example the highest market capitalization.

This analysis has not attempted to establish causation but provided a first step in investigating the use of information such as different ratings or analyst coverage by investors during times of financial distress. Due to access and data restrictions, the investigation had to be confined to a narrow subset of the rated corporate universe, on selected variables, and for a specific case study (the collapse of Lehman Brothers). In a next step, this could be expanded to incorporate all rated companies in the three markets, as well as for further periods of crises. To establish a stronger relationship for future tests on the informational role of ratings and analyst coverage, upgrades and downgrades of ratings and analyst forecasts in comparison between 'normal' times and financial crises could be undertaken following the methodology of Loh and Stulz (Loh and Stulz 2018). This would also enable systematic tests of the additional value of private information in solicited ratings during times of distress following the hypothesis by e.g., Behr and Güttler or Byoun *et al.* (Behr and Güttler 2008, Byoun 2014, Byoun, Fulkerson et al. 2014).

5. Chapter conclusion

Whereas information intermediaries, such as information suppliers in the modern market for financial information explored in chapter 3, or the early precursors to CRAs such as Henry Poor's 'Manual' or Lloyd's register, arguably provided investors and financial institutions with relevant information services, especially also in times of financial distress, the picture for CRAs is less clear cut. As this chapter showed, with the increasing regulatory entanglement in the US from the 1970s onwards, the additional informational value derived from credit ratings for investors is questionable at best. Yet, their ratings still maintained at least a signaling, as well as a regulatory effect, as shown at the examples of the Asian Financial Crisis, Enron, and the GFC. The types of information relied on by rating agencies, public and private, as well as soft and hard, are central elements explored in this chapter. On the one hand, as in the case of the market for financial information (chapter 3), the type of information provided or taken into account for information provision are fundamentally connected to the resulting market structure as is discussed further below. On the other hand, as seen at the example of central bank broadcasting (chapter 4), the information provided by (quasi-)regulatory institutions does not necessarily have to correspond with the information perceived by investors. In both cases, signaling and regulatory effects especially during financial crises are significant components in investor perception; potentially even more so than information on economic fundamentals (at least in the case of CRAs).

Financial indicators, indices, and 'official' credit ratings represent a central component of the public and non-proprietary information sought out by investors. As seen and pointed out in previous chapters, economic and historical research has suggested for example a move by investors from reliance on soft information towards a system that prioritises and seeks out hard information (see e.g., Liberti and Petersen 2018). Yet, as pointed out in this project, qualitative evidence suggests that during times of distress and increased uncertainty in financial markets, these hard information variables such as indicators, indices, and credit ratings are increasingly questioned by investors, dealers and brokers, and soft information sources are employed to better assess and

understand the respective situation. Sinclair touches on the points laid out in this chapter in his assessment of the Asian financial crisis. He described a fundamental struggle of the large CRAs both for the incorporation of soft information and the informational value of credit ratings for investors during times of crises:

> "In a crisis like this one, market sentiment seemed to have been driven at least initially by fears of liquidity problems (…) Fundamental issues of assets and liabilities were therefore secondary. How could rating analysts, trained principally to think about these values not as fluctuating social variables but as real, hard numbers, incorporate market risk and its consequences for currency values into their assessments? Could devoting more resources solve a problem analytically if these changes in values are 'an inherent problem with market volatility?'" (Sinclair 2005).

This chapter shows the intricate development of credit ratings, the CRA market and its entanglement in the regulatory system especially in the US with major implications for the market development and the informational content of ratings. The novel quantitative and qualitative evidence provided on the changing market for credit ratings and CRAs since the 1970s and especially in the 1990s and early 2000s yields a differentiated picture: the generally adapted narrative of a rigid market dominated by an oligopoly of the big 3 CRAs blocking entry and extracting rents through its quasi-regulatory status might be partially affirmed, as the regulatory dimension played a fundamental role in the development of CRAs and shaped changes after significant crises and high-profile cases such as Enron or the GFC. However, upon closer analysis and looking beyond the big 3 agencies, there is in fact more dynamism in the CRA market than expected based on this stylized narrative, with new agencies entering and exiting especially in the early 2000s and crucial segments of the credit rating market such as insurance and financial institutions becoming more diversified and competitive.

From an informational perspective, these different trends at the beginning of the new millennium highlight the close interaction between rating methodology, rated institutions, the business model of rating agencies, and the type of information that feeds into ratings - for example, government and sovereign ratings with a higher reliance on soft information factors (Gill 2015),

compared to harder information factors for insurance corporations. However, this development was already established in the 1990s, as one of the few extensive newspaper articles of the time summarizes: "Although the bigger rating agencies have introduced similar bank and insurance rating products, the specialists dominate those industries".[376] The smaller agencies in the US managed to establish themselves especially by focusing on the areas in the CRA market where economies of scale through relying on hard information was attainable, differentiating themselves often through a subscriber business model in contrast to the big 3's issuer-pay model, and seemingly without losing informational value when comparing default outcomes and significant downgrades.

Publicity and discourse about the role of rating agencies after a collapse or crisis are nothing new, as was the case during the Penn Central railroad bankruptcy in 1970, the default of NYC in 1975 or in the case of Franklin National Bank in 1974 (Sinclair 2005). Yet, with the changes in the CRA market in the latter decades of the 20th century and the development of its major companies into quasi-regulatory entities in the US, the discourse and reform pushes changed. The Asian financial crisis, Enron and the GFC have had major implications for the development of CRAs, their regulatory interrelation and thus the informational value of their ratings, yet the crises in these cases acted as triggers and major inflection points, promoting and establishing reforms circling around ideas that had lingered around the US regulatory spectrum at least since the 1990s.

Even though public discourse and criticism of the CRAs in the three crises revolved around different rating categories (sovereign, corporate, and structured finance ratings respectively) and the three cases might be perceived as idiosyncratic at first glance, the regulatory response focused on a shared theme. The informational value of ratings for investors and its preservation through transparency, disclosure, and competition was for regulators and legislators in the US the primary concern regarding reforms and changes after these crises and high-profile collapses around the turn of the millennium. The changed information environment during times of distress compared

[376] FT, *Evaluating*, 27.05.97.

to ‘normal’ times emphasizes the ambivalence presented in discussions about the informational value of credit ratings and their use by investors: despite frequent challenges to the additional information benefit of credit ratings for investors, their performance and adaption during times of distress have been criticised as both too ‘fast’ and ‘slow’ for investors to be a useful indicator and source of guidance in crises.

Yet, the informational value of ratings is highly elusive and difficult to disassociate from the quasi-regulatory status of NRSROs and their equivalents in jurisdictions outside the US (for an overview of different national regulations using ratings and the NRSRO or equivalent concepts see Appendix 6). The analysis of a new dataset of solicited and unsolicited ratings, as well as further indicators of firm level informativeness for investors at the example of the collapse of Lehman Brothers during the GFC in September 2008, showed no significant effect of different kinds of ratings on outcomes such as stock prices changes, traded volume or volatility. However, the level of analyst coverage showed a significant and robust effect on exactly these price changes and volatility, with more analyst coverage and thus higher levels of firm informativeness for investors contributing to significantly lower stock price changes and volatility, what might point to effects found in previous studies of increased importance of this kind of information by investors during times of increased uncertainty – though a similar effect for credit ratings as information source couldn’t be found. In a next step, the analysis of credit ratings as information sources during times of distress could be expanded to include further economic sectors and national markets, to identify potential regional differences based on regulatory regimes or national characteristics.

Chapter 6 – Conclusion

As stated at the beginning of this dissertation, a detailed focus on information from an active perspective (both over time and during crises) can help to develop new perspectives in financial and business history regarding actions and decisions of actors and institutions in financial and banking markets before, during, and after crises. Several of these perspectives were examined and highlighted throughout this dissertation, such as the dynamics between demand and supply of information and the institutions involved in this market; the critical aspect of timing and speed for information acquisition and broadcasting; the importance of the (changing) information environment in which information releases and actions can be affected during crises; and the different use and reliance on information sources and channels by financial and banking institutions. Especially the last aspect, with the continuum between public and private, and soft and hard information in the information acquisition, processing and diffusion of financial institutions and regulators has featured prominently throughout this project. The effort by financial information providers to add more proprietary (private) elements to their products and services while also differentiating on soft information (news) for the two leading firms (chapter 3); the importance of soft information for central banks' information acquisition in financial crises and the dynamic balancing between broadcasting (public) versus remaining opaque (private) about critical information (chapter 4); and the reliance on soft versus hard information shaping sub-sectors of the credit rating market, while CRAs projected both public and private information that became obscured in their informational value for investors by the regulatory entanglement of CRAs (chapter 5) all shed light on these theoretical outlines from different perspectives.

In the introduction to this thesis, several overarching research questions were outlined regarding the role of information during financial and banking crises and crashes from 1973 to 2008: (I) What forms or types of information (public v. private, soft v. hard etc.) do actors in financial and banking markets seek out, and rely on for decision-making? (II) How does this change during a crisis, or why might we observe persistence in the informational intake and processing? (III) How

persistent are changes to this informational process after a particular crisis has been resolved? (IV) How and why might we observe organisational and procedural changes or persistence of financial institutions with regard to the information process? And (V) how were these changes and processes influenced by underlying macro-developments in financial and banking markets between 1973 and 2008 such as technological progress, regulatory changes, financial innovation, and globalisation?

The general theoretical framework in chapter 2 and the concrete operationalisation in the analytical chapters 3 to 5, in combination with the empirical evidence provided in these analytical chapters, allow us to draw out avenues to answer these overarching questions. Regarding the forms or types of information sought out by actors in financial and banking markets and the changes over time and during crises and crashes (I & II), each of the analytical chapters has investigated this matter from different angles. The analysis of the market for financial information (chapter 3) emphasized the significant shift in the demand and supply for different types of information to investors and banking institutions. While the supply of 'basic' price information for different asset classes and geographies was central to this market at the beginning of the 1970s, this segment became increasingly commodified over the following two decades as the underlying information had become publicly accessible and different means of communication became available. Information suppliers shifted their focus with the changes in information demand towards the provision of 'proprietary' financial information, a type of information with less public and more private attributes. In this segment they could still operate profitably besides the increasing commodification of public information, as this information segment first needed centralisation and aggregation before becoming of value. At the same time, the investigation highlighted the increasing importance of information processing capabilities in this market over time as a differentiating factor on the supply side. As availability of information, both public and private, increased continuously, investors and financial institutions became more willing to pay premiums for, in Reuters CEO Tom Glocer's words, "the right information at the right time" instead of just more information. The crises in different markets investigated in chapter 3 showed more

idiosyncratic patterns to these information preferences and information intake of financial and banking institutions than one might expect. The crises often worked as catalysts, propelling tendencies that have already been observed beforehand, such as the increasing consolidation on the supply side after the 1987 stock market crash, or the significant switch in information demand after the burst of the Dotcom bubble.

The analysis of central banks' information strategy within the context of the BoE during the secondary banking crisis of 1973/74 and the Fed during the GFC (chapter 4) emphasized the changes but also persistence regarding information acquisition of central banks within the context of the two crises. As discussed, the BoE significantly expanded its information intake for its supervisory role as a direct consequence of the secondary banking crises, both in terms of frequency & extent of information requested. Furthermore, it extended its supervision subsequently over a number of institutions performing essentially banking services. Yet, at the same time the BoE emphasized the persistence in its information acquisition, continuing to rely centrally on qualitative (soft) information through its "cornerstone" interview process. The case of the Fed's information strategy during the GFC showed a similar pattern, even though the two cases happened in geographically and environmentally different circumstances and over 30 years apart. The Fed extended its information acquisition significantly during the GFC, covering through its extended mandate and special lending facilities previously untouched sorts of institutions for which it needed to cooperate with other supervisors in the US context to gather and contextualise the required information. At the same time, new supervisory approaches to crisis resolution such as the extensive application of stress tests in late 2008 and early 2009 extended the demand of the Fed for new kinds of information from within the supervised banking sector. Yet, as chapter 4 showed along the archival and public evidence, personal connections, and interactions in the context of the soft information conveyed through them remained a central element in shaping the Fed's policy response and the actions of key personnel such as Ben Bernanke or Timothy Geithner.

The analysis of CRAs and the use of credit ratings as a source of information in financial markets (chapter 5) discussed the information content investors theoretically can derive using credit ratings as a summary and third-party judgement on public (and in some cases also private) information. CRAs rely in different sectors to various degrees on quantitative and qualitative information for their credit ratings, as shown exemplary in the distinction between sovereign ratings and insurance ratings, and the proliferation of smaller CRAs with a heavier reliance on hard information and quantitative methodologies in the latter segment during the late 1990s and early 2000s. Yet, the claims against rating agencies regarding the information value of their ratings has been diffuse in the past, especially during times of distress. They range from CRAs not adapting ratings fast enough and thereby portraying a false sense of confidence towards investors (as e.g., in the case of Enron), to CRAs aggravating crises by downgrading their ratings (as e.g., in the case of the Asian financial crisis). As chapter 5 showed, the questions of additional informational value of ratings over other measures (for example market-based measures such as credit default swap spreads) remains up for debate. The analysis in the last section of chapter 5 tested on a dataset of two different kinds of ratings - unsolicited (based purely on public information) and solicited (based both on public and additional private information) - if investors valued the additional private information gained through solicited ratings in the context of the Lehman Brothers collapse. It found no statistically significant relationship between the type of rating (and thus the different information levels associated with them) and observable outcomes such as stock price volatility or traded volume, yet for other indicators such as sell-side analyst coverage, this relationship could be observed. With all the caveats in mind described in chapter 5, this outcome provides another hint that investors, especially during times of distress, do not value the additional information gained through ratings, but rather rely on other sources of information.

Each of the three main chapters 3 to 5 has highlighted a remarkable consistency regarding the persistence of changes to the information intake and processing after crises had been resolved (III). Furthermore, both organisational and procedural changes in the wake of financial and banking

crises with regard to the information process (IV) have been another common theme throughout the analysis of this project. The exploration of the market for financial information in chapter 3 shows for several crises and crashes between 1973 and 2008 that these episodes of increased uncertainty and volatility acted as catalysts, accelerating tendencies and developments already under way on the demand and supply side of this market. The introduction of Reuters MMR in 1973 amid the breakdown of the Bretton Woods system and the increased fluctuations in FX markets after the outbreak of the Arab-Israel war emphasized the initial inertia of institutions engaged in FX trading in leveraging this new technology due to lacking network effects among too small a base of contributors and recipients. Yet, the MMR proved remarkably successful after these initial hurdles had been cleared, and multilateral, interactive systems for the supply of basic and proprietary price information and journalistic information quickly became the new standard. The interactive, multilateral information systems introduced in the 1970s that permeated financial and banking markets over the following years and decades not only changed organisations in an abstract sense, but as shown in the examples in Exhibit 1 to Exhibit 6, they fundamentally changed business processes, interactions with counterparties, and the tangible setup of trading floors. The evolution in the market for financial information following the demand for digital information that could be manipulated, along with increasingly advanced information processing capabilities starting in the late 1980s and digital, multilateral systems resulted in a decrease in the necessity for bilateral interaction between actors. The burst of the dotcom bubble in 1999/2000 resulted in a significant reassessment on the demand side of the market for information, which led to further consolidation among information suppliers. It propelled the differentiation between low-cost suppliers, focusing on the supply of basic price information through new digital means, and high-end suppliers focused on the supply of proprietary price information and information processing solutions (such as Bloomberg and Reuters).

As chapter 4 shows, using the examples of the BoE in 1973 and the Fed in 2007/08, central banks' supervisory processes and organisational structures were transformed significantly by the

respective crises. The BoE abandoned the previous structure of the Discount Office as a direct consequence of its experience during the height of the secondary banking crisis, establishing the Money Market Supervision Division with increased responsibilities, staff, and extended scope for information gathering and processing for supervision. As discussed, this extension of information acquisition for the BoE's supervision culminated with the other lessons learned from the fringe banking crisis in the Banking Act of 1979. Throughout the GFC, the Fed extended its information gathering capabilities and its supervisory scope towards organisational forms beyond traditional deposit-taking institutions. Some of the newly introduced processes in its information strategy such as for example the 'stress tests' to signal credibility to market participants became regular features of the Fed's and many other central banks' playbook, while the creation of the financial stability oversight council was a direct consequence of the need to share information between US regulators to facilitate a system-wide stability monitoring. As discussed in chapter 5, the rise of smaller CRAs besides the established Big-3 firms in sub-fields of the credit rating market can be attributed to their focus on rating segments with a focus on hard information allowing economies of scale for example for ratings of insurance and financial institutions. However, only after the experience of the Enron crash and the resulting enquiries did the market for CRAs become more open with the SEC establishing clear guidelines for the accreditation of new NRSROs. Further changes in US regulation, impacting directly and indirectly the informational value of credit ratings for investors, in the form of the Credit Rating Agency Reform Act of 2006 and the Dodd Frank Act picked up on ideas and discussions circulating within the US regulatory sphere at least since the 1990s. Yet, it took the experience of the Asian Financial crisis, the Enron collapse and the GFC for these reform ideas to be implemented and executed.

The underlying macro developments changing financial and banking markets between 1973 and 2008, such as technological and regulatory changes, as well as financial innovation and globalisation (V), had a profound impact on the development of how financial institutions processed information both in normal times and during times of distress. Technological change was

a key driving force in shaping the supply side of the market for financial information in the latter half of the 20th century and during the early 2000s, as can be seen for example at the introduction of the Reuters MMR or the advent of new low-cost internet-based providers of basic price information. At the same time, this also affected the demand by financial institutions, as financial information needed to be increasingly digital with the rising possibilities for data manipulation, thus shaping both demand for digital datafeeds and information processing capabilities. Yet, technological change and progress also influenced other aspects dealt with in this project in more subtle ways, as for example central bank broadcasting had to have a profoundly different intensity and channels used during the GFC than could be seen in the secondary banking crisis. However, during several of the examined crises, a focus on information gathering was placed on less-technologically heavy paths. Information acquisition and distribution through personal networks were central for both the BoE during the secondary banking crisis and the Federal Reserve during the GFC, as well as for FX traders at the height of uncertainty in October/November 1973 (leading to the near failure of the MMR).

The importance of regulatory changes has been picked up already on several occasions in this conclusion and the respective chapter conclusions. Yet, financial innovation and globalisation have also clearly played an integral part in shaping developments regarding the market for financial information, central banks' information strategy and the use of credit ratings as sources of information. The changes in the market for financial information from geographical and asset-class monopolies, towards centralisation and ultimately a duopolistic structure, were predicated on the expansion of firms on the demand side and their need for information suppliers providing their services not only in a single location or a single market. Similarly, central bank cooperation during the GFC was an integral element to their information broadcasting in a globalised financial system, as was emphasized at the joint actions and statements by the G8 central banks and finance ministers in October 2008. The expansion of the quasi-regulatory status of credit ratings and the agencies supplying them, with all the implications this development had on the information

investors could derive from these indicators, started in the US but was adopted in many other advanced and developing markets, not least through the discussions and agreements reached in the Basel II process. Financial innovation proved to be another significant driver in this field, as can most clearly be seen looking at the events leading up to and during the GFC. The innovations in structured finance products and the special role CRAs would hold in the issuing process have repeatedly been identified as a central element in tainting the rating agencies' reputation and leading to profound regulatory changes in the Dodd-Frank Act. At the same time, the same financial innovations in structured finance were the driving force leading to a lack of information in the US supervisory system and impeding relevant information acquisition.

One element underlying all three analytical chapters is speed - both the importance of speed in information acquisition and decision-making under circumstances of increased volatility and uncertainty, and the speed of information diffusion throughout the financial and banking system at various points in time and space. The significant value placed on soft information for example by George Richardson and Jasper Hollom during 1973/74, and Ben Bernanke and Timothy Geithner at the height of the GFC in 2007/08, was at least partially influenced by the faster availability of soft information over hard information, which is usually produced with time lags. In Gorton's concept of information environment (looking at financial and banking crises as dynamic events during which different actions, decisions & their broadcasting might result in different outcomes based on environmental factors) speed of information diffusion especially by central banks might be identified as the most important of these factors. The public and regulatory criticism of CRAs both during the Asian Financial crisis and the Enron collapse have centred around the timing of their rating downgrades as information events aggravating the crises (albeit the criticism going in opposite directions as too early vs. too late). This might suggest that for information events and their diffusion (such as central bank broadcasting or rating downgrades) timing in the suitable information environment might be more important than pure speed in information diffusion based on new assessments during crises. Tom Glocer's statement regarding

the new business model of information providers after the turn of the century, that they were moving towards not providing more information alone but focusing on the right information at the right time, encapsulates this timing component from a market perspective. A closer examination of the timing and speed of information acquisition and diffusion during financial and banking crises would prove a valuable avenue of further research in this regard.

This thesis has engaged with a far-ranging topic, over a considerable time frame, and has through various case studies tried to draw out transnational comparisons of different aspects regarding the role of information in financial and banking markets. Naturally, not all aspects and avenues that this subject entails could be covered within the confines of this dissertation. Further detail on most of the case studies needed to be left out or dealt with too briefly in order to meet the requirements of this project and to focus on the overarching arguments and novel sources. Yet, these further avenues and details leave open a significant space and spectrum of possibilities for continued research in this area. One significant aspect for further investigation can be found in the social and economic concepts underlying the information process and the use of information in financial and banking markets. Chapter 2 has dealt with several of these concepts, yet especially aspects such as reputation, trust, and social networks play a critical role in each of the domains examined in this dissertation. As Frank Knight emphasized "in a world where uncertainty plays so great a part as it does in our (…) society, the virtue of truthfulness becomes the very pearl of character" (Knight 1921). Research from various disciplines has long asserted the importance of these concepts for economic and financial interactions, especially as a means of establishing valued and trusted sources and channels for private and soft information (see e.g., Ogilvie 2005, Flandreau, Flores et al. 2010, Ogilvie 2011). However, the influence and effect of financial crises and crashes on these underlying elements still lacks further exploration, especially in the context of their relevance regarding the information process in financial and banking markets. For example, what effect did the scandal surrounding CRAs in the field of structured finance during the GFC have on the informational value that investors derive from this rating category, and how might the

reputation of CRAs be affected by spill over in other rating categories? Or how do changing social network structures as information channels in banking markets affect the information acquisition and broadcasting of central banks during times of distress? As mentioned on several occasions throughout this thesis, the value placed on soft information by both private actors and central banks in financial and banking crises, in contrast to the stated decreasing importance of soft information compared to hard information over the period from the 1970s to the early 2000s, should be explored further in this context. A detailed mapping of the development of personal and professional networks in financial and banking markets, as the primary source of soft information acquisition, would benefit our understanding greatly in this regard.

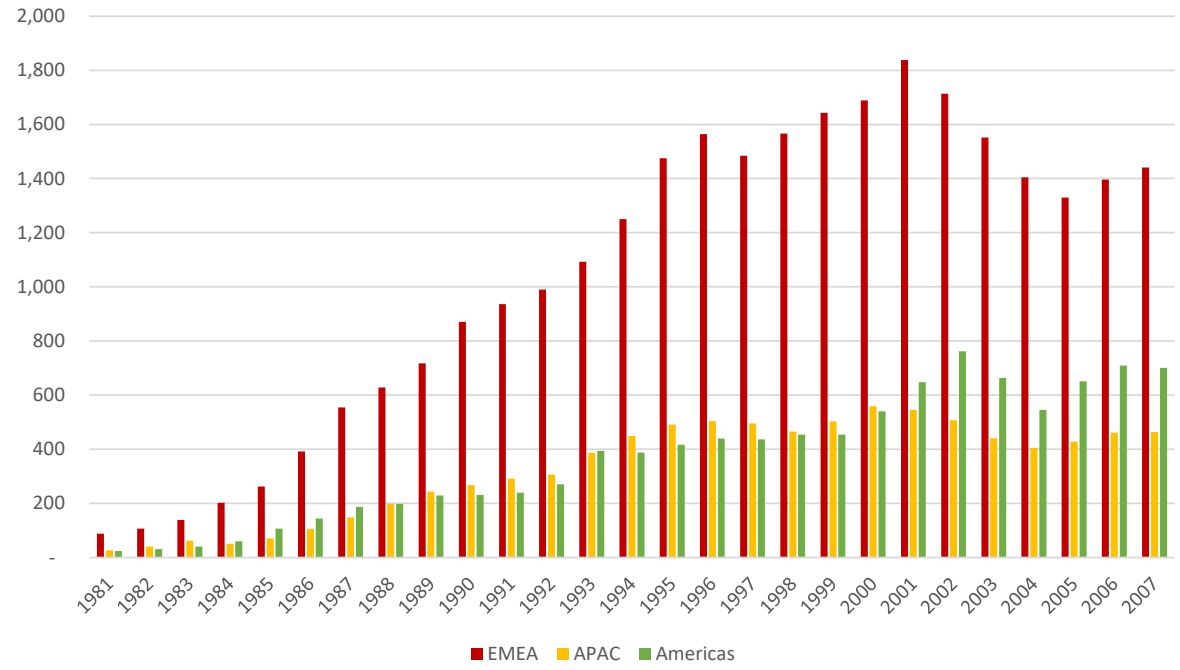
Furthermore, chapters 3 and 5 of this project have dealt with generally under-researched topics in financial history, even though both the market for financial information and credit ratings and the institutions supplying them represent central elements of the modern international financial system. Investors, traders, bankers, and regulators alike rely to various degrees on the different information supplied through these sources and channels, and failures in their operations can lead to profound systemic misalignments. Thus, the treatment of the market for financial information and its central constituent firms primarily from a journalistic perspective, and the lack of historical enquiries into the CRA market with its regulatory entanglement esp. in the second half of the 20th century seems to be a shortcoming. This thesis has attempted to provide insights into these topics, yet several further questions had to remain unanswered. For example, besides the transnational perspective in this project focused on the UK and the US, as well as in some instances other developed economies, the effect and use of ratings as sources of information might reasonably be assumed to depend on the respective national context regarding their different role in national regulation (see e.g., Appendix 6) and the different access to information sources in other economies. A detailed comparative analysis of the informational value for investors encompassing these different circumstances would provide valuable insights. At the same time, chapter 3 on the market for financial information has focused its narrative primarily on Reuters and Bloomberg, as

the two global firms emerging and manifesting as a duopoly in the late 1990s. However, the development of other firms significantly shaping this market during various times and in various geographies, such as Telerate or Bridge Information Systems, could also provide insights into the market's structure. A closer historical analysis of these firms for which there exists scarce if any historical enquiry would provide a valuable additional narrative to the story followed in this dissertation, especially for the transformative period in the market for financial information between the early 1970s to the 1990s.

The two highlighted main avenues for further research in this field represent only a glimpse of the potential for academic enquiry to better understand the role of information in modern financial and banking markets. Other possibilities for further research that this thesis has touched upon could be found for example in closer analysis of potential negative outcomes of information transmission along social networks (such as echo effects or information cascades), selection processes of information by investors and bankers faced with increasing information overload, and their effects and potential adaptations during times of distress. The multi-faceted field of an active perspective on information in financial and banking markets has the potential to yield many more insights to progress our understanding from the standpoint of financial history. The narratives, evidence, and arguments laid out in this dissertation might thus serve as an impulse to open up this area of research for further investigation.

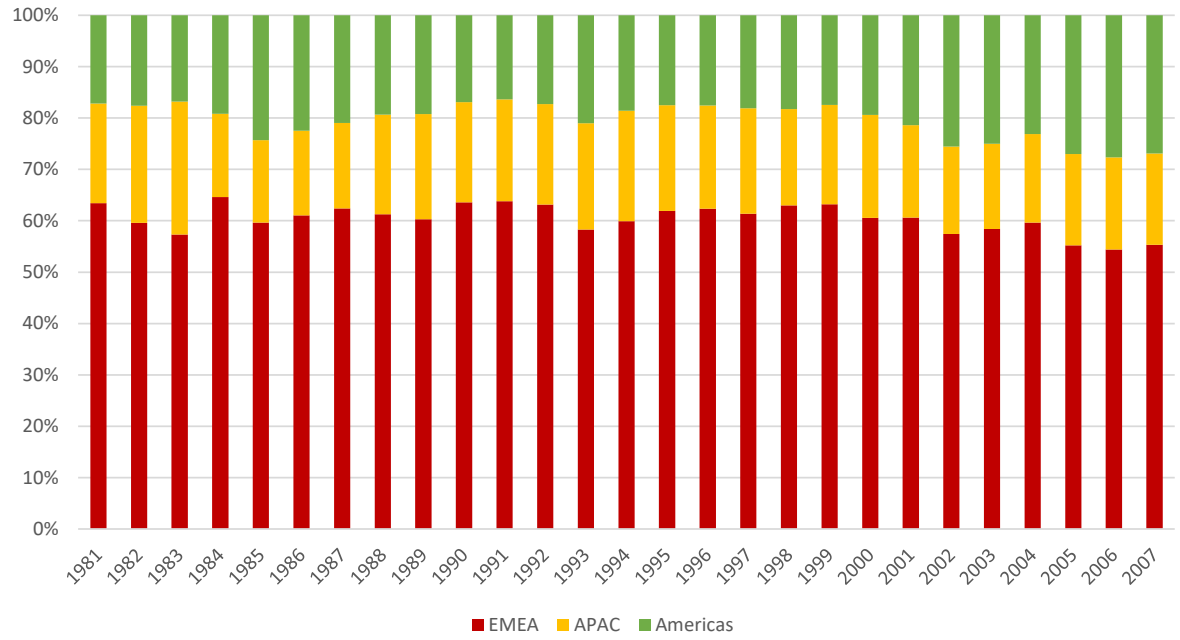
Appendix A – The market for financial information

Appendix 1: Reuters revenue per main region, mn. pounds, 1981-2007.



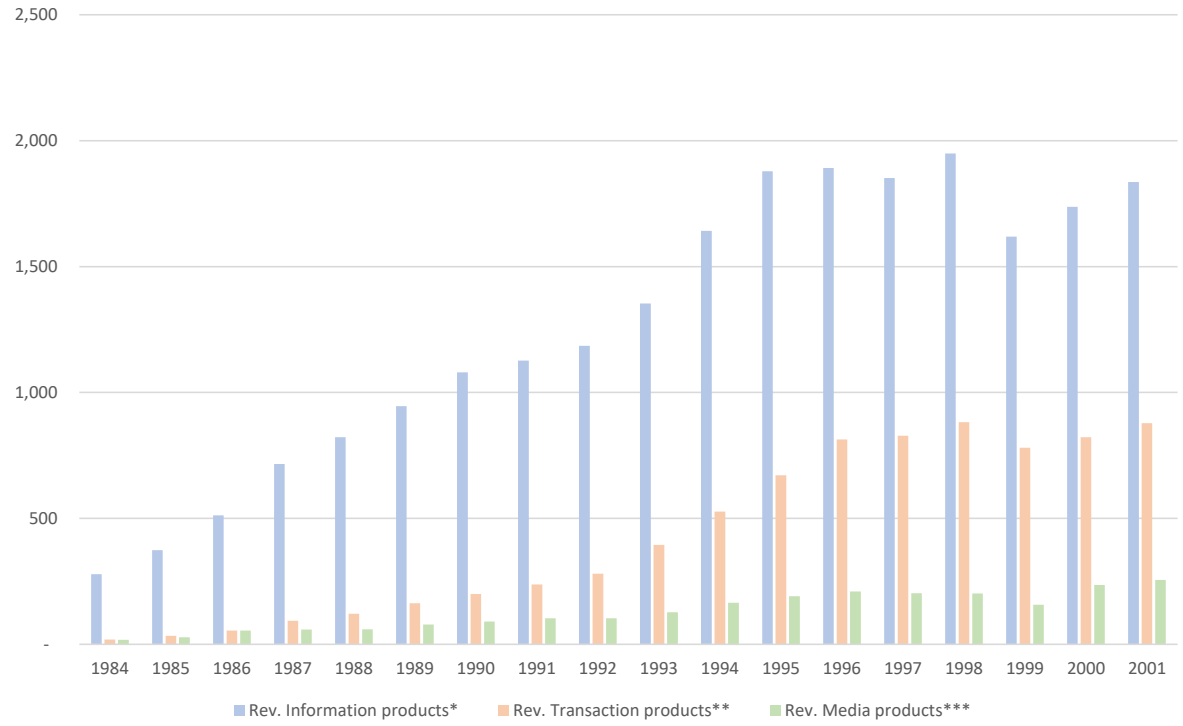
Source: Data from Reuters corporation annual reports (1984-2007) in mn. Pounds Sterling. Note: exclusive of Instinet revenue.

Appendix 2: Reuters regional revenue share split, 1981-2007.



Source: Data from Reuters corporation annual reports (1984-2007). Note: exclusive of Instinet revenue.

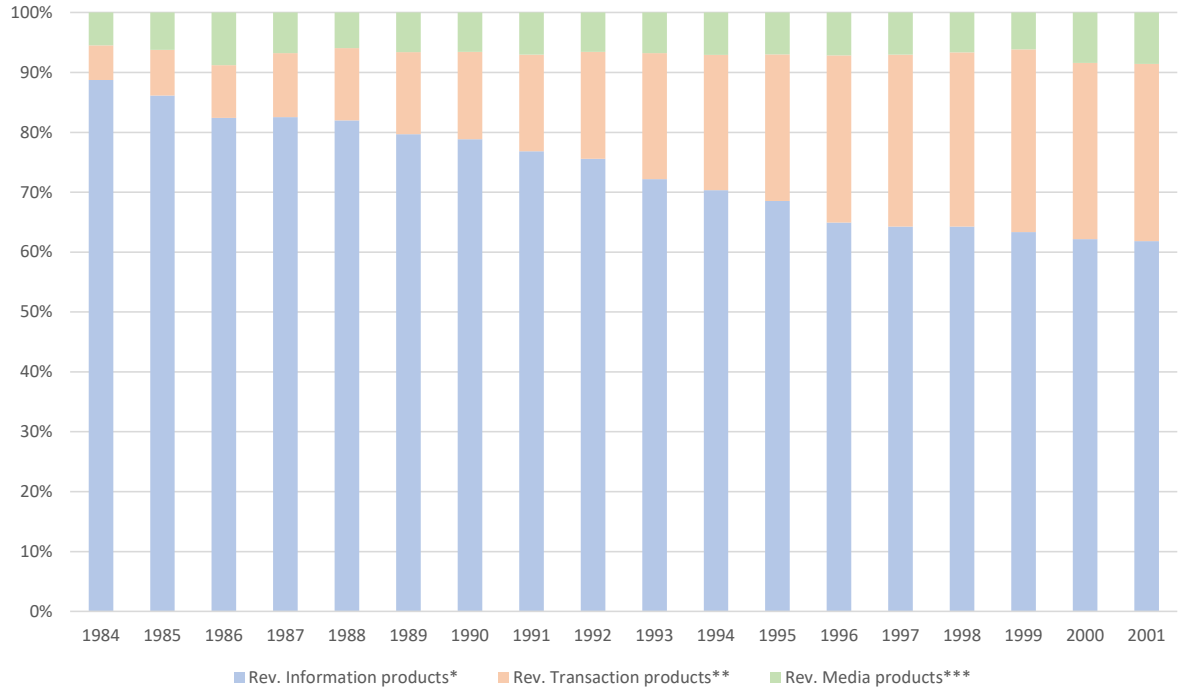
Appendix 3: Reuters rev. per product division, absolute mn. pounds, 1984-2001.[377]



Source: Data from Reuters corporation annual reports (1984-2001) in mn. Pounds Sterling. Note: exclusive of Instinet revenue.

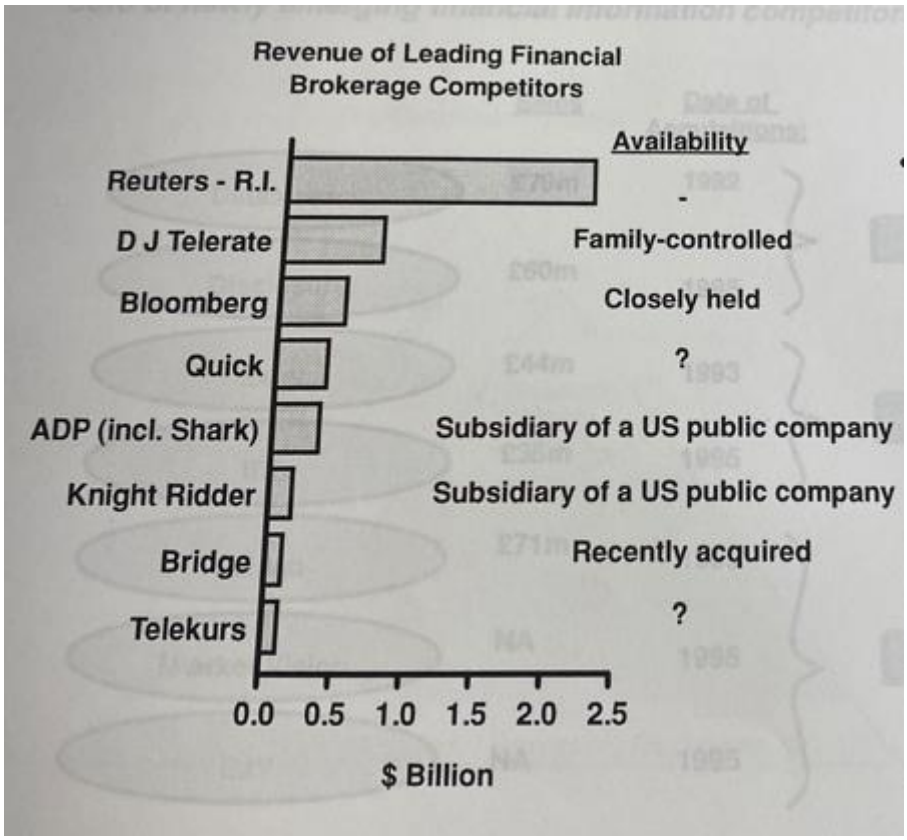
[377] Reuters annual reports definition of categories: "*Information products deliver news and prices to customer screens. They provide data feeds to financial markets, and the software to analyse data. They cover currencies, stocks, bonds, futures, options, and other instruments. **Transaction products enable traders to deal form their keyboards in such markets as foreign exchange, futures and options, and securities. ForEx dealers can either converse with chosen trading partners, or use an automated matching system. ***Media products deliver news in all the dimensions of multimedia: text, television images, still pictures, sound and graphics", see in **Error! Reference source not found.** and **Error! Reference source not fo und.**.

Appendix 4: Reuters rev. per product division, share of total, 1984-2001.



Source: Data from Reuters corporation annual reports (1984-2001). Note: exclusive of Instinet revenue.

Appendix 5: Revenue of leading financial brokerage competitors.



Source: Strategy presentation to the Reuters Board, November 1995, LN1222, Reuters Group Archive, London.

Appendix B – Credit ratings, CRA's and the use of information in financial crises

Appendix 6: Introduction of NRSRO equivalent regulation and use of concept & ratings in national regulation.

Country	BCBS member	NRSRO first introduced	Ratings/NRSRO use in national regulation
Belgium	Yes	1996	CAD**/Market risk amendment; Prudential reporting
Canada	Yes	1997	Market risk amendment
France	Yes	1995	CAD/Market risk amendment
Germany	Yes	-	-
Italy	Yes	1996	CAD/Market risk amendment
Japan	Yes	1997	Market risk amendment
Luxembourg	Yes	1993	CAD/Market risk amendment
Netherlands	Yes	1996	CAD/Market risk amendment
Sweden	Yes	1996	CAD/Market risk amendment
Switzerland	Yes	1997	Market risk amendment; credit risk (risk weights); Investment funds (restrictions on derivatives trading depending on counterparty's credit rating)
UK	Yes	1995	CAD/Market risk amendment; Liquidity reporting guidelines for non-clearing banks
USA	Yes	1975	CAD/Market risk amendment; disclosure requirements; (pension) fund and savings & loans capital allocation, etc.
Argentina	No	1997	Banks and fin. institutions need rating by authorized national CRA; prohibition of pension fund investors to invest below defined rating threshold; etc.
Australia	No	1997	Capital adequacy for banks; parts of mortgage insurance market
Chile	No	N/A*	Min. rating for companies issuing equities in ADRs; Institutions can only invest in overseas securities with min. rating
Hong Kong	No	1994	Market risk capital adequacy framework (rated securities carry lower risk weights than unrated); access to Discount window (eligible paper); etc.
Mexico	No	-	-
New Zealand	No	N/A*	Registered banks need to disclose ratings in quarterly statements; need to disclose rating downgrades over at least last 2 years; also disclosure if no rating was obtained

**N/A when credit ratings in legislation but by 2000 no NRSRO or equivalent designation in legislation*
***Capital Adequacy Directive*
Source: BIS report, Credit Ratings and Complementary Sources of Credit Information, August 2000, pp. 42-54.

Appendix 7: Partial list of credit ratings-dependent regulation in the United States.

Year adopted	Ratings-dependent regulation	Minimum Rating	No. of ratings required	Regulator/Regulation
1931	Required banks to mark-to-market 'lower rated bonds'	BBB	2	OCC and Federal Reserve examination rules
1936	Prohibited banks from purchasing 'speculative securities'	BBB	Unspecified	OCC, FDIC, and Federal Reserve joint statement
1951	Imposed higher capital requirements on issuers' lower rated bonds	Various	N.A.	NAIC mandatory reserve requirements
1975	Net-capital rule – Imposed higher capital requirements on broker-dealers below-investment grade bonds	BBB	2 (NRSRO introduction)	SEC amendment to Rule 15c3-1 (uniform net capital rule)
1982	Eased disclosure requirements for investment-grade bonds	BBB	1	SEC adoption of Integrated Disclosure System
1984	Eased issuance of non-agency mortgage-backed securities	AA	1	Congressional promulgation of the Secondary Mortgage Market Enhancement Act of 1984
1987	Permitted margin lending against MBSs and (later) foreign bonds	AA	1	Federal Reserve Regulation T
1989	Allowed pension funds to invest in high-rated ABS	A	1	Department of Labor relaxation of ERISA Restriction
1989	Prohibited Savings & Loans from investing in below-investment grade bonds	BBB	1	Congressional promulgation of the Financial Institutions Recovery and Reform Act of 1940
1991	Required money market mutual funds to limit holdings of low-rated paper	A1	1	SEC amendment to Rule 2a-7 under the Investment Company Act of 1940
1992	Exempted issuers of certain ABS from registration as a mutual fund	BBB	1	SEC adoption of Rule 3a-7 under the Investment Company Act of 1940
1994	Imposes varying capital charges on banks' and S&Ls' holdings to different tranches of ABS	AAA & BBB	1	Federal Reserve, OCC, FDIC, OTS Proposed Rule on Recourse and Direct Credit Substitutes
1998	Department of Transportation can only extend credit assistance to projects with an investment grade rating	BBB	1	Transport Infrastructure Finance and Innovation Act 1998
1999	Restricts the ability of national banks to establish financial subsidiaries	A	1	Gramm-Leach-Biley Act of 1999

Source: BIS report, Credit Ratings and Complementary Sources of Credit Information, August 2000, p. 54.

Appendix 8: Descriptive Statistics – GFC dataset – continued.

Descriptive statistics	*Mean*	*Min*	*Max*	*s.d.*	*Median*	*Mean*	*Min*	*Max*	*s.d.*	*Median*	*Mean*	*Min*	*Max*	*s.d.*	*Median*
Revenue [bn. USD]	10,27	0,001	284,37	28,56	2,15	4,09	0,001	31,81	6,34	1,13	*8,51*	*0,001*	*284,37*	*24,34*	*1,84*
Company Market Capitalization [bn . USD]	14,09	0,001	244,87	31,69	2,69	3,21	0,001	26,55	4,88	1,21	*10,88*	*0,001*	*244,87*	*24,99*	*2,23*
Number of sell-side analysts	7,53	-	40	9,14	4	4,96	-	29	7,33	1	*6,76*	*0*	*40*	*8,72*	*2*
Volume traded 15-17.09.2008 (after) ['000]	3.199,09	0,117	101.953,81	10.701,20	396,63	859,27	0,073	31.085,21	4.141,16	163,50	*2.533,96*	*0,073*	*101.953,81*	*9.366,36*	*291,33*
Volume traded 11-12.09.2008 (before) ['000]	1.712,94	0,230	52.615,30	5.157,96	310,75	466,34	0,056	12.946,08	1.762,76	78,05	*1.355,84*	*0,056*	*52.615,30*	*4.487,91*	*185,48*
Change in volume traded before/after - %	86,8%	-49,0%	93,8%	107,5%	27,6%	84,3%	29,5%	140,1%	134,9%	109,5%	*86,9%*	*29,5%*	*93,8%*	*108,7%*	*57,1%*
Price volatility 15.09 - [%]	-3,8%			2,7%	-3,8%	-4,6%			3,9%	-4,2%	*-4,0%*			*3,1%*	*-3,8%*
Price volatility 16.09 - [%]	-6,7%			13,0%	-5,0%	-5,6%			4,5%	-5,1%	*-6,4%*			*11,3%*	*-5,0%*
Price volatility 17.09 - [%]	-5,2%			4,0%	-4,8%	-5,7%			4,4%	-6,3%	*-5,4%*			*4,1%*	*-5.03%*
Price volatility 15-17.09 - [%]	-4,7%			3,1%	-4,9%	-5,3%			3,9%	-5,3%	*-4,9%*			*3,3%*	*-4,9%*

Appendix 9: Logarithmic relationship test – Analyst coverage.

VARIABLES	(1) PriceChangeT1	(2) PriceChangeT2	(3) DailyVolatilityT0	(4) DailyVolatilityT1	(5) DailyVolatilityT2	(6) AverageVolatilityT012
ln_NumAnalysts	-13.96	-16.57*	-24.10***	-20.76**	-16.80*	-21.57**
	(9.543)	(9.322)	(8.862)	(9.185)	(8.795)	(9.352)
Unsolicited	1.100	2.770	14.72	18.96	8.475	10.02
	(17.05)	(16.65)	(15.83)	(16.41)	(15.71)	(16.70)
RevenueEvent	2.08e-10	4.02e-10	1.87e-10	6.73e-11	-8.86e-11	0
	(2.73e-10)	(2.67e-10)	(2.54e-10)	(2.63e-10)	(2.52e-10)	(2.68e-10)
RatingRank	-3.846**	-1.310	-0.502	-1.013	-0.679	-0.101
	(1.648)	(1.610)	(1.531)	(1.587)	(1.519)	(1.615)
MarketCapT0	-3.23e-10	-3.35e-10	-2.74e-10	-2.46e-10	-1.75e-10	-1.96e-10
	(2.79e-10)	(2.73e-10)	(2.59e-10)	(2.69e-10)	(2.57e-10)	(2.74e-10)
Constant	149.0***	127.5***	142.6***	140.7***	124.6***	136.9***
	(30.89)	(30.18)	(28.69)	(29.73)	(28.47)	(30.28)
Observations	170	170	170	170	170	170
Fixed-Effects	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.067	0.043	0.091	0.087	0.062	0.069

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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