

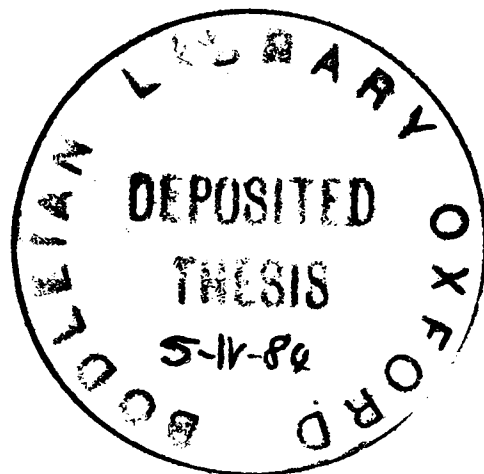
THE APPLICATION OF THE MODIGLIANI-MILLER THEOREM
TO JAPANESE INDUSTRY

Farzad Katirai

Trinity College

Michaelmas Term, 1983 [i.e. 1984] HT

Presented in Partial
Fulfilment of the Requirements
for the Degree of D.Phil.;
University of Oxford.



THE APPLICATION OF THE MODIGLIANI-MILLER THEOREM TO JAPANESE
INDUSTRY.

FARZAD KATIRAI, TRINITY

D. PHIL.,

MICHAELMAS, 1983. *lie 1984*^{HT}

ABSTRACT

The purpose of this thesis is to study some aspects of Japanese corporate finance, using the analytical tools of the Modigliani-Miller theorem.

The Modigliani Miller theorem is a fundamental element in the theory of finance, and establishes the conditions under which the financial structure of the firm is irrelevant to the determination of real corporate values. In its simplest form the theorem requires the presence of perfect capital markets. In the real world, however, in which perfect capital markets don't exist the validity of the theorem depends upon a number of additional restrictions which can be viewed as special case extensions of the general form. One set of sufficient conditions ensuring the validity of the theorem, is obtained by imposing the assumption of riskless debt.

Large groups of major Japanese corporations can be characterized as operating virtually free of bankruptcy risk. The thesis attributes this to the Japanese system of values underlying economic relationships, to the system of corporate groupings (known as keiretsu), and to the strategic objectives of industrial policy which provide industry with a safety-net. It argues that the popular belief that Japanese industry is subject to excessive risk exposure because of its high degree of leverage is misleading. The belief arises from data based on accounting conventions which distort the true position of firms' own wealth.

The thesis undertakes an empirical study of the validity of the MM theorem. Although the focus of the analysis is on the period 1978-80, the study is run on a second and very different time period, 1970-72. The major finding for the most recent period is that debt, after adjustment for tax advantages, makes no significant contribution to the valuation of companies in keiretsu groups. Interestingly, however, in the earlier period debt is found to make a positive and significant contribution to valuation.

ACKNOWLEDGEMENT

The debts accumulated in the writing of this thesis are many. Acknowledgments are due to many more people and institutions that can be contained in a few paragraphs such as these. The following, however, can not be omitted. The author wishes to acknowledge a great debt to his supervisor, Mr. Andrea Boltho, for his inspiration, enlightenment, and patient understanding. He also wishes to acknowledge his thanks to: Professor Shoichi Royama (Osaka University), Professor Shigeki Sakakibara (Kobe University) and Dr. Takaaki Wakasugi (Tohoku University), from discussions with whom he benefited immensely.

In the collection, dispatch and processing of data, the kind assistance of Mr. Mitsutake Yoshimura of the Data-Bank Service of the Nihon Keizai Shimbun, Ms. Junko Maru of the Japan Securities Research Institute, and Dr. Paul Griffiths of the Oxford University Computing Service are remembered.

The author also wishes to thank his brother, Foad, and last but not least his wife, Sylvie, for endless support and encouragement.

PREFACE

The purpose of this thesis is to study some aspects of Japanese corporate finance using the analytic tools of the Modigliani Miller (MM) theorem.

The MM theorem is now recognized as one of the fundamental elements in the theory of finance. Stiglitz has suggested that its significance, for purposes of understanding this theory, is analogous to the understanding of frictionless surfaces in the physics of motion. He has furthermore defended empirical testing of the theorem, despite the inability to construct conditions approximating frictionless environments, as revealing the extent of the limitations which impede the operation of the theorem.¹

Nevertheless, despite the considerable and growing body of literature available on Japanese industrial and financial economics, no attempt appears to have been made - to date - to study the theorem in the Japanese context. This thesis sets out to investigate the applicability of the Modigliani Miller (MM) leverage theorem to Japanese industry. The study is divided into three parts: the first surveys the main theoretical (as distinct from empirical) developments in the understanding of the MM theorem; the second focuses on those features of the Japanese financial and industrial system which are relevant to an application of the theorem; and the third tests for the validity of the theorem in the Japanese context.

¹J.Stiglitz, "On The Irrelevance of Corporate Financial Policy" American Economic Review, Dec. 1974, pp.851-66.

TABLE OF CONTENTS

ACKNOWLEDGEMENT.....	i
PREFACE.....	ii
PART I	
1. Introduction.....	1
2. Partial Equilibrium Interpretations.....	6
A. The MM Model	
B. The Model With Arrow Debrue Type Uncertainty	
3. General Equilibrium Results: Complete Captial Markets.....	18
A. Overview	
B. Characterization of the World	
C. The Model	
D. Some Implications of Completeness	
4. General Equilibrium Results: With Incomplete Markets.....	35
A. Overview	
B. The Stiglitz Model With No Default Risk	
C. Extensions of The Stiglitz Model	
D. Differential Expectations and Risk Aversion	
E. Relaxation of The Riskless Debt	
F. Expropriation with Risky Debt	
G. Relaxation of The Equal Access Assumption	
H. Taxation and The Irrelevance Results	
5. The MM Theorem, Incomplete Markets & Portfolio Separability.....	69
A. Overview	
B. Restrictions on Returns Distributions: Implications of Portfolio Separability	
C. Sample Derivation of The CAPM	
D. MM Results in A Two Parameter Model	
E. Extension to 3 Parameters	
6. Conclusion.....	95

PART II

1. Introduction.....	100
2. Some Realities of Japanese Corporate Finance.....	104
A. Overview	
B. Equity Ratios	
C. Imbalance in Fund Sources	
D. Ownership Structure	
E. Some Recent Changes	
3. The Japanese Tax System.....	140
4. Some Risk Absorbing Characteristics.....	152
A. Overview	
B. Human Relations	
C. Keiretsu Groups	
D. Industrial Policy	
5. Summary of Some Tests of Japanese Capital Markets...	186
A. CAPM Tests	
B. Captial Market Efficiency	
6. Conclusion.....	205

PART III

1. Introduction.....	213
2. Some Methodological Aspects of Previous Studies	
A. Inferential Tests	
B. Yield Form Models	
C. The Impact of Financial Structure Changes	
D. Valuation Model Tests	
3. The Valuation Model.....	231
A. Growth	
B. Size	
C. Taxation	
4. Data Selection, Time Period, & Definition of Variables	240
A. The Samples	
B. The Time Period	
C. Definition of The Variables	

5. Statistical Model and Empirical Results.....256

- A. Heteroskedasticity
- B. A Priori Expectations
- C. Single Stage OLS Estimates
- D. Two Stage Model
- E. The Problem of Growth
- F. The Change in Debt
- G. The Problem of Size
- H. A Second Time Period
- I. The Debt Variable

6. Conclusion.....292

PART I

1. INTRODUCTION.

Part I of the thesis reviews the main developments in the theoretical understanding of the Modigliani-Miller (MM) leverage theorem. This introductory section provides an outline of what is covered.

In their classic study entitled: "The Cost Of Capital, Corporation Finance, and The Theory of Investment", Franco Modigliani and Merton Miller demonstrated a result having far reaching implications for the theory of finance.¹ Their conclusion was explicit. Using some familiar neoclassical assumptions, they showed that the composition of debt and equity in the financial structure of a firm was irrelevant to the determination of its market valuation.

The irrelevance of leverage theorem, as the main proposition came to be known, proved highly controversial in view of the new and conflicting predictions which it made relative to the traditional doctrine.² Unfortunately, the partial equilibrium approach adopted by the original authors left many important implications of the proposition, as well

¹F. Modigliani and M. H. Miller, "The Cost of Capital, Corporation Finance and the Theory of Investment," American Economic Review, June 1958, pp.261-96.

²Traditional theory had implied that some optimum capital structure exists in the sense that up to some critical point as leverage rises the cost of capital decreases; thereafter however, the opposite happens as investors become increasingly aware of the rising risk associated with growing leverage. For a discussion see: A. Barges, The Effect of Capital Structure on the Cost of Capital (Englewood Cliffs, N.J.: Prentice-Hall Inc., 1963) p.11.

as the exact nature of the underlying assumptions it required, implicit and unclear. As a result, much of the early theoretical debate engendered by the theorem proved immaterial to the correct understanding of the issues involved and served largely to divert attention away from the main implications. The implicit nature of the partial equilibrium exposition meant that even the internal consistency of the MM arguments remained unresolved for some time.³

The major breakthrough in clarifying the theorem - both with regards to its implications and to the underlying assumptions it required - came with the successful expression of the theorem in a general equilibrium framework, which enabled attention to be focused on the simultaneous determination of investor portfolios and the equilibrium prices of all securities. Changes in the market value of firms could then be examined in terms of changes in the returns accruing to investors, and the main conclusion to emerge from the general equilibrium discussion was that: viewed in terms of income (or returns) space, for the irrelevance theorem to be valid, any purely financial change must leave the attainable set of income (or returns) distributions available to investors unaffected. The opportunity set must remain unaltered, neither shrinking nor growing as a result of leverage changes.

³ See: J. Boness, "A Pedagogic Note on the Cost of Capital", The Journal of Finance, March 1964, pp.99-106.

The general market equilibrium models which were applied to the MM theorem can be classified according to the assumptions they make about the characteristics of capital markets. One approach ensures the validity of the theorem by constraining the opportunity set. A sufficient restriction on the opportunity set is to assume that capital markets are complete in the Arrow-Debreu sense - implying that any distribution of returns created by a financial structure change on the part of any particular firm would have been available to investors beforehand. When capital markets are complete, the opportunity set remains unaffected by purely financial changes and any set of returns distributions will always be attainable by investors.

Complete capital markets are, however, essentially theoretical constructs bearing little resemblance to reality and serve only as useful pedagogical tools. Recent studies, recognizing the existence of incomplete capital markets, have focused on the additional restrictions which must be imposed on investor and firm behaviour to prevent the opportunity set from being affected by purely financial changes.

Although no single necessary assumption exists, several - mutually exclusive - sets of sufficient conditions, each of which can be viewed as a special case solution for the theorem, have been put forward. Three have received widespread attention in the literature. They are:

1. the Stiglitz model which utilizes the no bankruptcy

assumption to impose the requisite restrictions; 2. the Fama (and Miller) model which rules out any erosion of investor positions; and 3. the mean variance approach which depends on conditions satisfying portfolio separability.

Following our review of the partial equilibrium models of the theorem in section 2, and the general equilibrium model with complete capital markets in section 3, the discussion of section 4 surveys each of the above noted models along with three further proofs of weaker forms of the theorem. Section 4 also considers the question of taxation which, since the 1963 tax correction study of the original authors, had remained problematic.⁴ Prior to Miller's celebrated study, most attempts to incorporate further features of real world tax systems had adopted a partial equilibrium interpretation taking different features of the tax system one at a time.⁵ The breakthrough in the understanding of the full implications of the theorem within a tax framework had the further advantage - in addition to being expressed in a market equilibrium context - of explicitly incorporating personal as well as corporate tax features.⁶ Finally, section 5 considers another special case

⁴ F. Modigliani and M. Miller, "Corporate Income Taxes and the Cost of Capital: A Correction", Amer. Econ. Rev., June 1963, pp. 433-43.

⁵ M. H. Miller, "Debt and Taxes", The Journal of Finance, May 1977, pp. 261-275

⁶ See: J. Stiglitz, "Taxation, Corporate Financial Policy, and the Cost of Capital" Journal of Public Economics 2, 1973, pp. 1-34; and M. King, "Taxation and the Cost of Capital", Review of Economic Studies, 41, 1974, pp. 21-36.

solution of the MM theorem when capital markets are incomplete by imposing sufficient restrictions on investor behaviour and the characteristics of capital markets to ensure that the conditions for portfolio separability are satisfied and all investors hold perfectly balanced portfolios of risk - assets.

We should note at the outset, the limitations on the scope of the survey. The present survey is inevitably selective. It focuses only on the models demonstrating the validity of the MM theorem. This restriction has meant that a wide range of related issues and models have had to be excluded. Specifically, the following related areas are omitted: 1) discussion of the so-called traditional view of the cost of capital; 2) the historical debate surrounding the original theorem; 3) models considering simultaneous changes in financial structure and investment; and 4) the optimal capital structure literature which examines the consequences of the introduction of real world limitations which obstruct the operation of capital markets and invalidate the theorem. The scope of this study does not permit their proper consideration. Another area omitted from the study is the relationship between inflation, leverage and valuation. Several important contributions have recently been made in this field which it was not possible to properly assess.

2. PARTIAL EQUILIBRIUM INTERPRETATIONS

Two important partial equilibrium expositions of the MM leverage theorem have been widely reported in the literature. They are: i) the contributions of the original authors (based on the risk class concept of uncertainty) and ii) Hirshleifer's extension of the same partial equilibrium context to a world characterized by Arrow-Debreu type uncertainty. We consider each in turn.

A. THE MM MODEL. The primary contributions of MM to the leverage theorem bearing their name were threefold and extended over a number of articles spanning more than thirteen years since their first publication.¹ They were respectively: 1. the demonstration of the irrelevance result under certainty and its extension to a world characterized by uncertainty; 2. explicit illustration of the operation of the arbitrage mechanism ensuring the irrelevance result; and 3. demonstration of the effects of two different types of tax schemes on the validity of the theorem.

The study of the evolution of the partial equilibrium results is largely of historical interest and adds little to -----

¹These include, in addition to MM [1958], the following well-known publications: "Reply to Rose and Durand" American Economic Review (Amer. Econ. Rev.), September 1959, pp.655-59; "Dividend Policy, Growth, and the Valuation of Shares" The Journal of Business, October 1961, pp.411-33; "Corporate Income Taxes and the Cost of Capital" Amer.Econ. Rev., June 1963, pp.433-43; "Reply to Brewer and Michaelson" Amer.Econ.Rev., June 1965, pp524-7; and "Reply to Heins and Sprenkle" Amer. Econ,Rev., September 1969, pp.592-5.

our present understanding of the theorem. It is, therefore, not included in this selective survey. Here, we confine ourselves to a brief review of each of the three above results.

The first result demonstrated by the original authors was based on the single price law of markets according to which no two assets having identical characteristics could, in equilibrium, have different prices. Initially they confined themselves to the demonstration of the result in a world characterized by: i) perfect certainty - where each investor has full knowledge of the future investments and the exact returns of each firm; ii) perfect capital markets - implying in addition to the usual atomistic properties, equal and costless access to information by all, no taxation, and the absence of transaction costs;² and iii) investor rationality - according to which investors prefer efficient boundary positions. Based on these building blocks they were able to demonstrate that the following two results would hold:

²The presence of transaction cost are another constraint on the free operation of capital markets. As with non-distortionary taxes (more about which will be said below) transaction costs can be accomodated into the model if strict proportionality is preserved. Such is not the case in the real world, however. One of the few studies to explicitly incorporate transaction costs into the derivation of a model of optimal capital structure was the one by W. J. Baumol and B. Malkiel (1967) ["The Firm's Optimal Debt Equity Combination and the Cost of Capital" Quarterly Journal of Economics, 1967, pp.547-78] but their result that in a world with transaction costs the levered firm can command a premium over the unlevered firm were ruled out by Stiglitz (1969) who also questioned the ability of a simple two period model to cope with the sort of problems introduced by transaction costs.

i) the market value per dollar invested must be the same for all firms. This means that all firms with the same scale - total value of capital employed - would have identical total market values; and

ii) the market value of each firm would be independent of the sources and composition of its financing. The financial structure of the firm would be irrelevant to the determination of its (total) market value.

Both of the above results denote equilibrium properties of a system characterized by perfect certainty whereby the market value of the firm is exactly the discounted value (at the riskless rate of return) of the firm's earnings stream - which is known with certainty. There is no meaningful distinction in such a world between debt and equity. Both earn the same riskless rate of return. In this sense, the above results are trivial.

A more important contribution of the original authors was, however, the extension of the same results to a world characterized by uncertainty. They accomplished this within their partial equilibrium framework by using the ingenious construct of the equivalent-risk-class hypothesis whereby all firms having the same ex ante probability distribution of expected returns are classified together into equivalent risk classes.³ This enabled the authors to associate a -----

³The risk class assumption was used by MM in lieu of a valuation model. It allows the securities to be evaluated by comparison with the prices of other securities identical to them in all respects. It is discussed in more detail below in part 3.

single capitalization factor with all firms belonging to the same risk class and to infer that all firms within that risk class - having the same expected ex ante probability distribution of returns - would have the same market value adjusted for differences in scale (or per dollar invested) regardless of their financial structures.

MM demonstrated the prevalence of the single price law of markets by explicit illustration of an arbitrage mechanism through which investors by engaging homemade leverage would ensure that the market paid only one price for any two assets in the same risk class - possessing the same expected pattern and size of returns.

Their actual proof of the irrelevance theorem lay in depicting how an investor could engage homemade leverage to undo - on personal account - any undesirable effects of leverage engaged at the corporate level. They relied on the pair-wise comparisons afforded by the equivalent risk class hypothesis to show how two firms having identical ex ante distributions of expected returns could not but have the same market value in equilibrium.

To illustrate, consider two firms identical in all respects except their respective financial structures.⁴ For simplicity, let one firm be unlevered (which for

⁴This proof is based on MM [1969] and focuses on the properties of market equilibrium rather than the switching operations of investors which MM had originally concentrated on. The earlier proof had imposed such unnecessary additional restrictions. See: MM, "Reply to Heinz and Sprenkle" p.557.

demonstration purposes can be denoted by the subscript U) and the other be levered (denoted by the subscript L). It follows from the firm's basic accounting identities that for the unlevered firm the total market value, V_U , is equal to the market value of equity outstanding, S_U :

$$V_U = S_U$$

and for the levered firm, total market value, V_L , is equal to the market value of leverage adjusted equity, S_L , and debt, D_L , outstanding:

$$V_L = S_L + D_L.$$

Since both firms are identical in all real respects - that is except in their financial structures - both have the same expected earnings, X , and their respective expected rates of return, Y_U and Y_L , may be written:

$$Y_U = X/V_U \text{ and } Y_L = X/V_L.$$

Since both firms have the same expected returns in equilibrium they must represent the same market value. Otherwise opportunities are created for arbitrage, which in equilibrium, will bring the values to equality. These arbitrage opportunities can be exemplified by considering two counter-examples.

Let us suppose $V_L < V_U$, that is, the value of the unlevered firm exceeds that of the levered one. In such circumstances Y_U would be **smaller** than Y_L and the levered firm would be relatively undervalued (yielding a higher rate of return). Investors would then have an incentive to dispose of their assets in the ^{un}levered firm and buy the assets of the undervalued levered firm, thereby providing

for themselves the same expected return per dollar invested at a smaller capital cost.

This can be shown by focussing on some individual, i , who initially owns a fraction z of the shares of the unlevered firm, S_U . For the capital investment zS_U he earns the return zX . Now, if he finds that the levered firm is undervalued, investor i will switch out of the unlevered firm to acquire holdings in the levered firm and reproduce through a portfolio of security holdings the same return at a smaller capital investment. Since $V_U > S_L + D_L$, by selling his shares, zS_U , he can buy zS_L of the shares of the unlevered firm, where:

$$zS_L = z [V_L - D_L].$$

This produces the returns $z(X - rD_L)$. The second term in the last bracket represents the gross interest expenses on the levered firm's debt and is deducted from earnings before distribution to shareholders. With the funds left-over, $zV_U - zS_L$, the investor can also buy the fraction zD_L of the debt which the levered firm issues. The returns to the investor from the capital investment zD_L in the debt of the levered firm is zrD_L .

Combining the two, the investor can create an income of:

$$[z(X - rD_L + rD_L)] = zX$$

which is exactly the return he would have got from the unlevered firm.

Next, consider the converse and suppose $V_L > V_U$. In this

case the unlevered firm is relatively undervalued. The investor can now obtain the same returns as in the levered firm at a lower capital cost, by forming a portfolio consisting of shares of the (undervalued) unlevered firm and borrowing.

Initially, for a capital investment of $z(V_L - D_L)$ in the equity of the levered firm he earned the returns $z(X - rD_L)$. Since $(S_L + D_L) > V_U$ it follows that $S_L > (V_U - D_L)$ and so by investing the equivalent funds zS_L in a combination of equity of the unlevered firm and debt of the levered firm, $z(S_U - D_L)$, where the negative value of debt denotes borrowing, the investor can reproduce the returns $z(X - rD_L)$ which secure for him exactly the same returns as he would have obtained from his investments in the levered firm, but at a smaller capital cost. Therefore in equilibrium Y_U must equal Y_L and the same applies for the values of the two firms.

The third contribution of the original authors to the understanding of the leverage theorem was the explicit treatment of taxation. When a uniform tax system is incorporated into the analysis the validity of the theorem is unaffected. The returns throughout are adjusted by the rate of tax and the equality in equilibrium is preserved - taxes affect debt and equity in a non-distortionary manner. In the real world, however, tax schemes are almost invariably discriminatory in their treatment of equity and debt. One important characteristic common to most real world

tax schemes is the deductibility of interest charges in the computation of taxable income. MM incorporated this feature into their analysis of the irrelevance theorem and found that it served, by favouring debt finance through an effective subsidization, to invalidate the irrelevance theorem.⁵

The effects of both types of tax schemes can be illustrated. With uniform taxation and no deductibility clause, the after-tax returns on the levered firm are: $(1-t)(X)$, where t represents the marginal rate of corporation tax. When interest payments on debt are tax deductible, after-tax returns have the form: $[(1-t)(X - rD_L)]$.

Assuming that the tax savings on debt are measured with certainty, converting them into a market value is accomplished by capitalizing them at the rate r , and gives a present value of tax savings equal to tD_L . Consequently, the market value of the levered firm will, in equilibrium, exceed that of the unlevered firm by the capitalized value of the tax savings on debt. The MM theorem is invalidated and the equality no longer holds. Financial structure makes a real difference.

⁵The views of the authors regarding the effects of taxation on the cost of capital underwent major revision during the course of their contributions. Most significantly, MM [1958] had argued that for each risk class the proportionality (or capitalization) factor remained intact relative to expected returns measured net of taxes even when a tax scheme incorporating the deductibility of interest charges was considered. This was, of course, incorrect and MM subsequently found that the tax advantages to debt had permanent effects on valuation. This discussion considers only the corrected view presented by the authors in: MM, "Corporate Income Taxes: A Correction".

B. THE MODEL WITH ARROW DEBREU TYPE UNCERTAINTY. The next significant extension of the MM theorem, due to Hirshleifer [1966], was to incorporate a generalized characterization of uncertainty based on the Arrow-Debreu contingent claims model.⁶

Fundamental to the incorporation of Arrow-Debreu type uncertainty is the extension of the definition of a commodity to specify the state (of the world) in which it becomes available. Accordingly, two units of the same good available at the same place are not identical if they appear exclusively in different states of the world. Re-defining commodities to make them state contingent introduces uncertainty into the model. Each state of the world is characterized by a single random variable which describes all relevant aspects of uncertainty with no loss of generality - since any state distinct from others in any aspect of uncertainty is separately classified. If there are n traditionally defined commodities and s states of the world, there will be ns state contingent commodities. All investors agree about the finite number of mutually exclusive states of the world.

Completeness conditions in the context of a state theoretic model ensure a unique solution to the set of state contingent prices enabling firms to make their profit

⁶J. Hirshleifer, "Investment Decisions under Uncertainty: Applications of the State Preference Approach", Quarterly Journal of Economics, May 1966, pp.237-77.

maximizing investment decisions and investors to choose their optimal holdings of portfolios. Completeness requires the existence of a full set of prices - one for each state contingent security. This means that there must be as many linearly independent securities as there are states of the world. When a unique set of prices exist then the profit function of the firm, despite the presence of uncertainty, will be determinate.⁷ If the number of securities available were to exceed the different states of the world, arbitrage opportunities would be created and individual securities would not all be linearly independent. On the other hand, if the number of states exceed the number of securities, then even if all securities are linearly independent, no unique solution would exist and the resulting allocations would be inconsistent with efficiency considerations except under special circumstances.

Complete capital markets are, however, no more than theoretical constructs bearing little resemblance to reality, although they serve a useful pedagogical function when studying the theorem - because they preclude any possibility of the opportunity set (of investors) becoming enlarged as a result of any purely financial changes.

The main shortcoming of the Hirshleifer study was that it, too, was essentially partial equilibrium by nature and left many of the underlying assumptions of the theorem

⁷For a discussion see: J. Hirshleifer, "Investment Decisions Under Uncertainty: Choice Theoretic Approaches" Quarterly Journal of Economics, November 1965, pp.509-536.

implicit. Nevertheless, because of its more advanced conceptualization of uncertainty it succeeded in developing some novel implications of the theorem which had not been made explicit by the original authors.⁸

He focused on and made explicit the overall investment and financing constraints for the single firm under consideration. From the identity of the sources and uses of funds (whereby total output is just equal to the sum of inputs measured by debt and equity type securities) and from the assumption that all of the firm's income is distributed to its security holders, he invoked the single price law of markets - utilized by MM in their proof - to show that in equilibrium the sum of claims to contingent incomes of the elementary securities of a firm could not diverge from a value of a package of the same claims.

Therefore, the market value of the firm can not, in equilibrium, diverge from the sum of its debt and equity outstanding, since the former is non other than the product of the price of each state contingent security outstanding times the number issued. The total value of the package of debt and equity type claims remains invariant to their composition. Hirshleifer drew the following implications from these results: i.) production decisions alone determine income levels; ii.) financing decisions are taken in the context of each firm's overall wealth constraint and do not -----

⁸ Hirshleifer demonstrated the above results using a simple two-period and two-contingent-state model where the set of prices of all Arrow-Debreu securities are given.

change that constraint; and iii.) financial decisions can affect the distribution and timing of income claims but not their real levels.

Although the necessity of the risk class concept was obviated, the partial equilibrium nature of Hirshleifer's contribution still left many of the theorem's key assumptions implicit. Did the characterization of uncertainty imply homogeneous expectations? Did the successful operation of the arbitrage mechanism imply equal access to capital markets by investors? These and several other key questions remained unanswered. The further extension of the model to a general equilibrium context proved necessary before the underlying assumptions could be made explicit and the further implications of the leverage theorem developed.⁹

⁹The partial equilibrium models take all the relevant information, namely the financing decisions and security prices, of all firms as given except for the one under study. They focus only on the effects of financing on its market valuation. The general equilibrium models take only the over-all resource constraints of the economy as given.

3. GENERAL EQUILIBRIUM RESULTS: COMPLETE CAPITAL MARKETS.

A. OVERVIEW. In 1967 Diamond extended the demonstration of the MM irrelevance results to a general equilibrium context utilizing the usual neoclassical specification of production and utility functions, as well as explicitly recognizing the over-all resource and budget constraints of the system.¹ He characterized uncertainty by adopting the state-theoretic approach of Arrow and Debreu but where allocation is effected by stock market trading of corporate securities rather than by means of the contingent claims model.²

The main contribution of the Diamond study to the understanding of the leverage theorem lay in its formulation of a precise set of conditions sufficient to establish the theorem's validity, and in its making explicit the limitations of the model. The demonstration of the MM results were, however, only secondary implications of the Diamond model. The primary objective of his study was to

¹P. Diamond, "The Role of a Stock Market in a General Equilibrium Model with Technological Uncertainty", Amer. Econ.Rev., Sept.1967, pp.117-30

²These authors had, earlier, shown that a central result of equilibrium theorem under certainty - which stated that when individuals engage in competitive exchange at a set of market clearing prices then the resulting equilibrium allocations will be Pareto-optimal - would hold even under uncertainty subject to a number of additional restrictions on the characterization of uncertainty and the description of investor behaviour. See: K. Arrow, "The Role of Securities in the Optimal Allocation of Risk Bearing", reprinted in Arrow, Essays in the Theory of Risk Bearing, (Amsterdam, North Holland, 1974).

show that the allocation effected through exchange on the stock market was Pareto optimal. The sufficient conditions for a Pareto optimal allocation were found to coincide exactly with those sufficient to establish the MM theorem.

An important contribution of the Hirshleifer model, discussed earlier, had been to show that the characterization of uncertainty was a significant element in the sufficiency conditions for the irrelevance result. Hirshleifer's results depended critically on the existence of complete contingent claims markets - having a full set of Arrow-Debreu securities. Diamond's stock market model appeared, on the surface at least, to offer an improvement in the realism of the underlying characterization of uncertainty. The implications of equilibrium resulting from trading on the stock market differ from the contingent commodity model in two important respects.³

First, whereas the profit function in the contingent claims model is determinate and no probabilistic element enters in its calculation, in the stock market model there is technological uncertainty associated with the production

³The question of the Pareto optimality of the equilibrium allocation effected by the stock market has been studied by a number of other authors - most notably by Jensen and Long [see: M. Jensen, and J. Long, "Corporate Investment Under Uncertainty and Pareto Optimality in the Capital Markets", Bell Journal of Economics and Management Science, vol. 3, no. 1, Spring 1972, pp. 151-74 and J. E. Stiglitz ["On the Optimality of the Stock Market Allocation of Investment" Quart. J. Econ., 1972, pp. 25-60. That the conclusions of both these studies contradicted the Diamond results can be attributed to the special nature of the Diamond assumptions which were that firms were price takers and considered the demand schedule for their shares as being perfectly elastic.

function of the firm. Shareholders receive residual returns and the owners of the firm have to bear risks. Diamond bridged this discrepancy by assuming that capital markets were complete in the sense that the equilibrium set of Arrow-Debreu prices could be imputed from the prices of securities available on the stock market.

Second, whereas in the contingent claims model individuals purchase elementary consumption claims in each state of the world, in the stock market model they purchase packages of elementary Arrow-Debreu securities (joint patterns of consumption claims across states of the world). In the Diamond model, therefore, consumption claims are confined to linear combinations of firm output and in this sense the resulting Pareto optimal allocation is a constrained one.⁴ These two assumptions effectively imply an Arrow-Debreu type world, as would exist when capital markets are complete.

Focusing only on the implications directly relevant to the leverage theorem, we re-construct a simplified version of the model. This reconstruction provides the background for many theoretical models of capital market equilibrium including some to be considered later in this chapter.

⁴We describe the resulting allocation as constrained because the allocation effected via securities issued by firms restricts the pattern of second period returns to being some linear function of the firm's output. This is because the securities give owners returns which are directly proportional to the returns of the firm and preclude any non-proportional distribution however desirable.

B. CHARACTERIZATION OF THE WORLD. The world, in the Diamond model, consists of only a single time period. At the start of the period firms exist and individuals find themselves with fixed initial endowments of wealth. During the period trading occurs and firms make their investments. At the end of the period the state of the world is announced, the actual returns become known and are distributed to investors. The final distribution consists of gross returns -- earnings as well as capital invested. Nothing remains of the firms after returns are distributed.

Uncertainty, is restricted to the technology of the economy - only the outcome of production decisions are uncertain - and price uncertainty is ruled out altogether. This was accomplished by assuming that all relative prices are fixed so that all goods can be combined into a single composite good.⁵

To focus attention only on the implications of the leverage theorem we make two simplifying modifications to the original version of the Diamond model. First, Diamond distinguishes between the individual's supply of labour input to the firm, for which he receives a contractually fixed wage and financial assets which he holds against investments in the firm. Here, the investor makes no labour input. Inputs into the firm consist only of delivering

⁵The treatment of price uncertainty introduces complications with which even the Arrow-Debreu model is unable to cope. The possibility of trading conveying information about future returns distributions introduces the difficult problem of expectations with which the model cannot cope.

quantities of the single good in exchange for which the individual is entitled to a claim on the firm's gross returns. Second, in the original Diamond model individuals exchange quantities of the composite good among each other. Here, transfers take place only between firms and individual investors. Trading among investors is restricted to only exchange in securities.

There are altogether n firms. The first $n-1$ firms each face a stochastic production function of the same decomposable form. For these firms output is a function of inputs (since there is only one good we may consider a single input or a composite input subject to a fixed technology) and the state of the world which occurs after investment levels are chosen.

Production functions conform to the usual restrictions on concavity and the absence of externalities. They are continuous and twice differentiable with positive first and negative second derivatives. If we denote output of the j th firm in the state $\emptyset$ by $X_j(\emptyset)$ and the level of inputs by k_j , then:

$$\begin{aligned} X_j(\emptyset) &= f_j(k_j, \emptyset) \\ f_j' &> 0, \quad f_j'' < 0. \end{aligned}$$

The decomposability of the function implies that changes in inputs affect outputs equally in all states of the world. Output is changed by the same proportion in each state when the scale of input is altered. Consequently, the production function may be expressed as:

$$x_j(\emptyset) = f_j(k_j)g_j(\emptyset).$$

Not only is the firm a price taker in the usual competitive sense but its value changes directly and in exact proportion to the investment it undertakes. The latter is, of course, a rather restrictive behavioural assumption.

The last firm, denoted by the subscript n , is riskless and provides investors with an opportunity to obtain a certain rate of return, r , independently of which state of the world prevails. For simplicity, the riskless firm is assumed to operate subject to a constant returns to scale production function. Given the overall feasibility constraints of the economy (by which the total supply of resources is just equal to the total demand) the optimal scale of the n th firm is determined as a residual.

There are m individuals each receiving at the beginning of the first period an initial endowment of wealth. From the beginning, this wealth is held by firms on behalf of individuals in exchange for which the latter own claims against the firms. Even in this simplified world there are two kinds of claims on firms revealing the fundamental distinction between bonds and shares. Claims on the $n-1$ risky firms are share-type claims earning an uncertain return while the riskless firm yields a certain return characteristic of bond type claims.

Just as under certainty, the individual has a preference ordering over the combination of returns allocated to him at the end of the period. Only now, the

utility function is expressed in terms of state contingent end of period income. Each individual has a subjective probability distribution defined over state-space. His utility function conforms to the convexity requirements of utility levels, and is strictly in accordance with the Von Neumann Morgenstern axioms of expected utility maximization. In the context of this model this is equivalent to defining the function in terms of end of period wealth.

We can express this subjective density function over the states of the world as follows: Let $h^i(\emptyset)$ express the probability with which the i th individual expects the state, $\emptyset$, to occur. Then maximizing the expected value of utility, U^i , we can proceed in the usual manner by maximizing:

$$U^i = \sum_{\emptyset} U^i(Y^i(\emptyset)) h^i(\emptyset)$$

subject to the individual's budget constraint which we can now spell out.

The investor finds himself at the start of the first period with an endowment consisting of some initial holdings of claims on the riskless firm and claims on the gross returns of the $n-1$ risky firms. Denoting his initial wealth by W^i :

$$W^i = D_n^i + \sum_{j=1}^{n-1} C_j^i$$

where D^i represents the aggregate bond holdings of individual i , and c_j^i his holding of the shares of the j th firm.

C. THE MODEL. By assumption market clearing and full resource utilization conditions are satisfied. The $n-1$ risky firms incur no fixed contractual charges -- they have no debt outstanding and no factor inputs which earn contractual returns. Their profits, $P(\emptyset)$ consist of the returns on total investment value, k_j , so that total profits distributed just equal the output of the firm in that state:

$$P_j(\emptyset) = X_j(\emptyset).$$

When trading is completed, investors have altered their portfolios to hold preferred combinations of the n firms. Their new holdings will reflect their attempts to maximize expected utility from end of period consumption opportunities made available to them by their investments. Their budget constraints impose the restriction that the equilibrium value of each investor's portfolio must be equal to the value of his initial endowment. This can be expressed as:

$$D_n^i + \sum_{j=1}^{n-1} C_j^i = \tilde{D}_n^i + \sum_{j=1}^{n-1} \tilde{C}_j^i$$

where the tilde over the variables on the right hand side indicates that those variables represent final equilibrium holdings.

Income is defined as the final gross consumption stream made available to the investor. In this simplified time context, income, consumption and wealth maximization are all identical. Income can be expressed as:

$$Y^i(\emptyset) = r\tilde{D}^i + [\sum_{j=1}^{n-1} P_j(\emptyset)/V_j] \tilde{C}_j^i$$

where r represents the gross (one-plus-the) rate of return for the riskless firm. For the unlevered firm:

$$V_j = \sum_i^m c_{ij}^i.$$

Faced by the set of market clearing prices, investors choose their portfolios to maximize $E\{U^i[Y^i(\emptyset)]\}$, subject to the satisfaction of the wealth constraint in their preferred portfolios. The $E[\cdot]$ denotes an expectations operator and applies to the probability distribution. A Lagrangean function can be formed from which optimal portfolio holdings satisfying the first order conditions for expected utility maximizations are obtained:

$$G^i = U^i\{r\tilde{D}^i + [(\sum_j P_j(\emptyset)/V_j)\tilde{C}_{ij}^i] + L^i[\tilde{W}^i - \tilde{D}^i - \sum_j \tilde{C}_{ij}^i]\}$$

from which the following first order conditions are derived:

$$dG/d\tilde{D}^i = r - L^i = 0$$

and

$$dG/d\tilde{C}_{ij}^i = [P_j(\emptyset)/V_j] - L^i = 0$$

which after setting to zero and substitution for L^i gives:

$$r = P_j(\emptyset)/V_j = X_j(\emptyset)/V_j$$

from which the market value of the firm can be expressed:

$$V_j = P_j(\emptyset)/r = X_j(\emptyset)/r.$$

Now consider the same economy identical in all real respects but where all firms issue debt. The incorporation of widespread leverage poses no complications. Investors still find themselves with initial endowments comprised of the same two types of claims - shares and bonds. The only difference is that whereas previously all bond type claims were concentrated in the single riskless firm, the same volume of bond type claims are now divided among the n firms. To preserve comparability all bonds are considered riskless.

In this new scenario initial wealth holdings remain unchanged, In the absence of default risk on debt it does not matter who issues bonds. The new constraint can be written as:

$$W^i = \sum_{j=1}^n D_j^i + \sum_{j=1}^n C_j^i,$$

and the income of the i th investor now becomes:

$$Y^i(\emptyset) = \sum_j r \tilde{D}_j^i + \sum_j [P_j(\emptyset)/(V_j - D_j)] \tilde{C}_j^i.$$

but the profit function has now become:

$$P_j(\emptyset) = X_j(\emptyset) - rD_j,$$

so the Lagrangean function must be written as:

$$G^i = U^i \{ \sum_j r \tilde{D}_j^i + [\sum_j (X_j(\emptyset) - rD_j) / (V_j - D_j)] \tilde{C}_j^i \\ + L^i [\tilde{W}^i - \sum_j \tilde{D}_j^i - \sum_j \tilde{C}_j^i] \}$$

giving the following first order conditions:

$$dG/d\tilde{D}_j^i = r - L^i = 0$$

and

$$dG/d\tilde{C}_j^i = (X_j(\emptyset) - rD_j) / (V_j - D_j) - L^i = 0$$

which by setting to zero and upon substitution gives:

financial structures, both will have the same market value irrespective of the proportion of debt they carry. The strict dichotomy between real and financial variables is preserved.

Another remarkable feature of the Diamond model was the demonstration of the coincidence of the sufficient conditions for Pareto optimality with leverage irrelevance. The conjunction of the two in the certainty model was only a trivial result - competitive exchange at a set of market clearing prices ensures both outcomes - and was left implicit in the work of the original authors. The extension of the same results to a world with uncertainty and where the allocation is effected by means of trading in securities was, however, a significant outcome even though a complete set of state contingent prices could be imputed by all agents and so capital markets were effectively complete.

Mossin (1977) illustrated the Pareto optimal nature of an allocation similar to that implied by the Diamond model and it can be shown as follows:⁶ Let us focus on the earlier case where only the n th firm is levered and denote the scale of the riskless firm by D , $D = D^i$. First we set up the i th investors utility function,

$$U^i = \sum_{\emptyset} U^i(Y^i(\emptyset))h^i(\emptyset)$$

from which we can derive marginal utility:

$$dU^i = \sum_{\emptyset} U^{i'}(Y^i(\emptyset))dY^i(\emptyset)h^i(\emptyset)$$

⁶J.Mossin, The Economic Efficiency of Capital Markets, chapter 3, (Toronto: D.C. Heath & Co.), 1977.

Next, we set up the investors utility maximization problem by again defining a Lagrangean function having the form:

$$G^i = \sum_{\theta} U^i(Y^i(\theta))_{\lambda}^{h^i(\theta)} + L^i[W^i - \sum_{\theta} q(\theta)Y^i(\theta)]$$

where L^i is the Lagrangean multiplier and $q(\theta)$ denotes the set of prices (which are explained below, p.31) and from which the following first order utility maximizing condition is obtained:

$$U^i_{\lambda}^{(h^i(\theta))} = L^i[\sum_{\theta} q(\theta)h^i(\theta)]$$

where L^i is equal to the marginal expected utility of wealth. Substituting from the first order term into the expression for marginal utility:

$$dU^i = L^i \sum_{\theta} q(\theta) dY^i(\theta)$$

and summing over all individuals, i , for the market clearing conditions:

$$\sum_i dU^i = \sum_{\theta} q(\theta) [\sum_i L^i dY^i(\theta)]$$

Now, expressing the change in income in terms of the change in returns from the n firms:

$$\sum_{\theta} q(\theta) [\sum_i dY^i(\theta)] = \sum_{\theta} q(\theta) [\sum_j dX_j(\theta) + r dD]$$

and substituting this into the right hand side above gives:

$$\sum_i dU^i = \sum_{\theta} q(\theta) \{L^i [\sum_j dX_j(\theta) + r dD]\}$$

and expressing output in terms of the production function:

$$\begin{aligned} \sum_i dU^i &= \sum_{\theta} q(\theta) [\sum_j dX_j(\theta) + r dD] \\ &= \sum_{\theta} q(\theta) [\sum_j f_j'(k_j, \theta) dk_j + r dD]. \end{aligned}$$

For profit maximizing firms, in equilibrium, $f_j'(k_j, \theta)/dk_j = r$ and since we also know that when capital markets are complete $\sum_{\theta} q(\theta) = (1/r)$ we have the result that in equilibrium:

$$\sum_i dU^i = L^i [\sum_j dk_j + dD].$$

For the reallocation to be feasible the overall change must equal zero:

$$\sum_i (1/L^i) dU^i = [dk_j + dD] = 0$$

Since, L^i is the marginal expected utility of initial wealth, it must be positive. Then, some dU -- changes in utility -- must be negative for the product to be zero when summed over all individuals. Some $dU < 0$ implies that the allocation is Pareto optimal.

The Diamond model had three main shortcomings. One had to do with its continued characterization of uncertainty in terms of the unrealistic completeness conditions. A second problem had to do with the neoclassical restrictions imposed on production and utility functions. It was not clear whether these unnecessarily restricted the generality of the results obtained. Finally, the model assumed riskless debt and left the issue of the validity of the theorem in the face of default risk unresolved.

The first and third problems just cited are not mutually independent. Given the assumption of complete capital markets, the Diamond model could have been extended to incorporate risky debt without affecting the validity of the leverage theorem. Recognition of this requires an understanding of the significance of the completeness assumption.

D.SOME IMPLICATIONS OF COMPLETENESS. An explicit illustration of the insignificance of default risk when capital markets are complete was subsequently provided by a number of authors, most significantly by Baron [1976] whose results we review below.⁷

In a contingent claims model when capital markets are complete and a full set of Arrow-Debreu securities exist then the set of market clearing (equilibrium) prices can be standardized by defining $q(\emptyset)$ as the price of a security promising to pay one unit of the (single) good upon the occurrence of the state $\emptyset$. A portfolio of s state-contingent securities, one for each possible state, gives a sure return of unity and its value in the first period must be equal to the present value of a unit return in the second period:

$$\sum_{\emptyset} q(\emptyset) = (1/r).$$

Given these prices, the outputs of firms and the incomes of individuals can be evaluated.

When debt is riskless the returns to it are given by:

$$r(\emptyset) = r'$$

in every state that may occur and the market value of the firm's debt can be expressed as:

$$r(\emptyset)D_j = r'D_j$$

for all $\emptyset$. When debt is risky, however, state space can be partitioned, say, by the state, $\emptyset^*$ such that for all $\emptyset > \emptyset^*$

⁷D.P. Baron, "Default Risk and the Modigliani-Miller Theorem: A Synthesis", Amer. Econ. Rev., March 1976, pp.204-12.

the firm remains solvent while for those states $\emptyset \leq \emptyset^*$ it defaults on its debt and goes bankrupt.⁸

The conditions for a change in the value of the firm due to a purely financial change can now be made explicit. First, we need to define the market value of the firm, V_j , and to express it in terms of its component parts, S_j and D_j , which are equity and debt outstanding respectively. Then, changes in the market value of the firm can be obtained by total differentiation of V_j .

The total differential of V_j , given a change in financial structure is, of course, the sum of the respective differentials of the equity and debt components. Totally differentiating S_j , gives:

$$dS_j = \sum_{\emptyset} dq(\emptyset) [X_j(\emptyset) - rD_j] + \sum_{\emptyset > \emptyset^*} q(\emptyset) [dX_j(\emptyset) - [D_j(dr) + r(dD_j)]]$$

Analogously, when debt is riskless:

$$dD_j = \sum_{\emptyset} dq(\emptyset) rD_j + \sum_{\emptyset} q(\emptyset) [D_j(dr) + r(dD_j)]$$

for all $\emptyset$.

Then, since

$$dV_j = dS_j + dD_j$$

$$dV_j = \sum_{\emptyset} dq(\emptyset) X_j(\emptyset) + \sum_{\emptyset} q(\emptyset) f'_{j \text{ all } \emptyset} dX_j(\emptyset).$$

For a purely financial transaction the second term on the right hand side is nil because $dX_j(\emptyset) = 0$. The change in the value of the firm must therefore be a function of the change in the set of state contingent prices. When capital

⁸ The discrete form of the above characterization introduces the complication that for large changes in financial structure the boundary in state space between solvency and bankruptcy may not remain invariant. We therefore restrict ourselves to only the consideration of marginal changes.

markets are complete the set of prices will be unaffected by financial changes, $dq(\emptyset) = 0$, and the market value of the firm will be independent of its financial structure.

Remarkably, so long as capital markets are complete, the same results hold even when debt is not riskless. This can be demonstrated by noting that when there is a risk of default attached to debt its returns are given by:

$$r(\emptyset) = \min [r', X_j(\emptyset)/D_j]$$

where r' is the nominal gross return promised and which is actually paid in those states $\emptyset > \emptyset^*$ where $X_j(\emptyset) > rD_j$. In the remaining states, $\emptyset < \emptyset^*$, where $X_j(\emptyset) < rD_j$ then the actual gross returns on debt are X_j/D_j . From these the market value of the firm's risky debt may be expressed as:

$$r(\emptyset)D_j = \begin{cases} \sum_{\emptyset} q(\emptyset)r'D_j & \text{for } \emptyset > \emptyset^* \\ \sum_{\emptyset} q(\emptyset)X_j(\emptyset) & \text{for } \emptyset < \emptyset^*. \end{cases}$$

Just as in the no risk case above the conditions for a change in the value of the firm due to a purely financial change can be obtained by total differentiation of V_j . dS_j remains the same as in the no risk of bankruptcy case, but dD_j now becomes:

$$dD_j = \sum_{\emptyset} \frac{dq(\emptyset)}{d\emptyset} rD_j + \sum_{\emptyset} \frac{dq(\emptyset)}{d\emptyset} X_j(\emptyset) + \sum_{\emptyset} q(\emptyset) f'_j \frac{dX_j(\emptyset)}{d\emptyset}$$

$$\sum_{\emptyset} q(\emptyset) [D_j(dr) + r(dD_j)]$$

In this case:

$$dV_j = \sum_{\emptyset} \frac{dq(\emptyset)}{d\emptyset} X_j(\emptyset) + \sum_{\emptyset} q(\emptyset) f'_j \frac{dX_j(\emptyset)}{d\emptyset} +$$

$$\sum_{\emptyset} q(\emptyset) f'_j \frac{dX_j(\emptyset)}{d\emptyset} + \sum_{\emptyset} \frac{dq(\emptyset)}{d\emptyset} X_j(\emptyset)$$

which upon simplification gives:

$$dv_j = \sum_{\phi} dq(\phi) x_j(\phi) + \sum_{\phi} q(\phi) f'_j dx_j(\phi).$$

When capital markets are complete bankruptcy makes no difference to the outcome and the strict dichotomy between real and financial variables is preserved -- the leverage theorem is upheld and the market value of the firm remains independent of its financial structure.

4. GENERAL EQUILIBRIUM RESULTS WITH INCOMPLETE MARKETS.

A. OVERVIEW. Capital markets, in reality, are far from complete and models based on such assumptions are interesting more as pedagogical constructs than as any representations of the real world. Incomplete capital markets imply that financial changes will normally affect the opportunity set of returns. When the opportunity set expands combinations of returns which were not attainable previously now become feasible and when the opportunity set shrinks previously feasible returns no longer are attainable. The conditions which preserve the validity of the theorem in incomplete capital markets can, therefore, be viewed as special case instances which impose sufficient restrictions on firm and investor behaviour to ensure that the subspace of returns distributions available to investors remains unaffected by purely financial changes undertaken by any firm or firms.

In this section we consider three models (or approaches) which establish the theorem when capital markets are incomplete.¹ The first two models, associated with the names of Stiglitz and Fama respectively, distinguish between two facets of the independence theorem. The first, which we shall for convenience call the weak facet, implies only the independence of market value from financial structure while

¹We defer the discussion of mean-variance models ensuring the validity of the theorem when capital markets are incomplete, until the next chapter.

the second, stronger, version implies additionally the indifference of investors to any financial structure which any firm may choose^{2,3}. Stiglitz (1974) showed that in the latter case no optimal or predetermined overall debt-equity ratio exists for the economy as a whole.

In their proof of the weak facet of the theorem both models adopt an essentially common approach. The set of sufficient conditions in both is based on characteristics of perfect capital markets and depends critically on equal access to capital markets by all investors. The Stiglitz model proves this by means of explicit consideration of the arbitrage mechanism which brings about equilibrium in the system. Fama, on the other hand, relies primarily on an intuitive understanding of the nature of the restriction on second period returns distributions.

The two models, however, differ substantially with respect to the assumptions they make in order to derive the stronger facet of the theorem. In both cases restrictions -----

²The Stiglitz "model" was developed during the course of the following studies: J.E. Stiglitz, "A Re-examination of the Modigliani-Miller Theorem" Amer. Econ. Rev., Dec. 1969, pp. 784-93; J.E. Stiglitz, "Some Aspects of the Pure Theory of Corporate Finance: Bankruptcies and Take-overs", Bell Journal of Economics & Management Studies, 1972, pp. 458-482; and J.E. Stiglitz, "On the Irrelevance of Corporate Financial Policy".

³The Fama "model" was first developed in the stronger facet jointly by Fama and Miller: E. F. Fama, and M. H. Miller, Chapter 4, "Financing Decisions, Investment Decisions, & the Cost of Capital", The Theory of Finance and subsequently extended by Fama, in: E. F. Fama, "The Effects of a Firm's Investment and Financing Decisions on the Welfare of its Security Holders", Amer. Econ. Rev., June 1978, pp. 272-84.

need to be imposed to confine the distribution of returns to a particular sub-set of returns space which would have been attainable to investors initially - before any financial change. Stiglitz restricted his model by ruling out bankruptcy while Fama adopted restrictions on the expropriation of investor positions.

The third model to be considered provides the most general proof of the independence theorem. Fama, its author, shows that even the equal access assumption is not necessary and can successfully be replaced.⁴

B. THE STIGLITZ MODEL WITH NO DEFAULT RISK. In the first of the special case expositions, Stiglitz (1969) formally re-examined the leverage theorem in a general market equilibrium context and demonstrated the result that - in the absence of default risk - the MM theorem remained valid even when capital markets were incomplete. His model had two further, significant, advantages: i) no restrictions needed to be imposed on the nature of production and utility functions, and ii) the characterization of uncertainty remained completely general.⁵

⁴Fama, "The Effects of A Firm's Investment and Financing Decisions on The Welfare of Its Security Holders"

⁵Compared with the Diamond model, for example, this one does not require production functions to be either decomposable or subject to the proportionality assumption. The only restriction on investor behaviour is that they act rationally and evaluate their portfolios in terms of the distributions of second period returns (income). In terms of the characterization of uncertainty, moreover, no distinction needs to be made between technological or price uncertainty.

The following assumptions underlie the first Stiglitz model: 1. market imperfections such as taxes or transaction costs are ruled out; 2. all investors have equal access to capital markets; 3. all investors agree that there is no risk of default associated with corporate debt, and 4. the world consists of only two periods and investors evaluate their portfolios in terms of the second period returns (or income) which they generate.⁶

The first two assumptions belong to the usual characterization of perfect capital markets.⁷ The third also belongs to the same category but is much weaker than would usually be associated with the perfect markets assumption. In particular, no agreement on the subjective probability distribution of expected returns is required. The two period context is innocuous and was adopted only to simplify the analysis.⁸ The only new assumption adopted by Stiglitz was -----

⁶Another assumption implicit in the above model is the independence of investor expectations from any effects of financial changes. This rules out any signalling effects which may arise from changes in the firm's financial structure. The need for such an assumption is apparent, if investors expect the changes in the firm's financial structure to signal changes in the firm's real prospects then financial changes will indeed be relevant.

⁷An important respect in which the Stiglitz model differs from those assuming perfect capital markets is that no restrictions are imposed on the number of firms and the model is quite consistent with a less than perfectly elastic supply curve of bonds for any particular firm.

⁸This was subsequently extended (Stiglitz, 1974) and is described below.

the no default risk assumption.⁹

The demonstration of the validity of the theorem, in equilibrium, consisted of essentially two steps. In the first, the distribution of second period returns accruing to investors was shown to be a function of the total funds invested by the firm, independently of the composition of those funds -- as between debt and equity type claims. The second shows the exact operation of the arbitrage mechanism, ensuring the irrelevance result in equilibrium.

Bankruptcy was incorporated into the characterization of uncertainty by defining some critical value $\emptyset^*$ separating solvency from bankruptcy in state space such that in all states $\emptyset < \emptyset^*$, the firm defaults on its debt. In the two period context this is equivalent to its going bankrupt. The riskless debt assumption implies that attention is confined only to the states, $\emptyset > \emptyset^*$.¹⁰ Then, the second-period returns of the i th investor in each state $\emptyset$ may be written as:

$$Y^i(\emptyset) = r\tilde{D}^i + \left\{ \sum_{j=1}^J \tilde{C}_j^i [X_j(\emptyset) - rD_j] / [V_j - D_j] \right\}.$$

This states that the income of the i th investor in the

⁹The role and significance of bankruptcy in the Diamond model was ambiguous. Diamond, clearly, thought that bankruptcy made no difference. Stiglitz, however, argued that the validity of the Diamond model depended on the no bankruptcy assumption. The ambiguity seems to arise from the fact that completeness characteristics of capital markets are difficult to reconcile with the effects of bankruptcy on the totality of securities available when the model is based on a stock market.

¹⁰This characterization is necessary in order to restrict the distribution of second period returns to only those states in which the firm remains solvent.

state $\emptyset$ is equal to the sum of: his returns from debt-holdings and from his total holdings of corporate equity. There are, in such a world, only these two types of securities because when debt is riskless, there is no need to distinguish between its issuers. In equilibrium, $\tilde{C}_j^i$ is the amount of wealth the i th investor has invested in the shares of the j th firm and can be viewed as the product of: the fraction, a_j^i , of the j th firm's equity owned by the i th investor and the market value of that firm's equity. Consequently, we can write $\tilde{C}_j^i$ as:

$$\sum_j \tilde{C}_j^i = \sum_j a_j^i S_j.$$

which is exactly as in the Diamond model.¹¹

We know from the wealth constraint, moreover, that in equilibrium the holdings of debt by the i th investor is just equal to the excess of the individual's wealth over the value of his equity holdings:

$$\tilde{D}^i = W^i - \sum_j \tilde{C}_j^i.$$

Substituting first the wealth constraint and then $a_j^i S_j$ into the returns function for the investor, gives:

$$\begin{aligned} Y^i(\emptyset) &= r(W^i - \sum_j \tilde{C}_j^i) + \sum_j \tilde{C}_j^i (X_j(\emptyset) - rD_j) / (V_j - D_j). \\ &= r(W^i - \sum_j a_j^i S_j) + \sum_j a_j^i S_j [X_j(\emptyset) - rD_j] / S_j \\ &= r(W^i - \sum_j a_j^i S_j) + \sum_j a_j^i [X_j(\emptyset) - rD_j] \\ &= rW^i + \sum_j a_j^i [X_j(\emptyset) - rV_j]. \end{aligned}$$

Re-arranging terms, as above, it becomes apparent that

¹¹As before, the tilde ($\sim$) represents equilibrium holdings.

the income stream depends only on the total funds invested and is independent of how that sum is divided between debt and equity type claims.¹² Any change in the debt-equity ratio which leaves the aggregate value, V_j , unaffected will have no influence on the level of second period income and leaves the investor indifferent.

The arbitrage mechanism which sustains the above equilibrium characteristics can be shown as follows: suppose some firm disrupts an initial equilibrium situation by engaging in a purely financial change in its capital structure. We can trace how investors can undo the undesirable effects of such a change, thereby leaving - in the new equilibrium attained - their opportunity sets (of expected second period returns distributions) unchanged. Then, if all market clearing conditions are satisfied it can be said that the original equilibrium remains unaffected and the MM theorem is valid.

Let, as demonstrated by Stiglitz, the initial equilibrium be disrupted by only one firm (let us say the first firm). Let us also suppose that this firm was originally levered but now alters its capital structure to become unlevered (all equity financed). Then, if the i th investor's second period distribution of returns could initially be expressed as:

¹² It is apparent from this arrangement that the irrelevance result depends critically upon the no bankruptcy assumption whereby different units of debt are indistinguishable from one another and can be aggregated without any problem.

$$Y^i(\emptyset) = r\{W^i - \sum_j a^i_j S_j\} + \sum_j a^i_j [X_j(\emptyset) - rD_j],$$

now, when the first firm substitutes new equity for all its debt, the i th investor's opportunity set becomes:

$$Y^i(\emptyset)' = r\{W^i - [a^i_1 S'_1 + \sum_{j \neq 1} a^i_j S_j]\} + \{a^i_1 X_1(\emptyset) + \sum_{j \neq 1} a^i_j [X_j(\emptyset) - rD_j]\}.$$

Under the circumstances, for the opportunity set to remain unchanged despite the changes in the firm's capital structure, total second period income must be the same in both cases:

$$Y^i(\emptyset) = Y^i(\emptyset)'.$$

This equality implies that:

$$S'_1 = S_1 + D_1.$$

The first term on the right hand side of $Y^i(\emptyset)$, $r[W^i - a^i_j S_j]$, is the i th investor's income from the holding of debt assets directly. The second term represents the same investor's income from equity holdings. Therefore, if in the new equilibrium the income stream of the investor is to remain unchanged, the bond holdings of the i th investor must increase by exactly the amount of debt the particular firm unloaded when it disrupted the equilibrium.

This change can be effected by investors buying the new equity issued - which are claims to the same income stream as before but now unlevered - and engaging the same degree of leverage as existed in the original equilibrium. They can do this by pledging the unlevered shares to borrow just as the firm previously did.

Investors encounter no difficulty in engaging in the

above arbitrage operations because it is assumed that they can borrow under the same terms and conditions as firms. In equilibrium, as a result of these operations the amount of debt the firm withdraws from the market is re-supplied by investors on personal account and the new issue of equity is fully subscribed by the original shareholders. Therefore, if the equity and debt markets originally cleared, they now do too and all market clearing conditions are satisfied as they were originally.

C. EXTENSIONS OF THE STIGLITZ MODEL. The Stiglitz model has been extended in a number of important respects making it both more realistic and developing the implications of the underlying assumptions. We begin by considering the relaxation of the two period restriction as demonstrated by Stiglitz (1974).

Extension to a multi-period context complicates the characterization of the world. The most serious complication introduced concerns the additional features of financial structure and decision-making which are important factors in real world finance, but were absent in the simple two period model. The most important of these is the dividends-retention decision. Stiglitz focused on this and showed that the individual's consumption stream was unaffected by it, implying, therefore, that this complication was of no consequence to the outcome of MM theorem.

The new characterization of firms in the multi-period

context is based on two accounting identities. The first is the identity of total investment with the sum of changes in the value of equity, debt, and retained earnings which can be written:

$$I_j(t) = \sum_{T=t+1}^{\infty} p(t,T)[D_j(t,T) - D_j(t-1,T)] + [S_j^+(t) - S_j^-(t)] + RET_j(t)$$

where:

$I_j(t)$ = investment by the j th firm during period t .

$p(t,T)$ = the price during period t , of a unit of debt due in period T . The model assumes all interest charges are capitalized into the discount value so the debt bears no coupon or interest charges.

$D_j(t,T)$ = debt units issued in period t and due in period T .

$S_j^+(t)$ = j th firm's value of equity at the end of period t .

$S_j^-(t)$ = j th firm's value of equity at the start of period t .

$RET_j(t)$ = j th firm's retained earnings during period t .

Since $\sum_{T=t+1}^{\infty} p(t,T)D_j(t,T)$ is the value of debt outstanding at the end of period t , and $S_j^+(t)$ is the value of the same firm's equity at the same time, we can write:

$$V_j^+(t) = S_j^+(t) + \sum_{T=t+1}^{\infty} p(t,T)D_j(t,T).$$

By substitution,

$$I_j(t) = V_j^+(t) - V_j^-(t) + RET_j(t).$$

The second identity states that total income equals the sum of income distributed (as returns to both debt and equity) and retained earnings:

$$X_j(t) = Q_j(t) + \sum_{t=1}^{t-1} D_j(t-1,t) + RET_j(t)$$

where:

$X_j(t)$ = income of the j th firm in the period t .

$Q_j(t)$ = dividends paid by firm j during period t .

$D_j(t-1, T)$ is of course the correct measure for debt because bonds are defined as a promise to pay one unit (of currency) at some fixed time in the future and there are no coupons.

Substitution of the first identity into the second (and solving for dividends) gives:

$$Q_j(t) = X_j(t) - I_j(t) + [V_j^+(t) - V_j^-(t)].$$

As before, the characterization of investors in the economy focuses on their wealth levels. At the end of period t , ^{the} wealth of the j th investor is equal to the value of his portfolio of assets (equalling the sum of the value of his debt and equity holdings) which can be expressed as:

$$W^{+i}(t) = \sum_j a_j^i S_j^+(t) + \sum_{T=t+1}^{\infty} p(t, T) D^i(t, T)$$

where:

$W^{+i}(t)$ = the wealth of investor i at end of period t .

$p(t, T) D^i(t, T)$ = the value of the debt holdings, of investor i , due in period T .

At the end of period t , ^{the} wealth of the i th investor can alternatively be expressed as being equal to his wealth at the beginning of the period plus dividends received minus his consumption:

$$W^{+i}(t) - W^{-i}(t) = \sum_j a_j^i (t-1) Q_j(t) - C^i(t)$$

where

$C^i(t)$ = consumption of investor i in period t .

By substitution into $Q_j(t)$:

$$W^{+i}(t) - W^{-i}(t) = \sum_j a_j^i [X_j(t) - I_j(t) + V_j^+ - V_j^-(t) - D_j(t-1, T)] - C^i(t).$$

Solving for $C^i(t)$:

$$C^i(t) = W^{-i}(t) + \sum_j a_j^i(t-1)[X_j(t) - I_j(t) + V_j^+(t) - V_j^-(t) - D_j(t-1, T)] - W^{+i}(t).$$

From the above definition of $W^{+i}(t)$, it can be written:

$$W^{-i}(t) = \sum_j a_j^i(t-1)V_j^-(t) + \sum_{\tau=t}^T p(\tau, T)D^i(t-1, \tau) - \sum_j a_j^i(t-1)p(t, T)D_j(t-1, T).$$

Substitution into the investor's consumption opportunity set gives:

$$C^i(t) = \sum_j a_j^i(t-1)[X_j(t) - I_j(t) + V_j^+(t) - \sum_{\tau=t}^T p(\tau, T)D_j(t-1, \tau)] + \sum_{\tau=t}^T p(\tau, T)B^i(t-1, \tau) - W^{+i}(t)$$

which shows the consumption set is independent of the composition of dividends and retained earnings.

From these results, Stiglitz proceeded to establish the validity of the leverage theorem by comparing two market equilibria identical in all respects except the financial structure of firms. From the market clearing conditions necessary for equilibrium, Stiglitz argued that if all investors make offsetting changes to neutralize the effects of the firm's financial change then the consumption stream, as outlined above, remains unaffected and the returns distributions originally attainable by investors continue to remain so; and since the consumption stream is unaffected the portfolio allocations which were originally preferred by investors continue to remain so.

A second respect in which the multi-period context changes the characteristics of the two period model is with respect to the definition of bankruptcy.¹³ In the two period model bankruptcy was unambiguously identifiable. In the second period when the state of the world was finally announced, either the firm could meet its debt obligations in which case it was declared solvent or it could not, in which case it was declared bankrupt. In the multi-period context however the requirement that earnings be less than contractual (debt) obligations is not sufficient for bankruptcy to occur. The shortfall in earnings during any period can be made up by either borrowing or issuing new equity.

Stiglitz defined bankruptcy as occurring, in the multi-period context, when the market value of equity fell to zero - it can not be negative because of the limited liability status enjoyed by firms. For the market value of equity to be zero the value of bonds outstanding would have to exceed -----

¹³ A more detailed discussion of the bankruptcy problem was presented in: J.E. Stiglitz, "Some Aspects of the Pure Theory of Corporate Finance: Bankruptcies and Take-overs", Bell Journal of Economics & Management Studies, vol. 2, 1972, pp.458-482. There Stiglitz noted that the condition that no investor believes that the value of equity will be zero, although a sufficient condition for bankruptcy will not necessarily lead to the bankruptcy decision because the interests of various categories of claimants to the returns of the firm are not identical and the ability to pronounce the firm bankrupt depends on at least three factors: 1.how each category views its interests, 2.the legal delineation of the rights and obligations of each category, and 3.factors facilitating coalitions to ensure settlements in favour of certain parties. For a discussion of the last point (especially) see: J.I.Bulow and J.B.Shoven, "The Bankruptcy Decision", Bell Journal, Autumn vol. 9, no. 2, 1978, pp.437-56.

the value of the firm at some date and in some state. Therefore, the subspace of states in which the firm goes bankrupt is much smaller than in the two period context.

D. DIFFERENTIAL EXPECTATIONS AND RISK AVERSION.

Differential expectations and the question of investor risk behaviour, although considered, were left largely implicit in the original Stiglitz study. The consideration of their exact role and nature helps in the understanding of the true significance of the no bankruptcy assumption and Stiglitz returned to the question of expectations in his 1972 study as part of his continuing work on the implications of the bankruptcy assumption for optimal capital structure. An important conclusion which emerged from this study was recognition of the fact that when capital markets are incomplete and bankruptcy is possible then the MM theorem will depend critically upon the composition of investor portfolios, an important element of which is homogeneous expectations on the part of all investors. In the model formulated, he showed that so long as debt is riskless the theorem remains intact even when investors have differential expectations.

In focusing on the question of investor expectations, Stiglitz considerably simplified the context of his 1972 model. Let there only be two investors (denoted by the superscripts i and j) or equivalently let the m investors be divided into two groups with all members in each group being identical in all respects. Analogously, let there be two

firms, one of which is riskless - establishing the risk-free rate of return for the system - while the other is risky. Let the uncertainty associated with the returns of the risky firm be characterized by a density function, $f(X)$, and a cumulative distribution function, $F(X)$. Also, let the expected value of X by the k th group of investors be denoted $E(X^k)$ where:

$$E_{-\infty}^{\infty} [X^k] = \int_{-\infty}^{\infty} X f^K(X) dX.$$

Now, define $Y = \tilde{r}b$ as the critical value of X below which the firm is unable to meet its debt obligations and goes bankrupt. The expected value of X conditional upon $X > Y$ can be expressed as:

$$E_Y^{\infty} [X^K] = \int_Y^{\infty} X f^K(X) dX$$

and finally the expected value of X in those states in which the firm goes bankrupt is:

$$E_{-\infty}^Y [X^K] = \int_{-\infty}^Y X f^K(X) dX.$$

The returns to shareholders, $s(\emptyset)$, and the returns to debtholders, $d(\emptyset)$, can be described respectively as:

$$s(\emptyset) = \begin{cases} X(\emptyset) - \tilde{r}b & \text{for } X(\emptyset) > Y \\ 0 & \text{for } X(\emptyset) \leq Y \end{cases}$$

and:

$$d(\emptyset) = \begin{cases} \tilde{r}b & \text{for } X(\emptyset) > Y \\ X(\emptyset) & \text{for } X(\emptyset) < Y \end{cases}$$

where $\tilde{r}$ is the promised (or contractual) rate of interest on the firm's outstanding debt, D . Debtholders have priority in claiming the earnings of the firm but shareholders are protected by limited liability status restricting their returns to being non-negative.

The market value of the firm is the sum of the values of equity and debt, $V=S+D$, the present values of which are obtained by discounting the risk adjusted expected values of the respective returns at the riskless rate. In order to focus on the expectations of investors any influence due to risk behaviour must be eliminated. Therefore Stiglitz assumed that all investors have identical risk behaviour which for convenience is assumed to be risk neutral, making them interested only in the expected value of returns and indifferent to any higher order moments of the probability distribution of returns.

The two groups of investors have different expectations regarding the expected value of returns. This complicates matters because the market values are obtained by discounting expected values and any solution must specify which investor's expectations are the relevant ones. Let group i investors be more optimistic regarding the expected earnings of the firm. That is,

$$E_Y^{\infty} [X^i] > E_Y^{\infty} [X^j].$$

Then in equilibrium the shares of the risky firm would have to be held by group i investors. For convenience assume that group i holds all the shares of the risky firm so only their expectations are relevant for determining the market value of that firm's equity:

$$S = \{E_Y^{\infty} [X^i] - E_Y^{\infty} [(\tilde{r}b)^i]\}/r^*$$

where r^* is the riskless rate of interest and the returns to shareholders are zero when the firm goes bankrupt.

Group j investors are the holders of the firm's debt and it is their expectation that has to be used in deriving that market value:

$$D = \{E_Y^\infty [(\tilde{r}b)^j] + E_{-\infty}^Y [X^j]\} / r^*$$

so that:

$$V = \{E_Y^\infty [X^i] - E_Y^\infty [(\tilde{r}b)^i]\} / r^* + \{E_Y^\infty [(\tilde{r}b)^j] + E_{-\infty}^Y [X^j]\} / r^*$$

where:

$$E_{-\infty}^Y [X] = E_{-\infty}^\infty [X] - E_Y^\infty [X]$$

and by substitution:

$$V = \{E_Y^\infty [X^i] - E_Y^\infty [(\tilde{r}b)^i] + E_Y^\infty [(\tilde{r}b)^j] + E_{-\infty}^\infty [X^j] - E_Y^\infty [X^j]\} / r^*$$

collecting terms for which:

$$= \{E_Y^\infty [X^i - X^j] + E_Y^\infty [(\tilde{r}b)^j - (\tilde{r}b)^i] + E_{-\infty}^\infty [X^j]\} / r^*$$

from which it is readily apparent that when investors have homogeneous expectations,

$E_Y^\infty [X^i] = E_Y^\infty [X^j]$ and $E_Y^\infty [(\tilde{r}b)^j] = E_Y^\infty [(\tilde{r}b)^i]$ which then simplifies to: $E_{-\infty}^\infty [X^j] / r^*$

where the market value of the firm is equal to the expected value of its earnings independently of its financial structure.

When the two groups have non-identical expectations, but there is no risk of bankruptcy we get the result:

$$r^*S = E_Y^\infty [X^i] - E_Y^\infty [\tilde{r}b]$$

$$r^*D = E_Y^\infty [\tilde{r}b]$$

$$\underline{V} = S + D = E_Y^\infty [X^i] / r^*.$$

In the absence of bankruptcy the MM theorem is valid regardless of the differential expectations of investors.

Stiglitz next asked, what would happen when there is a risk of bankruptcy and the two groups have non-identical expectations. When the firm has no debt or such low levels that the more pessimistic lenders do not perceive any risk of default, then the results of the former case apply. As the firm increases its debt (substituted for equity) lenders first expect a real risk of default. At that level of debt, the more optimistic shareholders do not yet expect the firm to go bankrupt. Stiglitz shows that at this point an optimal debt-equity ratio will exist and the MM theorem is invalidated.¹⁴

¹⁴This can be illustrated as follows: Since $E_{-\infty}^{\infty}[X] = 1$, let $E_Y^{\infty} = (1-F)$ and $E_{-\infty}^Y = F$, according to which $(1-F)$ represents the probability that the firm will not go bankrupt, and F the cumulative probability that it will. Then we can write:

$$r*V = (1-F)X^i - (1-F)X^j + (1-F)(\bar{r}b^j) - (1-F)(\bar{r}b^i) + X^j$$

$$r*(dV/db) = \{X^i(1-F^i)' + (1-F^i)X^i' - [(1-F^j)X^j' + X^j(1-F^j)']$$

$$+ (1-F^j)((\bar{r}b^j)' + (\bar{r}b^j)(1-F^j)' - [(1-F^i)(\bar{r}b^i)'$$

$$+ (\bar{r}b^i)(1-F^i)'] + X^j'\} d\bar{r}b/db.$$

In this case $X_{\min}^i > \bar{r}b > X_{\min}^j$, so group i investors continue to neglect any risk of default despite changes in the firm's financial structure. So for group i, $F^i = 0$, and $X^i' = 0$ also. Moreover since they do not expect the firm to go bankrupt, $(\bar{r}b)^i' = 0$. Therefore,

$$r*dV/db = \{ -[(1-F^j)X^j' + X^j(1-F^j)'] + (1-F^j)(\bar{r}b^j)' +$$

$$(\bar{r}b^j)(1-F^j)' + X^j'\} d\bar{r}b/db$$

upon elimination of the terms equal to zero. Focusing on X^j , which is negative because it is being evaluated at the lower limit of the integral.

$$X^j' = -XdF^j/dX,$$

Since,

$$\int_{\bar{r}b}^{\infty} 1-F = \int_{\bar{r}b}^{\infty} f(X)dX$$

(cont'd on next page)

Increasing debt anywhere beyond the point where lenders to the firm perceive a risk of default makes the expected value of their returns smaller than the contractual value and means that the market value of the firm is decreased. When debt was riskless, the only restriction that needed to be imposed on the expectations of investors was the agreement by all investors that, in fact, debt was riskless. Then, all investors and firms would have equal access to the capital market. If debt were risky, however, equal access would require that each investor correctly assess the risk associated with his investments and that all investors be in agreement about these assessments.

Another element upon which the composition of investor portfolios depends is the risk behaviour of investors. From the above discussion it is intuitively apparent that when debt is riskless, differential risk aversion of investors is of no consequence and the MM theorem remains valid regardless. Nickell (1978) studied the effects of
=====

$dF^j/dX = f_{\min}^j(X)$, the probability of X evaluated at the particular point $X_{\min}^j$. Therefore, $X^{j'} = -X_{\min}^j f_{\min}^j(X)$. Also, $-F^{j'} = f^j(X) = f^b(X_{\min}^b)$.

By substitution these give the following result for the value of the derivative:

$$r \cdot dV/db = \{ X_{\min}^j - \bar{r}b^j \} f^j(X_{\min}^j) d\bar{r}b/db = 0$$

from which the second order condition

$$r \cdot d^2V/db^2 = -f^j(X_{\min}^j) [(d\bar{r}b)/db]^2 < 0$$

is negative implying a maximum value, V , at this level of debt.

differential risk aversion on the outcome of the MM results when the no bankruptcy assumption was relaxed.¹⁵

E. RELAXATION OF RISKLESS DEBT. Was the no bankruptcy assumption immutable? Already MM had considered a case, although its implications remained implicit in their discussion, where the risk premium function associated with debt increased in identical fashion for all borrowers -- personal and corporate. Stiglitz (1969) noted a second case where investors held some reserve of corporate bonds which could be drawn upon when engaging in homemade leverage. The implication of this was that so long as the debt-equity ratio of firms was high enough to keep individual investors continually in a net lender position then they could undo the effects of purely financial changes initiated by firms and would be indifferent to alternative financial structures within a wide range of debt-equity ratios.

In his 1974 study Stiglitz focused on the implications of the relaxation of the riskless debt assumption and found

¹⁵S. J. Nickell [The Investment Decision of Firms, (Welwyn: James Nisbett & Co., 1978), Ch. 9] used a two investor, two firm context similar to Stiglitz (1969) but in order to focus on risk behaviour he assumed that while investors had homogeneous expectations one was risk averse and the other risk neutral. Of the two firms, moreover, one was risky and the other riskless. Without bankruptcy he found that the MM theorem held regardless of the risk behaviour of investors.

When bankruptcy was introduced, however, Nickell found that his model implied two equilibrium allocations. In one the risk neutral investor held all of the risky securities and the risk averse investor only riskless assets. In such a situation the MM theorem remained valid because the risk
(cont'd on next page)

that in fact the no risky debt assumption, which earlier had appeared to be necessary for the validity of the MM theorem, was not. There was little to be gained from expanding the formal model so his arguments were presented in intuitive form and proceeded as follows:

If from any initial equilibrium position where all firms have capital structures which are optimal in the sense that they are market value maximizing configurations, some firm were to alter its financial structure so that the combinations of debt and equity it now issues were non-optimal, and if financial intermediaries could be costlessly formed, then such an intermediary could purchase the non-optimal configuration and re-issue securities in optimal proportions. The arbitrage profits which could be made in the process would provide an incentive for such situations to be exploited whenever they arose.

Given equal access to capital markets by investors, the financial intermediaries would be none other than personal investors re-issuing the securities on personal account. Investors could then alter the financial characteristics of securities on personal account thereby preserving the irrelevance results even when there is a
=====

neutral investor owns all of the securities of the risky firm and the risk averse investor holds no risky assets and so both returns will be unaffected by purely financial changes. In the second allocation, the risk neutral investor would hold all of the securities of the risky firm but also borrow from the risk averse investor to do so. This borrowing meant that the risk averse investor was indirectly affected by the variability of returns implied by changes in the risky firm's financial structure, and served to invalidate the MM theorem.

positive risk of default.

The result is that the no bankruptcy assumption is not necessary for the validity of the leverage theorem. When investors have equal access to capital markets, financial market equilibrium and the final positions that investors take depend on the expectations they have of the real investment plans (already announced) of firms, independently of their financial decisions. The fact that a particular firm may, relative to its expected real returns, issue any particular configuration of debt and equity has no bearing on investors who can alter the financial characteristics of the securities on personal account. The equal access and no risky debt assumptions are not entirely independent of each other. When debt is riskless the equal access assumption is quite harmless.

Relaxation of the no risk of default assumption affects the equal access assumption both directly and via the more severe restrictions needed to be imposed on the expectations of investors. Any investor can borrow any amount on identical terms as any other. When debt is risky, however, personal investors will have equal access to capital markets only under more stringent conditions.

Personal investors, normally, can not borrow on identical terms as firms and do not in the normal course of events benefit from limited liability status which incorporated firms have by law. Accordingly, whereas personal investors are liable to the full extent of their

total assets if they default on debt, corporate firms are only liable to the extent of their capital commitment. In those states, then, when default on debt does occur the investor who is not protected by limited liability status is unable to duplicate exactly the pattern of returns created by the firm. The equal access assumption must, therefore, include the ability of investors to acquire limited liability status.

F. EXPROPRIATION WITH RISKY DEBT. Fama and Miller (1972) drew attention to the fact that the no bankruptcy assumption (adopted by Stiglitz, 1969) was not the only restriction which, when combined with the perfect capital markets assumptions (described earlier), would suffice to ensure the irrelevance results. They presented another set of sufficient conditions ensuring independence of market value and indifference of all investors to financial structure, without requiring the no bankruptcy assumption.¹⁶

They focused on the fact that when - in a multiperiod context - debt is risky, financial changes initiated by firms can affect the returns to different groups of investors in the firm by causing the returns of some groups (in certain states) to be expropriated in favour of other groups, without commensurate compensation.

Such a case would exist, for example, if some firm

¹⁶E.F.Fama and M.H.Miller, "Financing Decisions, Investment Decisions, and the Cost of Capital", ch.4 in: The Theory of Finance (New York: Holt, Rinehart & Winston, 1972).

which in an initial equilibrium issued only riskless debt were to engage in a financial structure change to issue enough debt to make it risky. Then, if the firm were to default on its debt the returns to shareholders would only be a fraction of the returns which would have accrued to the original holders of the firm's debt (in the initial equilibrium) if the firm had not issued the additional debt. The issue of new debt by the firm, effectively, serves to erode the positions of its original debtholders.

When no default occurs erosion of investor positions cannot occur because the contractual returns on debt are certain. The no risk of default assumption is, therefore, sufficient to ensure that expropriations would not take place. Consequently, even if investors were able, as in the Stiglitz models, to duplicate exactly any returns distribution generated by firms, if the riskless debt assumption were withdrawn, the original positions of investors could be unalterably affected by the financial decisions of firms.

Unless the original debtholders make prior arrangements to protect themselves, the increased debt outstanding would, in the event of bankruptcy, mean that the original holders must share the total returns with a larger number of claimants. The authors demonstrated that by inserting "me-first" clauses into debt contracts investors could ensure that their positions could not be eroded by any subsequent actions of a purely financial nature by the firm. The me-first protective rules impose sufficient

restrictions to ensure that no erosion of positions would occur even with risky debt.

Fama (1978) further investigated the implications of expropriation when investors have equal access. He found that in consequence of the equal access assumption investors could reconfigure any financial structure initially established by the firm and so the firm's market value would be independent of its financial structure. From this he concluded that the consequent erosion of investor positions could not influence the irrelevance proposition; because if the original positions taken by investors were determined independently of the financing decisions of firms, then the positions which are subsequently eroded, too, must necessarily be independent of the financing decisions of firms. Expropriations could take place regardless of whether the positions taken by investors were based on securities issued directly by firms or indirectly by other investors reconfiguring the original securities of firms.¹⁷

That erosion is a characteristic of the positions taken by investors independently of the financing decisions of firms, is apparent from the fact that actions by investors can lead to expropriations of positions of fellow investors, too. Investors are, therefore, the ones who choose either expropriable or non-expropriable positions and firms can do nothing about this. If the positions of some

¹⁷Fama, "The Effects of A Firm's Investment and Financing Decisions on The Welfare of Its Security Holders".

investors under equal access conditions are eroded this happens irrespectively of the firm's financing decisions. Consequently when investors have equal access, me-first rules are not necessary for the leverage theorem either.

Quite analogously to the Stiglitz model, where relaxation of the no risky debt assumption necessitated stronger retrictions to be imposed on the nature of the expectations assumption in order to re-establish the validity of the leverage theorem, so too, in the case where investors are not protected by me-first clauses, we require more stringent conditions of the expectations assumption. It must be defined in such a way that all investors correctly assess outcomes and identify all positions which, in any state, could lead to expropriation.

G. RELAXATION OF THE EQUAL ACCESS ASSUMPTION. The second significant result derived by Fama (1978) was that even the equal access assumption is not necessary for the validity of the leverage theorem. This proof, too, was intuitive and based on the following line of reasoning. Any change in the financial structure of any particular firm, when the market is in value maximizing equilibrium, will leave the original equilibrium unchanged if security prices remain unchanged and if other firms can make offsetting financial structure changes.

The market value of the firm would, then, be unaffected by changes in its financial structure, and the proportions of securities available to investors in the

market would remain unchanged. This would remain the case whether me-first type restrictions or no risky debt assumptions are additionally imposed or not.

Sufficient conditions substituting for the equal access assumption were shown to be: 1) that no firm issues a security monopolistically - meaning that some firm will always be able to issue a perfect substitute for any given set of security prices - creating an incentive for firms to take offsetting action; and 2) financing decisions are always made to maximise market value for the given set of security prices - which was, of course, implicit in the Stiglitz model too. Given these two assumptions there was no need for investors to take action to neutralize the effects of financial changes initiated by firms. Other firms could do so on their behalf and the leverage theorem would be valid without the equal access assumption.

H. TAXATION AND THE IRRELEVANCE RESULTS. The extension of the model to a general equilibrium context, with taxation and the study of its expanded implications were due primarily to the 1977 Presidential address by Merton Miller, one of the theorem's original authors, to the American Finance Society.¹⁸ The major extension made by Miller was to incorporate into the analysis a third important characteristic of tax systems (following the explicit treatment of corporation tax and the deductibility of interest charges), namely consideration of personal

¹⁸ M.H. Miller, "Debt and Taxes", The Journal of Finance, May 1977, pp.261-275.

income tax. Miller showed that (in the U.S. tax system) the relative discriminatory tax burden applying to income from debt relative to income from equity at the personal level served, in equilibrium, to exactly offset the favourable treatment which debt got at the corporate level. Consequently, although a finite aggregate debt level existed for the economy as a whole, the financial structure of any particular firm would remain irrelevant to the determination of its market value.

Market valuation is derived by capitalization of the net cash flow. Whereas after tax returns on equity and debt are respectively $(1-t)(X-rD)$ and rD when there are only corporation taxes in the model, the incorporation of personal taxes into the model and the differential tax treatment of different classes of personal income means that each type of income has to be adjusted for net return (after tax) before capitalization. In the Miller model only two rates of personal income tax are assumed. One applies to equity income, denoted t_e , and the other applies to all other sources of income including the returns from bond holding, denoted t_b . In such a world the market value of an unlevered firm can be expressed as:

$$S=V_T^u = \{X(1-t_c)(1-t_e)\}/p$$

where all the variables are as described earlier in the chapter. For a levered firm, the returns to shareholders and bondholders must be counted separately. The returns to shareholders are: $(X-rD)(1-t_c)(1-t_e)$ and the returns to the bondholders are: $rD(1-t_b)$.

Adding the two together gives the total returns to all suppliers of capital:

$$X(1-t_c)(1-t_e) + rD\{(1-t_b) - (1-t_c)(1-t_e)\}.$$

In order to convert these cash flows into a market value the first term is capitalized at p and gives exactly V_U which is the market value of the unlevered firm. The market value of debt is the discounted value of the cash flow (gross contractual returns) adjusted by the marginal rate of tax for that class of income. We, therefore, need to define a new variable, $rB(1-t_b)$ representing the cash flow associated with debt. The relationship of this variable to the market value of debt can be expressed as $D=B(1-t_b)$, where the cash flows generated are discounted at the same rate of interest as exists on the debt.

$$D = rB(1-t_b)/r$$

This gives the following valuation for the levered firm:

$$V_L = V_U + D\{1 - [(1-t_c)(1-t_e)]/[1-t_b]\}.$$

From this the two special cases considered earlier in the chapter are apparent. In the absence of taxation altogether, the second term on the right hand side becomes zero and there are no gains from leverage, $V_L = V_U$. Likewise, in the special case where corporate taxation exists but there is no personal taxation, the gains from leverage become $t_c D$, exactly as derived by MM.

The main significance of Miller's analysis was, however, to show that in equilibrium for the marginal investor who serves as the price setter in the market, the following marginal tax condition will hold:

$$(1-t_b) = (1-t_c)(1-t_e)$$

and consequently in equilibrium there will be no gains from leverage, as predicted by the theorem. Miller incorporated the progressive nature of the personal tax, and assumed that it extends in range from well below the rate of corporate tax to well above it. He further assumed, for simplicity of exposition, that the marginal rate of personal tax on income from equity was zero, $t_e=0$, and that tax exempt bonds yield the riskless rate of return, r . Furthermore the model rules out the possibility of tax arbitrage whether directly - such as borrowing on personal account to buy tax free bonds - or indirectly - such as by short selling common stocks which can lead to infinite arbitrage opportunities. The equilibrium rate of interest and aggregate quantity of bonds can then be determined in a straightforward manner.

On the supply side, companies would not issue taxable bonds if the savings from their interest deductibility does not compensate for the extra increased returns which they must offer because of the tax burden which bonds carry on personal account. If they were over-compensated no equity would be issued. Therefore the supply of taxable bonds is perfectly elastic at the rate: $r_b^S = r/(1-t_c)$, which is the tax free rate grossed up by a premium equal to one minus the rate of corporation tax. This ensures that the excess returns over and above the tax free rate just equal the corporate tax savings on the interest deductibility of debt.

On the demand side investors would only demand taxable

bonds if their returns reflected the additional tax burden which they carry. As increased supplies of bonds are offered to the market the compensation over and above the tax free rate must continually rise to induce investors in higher marginal tax brackets to hold bonds. Since the marginal tax rates are progressive the demand interest rate, $r_b^d = r/(1-t_b)$, too, is a rising function, otherwise investors in progressively higher tax brackets would not find investment in bonds very attractive.

In equilibrium $r_b^s = r_b^d$, and $r/(1-t_b) = r/(1-t_c)$. An implied property of this equilibrium condition is that the marginal rate of personal income tax of the marginal investor just equals the rate of corporation tax. Otherwise the bond market will not clear. From the point of view of the individual firm, since $t_s=0$, $t_b = t_c$ means that there will be no gains from leverage and the market value of the firm is independent of its financial structure. The

choosing firms with high leverage. ¹⁹

The assumption of $t_e=0$, or no personal tax on equity income is not necessary for the irrelevance result. What is necessary is that t_e be significantly less than t_b . This is because the presence of a positive tax rate on income from shares serves to raise the supply rate of interest and therefore, in equilibrium, the bracket of the marginal investor. De Angelo and Masulis (1980), formulated a model explicitly treating the case where $t_e>0$.²⁰ From the assumption that the firm selects its financial structure so as to maximize its market value, and that investors seek to maximize a utility function defined in terms of after tax returns, they show that positive supply of both bonds and equity requires that neither have a price premium. A price premium on debt would mean that the firm issues only bonds and a premium on equity would mean that it issues no bonds. On the demand side they assumed that because of the progressive nature of the personal tax system there would always be some investors in one of the three following categories:

1. $(1-t_b) > (1-t_c)(1-t_e)$
 2. $(1-t_b) = (1-t_c)(1-t_e)$
 3. $(1-t_b) < (1-t_c)(1-t_e)$.
-

¹⁹The reason for this is that investors with relatively low tax rates find it is cheaper to borrow via the firm because proportionately more income is shielded by the tax savings afforded.

²⁰H. De Angelo and R. Masulis, "Optimal Capital Structure Under Corporate and Personal Taxation", Journal of Financial Economics, March 1980, pp.453-67.

Investors choose their portfolios of debt and equity on the basis of their respective after tax yields. In equilibrium there can only be positive supply and demand for both debt and equity if neither carries a price premium. In the absence of a price premium then the marginal - price setting - investor is category 2, for whom the net after tax yields are equal. Again the market value of the firm will be independent of its financial structure.

The authors also show that riskless debt is not a necessary assumption either. This is apparent from the fact that the prevailing prices of debt and equity are unaffected by the introduction of the possibility of bankruptcy. On the supply side, in the absence of bankruptcy the market value maximizing problem, expressed in terms of:

$$\max_{(B(\emptyset))} V = \sum_{\emptyset}^I P_b(\emptyset) D(\emptyset) + \sum_{\emptyset}^I P_e(\emptyset) (1-t_c) [X(\emptyset) - D(\emptyset)]$$

where $\emptyset$ represents the states of the world, and $P_{(b)}$ and $P_{(e)}$ represent respectively the market prices of bonds and equity in each state, $\emptyset$. The first order conditions for the above are:

$$dV/dD = P_b(\emptyset) - P_e(\emptyset)(1-t_c).$$

With bankruptcy risk the maximization problem becomes:

$$\max_{(B(\emptyset))} V = \sum_{\emptyset}^I P_b(\emptyset) \min_{\lambda} \{b(\emptyset), X(\emptyset)\} + \sum_{\emptyset}^I P_e(\emptyset) \max_{\lambda} \{(1-t_c) X(\emptyset) - b(\emptyset), 0\}$$

which upon differentiation gives the same first order condition.

Corporation tax, personal taxes, and deductibility of interest charges, however, do not fully characterize tax systems. A fourth major feature of most tax systems is the presence of interest and non-debt tax shields and shelters.

These, as would be expected, invalidate the theorem and are important elements to be considered in the study of optimal capital structure.²¹

²¹For a discussion see: E.Han Kim, "Miller's Equilibrium, Shareholder Leverage Clienteles, and Optimal Capital Structure", The Journal of Finance, May 1982, pp.301-19. See also De Angelo and Masulis, "Optimal Capital Structure Under Corporate and Personal Taxation".

5. THE MM THEOREM, INCOMPLETE CAPITAL MARKETS, AND PORTFOLIO SEPARABILITY

A. OVERVIEW. This section reviews some of the issues underlying the derivation of the MM theorem in the context of the mean variance approach to capital market theory. It considers the building blocks in the derivation of the Capital Asset Pricing Model (CAPM), which utilizes the generalized characterization of risk afforded by developments in portfolio theory and the equilibrium risk return relationship implied by investor behaviour, to make explicit the two key linkages between leverage and the cost of capital.¹ The review then proceeds to show explicitly the demonstration of the validity of the MM theorem in the CAPM framework. It describes some of the shortcomings of the model, focuses on the incompatibility of the standard two parameter version with some essential principles of firm valuation, and surveys an alternative three parameter model consistent with our expectations of investor risk behaviour and firm valuation.

The discussion of this section is, in a sense, a special case extension of the models of the previous sections. In the discussion of the MM theorem in the first section we saw that where capital markets are complete, a zero-sum redistribution of the types of securities outstanding would leave the set of the state contingent

¹These linkages are, of course, the risk-return relationship on the one hand and the risk-leverage relationship on the other.

returns (return distributions) available to investors unaffected. The total set of returns in all states of the world would already have been accessible to investors prior to the zero-sum redistribution; and from all combinations of expected returns, investors would have selected the combination of portfolios they now hold. These portfolios, therefore, represented their preferred (or optimal) positions.

Since any combination of state contingent returns created by the zero-sum redistribution would have been accessible to investors through homemade re-alignment of portfolios, their expected utility - which is defined strictly in terms of expected returns - remains unaffected by purely financial changes because their preferred positions are still attainable. Consequently, the market values of firms (which are a direct function of their expected returns) remain unaffected by their financial policies and the characteristics of the securities which they issue.

B. RESTRICTIONS ON RETURNS DISTRIBUTIONS: THE IMPLICATIONS OF PORTFOLIO SEPARABILITY. Our main concern in this chapter is with the following problem: under what conditions will a zero sum redistribution of securities outstanding, as implied by a purely financial capital structure change, leave the expected utility of investors unaffected? When capital markets are incomplete the set of state contingent returns covered by the portfolios of investors extends only to a restricted sub-set of returns

space. There is, then, no certainty that zero sum redistribution will not alter the returns space attainable by investors and the market value of the firm cannot generally be said to remain unaffected by changes in its financial structure.

A sufficient condition for a zero sum financial redistribution to leave the second period distribution of expected returns accruing to investors unaffected, even when capital markets are incomplete, is that second period returns depend only on aggregate wealth in each state of the world and be independent of the different types of securities comprising them. This will be the case if all investors hold perfectly balanced portfolios.²

It will be remembered from the discussion of section one that the function specifying second period returns had the linear form:

$$Y_i(\emptyset) = rB^i + \sum_j a_{ij}^i X_j(\emptyset).$$

Consequently, when portfolios are perfectly balanced the function defining second period income also takes the linear form:

$$Y_i(\emptyset) = rB^i + z^i \sum_j X_j(\emptyset)$$

²When firms issue only shares then the fraction of the shares of each firm held by the investor will be the same constant for all firms and for all investors. This means that if one investor holds 1% of the shares of the jth firm in equilibrium he will also hold 1% of the shares of all other firms. Different investors having varying budget constraints will hold different fractions of shares from one another. When they issue both debt and equity investors must hold the same proportion of the total of debt and equity.

where z is a constant, such that

$$z^i = a^i_j$$

for all j firms. By simple substitution from the wealth constraint, also described in the first chapter, it can be seen that with balanced portfolios the income of each investor will be a function of his aggregate wealth in the state, $\emptyset$,

$$W(\emptyset) = rB + \sum_j X_j(\emptyset)$$

independently of its component parts. Then,

$$Y^i(\emptyset) = z^i[W(\emptyset) - rB] + rB^i$$

by re-arrangement we have:

$$Y^i(\emptyset) = [rB^i - z^i rB] + z^i W(\emptyset)$$

where the term in square brackets is a constant independent of the state, $\emptyset$. $Y^i(\emptyset)$ is therefore a function of aggregate wealth only.

The critical question for our purposes is, therefore, under what conditions will it be optimal for investors to hold perfectly balanced portfolios? Formal conditions answering this question have been rigorously established by Cass and Stiglitz (1970).³ For portfolios to be perfectly balanced optimal asset proportions must be the same for all investors; and in order for this to be the case the optimal asset proportions must be independent of levels of investor wealth. In other words portfolios must be separable so that the optimal asset proportions in them will be independent

³D.Cass and J.E.Stiglitz, "The Structure of Investor Preferences and Asset Returns, and Separability in Portfolio Allocation: A contribution to the Pure Theory of Mutual Funds" Journal of Economic Theory, 2, 1970, pp.122-60.

of the level of wealth.⁴

Cass and Stiglitz show that a sufficient condition for separability is that the utility functions of all investors belong to the linear risk tolerance class and homogeneous expectations prevail universally.⁵ Then the risk properties of any asset can be characterized only in terms of market parameters independently of the behaviour of investors.

The CAPM conforms to both sets of the above conditions.⁶ The equilibrium it implies is, therefore, one where separability in the above sense applies. All investors hold the same combination of risky assets. This combination, called the market portfolio, ensures that the portfolios of all investors are perfectly balanced and the composition of risk assets in each are identical. It is this condition which leads to the expectation that the MM theorem will hold

⁴Separability also implies that a Pareto optimal allocation can be effected even when capital markets are incomplete - i.e., a full set of Arrow Debreu Securities doesn't exist.

⁵The linears risk tolerance property of utility functions can be expressed as:

$$[U'(W)/U''(W)] = a + LW$$

where $U(W)$ denotes the utility (of wealth) function. It is readily apparent that the property, as described, is the reciprocal of the Pratt-Arrow absolute risk aversion function. The latter indicates how the risk premium demanded by an investor changes as a function of his wealth.

⁶Only a restricted number of classes of utility function display linear risk tolerance properties. Among these are the logarithmic, exponential, and power functions. The quadratic utility function, which served largely as the basis for the development of the CAPM in its basic two parameter version, and which belongs to an acceptable class of functions, was first demonstrated by Tobin. See: J.Tobin, "Liquidity Preference as Behaviour Towards Risk" Review of Economic Studies, 2/1958, pp.65-86.

and indicates that the model can be viewed as a special case extension of those discussed in the previous chapters.

A simple and straightforward demonstration of the necessity of utility functions belonging to the linear risk tolerance class has been given by Mossin (1977).⁷ It has the further advantage of conforming to the basic model under consideration in this study. The proof consists of solving the system of three functional equations:

$$1) L = k^i U^i + \sum_i \lambda^i(\emptyset) [W(\emptyset) - Y^i(\emptyset)]^8$$

$$2) W(\emptyset) = \sum_i Y^i(\emptyset)$$

$$3) Y^i(\emptyset) = a + bW(\emptyset)$$

to show the equations are compatible with one another only when risk tolerance functions are linear. The first equation is the Lagrangean function set up in the demonstration (in an earlier section) of the Pareto optimality of the allocation implied by the Diamond model. The second equation represents the feasibility constraint for the system and implies that total wealth is the sum of individual incomes. The third equation represents the condition that income is a function of aggregate wealth independently of its components.

The following is a step by step demonstration of Mossin's proof. From the Lagrangean function:

⁷J.Mossin, Efficiency of Capital Markets, Chapters 5 & 6.

⁸The Lagrangean function is defined with a set of non-negative weights, k^i , defined such that a Pareto optimal allocation implies maximizing the weighted sum, $k^i U^i$ subject to the usual constraints.

$$L = \sum_i k^i U^i + \sum_{\emptyset} (\emptyset) [W(\emptyset) - Y^i(\emptyset)]$$

the first order optimal conditions can be written,

$$k^i U^{i'}(Y^i(\emptyset)h^i(\emptyset)) = U^{l'}(Y^l(\emptyset)h^l(\emptyset)),$$

where the arbitrary weight k^l has been set to unity. To find the solution to the system of equations, we differentiate with respect to the parameters $W(\emptyset)$ and k^i and substitute from $Y^i(\emptyset) = a^i + b^i W(\emptyset)$. This gives respectively:

$$k^i U^{i''}(Y^i(\emptyset))b^i h^i(\emptyset) = U^{l''}(Y(\emptyset))b^l h^l(\emptyset)$$

and

$$U^{i'}(Y^i(\emptyset)h^i(\emptyset)) + k^i U^{i''}(Y^i(\emptyset))(a^{ii} + b^{ii}W(\emptyset))h^i(\emptyset) = U^{l'}(Y^l(\emptyset)h^l(\emptyset)) + U^{l''}(Y^l(\emptyset))(a^{li} + b^{li}W(\emptyset))h^l(\emptyset).$$

a^{ii} (a^{li}) is the derivative of a^i (a^l) with respect to k^i and b^{ii} (b^{li}) similarly for b^i (b^l). By substitution from the first into the right hand side of the second gives:

$$U^{i'}(Y^i(\emptyset)h^i(\emptyset)) + k^i U^{i''}(Y^i(\emptyset))(a^{ii} + b^{ii}W(\emptyset))h^i(\emptyset) = \{k^i U^{i''}(Y^i(\emptyset)h^i(\emptyset)/b^l\} \{a^i + b^i W(\emptyset)\}.$$

Collecting terms on the right hand side:

$$[k^i b^i/b^l] U^{i''}(Y^i(\emptyset)h^i(\emptyset))(a^{li} + b^{li}W(\emptyset))$$

and transferring terms:

$$[U^{i'}(Y^i(\emptyset)h^i(\emptyset))/U^{i''}(Y^i(\emptyset)h^i(\emptyset))] = -k^i(a^{ii} + b^{ii}W(\emptyset)) + (k^i b^i/b^l)(a^{li} + b^{li}W(\emptyset)).$$

Now, substituting $W(\emptyset) = (Y^i(\emptyset) - a^i)/b^i$ gives:

$$\begin{aligned} -[U^{i'}(Y^i(\emptyset)h^i(\emptyset))/U^{i''}(Y^i(\emptyset)h^i(\emptyset))] &= \\ k^i[a^{ii} + b^{ii}(Y^i(\emptyset) - a^i)/b^i] & \\ - (k^i b^i/b^l)[(a^{li} + b^{li}(Y^i(\emptyset) - a^i)/b^i)] & \end{aligned}$$

simplifying:

$$\begin{aligned} &= k^i a^{ii} + (b^{ii}/b^i)k^i Y^i(\emptyset) - k^i b^{ii}a^i/b^i - (k^i b^i/b^l)a^{li} + \\ &(k^i/b^l)b^{li}Y^i(\emptyset) - (k^i b^{li}a^i)/b^l \end{aligned}$$

and collecting terms for which:

$$k^i[a^{ii} + (b^{ii}/b^{li})Y^i(\emptyset) - (b^{ii}a^i/b^i) - (b^{li}/b^l)Y^i(\emptyset) - (b^{li}/b^l)a^i].$$

Letting:

$$k^i[a^{ii} - (b^i/b^l)a^{li}] - k^i a^i[(b^{ii}/b^i) - (b^{li}/b^l)] = \mu^i$$

and

$$k^i[(b^{ii}/b^i) - (b^{li}/b^l)]Y^i(\emptyset) = \lambda^i Y^i(\emptyset).$$

gives the result that:

$$-[U^{i'}(Y^i(\emptyset)h^i(\emptyset)/U^{i''}(Y^i(\emptyset)h^i(\emptyset))] = \mu^i + \lambda^i Y^i(\emptyset).$$

This indicates the need, if the first order optimality conditions are to be satisfied, for utility functions to belong to the linear risk tolerance class.

The necessity of investors having homogeneous expectations can be demonstrated by showing that for the second period returns of each investor, i , to be a linear function of aggregate wealth only, homogeneous expectations must prevail. The illustration, again, is based on a step by step derivation of Mossin's proof; but whereas he assumed investors had exponential utility functions, we assume that investors have logarithmic utility functions of the form: $U^i(Y^i) = \ln(Y^i + \mu^i)$, with marginal utility, $U^{i'}(Y^i) = 1/(Y^i + \mu^i)$.

Substitution into the first order condition of the Lagrangean gives:

$$k^i h^i(\emptyset)/(Y^i(\emptyset) + \mu^i) = h^l(\emptyset)/(Y^l(\emptyset) + \mu^l)$$

from which it follows that:

$$Y^i(\emptyset) = [k^i h^i(\emptyset)/h^l(\emptyset)][Y^l(\emptyset) + \mu^l] - \mu^i.$$

Letting, $A^i(\emptyset) = [k^i h^i(\emptyset)/h^l(\emptyset)]$, then

$$Y^i(\emptyset) = A^i(\emptyset)[Y^1(\emptyset) + \mu^1] - \mu^i$$

and summing over all i , we have:

$$\sum_i Y^i(\emptyset) = \sum_i A^i(\emptyset)[Y^1(\emptyset) + \mu^1] - \mu^i = W(\emptyset).$$

Solving for $Y^1(\emptyset)$:

$$Y^1(\emptyset) = [W(\emptyset)/\sum_i A^i(\emptyset)] - [A^1(\emptyset)\mu^1/\sum_i A^i(\emptyset)] + [\sum_i \mu^i/\sum_i A^i(\emptyset)]$$

which when substituted back into $Y^i(\emptyset)$ gives:

$$\begin{aligned} Y^i(\emptyset) &= A^i(\emptyset)\{[W(\emptyset)/\sum_i A^i(\emptyset)] - \mu^1 + [\sum_i \mu^i/\sum_i A^i(\emptyset)] + \mu^1\} - \mu^i \\ &= [A^i(\emptyset)/\sum_i A^i(\emptyset)]W(\emptyset) + [\sum_i \mu^i/\sum_i A^i(\emptyset)] - \mu^i \\ &= \{[\sum_i \mu^i/\sum_i A^i(\emptyset)] - \mu^i\} + [A^i(\emptyset)/\sum_i A^i(\emptyset)]W(\emptyset) \end{aligned}$$

which will have the desired form, $Y^i(\emptyset) = a^i + bW(\emptyset)$, only if the coefficients of A^i are state independent. From the definition of $A^i(\emptyset)$ it is apparent that for this to be the case, $h^i(\emptyset) = h^1(\emptyset)$, is a necessary condition.

C. SIMPLE DERIVATION OF THE CAPM. The first building block in the derivation of the CAPM is the characterization of uncertainty.⁹ The model approaches the problem of uncertainty in the Markowitz tradition by viewing the return on an uncertain asset as a random variable governed by a probability distribution.¹⁰ Description of the parameters of this distribution would specify the uncertainty prevailing.

Uncertainty, in the two parameter version of the CAPM, is fully characterized by the first and second moments of

⁹For an evaluation of the foundations of the model and its relationship to mean variance type uncertainty see: M.C. Jensen, "Risk, The Pricing of Capital Assets, and the Evaluation of Investment Portfolios" The Journal of Business, April 1969, pp.167-247.

¹⁰Markowitz, "Portfolio Selection", Journal of Finance, March 1952, 7, pp.77-91.

the distribution of returns about the mean. Higher order moments either do not exist or if they do they make no difference to investors. The distribution of returns on every asset is assumed to be univariate normal. Since portfolios are, by definition, linear combinations of assets the distribution of returns on portfolios, too, is multivariate normal. A complete description of a multivariate normal distribution requires knowledge not only of the means and variances of the n risky assets but also of the $(1/2)(n(n-1))$ pairwise covariances.¹¹

Investors are expected utility maximizers behaving in accordance with the Von Neumann-Morgenstern axioms of choice under uncertainty. They are risk averse and their preference orderings are defined only in terms of the first two parameters of the distribution of returns. It makes no difference to them what the actual characterization of the distribution is and whether higher order moments exist or not. The risk aversion of investors means that their utility functions have both expected returns and variance as arguments; positive partial derivatives with respect to the former and negative partial derivatives with respect to the latter. Investor behaviour is based on the criterion that he chooses from among any set of alternatives having the same expected value but differing variances of returns the option having the lowest variance; and from a set of alternatives having the same variance but different expected

¹¹See: E.F. Fama, Foundations of Finance (Oxford: Basil Blackwell, 1972), Chapter 3.

returns the option with the highest expected return. By this criterion the investor can, when ranking alternative portfolios, restrict his attention to only those which are mean variance efficient.

Utility functions can be expressed in the form:

$$U^i = f^i(e_p^i, \sigma_p^{2i})$$

where e is the expected cash flow on the portfolio of the i th investor and σ^2 is the variance of the same. The function U is continuous and twice differentiable. Because investors are risk averse, it is concave with positive first and second derivatives: $U^{i'} > 0$, and $U^{i''} < 0$.

A third building block is the principle of diversification and portfolio formation which follows from the risk averse behaviour of investors in a two parameter world. Diversification appeals to risk averse investors because it eliminates some variance.

Investors holding a portfolio are interested in the variance of the entire portfolio and are only concerned with the variance of any single asset insofar as it affects the variance of the portfolio. Diversification eliminates most of the effects of the own variance term leaving the covariance term as the contribution of an asset's variance to that of the portfolio. This can be illustrated by considering the first and second central moments of any linear combination of risky assets. Let $R_1, \dots, R_{n-1}$ represent the random returns (cash flows) on $n-1$ risky assets in the market. The expected values of these returns

may be denoted, $E(R_1), \dots, E(R_{n-1})$. Then the expected return on a portfolio, P , which consists of a linear combination of these assets can be expressed as:

$$E(R_p) = \sum_j x_j E(R_j)$$

where the expected return on the portfolio is a weighted sum of the expected return on each asset comprising it. x is a constant representing the fraction (or weight) that asset j is of the portfolio; $\sum_j x_j = 1$.

The variance of the portfolio is:

$$\begin{aligned} \text{var}(R_p) &= \sum_j \sum_k [R_j - E(R_j)][R_k - E(R_k)] x_j x_k \\ \sigma^2 &= \sum_j x_j^2 \sigma_{jj} + \sum_j \sum_k x_j x_k \sigma_{jk} \end{aligned}$$

where:

$$\sigma_{jk} = [R_j - E(R_j)][R_k - E(R_k)]$$

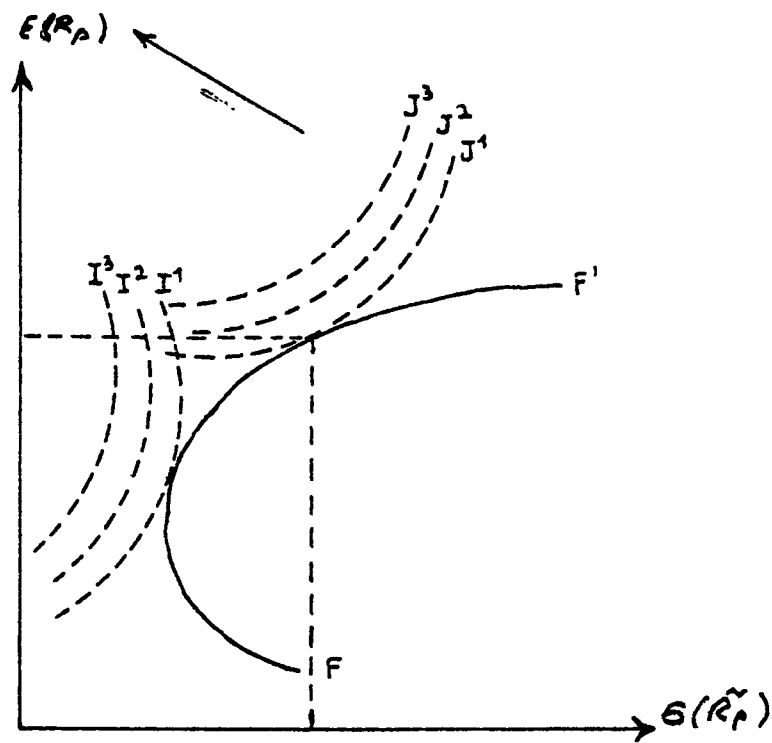
represents the pairwise covariance of assets j and k . The variance of the portfolio is comprised of two components, i) the sum of an own variance term for all assets, and ii) the sum of all pairwise covariances between assets. For a portfolio containing all $(n-1)$ assets in equal proportions, the effects of the own variance term is only of the order $\{1/(n-1)\}$. In a well diversified portfolio, then, the relative effects of the own variance term will be small compared to the covariance term. In the limit as the number of assets in the portfolio increases the average variance component approaches zero and the variance of the portfolio approaches the average covariance of the respective assets.¹²

¹²See: H.M.Markowitz, Portfolio Selection: Efficient Diversification of Investments, New Haven: Yale Univ. Press Cowles Foundation Monograph 16, 1959.

On the basis of the above characterization a simple geometric description of the equilibrium properties of the model can now be presented.¹³ The Von Neumann-Morgenstern axioms enable us to visualize

FIGURE 3-1

a set of positive sloping and strictly convex indifference curves in mean-variance space. These are indicated by the sets of curves marked I and J in figure 3-1. In the same space, corresponding to the indifference curves are a set of investment opportunities



representing all possible risk and return combinations obtainable from the $n-1$ risky assets. The locus of mean variance efficient combinations of assets (or portfolios) forms - when the assets are perfectly divisible and less than perfectly correlated - a positive sloping concave frontier denoted in the figure by FF' .

The usual tangency solution between the investor's indifference curve and the opportunity frontier represents for him the optimal choice of portfolio. Optimal portfolio combinations for different investors, in equilibrium, will differ according to their respective degrees of risk aversion as indicated by the different tangency points of I

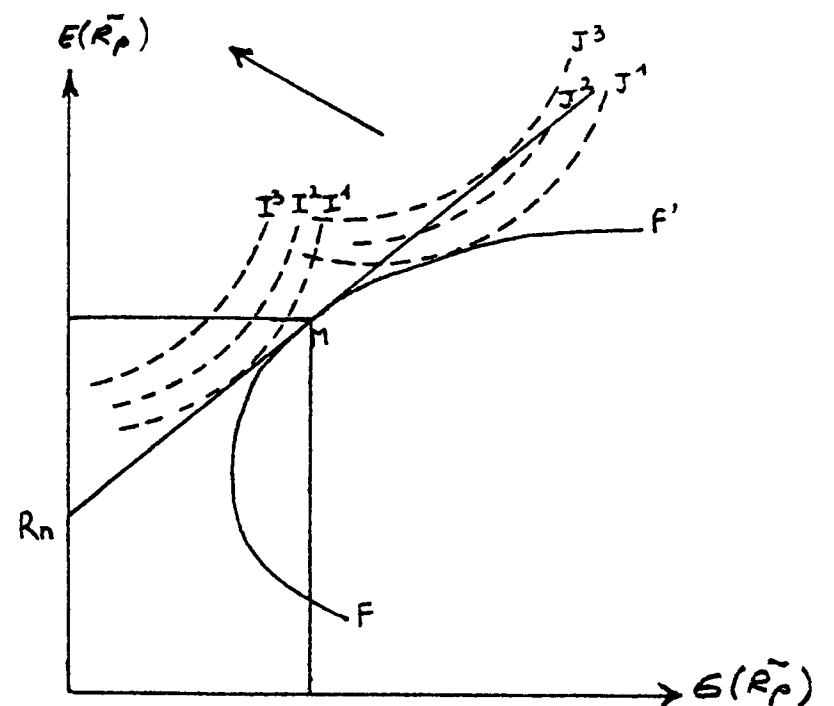
¹³For a mathematical derivation using the latter approach see, for example: J. Mossin, "Equilibrium in a Capital Asset Market" Econometrica, October 1966, pp.768-83.

and J. Although all portfolios selected have the efficient set properties, generally each investor will have a unique optimal portfolio.

The introduction of a riskless asset into the analysis fundamentally alters the

FIGURE 3-2

equilibrium properties of the model. The model with a riskless asset is depicted in figure 3-2. Given a riskless asset, the investor can choose to place his funds entirely in that asset, entirely in the portfolio of risky assets, or in some preferred combination of the two. Whatever fraction of his wealth the investor may



choose to place in the riskless asset, its availability dramatically alters the opportunity set facing all investors. It is apparent from Figure 3-2 that both investors with indifference curves I and J stand to gain by choosing the market portfolio, M, and combining it with holdings of the riskless asset. Each will in equilibrium hold different fractions of the riskless asset but the same combination of risky assets. The parameters of the new frontier can now be illustrated.

Consider the expected return on a combined portfolio containing risky and riskless assets:

$$E(R_z) = q E(R_p) + (1-q) R_n$$

where q is the fraction of the investor's wealth placed in the risky portfolio, $E(R_p)$, and $(1-q)$ is the fraction of his wealth (or investible funds) placed in the riskless asset.

The variance of the combined portfolio is:

$$\sigma^2(R_z) = q^2 \sigma^2(R_p).$$

Solving for q in each equation:

$$q = [\sigma(R_z)/\sigma(R_p)] = \{[E(R_z) - R_n]/[E(R_p) - R_n]\}$$

from which by substitution:

$$E(R_p) = R_n + \{[E(R_z) - R_n]/[\sigma(R_z)]\} \sigma(R_p).$$

The efficient opportunity frontier faced by investors is linear with slope

$$\{[E(R_z) - R_n]/[\sigma(R_z)]\} \sigma(R_p)$$

and intercept equal to the riskless rate. The convexity of both indifference curves and the original opportunity frontier implies that a new linear frontier tangent to the original convex frontier will be preferred by utility maximizing investors who will locate themselves somewhere on the new linear frontier.

For our purposes, the characteristics of this new equilibrium are significant. First, the fact that all investors locate themselves on the linear frontier means that they will divide their total investible wealth between some combination of risky and riskless assets. The exact proportions of risky and riskless assets which are included in the optimal portfolios of investors may differ according to the degree of risk aversion of different investors but the composition of all risky asset portfolios is the same

for all investors. Portfolio separability holds and all portfolios are perfectly balanced.

Next, from the equilibrium relationship expressing the rate of substitution between risk and return, we can derive an expression for the expected return, in equilibrium, on each asset. This relationship takes the form:

$$E(R_j) = R_n + \{[E(R_m) - R_n]/\sigma^2(r_m)\}\text{cov}(R_j, R_m).$$

It can be derived by considering the equilibrium condition as applying to the two combined portfolios, a and b, where a is a combination of a single risky asset, j, and the portfolio, m; and b is a combined portfolio of the riskless asset, n, and m. Denoting the fraction of investible funds put into the single asset in either case by y, and the fraction put into the portfolio, m, by (1-y), then their expected returns can be written respectively as:

$$E(R_a) = yE(R_j) + (1-y)E(R_m)$$

and

$$E(R_b) = yE(R_n) + (1-y)E(R_m).$$

Focusing on portfolio a, the variance is:

$$\sigma^2(R_a) = y^2\sigma^2(R_j) + 2y(1-y)\text{cov}(R_j, R_m) + (1-y)^2\sigma^2(R_m)$$

and taking derivatives of $E(R_a)$ and $\sigma^2(R)$ with respect to y:

$$d\sigma^2(R_a)/dy = 2y\sigma^2(R_j) + 2(1-2y)\text{cov}(R_j, R_m) - 2(1-y)\sigma^2(R_m)$$

and

$$dE(R_a)/dy = E(R_j) - E(R_m).$$

Solving for $d\sigma^2(R_a)/dE(R_a)$ by substitution gives:

$$\begin{aligned} d\sigma^2(R_a)/dE(R_a) &= [d\sigma^2(R_a)/dy]/[dE(R_a)/dy] \\ &= \{2y\sigma^2(R_j) + 2(1-2y)\text{cov}(R_j, R_m) \\ &\quad - 2(1-y)\sigma^2(R_m)\}/\{E(R_j) - E(R_m)\}. \end{aligned}$$

By the same process for portfolio b,

$$d\sigma^2(R_b)/dE(R_b) = \{2y\sigma^2(R_n) + 2(1-2y)\text{cov}(R_n, R_m)$$

$$- 2(1-y)\sigma^2(R_m)\} / \{E(R_n) - E(R_m)\}.$$

Evaluating each at $y=0$;

$$d\sigma^2(R_a)/dE(R_a) = \{2\text{cov}(R_j, R_m) - 2\sigma^2(R_m)\} / \{E(R_j) - E(R_m)\}$$

and

$$d\sigma^2(R_b)/dE(R_b) = \{2\text{cov}(R_n, R_m) - 2\sigma^2(R_m)\} / \{E(R_n) - E(R_m)\}$$

which since the variance of $R_n=0$ can be simplified to;

$$d\sigma^2(R_b)/dE(R_b) = -\sigma^2(R_m) / [E(R_n) - E(R_m)].$$

From the equilibrium conditions, knowing:

$$[\text{cov}(R_j, R_m) - \sigma^2(R_m)] / [E(R_j) - E(R_m)] = -\sigma^2(R_m) / [E(R_n) - E(R_m)]$$

the right hand side of which can be written;

$$\sigma^2(R_m) / [E(R_m) - E(R_n)].$$

Therefore by substitution and simplifying:

$$\begin{aligned} \sigma^2(R_m)[E(R_j) - E(R_m)] &= \text{cov}(R_j, R_m)[E(R_m) - R_n] - \sigma^2(R_m)E(R_m) \\ &\quad + \sigma^2(R_m)R_n \end{aligned}$$

from which we have the equilibrium relationship:

$$E(R_j) = R_n + \{[E(R_m) - R_n] / \sigma^2(R_m)\} \text{cov}(R_j, R_m),$$

expressing the equilibrium expected return on each asset, j , as a linear function with intercept equal to the riskless rate of return, and slope equal to the product of i) the asset's covariance with the market portfolio and ii) the market price per unit of risk.

D. MM RESULTS IN A TWO PARAMETER MODEL. Based on the above results we can proceed to consider the demonstration, by Hamada, of the validity of the MM theorem in the context of the CAPM.¹⁴ We construct his proof by first defining the expected rate of return on asset j as follows:

$$E(R_j) = [E(X_j)/S_j] - 1 = [E(x_j)/S_j].$$

Now consider another firm, denoted by the subscript k , identical in all real respects to j but differing only in that firm k is levered. The expected rate of return for the levered firm, k , can be written:

$$E(R_k) = \{E(x_k) - R_n b_k\} / S_k$$

where S represents the market value of the firm's equity.

Then in equilibrium:

$$E(R_k) = R_n + [E(R_m) - R_n] \text{cov}(R_k, R_m) / \sigma^2(R_m).$$

Since both firms are identical in real respects the above notation can be simplified by dropping the subscripts on the earnings variable. Then:

$$E(x)/S_j = R_n + L \text{cov}(R_j, R_m)$$

where $L = [E(R_m) - R_n] / \sigma^2(R_m)$. Then, for the k th firm we can write:

$$\begin{aligned} E(x) &= S_k [R_n + L \text{cov}(R_k, R_m)] + R_n b_k \\ &= R_n (S_k + b_k) + S_k L \text{cov}(R_k, R_m) \\ &= S_k [R_n (1 + b_k/S_k) + L \text{cov}(R_k, R_m)]. \end{aligned}$$

Before combining terms, the covariance terms can be expressed in directly comparable forms:

$$\text{cov}(R_j, R_m) = \text{cov}\{[x/S_j] - E(x/S_j)\} \{R_m - E(R_m)\}$$

which can equivalently be written as:

$$\text{cov}(R_j, R_m) = (1/S_j) \text{cov}(x, R_m)$$

and similarly

$$\text{cov}(R_k, R_m) = (1/S_k) \text{cov}(x, R_m).$$

¹⁴R.S. Hamada, "Portfolio Analysis, Market Equilibrium and Corporation Finance" The Journal of Finance March 1969, pp.11-31. See also: R.S. Hamada, "The Effect of the Firm's Capital Structure on the Systematic Risk of Commons Stocks" The Journal of Finance, May 1972, pp.435-52.

Then by substitution:

$$\begin{aligned}
 S_j \{R_n + L/S_j [\text{cov}(x, R_m)]\} &= S_k \{R_n [1 + (b_k/S_k)] + L \text{cov}(x, R_m)\} \\
 &= S_k R_n [1 + (b_k/S_k)] \\
 &= S_k R_n + R_n b_k \\
 S_j &= S_k + b_k
 \end{aligned}$$

according to which the market value of the equity of the unlevered firm is equal to the sum of the value of debt and equity of the levered firm, which is the original MM proposition.

E. EXTENSION TO THREE PARAMETERS. A number of studies have recently critically re-appraised the CAPM, questioning both its underlying theoretical structure and the empirical evidence relating to it.¹⁵ The theoretical objections focus largely on the restrictive nature of the assumptions, particularly such problems as: aggregation to a market portfolio, the convexity and efficiency of the market portfolio, identical expectations, the coincidence of the ex post distribution of returns with the ex ante upon which investors decisions are based, the heterogeneous horizons problem, the existence of non-diversifiable assets, problems with the riskless rate, the adequacy of the two-parameter treatment of uncertainty and many others.

¹⁵ See: R. Roll, "A Critique of the Asset Pricing Theory's Tests; Part I: On the Past and Potential Testability of the Theory"; Journal of Financial Economics, March 1977, pp.129-76; see also: S.A. Ross, "The Current Status of the Capital Asset Pricing Model (CAPM)" The Journal of Finance, June 1978, pp.885-902.

We focus only on the adequacy of the parametric treatment of the mean-variance model as this is the most relevant to the study of valuation models. As noted earlier the standard version of the model assumes either that the probability distribution of asset returns ^{is} fully characterized by the first two central moments or investor preference functions are defined only in terms of the same. In reality, however, firms are protected by limited liability laws which truncate the distribution of returns from below by restricting the returns of firms to being non-negative. Moreover, the returns to debt holders are also truncated at the contractual rate. Therefore, the normality of returns distributions can not be justified as an adequate basis for describing expected returns in probability space.

Nor is the alternative assumption of quadratic utility functions very plausible. It is well known that quadratic utility functions, or any second order polynomial, are unacceptable as utility (of wealth) functions because of their incompatibility with the Pratt-Arrow risk aversion conditions. According to the Pratt-Arrow conditions an appropriate utility function of wealth, $[U(W)]$, must possess at least the following properties: 1. positive marginal utility of wealth, $(U'(W) > 0)$, implying non-satiety of wealth and that the function is monotonically increasing. 2. decreasing marginal utility of wealth, $(U''(W) < 0)$, implying risk aversion and that the rate of increase of utility continuously declines. And, 3. non-increasing absolute risk aversion, $\{d[-U''(W)/U'(W)]/dW = 0\}$, indicating that risk

asset holdings increase with wealth and are not inferior goods.¹⁶

It can readily be shown that quadratic utility functions do not satisfy the first condition - positive marginal utility - for all levels of wealth. This can be made apparent by considering a quadratic utility function having the form:

$$U(W) = a + bW - cW^2.$$

Satisfaction of the risk aversion conditions would require: $b > 0$, $W < b/2c$ and $c > 0$; since $U'(W) = b - 2cW > 0$ and for $U'(W) > 0$, W must be smaller than $b/2c$. Moreover, $U''(W)$ will be negative only if $c > 0$ because $U''(W) = -2c$.

Recently Gonzalez, Litzenberger and Rolfo have argued that the standard version of the CAPM based on the assumption of quadratic utility functions misspecifies the market value of the firm and leads to paradoxical results.¹⁷ The market value of the firm can readily be derived from the equilibrium returns relationship of the model:

$$R_j = R_n + L\text{cov}(R_j, R_m).$$

Since, $R_j = (X_j - V_j)/V_j = (X_j/V_j) - 1$, by substitution:

$$(V_j/X_j) - 1 = R_n + L\text{cov}(R_j, R_m).$$

Also since:

¹⁶See: K.J. Arrow, "The Theory of Risk Aversion", Essays in the Theory of Risk Bearing. (Amsterdam: North Holland) 1970; also J. Pratt, "Risk Aversion in the Small and in the Large" Econometrica, 1964, pp. 122-36.

¹⁷N. Gonzales, R. Litzenberger, and J. Rolfo, "On Mean Variance Models of Capital Structure and the Absurdity of their Predictions" Journal of Financial and Quantitative Analysis, June 1977, pp. 165-79.

$$\text{cov}(R_j, R_m) = (1/V_j) \text{cov}(X_j, R_m)$$

by substitution again:

$$X_j - L \text{cov}(X_j, R_m) = (1 + R_n) V_j$$

and:

$$V_j = [X_j - L \text{cov}(X_j, R_m)] / (1 + R_n)$$

giving the equilibrium market value of the j th firm. From this valuation the changes in the market value as a result of changes in the volume of debt outstanding can be found by differentiating:

$$[dV_j/dD_j] = [1/(1+R_n)] [(dX_j/dD_j) - L(d\text{cov}(X_j, R_m)/dD_j)].$$

This states that the marginal changes in the market value of the firm are the result of two separate effects: i) changes in the expected earnings of the firm with respect to changes in its debt, and ii) changes in the covariance of the firm's earnings (with the market) due to changes in its debt. Whereas, when the changes in the covariance term are positive - as would normally be the case - the market value of the firm will not necessarily be a monotone increasing function of leverage; the authors have argued that in a world where bankruptcy costs are absent, the non-negative present value of tax savings on debt would mean -for the investor having positive marginal utility of wealth -that the valuation implied is inconsistent with the principles of first degree stochastic dominance.

Quadratic utility functions also imply that risky assets are inferior goods. From the measure for absolute risk aversion:

$$[-U''(W)/U'(W)] = 1/ [(-b/2c) - W]$$

it is apparent that the investor's risk aversion (in the Arrow sense) as indicated by his willingness to accept any bet of fixed amount decreases as his wealth increases - implying that risk assets are inferior goods.

A third objection to quadratic utility functions arises from the preference for positive skewness by investors. Arditti has shown that the absolute risk aversion property is sufficient to ensure preference for positive skewness by investors.¹⁸ Such preference can be noted from the unwillingness of a risk averse investor to invest in an asset with asymmetric returns combining a large probability of loss with a small gain. Characterization of this aspect of investor preferences would require a utility function capable of handling the next higher moment of the distribution of returns. The extension, theoretically, is a significant one and recently a number of authors have extended their treatment of the CAPM to incorporate a third parameter. The validity of the MM theorem in the context of an extended three parameter model has been demonstrated. To illustrate, first we set out the model.¹⁹ The relevant utility function can be defined as:

¹⁸F. Arditti, "Risk and the Required Return on Equity", Journal of Finance, March 1967, pp.19-36.

¹⁹These problems have been discussed in some detail in: A.Kraus and R. Litzenberger, "Skewness Preference and The Valuation of Risk Assets" Journal of Finance, Sept. 1976, 31, pp.1085-1099; For the general extension of the model to a multi-parameter context see: M. Rubenstein, "The Fundamental Theorem of Parameter-Preference Security Valuation" Journal of Financial and Quantitative Analysis, Jan. 1973, pp.61-9.

$$U = U[E(W), \sigma^2(W), m^3(W)]$$

where the arguments: mean, variance, and skew, are respectively:

$$E(W) = c_n R_n + \sum_{j=1}^{n-1} c_j E(R_j)$$

$$\sigma^2(W) = \sum_{j=1}^{n-1} \sum_{k=1}^{n-1} c_j c_k \text{cov}(R_j, R_k)$$

and

$$m^3(W) = \sum_{j=1}^{n-1} \sum_{k=1}^{n-1} \sum_{l=1}^{n-1} c_j c_k c_l \text{cosk}(R_j, R_k, R_l).$$

When the market portfolio is held the covariance and coskewness terms can be expressed in terms of the bivariate distribution of each asset with respect to the portfolio, m .

The utility function can then be written:

$$U(W) = U[\sum_{j=1}^n c_j E(R_j) + c_n R_n, \sum_{j=1}^n c_j \text{cov}(R_j, R_m), \sum_{j=1}^n c_j \text{cosk}(R_j, R_m, R_m)].$$

As usual, the first order optimal allocation conditions can be derived from a Lagrangean function maximizing utility subject to the investor's budget constraint. Setting up the Lagrangean:

$$G = U[\sum_{j=1}^n c_j E(R_j) + c_n R_n, \sum_{j=1}^n c_j \text{cov}(R_j, R_m), \sum_{j=1}^n c_j \text{cosk}(R_j, R_m, R_m)] + L(W - c_n - \sum_{j=1}^n c_j)$$

from which, upon differentiation, the following first order conditions are obtained:

$$\begin{aligned} dG/dc_j &= (dU/dW)R_j - L + (DU/d\sigma^2)\text{cov}(R_j, R_m) + \\ & (dU/dm^3)\text{cosk}(R_j, R_m, R_m) \end{aligned}$$

$$dG/dc_n = (dU/dW)R_n - L$$

and

$$dG/dL = W - c_n - \sum_{j=1}^n c_j$$

Eliminating L , substituting, solving and setting to zero:

$$(R_j - R_n)(dU/dW) + (dU/d\sigma^2) \text{cov}(R_j, R_m) + (dU/dm^3) \text{cosk}(R_j, R_m, R_m) = 0$$

$$R_j = R_n + (-dW/d\sigma^2) \text{cov}(R_j, R_m) + (-dW/dm^3) \text{cosk}(R_j, R_m, R_m)$$

gives the equilibrium expected returns relationship:

$$R_j = R_n + \emptyset_2 \text{cov}(R_j, R_m) + \emptyset_3 \text{cosk}(R_j, R_m, R_m)$$

where $\emptyset_2$ and $\emptyset_3$ are, respectively, the marginal rates of substitution between total expected returns and variance; and total expected returns and skewness of returns. The rate of substitution, at the margin, between return and each measure of risk is the market's price of risk reduction for that measure.

The validity of the MM theorem can be demonstrated in this context by means of a straightforward extension of the Hamada proof.²⁰ Considering again, two firms - a and b - which are identical in all respects except that b is levered,

$$E(R_a) = R_n + \emptyset_2 \text{cov}(R_a, R_m) + \emptyset_3 \text{cosk}(R_a, R_m, R_m)$$

and

$$E(R_b) = R_n + \emptyset_2 \text{cov}(R_b, R_m) + \emptyset_3 \text{cosk}(R_b, R_m, R_m)$$

where

$$E(R_a) = E(x)/S_a$$

and

$$E(R_b) = [E(x) - R_n b_b]/S_b$$

solving for E(x):

$$\text{-----} E(x) = S_a R_n + S_a \emptyset_2 \text{cov}(R_a, R_m) + S_a \emptyset_3 \text{cosk}(R_a, R_m, R_m) \text{-----}$$

²⁰See: J. Becker, "General Proof of Modigliani-Miller Propositions I and II Using Parameter-Preference Theory" Journal of Financial and Quantitative Analysis, March 1978, pp.65-69.

and

$$E(x) = S_b R_n + R_n b_b + S_b \theta_2 \text{cov}(R_b, R_m) + S_b \theta_3 \text{cosk}(R_b, R_m, R_m).$$

Since

$$\text{cov}(R_a, R_m) = (1/S_a) \text{cov}(x, R_m)$$

and

$$\text{cov}(R_b, R_m) = (1/S_b) \text{cov}(x, R_m)$$

and likewise:

$$\text{cosk}(R_a, R_m, R_m) = (1/S_a) \text{cosk}(x, R_m, R_m)$$

$$\text{cosk}(R_b, R_m, R_m) = (1/S_b) \text{cosk}(x, R_m, R_m).$$

By substitution

$$S_a R_n + \theta_2 \text{cov}(x, R_m) + \theta_3 \text{cosk}(x, R_m, R_m)$$

and

$$S_b R_n + R_n b_b + \theta_2 \text{cov}(x, R_m) + \theta_3 \text{cosk}(x, R_m, R_m)$$

which simplifies to

$$\begin{aligned} \text{or} \quad S_a R_n &= S_b R_n + b_b R_n \\ S_a &= S_b + b_b \end{aligned}$$

which is exactly the same as the MM result obtained for the two parameter model.

6. CONCLUSION

This part of the thesis has surveyed the main theoretical contributions to the MM leverage theorem. Each of the models considered has presented a set of sufficient conditions ensuring the validity of the theorem and, consequently, the irrelevance of financial structure to the determination of real corporate values - the cost of capital and market valuation.

Although the theorem was originally presented in partial equilibrium exposition, this context left the exact implications of the theorem implicit. The earliest extension to a general equilibrium framework focused on complete capital markets. It was found that, generally, the MM theorem appeared to be a perfect capital market construct, the sufficiency conditions for which seemed to coincide with those establishing a Pareto optimal allocation of security holdings.

Specifically, the validity of the theorem was found to depend on the opportunity set of returns distributions remaining unaffected by any purely financial changes undertaken by firms. When capital markets are complete, this opportunity set remains unaltered by purely financial changes. The characteristics of every security created can be matched. Apart from the usual competitive assumptions of no impediments (such as distortionary taxes or transaction costs), access to correct information costlessly, and equal

access to markets by all agents, no further restrictions need to be imposed on investor behaviour or the characteristics of the economic system in order to obtain the MM results.

In reality capital markets are not complete and the opportunity set attainable by investors is restricted to only a subspace of the complete set. The creation of securities with new characteristics (returns distributions) as a result of financial structure changes will not normally leave the opportunity set unaffected. When the subspace of returns distributions is altered, investors will not normally be indifferent to changes because their income streams will naturally be affected. Only under exceptional circumstances will the subset of returns distributions remain unaffected by financial changes.

In order to ensure the validity of the theorem when capital markets are incomplete the special case solutions impose additional restrictions on the behaviour of investors and the characteristics of the system.

One set of further restrictions, additional to the perfect capital markets assumptions, sufficient to establish the theorem was presented by Stiglitz. He found that the absence of default risk on debt was sufficient to restrict the subset of feasible returns distributions to those which could be re-created by investors and that this would consequently leave the opportunity set available to investors unaffected. An important implication of the

Stiglitz results was that with the riskless debt assumption the perfect capital market assumptions of homogeneous expectations and equal access took on very different meaning. All that was required of the expectations assumption, now, was that all investors agree that debt was riskless and with riskless debt the main obstacles to equal access were also removed. Although the riskless debt assumption was not a necessary condition for the validity of the theorem and it could be proven only on the strength of the perfect capital markets assumptions, in this case the implications required of the expectations and equal access requirements would be much more stringent.

An entirely different approach to restricting returns distributions was investigated by Fama and Miller. They focused on means to prevent firms from issuing securities with new characteristics which would alter the opportunity set. They found that this could be accomplished imposing contractual stipulations (me-first clauses) into debt contracts, thereby preventing the positions taken by investors from being expropriated as a result of financial structure changes.

More recently, Fama has shown that yet another set of sufficient restrictions could be imposed only by assuming that no firm can issue securities monopolistically. This ensures that any security issued could have been issued previously and so does not alter the returns distributions available to the market. Obviously, any configuration of

securities which could have been issued previously - *ceteris paribus* - but was not, must have been sub-optimal. Therefore if any firm were to issue such a sub-optimal configuration other firms could duplicate its original configuration and supply it to the market making arbitrage profits in the process.

A fourth set of restrictions sufficient to ensure the validity of the theorem has evolved out of the mean variance approach to capital market theory and the formulation of the Capital Asset Pricing Model. In this case all of the perfect capital market assumptions are preserved while additional restrictions on investor behaviour and the characterization of uncertainty are imposed. These are sufficient for the portfolios of all investors to be separable, in which case from the homogeneous expectations assumption it follows that all investors hold perfectly balanced portfolios and in equilibrium carry the same fraction of all risky securities. When portfolios are perfectly balanced the returns distributions are restricted to a sub-space which remains unaltered by financial structure changes.

The most serious impediment to the smooth operation of capital markets has been the distortionary effects of taxation. The extension of the MM theorem to a general equilibrium framework incorporating both personal and corporate taxes remained a problem until the results known as Miller's equilibrium were developed. These show that under tax schemes not unlike those existing in reality, the MM theorem remains valid despite the existence of

distortionary personal and corporate taxation:

On the basis of some of the special case solutions implying the validity of the theorem, we shall, in the following section, argue that the MM theorem can be expected to hold in select areas of Japanese industry and that the Japanese context provides both an interesting and plausible case for the study of the theorem and its empirical testing.

PART II

1. INTRODUCTION

The previous part of this thesis began from the premise that the question of whether the financial structure of a firm affects its real values, such as its market valuation or cost of capital, is one of the fundamental questions in the theory of finance. It surveyed sets of sufficient conditions ensuring the validity of the MM theorem both when capital markets were complete and when, more realistically, they were not.

It surveyed four sets of sufficient conditions which ensured the operation of the theorem in incomplete capital markets. These were, respectively, based on the following key assumptions: 1) no monopolistic issue of securities, 2) no expropriation of investor positions, 3) no bankruptcy, and 4) portfolio separability. We begin by asking the question: which of these sets of sufficient conditions, if any, can be said to reasonably conform to the characterization of the system of Japanese corporate finance?

The question of no monopolistic issues of securities is a difficult one to verify. The highly diversified and multi-product nature of most modern corporations would seem to preclude any possibility that the securities issued by one company could exactly duplicate the characteristics of another. Moreover, a number of factors ranging from the segmented nature of capital markets to the group structure

of industry (and the principle of one-set-ism on which the corporate groupings are based) would appear to make a model based on this approach a highly unlikely one in the Japanese context.

The remaining three models present interesting contexts for examination in Japan but among these we can note the third with special interest. It is widely accepted as a stylized fact of the Japanese financial system that major corporations operate free of bankruptcy risk. This condition is, of course, the crucial one in the Stiglitz (no bankruptcy) model and would, therefore, seem on a priori grounds to present an interesting case for further investigation. It is noteworthy, moreover, that the no bankruptcy assumption automatically implies no expropriation because the characteristics of debt remain unaffected by any purely financial changes when debt is riskless.

Consequently, much of the discussion in this part of the thesis will focus on the extent to which the Japanese financial system can be said to conform (reasonably) to the conditions required by the Stiglitz model. The following section (2) begins with a brief over-view of the Japanese financial system and then focuses on four aspects of corporate finance.

In the first, the popular belief that Japanese corporations operate subject to phenomenally high degrees of leverage is questioned. The problem of hidden wealth and the undervaluation of assets is considered and it is shown that

the orders of magnitude of the undervaluation are so great that even with large margins of error the implication is that Japanese companies are not in any sense under-capitalized. Concomittant to the view that the Japanese corporate sector operates subject to high leverage ratios is the view that the corporate sector is highly exposed to risk. It will be argued that this does not seem to be the case either.

Although the undervaluation of assets implies that nothing can be said about the actual financial structures of Japanese corporations, the problem of the imbalance in the sources of corporate funds remains. This imbalance is considered in section 2 and some plausible arguments for the insignificance of bonds and shares as sources of corporate funds are reviewed.

Another condition required by the Stiglitz model was that investors have equal access to capital markets and be able to protect themselves from bankruptcy. The third feature considered in the discussion of section 2 focuses on the structure of ownership in the corporate sector.

The last feature considered in section 2 has to do with the changing realities of the Japanese financial system in the late 1970s. Two important trends are discernable. One is the declining external fund requirements of the corporate sector - due to the deceleration in growth rates - and the other is the liberalization and deregulation of capital markets. The latter is particularly relevant to the characterization of the world implied by the Stiglitz model.

Taxation, too, can be an important impediment to the smooth operation of capital markets and can systematically discriminate between the alternative sources of capital. Section 3 looks at some features of the Japanese tax system relevant to the choice between debt and equity.

Section 4 returns to the no bankruptcy characterization and looks at some features of the Japanese economic system which serve to effectively suppress the risk of bankruptcy among large groups of firms. The discussion focuses on three types of factors: the role of the value system underlying economic relationships, the keiretsu system of corporate groupings, and the role of industrial policy. If any group of Japanese corporations can be said to be free of bankruptcy risks, it is in the explanations here that the underlying causes must be sought.

Finally, section 5 summarizes the results of the existing empirical work on the subject of Japanese capital markets. Tests of the Capital Asset Pricing (CAP) models provide joint tests of the MM theorem insofar as they imply portfolio separability and characterize investors as holding perfectly balanced portfolios. Moreover, the tests of capital market efficiency provide insight into the operation of capital markets and so are not unrelated to the neoclassical paradigm of perfect capital markets which underlies all of the models studying the MM theorem.

2. SOME REALITIES OF JAPANESE CORPORATE FINANCE.

A. OVERVIEW. Japan is essentially a corporate economy and shares with similar economies a common economic framework based on the principles of private ownership and allocations properties of the market mechanism. Consequently, the institutions which exist for the allocation of resources, incomes and risks do not differ in any fundamental respect from those common to all corporate economies. Capital markets, insurance markets, and forward markets, all perform similar functions in every country. Two special characteristics should nonetheless be noted: i) the flows have been greatly exaggerated in Japan as a result of the high saving ratios of the personal sector and the high investment ratios of the corporate sector;¹ and ii) The inter-sectoral flows have been channelled via an indirect financial mechanism.²

A consequence of the prevalence of indirect finance has been the heavy dependence of the corporate sector on loan-funds commonly referred to as the "over-borrowed" position of the corporate sector. A mirror-image of the

¹The saving ratio of the household sector has been in excess of 20% of disposable income over the period 1970-80. During the same period the ratio of gross domestic capital formation to GDP has been around 34%. By contrast the saving ratios in the U.S.A. and U.K. have been about one-third to one-fourth and investment ratios roughly one-half of the Japanese figures.

²Direct finance refers to the acquisition by savers of the securities of ultimate investors directly. With indirect finance funds flow through intermediaries.

over-borrowed position of the corporate sector is the "over-loaned" position of the banking sector which reflects its net indebtedness position with respect to the Bank of Japan (BOJ)³ and results from its accomodating the demands of its customers for ever-increasing loans.

Liquidity in the financial sector has not been evenly distributed. Traditionally, a small (but important) group of banks, because of their special and close ties with the customers having the greatest demand for funds, found themselves continously short of funds and had to rely on borrowing either from the BOJ or the inter-bank money market to rectify their negative reserve asset positions. This dependence was effectively utilized by the BOJ which adopted the monetization of corporate debt (through the re-discount of commercial bills) as the main instrument for control of the money supply.

In order to achieve their policy objectives of encouraging growth and keeping the cost of production internationally competitive, the monetary authorities have traditionally pursued a policy of keeping the capital markets strictly regulated so as to perpetuate the administered allocation of capital. They accomplished this by keeping interest rates artificially low - below the -----

³As Suzuki has noted: though over loan and over borrowed positions of corporations appear as mirror images, the two are not necessarily complementary. The banking sector may find itself in an over loaned position without the non-financial sector being over borrowed. For a detailed discussion see: Y. Suzuki, Money and Banking in Contemporary Japan, (New Haven: Yale University Press, 1980), chapter 1.

market clearing rate - and capital markets closed to foreign capital inflows. A consequence of this policy has been the stifling of the development of the capital markets and interference with ^{their} efficient functioning.

In the late 1970's, in response to the changing realities of the Japanese economic environment, government policy has shifted dramatically and the present trend is towards deregulation and liberalization (as will be described in greater detail below).

B. EQUITY RATIOS. Probably the best known feature characterizing Japanese corporate financial structure is the extremely low equity ratios believed to prevail. Table 2-1 compares the structure of balance sheets for Japanese and U.S. corporations. The striking difference in equity ratios ^{is} readily apparent. Obviously, taken at face value, the imbalanced financial structure of Japanese corporations implies excessive risk exposure. Two commonly used shorthand measures of safety are the net worth ratio and the current ratio. As a rule of thumb, by U.S. standards, safe levels for the former are considered to be around 50%, and for the latter around 200%.⁴ From the table, net worth ratios (defined as the ratio of equity to total assets) for Japan appear as only 13.6% as compared with 58.5% for the U.S. The current ratio is only implicit in the table but

⁴For a discussion of the significance of these ratios see: R. Brealey and S. Myers, Principles of Corporate Finance, (London: McGraw Hill, 1981); chapter 25.

=====

TABLE 2-1
COMPOSITION OF CORPORATE BALANCE SHEETS, 1977
(JAPAN & U.S.A.; PERCENTAGES)

	JAPAN	U.S.A.
TOTAL ASSETS	(100.00)	(100.00)
NON-FINANCIAL-ASSETS	40.72	73.16
SH.TERM FINANCIAL ASSETS	51.79	20.76
CASH & DEPOSITS	(13.80)	(3.45)
TRADE CREDITS & ADVANCES	(31.11)	(12.14)
OTHER ACC. RECEIVABLE	(6.88)	(5.17)
L.TERM FINANCIAL ASSETS	7.49	6.08
EQUITY & T. LIABILITIES	(100.00)	(100.00)
SH.TERM LIABILITIES	62.25	17.81
BILLS & BONDS	(0.00)	(0.34)
BORROWED FUNDS	(25.37)	(7.53)
TRADE CREDIT	(25.28)	(8.71)
OTHERS	(11.60)	(0.83)
L.TERM LIABILITIES	24.18	23.65
BONDS	(2.04)	(12.55)
BORROWED FUNDS	(20.30)	(11.10)
OTHERS	(1.84)	(0.00)
EQUITY	13.57	58.54
SHARE CAPITAL	(5.17)	(-----)
RESERVES & PROVISIONS	(8.40)	(-----)

Source: O.E.C.D., Financial Statistics, October 1979, 13/I

Note: These figures cover a cross-section sample of all incorporated enterprises. Subsequent tables dealing with equity ratios are based on samples of listed corporations only. Therefore the ratios are not exactly comparable.

=====

can be approximated by using the ratio of short-term financial assets plus inventories to short-term liabilities. The current ratio is intended to reflect the liquidity position of the firm. The respective values for Japan and the U.S. are 107% and 209%. By both accounts, Japanese firms appear to be highly exposed.

Do the structural differences observable and the risk exposure they imply, mean that Japanese industry is in some fundamental respect different, say, from American industry? For a long time, popular belief took the view that the structural differences implied by the data shown in Table

2-1 accurately reflected the differences in the respective countries. If this were true, Japan would be unique.⁵ Increasingly, however, attention has been directed to this question and, as we shall now argue, the apparent differences can be explained in terms of systematic biases introduced by the peculiarities of Japanese accounting conventions.

In this regard two practices deserve special mention. They are: 1. the treatment of reserves, and 2. the problem of the undervaluation of assets. Both have long been recognized. What had not been recognized, however, was the extent of the undervaluation problem. Let us consider both.

Liabilities in Japan are divided into three classes. Current liabilities, fixed liabilities, and reserves. Inclusion of the third among liability accounts is one of the idiosyncracies of Japanese accounting practices - institutionalized by legal prescription. By usual accounting principles, reserves, whether of the valuation or liability type, because they accrue in the form of a surplus, should normally be included among shareholders' equity accounts. Intuitive justification for this procedure is that the reserves have all the characteristics of retained earnings.⁶

It would appear that the unusual method of

⁵For an example of this line of argument see: Y. Miyazaki, "The Japanese - Type Structure of Big Business," Japanese Economic Studies, Fall, 1973, pp.3-61.

⁶See: T. Nakamura, "Corporate Financial Reporting in Japan", The Hitotsubashi Journal of Commerce and Management, Vol.8, No.1, July 1973; pp. 36-51.

classifying liabilities adopted in Japan owes as much to tax considerations as to the argument that reserves, which in all probability will have to be applied against losses in the course of business, ought from the beginning to be included as liabilities if a fair picture of the state of affairs is to be presented. Items usually included under liability accounts include reserves for: retirement allowances, doubtful accounts, price fluctuations, compensations, foreign operations, research and development, and plant alterations. From the tax point of view special categories of income can be transferred to reserve accounts where they are shielded, sometimes permanently, from taxation.

Transferring special reserves from liability accounts and including them under the equity accounts as is done in other countries, increases the equity ratio (taking averages of 1976-80 percentages for all listed firms) by a whole percentage point from 13.6% to 14.6%. Clearly, this practice by itself is inadequate to explain away the apparent structural differences.

The undervaluation of assets is another feature of company accounts in Japan. Unfortunately, many important questions arising from it have traditionally remained unanswered. What is the extent of the undervaluation? How are different assets affected in relation to one another? It is generally recognized that the problem of asset undervaluation arose in consequence of the rapid inflation

of the immediate postwar period. Following the recommendations of the Shoup Commission (for the revision of the Japanese tax system) a number of attempts were made, through special legislation, to make revaluations mandatory. These measures, however, concentrated on depreciable fixed assets leaving the other major categories of assets unaffected.⁷ For obvious reasons, financial assets which could not be measured independently of their book values were not subject to revaluation. Nor were the other major categories of fixed assets - land and inventories - affected by the legislation.

In view of the manifold increases in land values the failure to revalue corporate accounts has meant that the book value measures grossly understate land values and, therefore, overstate the true extent of leverage. A second major source of systematic underestimation is the practice of recording securities held at cost. This means that the large volume of securities obtained through par value subscriptions, gratis, or those held on the accounts for long periods of time, substantially underestimate their true value.

As regards the matter of securities held, although no estimate has been made of the extent of the undervaluation, it should be noted that the problem is not a minor one. Security prices have appreciated phenomenally over the post-

⁷See: S. Fujita, "Tax Policy" in R. Komiya (ed.) Postwar Economic Growth in Japan (Berkeley: University of California Press), 1966.

war period and, as we shall argue later in this section, the custom of issuing shares at less than their full market value has been widespread in Japan. Unfortunately no precise estimate of the extent of the problem appears to have been made.⁸

As regards the problem of land values, however, recently Wakasugi, Tsuchiya, and Nishino have undertaken the formidable task of calculating the adjustments necessary, to bring their book values of depreciable assets, land, and inventories in line with more meaningful replacement values. As their results are unpublished we discuss them in some detail.⁹ In order to convert depreciable fixed tangible assets from book values into replacement values they adjusted the former by changes in a price index for investment goods during the (average) life span of each asset. They obtained current values of inventories by a similar procedure using the change in the wholesale price index and a measure of the average holding period of stocks. Finally, they transformed land by multiplying corporate land holdings in each area by the current land price for that area.

Table 2-2 shows aggregate revaluation ratios, defined as the ratio of revalued value to book value, for each of -----

⁸See: I. Kuroda and Y. Oritani, "A Re-examination of the Unique Features of Japan's Corporate Financial Structure", Japanese Economic Studies, Summer, 1980, pp. 82-117.

⁹T. Wakasugi, K. Nishino, and M. Tsuchiya, Trends in Profitability for Japanese Industrial Corporations, Paper Presented at London Conference on Rates of Return on Capital, September 1980.

the three classes of assets described. It emerges from this that inventory poses no serious valuation problem. We notice a significant discrepancy between book and replacement values for depreciable assets, however. In 1979, furthermore, these assets were being undervalued on average by about fifty percent on the company books. It would appear from these results that whatever successes may have been achieved by the post-war mandatory revaluation measures, these were nullified by the inflation years of the early 1970s. The most serious problem, however, arises from the undervaluation of land, the revaluation ratio for which stood at 18.3 in 1979.

=====						
TABLE 2-2						
REVALUATION RATIOS FOR ALL INDUSTRY						
	1965	1970	1973	1976	1979	AVE.
DEPRECIABLE ASSETS	1.07	1.19	1.45	1.65	1.54	1.38
INVENTORIES	1.08	1.07	1.12	1.06	1.05	1.07
LAND	17.74	17.72	21.45	16.47	18.34	17.74
Source: Compiled from results presented by Wakasugi et al, 1980; (see: note 9).						
=====						

Table 2-3 shows a breakdown of industry net-worth ratios obtained by re-constructing corporate balance sheets using the revaluations just described and attributing the revalued amounts to the revaluation accounts under shareholders equity as would be customary. As can be seen, the ratio of equity to total assets for listed companies jumps by almost 3 times from 17.5% to 51.3%. Clearly, these figures are subject to large margins of error but given the orders of magnitude

suggested by the second column of Table 2-3, it would seem that Japanese equity ratios can hardly be said to be low.¹⁰ This conclusion is strengthened if it is remembered that the figures here shown underestimate net worth because of the exclusion of reserves from equity (a small matter) and the undervaluation of securities held by corporations (probably a much larger matter). In other words, it seems highly unlikely that the asset structure of Japanese corporations differ in any fundamental way from those elsewhere in terms of their risk implications.

=====

TABLE 2-3		
FIRST SECTION COMPANIES, 1980		
NET WORTH RATIOS ALTERNATIVELY DEFINED		
	BV/TA	RBV/RTA
ALL INDUSTRIES	17.51	51.33
MANUFACTURING	22.23	55.18
WHOLESALE	5.56	30.31
RETAIL	24.92	43.98
REAL ESTATE	16.78	75.06
LAND TRANSPORT	13.66	71.15
SHIPPING	14.49	22.64
AIR TRANSPORT	19.66	71.07
WAREHOUSING	36.47	57.51
ELECTRIC POWER	16.54	45.10
GAS UTILITY	23.59	45.34
SERVICES	25.81	74.09

NOTE: BV/TA= BOOK VALUE OF EQUITY/ TOTAL ASSETS
RBV/RTA= EQUITY AT REVALUED BOOK VALUE/ REVALUED TOTAL ASSETS

Source: Constructed from Revaluation Ratios estimated by Wakasugi, et.al. See Table 2-2

=====

¹⁰: These figures must of course be interpreted subject to the important proviso that they represent the market value of the land and must not be regarded as the value accruing to investors upon dissolution. Distress sale values, for example, will naturally be at significant discounts especially in view of the fact that the land has buildings and plant which strictly restrict the range of uses to which it can be put.

C. IMBALANCE IN FUND SOURCES. A second more remarkable feature of Japanese corporate financial structure is the imbalance existing in the sources of funds. Table 2-4 shows the composition, by source, of corporate funds. The most striking features of the table are the insignificance of equity and the very low weight of bonds as sources of corporate funds.

A consequence of the prevalence of indirect finance in the Japanese case is the heavy dependence on loans, usually referred to as the over-borrowed position of the corporate sector. Funds borrowed from financial institutions alone accounted for over one-half of the increase in liabilities by the sector. When trade credits payable are included the share of borrowed funds rises to over 80%.

=====

TABLE 2-4
SOURCES OF EXTERNAL CORPORATE FUNDS, 1977-81
ACQUISITION OF FINANCIAL LIABILITIES

	BILLION YEN	PERCENT
LOANS	15710.6	51.93
TRADE CREDIT	9586.1	31.68
BONDS	3308.8	10.93
SHORTTERM SECURITIES	64.2	0.21
SHARES	1463.6	4.84
OTHERS	123.0	0.41
TOTAL	30256.3	100.00

Source: Economic Planning Agency, (EPA), Annual Report on National Accounts.

=====

First, we ask why is bond financing so small? Having got this problem out of the way we can direct attention to the debt-equity choice. The limited share of bonds as a source of corporate funds can be attributed to the under-developed state of the bond market. This state of impeded

growth and development -lacking both scope and depth - was, prior to the mid-1960's, due largely to the strict regulation of the bond market by the government. All the terms of bond issues required the prior approval of the government and these were set according to policy and market conditions. Moreover, prior to the 1970s, there was no significant government participation in the bond market and this absence, inevitably, restricted the scope of the market and its potential for development. Government bond financing activities were, of course, proscribed by the so-called Dodge line restrictions which called for a balanced budget as a goal of sound finance.¹¹

Despite the abandonment of the Dodge line restrictions on government borrowing and deficit expenditure in the mid-1960s, however, the development of the market has continued to be thwarted by the ever growing public sector deficit.¹² This has been especially marked in the post oil crisis period when the large drop in the economy's growth rate implied a decline in government revenues on the one hand and necessitated greatly expanded public sector spending on the -----

¹¹The Dodge-line gets its name from Joseph Dodge, financial adviser to the Supreme Commander Allied Powers and chief architect of their financial policies.

¹²The expansion of the bond market can be illustrated by noting that between 1970-80, the volume of bonds outstanding on the primary market grew by 7 times. In contrast, GNP increased by only a factor of 3. By 1980, bond issues exceeded 15% of GNP with the greatest growth being observed in government bond issues which expanded by over 20 times. By comparison, corporate bonds - including private placements - grew by only 3 times and by 1981 private corporation bonds accounted for only 6% of total bonds outstanding.

other. Its development has been further impeded by two conflicting policy goals: the need to maintain interest rates high enough to ensure sufficient absorption of government bonds on the one hand and the low interest rate aims of monetary (and possibly exchange rate) policy on the other.

The net result of these conflicting objectives has been a continuing situation of excess supply of bonds requiring regulation of both the quantity and terms of new bond issues. Efforts have had to be made to artificially sustain demand by requiring financial institutions to underwrite prescribed allocations.¹³

Under such circumstances the very existence of any demand for corporate bonds carrying sub-standard yields and comparatively greater risks than government bonds would need to be explained. The two main groups holding corporate bonds are personal investors and financial institutions. The former who have only recently become major subscribers are long term investors holding the bonds until maturity rather than offering them on the depressed secondary market. They are attracted partly by the better long-run returns provided

¹³Traditionally, issue terms for all bonds and debentures have been set by the Ministry of Finance according to policy and market conditions. The coupon rate, issue price, and term to maturity have all been strictly controlled. Moreover, underwriting of government bonds is legally prescribed. See: T.F.M. Adams and I. Hoshii, A Financial History of the New Japan, (Tokyo: Kodansha International; 1972). For a more recent survey of the bond market see: Industrial Bank of Japan, Handbook of the Japanese Bond Market (Tokyo: IBJ, 1982).

by bonds relative to interest on bank deposits (although this has not always been the case) and partly by the popularity of convertible bonds which allow the holder to convert at market values - traditionally, convertible bonds could only be converted at par or some equivalent pre-determined value.¹⁴ The rapid growth of market values of equity combined with the tax exemption of capital gains from securities serve to compensate for the sub-standard yields on convertible bonds and make them attractive investment opportunities for the personal sector. The determined and successful sales campaign of the security companies must be regarded as a further element in the favourable response of that sector.

The willingness of financial institutions to hold corporate bonds, on the other hand, is largely due to the following.

First, corporate bonds provide a desirable marginal asset to bank portfolios because, although they can be issued in unsecured form, they almost never are. Issues are overwhelmingly mortgage bonds having real property attached to guarantee both interest and principal. The secured nature of these bonds make them attractive investments for banks, a significant proportion of whose lending (primarily through discounting of commercial bills) is unsecured.

¹⁴ During the decade of the 1970's personal sector holdings of bonds increased from about 5% to over 8% of total financial assets held. This sector accounted for over 80% of all bank debentures held and over 50% of corporate bonds.

A second attraction of bonds is to smaller commercial banks and specialized financial institutions which find in them a convenient means of lending to major corporations enabling them to derive more balanced allocations of risk in their portfolios.¹⁵

Third, it has been suggested that banks take these sub-standard yields into account when establishing the levels of compensating balances required of their customers. As such, corporate bonds can be regarded as essentially nothing more than special forms of bank loans.¹⁶

Finally, the banks are in a position to negotiate private placements whereby the terms and amounts of issue are determined by agreement between the parties rather than through the operation of market forces. This ensures their ability to obtain more favourable terms than would otherwise be available and serves to make bonds comparable with the other main form of bank investment - lending.

The above arguments notwithstanding, the aggregate figures regarding corporate bond financing can be very misleading. The inter-industry (and inter-firm) distribution of bond issues is highly skewed. Even among major listed firms, where the greatest concentration of issues can be expected, the variation on an inter-industry basis is great.

¹⁵Credit Associations, for example, hold proportionately - to their size - five times more corporate bonds as the city banks which are the main lenders to corporations.

¹⁶Y. Suzuki, 1980, p.51.

Comparing the ratio of bonds outstanding to total liabilities in company accounts aggregated on an industry basis, we find that such broadly based industries as wholesale trade, construction, and manufacturing have respectively 0.5%, 1.4%, and 4.8%, whereas such specialized industries as real estate, air-transport, and electric power, have respectively 10.2%, 25.4%, and 35.2%.¹⁷ Public corporations and those with government affiliations rely relatively most heavily on bond issues because they partake of credit ratings - and often favourable tax treatment - equal to those on government bonds.

We can now address ourselves to the debt-equity problem generally. We consider first the insignificant share of equity as a source of corporate funds. One commonly suggested explanation has been in terms of historical factors, tracing their roots to the Second World War when the destruction of physical capital that occurred exceeded one third of national wealth outstanding in 1935. Table 2-5 illustrates the extent of the destruction in fixed assets on the balance sheet accounts of major industries.

As a result, the ratio of own capital to total assets fell from about two-thirds to less than one-fourth.¹⁸

¹⁷These figures apply to corporations listed on the first section boards of the major stock exchanges. Otherwise, the ratios for the former set of industries would be very much lower. Figures from Daiwa Securities, Analyst's Guide, 1980.

¹⁸It is not clear how the inclusion of reserves and other accounting irregularities would have affected these ratios.

The detrimental effects of war-time destruction were, however, offset for corporate balance sheets by the rampant inflation which followed in its immediate aftermath. This can also be seen from Table 2-5 where we note the phenomenal increase in short-term liabilities combined with the corresponding fall in liquid assets. The corporate sector was probably the major beneficiary of the redistribution of income following the many-fold devaluation of debt obligations that occurred in the course of the inflation. The net effect of these two counteracting influences probably

=====

TABLE 2-5		
PRE AND POST WAR COMPOSITION OF BALANCE SHEETS		
MAJOR NON-FINANCIAL CORPORATIONS		
(1936,1951; ELEVEN INDUSTRIES, PERCENTAGES)		
	1936	1951
FIXED ASSETS	52.6	27.6
LIQUID ASSETS	34.9	40.4
INVENTORIES	13.5	32.0
TOTAL	100.0	100.0
SHORT-TERM LIABILITIES	19.4	37.8
LONG-TERM LIABILITIES	15.3	14.9
OWN CAPITAL	65.3	23.7
REVALUATION RESERVES	0.0	23.6

Source: Economic Stabilization Board, Economic Survey of Japan, 1951-2; pp.146-50

=====

left corporations, at least as regards financing, with a clean slate. On the one hand, destruction had obliterated physical capital while, on the other hand, inflation had wiped out the real value of their outstanding debt.

The war and its aftermath had a second lasting influence on corporate financial structure with even more serious consequences than the first. This arose largely, and

inadvertently, from the reform policies of the occupying powers. The financial institutions through which equity and debt are raised, the stock exchange and the banking system, were asymmetrically affected by reform policy.¹⁹

Corporations seeking to raise capital found the stock exchange in a state of chaos. The occupying authorities refused to allow its formal re-opening until an acceptable plan for future operations - consistent with their de-concentration policies - could be drawn up. There was moreover a crisis of confidence of major proportions among investors on the stock exchange. This was aggravated by the substantial volumes of shares expropriated from the zaibatsu families and holding companies which remained to be re-allocated. Pending settlement of these shares and in the absence of investor confidence, the stock market appeared quite incapable of handling the tremendous fund raising demand of the corporate sector.

By contrast to the controversy surrounding the future of the stock-exchange, banking institutions escaped reform and emerged relatively unscathed from the occupation period. Although de-concentration plans for financial institutions were drawn up by the occupying powers, for reasons unknown they were never implemented.²⁰

The household sector found the banking system the only

¹⁹This subject has been discussed in length by Adams and Hoshii, 1972, Part I, "The Economy Under Occupation".

²⁰See: E.M. Hadley, Antitrust in Japan, (New Jersey: Princeton University Press), 1970, pp.163-5.

viable outlet for their savings. The banks were, therefore, both financially and administratively well prepared to respond to the fund requirements of the corporate sector. Within this context, loans effected through the banking system offered the quickest and most effective means for channelling funds into industry.

A second important influence on corporate financial structure has been the role of government policy. It can be argued that as a matter of industrial policy the Japanese government actively discriminated against equity and favoured debt finance. The imbalanced financial structure of Japanese industry, if not the deliberate creation of government policy, was sustained and supported by its actions.²¹

To recognise the plausibility of this argument it must be remembered that in the post-war period the Japanese economy has developed subject to the control of a well-defined industrial policy.²² Responsibility for the coordination of monetary and fiscal policy was vested in the various departments and bureaus of the Ministry of Finance.²³

²¹Here we consider only the effects of monetary policy. The question of tax policy and the distortionary effects of the tax system are considered under a separate heading below.

²²This question is taken up in Section 4 below.

²³The Ministry of Finance is the ultimate responsible body for both monetary and fiscal policy. Responsibility for industrial policy is, however, jointly and successfully shared with the Ministry of International Trade and Industry (MITI).

The heavy dependence by the corporate sector on bank lending (commonly referred to as the over-borrowed position of that sector) and the corresponding dependence of the banking sector on Bank of Japan (BOJ) lending (commonly referred to as the over-loaned state of that sector) provided policy makers with a potent instrument for both the control of industry and the traditional macro-economic goals of monetary policy.

Continued over-lending by banks was made possible only by the willingness of the BOJ, in its capacity as lender of last resort, to finance the loans extended. Since borrowed funds constituted the single largest item in the accounts of the financial system as a whole, the re-discount of commercial bills provided both the natural means for the control of the money supply as well as an effective means to channel funds selectively into goal areas. Consequently, the process of the monetization of corporate debt became the instrument for the injection of high powered money into the economy. The efficacy of monetary policy, therefore, became linked with the over-borrowed and over-loaned positions of the corporate and banking sectors respectively.

Another important respect in which government policy influenced the imbalanced financial structure of industry was through its low interest rate policy designed to encourage investment and keep the cost of production internationally competitive. One consequence of this policy of interference with the market mechanism was the creation

of a continuing situation of excess demand for funds which resulted in credit rationing by banks.

The rationing mechanism adopted took the form of compulsory deposits required from customers as compensating balances for loans extended and served to effectively raise the rate of interest paid by borrowers. The main beneficiaries of the redistributive effects of this system, were, of course, the major corporations which presented the lowest risks to the banking system and which were often favoured by government support. These corporations found the resources they required at rates well below those which would have prevailed if the allocating mechanism - interest rates - operated freely. To major corporations, therefore, the cost of borrowed funds was kept artificially low as a result of monetary policy. The main losers were the small and non-protected companies which felt the full crowding-out effects.

Yet another explanation often given for the insignificance of equity as a source of corporate funds in Japan is that it has traditionally been very expensive.

When shareholders are in control of the firm, the windfall gains they make from rights issues represent no more than a transfer from one account to another and there are no additional costs. Two types of arguments have been forwarded in support of this view. Traditionally it was believed that equity financing in Japan was expensive because of the widespread practice of issuing new shares at

less than market value. As Wallich and Wallich have persuasively argued, this depends on whether management is perceived to be independent of shareholders or not.²⁴

The question of the separation of management from ownership is an empirical issue. We can, however, get some rough idea of the separation of ownership from management by using the 10% criterion by which over 80% of major U.S.²⁵ companies appear to be management controlled. By contrast, using the same criterion in Japan we find that less than 20% would be be classified as management controlled. Viewed from the other angle, only 12% of listed companies are majority controlled. Therefore, control in Japan appears to be exercised by means of minority holdings and although we can expect some dominant coalition to control corporate distribution policy, the fact that non-coalition shareholders exist in large numbers means that the attendant costs of having to provide them with the wind-falls clearly raises the cost of equity issues.

Although market value issues are now the dominant form

²⁴H. C. Wallich and M. I. Wallich, "Banking and Finance" in H. Patrick and H. Rosenberg (ed.) Asia's New Giant, (Washington: The Brookings Institution, 1976), p.267-70.

²⁵The 10% criterion was proposed by R.J. Larner ["Ownership and Control in the 200 Largest Non Financial Corporations, 1929 and 1963", AER, September 1966, pp.777-787] for identifying management controlled corporations. It represents the share of total equity held by any common group of investors. Larner found that over 80% of the largest corporations in the U.S. were by this criterion management controlled in 1963.

of equity issue, accounting for about 70% in terms of value, it would be incorrect to presume that the custom of issuing shares at less than market value has been discarded. For 584 manufacturing companies listed on the first section boards, the 3500 most recent capital changes were tallied. The results show that as many as 49% of these - by number of issues - took the form of shares either allotted gratis to existing shareholders or as stock dividends. About 2% were allocated to designated third-parties other than existing shareholders and 19% were issued on a rights basis. This leaves only 30% for public offerings at market value. Public offerings are often combined^{with} simultaneous issues at substantially less than market values; nor is it uncommon to find companies making market value issues, re-imbursing shareholders with the difference by transfers from surplus accounts.²⁶

A second argument put forward by Wallich and Wallich is that equity financing is expensive in Japan because of the rapid growth rates experienced.²⁷ This argument is based on the fact that a growing corporation commits a fixed share of a growing income stream when it issues equity but a declining one when it issues debt. This effect is magnified when, as in the case of Japan, price earnings ratios have, until recently, been depressed.

²⁶ See: T. Tsujita, Securities Regulation in Japan, (Tokyo: University of Tokyo Press, 1970)

²⁷ Wallich and Wallich, in "Banking and Finance", pp. 269-70.

Despite the structural changes in the Japanese economy in the early 1970's and the consequent decline in aggregate growth rates, the growth argument for the expensiveness of equity has continued to remain a significant one. Table 2-6 shows compound growth rates of operating income for listed companies. Except for the severe recession year of 1981-2, growth rates continue to be significant.

All in all, the indications are that equity in Japan does not appear to be seriously considered as a source of funds for financing corporate activities. The question then arises, why do corporations continue to use equity as a source of finance? At least three reasons can be given:

=====		
TABLE 2-6		
ANNUAL COMPOUND GROWTH RATES OF OPERATING INCOME		
LISTED JAPANESE COMPANIES, BY INDUSTRY		
	ALL INDUSTRIES	MANUFACTURING
82/3-81/3	-3.66	-0.06
82/3-80/3	8.46	1.44
82/3-79/3	15.49	15.83
82/3-78/3	14.65	15.87
82/3-77/3	10.24	10.54

Source: Daiwa Securities, Analyst's Guide, 1982.

1. Clearly, there are trade-offs of an optimizing nature as a result of agency costs associated with debt financing.²⁸ Equity, it may be argued, serves as a reserve

²⁸ Proper assessment of the fuller implications of this moves into the domain of optimal capital structure. Although an awareness of these problems exists, [see: T. Mizuno, Shogaku Chochiku Hikaze Seido to Shihon Costo University of Fukuoka mimeograph, 1982], the problem has not been tackled on an empirical level.

fund securing the (riskless) status of corporate debt, without which, the supply of adequate loans could not be ensured.

2. Equity issues provide the means for consolidating and perpetuating control over the corporation as the corporate environment changes.

3. It should not be overlooked that listing on the stock exchange is a corporate objective of high priority. It enhances the prestige of the company, its management and shareholders; and recognizes the company as being of sound financial structure. Listing requirements include certain conditions regarding the number and characteristics of so-called floating shareholders which have to be satisfied so as to ensure the active trading and marketability of the company's shares. These conditions necessitate minimum levels of diffusion of shareholdings.²⁹

D. OWNERSHIP STRUCTURE. A third interesting feature of Japanese corporate financial structure ^{is} the patterns of corporate ownership. Our primary interest, here, is in the prevalence of corporate shareholdings. Table 2-7 shows the structure of ownership by types of investors. The most remarkable point to note is the significant drop, over the period covered, in the share of the personal sector and consequently the predominance of corporate shareholders. Today, it can be said that the shareholders of the major

²⁹Stock exchange rules call for delisting when these conditions fail to be met.

Japanese corporations are corporate entities themselves. A number of reasons can be cited to explain this pattern:

The continued decline in the share of the personal sector is not surprising when viewed in terms of the historical patterns of share ownership. Broad based ownership by the personal sector has little precedent and owes much to post-war regulatory intervention. Before the War, ownership was heavily concentrated and the prevailing patterns were determined by the characteristics of industrial structure. Public ownership, as we know it today, was non-existent.

After the Japanese defeat in the War, the occupation forces sought to introduce broad based public ownership as a means of destroying the concentration of wealth and economic power on which the pre-war industrial structure was based. Among the democratization goals, priority was given to redistributing the expropriated shareholdings of the zaibatsu families and their holding companies by making them available to the public. As a result of these measures personal sector shareholding rose to stand at around 60% in 1950.

The deconcentration measures implemented by the occupying powers left inter-subsidary ties of the zaibatsu groups largely unaffected.³⁰ These ties were subsequently consolidated and have formed the basis of the structure of -----

³⁰We shall consider the nature and implications of these linkages in greater detail in Section 4, below.

post-war corporate ownership.

In fact, further erosion of the relative position of the personal sector has been prevented by legal measures such as the Anti-Monopoly Law which, apart from its prohibition of holding companies has, during most of the

=====

TABLE 2-7			
STRUCTURE OF STOCK OWNERSHIP BY TYPE OF INVESTORS			
(Relative shares, Percentages)			
STRUCTURE OF CORPORATE OWNERSHIP			
	1965	1970	1980
FINANCIAL INSTITUTIONS	23.3	31.0	37.3
PRIVATE INDIVIDUALS	44.8	39.9	29.2
NON-FINANCIAL CORPORATIONS	18.4	23.1	26.0
FOREIGN INVESTORS	1.8	3.2	4.1
SECURITY COMPANIES	5.8	1.2	1.7
INVESTMENT TRUSTS	5.7	1.4	1.5
GOVERNMENT	0.2	0.2	0.1

Source: Toyo Keizai Shimposha 1981

=====

post-war period, limited the equity holdings of financial corporations - which would naturally have expanded their shareholdings otherwise - to a maximum share of 10% in each firm.

Another factor promoting corporate shareholding has been the preference by corporations for stable shareholders since it is believed in Japan - and not without justification - that corporate shareholders are stable while personal shareholders are not. Corporate shareholdings are usually influenced more by considerations of direct investment than purely portfolio objectives and corporate investors have traditionally been long-term investors, whose behaviour has been largely unaffected by transient

fluctuations in market conditions and stock prices. Corporate shareholders have a vested interest in supporting management and would not normally disrupt act in a manner detrimental to the interests of the firm.

In the case of financial institutions, which are the largest class of investors, the inter-locks afforded by shareholdings go far to protect and secure their larger investments - either in the form of loans or the interests of other clients - by giving them a voice in corporate policy.³¹

The volatile nature of personal shareholdings are well known. Personal investors, because of budget constraints, are unable to invest with "control" objectives. They are therefore, primarily, interested in portfolio considerations. Consequently, an average of 70% of the turnover of the stock exchanges can be attributed to trading engaged in by personal investors.³² The tax laws, moreover, encourage them in this by exempting capital gains (for up to 50 transactions per year) from tax liabilities.

³¹In this connection it is interesting to note that the shares of financial institutions as shareholders correspond to their shares as suppliers of finance generally. The banks are the largest shareholders, and among them the city banks in particular. These are followed by the life-insurance companies which by the long-term nature of their own commitments are well placed to make equity investments. Budget constraint considerations should not be effective because of the legal ceiling on shareholdings.

³²See: D.L. Allen and J. Greenwood, "Japan: Banking, Money and Bond Markets", in A.M. George & J.H. Giddy (ed.), International Finance Handbook, Vol. 1, 4.7, (N.Y.: John Wiley & Sons, 1983).

In connection with the decline of the share of the personal sector, we can also note the role of the finance organizations created to preserve stability in the market by support buying measures during the volatile period of the mid and late 1960's. They contributed to the erosion of the share of the personal sector insofar as the large volumes of shares they acquired during slump periods, mostly from personal investors, subsequently found themselves in the hands of corporate investors.³³

Table 2-8 shows the respective shares by type of shareholders when the top six and twenty shareholders are considered. It indicates a number of interesting features regarding ownership and control. Personal shareholdings, as would be expected from the budget constraints of the personal investor, are small and fragmentary. The relative share of personal investors among the top six is only 4.8 and among the top twenty it increases to only 6.6%. On the other hand, whereas the overall share of corporate institutions in total shareholding is 66.5%, their share among the top twenty shareholders - where control is concentrated - is an overwhelming 85.6% and among the top six it is almost 90%. It may safely be said of Japanese corporations that they are owned and controlled by other domestic corporations. A secondary implication which follows from this is, of course, that control is being exercised by one group of managers on another. There is another

³³See Section 5 for further discussion of these special companies.

=====

TABLE 2-8

CONCENTRATION RATIOS & STRUCTURE OF OWNERSHIP

BY MAIN SHAREHOLDERS

FIRST SECTION COMPANIES

	TOP 6	TOP 20
CONCENTRATION RATIO	37.1	54.0
RELATIVE SHARES:		
NON-FINANCIAL CORPORATIONS	39.0	33.3
BANKS	20.9	22.3
LIFE INSURANCE COMPANIES	13.3	13.9
NON-LIFE INSURANCE CO`S.	3.7	6.6
TRUSTS	7.1	5.4
PRIVATE INVESTORS	4.8	6.6
SECURITY COMPANIES	5.5	4.2
FOREIGN INVESTORS	3.0	4.1
OTHER	2.7	3.6

Source: Constructed from lists of shareholders published by Toyo Keizai Shimposha.

=====

interesting implication of the predominance of corporate or stable shareholders. The very fact that 70% of the shareholders can be classified as "stable" gives the remaining 30% disproportionately great influence over the supply and demand forces in the market. Personal shareholdings are too fragmented and dispersed to have a major influence but foreign investors can be considered a potentially important destabilizing element in the market. The significant growth of foreign investors reflecting the recent liberalization of capital markets has been concentrated in investment trusts operating large volumes and capable of moving large blocks of shares. These funds now dominate the share of foreign shareholdings.³⁴

³⁴The other main groups of shareholders are the foreign corporations having subsidiaries in Japan.

In view of the nature of the involvement and commitment of the Japanese government to industry, it is interesting to note that the share of the government as a corporate shareholder has been trivial and declining. Involvement of the national government has long been restricted to a few public corporations such as Japan Air Lines (in which the Ministry of Finance is the largest shareholder with 37.7%) or the International Telephone and Telecommunications Company (KDD) in which the Ministry of Postal Services is the main shareholder. As we shall argue in a subsequent section, government involvement in Japan is no less real than if it were a significant shareholder in industry. It only takes a less conspicuous appearance.³⁵

E. SOME RECENT CHANGES. Finally we ask what changes have been taking place in recent years and how these affect our characterizations of financial structure? Two would seem to be most important: 1) the deceleration in growth and the concomitant increase in corporate self-sufficiency, and 2) government deregulation.

The problem of declining growth rates is an important one with major implications for the future of the Japanese financial system as a whole. Already, at the level of the corporate sector, we can see the emergence of a special group of firms having hardly any interest bearing debt outstanding. Among these, some such as Toyota Motors,

³⁵Local government shareholdings, although more observable, are primarily restricted to local industries.

Shiseido - the major cosmetics manufacturer - and Matsushita Electric have eliminated debt from their capital structures altogether.³⁶

Let us consider the effects of the increasing self-sufficiency of the corporate sector as a result of the declining growth rates experienced. Table 2-9 shows the trend in the equity ratio for the sector. We notice that the ratio which had been declining continuously since the early post-war years bottomed out in the midst of the oil crisis recession and has been increasing ever since.

=====

TABLE 2-9

RATIO OF NET WORTH TO TOTAL ASSETS

(1955-81, ALTERNATE YEARS, MAJOR CORPORATIONS)

1955	28.98	1969	16.77
1957	25.26	1971	15.78
1959	23.81	1973	14.39
1961	22.31	1975	13.95
1963	20.47	1977	14.13
1965	19.04	1979	14.35
1967	17.51	1981	15.76

Source: Japan Statistical Yearbook, 1982.

=====

We know from the discussion above that no change has taken place in the use of equity finance. Its relative share in the sources of corporate funds remains effectively unchanged. The main reason for the reversal appears to be the decline in the external funds required by corporations because of the fall in growth rates.

From the point of view of the financial sector this

³⁶Many others, representing such diverse industries and backgrounds as Hitachi, Sony, Casio, Lion (Dentifrice), Kirin (Breweries) and Ajinomoto (Foods), have reduced their debt levels to virtually zero.

would imply an alleviation of the acute shortage of funds experienced by the sector. The institutions most affected by the decline would appear to be the major commercial (city) banks which have traditionally been the main supplier of loans to the corporate sector.

Indeed a distinct decline in the share of lending by the major city banks can be discerned. Between the two periods, 1968-72 and 1977-81, the share of the banking sector in the total flow of funds to borrowers had fallen from 60.6% to only 48.7%.³⁷ The erosion of the traditional role of the major commercial banks has far reaching implications for the system as a whole. It means that the de facto transmission mechanism for the injection of high powered money into the system through the monetization of commercial paper is undermined. Its consequences do not stop here either. The whole inter-bank money market is affected and the role of public financial institutions relative to private ones is altered.

The second important change that has been occurring[^] and which has potentially significant implications for the operation of the MM theorem is the deregulation and liberalization of capital markets.³⁸ With regard to deregulation we can distinguish between changes on the bond

³⁷Source: EPA, "Annual Report on the National Accounts" 1982 (Closing Stocks of Financial Assets).

³⁸For a discussion see: J.E.W. Kirby, "The Japanese and Their Changing Economic Environment" in P.Norbury and G.Bownas (ed.) Business in Japan, (London: The MacMillan Press Ltd., 1980) pp.84-94.

market and on the money market.³⁹ In the former, the secondary market has been relatively unregulated for some time; it has reflected supply and demand conditions and has remained sensitive to the influences of exchange rates, international interest rates and domestic monetary conditions. The main obstacle to the development of the Japanese bond market has been the regulation of the primary market in view of the ever growing financing requirements of the government. Because of the relatively free functioning of the secondary market and the ceilings on yields imposed by the authorities on the primary market to keep the cost of borrowing low, perverse conditions have traditionally characterized the functioning of the bond market. Yields on the secondary market have been continually in excess of subscriber's yields on the primary market. Recent deregulation measures in the bonds market have concentrated on the expanded use of open market operations and promotion of the secondary market. The former has concentrated on competitive tenders - the traditional methods of prescribed allocation. Efforts to promote the secondary market have focused largely on easing the restrictions on re-sale of government bonds and more active participation on the market by the BOJ. These developments may remove a major impediment to greater utilization of the market by the corporate sector in their fund-raising activities. Signs are emerging, however, of the gap being narrowed.

³⁹See D.L. Allen & J. Greenwood, 1983.

Liberalization measures have been stronger and even more effective on the short-term money markets. Both the inter-bank market and the open money market have undergone major changes over the last few years greatly enhancing the free functioning of the interest rate mechanism.

As late as the early 1970s the inter-bank market was mainly characterized by the call market where the unbalanced liquidity of the banking sector was sorted out. The call market was, at the time, the only access the funds-short (illiquid) major banks had to the surplus funds of other financial institutions. Participation in the market was, however, restricted and rates were determined by quotations effectively prescribed by the BOJ. During the late 1970s however, relaxation has affected the range of participants allowed on the market and has led to the replacement of the quotation system for rate-setting by the free functioning of the interest rate mechanism. Very similar changes have occurred in the bills discount market.

The other short-term money market, the open market, has traditionally consisted of the repurchase (or gensaki) market where short term funds could be raised by selling long and medium term bonds subject to a repurchase contract. Prior to the liberalization measures the repurchase market had been the only one accessible to the corporate sector both for raising of short-term funds and for investment of similar idle funds. These markets which previously were subject to strict regulations had by the late 1970s become

freely functioning.⁴⁰

A second aspect of these fundamental changes in the capital markets, also marking the latest stage in the adaptation of the economy to the international environment, has been their greater internationalization. A complete catalogue of the liberalization measures requires detailed explanation of the foreign exchange control laws. It suffices for our purposes to note that the trend has been towards simplification of these laws and a relaxation of the controls on foreign capital inflows, the immediate implications of which has been the accelerated inflow of foreign investment into Japanese securities. The scope of relaxation has extended from the long term bonds market to the more volatile and highly protected short term markets as well. By 1979 all restrictions on non-resident purchases of yen denominated securities had been lifted.

On the equity market liberalization has taken the direction of switching from the principle of general prohibition of foreign investment and listing of specific allowed categories to general freedom for foreign investment and listing of the prohibited categories. Portfolio investments made through major Japanese security companies are freely allowed and only acquisitions in excess of 10% of the equity of any corporation require prior approval from the authorities.

⁴⁰On the open money market, there has also recently developed a flourishing market for negotiable Certificates of Deposit (CD), interest rates on which are freely determined by market forces.

3.THE JAPANESE TAX SYSTEM

In Japan, as elsewhere, three major goals can be associated with the tax system. They are: income redistribution, the transfer of resources to the public sector, and the promotion of economic objectives. Taxation in Japan has been an important instrument of a well planned industrial policy and growth strategy. Fortunately, the rapid growth of the economy has reduced the difficulty of choosing among the conflicting goals and has meant that the undesirable effects of tax measures implemented were limited. The complexity of the Japanese tax laws moreover can be attributed in large part to this fact.¹

We approach the tax system from the perspective of its effects on the choice between debt and equity in corporate financial structures. Most previous studies which considered the Japanese tax system and its relationship to corporate finance have interpreted its effects in terms of the so-called MM "tax correction model" and have concluded that there are definite tax advantages to debt arising from the deductibility of interest charges.²

¹R. Komiya, "Japan" in NBER, Foreign Tax Policies and Economic Growth (New York: Columbia University Press), 1966, pp.38-96

²The subject has been researched by R. Komiya and K. Iwata, [Kigyo Kinyu no Riron, (The Theory of Corporate Finance) Tokyo: Nihon Keizai Shimbun, 1973], where the tax correction model is extended to incorporate the effects of personal taxation in the pre-Miller (1977) tradition. Implications of Miller's equilibrium were considered by Mizuno (see: footnote 25 in Section 2,) who concluded that the exemption on interest income renders such an equilibrium invalid in Japan. Wallich and Wallich, Asia's New Giant, p.270, also state that the tax advantages to debt dominate.

First, we summarize the main characteristics of the Japanese income and corporate tax systems which appear to be directly relevant to the corporate financing decision.³

The individual tax system is progressive with rates ranging from 10% to 75%, extending well on either side of the corporate tax rate. Personal taxation occurs at both the national and local levels. Local income taxes are levied by both prefectural and municipal governments and differ from the national tax primarily in respect to the rates applicable to various forms of income, deductions, and credits. In contrast to the national tax, the rate structure of local taxes is much smaller and less progressive - ranging only from 4 to 18%. However, the deductions and tax credits allowed by local taxes although of the same kind as those allowed by the national tax are of a smaller magnitude. The total tax burden on individual income, however, cannot exceed 80% and the levies on local tax are reduced accordingly when - if ever - the ceiling is reached.

The corporation tax is two tiered. Corporations capitalized at less than 100 million yen (\$4,550,000) and having incomes of less than 7 million yen (\$32,000) are subject to a lower tax rate than large corporations.⁴ Large

³See: T. Hayashi, Guide to Japanese Taxes, (Tokyo: Zaikei Shoho-Sha) 1976-77, and 1979-80. See also: An Outline of Japanese Taxes, 1979, (Tokyo: Tax Bureau, Ministry of Finance).

⁴An exchange rate of \$1=220 yen is used throughout. As exchange rates have been in flux the calculations are rounded to the nearest hundred or thousand dollars.

corporations are subject to a constant tax rate of 40% on undistributed income and 30% on distributed income.⁵

As noted, the corporate tax system is based on the split rate principle whereby distributed earnings are taxed at a favourable rate relative to retentions. Split rate systems are usually adopted to avoid the double taxation of dividends which exists under the classical tax system and which views the tax liability of a company independently of that of its shareholders. Split rates, therefore, also affect the choice between debt and equity because their preferential treatment of dividends reduces the burden of double taxation thereon and thereby serves to favour equity financing relative to debt.

Corporation tax is also supplemented by a number of local taxes. At the prefectural level corporation income is subjected to inhabitant tax and at the municipal level to both inhabitant and enterprise tax. The standard tax rate for prefecture and municipal inhabitants tax taken together is about 17%, with the tax base being roughly equal to the amount of corporation tax. The enterprise tax rate, moreover, is basically 12% but the amount of the tax can be deducted in the computation of taxable income for both the corporation tax and the enterprise tax in the following year so the net burden is much lower. These additional taxes raise the overall nominal tax rate to about 42% and 53%

-----retained-----
⁵For small corporations the tax rates are 28% on
and 22% on distributed profits

respectively on distributed and undistributed income.

The tax deductibility of interest charges is another characteristic of the corporate tax system. Accordingly, interest payments on debt are allowed to be deducted from taxable income. In this respect debt is asymmetrically favoured relative to equity finance because no compensating deduction is granted to companies making dividend payments on equity funds raised.⁶

Next we consider the tax treatment of interest income, dividends, and capital gains. Fundamentally, according to the tax law, interest income is partly to be collected by withholding at source at the rate of 20%, and partly by assessment on the total income of the taxpayer at the appropriate marginal level.

Since 1971 however this provision has been over-ridden by special measures which subject certain categories of interest income to preferential tax rates. The recipient of interest income is given the choice of either a 15% withholding rate, with the remainder of interest income subject to assessment or a 30% rate and no further assessment. Income sources preferentially treated in this manner include interest from time deposits with banks, trusts, public bonds, and debentures. Interest received on ordinary deposits, moreover, is subject only to a 15%

⁶It was this feature of the corporate tax which was focused upon by MM (1958 and 1963) and underlies the tax advantages associated with debt finance.

withholding tax and need not be included in returns for assessment purposes.

Other categories of interest income from deposits are exempted from taxation altogether. These include income from so-called minor deposits in banks, the postal savings system, public bonds, debentures, and trusts. Income from principal not exceeding 3 million yen (\$14,000) is also exempted. A further special exemption on income from government bonds issued between 1968-80 is granted for up to 3 million yen too. Finally, the Employee Property Formation Promotion Law, has exempted employees from interest income on their savings up to a principal amount of 5 million yen (\$23,000). The overall significance of the minor deposits exemption is disproportionately great because of the opportunities for, and the great popularity of, anonymous and fictitious accounts, by the same individual, which are made possible by the traditional use of seals rather than signatures for opening and operating accounts.⁷

Favourable tax treatment also applies to income from debentures issued by financial institutions and the Japan Telephone and Telegram Public Corporation. Only a withholding tax ranging between 10 and 12% applies to such income.

The income tax law fundamentally prescribes that

⁷See: J.Pechman and K.Kaizuka, "Taxation", in Asia's New Giant, p.334. They reveal figures (compiled by the Tax Bureau) indicating that about two-thirds of all deposits are either anonymous or under fictitious names.

dividends are subject to a 20% withholding tax and the remainder subject to assessment. As of 1977, however, special concessions reduced the withholding rate to 15% and gave the taxpayer the option of having a 30% withholding rate applied with no requirement to include any further amount in income for assessment purposes, subject to the total dividends received from any particular company being less than 500,000 yen (\$2,300).

If dividends received from any one company amount to less than 100,000 yen (\$450) that income is taxed at source at the rate of 20% and can be excluded from further calculations of taxable income.

Dividend income is also favoured by a tax credit. 10% of income, up to 10 million yen (\$45,000), and 5% of income beyond that is covered by the credit and can be deducted from the tax otherwise payable. The credit was intended to eliminate the incidence of double taxation which would occur when dividends received had already been subject to corporation tax. The two rate principle underlying the corporation tax system is effected by a twofold process of extending credit to dividends received (at the income tax level) and allowing deductions for dividends paid at the corporate level. The tax credit on dividends received^e by individuals was described above.

At the corporate level, dividends received are exempted from taxation so long as they do not exceed the dividends paid out by the corporation. If they do, one

quarter of the excess is included in income to be computed. This means that after some free level, inter-corporate dividends are subject to an additional tax. Nothing of a general nature can be said about the rate of the extra tax - since it depends on the composition of the firm's portfolio relative to its dividend policy.

An asymmetry exists in the treatment of capital gains between the individual and corporate taxes. For individuals capital gains resulting from the sale of shares are exempted from taxation so long as such transactions are not engaged in frequently enough to make them of a professional nature, no intention of share price manipulation can be ascribed and the sales do not have the effect of transferring control in any particular company. At the corporate level, however, no allowances are made for capital gains derived from security investments.

Finally, we summarize some special tax measures relevant to the financial structure decision. The Japanese tax system is relatively heavily laden by non-debt tax shields of many varieties which can affect the market value of the levered firm. No exhaustive classification of the numerous provisions available is possible here but there are three major kinds of special tax measures which through their sheltering effects on income serve to shield it from taxation. They are: special depreciation measures, tax free reserves, and investment tax credits.

Depreciation tax shelters have played an important

role in the armoury of MITI's policy instruments. Designated equipment in select industries *has* since the early post-war years been allowed specially approved depreciation schemes. It is questionable whether accelerated depreciation schemes actually affect aggregate levels of investment in an economy growing as rapidly as the Japanese one in the post-war period. Their main effects during the period of rapid growth were probably in their selective use. Our interest here arises from their implications for the debt-equity choice.

Accelerated depreciation allowances imply both a faster pay-back period on investment and larger cash flows from an after tax point of view. When (as in Japan during the period of high growth) credit is short then the allocation criteria take on non-price dimensions. In such a situation a company which is allowed accelerated depreciation has an advantage in competing for funds. The market will regard it as presenting better risks and prefer lending to it. In this respect accelerated depreciation can be viewed as providing an additional subsidy on the costs of borrowed funds and favour debt relative to equity finance.⁸

Another important tax shelter available to Japanese companies *is* the reserve funds already described earlier in this section and which effectively serve to shield many categories of income from taxation. These reserves are essentially of two kinds. The first category, called "hikiatekin", are recognized by accounting conventions as

⁸R. Komiya, "Japan" pp.38-96.

acceptable reserves everywhere and these are allowed direct tax exemptions.⁹

The second category, called jumbikin, are of a risk absorbing nature and although they are not directly exempted, tax laws provide generous deferments. These include the following reserves: for bad debts, loss on returned goods, bonuses, retirement allowances, repairs of special assets and products, guaranteeing certain products, price fluctuations, overseas market development, overseas investment losses; among many others. The income shielding effects of these reserves can be illustrated as follows: in the case of reserves for bad debts some percentage (depending upon the nature of the industry) of accounts receivable can be credited to the tax free reserve and only included in income during the following year. In the case of reserves for overseas investment losses, a generous fraction of the costs of overseas investment can be credited to the reserve for a period of five years. From the sixth year repayment is made over five subsequent years, with one fifth of the amount being credited back to income each year.

The tax treatment of reserve funds serve^s, as we noted earlier, to increase the ratio of equity and lower that of borrowings. **It** also influence^s the debt capacity of firms - even though all corporate entities are identically affected

⁹T. Fujita, "Tax Policy" in R. Komiya Postwar Economic Growth in Japan, (Berkeley: University of California Press), 1966, pp.32-59.

- by reducing the risks associated with lending to them.¹⁰

Other special taxation measures in operation include:

1) Overseas technical service transactions for which a special deduction of up to 50% is allowed.

2) An investment tax credit introduced in 1978 to promote "efficient" and energy saving industries.

3) The 1979 extension of this credit to include depressed industries. Accordingly, 10% of the cost of equipment and machinery can be credited against tax up to a maximum of 20% of total tax liability.

4) Tax credit applicable to R&D expenditures and intended to promote the development of advanced technology. This allows a tax credit of one-fourth the increase in R&D spending over the previous year subject to a maximum of 10% of the company's total tax liability.

These various special tax measures have, of course, indirect effects on financial structure. These may be called the implicit costs of leverage and refer to the loss of tax shields - as a result of their remaining unutilized - when earnings are depressed. These implicit costs serve to reduce the market value of the tax advantages associated with debt.¹¹

Having summarized the characteristics of the tax system we may now ask, what do these characteristics imply

¹⁰For a discussion see: Komiya, 1966.

¹¹See: H.deAngelo and R.Masulis, "Optimal Capital Structure Under Corporate and Personal Taxation", Journal of Financial Economics, 1980, pp.3-29.

for a Miller type equilibrium? No simple answer exists, but we may nevertheless make the following observations on the basis of the above characterization:

The condition of the progressivity of the tax on income from debt appears not to hold. As noted, wide ranging exemptions apply to interest income. In this connection the significance of widespread use of anonymous accounts must be stressed. In any case the special measures described impose a ceiling of 30% on interest income. Even more significantly, Miller's requirement that the equilibrium marginal tax rate on income from interest significantly exceed that on income from shares does not hold either.

On the corporate side, moreover, not only is the tax two tiered but it is also subject to a split rate calculation. At the corporate level the tax advantages of debt finance appear to remain intact. A Miller type equilibrium does not hold. The general picture which emerges is that the tax system is not neutral in its treatment of the alternative forms of corporate financing. Debt appears to be favourably treated both insofar as there is no offset at the personal level for the tax advantages of debt at the corporate level and because the tax exempt status of interest income in fact serves as a further factor depressing the cost of borrowed funds and providing an additional inducement to debt finance.

The discussion of the previous section, considering

the structure of corporate ownership, noted that corporations were the predominant shareholders in the Japanese corporate sector. This raises a fundamental question: it can no longer be said that ^{it is} personal tax rates ^{that} are relevant for consideration from the point of view of the investor. Nor can the existence of leverage clienteles be considered because the market is effectively segmented and the keiretsu system operates, as ^sdiscussed later, on the principle of one-set-ism.

If one group of investors were to be singled out and identified not only as the main investors in the corporate sector but also the key element in the coalition of shareholders controlling the major corporations, it would undoubtedly be the financial corporations. For them, however, the choice between holding shares and lending to corporations is not freely determined by market conditions. They have been, as noted in the previous section, restricted in their shareholdings during the post-war period to a maximum of 10% of the shares of any corporation. This constraint implies that, regardless of the tax advantages, they face a ceiling on equity type investments. Therefore, from the point of view of both these investors and the corporations in which they invest, the tax advantages ^{of} debt are real and provide a situation of ^sconstrained optimization.

4. SOME RISK ABSORBING CHARACTERISTICS

A. OVERVIEW. Official Japanese figures show that in 1980 no less than 17,884 companies went bankrupt. Those capitalized at over 100 million yen (equivalent to about US\$550,000) accounted for less than 0.3% of the total. No bankruptcies occurred among listed firms. In fact, during the whole post-war period (until the second oil crisis) only three cases of outright bankruptcy by major listed companies occurred in Japan. This remarkable phenomenon requires explanation. In this section we focus on several aspects of the Japanese economic system which characterize the risk absorbing capacity of the system as a whole and its risk shifting implications at the corporate level.

In this connection it should be noted that two of the bankruptcy cases shared an over-riding common feature. Both firms were found to be involved in gross violations of the Security and Exchange Laws and bankruptcy was allowed to occur in consequence. The first was the Sanyo Special Steel Company which, in 1965, unexpectedly applied for corporate insolvency despite having shown large and growing profits in the company accounts. The special steel industry at the time was having problems. The Japan Special Steel company had already applied some months earlier for bankruptcy proceedings, only to find itself the subject of government sponsored reorganization efforts. Similar assistance was planned for the Sanyo Steel Company until it became apparent that gross misappropriation of funds had taken place by

management with the collusion of the company auditors. Eight years later, just when accounting reforms motivated by the above bankruptcy had become law, a second company, Nihon Netsugaku Kogyo - a leading manufacturer of air conditioning equipment - applied for insolvency. Investigation revealed gross wrong-doings by management on a similar scale to the other.¹ It had not only misrepresented profits and falsified accounts but was suspected of having engaged in active trading in its own shares and in the use of non-public information for insider trading. The corporate auditors and underwriters also appeared as having been seriously negligent in taking even the most basic precautions. The problem of window-dressing of accounts had already occurred in a number of major companies - Nitto Textiles, and Sekisui Chemicals - and had proven extremely damaging for investor confidence. Both bankruptcies were symbolic gestures of the intolerance of the system towards corruption.²

¹K. Kanzaki, "Legal Analysis of Nihon Netsugaku Case", Kobe University Law Review, No. 11, 1977, pp.21-29

²The third major bankruptcy occurred in 1977 but does not fit the above pattern. Eidai Sangyo, a major plywood and construction company, had close ties with a number of banks (most notably Daiwa) and prior to its bankruptcy had received substantial financial and management assistance. Despite extended rescue efforts neither the company nor any of its 36 subsidiaries experienced any improvement in performance and it was finally decided to accept losses on total debts outstanding of over 180 billion yen (US\$900 million) and allow bankruptcy to be declared. This decision, however, came as a great surprise to the market prompting the Oriental Economist [See: Oriental Economist, March 1978, p.10] to ask whether this marked the beginning of a new trend in the structure of Japanese industry. Despite the deteriorating market conditions and the near failure of many companies, the usual rescue patterns have re-emerged implying that the Eidai bankruptcy was exceptional.

As with the allocation of resources and income, the market allocation of risks are not immutable. Extensive networks of institutional facilities exist for this purpose and are essentially common to all corporate economies. These include such risk re-distributing institutions as the stock market, insurance markets, and forward markets. Most corporate economies also share the same regulatory framework, having the same legal measures such as bankruptcy laws and limited liability status. Despite these institutional similarities, major differences are observable in the scope for risk sharing and the same institutions in different countries may perform very different functions and allow varying extents of risk re-distribution. The stock market, for example, can also allow margin trading, the issue of convertible bonds, and options trading, all of which influence the resultant allocation of risk bearing. In Japan, while extensive margin trading exists and convertible bonds are popular, no widespread precedent for option trading has arisen.³ In any case, the value systems which underlie economic relationships differ from one country (or culture) to another. Therefore, over-riding welfare considerations justify intervention to effect a socially desirable distribution of risk bearing.

³It is interesting to note that, although margin trading has been allowed since the early 1950's, it is strictly regulated. Trading is allowed only on shares of first section firms; the permitted time-lag between contract and settlement is circumscribed; foreign investors are prohibited from participating and margin terms and requirements are under the constant and vigilant supervision of the Ministry of Finance.

Perceptions of the correct distribution of risk bearing are influenced by historical, socio-political, and geographic⁴ realities which can be collectively described as the prevailing industrial philosophy. These differ significantly among countries and although manifested primarily in a behavioural context they become institutionalized over time into what might be called the super-environment of the system. From among many, in this section we focus on three such special institutions which feature prominently in influencing the unique allocation of risks in Japan. These are: the role of human relations, inter-corporate ties known as the keiretsu system, and the function of industrial policy.

B. HUMAN RELATIONS. Much has been written about the Japanese system of values which influence industrial organization in that country.⁴ Human relations in modern Japan owe a great deal to the Confucian legacy continuing from Tokugawa times, according to which society was classified into strict hierarchical stages and conduct regulated by prescribed codes of behaviour centered on the principle of respect for and subservience to authority. Another feature of this legacy was the subordination of the individual to the collectivity, a notion which found expression in the view of the House (ie) as an entity transcending its members, and in the face of which the

⁴ See: R. Benedict, The Chrysanthemum and the Sword: Patterns of Japanese Culture (Houghton Mifflin, 1946); see also: C. Nakane, Japanese Society (Berkeley: University of California Press, 1970).

interests of the individual are secondary. Human relations also owe much to the common historical experiences of the realities of economic life in Japan - such as the critical dependence on imports of food and raw materials on the one hand, and the constraints of foreign exchange availability on the other. Two important areas directly relevant to the question of risk sharing which human relations have greatly influenced in Japan are labour-management ties and business-government intercourse.

Identification with and transfer of the allegiances traditionally reserved for the House to the corporate entity was but a logical extension of the development of the corporate form of organization. Employment relations in Japan draw heavily on the system of values inherent in the Confucian legacy and on the historical realities of Japan's unique experience. The harmonious co-existence of management and labour is on the one hand buttressed by the principles of corporate paternalism and the reciprocity owed by the members to it; and on the other hand by the mutual recognition of the ultimate inter-dependence of management and labour in view of the over-riding importance of the common national identity.

There is much in the Japanese system of corporate employment which would appear to make the costs of labour fixed.⁵ These include the provision of life-time employment

⁵See: W. Galenson and K. Okada, "The Japanese Labor Market" in Asia's New Giant, for a summary of the characteristics of the employment system, the process of wage determination, and the nature of the personal commitment.

tenure to a substantial proportion of employees, a seniority wage system whereby promotion is directly correlated with age and length of service, and the extended scope of corporate responsibility - to such key matters of private life as housing, education and training, health care, and even leisure.⁶ The fixed nature of the corporate commitment to labour has an interesting converse which influences the spreading of risks in the economy. It is the firm specific nature of labour's investment in human capital. Bankruptcy erodes the capital value of this investment which typically constitutes the largest capital asset owned by the worker. Consequently, labour serves as an effective partner to shareholders in the absorption of ultimate and residual risks. It consequently provides a cushion - however small

⁶ The above is a stylized characterization intended to highlight the features of the Japanese system of life-time employment. A similar interpretation has been adopted by such writers as J.G. Abegglen [The Japanese Factory (Glencoe: Free Press), 1958], E.F. Vogel [Japan's New Middle Class, (Berkeley: University of California Press), 1963], and R.P. Dore [British Factory: Japanese Factory - The Origins of National Diversity in Employment Relations, (Univ. of California Press) 1973]. It would, however, be incorrect to regard this as being descriptive of a ubiquitous practice. Undoubtedly economic realities, such as pay, perceived promotion chances, technical competence play a critical part in the determination of the employment commitment. Marsh and Mannari [R.M. Marsh and H. Mannari, "Divergence and Convergence in Industrial Organizations: The Japanese Case", in J. Dlugos and K. Weiermair Management Under Differing Value Systems (Berlin: Walter de Gruyter) 1981] have, over the course of numerous studies, stressed the importance of the economic factors. There can, moreover, be little doubt that the trend of events is towards convergence of Japanese employment patterns to those of comparable corporate economies. However, even if diminishing these special features of the Japanese system and can not be neglected in a discussion of the factors introducing an element of flexibility into the risk bearing potential of the economy.

the net effects may be - against the ultimate risk of bankruptcy.

That labour unions in Japan are characteristically organized along company rather than trade lines and display both a recognition and sharing of the basic goals and interests of the company; that wage demands are usually moderated by unions according to the ability of the company to pay, so as not to impair the company's long run development; that (symbolic) wage cuts by both labour and management are not uncommon; and that the wage system is supplemented by a bonus system which is directly related to the state of corporate performance are all manifestations of the same risk absorbing phenomenon and serve to introduce major elements of flexibility into the employment system.⁷

Equally important as harmonious labour relations, from the point of view of companies, are the avenues for dialogue and interaction between them and the government, best characterized by the extra-ordinary capacity for cooperation which they produce and which has won such epithets as "Japan Inc."⁸ In many respects the concerted identity, which the business community acquires through the

⁷For a discussion of the strengths and weaknesses of enterprise unions see: H. Kawada, "Workers and their Organizations" in K. Okochi, B. Karsh, and S.B. Levine, Workers and Enterprises in Japan, (Tokyo: University of Tokyo Press, 1973).

⁸See: E.J. Kaplan, Japan: The Government Business Relationship (A Guide for the American Businessman) U.S. Department of Commerce, 2/1972; and also: OECD, The Industrial Policy of Japan (Paris: OECD), 1972.

leadership of the zaikai (the business elite), firmly places it as the third member of the ruling triumvirate along with the Diet and the Bureaucracy. The involvement of the business community at the highest levels of decision making in government arises from an intricate network of ties ranging from old-boy connections to the financial support of large numbers of politicians.⁹ The active participation by the business community in the many deliberation councils accounts in no small measure for the successful implementation of industrial policy. The opportunities provided for dialogue and consensus in policy making have a further implication. They provide, apart from the well known avenues for business community involvement in the formulation of industrial policy, opportunities for the exchange of information. Membership of the tax and tariff deliberation councils, for example, allows business investment plans to be formulated with reliable knowledge of the effects of tax concessions and liberalization or protection measures being planned. Not unrelated to this is the practice of amakudari or the placement of retired government officials in key industry posts, which also serves to remove important elements of uncertainty from the system.

Another feature of human relations in Japan which influences the distribution of risks is the extent to which Japanese industrial philosophy tolerates the appropriation by

⁹These are discussed by: C. Johnson, MITI and the Japanese Miracle, (Stanford: Stanford University Press) 1982; see especially chapter 2 (The Economic Bureaucracy).

one party alone of the attendant advantages of bilateral relationships. This tolerance is exemplified by the liberal attitudes shown towards the whole question of monopoly.¹⁰ The substantial revisions and relaxation of the Anti-Monopoly Law drawn up by the occupation powers were among the first pieces of legislation enacted by Japan's newly independent government.¹¹

One example of the risk shifting potential of this tolerance is illustrated by the inextricable ties - based on ownership, buyer-seller relations, and technological dependence - which bind major Japanese companies with their subsidiaries and sub-contractors. These provide effective channels for the parent firms to shift both financial and technological risks onto their subordinates. The latter relieve the parent company of financial burdens in the course of their business; by extending credit, accepting inventory build-ups, absorbing fluctuations in demand, and adjusting costs; thereby providing the parent company with another cushion against bad times. The scope for risk shifting through subsidiaries was greatly enhanced by the absence of legal requirements, until the late 1970's, for companies to prepare consolidated statements of account. Furthermore, the relative independence of sub-contractors

¹⁰ See: M. Matsushita, "The Anti-Monopoly Law of Japan", Law in Japan, vol. 11, 1978; see also: K. Sanekata, "Administrative Guidance and the Anti-Monopoly Law"; Law in Japan, vol. 10, 1977; pp. 65-80.

¹¹ For a discussion see: E. Hadley, Antitrust in Japan, (Princeton: Princeton University Press), 1970.

and subsidiaries from keiretsu obligations which bind the parent company enable them (the subsidiaries) to solicit profitable new business for the parent and relieve it of the burden of support during difficult times.¹²

C.KEIRETSU GROUPS. Next we consider the role of the inter-corporate groups known as keiretsu. We focus on the group ties which serve not only to suppress risks of business losses but more importantly to avoid bankruptcy when failures occur.

The virtual absence of bankruptcy among major Japanese firms does not imply that businesses do not come upon hard times. In fact, because of the high growth profile of the economy and the relatively high ratio of fixed costs Japanese companies appear highly vulnerable. In 1980, consequently, no less than 28 companies (out of approximately 1000) listed on the first section boards of the major stock exchanges were undergoing corporate reorganization or reconstruction. Typically, when the threat of business failure becomes serious rescue efforts are organized, by group companies and banks, serving to break the link of inevitability which normally leads to bankruptcy.¹³

¹²See: M.Y.Yoshino, Japan's Managerial System: Tradition and Innovation (Boston: MIT Press), 1975.

¹³The rescue of Maruzen Oil by the Sanwa Bank, Honda Motors by the Mitsubishi Bank, Showa Denko by the Fuji Group, Sumitomo Coal Mining by the Sumitomo Group and Toyo Kogyo by the Sumitomo Bank are but a few well known examples of the rescue of major (first section corporations) in the postwar period.

Keiretsu group ties characterize Japanese industrial structure today in much the same way as the zaibatsu combines characterized pre-war industrial structure. Through their networks of vertical and horizontal ties, direct keiretsu affiliations embrace over two-thirds of all listed Japanese firms. Of the six major keiretsu groups almost all have zaibatsu connection in one form or another.¹⁴ Three of them are essentially industrial groups which are descendants of the major zaibatsu combines - Mitsubishi, Mitsui, and Sumitomo. The other three are bank based groups whose group identity arises from their common financial interests resulting from their relations with a common bank. The Fuji group is the Yasuda zaibatsu which historically stood apart from the other three main zaibatsu groups by concentrating on banking and finance rather than industrial strength. The Dai-ichi Kangyo Bank (DKB) group was formed through the merger of two zaibatsu banks - the Dai-ichi Bank which belonged to the Shibusawa zaibatsu and the Kangyo Bank group, and incorporates within its ranks three industrial groups (Furukawa, Kawasaki, and the old Kangyo Bank group) all of zaibatsu origin. Only the Sanwa Bank group has somewhat tenuous zaibatsu connections.

The principle on which the zaibatsu groups thrived was the internalization of an otherwise vast network of arms-distant transactions in a system of joint oligopoly intended to achieve the goals - presumed to be profit maximization -

¹⁴These groups are: Mitsubishi, Mitsui, Sumitomo, Daiichi Kangyo, Fuji and Sanwa.

of the holding company at the top of the hierarchy. To the world outside, they presented one united front taking advantage of both monopsony and monopoly powers; and internally, through a system of transfer prices, they ensured the allocation of resources and returns considered most desirable by the holding company. The chief implications of this were that the different subsidiaries, although independently incorporated, effectively served as departments within a larger corporate system.

The zaibatsu groups had been connected together in pyramid structure under a holding company which appeared at the apex and controlled through a common ownership base, financial interdependence, managerial control through appointment, and centralized procurement and sales. In order to preserve absolute control by the families and holding companies, the zaibatsu groups attached importance to vertical ownership ties and effectively proscribed horizontal inter-subsidiary share-holding. In the Mitsui group, for example, group ownership in Mitsui Petrochemicals, Shipbuilding, and Warehouse, was respectively 100%, 100%, and 93%. Of these totals, the family and holding company held all the shares of the first two companies and 83% of the shares of the third. As a result post-war efforts to dissolve the zaibatsu combines concentrated primarily on the zaibatsu family holdings and those of the holding companies which formed the apex of the pyramid of control.¹⁵ Ownership ties in the keiretsu groups,

¹⁵See: E. Hadley, chapter 11.

therefore, became dependent only upon inter-corporate shareholdings which historically had been of relatively minor significance. In order to avoid any resurrection of the dissolved structure, strong legal restrictions were imposed on industrial structure. Holding companies were forbidden by law. Financial institutions were restricted to shareholdings of less than 10% in any non-financial corporation and 5% in any competing financial institution.

The consolidation of group ties within the post-war legal framework has been pursued vigorously.¹⁶ The keiretsu groups can now be said to have a new integrated identity based on structural linkages of a very different kind to those which bound the zaibatsu groups. The extent of consolidation activity is apparent when we compare the figures for group ownership in each corporation as reported by Hadley in 1966 with their more recent magnitudes. She estimated average group holdings in each major Mitsubishi, Mitsui, and Sumitomo corporation as 20.2%, 16.5% and 26.6% respectively.¹⁷ As of 1981, the same ratios were 24.3%, 22.5%, and 27.3% respectively.¹⁸ Intra-group shareholding in the three other bank based groups, however, stand at much lower levels--averaging about 14%-- although they too have been on the increase. These ownership figures, interpreted in -----

¹⁶See: Y. Miyazaki, "Excessive Competition and the Formation of 'Keiretsu'", in K. Sato (ed.) Industry and Business in Japan, (London: Croom Helm, 1980), pp.53-73.

¹⁷See: E. Hadley, chapter 11.

¹⁸These ratios, and all subsequent ones given for 1981 below, were calculated from shareholder lists published by Toyo Keizai Shimposha.

the light of the study of control types in modern corporations by Berle and Means,¹⁹ and more recently by Larner,²⁰ indicate unequivocally the presence of minority control in the vast majority of Japanese companies in contrast to the predominance of management control in the U.S. When control is the object of study, relative shareholdings may be even more important than absolute amounts. Of the top twenty shareholders of each firm, group members account for about one-half. The remainder is divided among non-group companies having business ties with the firm - among which other financial institutions rank prominently - but without any affiliation to one another. Among the top twenty shareholders of each firm, average shareholding by each investor is 2.6% giving the group, collectively, definitive control.

Intra-group ties are solidified by the common thread of ownership entrenched in the hands of the group financial institutions and the respective trading companies. In the zaibatsu-rooted groups the financial companies of the group present a small core of firms capable of much greater joint action and coordination. Each group has four financial companies - a bank, a trust company, a life insurance, and a marine and fire insurance company. In these companies, with the exception of the life insurance ^{enterprises} which are organized as

^

¹⁹A. Berle and G. Means, The Modern Corporation and Private Property (New York: Macmillan, 1932).

²⁰R. J. Larner, "Ownership and Control in the 200 Largest Nonfinancial Corporations, 1929 and 1963", American Economic Review, September 1966, pp. 777-787.

mutual companies, relative concentration of group ownership - despite the greater legal restrictions on shareholding by competing financial companies - is greater than in the non-financial companies. That is, the financial companies of the group are more closely held by the group than the non-financial ones.²¹ Together the four financial companies of each group hold an average of 18.4%, 18.0%, and 15.2% of the shares outstanding of the Sumitomo, Mitsubishi, and Mitsui group companies. The indications are that the group banks and trading companies have emerged into positions of leadership - largely responsible for coordinating functions in the groups.

Control is, probably, best reflected through interlocking linkages of directorates. In Japan corporate boards are essentially internal to the company. That is, they are staffed by full time executives of the firm who are engaged in its day to day operations in their capacity as managers. The prevalence of internal directors can be traced to the post-war purges of high officers of the zaibatsu combines and the pressing needs at the time to replace the expelled officers and continue with the management of the firm. The particularistic structure of relationships upon which the Japanese board is comprised as well as the features noted above, however, delegate the external decision making functions - those which commit the firm to undertakings with

²¹We must stress "relative" because much greater absolute diffusion of shareholders can be found among financial companies.

others - to a small group of individuals legally referred to as the representative directors. Group influence is, therefore, less likely to be overt and exerted in the board meetings, and more likely to be behind the scenes and exerted through the key positions.

Hadley reported that in 1966 only 11 out of 22 major Mitsubishi companies had interlocking directorates.²² In 1982, 22 out of 23 companies represented on the President's council had interlocking directors on their boards. Of the total of 632 seats on the boards of these 23 companies 554 (or 87.6%) were held internally, 73 (or 11.6%) seats were occupied by directors representing group companies and only 5 were held by directors representing companies (or banks) from other groups. In the Sumitomo Group only 13 of 19 companies have group directors on their boards occupying 9.7% of the seats available and in the Mitsui Group only 14 of 22 firms have directors from group companies holding an average of 3.5% of each board. Although these may appear low Hadley reported only 4 interlocks in the Sumitomo Group and only 3 in Mitsui. By contrast to the independence which management has during successful times, group influence is effectively expressed through management interlocks when business failure occurs. The boards of companies under reconstruction are weighed heavily by directors dispatched from group companies and banks. Among the 28 companies under reconstruction 40% of the total seats on their boards are -----

²²E. Hadley, chapter 11, pp.249-56.

occupied by dispatched directors consistent with ownership ties. 37% of these are occupied by directors representing banks.

In the absence of the strong vertical controls exercised by the holding companies of the zaibatsu groups - standing at the apex of the pyramid of group control - and in view of the fact that each group member is an independent corporate entity, the main avenues for group coordination among the group members are the systematic and multi-tiered intra-group contacts which take place. The best known of these are the presidents' clubs of the six main groups which range from informal exchange of information to coordination of group efforts. The notion of collectivity which is so basic to the Japanese way of thought and association inculcates a sense of groupism which provides the basic cohesive force for group solidarity. Moreover, because of the particularistic structure of relationships within management and the delegation of key decision making matters to the representative directors, influence and coordination of efforts in Japan are less likely to be exerted overtly than behind the scenes and through personal contacts. The so-called clubs provide just the necessary venue for such contacts.²³

²³For a discussion of the activities of these clubs as well their over-riding common identity see the following surveys of the groups in the Oriental Economist: Mitsubishi Group, December 1980, pp.6-43; Mitsui, May 1981, pp.10-41; Sumitomo, October 1981, pp.12-40; Fuyo, February 1982, pp.14-51; DKB, April 1982, pp.14-47; and Sanwa, September 1982.

Intra-group meetings have in recent years been extended to the middle-management level where the greatest responsibility for day to day running of the firm is vested and the scope of these meetings ^{is} on the increase. The result of this has been a noticeable increase in joint group undertakings in such diverse areas as overseas investment projects and major research and development efforts. The significance of group solidarity is best illustrated in an

interview given to the Oriental Economist by Ichiro Isoda, President of the Sumitomo Bank and co-ordinator of the Hakusui-kai president's club, to the effect that no group member would be allowed to ever go into business default.²⁴

Dependence by zaibatsu companies on the group banks was over-whelming in the pre-war period. This dependence has been greatly reduced in the keiretsu groups. Examining the dependence on loans from keiretsu group banks we find that average dependence on the group bank, which is generally the largest supplier of borrowed funds, is only 16.4%, 14.0%, 16.8%, respectively in the Mitsubishi, Mitsui, and Sumitomo groups. These ratios have been declining continually in the post war period. Most significantly dependence does not appear to alter in any systematic way when a company undergoes reconstruction.²⁵ This means that all the various lenders continue their policies unaltered during reconstruction. Nor is there any evidence of individual

²⁴See: Oriental Economist, Oct. 1981, p.21.

²⁵Based on the study of changes in the pattern of shareholdings and structure of bank loans before and after reorganization.

shareholders, even the very largest, influencing the lending behaviour of banks. Shareholdings in banks appear to be motivated by portfolio considerations. In the Mitsubishi Bank, for example, the largest non-financial shareholder (Mitsubishi Heavy Industries) acquires only 9.3% of its total borrowings from the Bank. In the Mitsui and Sumitomo Banks, the largest non-financial shareholders (Toyota and Matsushita respectively) had no borrowings at all. Moreover, no representation by non-financial group companies appears on any of the respective bank boards.

The structure of borrowing ties, therefore, can hardly account for any re-allocation of either returns or risks within the group. Clearly the internalization which characterized risk suppression in the zaibatsu groups is lacking. The keiretsu groups are not the closed systems which their zaibatsu predecessors were. Nevertheless, within the post-war structure of industry the groups provide an important risk sharing function, quite apart from that made possible by the coordination of their activities. They enable the causal links between business failure and bankruptcy to be severed.

The avoidance of bankruptcy requires the absorption of some dead weight financial loss as well as the commitment of additional funds to the company. The provision of additional funds requires that the present value - given the risk attitudes and expectations of the provider of the funds - must justify the additional costs. The present value calculations (or any other that might be used) require the

formulation of a precise and accurate plan for reconstruction. An integral element of reconstruction is reorganization which often takes the form of a thorough change of management. Consequently, a conflict of interests can normally be expected between management who were the architects of the company's previous plans and the suppliers of additional credit - which we may conveniently identify as a bank. In the corporate scheme where management is autonomous from shareholder control - as is typically believed to be the case in the U.S.- the opportunity set for mutual agreement between the bank and management is therefore circumscribed. In Japan, however, management is not autonomous. Not only is it controlled by a coalition of shareholders but that coalition happens to be, typically, the supplier of funds, and shareholders, because of the residual nature of their claims, always find it in their interests to cooperate with the banks in reconstruction. The opportunity set for mutual agreement is therefore greatly expanded.

D. INDUSTRIAL POLICY. However important and effective group ties may be, the keiretsu groups are not a closed system. The role of government, as manifested through the implementation of industrial policy, is the ultimate factor in suppressing the risk of business failure and avoiding the occurrence of bankruptcy. The growth policies adopted by Japan in the post-war period negated the classical prescriptions of economic development to specialize in keeping with the factor proportions outstanding. Instead,

efforts were made - under the supervision of the Ministry of International Trade and Industry (MITI) - to concentrate on high technology, high income elasticity of demand industries having global growth prospects. Consequently the market mechanism could not be expected to correctly and adequately signal resource allocation and had to be supplemented by appropriate intervention to nurture the growth of the strategic industries. Industrial and trade policy were formulated and executed with this over-riding priority in mind. Government policy and intervention take both direct and indirect forms.

Direct government intervention is rare but not without precedent. A recent example is the fate of the Mitsui Group's Iran Japan Petro-chemical Company (IJPC) which ran into severe difficulty as a result of the Iranian Revolution (1979) and the Iran-Iraq war which followed. In consequence of these difficulties the estimated cost of the project which had originally been only 130 billion yen had to be revised over and over again until by November 1980 it had reached over 800 billion.

The Mitsui Group, quick to recognize the enormity of its problems, sought the intervention of the Japanese Government and in October 1979 the Cabinet approved government funding for the project. Government participation, through public financial institutions or Treasury funds in private investment projects, was not new. The significance of the commitment lay in the fact that the

project was originally embarked upon by the Mitsui Group which intended to bear all of the risks arising. Then, faced with a potentially dangerous situation, the Government stepped in to accept part of the risks.²⁶

This case, and direct government intervention, generally, serves more than anything to confirm the existence of a government safety net underlying industry. Recourse to such drastic action, however, is seldom necessary. Active involvement of the government normally takes more subtle and indirect measures. We now proceed to consider these.

At least three elements of a coherent and well-defined government industrial policy can be identified. These include : trade and protection policy, industrial structure policy, and financial policy.²⁷

Industries and companies which came under the category of strategic industries were guaranteed protection and -----

²⁶Interesting insight into the operation of the Government policy is indicated by the fact that the target funds demanded by Mitsui were not provided by the Government. It provided only a fraction of the funds - through the Overseas Economic Cooperation Fund and the Industrial Bank - but arranged for the remainder to be raised from private channels through expanded equity participation. Industries involved with oil and likely to be affected by the outcome

support. Protection took the form on the one hand of insulating domestic industry from the threat of foreign competition and domination by foreign capital. Foreign competition was thwarted by an over-lapping system of quotas, tariffs, and other non-tariff barriers. Fear of domination by foreign capital posed a number of problems. Portfolio investments were resisted because the imbalanced financial structure of Japanese companies - arising from their heavy dependence on borrowed funds - and the low price earnings ratios which generally prevailed made companies highly susceptible to foreign take-overs. Protection of industry from direct investments was even more difficult because of its greater public visibility. Liberalization measures met with heavy procrastination by MITI. Even by the late 1960's the only industries which had been 100% liberalized were such industries as ice-cube making, sake brewing, and geta manufacturing in which foreign investment was improbable. Furthermore, partial liberalization was restricted to those industries in which major Japanese companies occupied in excess of 50% of market share, and even then major restrictions were imposed.²⁸

Fear of domination by foreign technology lead to the Foreign Investment Law stipulating that foreign technology would be acceptable only insofar as it contributed to the "self-support" of the economy. MITI also feared that the

²⁸ Even in such an industry as television ^{manufacture} where Japan has long had strong comparative advantage, ^ direct foreign investment was restricted to monochrome sets and prohibited from utilizing integrated circuit technology.

bargaining power of monopolistic suppliers of technology confronting a large number of domestic applicants would prove detrimental to national interests. Its screening of applications for the import of technology enabled it to enhance the bargaining power of Japanese companies by converting the original monopoly position into one of bilateral monopoly.

Protection has provided Government with a double edged sword. The threat of its removal and the selective sanctions at its disposal served to prevent the isolation of Japanese industry in a hot-house environment.^{29,30}

Another instrument by which industrial policy reduced the risks of business failure was through rationalization policy. Efforts to rationalize industry concentrated on the formation of cartels and the promotion of mergers. Although the Anti-Monopoly Law (article 24) permits the establishment of both temporary recession and rationalization cartels, these were under the scrutiny of the Fair Trade Commission

²⁹It should be stressed that, although major steps have been taken in liberalizing Japanese trade barriers, protection continues to be an important (but less frequent and less apparent) tool for the support and nurturing of a strategic industry - as exemplified by the protection extended to the computer industry in recent years.

³⁰The automobile industry provides a good example of the selective controls of technology. Initially, during the early 1950's contacts were for the universal transfer of technology - such as between Nissan and Austin or Hino and Renault. Gradually license agreements were restricted to specific technology while in the mean-time MITI actively sponsored and encouraged domestic R&D. For a discussion see: C.S. Chang, The Japanese Auto Industry and the U.S. Market, (New York: Praeger) 1980.

(FTC) and so proved of little interest to MITI. It concentrated instead on special law cartels which had no a priori restrictions imposed on their scope and were not subject to FTC control.³¹

Much experience in operating cartels was acquired during the 1930's when at least 26 major industries were *under control*. The critical problem of enforcing adherence was overcome through government direction. The function of cartels as a defensive measure to prevent business failure became important in the mid-1970's when due to the structural changes in world demand and the Japanese economy many growth industries of the early post-war period became stagnant. In 1978 the Depressed Industries Stabilization Law was passed which recognized such major industries as textiles, aluminium, ship-building, steel, and fertilizers as depressed industries qualifying for cartelization. Probably the best characterization of the role of industrial policy in preventing business failure would be to describe some of the main features of the cartels that consequently were formed.

To illustrate we focus on the ship-building industry which was one of the four industries marked for special reconstruction immediately after the war and served as a show-piece growth industry until the first oil crisis of 1973. Following the oil crisis, the industry suffered

³¹For a discussion, see: H.Ueno, "The Conception and Evaluation of Japanese Industrial Policy" Japanese Economic Studies, Winter 1975, pp.6-38.

heavily as a result of the glut in the world tanker market. Total tonnage launched in 1978 amounted to only about one-third of the 1973 level, and the Japanese share of the world market fell from around one-half to under one-third. Capacity reduction and rationalization were considered essential for the survival of the industry but no mutually acceptable solution was forthcoming ~~from~~ the members of the industry themselves. Only after MITI and the Ministry of Transport intervened to form a cartel supported by law, was a mandatory 35% cut in total output successfully imposed and apportioned among the member firms.

The two major obstacles faced were the problem of the dislocation of workers which in consequence of a one-third cut in capacity implied a reduction in the total industry workforce of about 50,000 persons and the problem of disposing of idle plant capacity. The heaviest burdens of cut-backs were allocated to the largest firms because of their keiretsu ties and the relative ease with which they could transfer surplus workers to other divisions or group companies. Hitachi Shipbuilding successfully passed on over 2000 workers to its keiretsu company Hitachi Ltd; and Mitsui Shipbuilding transferred a similar number to Toyota which was a keiretsu company with labour shortage.

The problem of idle capacity was complicated by the fact that most companies had their physical assets placed as collateral with banks against their borrowings. The destruction of plant capacity would have affected their credit lines. To solve this problem, a credit guarantee

fund--amounting to 10 billion yen-- was established with 80% participation by both public and private banks. The fund was available for companies to draw upon for releasing their pledged assets without affecting the credit available to them by offering the guarantees of the fund in lieu of the capital pledged as collateral.

Merger policy has actively been pursued as an instrument of industrial policy to rationalize industry. This acquired particular importance in view of the closely held nature of most Japanese firms which made them unsuitable for corporate take-overs. As regards bankruptcy risks, merger policy has had three important consequences. First, it served to expand and consolidate group ties. This applied not only to the re-formation of the pre-war majors which had been subjected to dissolution measures but also provided an opportunity for group ties to be expanded and consolidated through the acquisition of new members. The re-formation of such giants as Mitsubishi and Mitsui Trading, and Mitsubishi Heavy Industries which had been the object of special dismemberment endeavours, typified early post-war efforts. The process, moreover, has been continuing--as exemplified by the merger record of Kawasaki Heavy Industries in the 1970's.

Second, it provided an instrument for the formation of an industrial structure compatible with MITI's perception of internationally viable and competitive industries. Despite considerable efforts exerted by MITI, merger policy,

especially in successful industries with good growth prospects, met with strong resistance from the companies involved. In the automobile industry, for example, MITI sought to rationalize what it considered to be a fragmented and sub-optimally scaled industry by organizing all the member firms around the two major producers - Toyota and Nissan. Of the many mergers which it attempted to engineer only three were successfully consummated^m and among these the largest and most important - between Nissan and Prince - was motivated to a great extent by the financial difficulties and risk of failure which threatened the latter.³¹ The willingness to conform to rationalization policy through mergers became widespread, however, as the depressing effects of structural changes came to be increasingly felt in the the growing number of stagnant industries.

Finally, mergers also provided a means for companies experiencing business failure to avoid bankruptcy although thier significance in the context was circumscribed by the fact that group ties based on the one-set principle³² make

³¹Administrative guidance served as an important instrument for MITI, although it did not always command the obedience which the monetary authorities were able to. The effectiveness of administrative guidance depends critically upon the sanctions to punish non-compliance. Industry did not always perceive the sanctions - usually of a negative nature - at the disposal of MITI to be of critical importance.

³²One setism refers to the operational principle adopted by the Keiretsu groups whereby each^{only} would arrange to be represented in each industry by a single representative company so as to take full advantage of diversification opportunities without generating intra-group competition, while avoiding any gap in the spheres of business available to the group.

inter-group tie-ups difficult while intra-group tie-ups of unprofitable companies with poor prospects are effected well before the threat of bankruptcy becomes real. Nevertheless mergers do provide an opportunity to circumvent bankruptcy as was recently demonstrated by the highly publicized merger between C.Itoh and Ataka.³³

Next, we direct our attention to the financial aspects of industrial policy. The financial instruments available to the authorities are, arguably, the most potent weapons of industrial policy. Moreover, through them the Government also exercises considerable financial control over the banks which are at the hub of the keiretsu system. In the exercise of this control it has assumed the role of the ultimate underwriter of risks arising from corporate debt.

Whatever the underlying causes of the dual phenomena of corporate over-borrowing and bank over-lending, the monetary authorities effectively utilized the prevailing characteristics of the system not only to achieve the traditional monetary goals but also in direct pursuit of the goals of industrial policy, by ensuring the provision of adequate funds required by strategic industries at concessional terms. There is no question that, had financial intervention in this manner not been extensively applied and

³³Ataka had been a medium sized trading company which, as a result of speculative trading by its American subsidiary, had incurred around 200 billion yen in debts and was threatened by imminent bankruptcy. The absence of any strong group identity or ties denied it any major source of support and rescue. It was only after considerable pressure from MITI and extensive compromise of interests that a merger with C. Itoh was finally arranged.

had market forces been left with the allocation of funds, the growth of priority industries would have been severely hampered.

Two common instruments of monetary policy - open market operations, and the control of reserve ratios - were rejected in favour of loan and discount policy as the major tool of monetary control. This provided for selective and discriminatory control over both the volume and terms of credit extended. A third major instrument was administrative guidance which because of BOJ jurisdiction over the banking community and because of the direct sanctions which it could apply through its lending policy provided an important weapon in the arsenal of monetary control. It provided the bank with the opportunity of regularly examining corporate lending policy and applying restrictive guidance to achieve the fine-tuning required for the success of industrial policy.

Government intervention using combinations of all the above financial instruments has often been applied to saving companies in trouble, too. The principle of such intervention was established when the BOJ intervened in support of Toyota, the leading member of the automobile industry. During the severe deflation in the early post-war years, Toyota found itself in financial trouble - and threatened by bankruptcy - resulting from high levels of customer defaults and the growing strain of accumulating inventories. The BOJ successfully negotiated a financial rescue package, on behalf of the company, with its two main

banks - Mitsui and Tokai - ensuring its survival.

Government intervention also occurs through public financial institutions which supplement the private institutions in the provision of funds to industry. Their importance is greatly disproportionate to their size because of their ability to direct funds into select areas where the risks involved proscribe the flow of private funds, and because of the indicative nature of their lendings. The most important government institutions are the two banks - the Japan Development Bank (JDB) and the Export Import Bank (EXIM). Both banks and the other finance and loan corporations draw their funds, for the most part, from the Trust Fund Bureau which collects the massive savings - comparable in amount to the total personal deposits of all banks - accumulating in the postal savings and insurance system. The capital in these institutions is wholly subscribed to by the government.

The JDB is the biggest of the government financial institutions and comparable in size of loans to an average city bank (with 6,300 billion yen - about \$31 billion - in loans outstanding as of the end of 1982). The bank's significance today arises both from the signalling effects of its lending policies and its role as a bank of last resort. Because of the important indicative nature of its lending the bank has increasingly concentrated on dispersing its limited resources as widely as possible with extensive use of joint loans in conjunction with private institutions,

and also by guaranteeing private sector loans raised by its customers. An industry or development project favoured by JDB funds is known to be an indispensable element in industrial policy and to have MITI's support firmly behind it. It could therefore be considered effectively free of default, a fact which greatly facilitated the flow of private funds into high risk areas.

The EXIM bank, also the size of a typical city bank, supplements the availability of finance for exports, imports, and overseas investment credits. Its functions include both subsidization of industry and suppression of the heavy financial risks involved in international trade which deter private financial institutions from making adequate funds available. In the depressed shipbuilding industry, for example, the commitment of funds by the bank doubled between 1980-81.

Moreover government intervention firmly established the principle that banks would never be allowed to fail. This view was incorporated implicitly into the Bank of Japan Law (article 25) which specifically allows the BOJ to intervene appropriately to support and maintain the financial system. This mandate makes the Bank indirectly responsible for the rescue of industry. Historical precedent for the special status of banks and the use of financial institutions as a conduit for the absorption of private sector risk was demonstrated by government policy in the aftermath of the 1923 earthquake. On orders of the BOJ all debts which had fallen due during the closure of the

banking system after the disaster were re-financed with the BOJ agreeing to underwrite any losses incurred by banks. Although inherent weaknesses in the banking system led to the collapse of the Government on that occasion, the principle of government underwriting was firmly established.

The same principle was confirmed when Article 25 was invoked by the BOJ for the first time to rescue the Yamaichi Securities Company. During the rapid growth of the stock market in the early 1960's Yamaichi pursued an aggressive policy of trading on own account and accumulated a vast portfolio of shares in growth companies, the fall in value of which during the 1964-5 recession left it with enormous debts and on the verge of default. The BOJ, citing the emerging crisis in market confidence, intervened by arranging for unlimited and unsecured credits to be extended on favourable terms by the city banks and guaranteed by itself.

Finally another notable feature, referred to in an earlier section, is the role played by the special securities companies in support buying of shares of companies threatened with business failure. The support buying, by preventing the market valuation of companies from falling, makes a major contribution to relieving the risks associated with a run on company stocks when a confidence crisis develops. They also are of great benefit to reconstruction efforts when corporate re-organization becomes essential.

Support buying was institutionalized in the prolonged

and severe recession of 1965 when two organizations were separately formed--one by the main banks and the other by the major security companies themselves--to prevent large fluctuations in share values resulting from the possible collapse of investor confidence. Within a matter of a few months after their formation, the Japan Joint Security Company and the Securities Holding Association acquired almost 400 billion yen worth of corporate shares which they held until recovery was well established and then divested in such manner as to create stable investors for the companies--an effort which significantly contributed to the present patterns of shareholding. Both organizations have been succeeded by the Japan Securities Clearing House (JSC) which, owned and operated by the Stock Exchange, has assumed responsibility for maintaining stock market stability and support buying of shares of companies which fail to prevent serious deterioration in their market values, while rescue efforts are being organized. As of 1981, of the 28 first section companies undergoing reconstruction, JSC ranked among the major (top ten) shareholders of 21 and ranked as the largest shareholder in 6.

The picture which emerges to explain the absence of bankruptcy among large groups of Japanese firms is the existence of a government safety net underneath industry. Government's adoption of a growth and development strategy which could not be left to market forces made it responsible for seeing it through to its successful accomplishment.

5. SUMMARY OF SOME TESTS OF JAPANESE CAPITAL MARKETS

In this section we review the results of some empirical studies on the operation of Japanese capital markets. The scope of such studies, in Japan, is restricted by the peculiarities of the system of corporate finance. Option pricing literature, for example, is non-existent because option trading has not existed on any large scale. Takeovers, too, are virtually absent and merger studies focus on factors other than corporate performance on the stock exchange.

Two areas of capital market theory which have received attention in empirical studies have been the tests of the various models of capital asset pricing (based on the CAPM) and the question of capital market efficiency tested by means of the efficient markets hypotheses. Both are directly relevant to our interest in the MM leverage theorem.

With regard to the CAPM, we know from the discussion of Part I that it provides a set of sufficient conditions for the operation of the MM theorem even when capital markets are incomplete and bankruptcy risks are real.¹ In a CAPM type world or in any of the auxiliary models (such as the market line) which imply that investors hold the market portfolio of risky assets, all investors are characterized as holding perfectly balanced portfolios. Then, any financial changes would affect the debt and equity holdings

¹See the discussion of Part I Section 5.

of all investors symmetrically, leaving them indifferent to the changes. It may therefore be said that the CAPM provides joint tests of the validity of the MM theorem, too. Moreover, the CAPM provides a capital market equilibrium context from which we can derive a generalized characterization of the risk-return relationship which, when utilized as a valuation model, can greatly enhance the potential scope for testing the MM theorem.

Tests of capital market efficiency are also relevant to our study not only because they are inseparable from the tests of the asset pricing models but more significantly because they shed light on the extent to which capital markets operate efficiently.

A. CAPM TESTS. We begin by considering the quite extensive CAPM tests.² With the exception of one study, by Lau, Quai and Ramsey (LQR) of the Wells Fargo Bank, all of the tests of the model have been presented in Japanese and do not seem to be available in translation.³ More significantly, all of the Japanese studies appear to reject the model both in its traditional form and in the modified two factor version which has generally proved to be

²It should be noted that neither of the summaries presented in this section are meant to be exhaustive. The literature, both regarding the asset pricing models and market efficiency, is quite voluminous and extends well beyond the scope of this section and the subject of this study. Our interest is confined only to the extent to which these illuminate underlying conditions relevant to the MM theorem.

³S.C.Lau, S.R.Quai, and C.M.Ramsey, "The Tokyo Stock Exchange and The Capital Asset Pricing Model" Journal of Finance, May 1974, pp.507-69.

successful in U.S. studies. The only favourable results

across were presented by LQR who found evidence supporting the validity of the model.⁴ We therefore report the results and summarize the salient features of the main Japanese studies.

At least three major tests of the model are prominently reported in the Japanese literature. Each of the three corresponds to a major development in the empirical study of the model and all three essentially duplicate the American studies on which they are based. The first, by Maru and Royama,⁵ was based on the early cross section studies of the model and reflects the contributions of the Miller and Scholes study.⁶ The second, by Sakakibara,⁷ reproduced the time series tests and the two factor model of Black, Jensen and Scholes;⁸ and the third, by Konya,⁹ applied the four

⁴The authors performed both time series and cross section tests. They obtained both a direct correspondence between the ranks of average excess returns and betas; and found that the slope of the market line implied was significantly positive - though their intercept was slightly negative.

⁵J.Maru and S.Royama, "Rates of Return in Relation to Risk: An Empirical Analysis of the Tokyo Stock Exchange", Technical Paper 29, Japan Securities Research Institute (JSRI), January 1974.

⁶M.Miller and M.Scholes, "Rates of Return in Relation to Risk: A Re-examination of Some Recent Findings", in M. Jensen (ed.) Studies in the Theory of Capital Markets, (New York: Praeger), 1972.

⁷See: S.Sakakibara, "Tests of the Capital Asset Pricing Model: Comparison of NYSE and Tokyo Stock Exchange" Investment, Osaka Securities Exchange, June 1981, pp.2-33

⁸F.Black, M.Jensen, and M.Scholes, "The Capital Asset Pricing Model: Some Empirical Results" in Jensen, 1972.

⁹F. Konya, Technical Paper, 1978, JSRI.

factor model of Fama and Macbeth to Japan.¹⁰

The first comprehensive cross section test of the model applied to Japan was the study by Maru and Royama (MR) which, using monthly rates of returns over a twenty year period (1952-72) for all firms listed on the first section board of the Tokyo Stock Exchange, tested a basic model having the form:

$$E(R_j) = R_f + [E(R_m) - R_f] B_j$$

where $E(R_j)$ is the expected return on asset j , R_f is the riskless rate of return, $E(R_m)$ is the expected return on the market portfolio, and B_j is the measure of systematic risk defined as the covariance of the j th asset's returns with the market portfolio.

The model as formulated above is an expression of the Sharpe-Lintner equilibrium condition, the basic idea of which is that: i) the risk premium earned by an asset is linearly related to its risk, and that ii) the correct measure of risk is the covariance between the asset and the market portfolio. The above expression was converted from expectational form to ex post form (based on observed rates of return) using the fair-game assumption. They then estimated the regression equation:

$$R_j = r_0 + r_1 \hat{B}_j + e_j$$

where R_j is the average returns for the j th asset in the (cross sectional) sample, $\hat{B}_j$ is the estimate of B_j derived

¹⁰E.F. Fama and J.D. Macbeth, "Risk, Return and Equilibrium: Empirical Tests", Journal of Political Economy, May/June 1973, pp.607-36.

from a time series regression of individual asset returns on the market index used as a proxy for the market portfolio, r_0 and r_1 are regression coefficients and e_j is the residual error from the regression for asset j .

The authors tested the CAPM by comparing the intercept and slope regression coefficients with the predictions of the model. According to the CAPM the intercept term should be equal to the riskless rate of interest and the slope coefficient equal to the excess of the average return on the market index over the riskless rate. Their regression results were as follows:

$$R_j = \begin{matrix} 0.139 \\ (15.8) \end{matrix} + \begin{matrix} 0.073 \\ (10.7) \end{matrix} \hat{B}_j \quad R^2=0.22 \quad \begin{matrix} \\ (t \text{ values}) \end{matrix}$$

Before interpreting the results some estimate has to be made of the riskless rate of interest. In Japan no equivalent to the treasury bill rate (which was the commonly used proxy for the riskless rate in the U.S.) was available so MR chose to use a value corresponding to the one year time deposit rate of banks. During the period under study this value ranged between 5.5 to 6%. As^{is} apparent from the above results, the intercept term estimated was in excess of twice the value of the riskless rate and the slope coefficient only about one-half the predicted value (which is the excess returns on the market index over the riskless rate of return).

Next the authors tested for the non-linearity in the risk-return relationship by introducing beta-squared as an explanatory variable alongside beta. Their results were:

$$R_j = r_0 + r_1 \hat{B}_j + r_2 \hat{B}_j^2 + e_j$$

$R_i =$	0.19	-0.01	0.03	$R^2 = 0.256$
	(13.2)	(-0.06)	(4.3)	(t values)

strongly rejecting the hypothesis that the squared term would not significantly differ from zero. As further indication of the rejection of the model they found that the coefficient of beta in the same regression was not significantly different from zero. The implication of their results was that the risk-return relationship is strongly non-linear.

They also introduced the variance of the residuals from the time series (first-pass) regression of individual security returns on the market index, as an explanatory variable along side beta, to represent the non-market component of each share's total variance. If the model were correct, this additional term should not contribute in any significant way to the risk premium on the asset. Their results were:

$$R_j = r_0 + r_1 \hat{B}_j + r_2 s^2(\hat{e}_j)$$

$=$	0.12	0.06	0.29	$R^2 = 0.396$
	(14.2)	(10.1)	(10.7)	(t values)

The coefficient of the residual variance term was found to be positive and very highly significant. The intercept term was again twice as great as the riskless rate and the slope coefficient much smaller than the predicted value.

They finally regressed ex post mean returns on the own variance of securities and found a strong positive relationship:

$$\begin{array}{rcll}
 R_j & = & r_0 & + & r_1 \text{cov}(R_j, R_m) & + & r_2 \text{var}(R_j) \\
 & = & 0.13 & & 1.23 & & 0.31 & & R^2 = .40 \\
 & & (16.7) & & (5.2) & & (10.6) & & (t \text{ values})
 \end{array}$$

They found that while the inclusion of an own variance term proved highly significant along side beta - its inclusion more than doubled the R^2 value - dropping the beta term and using only the variance term as a proxy for risk proved just as good. MR concluded from their study that the CAPM was not valid in Japan. They suggested, instead, that the structure of security returns might better be explained by the two factor model than by the traditional form of the Sharpe-Lintner model.

The rejection of the traditional form of the CAPM in cross section testing was the starting point for the Black, Jensen and Scholes (BJS) time series study. They began by re-expressing the CAPM relationship as follows:

$$E(R_j) - R_f = [E(R_m) - R_f]B_j$$

implying implicitly a proportionality between the excess return on any asset and its beta. They then adopted the market model which expresses security returns as a fair game:

$$R_{jt} = E(R_{jt}) + B_j[R_{mt} - E(R_{mt})] + e_{jt}$$

where e_{jt} is a random error term, with expected value equal to zero, $E[R_{mt} - E(R_{mt})] = 0$, and $\text{cov}\{e_{jt}, R_{mt} - E(R_{mt})\} = 0$. By substitution from the CAPM into the market model, they derived:

$$R_{jt} = E(R_{jt}) + B_j[R_{mt} - E(R_{mt})] + B_j[R_{mt} - E(R_{mt})] + e_{jt}$$

which in ex post excess return form is:

$$R_{jt}' = R_{mt}'B_j + e_{jt}.$$

In this form the model conforms to the usual regression conditions and can be estimated. The validity of the theorem is tested by the expectation that the intercept term would not significantly differ from zero.

BJS also noted that in the above form the time series test of the model is inefficient in its use of data. They addressed themselves to this issue and solved the problem by grouping the data and running the regressions on portfolios of securities. To avoid any selection bias arising from the construction of portfolios, BJS used independent estimates of betas obtained from past data as instrumental variables giving independent estimates of the beta of each security.

Sakakibara, using monthly rates of return for all listed firms on the Tokyo Stock Exchange between 1962 and 1977, tested the model in excess return form using time series and an instrumental variables method similar to BJS. He found that the intercept terms were negative for the high risk portfolios ($B > 1$) and positive for the low risk ones ($B < 1$) meaning that the more risky securities earned on average less than the model predicted and the less risky ones more than predicted. Moreover, reversal of signs were continually observed. Although the former were identical to the results obtained by the original authors in the U.S.A., no reversals had been observed there.

He also found that beta values estimated were

inconsistent with those obtained in the trial runs (used to rank the portfolios) and in any case the estimated betas clustered together very closely indicating that no good results could be obtained from the cross section studies.

Furthermore, Sakakibara presented a cross section test of the two factor model which requires only that the risk-return relationship be linear and the intercept term be non-zero. This is, of course, a much weaker requirement than the CAPM according to which the intercept term is equal to the riskless rate of return. The two factor model, originally developed by Black, was found by BJS to provide a better representation of the process generating security returns. It takes ^{the} form:

$$R_{jt} = (1-B_j)R_{zt} + B_jR_{mt} + e_{jt}$$

where R_z is the return on the beta factor which represents a portfolio having a zero covariance with the market index. The cross section regression equation implied by the two factor model has the form:

$$R_j = r_0 + r_1\hat{B}_j + e_j$$

and the theory implies that $r_0=0$ and $r_1=R_m$.

If the market line were valid, the relationship should be linear and have an intercept of zero. Although BJS had found the relationship to be highly linear in the U.S.A., this was not the case in Japan. The Japanese results, showing very poor linearity, raise some fundamental questions about the validity of the model in that context. Even more significantly, in the BJS results, although the slope was found to have less than the predicted value, it

nevertheless had a positive slope. In Japan, however, the slope which should have been positive and equal to the mean excess return on the market portfolio was found in fact to be negative.

Sakakibara divided the sample into two sub-periods (1962-69, and 1970-77) and repeated the cross section procedures on each. In the first sub-period he found a much better spread of beta values (ranging from 0.4 to 1.5) and also discovered that the estimated beta values declined continually from the high risk portfolios to the low ones. In this sub-period, although the slope of the empirical market line was less than that predicted by the model, its slope was at least positive. During the second sub-period, however, no trend whatsoever could be observed, leading Sakakibara to conclude that, while beta values remained fairly stationary in the 1960s, they had become highly volatile in the 1970s. The Japanese results did not even support the validity of the two factor model.

Testing of the Fama and Macbeth (FM) model was performed by Konya (1978). FM, applying U.S. data, had found that a four factor random coefficient model having the following form:

$$R_{jt} = r_o + r_1 B_j + r_2 \beta_j(u) + r_3 B_j^2 + e_{jt}$$

gave a better fit than the BJS model. The

intercept term in the above regression equation represents R_{zt} , B_j , is as before, and B_j^2 is the average of the square of beta for each security in the jth portfolio. The FM (and

therefore the Konya) test is based on a time series examination of the coefficients of the above regression estimated from cross sectional regressions for each month in the period under study. The tests were carried out on portfolios constructed to eliminate the problems in measurement error biases.

The original authors focused on three major implications of the model: 1) that the risk return relationship should be linear; 2) that B should be the only risk measure systematically influencing expected returns; and 3) that a positive trade-off should exist between risk and return. These imply $r_2=r_3=0$. The Sharpe-Lintner (CAPM) model can be tested against the BJS two factor model by comparing the coefficient of r_0 . For all versions of the model to make sense, r_1 would, of course, have to be positive and significant.

FM had concluded that their results were consistent with the three implications tested. Konya, however, found that although (1) and (2) could not be rejected in Japan (the average values of r_2 and r_3 were small and insignificant even though on a period by period basis some significant effects could be observed), the fact that the coefficient of beta was negative and insignificant meant that beta was not the proper measure of risk. Hence his conclusion that the two model parameter was not valid in Japan.

The conclusion which emerges from all of these studies

is the failure of beta (the systematic risk component) to explain the risk return relationship. Some aspect of Japanese investor behaviour is fundamentally at variance with the characterization of the model. Konya attributed this to one or more of the following: i) some conditions necessary for market equilibrium remained unsatisfied; ii) investor behaviour did not conform to the properties of either risk aversion or investor rationality or both; and iii) investor behaviour could not be adequately characterized by even the two parameter model.

B.CAPITAL MARKET EFFICIENCY. Next we consider some tests of the efficient capital markets hypothesis, covering all three forms: weak, semi-strong, and strong.

The weak form tests of the hypothesis ask whether returns in excess of the market can be earned when the information set available to the investor is restricted to the set of price histories.¹⁵ Weak form tests were performed by Okuda (1975) and by Komine (1975).^{16,17} Both adopted the methodology of testing for serial covariances of returns in the context of a fair game model. The hypothesis tested, in both cases, was that the market behaved as a fair game and -----

¹⁵See: E.F.Fama, "Efficient Capital Markets: A Review of Theory and Empirical Work", Journal of Finance, May 1970, pp.383-417.

¹⁶T.Okuda, "Kabushiki Shijo no Koritsu Sei no Hyoka" (A Test of the Efficiency of Capital Markets) Nomura Research Institute, Zaikai Kansoku, April 1975.

¹⁷M. Komine, "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei" (A Test of Capital Market Efficiency Based on the Fair Game Model) JSRI, Technical Paper, 1975.

the serial covariances between lagged values of returns were zero.

Okuda, using an index of stocks from the Tokyo Stock Exchange, found that linear dependence was observable between lagged values of returns and that prices appeared to move in a non-random fashion indicating that excess returns could be earned on the basis of trading systems based on historic data. He questioned, however, whether excess returns were large enough to withstand transaction costs.

Okuda also considered alternative trading rules and found that there seemed to be a pattern favouring the use of filter rules. He compared a number of $y\%$ filters with alternative buy and hold policies and found that the former gave consistently better returns, the differentials being inversely proportional to the size (or percentage) of filter adopted. *The more frequent the transactions, however, the* greater the associated costs and the presence of even 2% transaction costs was found to wipe out any gains from applying filter rules.

Okuda, therefore, argued that, although a definite pattern appeared to exist in market returns, this was not sufficient to yield excess returns large enough to cover trading costs; and concluded that, at least in the weak form, the fair game hypothesis could not be rejected and interpreted these results as indicative of the efficiency of Japanese capital markets.

Komine also tested for the weak form of the hypothesis by taking a random sample of 47 companies listed on the

Tokyo Stock Exchange. For these, he calculated serial correlations for different intervals of daily returns to test the randomness of security returns. He concluded that substantial linear dependence between lagged returns could be observed - for daily returns he found that about 80% of the observations had significant (non-zero) correlations. He found however that the absolute sizes of the correlations were small and even the largest could account for only a tiny fraction of the variation in price changes. He noted that incorporating transaction costs would practically wipe out even the largest differentials and concluded that the fair game hypothesis could not be rejected. He concurred with Okuda that capital markets were efficient in the weak form.

There was another interesting aspect to the Komine study. He also focused on the performance of two companies - Sony and Daido Worsted Mills.¹⁸ The former was selected to represent major Japanese corporations for which there is a great deal of public interest and awareness. The latter was selected to represent a typical medium sized corporation. In the case of Sony, he found that variations in price movements were purely random - no systematic trend could be observed. In the case of Daido, however, significant serial correlation was observable in price movements and excess returns could be earned by utilizing trading rules. On the

¹⁸Both in terms of market value and shares outstanding, Sony is about 10 times the size of Daido.

basis of these results he suggested that the Japanese capital markets were segmented. The markets in which the major corporations operated were efficient. The same can not be said for markets for medium and small sized firms.

The semi-strong form of the hypothesis asks whether markets are efficient when the information set is expanded to include all publicly available information. If they are, no excess returns can be earned by utilizing the information set. Komine (1978) studied the effects of the adjustment of stock prices to discount rate changes.¹⁹ He adopted the model which allowed him to operate in a market equilibrium context thereby comparing assets having different risk characteristics. Using the market model which takes the form:

$$R_{jt} = a_j + b_j R_{mt} + e_{jt}$$

he focused on the behaviour of the regression residuals as an indicator of abnormal returns. Komine asked whether, by focusing on the behaviour of the residual term, any statistically significant changes in returns could be observed which could be attributed to the announcement effects of changes in the discount rate. He found no noticeable movements on or after the announcement date but found that looking back as far as 15-20 days prior to the announcement a definite trend existed in the market. The trend was, as would be expected, in the reverse of the -----

¹⁹M.Komine, "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei to Kottei Buai no Henka ga Kabuka ni Oyobosu Kekkai" (A Test of the Efficiency of Capital Markets Based on the Fair Game Model and the Effects of Changes in the Discount Rate). JSRI, Technical Paper 44, May 1978.

direction of the change anticipated. He interpreted these as signifying departures from a fair game and concluded that in the semi-strong form the markets could not be considered efficient.

In a second study of the semi-strong hypothesis, Komine investigated the impact of free (gratis) distributions of shares on the behaviour of returns.²⁰ Again, he used the market model and focused on the regression residual as an indicator of abnormal returns. Komine found two significant systematic trends in the behaviour of the average residuals plotted from the market model. The first trend was upward and occurred between the announcement day (which is the day of the board's meeting) and the distribution date. He attributed this to market adjustments resulting from the imperfect transmission of information. The second trend he observed occurred after the distribution which he attributed to the decline in market interest in the stock. This, he noted, was contrary to principles of market efficiency according to which if information were efficiently utilized the returns should have shown random fluctuations. He concluded, therefore, that the market could not be said to conform to a fair game and the principle of market efficiency had to be rejected.

In a third study of the semi-strong form, Kunimura

²⁰M.Komine, "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei, Musho Zoshi ni Kansuru Kabuka no Hanno" (A Test of the Efficiency of Capital Markets Based on the Fair Game Model and the Response of Share Prices to Free Distributions); JSRI, Technical Paper, 51, 1980.

studied the effects of market predictions of corporate performance.²¹ He constructed an abnormal performance index around the announcement date and noted the existence of systematic trends, which he attributed to the fact that the market does not adjust smoothly and instantaneously to changes in the information set. He concluded that markets did not satisfy the conditions for semi-strong efficiency.

Finally we consider the strong form test of the hypothesis which asks whether all information is fully reflected in the market. Terada (1976)²² and Sudo (1977)²³ compared the performances of mutual trusts and asked whether they, with all the technical expertise and size advantages which they provide, could earn returns in excess of the market average. Both concluded that they did not.

Terada (1977) focused on another aspect of the strong form hypothesis.²⁴ He asked whether market leaders were able to provide returns in excess of the market average. He found that the rates of return provided by market leaders were categorically lower than the market average. He concluded from this that markets could be said to operate efficiently.

²¹M.Kunimura, "Kaikai Joho to Kabuka" (Accounting Information and Share Prices), Kaikai, 105, 3, 1979.

²²T.Terada, "Gendai Toshi Seisaku to Toshi Shintaku no Kihon Mondai", (The Basic Problem Between Investment Strategy and Mutual Funds); Shoken Toshi Shintaku Geppo, November 1976.

²³K.Sudo, "Waga Kuni Kabushiki Toshi Shintaku no Performansu" (Our Country's Mutual Fund Performance), JSRI, Technical Paper 42, 1977.

²⁴T.Terada, "Toshi Bunseki no Juyo Kadai" Shoken Anaristo Journal, 3/1977.

Much more work is called for in this area before definitive conclusions can be drawn regarding the efficiency of Japanese capital markets. Nevertheless, some tentative conclusions do emerge from the few studies cited above. In the weak-form, although there appear to be weaknesses in the market in the sense that serial dependencies are exhibited, the presence of transactions costs prohibits excess profits to be made from the utilization of trading rules. The market would appear to be segmented with much greater efficiency being observable among major corporations.

In the semi-strong form, both Komine and Kunimura concur that the market does not appear to be efficient. However, the strong form results indicating that mutual funds are unable to out-perform the market would seem to favour semi-strong efficiency unless it can be shown that fund managers are privy to non-public information. The apparent support found for strong form efficiency also needs to be explained in view of great popularity of mutual funds in Japan.

The failure of the CAP models and especially of beta to characterize the risk-return relationship implies two things: first, that one set of sufficiency conditions for the validity of the theorem are rejected; and second, the futility of seeking to apply a valuation, based on the market equilibrium properties and generalized risk characterization implied by the CAPM, in any subsequent empirical work.

The market efficiency tests do not provide any direct evidence on the MM theorem and ~~were~~ not included among any of the sufficiency conditions described in Part I with the exception of the CAPM. Nor do ~~they~~ provide any evidence on the conformity of capital markets with the neo-classical paradigm. They do, however, provide some tentative evidence consistent with our a priori expectations that capital markets are segmented and those in which the major corporations operate are "more" efficient.

6. CONCLUSION

Part I of the thesis focused on four sets of sufficient conditions ensuring the validity of the MM theorem even when capital markets are incomplete. This part focused on one of these four sets - the Stiglitz (no bankruptcy) model - and sought to characterize some of the main features of the system of Japanese corporate finance which appear to conform well to those conditions. They are: the no bankruptcy risk status of groups of major corporations; the predominance of corporate ownership of major corporations; and the deregulation of capital markets. First, we summarize the arguments with respect to each of these.

No Bankruptcy. Four arguments were presented with regard to the special factors serving to suppress bankruptcy risk among major Japanese corporations. The first began by stressing the point that the leverage ratios of the Japanese corporate sector were not as high as is popularly believed and that, consequently, their risk exposure is greatly exaggerated on the company accounts. This was attributed to the widespread existence of hidden assets due to the extensive undervaluation of land, the practice of recording securities held at acquisition costs, and the classification of items which would normally be included under capital reserves as liabilities.

The second argument focused on the system of values underlying economic relations in Japan. It was argued that

in this respect Japan differs in a fundamental way from most comparable economies. These special behavioural characteristics of Japanese society have found expression in the prevailing industrial philosophy and become institutionalized in what may be called the super-environment of the Japanese system. It was noted that the successful triad of employment relations, inter-corporate ties, and government-business interactions depended in large measure on this value system. Employment relations, for example, draw heavily upon these and are characterized by the fixed nature of the corporate commitment to its employees. It was argued, however, that they also have an interesting converse which influences the spreading of risks in the economy and provides a cushion to corporations threatened by business failure. This converse is the firm specific nature of labour's investment in human capital which introduces an important element of flexibility into economic relationships and serves to greatly increase the scope for risk spreading. Parallels can also be made with the firm specific nature of Japanese trade unions, subsidiaries, and sub-contractors.

The third argument focused on the keiretsu groups. These depend critically upon the Japanese system of values described but their common identity is further buttressed on a substantial system of inter-corporate linkages which are characterized by: cross holdings of equity, concentrated dependence on borrowings from common financial corporations, wide-spread use of intra-group trade credits, and inter-

locking directorates.

An important function of the keiretsu groups is the spreading of risks, especially ultimate bankruptcy risk. The risk sharing potential of these groups is apparent in their joint undertakings of major investments and high risk projects; in the coordination of their managements by a system of multi-tiered contacts extending to the very highest levels of the corporate hierarchy; and in the slogan that no group company would ever be allowed to fail. The principle of group support and rescue has been repeatedly established and is based on numerous precedents. When the threat of bankruptcy becomes real group-wide rescue efforts are undertaken at whatever level required and the ailing member is revived.

The fourth factor described which serves to suppress the risks of business failure is government industrial policy which can be said to provide industry with a safety net. The success of industrial policy owes much to the well-defined policy objectives but also to the values inherent in Japanese society which facilitate government-business intercourse. Industrial policy is implemented both through direct and indirect interventions and its efficacy is greatly enhanced by the fact that the principles of government support have been firmly established by precedent. Two important instruments of direct government intervention are the practice of administrative guidance and the availability of public financial institutions whose lending policies have strong signalling effects in the market.

Indirect government support takes diverse forms and permeates all facets of the Japanese financial system. In the discussion here, these were classified into three types: trade and protection policy, industrial structure policy, and financial policy. All of these are systematically utilized to create a business environment intended to support and nurture strategic industries.

Corporate Ownership. A second important characteristic of the Japanese financial system is the predominance of corporate shareholders. Since the war, there has been a steady decline in the share of personal sector shareholdings and it may be said, today, that major Japanese corporations are owned by other corporations - especially financial ones. The dominant investors in Japanese capital markets can, therefore, be said to have access to these markets on terms identical to those of the companies in which they invest. Moreover, they, too, benefit from the same no bankruptcy risk status as the companies in which they invest.

Capital Market Deregulation. The third main characteristic stressed in this part was the deregulation of Japanese capital markets. Traditionally, Japanese capital markets have been depicted as being subject to a complex system of controls which effectively serve to segment them and prevent the interest rate mechanism from freely functioning. The allocation mechanism has, therefore, been effected through a complex network of regulatory measures and credit rationing. Moreover, the domestic capital markets

have traditionally been closed to any extensive foreign participation. Both of these characteristics of Japanese capital markets have however been the subject of major deregulation and liberalization measures in recent years. The main implication of these changes has been the greater scope for the free functioning of the interest rate mechanism and the greater sophistication of capital markets as defined in terms of the types of securities available to investors and increased scope for participation in the markets by different types of investors.

Although, as a result of these undervaluations nothing can be said about the actual financial structure of corporations, there nevertheless exists an imbalance in the sources of corporate funds - heavily weighted towards debt finance - which must be explained. One explanation is, of course, the presence of hidden wealth which is, undoubtedly, taken into account by financial institutions when lending. A second explanation was sought in the historical realities of the Japanese financial system. In the early post-war years while the capital markets either found themselves closed or in a state of chaos, bank borrowing proved the most convenient source of external funds - if not the only.

The insignificant share of bonds and equity as sources of corporate funds was also considered. The former was attributed partly to the prolonged underdeveloped state of the bond market which has suffered^r₁ as a result of a complex system of regulatory measures imposed by government and more

recently by the domination of the markets by government seeking to finance its ever-increasing deficits at the lowest possible costs. As regards the problem of equity, it was argued that equity finance is expensive in Japan both because of the continuing practice of issuing shares at less than full market value and because of the rapid growth experienced by corporations which accentuated the advantages arising from the fixed nature of the debt commitment.

Another explanation was found in the low interest rate policy of Government which sought to maintain the cost of capital for strategic industries internationally competitive. The imbalance in the sources of corporate funds had another advantage for government policy. The monetization of corporate debt grew to become, in the post-war period, the primary means for the injection of money into the economy and the success of the transmission mechanism depended on its continuation.

A further explanation for the preference of debt finance was shown to be the tax discrimination in favour of debt. In Japan the tax advantages to corporate debt finance (arising from the deductibility of interest charges) are not offset by the Japanese personal tax code. Widespread exemption of interest income, combined with the popularity of anonymous deposit accounts, serve to re-enforce the corporate tax advantages of debt finance.

An interesting question related to the preceding is

whether the personal tax is the right one to consider from the stand-point of investors. As a stylized fact of the Japanese corporate system it may be said that financial corporations are the typical investors in major Japanese companies. This suggests that it might be more realistic in the Japanese context to view the financial corporations as the typical investors in the system. For the financial institutions, moreover, the choice between debt and equity investments^{is} restricted by legal measures. The Anti-Monopoly Law has, during most of the post-war period, prohibited financial institutions[†] from acquiring more than 10% of the shares of any non-financial corporation. This constraint is a real one, and serves to re-enforce the preference for debt finance.

The picture which emerges from summarizing the asset pricing models is that beta (the systematic risk components of an asset's variability) fails to explain the risk return relationship in Japan. The evidence on capital market efficiency shows that although weaknesses exist, weak-form efficiency can not be rejected in the sense that the transaction costs involved make it impossible to earn excess returns by using trading rules based on the history of price changes. In the semi-strong form, however, the hypothesis of market efficiency is rejected. In the strong form, although the evidence shows that mutual funds cannot out-perform the market, their popularity^{despite} this fact attests to the presence of weaknesses in the market. An interesting implication of the findings of one study is that Japanese

capital markets appear to be segmented. The markets in which the major corporations operate seem to be more efficient than the others.

Part III of the thesis conducts an empirical study to test the validity of the MM theorem.

PART III

1. INTRODUCTION

This part of the thesis undertakes an empirical study testing for the validity of the MM theorem in the Japanese context. It combines the set of sufficiency conditions implied by the Stiglitz (no-bankruptcy) model described in part I, and the characterization of Japanese industry provided in part II of the thesis.

Section 2 reviews some previous empirical work on the MM theorem from a methodological point of view, concentrating on how the alternative empirical models test the theorem. From among the four approaches discussed: inferential, yield form, tests of the impact of financial structure changes on security prices, and valuation models, the last is selected as being the most appropriate for study in our context.

Section 3 focuses on the valuation model as formulated and empirically estimated by MM (1966).¹ It considers the specification of the valuation function, especially the treatment of growth and size factors. With respect to the former it also reviews the Arditti-Pinkerton valuation model which is based on the MM one but was extended to incorporate the present value of tax savings associated with the future debt finance of a firm having growth opportunities.²

¹M.Miller and F.Modigliani, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57", American Economic Review, June 1966, pp.333-87.

²F.D.Arditti and J.M.Pinkerton, "The Valuation and Cost of Capital of the Levered Firm With Growth Opportunities", The Journal of Finance, March 1978, pp.65-73.

Section 4 specifies the composition of our samples, describes the selection of time periods and defines the variables used in the basic valuation model to be tested.

The choice of the main sample differs from the traditional association of risk classes with the industry concept. It is, instead, based on keiretsu groupings which are not only more natural in the Japanese industrial context but may well represent a superior classification basis when the criterion is the definition of a risk class based on the homogeneity of the cost of capital. Regarding the time period the study concentrates on the most recent years for which data were available. Results are also presented for a second and earlier period. All the equations are run both for three separate years (1978, 1979, and 1980) as well as for an average of the three years taken together, (1978-80). The averaging procedure is intended to better reflect the longer term properties of valuation and to conform more closely to a time horizon appropriate in a Japanese context.

Section 5 reports the results of the three regression models estimated and their intermediate stages. The first is a single equation regression model. Results are reported for the main sample of firms under study (the keiretsu group) along with two control samples - railroads and automobiles. It is argued that the single equation model suffers from a number of serious statistical shortcomings the most significant of which is the errors-in-variables problem due to the expectational and non-observable nature of some of the key variables. In order to remedy some of these

problems, the approach adopted by MM is followed and the valuation function is estimated using a two equation (stage) model with the earnings term constructed from a first stage instrumental regression. The coefficients of the estimated parameters appear inconsistent, in terms of both size and sign, with our a priori expectations. It is observed that the two stage model is also subject to major errors-in-variables problems because of the mis-specification of the growth term and the existence of measurement errors in that variable. It is argued that without some correction for the measurement errors in the growth term, nothing conclusive can be said about the validity of the MM theorem in the sample under study.

A three equation model is thus proposed and estimated, using instrumental regressions to estimate both earnings and growth. The three equation model is found to give reasonable estimates of the parameters for which we have definite a priori expectations in terms both of the size and the signs of the coefficients. The behaviour of the debt coefficient is then studied and found to make no significant contribution to valuation. The debt coefficient is, moreover, found to be invariant with respect to alternative formulation of a minor nature. It is concluded that, since the valuation model seems to have been correctly specified and the estimates appear reasonable, the insignificance of the debt coefficient can be interpreted as an indication of the validity of the MM theorem.

The same valuation model is also applied to a second and earlier time period, 1970-72, where debt is found to make a positive and significant contribution to valuation. It is argued that in terms of the no bankruptcy status of the sample firms and the predominance of corporate ownership in the keiretsu groups, no significant changes occurred between the two sample periods. It is suggested that possible reasons for the rejection of the theorem in the first period and its validity in the second may be attributable to the major changes in deregulation and liberalization of capital markets. The Japanese capital markets - at least those in which the major keiretsu companies operate - come much closer at present to satisfying the conditions implicit in the neoclassical paradigm than they did in the early 1970s.

2. Some Methodological Aspects of Previous Studies

Since the publication of the original MM propositions almost thirty years ago, numerous tests of the irrelevance theorem have been performed using a variety of statistical techniques. Although it would extend well beyond the scope of this brief survey to attempt to review them all, we can summarize their methodological characteristics by classifying them into four categories: 1) the inferential tests, 2) the yield form tests, 3) tests studying the impact of changes in financial structure on security valuations, and 4) the valuation models. Each of these approaches has distinct advantages and disadvantages. We briefly summarize them, concentrating on contrasting their methodological differences rather than on their results.

A. INFERENTIAL TESTS. The inferential (or surrogate) tests are essentially indirect tests of the theorem. They test the prediction that in a MM world there would be no optimal level of debt and the financial structure of firms would vary randomly from one firm to another. By implication, no systematic differences should, then, be observable in the financial structures of firms operating in different business risk environments.

Although intra-industry similarities in financial structure had long been noted in the finance literature, the first systematic study contrasting the implications of the MM theorem with observed financial structure (by means of an inferential test) was undertaken by Schwartz and Aronson

[SA] (1967).¹ They focused on the prediction that no systematic differences would be observable in the financial structure of firms operating in different business risk environments. Their method consisted of testing the null hypothesis that the observations under study could be said to come from the same underlying population and differences could be attributed to chance variations.² They adopted the traditional industry concept as the basis for defining homogeneous risk classes and compared the financial structures of firms in four industries. Specifically, they asked whether intra-industry variability was greater than inter-industry variation.

Scott (1972) criticised the SA study on a number of methodological points.³ Most significantly, he noted that the one way analysis of variance tests performed by SA only tested whether the sample means were not all equal and suggested that the SA conclusions could be biased if the results had been rejected because of only one industry. He suggested, instead, the use of a multiple comparison test which would also test the null hypothesis on a pair-wise basis.

¹ E. Schwartz and J.R. Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure", The Journal of Finance, March 1967, pp.10-18

² Using the method of one way analysis of variance they compared the ratio of two unbiased estimates of the population variance with the theoretical value of F to determine whether the discrepancy between observed and expected outcomes (the latter based on a uniform distribution) could be attributed to chance variations.

³ D.F. Scott, Jr. "Evidence on the Importance of Financial Structure", Financial Management, Summer 1972, pp. 45-50.

Scott and Martin (1975) drew attention to another shortcoming of the earlier studies.⁴ They argued that the analysis of variance ^Papproach suffers from a further defect. It imposes parametric assumptions on the underlying distribution which are probably incorrect.⁵ They suggested, instead, the use of a non-parametric technique having the advantage that no specific assumptions are made regarding the parameters of the population under study.

Testing of the null hypothesis implied by the inferential approach was extended by Remmers et al., to an international context.⁶ An interesting aspect of the study for us was that Japan was included among the five countries studied and the authors concluded - on the basis of tests similar to those of Scott (1972) - that industry appeared to be a determinant of financial structure in Japan. These results are however doubtful because, quite apart from any methodological shortcomings of the parametric approach and the fact that the Japanese tax system would be expected to systematically influence observed financial structure, the

⁴ D.F. Scott, Jr. and J.D. Martin, "Industry Influence on Financial Structure", Financial Management, vol.4, Spring 1976, pp.67-73.

⁵ It assumes, of course, that the population is normally distributed with constant variance. Non-compliance of the samples with the parametric requirements increases the possibility of rejecting a null hypothesis which is true. They adopted the Kruskal Wallis test which specifies a statistic analogous to the F-test but based on the ranking of observations in all samples.

⁶ L. Remmers, A. Stonehill, R. Wright and T. Beekhuison, "Industry and Size as Debt Ratio Determinants in Manufacturing Internationally", Financial Management, 1975

problem of the undervaluation of assets in Japan renders any inter-industry comparisons based on book value ratios gravely deficient.

The identification of industry with homogeneous business risk, although functionally simple and intuitively appealing, is not necessarily valid. Parallel with the developments in testing the inferential tests, the association of the industry concept with the risk class notion has also been investigated. Invariably, these studies point to the inadequacy of the industry concept as a proxy for a homogeneous risk class.⁷ Recently, recognition of the inadequacy of an univariate definition of risk has prompted studies attempting to develop a multi-dimensional risk criterion. In one such study, Martin, Scott Jr., and Vandell (1979) have adopted cluster analysis techniques to group firms into risk classes on the basis of n dimensional risk characteristics. Using this approach they attempted to define a multi-variate definition of risk.⁸

Ferri and Jones (1979), noting the inadequacy of "isomorphic" risk measures to characterize risk in diversified multi-product firms, also adopted cluster analysis techniques to partition firms into classes based on -----

⁷ See: N.J. Gonedes, "A Test of the Equivalent Risk Class Hypothesis", Journal of Financial and Quantitative Analysis, June 1969, pp.159-77. This also includes a summary of Wippam's test of the same hypothesis.

⁸ J.D. Martin, D.F. Scott Jr., and R.F. Vandell, "Equivalent Risk Classes : A Multidimensional Examination", Journal of Financial and Quantitative Analysis (JFQA), March 1979, pp. 101-18.

leverage characteristics.⁹ They then cross-tabulated these with industry classifications to measure the degree to which knowledge of industry class allows prediction of financial leverage class.

In another interesting development of the inferential approach, Hamada (1972) made a significant contribution to overcoming the risk characterization problem.¹⁰ He adopted the specification of risk in a market equilibrium context (given by the CAPM). The linearity implied between the equilibrium risk-return relationship in the CAPM and the linearity implied by proposition II of the MM theorem provided a potentially testable combination. Hamada noted however that it was impossible to test the validity of the theorem directly in a capital market equilibrium context in the absence of any independent estimate for the leverage extricated (or leverage free) value of beta. Therefore, he had to rely on an indirect test performed by comparing the dispersion of observed systematic risk (beta) values with their leverage extricated equivalents. He calculated the latter from the raw data by grossing up the observed rate of returns on equity by the returns to debt for each firm. Hamada interpreted the greater homogeneity of leverage extricated beta values as indirect evidence supporting the

⁹M.G. Ferri and W.H. Jones, "Determinants of Financial Structure: A New Methodological Approach", Journal of Finance, June 1979, pp. 631-44

¹⁰R.S. Hamada, "The Effect of the Firm's Capital Structure on The Systematic Risk of Common Stocks", The Journal of Finance, May 1972, pp. 435-52

MM theorem.¹¹

B. YIELD-FORM MODELS. The first variant of the yield-form was originally formulated by MM as part of their pioneering study of 1958. They tested the irrelevance proposition - their Proposition I - by regressing the cost of capital. They used the following yield form model:¹²

$$[X/V] = a_0 + a_1(D/V) + u$$

and tested the irrelevance hypothesis by the expectation that the slope coefficient of the regression equation would not significantly differ from zero. MM also estimated a second regression on the expectation that the coefficient of the debt variable would be significantly positive. The model:

$$[X/S] = a_0 + a_1(D/S) + u$$

(where S = the market value of equity) tested the validity of the theorem (based on proposition II) by comparing the size of the intercept term with the slope coefficient based

¹¹Very recently, D.R. Mehta, E.A. Moses, B. Deschamps, and M.C. Walker "The Influence of Dividends, Growth, and Leverage on Share Prices in the Electric Utility Industry : An Econometric Study", JFQA, December 1980, pp. 1163-94 have sought to test the MM theorem in a capital market context, by substituting the equilibrium risk-return relationship implied by the CAPM into the function implied by MM proposition II. The function actually estimated by the authors is, however, the partial equilibrium function and the parameters of CAPM are then compared with the regression coefficient obtained. Therefore, the test cannot be interpreted as an extension of the underlying valuation model to a market equilibrium context.

¹²Where X/V is the ratio of net earnings after taxes to capital employed and D/V is a measure of leverage expressed as the ratio of debt to capital employed.

on the relationship:

$$e = v + (v-d)(D/S)$$

where e is the cost of equity capital, v is the overall cost of capital and d is the cost of borrowed funds.

Despite the straightforward and intuitively attractive nature of the model, the yield form equation, as specified above, contained a number of shortcomings. One, which was recognized by the authors themselves, was due to the same endogenous variable appearing in the denominator on both sides of the structural equation. MM noted that as a result stochastic elements contained in the denominators would appear on both sides of the equation so that the disturbance term would no longer be independent of the explanatory variables. As a result, a basic assumption of the least squares method is violated and the estimated coefficients are rendered biased and unreliable.

A number of subsequent studies testing the theorem sought to preserve the yield form approach but avoid this defect. Most concentrated on redefining the basic variables. Barges (1963) substituted a book value measure for the leverage variable and plotted it against a constructed measure of the cost of capital evaluated at market values. He noted that the plot appeared to be a second degree polynomial having a minimum - as would be predicted by the traditional view.¹³ Barges explicitly recognized the exceptional nature of the earnings variable and sought to

¹³ A. Barges, The Effect of Capital Structure on the Cost of Capital (Englewood Cliffs, N.J.: Prentice-Hall, 1963).

adjust for any non systematic deviations of observed earnings from their true value by means of a simple annual average.

Weston (1963) drew attention to two further shortcomings of the model.¹⁴ MM had applied the test to two sample industries, oil companies and electric utilities. Weston took issue with the association of any industry with the equivalent risk class concept, noting that the cost of capital was of a highly firm-specific nature. He argued that the oil industry, in particular, was too heterogeneous to be identified as a common risk class. Weston's second objection focused on the MM regression earnings equation. He correctly argued that the MM measure of the cost of capital reflected only the current earnings potential of the firm and failed to account for the effects of expected growth in earnings on the cost of capital. Weston, therefore, restricted his study to only the electric utilities industry and included a measure of growth in earnings and of size among the explanatory variables along with current earnings. He found that the inclusion of the growth term influenced the dependent variable whether the latter was expressed in terms of equity finance only or in terms of the total cost of capital. He noted, moreover, that the inclusion of the growth term made the leverage coefficient insignificant in the former case and significant but negative in the latter.

Weston attributed MM's apparent irrelevance results to

¹⁴ J.F. Weston, "A Test of Cost of Capital Propositions", The Southern Economic Journal, October 1963, pp. 105-12.

the negative correlation between leverage and growth of earnings which had remained implicit in the original study. The omission of growth had been a second major defect in the MM 1958 study.

Davenport (1971) focused on the same two problems inherent in the empirical study of the original authors.¹⁵ Regarding the problem of the non-independence of the disturbance from the explanatory variables he sought to avoid this by defining the equity component in the denominator of the dependent variable as a market value but using book values for the same in the denominator of the leverage variable on the right hand side. The second problem he considered was the incorporation of expected growth (of earnings) into the model.

Davenport recognized both the importance of incorporating growth and the complexity of correctly specifying it. He adopted an infinite-horizon constant growth term, but had to assume that future expected growth could be estimated from past values. He further had to assume that any errors resulting from the incorrect specification of the growth term were stochastic and independent of all the other variables.

Following MM (1966), Davenport justified his specification of growth by the reasonableness of the the empirical estimates. As regards his choice of samples

¹⁵ M. Davenport, "Leverage and the Cost of Capital: Some Tests Using British Data", Economica, May 1971.

Davenport used broad based samples derived from industry classifications which would not have been acceptable to either MM or Weston. In order to overcome the problems of cross-sectional heterogeneity in the sample, he introduced two control variables: size and variability of earnings.

C. THE IMPACT OF FINANCIAL STRUCTURE CHANGES. Masulis (1980) drew attention to the importance of isolating purely financial structure changes from asset base changes.¹⁶ He noted that even the issue of financial securities, since it generated a cash flow, affected the asset base of the firm and would thus be, strictly speaking, inappropriate for the purposes of testing the MM theorem. He accomplished this by considering exchange offers which give security holders the right to exchange one type of security for another without generating any cash flow. Masulis assessed the statistical significance of security price changes following the announcement of exchange offers by postulating a stationary returns generating process for securities which consisted of: a non-stochastic market determined factor and a disturbance term which represents market-wide stochastic influences and firm-specific effects. The former was assumed to remain stationary between two specified periods -the announcement period when the exchange offer is made and some arbitrary comparison period. He was then able to focus on the behaviour of the disturbance term (in the announcement

¹⁶ R.W. Masulis, "The Effects of Capital Structure Change on Security Prices : A Study of Exchange Offers", The Journal of Financial Economics, 1980, pp.139-77.

period) and to compare it with behaviour of the disturbance term during the comparison period. This was, of course, implicit in the comparison of mean returns over the period.

D. VALUATION MODEL TESTS. Finally, the fourth approach tests the theorem on the basis of a valuation model. It was originally suggested by MM in their pioneering study as an alternative to the yield form model (free of dependence between the explanatory variables and the disturbance term) and was used by them in their 1966 study of the cost of capital in electric utilities.¹⁷ They derived it by simple re-arrangement of their fundamental equation which, after incorporation of tax effects, takes the following form:¹⁸

$$[X(1-t)/(V-tD)] = p$$

to:

$$[V-tD] = [(1/p)X(1-t)]$$

making the firm's market value the dependent variable and estimating the cost of capital as the regression coefficient of the (expected) earnings variable.

There are two complications in estimating a valuation model of this form. One arises from the complexity of the specification of the valuation function with its ^{implication} -----^

¹⁷ M. Miller and F. Modigliani, "Some Estimates of The Cost of Capital to the Electric Utility Industry, 1954-57", American Economic Review, June 1966, pp.333-91.

¹⁸ where X is expected long run earnings, t is the marginal rate of corporation tax, V is the total market value of the firm, D is the market value of debt, and p represents the capitalization factor (or the cost of capital).

that the relationship is expressed in terms of present market values on the one hand and a number of expectational variables, which are of an ex ante and non-observable nature, on the other. Both introduce serious complications into any empirical study.

An interesting variant of the MM valuation model was examined by Glyn (1973).¹⁹ Following MM, he adopted the total market value of the firm as the dependent variable but focused on the different claims against company returns (representing the different sources of company funds) separately as explanatory variables. This, of course, had the advantage of allowing the respective multipliers for each of the four different kinds of debt to be individually examined.

E. SUMMARY. Each of the four approaches summarized above has its advantages and disadvantages. In this study we adopt only one test of the theorem which means we must select one of the above four methods. The choice is, of course, not a simple one and in the final analysis subjective factors weigh heavily.

The inferential approach was rejected, primarily because it is an indirect or surrogate test of the theorem and focuses on the observed financial structure of companies

¹⁹ A. Glyn, "The Stock Market Valuation of British Companies and The Cost of Capital 1955-1969", Oxford Economic Papers, 1973, pp.212-40.

within different business risk environments. In Japan we expect tax considerations, for example, to systematically influence observed financial structures. Compared with the other approaches which enable tax adjustments to be made explicit the inferential tests are at a disadvantage.

In this connection, we should also note the failure of the CAPM, and more significantly, of the two factor model to characterize investor behaviour and to explain the risk-return relationship in Japan. The odd behaviour of beta effectively eliminates any possibility for the study of the theorem in the market equilibrium context implied by the CAPM.

The Masulis approach was also rejected. Its rejection was not due so much to the absence of any widespread existence of exchange offers in Japan as it was to the fact that the method is implicitly a joint test of the MM theorem and capital market efficiency. If capital markets were inefficient in the sense that prices did not fully reflect the impact of the announcement effect of exchange offers, then the leverage theorem test is confounded. Again, the indications of the tests of capital market efficiency - especially of the semi-strong form - seem to be categorically rejected in Japan (as discussed in the previous part). Given such a background, this approach too was rejected.

This leaves us with either the yield form approach or the valuation model to choose from. Both are integrally

related and no fundamental difference would be expected in adopting either. As noted earlier, the non-independence, in the yield form models, of the explanatory variables from random effects contained in the disturbance term is a defect which although not entirely absent in the valuation approach pre-disposes us in favour of the latter.

The valuation model was thus selected as the basis for the empirical study in this thesis.

3. THE VALUATION MODEL

The rudiments of the MM valuation model were presented in the previous section and the theoretical justification for it discussed in part I of the thesis. In formulating their valuation equation, MM included two other explanatory variables apart from leverage - growth and size. The former was included on the grounds that p , as described above, represents the cost of capital for a non-expanding firm with no growth potential. Size was included to account for systematic differences in the capitalization rates between large and small firms. The effects of tax deductibility of interest expenses were also incorporated into the model. The theorem was then tested by the inclusion of debt among the explanatory variables. The expectation was that, if the MM theorem were valid, it would not contribute in any significant way to the firm's market valuation. In this section, we consider the treatment of each of the above variables and review some contributions made to the specification of the valuation model since 1966. We begin by considering growth.

A. GROWTH. The MM valuation model has in perpetuity the basic form:

$$V(0) = \sum_{m=0}^{\infty} X(m)(1+p)^{-(m+1)}$$

where both $V(0)$ and $X(m)$ are time dependent variables, with the former representing the market value of the firm at time, $m=0$, expressed as a function of the expected earnings of the firm given its asset base and earnings power at that

time. When, as in the case of the no growth firm, the expected cash flows which are being capitalized have the same distribution of returns period after period, the relationship can be written independently of the time factor and as m grows very large it can be approximated by:

$$V = X(p^{-1}).$$

As is apparent, the capitalization rate, p , by itself is irrelevant to any real world situation where firms grow, and cannot be used to represent the cost of capital for such (growing) firms.

Growth can be incorporated into the model in any number of ways depending upon the assumptions made about: the rate of return in excess of the cost of capital anticipated, the scale of investment undertaken, and the time horizon of the growth opportunities. Probably, the simplest method is to assume a constant growth rate of earnings in perpetuity.¹ Assuming perpetual growth, however, is unacceptable. Moreover, with such an assumption earnings in period m can be written:

$$X(m) = X(0)[1 + kp^*]^m$$

where p^* is the perpetual rate of return expected on the firm's investments, and k represents the scale of investment defined as a fixed fraction of earnings in period 0. This leads to the so-called growth paradox whereby a finite and meaningful valuation requires not only that $p > kp^*$ but by a

¹See: M.H. Miller and F. Modigliani, "Dividend Policy, Growth, and the Valuation of Share Assets", The Journal of Business, October 1961, pp.411-33.

sufficient amount. This can be shown by the following derivation:

The last expression shows that earnings are growing at the constant rate kp^* each period for m periods. Both terms are meaningful, p^* is the rate of return expected on investment, and k is the scale of investment undertaken defined as some fraction of earnings. The conversion of these future earnings into a market value today can be accomplished by taking the discounted value of the product of the excess rate of return - over and above the cost of capital - and the scale of investment undertaken in each period. This discounted value can be written as:

$$\{[kX(m)][p^*-p]\}(1+p)^{-(m+1)}$$

summed over all future periods. Then the present value at time $m=0$ of the firm with constant perpetual growth opportunities may be written as the sum of the present value of the expected earnings of the firm as implied by its current asset base and the present value of the sum of net returns from its expected growth:

$$V(0) = \{X(0)/p\} + \sum_{m=0}^{\infty} \{kX(0)[1 + kp^*]^m[(p^*-p)/p]\}(1+p)^{-(m+1)}$$

Evaluating the summation:

$$\begin{aligned} V(0) &= X(0)/p + \{kX(0)(p^*-p)/p(1+p)\} \{(p-kp^*)/(1+p)\}^{-1} \\ &= \{X(0)/p\} \{p(1-k)/(p-kp^*)\}. \end{aligned}$$

To avoid this complication, MM limited their growth horizon to a finite duration of m periods. In this case the valuation equation takes the form:

$$V(0) = \{X(0)/p\} \{1 + k(p^*-p)/(p-kp^*)\} \left\{ \sum_{m=0}^{\infty} [(1+kp^*)/(1+p)]^m \right\}$$

which in closed form can be expressed as:

$$V(0) = \{X(0)/p\}\{1 + [k(p^*-p)/(p-kp^*)][1-(1+kp^*)^m/(1+p)^m]\}.$$

the expression in the last square brackets on the right hand side can be evaluated [assuming $(1+kp^*)/(1+p)$ is close to unity] by means of a Taylor series expansion of the binomial form. Letting:

$$c=(1+kp^*)/(1+p)$$

and

$$n=m$$

expanding c^n around 1 and approximating by using only the first two terms of the series:

$$(a+c)^n = a^n + n(a)^{n-1}c...$$

$$c=(1+kp^*)/(1+p) = 1 + (kp^*-p)/(1+p)$$

so:

$$[(1+kp^*)/(1+p)]^M = 1 + [m(kp^*-p)/(1+p)]$$

which by substitution into the valuation equation gives:

$$\begin{aligned} V(0) &= \{X(0)/p\}\{1+[(kp^*-p)/(p-kp^*)][(p-kp^*)/(1+p)]^M\} \\ &= \{X(0)/p\}\{1+[m(kp^*-p)/(1+p)]\}, \end{aligned}$$

where the second term on the right hand side is MM's growth component representing the contribution of expected growth to the market valuation of the firm. It implies that the firm re-invests a fixed fraction, k , of its earnings for a duration of M periods at an excess rate of return equal to (p^*-p) , where p is the cost of capital to the stationary firm. The contribution of growth to market value is viewed as the product of these three terms interacting multiplicatively.

B. SIZE. The inclusion of a size variable is warranted by the possibility of systematic differences in the capitalization factors of large and small firms. If size and

diversification effects, then market value will be influenced by size and the value-earnings relationship will be non-linear. The most plausible possibility is, of course, that large firms have proportionately a greater valuation. In this case:

$$dV/dX > 0 \quad \text{and} \quad d^2V/dX^2 > 0.$$

Failure to incorporate size among the explanatory variables would then affect the capitalization of the earnings variable. In fact, if size were a significant determinant of value then the capitalization rate associated with the earnings variable would represent the marginal cost of capital (which because of the favourable size effects would be less than the average). Accepting the non-linear relationship between value and earnings, MM opted to introduce size into their valuation equation. They accomplished this by simply introducing a constant term into their structural equation which effectively meant that they were approximating the underlying non-linear relationship by a linear function. This was not a necessary approach. Alternatively, they could have introduced a continuous variable (representing size) in the valuation equation.

C. TAXATION. As indicated in the theoretical survey of the earlier section, the distortionary effects of the tax system - asymmetrically affecting different sources of capital - can influence the firm's market valuation. In MM's world (as distinct from Miller's world) the market value of the levered firm is increased by the full amount of the tax shield on debt. This shield, resulting from the tax

deductibility of interest charges, is equal to the product of the interest expenses on debt outstanding and the marginal rate of corporation tax. Accordingly, the value of the levered firm becomes equal to the present value of earnings plus the capitalized value of the tax savings on debt:

$$V = [X(1-t)/p] + (trD)/r$$

where t is the marginal rate of corporation tax. Recognition of the effects of MM type taxation requires re-adjustment of both the debt and earnings variables. Moreover, in a world where growth occurs and is explicitly treated the model remains incomplete if the tax advantages to present earnings are considered without due recognition of the present value of the tax savings from the growth in income financed by debt.

Recognizing the need for symmetric treatment of taxation in both the earnings and growth variables, Arditti and Pinkerton formulate a modified version of the MM valuation equation in which there is an explicit positive present value associated with the advantages of future (quite independently of the advantages to present) debt finance. Their valuation equation is derived as follows.² Since the present value of the tax savings on current debt outstanding is the amount tD , the present value of tax savings on that portion of new investment to be undertaking in time M is the discounted value of t - which is the

² Arditti and J. Pinkerton, "The Valuation and Cost of Capital of the Levered Firm With Growth Opportunities." The Journal of Finance, March 1978, pp. 65-73.

marginal rate of corporation tax - times that fraction of the new investment to be financed by debt. Using the MM terminology:

$$I(M) = kX(M)(1 - t).$$

This states that investment, (I), is a fixed fraction, k, of net earnings in period M, X(M). Then, that fraction of investment financed by debt can be denoted by a, so

$$D(M) = akX(M)(1 - t)$$

and

$$D(M) / I(M) = a.$$

The annual tax savings are on the interest on debt, i, which when capitalized at the same rate gives:

$$[(tia I(M)) / i] = (ta I(M))$$

meaning that the increment to the market value of the firm is proportional to the value of investment undertaken and the proportionality factor is given by ta.

In order to illustrate more precisely the authors define three variables for the present value of the growth components of income. The first denoted by B_I is:

$$B_I = [kX(M)(1 - t) / p] = I(M) / p$$

which expresses the present value of the stream of future investments continuing indefinitely into the future. The second variable denoted by B_L is the present value increment - or the contribution to the levered firm's market value - of the discounted stream of future investments partly financed by debt under a tax scheme favouring debt. The third variable, B_U is the contribution to the market value

of the firm of the stream of future investments financed only by equity. Then:

$$B_L - B_U = (ta) B_I$$

implying that in equilibrium the value of a levered growth firm, which finances some of its new investment by debt, exceeds the value of an identically growing but unlevered firm (in the sense that it finances new investment entirely by equity) by the amount:

$$(ta) B_I = [I(M)] / p.$$

Expressed in terms of the MM growth model described earlier:

$$B_I = \{ kX(0)(1 - t)(1 + kp^*)^{m-1} / \{ 1 + p \}^m$$

and

$$\begin{aligned} B_U &= (p^* - p) / p \{ [kX(0)(1-t)(1+kp^*)^{m-1}] / [1+p]^m \\ &= [(p^* - p) / p] B_I. \end{aligned}$$

Then, by substitution:

$$B_I = [B_L - B_U] / ta = \{ B_L - [(p^* - p) / p] B_I \} / ta$$

so,

$$B_L = B_I [(ta) + (p^* - p) / p]$$

and expressing in terms of B_U :

$$\{ B_L / [ta + (p^* - p) / p] \} = \{ (B_U)p / (p^* - p) \}$$

from which:

$$\begin{aligned} B_L &= B_U (tap + p^* - p) / (p^* - p) \\ &= B_U [1 + (tap) / (p^* - p)] \end{aligned}$$

and

$$B_L - B_U = B_U (tap) / (p^* - p).$$

The last equality shows the amount by which the valuation of the levered growth firm exceeds that of its identical but unlevered counterpart. Adding this present value increment

to the MM valuation model gives:

$$V - tD = [X(0)(1-t)/p] + \{[(p^* - p)/p] \left[\sum_{m=1}^M kX(0)(1-t)(1+kp^*)^{m-1} / (1+p)^m \right] [1 + (ta)p / (p^* - p)] \}$$

$$= [X(0)(1-t)/p + \{[(p^* - p)/p] + ta\} \left\{ \left[\sum_{m=1}^M kX(0)(1-t)(1+kp^*)^{m-1} \right] / (1+p)^m \right\}.$$

Rearranging terms and evaluating the summation in closed form gives:

$$V - tD = [X(0)(1-t)/p] + \{[(p^* - p)/p] + ta\} \{kX(0)(1-t)/(p - kp^*)\} \{1 - [(1+kp^*)/(1+p)]^M\}.$$

It can readily be recognized that the right hand side differs from the MM valuation equation only by the inclusion of the multiplicative term (ta) in the growth component. The closed form model can be simplified and evaluated just as with the MM model above. Making the same assumptions and applying the Taylor series expansion to the binomial form, gives the result:

$$V - tD = X(0)(1-t)/p + \{[(p^* - p)/p] + ta\} \{[kX(0)(1-t)/(1+p)] M\}$$

which is the correct specification of the market valuation of the levered firm with growth opportunities under a tax regime favouring debt finance by allowing the deductibility of interest charges from taxable income. Its essential similarity with the MM valuation equation can be seen by supposing that the firm finances all future investment purely by equity. In that case $a=0$ and the equation becomes:

$$V - tD = \{X(0)(1-t)/p\} + [(p^* - p)/p] \{[kX(0)(1-t)/(1+p)] M\}$$

which is exactly the MM valuation equation.

4. DATA SELECTION, TIME PERIOD AND DEFINITION OF VARIABLES

Leaving aside the Arditti and Pinkerton contribution until later, the valuation model implied by the discussion of the previous section has the basic functional form:

$$V = V(X^*, G^*, A, D; u)$$

where V = the total (tax-adjusted) market value of the firm; X^* = the present value of expected earnings (after-tax) on the current asset base of the firm; G^* = the present value of future growth opportunities in earnings; (the asterisks denote the expectational nature of the variables); A = size; D = the market value of debt outstanding which we include to test the validity of the MM theorem; and u = a term representing the unexplained factors in the valuation equation. In this section we describe the sample, the time period to be studied and the definition of the variables.

A. THE SAMPLES. The homogeneity of the cross sectional sample is very important when the object of the study is the measurement of the cost of capital. The problem of the choice of samples has been a serious one confronted by all empirical studies of the MM theorem. In their own test of the theorem, MM recognized that the strict classification criteria they spelled out effectively implied single firm risk classes. They, therefore, chose to base their samples on the industry concept - characterized by homogeneity of product, market, and technology.

The use of the industry concept proposed by MM in

their original study has been criticized on two grounds. First, such relatively homogeneous samples as electric utilities and railroads severely circumscribe the scope for testing. This problem has been a particularly serious one in the non-American studies where market sizes are significantly smaller than in the U.S.A.. Even in Japan where size would not appear to be a constraining factor, there are only 10 electric utilities and 15 railroads listed on the first section boards of the major stock exchanges.

Second, as noted earlier, the conformity of the industry concept to the equivalent risk class hypothesis has been tested on a number of occasions and all of the results indicate its failure to correspond to reasonably homogeneous variability of returns. Recently, however, a more serious attack has been made on the conformity of the electric utility industry - (used by MM) - to the homogeneity implications of the risk class concept. Boness and Frankfurter (1977) [BF] subjected the MM sample to tests of the hypothesis that the observations could be said to have been drawn from the same population and concluded that the cross sectional pooling of electric utility companies was an invalid procedure.¹ They argued that under the circumstances fixed coefficient regression models could not provide efficient and unbiased estimates of the parameters,

¹A.J.Boness and G.M.Frankfurter, "Evidence of Non-Homogeneity of Capital Costs Within 'Risk-Classes'", JOF, June 1977, pp.775-87.

and suggested, instead, the use of a random coefficient regression model which still yielded best linear unbiased results. MM (1966) had recognized this possibility but noted that there were serious conceptual difficulties involved in the estimation of a random coefficient regression model incorporating a solution to the errors-in-variables problem.² To date no solution to this problem has been suggested in the literature and BF did not address themselves to this issue.

In the partial equilibrium analysis of the original authors the incorporation of risk into the analysis was accomplished implicitly by means of the equivalent risk class hypothesis according to which firms belonging to the same risk class could be said to face the same cost of capital - namely, identical capitalization rates. MM, in their pioneering study, defined a risk equivalent class in terms of two characteristics: 1. that the expected probability distribution of returns among member firms be identical except for a scale factor; and 2. that the returns be perfectly correlated inter-temporally.

Although the extension of the MM theorem to a general equilibrium framework obviated the necessity of risk class criterion in a theoretical context, the construct has proven much more difficult to overcome in an empirical context. The generalized characterization of risk in a market equilibrium

²MM, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57. cf.n.50, p.371.

framework afforded by the CAPM provides a potentially valuable approach but has been shown to be devoid of any empirical significance in Japan. Consequently, we are left with the MM model which views the valuation process in isolation and leaves the relationship between risk and the cost of capital largely implicit.

The selection of samples for this study go beyond the traditional industry concept. They are based jointly on selection criteria conforming to a particular set of sufficient conditions ensuring the validity of the theorem and considerations of sample homogeneity which would imply a reasonably uniform cost of capital for the member firms.

From among the set of sufficient conditions ensuring the validity of the theorem, the discussion of part II indicated that the Stiglitz no-bankruptcy model might be an appropriate context for the study of the theorem in Japanese industry. Based on the underlying conditions of the Stiglitz model, three sets of selection criteria were applied: 1. no bankruptcy risk, 2. ownership by investors who are capable of borrowing on terms identical to the firms in which they invest, and 3. operations by the firms in a capital market environment which functions reasonably efficiently.

In the discussion of part II two types of risk sharing mechanisms were described. They were the keiretsu group structures and the role of industrial policy. As regards the former, it was noted that the vertical and horizontal

linkages implied by the structure of the groups facilitated overall risk sharing and therefore reduction and possibly suppression of risks at the corporate level. It was also noted that the prevention of business failure on the part of any member firm could be regarded as a paramount objective of these groups. With regard to the role of industrial policy, it was characterized as providing a safety net for firms operating in strategic industries. These various characteristics were described as having both direct and indirect effects serving to remove the risk of bankruptcy for the companies involved.

The two types of risk absorbing mechanisms are not mutually exclusive and a sample possessing both characteristics may be said to benefit from double protection.

From among the keiretsu groups we focus on the core companies, each of which stands at the apex of a series of vertical linkages and is inter-linked with the other core companies of the group horizontally.

The keiretsu groups can be said to be the backbone of Japanese industry and the core keiretsu companies occupy the key positions. It is therefore not surprising that these same companies are invariably the ones which operate in the strategic industries and so are the main beneficiaries of the protection and support granted by industrial policy.

The keiretsu groups also satisfy the second and third selection criteria remarkably well. Ownership in these is

not only predominantly corporate but is also concentrated in group companies themselves. The dominant investors therefore benefit from the same virtually risk free status and can themselves borrow and invest on the market on terms identical to those of the firms in which they invest.

Although nothing categorically can be said about the extent to which Japanese capital markets come close to characterizing "perfect" capital market conditions, the fact that these markets appear segmented focuses our attention on the core keiretsu companies which consist of the major corporations. In terms of the homogeneity of a keiretsu group sample and its conformity to the risk class concept, we can also note that there exist common systematic tendencies in the distribution of returns among member companies as a result of the fact that there is a concentration of member activities on an intra-group basis and to a great extent large scale investments and high risk ventures are collectively planned and executed. Therefore, some degree of homogeneity can be expected in cross-sectional returns among member companies. All of these would imply that in terms of their respective costs of capital the major keiretsu group companies are more likely to be closely aligned with one another than they would be within the usual industry concept among large diversified companies.

In terms of the actual composition of our sample we focus on the Mitsubishi, Mitsui, and Sumitomo groups - all three of which have maintained their collective identity

inherited from the time of their pre-war zaibatsu predecessors. We restrict our sample to only the so-called core firms of each group. We define core firms on the basis of group-club membership. Each one of these groups has a coordinating forum called the Presidents' Club which meets regularly. Membership of this club is restricted to only the largest and most important companies in the group all of which conform to the above characterization.

The Mitsubishi Group has 28 companies represented on their Kinyo-kai (Friday) Club. We deduct from this sample the four financial institutions (bank, trust, life and non-life insurance) and the group's real estate company which in many respects bears greater resemblance to the financial companies than the non-financial ones. We also deduct another four unlisted companies for which data were not available. This leaves a sample of 19 companies representing the Mitsubishi Group.

The Mitsui Group has 24 companies on its Nimoku-kai (Second Thursday) Club. Deducting the four financial companies, the real-estate company, and the one unlisted member leaves a sample of 18 companies. The Sumitomo Group has 21 companies on its Hakusui-kai (White Waters Club), of which five are active in the financial and real estate areas, and one is unlisted. A seventh company, Sumitomo Forestry, was also subtracted from the sample because of the specialized nature of its activities. Adding the three groups together gives us 51 firms providing as large a sample as could be reasonably expected from Japanese

industry.

In order to develop a perspective on our results we also select two control samples which, at least in the preliminary stages of the study, enable us to compare and contrast the results of the keiretsu sample. The two control groups are railroads and the automobile industry. Although the railroad industry contains a couple of major keiretsu group firms, it can not be regarded as being comprised, in any sense, of keiretsu companies and has never, in recent years, been the subject of any special government consideration. Although it conforms to the a priori (intuitive) homogeneity characteristics associated with the industry concept, the sample size of only 15 companies - listed on the first section boards of the major stock exchanges - precludes any rigorous statistical testing. It should, nevertheless, provide an interesting contrast to the main sample of the study.

The second control sample, the automobile industry, although devoid of any major keiretsu ties - with the exception of Toyota - represents an industry which has long been considered a priority industry by MITI and has therefore been the object of thorough-going help benefiting, for instance, from protective tariffs and other import restrictions, as well as controls over foreign capital investment. It has, moreover, been continuously nurtured through such support measures as: low interest loans arranged for by public financial institutions, government

subsidies, special depreciation rates, exemption from import duty on machinery and equipment, and preferential access to imports of technology.

Automobiles rank among the most homogeneous of Japanese industries in the sense that about one-half of the twenty eight firms in our sample derive all of their revenue from this line of activity and as many as three fourths derive over 80% of their revenue from it. Returns on sample firms would, therefore, be expected to be highly correlated with one another and with industry wide movements.

The main short coming of the automobile industry as a sample for our tests is its size. The industry is comprised of three types of companies: the majors, their assembly-subsidaries, and parts manufacturers. Including only majors or assembly-subsidaries suffers from drastically inadequate sample size problems. The size of our sample can be expanded, however, through the inclusion of parts manufacturers. Their inclusion can be justified on the strength of MITI's active support for the sector and the strong likelihood that "safety net" provisions encompass all tiers of the automobile industry. Moreover, the parts manufacturers are almost invariably subsidiaries of the majors and show much greater dependence on the industry for their revenues than the majors. Nevertheless, even after the inclusion of the parts manufacturers the size of the sample (with only twenty eight firms) precludes extension beyond the simple single stage regression model.

B. THE TIME-PERIOD. Traditionally tests of the MM theorem have adopted single year values derived from annual corporate accounts. In the MM 1966 study this fact featured prominently because a major goal of that study was the estimation of the marginal cost of capital. When data are pooled over time to construct average values then the estimates derived represent average rather than marginal costs of capital and, unless we can assume that this cost is constant, the two are unlikely to be the same. In fact, given the volatility in observed annual rates of return from one year to the next such an assumption would appear quite invalid and an averaging procedure cannot be used to estimate the marginal cost of capital.

There are however a number of objections which can be raised against the single point in time approach. First, because the market does not instantaneously capitalize changes in structural variables, the single point in time approach can be misleading. Second, it would seem more realistic to assume that decision makers and investors focus on some average and not marginal value of the cost of capital, especially when volatility exists, when making their evaluations. Therefore the estimated coefficient of the earnings variable when data are averaged may well have a meaningful economic interpretation. Third, our primary concern in this study is with the leverage theorem and the effect of debt on market values in a market equilibrium framework. Arguably, average values taken over a number of accounting periods provide a better indication of the longer

run equilibrium properties of the market. These points justify the use of a valuation model based on pooling of data over time.

A number of peculiarities of the Japanese context strengthen the arguments for an averaging procedure. Among these we can note the following: first, the high susceptibility of the Japanese economy to short-run cyclical fluctuations due to the nature of the constraints to which the economy was subjected during most of the post-war period. Second, the highly turbulent and volatile nature of the period following the first oil shock (1973) implying not only that current values are likely to be subject to large deviations from their normal values but that the latter may not even be distinguishable in consequence of the major structural changes which the economy has undergone. Third, studies of Japanese managerial behaviour appear to indicate that management in Japan is not as concerned with short-term maximizing policies as it is with achieving long run goals and hence formulates policies accordingly. Similarly, major investors seem motivated more by direct investment rather than portfolio considerations and consequently adopt a longer-term perspective.

Averaged values of the data would thus seem to provide more meaningful information with which to study corporate valuation and the leverage theorem, especially in Japan. Initially, we confine ourselves to the years 1978-80. This allows us to focus on the most recent period for which data were available. Although the shortness of the period is a

limitation, years prior to 1978 were not included in the study because of the disruptive effects of the prolonged depression in earnings and the great volatility in stock market values which followed the oil crisis.

The above arguments notwithstanding, as tests of the valuation model have traditionally been performed adopting single period values we also present results for each of the three years under study. This not only serves to make our results generally comparable with those of other studies but also allows us to study the stability of the coefficients from one year to the next and to consider whether or not the averaging procedure glosses over the underlying characteristics of the data thereby causing the particular results we obtain. Our concern, however, is primarily with the averaged values. Finally, we also provide results for a second, pre-oil crisis period, 1970-72, and consider the validity of the MM theorem in that earlier period as well.

The data used were provided by the NEEDS SERVICE of the Databank Bureau of the Nihon Keizai Shimbun (Japan Economic Journal) and cover balance sheet and income statement accounts for all firms listed on the first section boards of the Tokyo Stock Exchange for the period 1955-80.

C. DEFINITION OF THE VARIABLES. We can write our valuation function in linear regression form and begin by defining the basic variables to be used:

$$(V-tD) = a_0 + a_1(X(1-t))^* + a_2G^* + a_3D + u$$

V represents the total market value of the firm. Correctly specified, it should consist of the sum of the market values of equity and debt. The market value of equity is readily observable and poses no problem. Debt in Japan, however, does not have a market value attached to it because only a very small fraction of borrowed funds ~~is~~ raised on the open market. It consists almost entirely of bank borrowings and discounted commercial paper, neither of which can be given a market value. Although book value measures have to be used for the debt component the heavy dependence on short-term debt, renewed and rolled over at regular intervals, means that the book values probably do not diverge significantly from what market values would have been.

tD is the present value of the tax savings on debt and represents the expected increment to the market value of the levered firm arising from the tax deductibility of interest charges. As such, it should appear on the right hand side in the valuation equation but since our a priori expectations are that its coefficient will be fixed for all firms at the level t (the marginal rate of corporation tax) it is transferred to the left hand side. As noted in an earlier chapter, Japan has adopted the split rate scheme whereby undistributed income is taxed at 40% and distributed income at the preferential rate of 30%. Furthermore, corporations are subject to inhabitants tax (very similar to the national corporation tax) at the rate of 12%. An exact calculation of the marginal tax rate is, therefore, rather complicated. We consider, for the purposes at hand, that a rate of 40% or

(.4) to be a reasonable approximation to the true values. This approach therefore ignores many of the complications that were discussed in the earlier parts of the study. In particular, there is no analysis of the influence of investor taxation on the marginal benefit to debt issues. Such an analysis would have involved consideration of the appropriate marginal tax rate applicable to investors and given the high proportion of investment by fellow members of the keiretsu, it is not clear whether the introduction of the personal tax rates is appropriate. Furthermore, had we introduced personal investment then that would have raised difficult problems regarding representative personal marginal tax rates. We would in addition have had to have known the relative contribution of capital gains and dividends to investor earnings and thereby created a weighted average marginal personal tax rate.² While all these factors are important a number of rather arbitrary and heroic assumptions would have had to be made to develop this line of thought. The simplifying assumption made above can therefore only be regarded as a first approximation to capturing the tax effects in the MM model.

²See the valuation model and the gains from leverage noted on page 63. In the subsequent discussion it is assumed that $t_e = t_b = 0$. In general it is believed that $t_e < t_b$ in which case the tax advantages to debt finance become much more complicated.

D debt (at book value), is defined to include only the interest bearing obligations of the firm. It consists of short-term borrowings (borrowings on deeds and on bills, etc, and overdrafts due within one year), securities due within one year, bonds and debentures, long term borrowings, long-term notes payable (arising from business transactions and having due dates in excess of one year), and long term accounts payable (with due dates longer than one year).

$X(1-t)$ represents the tax adjusted earnings of the firm, the capitalized value of which - according to the MM theory - should give the market value of the stationary firm. Two points are particularly noteworthy about our definition of earnings. First, our value contains components not usually included under operating income. In Japan the large amount of financial investments undertaken by firms makes the returns on these a systematic and recurring element in the earnings of firms. This is especially true in the case of the main keiretsu companies which comprise the main sample of firms in this study. Therefore our definition of earnings includes not only operating income but also interest received (on deposits and marketable securities) and dividend incomes.

Second, our definition of earnings, which is similar to the one used by MM, comes closer to an accounting definition than a cash flow concept. The main difference between ours and the cash flow definition is that although

we deduct depreciation - along with general and administrative costs - from revenues in arriving at our income value, we do not add it back after tax adjustment. As depreciation is a non-cash expense it should be added back to arrive at a cash flow definition of earnings. The fact, however, that depreciation is underestimated on company accounts - by as much as one-half - would mean that the discrepancy between the two is much less than would otherwise appear.

The earnings variable we require is a measure of normalized long run values which is clearly not the same as current measured earnings. We can eliminate any non-systematic deviations of current values from their normal counterparts by taking average values over some period of time. In this study our definition of earnings has been averaged over a three year period intended to purge earnings of at least some random disturbances of macro or industry-wide nature. More will be said about our procedures to correct for systematic deviations between observed and normal long run earnings later.

G = the growth variable poses, undoubtedly, the biggest problem of all as its specification is very complex. As discussed in the previous section, at a theoretical level the MM growth term is the product of three non-observable and expectational terms (a scale factor, an excess returns factor, and the time horizon during which growth is expected to continue) inter-acting multiplicatively. In practice,

however, MM resorted to proxying these by a single ex post (realized) variable -- an arithmetic average growth rate. Such a procedure was initially followed here. We began our estimation by adopting the same average growth rate for the single equation model. Growth was defined in terms of earnings, assets, and sales. The earnings definition proved consistently better than the other two, probably because of the greater heterogeneity of our sample relative to the electric utilities sample used by MM in which assets performed best. Moreover, exponential growth proved superior to arithmetic growth (which MM used) and five year growth rates proved superior to either three or eight year rates.

5. STATISTICAL MODELS AND EMPIRICAL RESULTS

A. Heteroskedasticity. We begin by considering the problem of heteroskedasticity which we expect on a priori grounds because of the nature of our cross section sample. Since firms of varying sizes are being analyzed together, we can expect the absolute values of the disturbances to be proportional to size of firm. OLS procedures applied to heteroskedastic data render the regression coefficients inefficient. This can be corrected by weighting the variables appropriately. A number of alternative deflators were tested and the book value of total assets was found to perform best in terms of over-all fit. In all the results to be reported, the variables have thus been deflated by the book value of total assets, A , so that the estimated regression equation takes the form:

$$(V-tD)/A = a_0/A + a_1(X(1-t))^*/A + a_2G^*/A + + a_3D/A + u'.$$

We now expect the transformed disturbance term $u' = u/A$ to be homoscedastic. The above deflation procedure, however, creates a complication. The constant term was introduced into the structural equation to show that our formulation amounted to a linear approximation of an underlying valuation function which was non-linear. The sign of the constant term would show how size affected market value. If the sign, as we would expect, was negative this would indicate the presence of favourable diversification effects implying that valuation increases more than proportionately with size. In deflated form the original constant term in

the structural equation, therefore, represents a size term.

Now, if a regression constant were introduced into the estimation process, this would imply that we expect the total book value of assets to be an explanatory variable in the valuation equation. We introduce it into our regression equation on the expectation that it should not be significantly different from zero. However, as we have no theoretical justification for the inclusion of a regression constant we show results both fitted with a constant term and where the constant term is suppressed.

B. A PRIORI EXPECTATIONS. Before reporting the main results, it is useful to spell out what our a priori expectations are for both the size and sign of the various coefficients: 1) beginning with the regression constant, we expect this to be insignificantly different from zero. If it were significant this would mean that the total book value of assets was also an explanatory variable in the valuation equation. 2) The coefficient of the earnings variable should in a full MM framework represent the reciprocal of the cost of capital for an all equity financed non-growing firm. 3) The growth term represents the contribution of expected growth to the current market value of the firm. For both samples we would expect growth to positively affect market value. 4) The size term represents the intercept in the non-deflated structural equation of the valuation model. A negative size term, implying increasing returns to valuation would be expected if the samples were homogeneous with

respect to size and the included firms were all of large size. 5) Finally, the debt variable is introduced to test the validity of the leverage theorem. As the expected tax advantages to debt have already been taken into account, if debt is irrelevant and the MM theorem valid, then the debt coefficient should not be significantly different from zero.

C.SINGLE STAGE OLS ESTIMATES. Tables 3-1, 3-2, and 3-3 show the results of single stage OLS (ordinary least squares) estimation of our valuation model on railroads, the automobile industry, and the keiretsu sample of firms. It will be seen immediately from the Tables that in each of the four equations reported for both automobiles and the keiretsu groups, the debt variables appear to have no significant effect on the dependent variable.¹ In railroads however, in all four equations, the debt coefficient is statistically significant and has a negative sign.

The implications of these results appear to be in keeping with the a priori expectations related to the absence of bankruptcy risk and the validity of the theorem. Both automobiles and the keiretsu group companies can be said to be free of default risk while this is probably not

¹ One implication of Table 3-3 which warrants comment is the combination of the separate keiretsu groups into one large sample of firms. In this connection we need to ask whether the striking debt results obtained might not have been due to our averaging among the three separate groups. To obtain some indication, the three groups were separately run and the results were compared with those in Table 3-3. Debt continues to remain insignificant in all three samples - in two cases the estimated coefficient is smaller than the corresponding standard error and in the third only just larger.

the case with railroads. It must be stressed, however, that these results are very tentative and no firm conclusions can be drawn from them because the model as estimated above has a number of major statistical problems.

In the remainder of this study we concentrate on remedying some of the most serious ones, thereby enabling us to draw more meaningful conclusions regarding the MM theorem and its implications. As the main statistical techniques which we subsequently adopt are based on large sample properties, the sample size constraints of both railroads and automobiles eliminates them from subsequent analysis. The following discussion concentrates only on the keiretsu group sample.

=====				
TABLE 3-1				
ORDINARY LEAST SQUARES ESTIMATES				
RAILROADS				
DEPENDENT VARIABLE: (V-tD)/A				
	1978	1979	1980	AVERAGE 1978-80
CONSTANT	1.724 (0.508)	1.860 (0.436)	1.576 (0.329)	1.719 (0.481)
X(1-t)/A	8.881 (5.778)	14.918 (6.107)	11.350 (4.597)	10.018 (5.828)
G(10 ⁻⁴)	-2.410 (5.942)	-4.568 (3.689)	-6.573 (3.851)	-5.356 (4.996)
(1/A)10 ⁶	-0.197 (0.218)	-0.345 (0.406)	-0.160 (0.195)	-0.121 (0.246)
D/A	-1.483 (0.629)	-1.854 (0.508)	-1.393 (0.342)	-1.539 (0.514)
R ²	0.50	0.82	0.82	0.66
Notes: 1.) R ² = multiple correlation coefficient, adjusted for degrees of freedom. 2.) The values in paranthesis are the standard errors of the coefficients.				
=====				

TABLE 3-2				
ORDINARY LEAST SQUARES ESTIMATES				
AUTOMOBILES				
DEPENDENT VARIABLE: (V-tD)/A				
	1978	1979	1980	AVERAGE 1978-80
CONSTANT	0.163 (0.291)	-0.091 (0.335)	-0.322 (0.310)	-0.166 (0.270)
X(1-t)/A	10.178 (3.794)	12.318 (4.108)	15.145 (4.243)	12.623 (3.341)
G(10 ⁻⁴)	1.192 (2.413)	0.621 (1.517)	-1.275 (2.556)	-0.021 (2.147)
(1/A)10 ⁶	-0.138 (0.475)	0.415 (0.330)	0.682 (0.570)	0.335 (0.489)
D/A	0.250 (0.387)	0.486 (0.478)	0.637 (0.449)	0.546 (0.381)
R ²	0.22	0.34	0.34	0.39
Notes: As for Table 3-1				

TABLE 3-3				
ORDINARY LEAST SQUARES ESTIMATES				
KEIRETSU				
DEPENDENT VARIABLE: (V-tD)/A				
	1978	1979	1980	AVERAGE 1978-80
CONSTANT	-0.017 (0.122)	0.045 (0.121)	0.124 (0.132)	0.032 (0.113)
X(1-t)/A	11.627 (1.466)	10.673 (1.656)	7.994 (1.792)	9.496 (1.364)
G(10 ⁻⁴)	-1.819 (1.907)	-2.774 (1.547)	-2.800 (2.006)	-3.209 (1.564)
(1/A)10 ⁶	1.462 (0.413)	1.280 (0.236)	1.449 (0.247)	1.457 (0.211)
D/A	0.181 (0.147)	0.142 (0.150)	0.250 (0.188)	-0.210 (0.148)
R ²	0.70	0.59	0.48	0.64
Notes: As for Table 3-1				

The first, and probably most serious, problem confronted in the single stage model is the bias inherent in the results arising from our substitution of realized values for two non-observable and expectational variables - expected earnings and future growth. It is well known that the application of OLS to variables which are measured subject to error, because their true values are non-observable, renders the estimated coefficients biased² and inconsistent. We know moreover that the resulting bias affects all the other estimated coefficients so that nothing conclusive can be said about the implications of our results until these statistical problems are confronted and solved.

The errors-in-variables problem can have two types of causes. One has to do with random fluctuations of the observable (current) value of a variable around its unobservable but true value. This aspect of the problem was referred to earlier and has to some extent, at least, been remedied with respect to the earnings variable by our averaging procedures. The principle involved in taking averages is to purge the variable's true value of the random fluctuations evident in its observable counterpart.³

² For a definition and discussion of the implications in the context of an errors-in-variables model, see J. Johnston, Econometric Methods (London: McGraw Hill Kogakusha Ltd., 1972), Ch. 9; and G.G. Judge, W.E. Griffiths, R.C. Hill and T.C. Lee, The Theory and Practice of Econometrics, (New York: J.Wiley and Sons, 1980), Ch. 13, especially pp.513-16.

³ Compared with current values used in our trial runs, we found that our R^2 improved markedly and the earnings coefficient increased significantly with averaging. This appears to signify the presence of measure errors bias.

Unfortunately, the averaging procedures are quite useless in remedying the bias inherent in the growth term and also leave unresolved any biases of a systematic nature which could influence the earnings variable. Therefore, we concentrate on remedying the second type of problem which has to do with systematic measurement errors due to the unobservability of the true variable. When confronted with this type of problem two options are usually available. One is to drop the unobservable variable and to continue to estimate the mis-specified equation. For obvious reasons this is a totally unsatisfactory approach. The alternative, which draws upon errors-in-variables theory, is to substitute a proxy for the problem variable. There can be little justification for direct substitution but a proxy variable can be constructed which when used to estimate the function yields consistent parameter estimates.

D.TWO STAGE MODEL. The correction of the problem (by means of constructing a proxy) was effected by MM using the method of instrumental variables. This method employs a set of exogenous variables thought to be related to the true but un-observable variables as instruments for estimation purposes.⁴ The procedure is to estimate the system one equation at a time, first using instrumental regression equations to construct an estimate of each unobservable variable and subsequently to estimate the original equation

⁴For an outline of the method of instrumental variables see: Johnston, 1972, pp. 278-81, where both the assumption and the properties of the method are discussed.

using the regression values of the instruments as estimates of their true values but uncorrelated with the original disturbance term.

The effectiveness of this approach depends largely upon the choice of an appropriate set of instruments and the extent to which the variables selected are: 1. truly exogenous - that is uncorrelated with the disturbance term, 2. strongly correlated with the variable as whose instrument they serve, and 3. free of multi-collinearity among themselves and the other explanatory variables of the system.

Correcting only for the error in the earnings variable (as was done by MM) by adopting a surrogate would result in a two equation model having the form:

$$Y = a_1 X^*_1 + \sum_{i=1}^m a_i X_i + u$$

$$X_1 = \sum_{j=1}^n b_j W_j + v$$

where X^*_1 is the true but unobservable value of earnings and X_1 is its observable counterpart measured subject to error. The set of W variables are instruments used to construct an estimate of X^* .

Our two stage model is intended to construct an estimate of long run earnings while based on the instrumental variables method is equivalent to the two stage least squares approach in the sense that the correctly measured exogenous variables are included as instruments for

themselves in the instrumental regression. Two instruments are selected to represent the long run earnings of the firm. They are dividends and provision for taxes payable.

Dividends, (DIV/A) , have good predictive qualities particularly when, as in Japan, companies practice widespread stabilization of dividends at levels considered sustainable by management. The use of dividends may be criticized, however, on the grounds that they convey information other than that implied for expected earnings and have an influence on valuation quite independently of their proxy for normalized earnings.⁵ We recognize the possibility that dividends may have valuation effects quite independently of earnings in Japan and that this may make their use, as an instrument, questionable. We, therefore, consider the construction of our earnings variable with and without dividends.

The second variable for inclusion, provision for taxes payable (P/A) , can be expected to be highly correlated with earnings while being independent of the disturbance term. Provisions for taxes can be expected to be particularly correlated with normalized long run earnings in the Japanese context because of the ability of Japanese companies to accumulate tax free reserves to meet contingencies. These serve to dampen any volatility in returns due to short-term unanticipated fluctuations.

⁵ J. Crockett and J. Friend, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57: Comment", AER, 1967, pp.1258-67; see: p.1259.

The other exogenous variables which can be included in the instrumental regression are the total book value of assets (which appears here as the constant term too), debt, size and growth. As noted earlier, while the choice of actual instruments is to a large extent arbitrary, the success of the instrumental approach nevertheless depends critically upon it. Consequently, the effectiveness of instrumental variables is based on subjective criteria. We have no definite expectations of the magnitudes of the expected coefficients, so we consider them on the basis of their over all behaviour. An important element in assessing their effectiveness should, of course, be their stability over time. Table 3-4 shows the results of our full earnings instrumental regression. Two remarkable features are noticeable. First, all of the variables with the exception of debt are highly significant (at the 95% confidence level). Second, all of the instruments remain quite reasonably stable over the three year period. Both these characteristics would suggest that the instruments chosen are reasonable proxies for earnings.

The results of our earnings instrumental regressions with dividends omitted are reproduced in Table 3-5. Here we notice some changes. Although the R^2 value falls as compared with the version including dividends, compared with the MM results the omission of dividends seems to affect the overall significance of the regression remarkably little.⁶

⁶ MM found that the R^2 values in their instrumental regressions fell from 0.64, 0.71, and 0.73 (in 1954, 56, and 57 respectively) to 0.19, 0.63, and 0.31, when dividends were excluded.

=====

TABLE 3-4
EARNINGS INSTRUMENTAL REGRESSION
DEPENDENT VARIABLE: $X(1-t)/A$

	1978	1979	1980	AVERAGE 1978-80
CONSTANT	0.040 (0.008)	0.033 (0.008)	0.029 (0.006)	0.029 (0.007)
DIV/A	1.152 (0.358)	1.073 (0.375)	1.473 (0.333)	0.981 (0.356)
P/A	0.522 (0.213)	0.465 (0.177)	0.514 (0.168)	0.998 (0.203)
$G(10^{-4})$	0.360 (0.146)	0.297 (0.105)	0.242 (0.116)	0.301 (0.108)
$(1/A)10^6$	-0.095 (0.033)	-0.039 (0.018)	-0.050 (0.014)	-0.056 (0.016)
D/A	-0.014 (0.012)	-0.003 (0.012)	-0.000 (0.012)	0.006 (0.013)
R^2	0.61	0.58	0.68	0.72

Notes: As for Table 3-1.

=====

=====

TABLE 3-5
EARNINGS INSTRUMENTAL REGRESSION
DIVIDENDS OMITTED
DEPENDENT VARIABLE: $X(1-t)/A$

	1978	1979	1980	1978-80
CONSTANT	0.048 (0.008)	0.041 (0.007)	0.040 (0.007)	0.036 (0.007)
P/A	0.848 (0.206)	0.645 (0.177)	0.784 (0.185)	1.223 (0.198)
$G(10^{-4})$	0.305 (0.159)	0.304 (0.110)	0.393 (0.131)	0.343 (0.115)
$(1/A)10^6$	-0.060 (0.035)	-0.019 (0.013)	-0.013 (0.014)	-0.003 (0.013)
D/A	-0.025 (0.013)	-0.012 (0.013)	-0.013 (0.014)	-0.003 (0.013)
R^2	0.53	0.52	0.55	0.68

Notes: As for Table 3-1.

=====

As evidenced by the large increase in its coefficient, the tax provisions term captures the effects of dividends. It may be said of the MM results that in view of the importance of dividends in their first stage regression (and the relative insignificance of the other explanatory variables), their second stage regression was effectively one substituting dividends for current earnings. This is not the case with our results. Nevertheless, we continue with our statistical tests using the version including dividends. Below (in panel C of Table 3-9), estimation results are shown based on the omission of dividends from the earnings instrumental regression.

We can now proceed to the second stage of estimation. Table 3-6 shows the second stage results of our two equation model. The valuation model is estimated using the least squares approach but with the computed value of earnings, derived from the first stage instrumental regression substituted for the observed value. Compared with Table 3-3, we find that the two stage model leads to several major changes. We observe significant increases in the statistical significance of the coefficient for the earnings and debt terms, with the debt variable now becoming positive and significant. Corresponding to this we note large falls in the constant term and in the coefficient of the growth variable. Both, while previously insignificant, now appear to have significant effects on valuation. These effects are magnified in the single year results but also observable in the averaged values.

=====

TABLE 3-6

SECOND STAGE ESTIMATES USING COMPUTED EARNINGS

DEPENDENT VARIABLE: $(V-tD)/A$

	1978	1979	1980	AVERAGE 1978-80
CONSTANT	-0.615 (0.147)	-0.579 (0.152)	-0.146 (0.161)	-0.316 (0.122)
$X(1-t)^*/A$	20.089 (1.932)	21.149 (2.346)	12.564 (2.409)	14.592 (1.600)
$G(10^{-4})$	-6.386 (1.793)	-8.181 (1.616)	-5.979 (2.243)	-6.827 (1.547)
$(1/A)10^6$	2.321 (0.379)	1.571 (0.203)	1.676 (0.250)	1.727 (0.190)
D/A	0.667 (0.150)	0.539 (0.144)	0.448 (0.193)	0.480 (0.139)
R^2	0.79	0.72	0.53	0.74

Notes: As for Table 3-1.

=====

Viewed in isolation the increase in the coefficient of the earnings variable can be interpreted as the result of elimination of measurement errors, especially in view of the large increase in multiple R^2 for each equation reported. We also notice from the behaviour of the standard errors in the two stage results that loss in efficiency appears to have been minimal . The standard errors of all the variables are much lower in the two stage model than in the single equation model. Despite these improvements, the results continue to show that even the two stage model is subject to serious problems.

We would, on a priori grounds, expect growth to make a

significant positive contribution to valuation in Japan. The largely insignificant coefficient in the single stage model (although over the three year period it was negative and significant) and its negative and significant coefficients in the two stage model suggest serious misspecification of the growth term in the valuation model. It would, as a result, seem best to defer any further consideration of the behaviour of the other variables (whether they be the reasonableness of the predicted cost of capital, or the significance of the constant term and the crucial debt variable) until after the problem of growth has been looked at more closely.

E. THE PROBLEM OF GROWTH. The above results highlight the necessity of reconsidering the growth term and possibly making some corrections to it. The correct specification of the growth term has been the single most important unresolved problem confronted by valuation models. Indeed, the main thrust of the criticism directed at the MM 1966 study focused on the problem of growth.⁸

MM recognized that their empirical specification of growth, as distinct from their theoretical specification,

⁸ With regard to the improper specification of the growth variable Robichek, McDonald and Higgins wrote: "In our opinion, this particular error in specification is so fundamental that it calls into question the value of the model itself as an estimating tool." A.A. Robichek, J.G. McDonald and R.C. Higgins, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57: Comment", AER, December 1967, pp.1262-63; and M.Jordan "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57: Comment", AER, December, 1967, pp. 1267-77.

had serious shortcomings but observed that the problem of correct measurement of growth had no satisfactory answer.⁹ They took recourse in the fact that the regulated nature and the homogeneity of the electric utilities industry made their proxy - which was based only on a scale factor and which assumed that the effects of the excess rate of return and the time horizon factor could be adequately subsumed in that coefficient - a tolerable approximation to growth.¹⁰

Although the simple specification adopted by MM may have been acceptable in the case of electric utilities in the U.S., it clearly poses an obstacle to estimation of samples which are less homogeneous and faster growing. As suggested by common sense and indicated by the results of both our single equation models and more significantly by our two stage model, such a simplified characterization of growth is not acceptable in the Japanese case.

Obviously the choice of a single value - realized

⁹ The authors state in their reply to comments:
"Finally, there is the question of the variable we have used to measure valuable future growth opportunities.... The problem of measuring this important but not directly observable quantity is a most complex and vexing one for which no one to our knowledge has yet been able to offer a completely satisfactory solution."

See: M. Miller and F. Modigliani, "Some Estimates of the Cost of Capital to the Electric Utilities Industry, 1954-57: Reply", AER, December 1967, (pp. 1288-1300).

¹⁰ The authors explained this as follows:
"Needless to say the particular approach adopted here with respect to representing the growth variable is not to be regarded as of general applicability and was chosen, at least in part, with a number of very special properties of the electric utility industry in mind."

See: MM, AER, 1966; cf. 17, p.345.

exponential growth of earnings - provides only a very crude approximation to a highly complex function. Viewed in terms of theoretical specification of the growth term (discussed in an earlier section) the variable used suffers from two types of defect. First, whereas in the theoretical specification the growth term was defined as being comprised of three inter-acting components: an excess returns component, a scale factor, and a time horizon variable, the growth term actually applied represents only the scale effect. Second, in theory the growth term is a forward-looking expectational variable, while the term used is defined over past growth rates. Although it is difficult to say at this stage precisely how these two factors influence the distortion in the growth coefficient, there can be little doubt that both are responsible for the perverse results obtained.

The importance of growth in the Japanese context makes this a matter of fundamental concern. First, considering the highly turbulent and volatile nature of the period under study, the adaptive expectations approach to estimating growth, which is effectively what the use of extrapolations from past realized values implies, is not sufficient. Second, the assumption that the other components of growth can be adequately subsumed in a variable representing only the scale effect is highly suspect especially when we are dealing with a sample which is very heterogeneous.¹¹ If our

¹¹ The annual growth rates in earnings for our sample range from -17% to 65%.

estimates are to provide meaningful results some adjustment must be made to correct for the errors-in-variables problem due to the growth term.

We must conclude from the above results that our growth term is subject to both mis-specification and measurement error. We are therefore still faced with an errors-in-variables problem which renders all of the coefficients in the model biased and unreliable. To tackle this problem we use a similar procedure to that used for earnings, i.e. we introduce instrumental variables to proxy growth. In the case where instruments are used for both earnings and growth the system expands to a three equation model:

$$\begin{aligned} Y &= a_1 X^*_1 + a_2 X^*_2 + \sum_{i=1}^m a_i X_i + u \\ X_1 &= \sum_{j=1}^n b_j W_j + v \\ X_2 &= \sum_{k=1}^p c_k Z_k + w \end{aligned}$$

where X^*_1 is the true value of the earnings variable which is unobservable and for which we construct a proxy using the instrumental regression equation X_1 ; and X^*_2 is the true value of the growth variable which is fitted by another proxy constructed using the instrumental regression equation X_2 .

Three methods were considered to estimate instrumental variables in which the growth term appears as a constructed value. One was the method of principal components which has the advantage of reducing the dependence on subjective and intuitive criteria when selecting the set of instruments for

inclusion. We rejected the method, however, because it fails to attach any meaningful economic interpretation to the principal components formed; and also because it requires a relatively large number of a priori instruments whereas we have only a few in our specification of the growth term.

The second approach was to specify the growth function using its component parts as instruments for constructing the variable. We remember from the earlier discussion that the MM growth function incorporating the Arditti and Pinkerton modification can be written:

$$G = \{[kx(1-t)T]/(1+p)\}\{1 + [pta/(p^*-p)]\}$$

which can be expressed in logarithmic form as:

$$\ln G = \ln kX(1-t) + \ln T - \ln(1+p) + \ln \{ 1 + [pta/(p^*-p)] \}.$$

For purposes of estimation the last term on the right hand side can be approximated by expanding a series of the form: $\ln[1 + x]$ where:

$$x = [pta/(p^*-p)].$$

Restricting this series to only the first order term, we have:

$$\ln G = \ln kX(1-t) + \ln T - \ln(1+p) + [pta/(p^*-p)]$$

which can, potentially, be estimated. However, attempts to estimate this function proved futile and provided no meaningful results.¹²

The third approach adopted was based on the selection of a number of instruments from the linear combination of which a proxy could be constructed. Three criteria were set

¹² Dropping Arditti and Pinkerton's additional growth term made no difference to the results either.

for selection of such variables. First, they would have to be ones which, on a priori grounds, could be expected to be highly correlated with expected growth. Second, they would ideally have to be compatible with a rational expectations view taken by investors. Third, they would have to be forward looking.

The first instrument selected is a measure of the "excess" rate of return which we defined as the excess of the rate of profit over the interest costs of the firm. We know from the earlier theoretical discussion that the expected excess return appears as a key element in the theoretical specification of the growth function. The second variable which we propose is the ratio of the market to the book value of equity. Intuitively, this would appear to proxy well for the growth of earnings. It has the further advantage of being forward looking in time and conforming, if crudely, to investor decision making on the basis of rational expectations. It should be noted, however, that it is doubtful that this variable completely satisfies the second condition we require of instrumental variables, namely, independence from the disturbances since the numerator is also a component of the dependent variable. The ratio, therefore, satisfies the condition of strong correlation with the problem variable but cannot be said to be truly exogenous.

Finding variables to play the role of instruments for growth was not easy. In experimental runs, both the ratio

of market to book value and the excess return proxy proved highly significant while none of the many other variables which we tried proved significant at all. Invariably, the best results were obtained when only these two variables were introduced. These results were furthermore improved when the (non-significant) constant term was dropped from the equation, suggesting, quite plausibly, that the underlying relationship may be non-linear.

A further problem we face is the expected correlation between our growth instruments and earnings. Ideally a good instrument should not be correlated with the other explanatory variables already appearing in the function. The problem of multi-collinearity which manifests itself here runs much deeper and has its roots in the specification of the valuation function itself. It arises because both earnings and growth of earnings appear as explanatory variables in the valuation model and nothing can be done to avoid it in the choice of instruments. The problem, moreover, is particularly accentuated in our study because growth is expected to be, a priori, an important determinant of valuation. Matrices of simple correlations are tabulated in Appendix 2 and confirm our expectations of high inter-correlation between earnings and growth.¹³

¹³ However, in no case is the simple correlation coefficient between the two regressions in excess of the 0.8 limit which is often used as a rule of thumb as regards multi-collinearity and beyond which it is felt that significant problems, requiring specific remedial measures, are encountered.

Clearly, estimating a growth function properly is no easy task. Our growth instruments, although deficient, represent the best trade-off obtainable under the circumstances. We stress the point, however, that our primary concern is not directly with the instrumental regression but with the plausibility of the final results.

Table 3-7 shows the results of our growth ^rinstrumental regression. The Table is divided into Parts A and B with the former showing the results with the constant term suppressed and the latter with it free. As will subsequently become apparent neither variant of the growth regression affects the outcome of the third stage results in any material way. Although we have no a priori expectations of the size of the coefficients we note in column 4 of Panel A that both instruments are highly significant having t-values in excess of 5. In terms of stability characteristics, we note that the excess return element is remarkably stable over each of the three single year results although the coefficient for the averaged period is almost three times the size of the single year values.

On the other hand, the market to book value ratio is unstable over the three years studied and statistically non-significant in two. To explain this instability we might look to the volatile nature of the stock market in the post-oil crisis period. There is in this connection an interesting parallel between the trend in the market to book ratio and the significance of growth in the valuation

function which warrants mentioning. Market to book values were very depressed in 1978 as compared with 1979 and 1980. They increased on average from 1.9 in 1978 to 2.3 in 1980. Correspondingly, the market's growth expectations increased materially over the period. Coincident with this is the fact that our growth term proved insignificant in 1978, was marginally significant in 1979, and highly significant in 1980. It may, therefore, be said that in 1978, when the market's growth expectations were at their lowest, the market to book value ratio made an insignificant contribution to growth and our growth term was effectively proxied only by the earnings effect.

=====				
TABLE 3-7				
GROWTH INSTRUMENTAL REGRESSION				
DEPENDENT VARIABLE: G				
(FIVE YEAR EXPONENTIAL GROWTH OF EARNINGS)				
	PANEL A			AVERAGE
	1978	1979	1980	1978-80
EXCESS-RETURNS	0.341 (0.020)	0.308 (0.032)	0.347 (0.045)	1.088 (0.172)
(MARKET-TO-BOOK VALUE)10 ³	0.178 (0.300)	1.265 (0.652)	4.803 (0.818)	6.222 (1.188)
	PANEL B			AVERAGE
	1978	1979	1980	1978-80
CONSTANT	0.004 (0.001)	-0.002 (0.004)	0.003 (0.051)	0.002 (0.008)
EXCESS-RETURNS	0.301 (0.022)	0.310 (0.032)	0.334 (0.050)	1.076 (0.181)
(MARKET-TO-BOOK VALUE)10 ³	-0.343 (0.312)	1.922 (1.611)	3.715 (1.904)	5.478 (3.595)
R ²	0.79	0.66	0.46	0.41

NOTES: As for Table 3-1.

=====

Using the constructed estimate of the growth term derived from the instrumental regression reported in Table 3-7, we can finally proceed to the third stage of our three equation model. Table 3-8 shows the estimation of the original valuation equation using constructed values for both the earnings and growth term.

Looking at the growth term first, the coefficient's sign has now become positive and significant in three of the four columns. In 1978 growth continues to remain insignificant but a possible explanation was given above. The market to book value ratio gives a good summary statistic for this phenomenon. The changes in the domestic and international circumstances which in the early 1970's disrupted the growth pattern of the Japanese economy took a long time to work themselves through and the post-oil crisis adjustment process almost certainly continued as late as 1978. In terms of the market's expectations of growth business confidence continued to remain weak and none of the usual signs of strong business recovery were apparent.¹⁴

③ It should be noted that the observed change in sign of the growth coefficient may be the consequence of an inappropriate instrument, namely the inclusion of the valuation ratio.

¹⁴ The main factors responsible for the lack of confidence were: the absence of any precedent for coping with the changed economic environment, the steep appreciation of the yen leading to expectations of powerful deflationary consequences, the absence of any strong element of endogenous demand (especially private equipment and machinery investment) and finally, the absence of any noticeable improvement in the corporate profit position. Furthermore, as late as 1978, the results of the usual government surveys of business conditions and prospects strongly indicated the lack of growth expectations by the business community. See: Economic Planning Agency, Economic Survey of Japan 1978/79 and 1979/80. (Tokyo: The Japan Times Ltd.)

=====

TABLE 3-8
THIRD STAGE ESTIMATION
USING COMPUTED EARNINGS AND GROWTH
DEPENDENT VARIABLE : (V-tD)/A

PANEL A		GROWTH INSTRUMENT WITH CONSTANT SUPPRESSED		
		AVERAGE		
		1978	1979	1980
		1978-80		
CONSTANT		-0.237 (0.163)	0.095 (0.154)	0.216 (0.121)
X(1-t) [*] /A		14.168 (2.742)	7.025 (2.732)	4.328 (1.990)
G [*] /A		2.166 (2.377)	6.928 (2.712)	5.376 (1.878)
(1/A)10 ⁶		1.077 (0.183)	1.108 (0.214)	1.367 (0.213)
D/A		0.382 (0.159)	0.171 (0.159)	0.116 (0.168)
R ²		0.74	0.62	0.54

PANEL B		PANEL C	
GROWTH INSTRUMENT		EARNINGS INSTRUMENT	
WITH CONSTANT FREE		WITH DIVIDENDS OMITTED	
AVERAGE 1978-80		AVERAGE 1978-80	
CONSTANT	0.122 (0.114)	0.243 (0.127)	
X(1-t) [*] /A	6.601 (1.800)	4.152 (1.973)	
G [*]	3.791 (1.767)	5.641 (1.838)	
(1/A)10 ⁶	1.316 (0.188)	1.292 (0.203)	
D/A	0.082 (0.144)	0.016 (0.157)	
R ²	0.66	0.61	

Note: As for Table 3-1.

=====

Table 3-9 presents some summary statistics which highlight the difference between 1978 on the one hand and 1979/80 on the other.

=====			
TABLE 3-9			
SOME KEY MARKET STATISTICS			
ALL LISTED MANUFACTURING COMPANIES			
	(1)	(2)	(3)
	GROWTH RATE ^a	INDEX OF	GROSS CAPITAL
	OF SALES	OPERATING INCOME ^b	EXPENDITURE ^a
1975	0.10	65.24	-31.67
1976	13.64	91.61	6.09
1977	5.61	83.82	-3.69
1978	3.82	97.99	-2.40
1979	17.33	146.70	18.50
1980	14.56	150.88	26.60

Notes: (a) represent nominal values; (b) 1973=100.

Source: Daiwa Securities, Analysts Guide, 1982.

=====

Turning to the earnings coefficients, we find that they all have the right sign and continue to remain statistically significant. As already noted, the reciprocal of the coefficient should approximate the cost of capital for an all equity financed firm. Independent estimates of the cost of equity capital during the late 1970s are hard to find. The cost of capital for a hypothetical all equity stream must differ from the rate of return on equity for a levered firm by both leverage effects as well as those arising from growth potential. Insofar as the leverage and growth effects can be expected to work in opposite direction[§]₁, possibly even offsetting one another to some degree, the earnings yield can be used as a crude short-hand measure for assessing the plausibility of our coefficients. The coefficient for 1978-80 indicates a cost of capital of about 15% which compares with an after tax rate of return (based on the earnings yield) of 12.5% for the same sample

of firms over the same period. The gap between these figures is clearly not too glaring. They also compare favourably with estimates made by Habgood (for the Boston Consulting Group) which placed the cost of capital in the mid-1970s at about 13%.¹⁵

Looking at Panel B of Table 3-8 we note that the inclusion of the constant term in the growth instrumental regression leaves the final third stage results largely unaffected. The earnings coefficient increases slightly and the growth coefficient falls correspondingly, but the basic results of the model and the goodness of fit remain almost identical. Panel C, however, shows that the omission of dividends from the earnings instrumental regression significantly lowers our estimated earnings coefficient.¹⁶ Remarkably, neither the Panel B nor the Panel C results materially affect the important debt coefficient. In all three panels debt (with the exception of 1978) remains insignificant.

F. THE CHANGE IN DEBT. Next we consider the implications of the Arditti and Pinkerton (AP) growth model. The main contribution of the AP model was to show that in a world where growth is expected to continue and where future investment is expected to be financed by debt, the market

¹⁵ A.J.Habgood, Debt Growth and Competitive Position: A Re-examination of Japanese Corporate Financing, The Boston Consulting Group, 1976.

¹⁶ Given our a priori expectations, the Panel A results give a closer estimate of the cost of capital.

value of the firm is affected by the present value of the tax savings on future debt finance. The authors themselves, recognizing the complexity of their growth function, made no attempt to incorporate it into any empirical model. The AP growth term was specified in an earlier section of this chapter but so far no attempt was explicitly made to incorporate it into the estimated valuation model.

We now focus briefly on this problem because we expect both growth and debt finance to remain important factors in the valuation of Japanese companies. A convenient, if crude, proxy for the effects of future debt finance is the change in past debt values. We consider these effects on valuation by incorporating a change of debt variable in our regression equation. Table 3-10 shows the results of our single and three stage models incorporating the change in debt levels. The structure of our results remain quite unaffected. In both columns the standard error of the change variable is many times its estimated coefficient and no perceptible change can be noted in the debt variable itself. It remains an interesting question, in view of the plausibility of the Arditti and Pinkerton model, why no significant effect is noticeable. Our results may be attributable to the increasing self-sufficiency of the corporate sector.

G. THE PROBLEM OF SIZE. Next we consider the behaviour of the size variable. Size was introduced into our model by incorporating a constant term into the undeflated version of the structural equation. The linear approximation of the

underlying non-linear relationship implies that if the sample under study is homogeneous with respect to size then we can be confident that our linear approximation gives a good estimate of the cost of capital (at the margin). When the sample of firms is large, as in our case, and if we expect increasing returns to valuation from size, as would be the case if there were diversification effects, then the coefficient should have a negative sign.

=====			
TABLE 3-10			
VALUATION MODEL INCLUDING CHANGE IN DEBT			
DEPENDENT VARIABLE: (V-tD)/A			
	SINGLE STAGE		THREE STAGE INSTRUMENTAL
	AVERAGE 1978-80		AVERAGE 1978-80
CONSTANT	0.033 (0.114)	CONSTANT	0.126 (0.116)
X(1-t)/A	9.464 (1.397)	X(1-t) [*] /A	6.551 (1.859)
G(10 ⁻⁴)	-3.198 (1.583)	G [*] (10 ⁻⁴)	3.813 (1.756)
(1/A)10 ⁶	1.446 (0.228)	(1/A)10 ⁶	1.315 (0.204)
D/A	0.211 (0.150)	D/A	0.078 (0.145)
DELTA D/A	-0.036 (0.262)	DELTA D/A	0.004 (0.259)
R ²	0.64	R ²	0.66
=====			

We find from our results that our size terms have a positive sign and are significant throughout. This requires some explanation. We can probably attribute the positive sign to the fact that our sample is not homogeneous with

respect to size. Our largest company, Toyota, is 76 times the size of the smallest, Sumitomo Coal Mining. In terms of numbers, however, the sample seems to be biased towards the (relatively) small firm end of the sample. We can get some idea of the extent of the heterogeneity of the sample by dividing it into two sub-samples according to size. By repeating the valuation regression, we find that the smaller firms have a lower coefficient on earnings implying a higher cost of capital. Clearly, these results confirm our intuitive expectations and also imply that the specification of our model is not fundamentally incorrect. The positive sign of the size coefficient can be interpreted as signalling that what we are estimating is not the marginal cost of capital for either the large group of firms or the small group of firms but some average of the two.

We also ran the regressions using a logarithmic size function and the results are reported in Table 3-11. The incorporation of size as a log function indicates our expectation that the size variable enters the valuation function in a non-linear manner. The coefficient of the variable when introduced in log form becomes negative and small and remains highly significant.

H. A SECOND TIME PERIOD. Finally, we consider a second and earlier time period. We focus on the years 1970-72. This period, too, was one of transition characterized by a deceleration of growth due largely to a lower growth of supply potential. Comparing the rate of growth of fixed

investment -- an indicator of the supply elasticity of output -- we find that this slowed down from some 16% in the years 1965-70 to only 6% in the period 1970-72. The growth of productive capacity moreover dropped from 12% to 7%, and GNP growth decelerated from 11% to 7%. Table 3-12 shows the main results for the keiretsu group companies (based on 1978 group membership) for the three years, 1970-72.

=====		
TABLE 3-11		
INSTRUMENTAL REGRESSIONS AND CONTINUOUS SIZE VARIABLE		
AVERAGE VALUES 1978-80		
DEPENDENT VARIABLES (V-tD)/A		
	TWO STAGE MODEL	THREE STAGE MODEL
CONSTANT	1.933 (0.295)	1.915 (0.328)
$X(1-t)^*/A$	13.280 (1.738)	5.689 (1.977)
$G^*(10^{-4})$	-6.361 (1.696)	3.835 (1.845)
LOG A	-0.103 (0.016)	-0.083 (0.015)
D/A	-0.340 (0.151)	-0.023 (0.156)
R^2	0.68	0.62
=====		

Applying our valuation model to this second and earlier period allows us to test a number of interesting features. First, we are interested to know whether the specification of the model remains valid in the earlier period. If it does, despite the fundamental structural changes which have occurred in the Japanese economy during the 1970's, this can be taken as further evidence of the

correct specification of the model. Furthermore, we would like to see how our instrumental regressions perform in this period. Finally and most importantly, we wish to test the leverage theorem.

=====			
TABLE 3-12 VALUATION MODEL FOR 1970-72 KEIRETSU SAMPLE DEPENDENT VARIABLE: (V-tD)/A			
	SINGLE STAGE	TWO STAGE	THREE STAGE
CONSTANT	-0.063 (0.142)	0.690 (0.124)	-0.991 (0.201)
X(1-t)/A	14.133 (2.662)	27.972 (2.304)	30.734 (3.848)
G(10 ⁻⁴)	-1.893 (10.356)	-4.527 (6.421)	15.748 (6.137)
(1/A)10 ⁶	0.709 (0.198)	0.768 (0.123)	0.677 (0.111)
D/A	0.517 (0.192)	1.159 (0.141)	1.521 (0.236)
R ²	0.50	0.81	0.67
=====			

Our interest in testing the leverage theorem in the earlier period arises from the following considerations. During the 1970-72 period the keiretsu groups were equally riskless as in the later period -- although some consolidation of group ties and identity has occurred in the meantime. Japanese capital markets, however, in the early 1970's were not functioning as "efficiently" as they have been more recently. To a far greater extent than the contemporary period, government restrictions were imposed on the free operation of financial markets. It remains

questionable, therefore, whether in this earlier period the arbitrage operations which necessarily must underlie the validity of the leverage theorem could have been performed adequately and efficiently.

Looking at the results, we can note statistical problems similar to those experienced above. Compared to the two and three stage models, the earnings coefficient in the single stage model is biased downwards and the growth coefficient is statistically insignificant. In the two stage model, where only an instrumental earnings regression is added, the size of the earnings coefficient almost doubles (while its standard error actually falls). Growth, however, continues to remain insignificant indicating the inability of our simpler growth function to capture the real effects of growth on valuation. In the three stage model, with earnings and growth instrumental equations, the growth term again becomes positive and significant.

The interesting thing to note is that the results correctly reflect the major structural changes which occurred in Japan during the 1970s. Two changes are particularly striking. One is the great increase in the cost of capital over the period and the other is fall in the contribution of growth. For variables measured in almost identical ways, the big differences in the coefficients obtained indicate structural changes which are both consistent with our a priori expectations. These results serve to confirm that the model is not fundamentally mis-specified.

For our purposes, however, the most remarkable feature

of the Table is the highly significant and positive debt coefficient observed in all three stages of estimation. Debt during this period made a real and important contribution to the market valuation of keiretsu companies.

I. THE DEBT VARIABLE. The discussion so far has shown that despite some inevitable approximations and some crude instrumental variable constructs, the basic equations which have been reported (especially in Tables 3-8 and 3-12) are correctly specified and provide meaningful and plausible results for those variables for which a priori expectations exist for both sign and size of the coefficients. We can therefore consider for both periods the behaviour of the leverage variable which for our purposes is the key one. If the MM leverage theorem were correct after adjustment for the expected tax advantages from debt finance, we would expect the market value of the firm to be unaffected by its level of debt. Our results in Table 3-8 show that both over the period 1978-80 and for the years 1979 and 1980 taken individually debt is insignificant. In each case the standard error of the debt term was greater than the estimated coefficient.

The apparent significant value of debt in 1978 can be attributed to the failure of the second stage instrumental regression to capture growth effects and to the consequent high degree of multi-collinearity which exists between earnings and growth in that year. The matrix of correlation coefficients tabulated in Appendix 2 indicates that the debt

term might be picking up and reflecting influences of earnings and possibly even growth.

The final results appear to support the validity of the MM theorem and imply the irrelevance of debt (or financial structure) to the valuation of major keiretsu group companies. It is remarkable that these correspond to the insignificant debt coefficients obtained in the single stage model. In the two stage model, however, the size of the debt coefficient increased significantly becoming greater than twice its standard error in each of the four equations reported. The significant coefficient of the debt variable in the two stage model can not be viewed in isolation from the growth term in the model which, as a result of mis-specification and measurement errors, had a perverse sign.

Some preliminary evidence was provided on two control samples - railroads and automobiles. Neither was large enough to allow tests implying consistency properties but in the single stage runs both keiretsu groups and automobiles, which may be considered free of bankruptcy risk, showed no significant contribution of debt to valuation while for the railroads, which can not be said to benefit from a similar status, debt was found to have a significant negative effect on valuation.

In a sense, the results were anticipated in the characterization of the Japanese financial system in the discussion of part II. The absence of bankruptcy risk and

the predominance of corporate ownership are both well known features of Japanese corporate finance. The most striking aspect of the results, therefore, is the extent to which the realities of Japanese capital markets can be said to approximate the frictionless environment of perfect capital markets. Traditionally, Japanese capital markets have been depicted as operating subject to a complex system of government controls and regulations. Recently, however, the capital markets have been the object of major liberalization and deregulation policies.

The favourable results indicating the validity of the theorem in Japan in the late 1970's imply that during this period capital markets in which the sample firms operated conformed remarkably well to the neoclassical characterization. On the other hand the apparent rejection of the theorem in the early 1970's provides an interesting contrast. Compared with the earlier period the no bankruptcy status of the main keiretsu group companies does not appear to have undergone any major change. Nor can any real significance be attributed to the increasing trend of corporate ownership. The predominance of group ownership and control, especially among the major keiretsu companies, had been well established by the early 1970's. The main structural difference between the two periods has been the liberalization and deregulation of capital markets.

Another remarkable feature of the results is the relative robustness of the insignificant debt results which

remained invariant to: the removal of dividends from the earnings instrumental regression, the inclusion of a constant term in the growth instrumental regression, the incorporation of a change-in-debt variable or the use of a continuous size variable, in the alternative estimates of the valuation model.

6. CONCLUSION

This thesis has set out to study the Modigliani-Miller irrelevance of leverage theorem in the Japanese context. Part I surveyed the theoretical background to the theorem. It began with the partial equilibrium model of the original authors, went on to consider the implication of the model extended to incorporate a generalized characterization of uncertainty, and continued by reviewing the implications of the theorem in the context of a general market equilibrium model. It noted that in reality capital markets are not complete, that the opportunity set attainable by investors is restricted to only a subspace of the complete set and that this set will normally be altered as a result of changes in financial structure. The discussion then focused on four sets of conditions sufficient to ensure the validity of the theorem even when capital markets are not complete (in the Arrow-Debreu sense). Each of these imposes additional restrictions on the behaviour of investors and on the characteristics of the system. These included the Stiglitz no-bankruptcy model, the Fama no monopolistic issue of securities model and the CAP (Capital Asset Pricing) models based on the portfolio separability principle.

From among the sufficient conditions, one - the Stiglitz model - was found to be quite consistent with some characteristics of the Japanese financial system and corporate finance. This model, in addition to the condition just noted, requires investors to have equal access to

capital markets whose smooth and efficient operation should not be impeded by regulations.

The discussion of part II had two primary objectives. First, it sought to dispel the common mis-conception that Japan was somehow structurally different from other comparable corporate economies and therefore needed to be studied from a different theoretical framework and using a different set of analytical tools. It argued that, at least in terms of corporate financial structure, Japan could not be said to be different in any fundamental way. In particular, the view that Japanese corporations were operating subject to remarkably low equity ratios was a mis-conception largely attributable to differences in accounting principles such as, the undervaluation of fixed assets, the recording of securities held at acquisition costs rather than at market values, and the classification of capital reserves under liability accounts. It moreover, sought to explain the prevalence of indirect finance and the imbalance in the source of corporate funds in terms of the realities of the financial system.

A second objective of the discussion of part II was the demonstration of the no-bankruptcy, equal access, and no impediments conditions underlying the Stiglitz model. It was argued that there were systematic elements in the system of keiretsu groupings and industrial policy which served to effectively suppress the risk of bankruptcy at the corporate level among large groups of Japanese firms. The keiretsu groups, it was noted, were characterized by strong inter-

corporate linkages which created a common identity. The performance of the whole group was inextricably linked to the success and failure of the individual members of the group. Consequently, the prevention of business failure among group members was described as constituting an important goal of the group as a whole. Member companies threatened by business failure invariably become the object of rescue mission^s organized by the group.

Industrial policy in Japan is based on a well planned and coherent set of objectives and extends to the nurturing and support of industries (and companies) considered strategically important in view of the national goals. It is, consequently, believed that the government provides a safety net protecting companies in the strategic industries from actual business failure. This attitude is itself important and has been carefully developed over many years through the continuous interaction between the public and private sectors.

Another feature of the Japanese financial system stressed in the discussion of part II was the predominance of corporate ownership of the corporate sector. In fact, the main investors in Japanese corporations happen to be the financial institutions which both lend to them and are their major shareholders. It was noted, that were it not for the restrictions imposed by the Anti-Monopoly Law, the share of financial corporations as shareholders in major corporations would have been much larger than it is now. This

predominance, not only ensured that investors in the firm were able to participate in capital markets on terms and conditions identical to the firms in which they invest, but also that they themselves were free from bankruptcy risk.

A third feature which the discussion of part II sought to highlight was the changing realities of Japanese capital markets in recent years. Traditionally, Japanese capital markets have been depicted as operating subject to a complex system of government controls and regulations. It has been widely believed that, burdened by these controls, the free and efficient operation of Japanese capital markets was impeded. Over the last few years, however, the deregulation of these markets has been made a primary goal of government policy. Deregulation and liberalization measures have been implemented which are significantly altering the scope and structure of Japanese capital markets.

The discussion of part III focused on presenting an empirical study testing for the validity of the MM theorem. While the original aim of this thesis had been that of faithfully reproducing the MM approach (as has, incidentally, been the case with the great bulk of the empirical literature applied to Japan) it was found that such a procedure would have been inappropriate in the Japanese context. Instead, it was found necessary to make a number of important modifications to the MM valuation approach.

Firstly, the traditional industry classification of

the risk class concept was abandoned in favour of a classification based on keiretsu groupings. It was argued that this provided a superior basis for forming a homogeneous risk class characterized by a common cost of capital than any equivalent based on the industry concept.

Secondly, in the empirical investigations, it was found that growth considerations (virtually ignored by MM) were of fundamental importance in the determination of corporate valuation in Japan and that the two stage model of MM was mis-specified in the Japanese case. Adjustments were made to the model and it was extended to a three equation instrumental variables system where instrumental regressions were used to construct proxies for both the earnings and the growth terms. The specification of the growth term proved very difficult and had to be approximated by means of somewhat crude instruments but it was found, in the final stage of analysis, that the valuation model estimated appeared to be correctly specified and the estimated coefficients appeared consistent with a priori expectations both in terms of the size and the signs of the parameters estimated.

Thirdly, it was felt that expectational considerations should be introduced more explicitly, at least in the formulation of the growth variable. Ideally, a rational expectations framework should have been adopted. This was, however, well beyond the scope of the present thesis. An attempt to proxy expectations was nonetheless made via the introduction of the market to book value ratio. Though, no

the right direction.

Fourthly, the model was run not only on data for single years but also on the three-year averages (which, in the Japanese context in particular, probably provide more meaningful answers) as well as on two very different time periods (1970-72 and 1978-80), to test for the stability or otherwise of the leverage theorem in an economy which underwent profound structural changes over the decade.

The major finding for the most recent period was that debt made no significant contribution to the valuation of companies in the keiretsu samples. These results can be interpreted as favouring the validity of the MM theorem. The insignificance of debt was, moreover, found to be invariant to various alterations in the specification of the model.

Interestingly, however, estimation during the earlier time period (1970-72) for the same sample of firms showed that the theorem did not hold and that debt made a positive and significant contribution to valuation. The conflicting results during the two time periods were attributed to the fact that Japanese capital markets in the earlier period were much further away from approximating the neoclassical characterization of efficient and unimpeded operations.

The implications of these results should not, however, be exaggerated. As noted in the introduction, the conditions underlying the MM theorem are analogous to the frictionless surface environment in the physics of motion. Whereas in the

surface environment in the physics of motion. Whereas in the physical sciences such conditions can be artificially created no comparable construct is available to the student in economics. Therefore, if he is to test the conformity of his theoretical constructs with reality and if he is to derive any implication from these to enhance his understanding of the real world, he must be vigilant and await the opportunity when favourable conditions appear. In a sense, this thesis attempted to do just this. The results are highly specific to the "time and space" parameters of the study. They can not be interpreted either as immutable laws operating in Japan or as results characterizing the whole of Japanese industry, let alone the industry of other countries.

They do, however, provide confirmation of a number of interesting features regarding some segments of the Japanese financial system and corporate finance. The main keiretsu groups appear to be characterized by the absence of bankruptcy. The dominant investors in capital markets appear to have access to them on identical terms as the firms in which they invest, and the operation of capital markets, at least those in which the major keiretsu group companies operate, is sufficiently free and unimpeded to allow the validity of the theorem to be upheld.

The phenomenal growth of the Japanese economy has been the subject of considerable attention. Much is made of the apparent differences between Japan and other comparable corporate economies in efforts to explain the sources and

causes of Japan's unique growth. The Japanese financial system and especially the structure of corporate finance are often cited as being exceptional. If any conclusion can be drawn from this thesis, it is probably that some of the existing views on this particular point may be inaccurate.

APPENDIX ONE

<u>COMPOSITION OF KEIRETSU SAMPLE</u>	<u>STOCK EXCHANGE CODE</u>
MITSUBISHI MINING & CEMENT CO. LTD	5238
MITSUBISHI METAL CORPORATION	5711
KIRIN BREWERY COMPANY LTD.	2503
MITSUBISHI RAYON CO. LTD.	3404
MITSUBISHI PAPER MILLS, LTD.	3864
MITSUBISHI CHEMICAL INDUSTRIES LTD.	4010
MITSUBISHI GAS CHEMICAL CO. INC.	4180
MITSUBISHI PETROCHEMICAL CO. LTD.	4184
MITSUBISHI PLASTICS INDUSTRIES LTD.	4213
MISTUBISHI OIL COMPANY LTD.	5404
ASAHI GLASS CO. LTD.	5201
MISTUBISHI STEEL MFG. CO. LTD.	5632
MISTUBISHI KAKOKI KAISHA LTD. (MACHINERY)	6331
MISTUBISHI ELECTRIC CORPORATION	6503
MISTUBISHI HEAVY INDUSTRIES LTD.	7011
NIPPON KOGAKU K.K. (OPTICS)	7731
MISTUBISHI CORPORATION (TRADING)	8058
NIPPON YUSEN K.K. (SHIPPING)	9101
MISTUBISHI WAREHOUSE & TRANSPORT. LTD.	9301
 SUMITOMO COAL MINING CO. LTD.	1503
SUMITOMO METAL MINING CO. LTD.	5713
SUMITOMO CONSTRUCTION CO. LTD.	1823
SUMITOMO CHEMICAL CO. LTD.	4005
SUMITOMO BAKELITE CO. LTD.	4203
NIPPON SHEET GLASS CO. LTD.	5202
SUMITOMO CEMENT CO. LTD.	5232
SUMITOMO METAL IND. LTD.	5405
THE SUMITOMO LIGHT METAL IND. LTD.	5738
SUMITOMO ELECTRIC IND. LTD.	5802
SUMITOMO HEAVY IND. LTD.	6302
NIPPON ELECTRIC COMPANY LTD. (NEC)	6701
SUMITOMO CORPORATION (TRADING)	8053
SUMITOMO WAREHOUSE CO. LTD.	9303
 MITSUI MINING CO. LTD.	1501
MITSUI MINING & SMELTING CO. LTD.	5706
MITSUI CONSTRUCTION CO. LTD.	1821
SANKI ENGINEERING CO. LTD.	1961
NIPPON FLOUR MILLS CO. LTD.	2001
TORAY INDUSTRIES INC. (TEXTILES)	3402
OJI PAPER CO. LTD.	3861
MITSUI TOATSU CHEMICALS INC.	4001
MITSUI PETROCHEMICAL IND. LTD.	4183
ONODA CEMENT CO. LTD.	5233
THE JAPAN STEEL WORKS LTD.	5631
TOSHIBA CORPORATION (ELECTRICAL)	6502
MITSUI ENGIN. & SHIPBLDG. CO. LTD.	7003
TOYOTA MOTOR CORP.	7203
MITSUI & CO. LTD. (TRADING)	8031
MITSUKOSHI LTD. (RETAIL)	8231
MITSUI O.S.K. LINES LTD. (SHIPPING)	9104
THE MITSUI WAREHOUSE CO. LTD.	9302

AUTOMOBILE SAMPLE

TOYODA AUTOMATIC LOOM WORKS
CLARION CO. LTD
STANLEY ELECTRIC CO LTD
JAPAN STORAGE BATTERY CO. LTD
YUASA BATTERY CO. LTD
THE FURUKAWA BATTERY CO LTD
NISSAN MOTOR CO. LTD
ISUZU MOTORS LIMITED
TOYOTA MOTOR CO. LTD
HINO MOTORS LTD.
NISSAN DIESEL MOTOR CO. LTD
TOYOTA AUTO BODY CO. LTD.
NISSAN SHATAI CO. LTD.
KANTO AUTO WORKS LTD.
NIHON RADIATOR CO. LTD
TOYO RADIATOR CO. LTD
NIPPON OIL SEAL IND. CO. LTD
KAYABA IND. LTD.
PRESS KOGYO CO. LTD.
PACIFIC INDUSTRIAL CO. LTD.
AISIN SEIKI CO. LTD.
TOYO KOGYO CO. LTD.
DAIHATSU MOTOR CO. LTD.
AICHI MACHINE INDUSTRY
HONDA MOTOR CO. LTD.
SUZUKI MOTOR CO. LTD.
FUJI HEAVY INDUSTRIES LTD.
SHIROKI CORPORATION

RAILROADS SAMPLE

TOBU RAILWAY COMPANY.
SEIBU RAILWAY COMPANY
SAGAMI RAILWAY COMPANY.
HAKONE TOZAN RAILWAY COMPANY
TOKYU CORPORATION
KEIHIN ELECTRIC EXPRESS
ODAKYU ELECTRIC COMPANY
KEIO TEITO ELECTRIC RAILWAY
KEISEI ELECTRIC RAILWAY CO.
FUJI KYUKO COMPANY
NISHI-NIPPON RAILROAD CO.
KINKI NIPPON RAILWAY CO.
HANKYU CORPORATION
HANSHIN ELECTRIC RAILWAY
NAGOYA RAILROAD COMPANY

APPENDIX TWO
MATRIX OF SIMPLE CORRELATION COEFFICIENTS

1978-80	V-tD/A	X(1-t)*/A	G*(10 ⁻⁴)	1/A(10 ⁶)	D/A
V-tD/A	1.000	0.569	0.536	0.489	-0.168
X(1-t)*/A		1.000	0.697	-0.132	-0.412
G*(10 ⁻⁴)			1.000	-0.105	-0.088
1/A(10 ⁶)				1.000	0.005
D/A					1.000
1980	V-tD/A	X(1-t)*/A	G*(10 ⁻⁴)	1/A(10 ⁶)	D/A
V-tD/A	1.000	0.376	0.423	0.532	-0.078
X(1-t)*/A		1.000	0.600	-0.142	-0.276
G*(10 ⁻⁴)			1.000	-0.139	-0.036
1/A(10 ⁶)				1.000	-0.095
D/A					1.000
1979	V-tD/A	X*(1-t)/A	G*(10 ⁻⁴)	1/A(10 ⁶)	D/A
V-tD/A	1.000	0.603	0.633	0.459	-0.198
X(1-t)*/A		1.000	0.759	-0.007	-0.538
G*(10 ⁻⁴)			1.000	-0.023	-0.291
1/A(10 ⁶)				1.000	0.013
D/A					1.000
1978	V-tD/A	X*(1-t)/A	G*(10 ⁻⁴)	1/A(10 ⁶)	D/A
V-tD/A	1.000	0.715	0.672	0.462	-0.314
X(1-t)*/A		1.000	0.770	0.025	-0.661
G*(10 ⁻⁴)			1.000	0.105	-0.353
1/A(10 ⁶)				1.000	-0.009
D/A					1.000

BIBLIOGRAPHY

- Abegglen, J.G., The Japanese Factory, Glencoe: Free Press, 1958.
- Adams, T.F.M. and I. Hoshii, A Financial History of The New Japan, Tokyo: Kodansha International, 1972.
- Allen, D.L. and Greenwood, "Japan: Banking, Money and Bond Markets", in A.M. George and J.H. Giddy (ed.), International Finance Handbook, vol. 1, 4.7, New York: John Wiley and Sons, 1983.
- Allen, J.C., Japan's Economic Policy, London: The MacMillan Press, 1980.
- Arditti, F.D., "Risk and The Required Return on Equity", The Journal of Finance, March 1967, pp.19-36.
- , and J.M. Pinkerton, "The Valuation and Cost of Capital of the Levered Firm with Growth Opportunities", The Journal of Finance, March 1978, pp.65-73.
- Arrow, K.J., "The Theory of Risk Aversion", Essays in the Theory of Risk Bearing, Amsterdam: North Holland, 1970.
- , "The Role of Securities in the Optimal Allocation of Risk Bearing", reprinted in Arrow, K.J., Essays in The Theory of Risk Bearing, Amsterdam: North Holland, 1970.
- Baumol, W.J., and B. Malkiel, "The Firm's Optimal Debt Equity Combination and the Cost of Capital", Quarterly Journal of Economics, 1967, pp.547-78
- Barges, A. The Effect of Capital Structure on the Cost of Capital, Englewood Cliffs, N.J.: Prentice-Hall, 1963.
- Baron, D.P., "Default Risk and the Modigliani-Miller Theorem: A Synthesis", American Economic Review, March 1976, pp.204-12.
- Becker, J., "General Proof of Modigliani-Miller Propositions I and II Using Parameter-Preference Theory", Journal of Financial and Quantitative Analysis, March 1978, pp.65-69
- Benedict, R., The Chrysanthemum and The Sword: Patterns of Japanese Culture, New York: Houghton Mifflin, 1946.
- Black, F., M. Jensen, and M. Scholes, "The Capital Asset Pricing Model: Some Empirical Results", in M. Jensen (ed.), Studies in The Theory of Capital Markets, New York: Praeger, 1972.

- Boltho, A., Japan: An Economic Survey, Oxford: Oxford University Press, 1975.
- Boness, J., "A Pedagogic Note on the Cost of Capital", The Journal of Finance, March 1964, pp.99-106.
- , and G.M. Frankfurter, "Evidence of Non-Homogeneity of Capital Costs Within Risk Classes", Journal of Finance, June 1977, pp.775-87.
- Brealey, R. and S. Myers, Principles of Corporate Finance, London: McGraw Hill, 1981.
- Bulow, J.I. and J.B. Shoven, "The Bankruptcy Decision", Bell Journal, Autumn 1978, vol. 9, no. 2, pp.99-106.
- Cass, D. and J.E. Stiglitz, "The Structure of Investor Preference and Asset Returns, and Separability in Portfolio Allocation : A Contribution to The Pure Theory of Mutual Funds", Journal of Economic Theory, 2, 1978, pp.122-60.
- Chang, C.S., The Japanese Auto Industry and The U.S. Market, New York: Praeger, 1980.
- Copeland, T.E., and J.F. Weston, Financial Theory and Corporate Policy, London: Addison-Wesley Publishing Co., 1979
- Crockett, J. and J. Friend, "Some Estimates of The Cost of Capital to the Electric Utility Industry, 1954-57: Comment", American Economic Review, 1967, pp.1258-67.
- Davenport, M., "Leverage and the Cost of Capital : Some Tests Using British Data", Economica, May 1971.
- Daiwa Securities, Analyst's Guide, 1980.
- DeAngelo, H. and R. Masulis, "Optimal Capital Structure Under Corporate and Personal Taxation", Journal of Financial Economics, March 1980, pp.453-67.
- Diamond, P., "The Role of a Stock Market in a General Equilibrium Model with Technological Uncertainty", American Economic Review, September 1967, pp.117-30.
- Dore, R.P., British Factory: Japanese Factory - The Origins of National Diversity in Employment Relations, Berkeley: University of California Press, 1973.
- Economic Planning Agency, Japan, Annual Report on the National Accounts, 1982.
- , Economic Survey of Japan 1978/79 and 1979/80, Tokyo: The Japan Times Ltd.

Fama, E.F., Foundations of Finance, Oxford: Basil Blackwell, 1972.

-----, "The Effects of a Firm's Investment and Financing Decision on the Welfare of Its Security Holders", American Economic Review, June 1978, pp.278-84.

-----, and M.H. Miller, The Theory of Finance, New York: Holt, Reinehart and Winston, 1972.

-----, and J.D. Macbeth, "Risk, Return and Equilibrium: Empirical Tests", Journal of Political Economy, May/June 1973, pp.607-36.

-----, "Efficient Capital Markets: A Review of Theory and Empirical Work", Journal of Finance, May 1970, pp.383-417.

Ferri, M.G., and W.H. Jones, "Determinants of Financial Structure : A New Methodological Approach", Journal of Finance, June 1979, pp.631-44.

Fujita, S., "Tax Policy", in R. Komiya (ed.), Postwar Economic Growth in Japan, Berkeley: University of California Press, 1966.

Galenson, W. and K. Okada, "The Japanese Labor Market", in H. Patrick and H. Rosovsky (ed.), Asia's New Giant, Washington: The Brookings Institute, 1976.

Glyn, A., "The Stock Market Valuation of British Companies and The Cost of Capital 1955-1969", Oxford Economic Papers, July 1973, pp.212-40.

Gonedes, N.J., "A Test of the Equivalent Risk Class Hypothesis", Journal of Financial and Quantitative Analysis, June 1969, pp.159-77.

Gonzales, N., R. Litzenberger and J. Rolfo, "On Mean Variance Models of Capital Structure and The Absurdity of Their Predictions", Journal of Financial and Quantitative Analysis, June 1977, pp.165-79.

Habgood, A., "Debt, Growth, and Competitive Position: A Re-examination of Japanese Corporate Financing, I: Recent Trends in Corporate Financing", circulated by the Boston Consulting Group, 1975.

Hadley, E.M., Antitrust in Japan, New Jersey: Princeton University Press, 1970.

- Hamada, R.S., "Portfolio Analysis, Market Equilibrium, and Corporation Finance", The Journal of Finance, March 1969, pp.11-31.
- , "The Effect of the Firm's Capital Structure on the Systematic Risk of Common Stocks", The Journal of Finance, May 1972, pp.435-52.
- Hayashi, T., Guide to Japanese Taxes 1976-77, Tokyo: Zaikei Shoho-sha, 1978.
- , Guide to Japanese Taxes 1979-80, Tokyo: Zaikei Shoho-sha, 1981.
- Hirshleifer, J., "Investment Decisions Under Uncertainty : Choice Theoretic Approaches", Quarterly Journal of Economics, November 1965, pp.509-36.
- , "Investment Decisions Under Uncertainty : Applications of The State Preference Approach", Quarterly Journal of Economics, May 1966, pp.237-77.
- Industrial Bank of Japan, Handbook of The Japanese Bond Market, Tokyo: IBJ, 1982.
- Jensen, M.C., "Risk, The Pricing of Capital Assets and The Evaluation of Investment Portfolios", The Journal of Business, April 1969, pp.167-247.
- , and J. Long, "Corporate Investment Under Uncertainty and Pareto-Optimality in The Capital Markets", Bell Journal of Economics and Management Science, vol. 3, no. 1, Spring 1972, pp.151-74.
- Johnson, C., MITI and The Japanese Miracle, Stanford: Stanford University Press, 1982.
- Johnston, J., Econometric Methods, London: McGraw-Hill Kogakusha Ltd., 1972.
- Kanzaki, K., "Legal Analysis of Nihon Netsugaku Case", Kobe University Law Review, no. 11, 1977, pp.21-29.
- Kaplan, E.J., Japan: The Government Business Relationship (A Guide for The American Businessman), U.S. Department of Commerce, February 1972.
- Kawada, H., "Workers and Their Organizations", K. Okochi, B. Karsh, and S.B. Levine, Workers and Enterprises in Japan, Tokyo: University of Tokyo Press, 1973.
- Kim, E.H., "Miller's Equilibrium, Shareholder Leverage Clienteles, and Optimal Capital Structure", Journal of Finance, May 1982, pp.301-19.
- King, M., "Taxation and The Cost of Capital", Review of Economic Studies, 41, 1974, pp.21-36.

Komine, M., "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei (A Test of Capital Market Efficiency Based on The Fair Game Model)", Japan Securities Research Institute, 1975.

-----, "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei to Kottei Buai no Henka ga Kabuka ni Oyobosu Kokka (A Test of Capital Market Efficiency Based on The Fair Game Model and The Effects of Changes in The Discount Rate)", Japan Securities Research Institute, Technical Paper 44, May 1978.

-----, "Fair Game Moderu ni Yoru Kabushiki Shijo no Koritsu Sei no Kentei Musho Zoshi ni Kansuru Kabuka no Hanno (A Test of Capital Market Efficiency Based on The Fair Game Model and The Response of Share Prices to Free Distributions)", Japan Securities Research Institute, Technical Paper 51, 1980.

Komiya, R. and K. Iwata, Kigyo Kinyu no Riron (The Theory of Corporate Finance), Tokyo: Nihon Keizai Shimbun, 1973.

Konya, F., "Technical Paper", Japan Securities Research Institute, 1978.

Kraus, A., and R. Litzenberger, "Skewness Preference and the Valuation of Risk Assets", The Journal of Finance, September 1976, pp.1085-99.

Kunimura, M., "Kaikai Joho to Kabuka (Accounting Information and Share Prices)", Kaikai, no. 3, 1979.

Kuroda, I., and Y. Oritani, "A Re-examination of The Unique Features of Japan's Corporate Financial Structure", Japanese Economic Studies, Summer, 1980, pp. 19-27.

Lau, S.C., S.R. Quai, and C.M. Ramsey, "The Tokyo Stock Exchange and The Capital Asset Pricing Model", Journal of Finance, May 1974, pp.507-69.

Lee, T.C., The Theory and Practice of Econometrics, New York: J. Wiley and Sons, 1980, pp.513-6.

Markowitz, H.M., "Portfolio Selection", The Journal of Finance, March 1952, pp.77-91.

-----, Portfolio Selection: Efficient Diversification of Investment, (Cowles Foundation Monograph 16), New Haven: Yale University Press, 1959.

Marsh, M. and H. Mannari, "Divergence and Convergence in Industrial Organizations: The Japanese Case", in J. Dlugos and K. Weiermair, Management Under Differing Value Systems, Berlin: Walter de Gruyter, 1981.

- Martin, J.D., D.R. Scott, Jr., and R.F. Vandell, "Equivalent Risk Classes : A Multidimensional Examination", Journal of Financial and Quantitative Analysis, March 1979, pp.101-18.
- Maru, J. and S. Royama, "Rates of Return in Relation to Risk: An Empirical Analysis of The Tokyo Stock Exchange", Technical Paper 29, Japan Securities Research Institute, January 1974.
- Masulis, R.W., "The Effects of Capital Structure Change on Security Prices : A Study of Exchange Offers", The Journal of Financial Economics, Spring 1980, pp.139-77.
- Matsushita, M."The Anti-Monopoly Law of Japan", Law in Japan, vol. 11, 1978, pp.57-75.
- Mehta, D.R., E.A. Moses, B. Deschamps, and M.C. Walker "The Influence of Dividends, Growth, and Leverage on Share Prices in the Electricity Industry : An Econometric Study", Journal of Financial and Quantitative Analysis, December 1980, pp.1163-94.
- Miller, M.H., "Debt and Taxes", The Journal of Finance, May 1977, pp.261-75.
- , and F. Modigliani, "Dividend Policy, Growth, and the Valuation of Share Assets", The Journal of Business, October 1961, pp.411-33.
- , and -----, "Corporate Income Taxes and The Cost of Capital: A Correction", American Economic Review, June 1963, pp.433-43.
- , and -----, "Reply to Brewer and Michaelson", American Economic Review, June 1965, pp.524-7.
- , and -----, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57", American Economic Review, June 1966, pp.333-87.
- , and -----, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57: Reply", American Economic Review, December 1967, pp.1288-1300.
- , and -----, "Reply to Heinz and Sprenkle", American Economic Review, September 1969, pp.592-5.
- , and M. Scholes, "Rates of Return in Relation to Risk: A Re-examination of Some Recent Findings", in M. Jensen (ed.), Studies in The Theory of Capital Markets, New York: Praeger, 1972.

Miyazaki, Y., "The Japanese - Type Structure of Big Business", Japanese Economic Studies, Fall 1973, pp.3-61.

-----, "Excessive Competition and the Formation of 'Keiretsu'", in K. Sato (ed.), Industry and Business in Japan, London: Croom Helm, 1980, pp.53-73.

Mizuno, T., Shogaku Chochiku Hikaze Seido to Shihon Costo, (The Tax Exemption of Interest Income on Small Deposits and the Cost of Capital); University of Fukuoka mimeograph, 1982.

Modigliani, F., and M.H. Miller, "The Cost of Capital, Corporation Finance and The Theory of Investment", American Economic Review, June 1958, pp.261-96.

-----, and -----, "Reply to Rose and Durand", American Economic Review, September 1959, pp.655-59.

Mossin, J., "Equilibrium in A Capital Asset Market", Econometrica, October 1966, pp.768-83.

-----, The Economic Efficiency of Capital Markets, Toronto : D.C. Heath and Co., 1977.

Nakane, C., Japanese Society, Berkeley: University of California Press, 1970.

Nakamura, T., "Corporate Financial Reporting in Japan", The Hitosubashi Journal of Commerce and Management, July 1973, pp.36-51.

Norbury, P. and G. Bownas (ed.), Business in Japan: A Guide to Japanese Business Practice and Procedure, The MacMillan Press, Revised Edition, 1980.

Nickell, S.J., The Investment Decision of Firms, Welwyn: James Nisbett and Co., 1978.

OECD, The Industrial Policy of Japan, Paris: OECD, 1972.

Okuda, T., "Kabushiki Shijo no Koritsu Sei no Hyoka (A Test of The Efficiency of Capital Markets)", Nomura Research Institute, Zaikai Kansoku, April 1975.

The Oriental Economist.

Pechman, J. and K. Kaizuka, "Taxation", in H. Patrick and H. Rosovsky (ed.), Asia's New Giant, Washington: The Brookings Institute, 1976.

Pratt, J., "Risk Aversion in the Small and in the Large", Econometrica, 1964, pp.122-34.

- Robichek, A.A., J.G. McDonald and R.C. Higgins, "Some Estimates of the Cost of Capital to the Electric Utility Industry, 1954-57 : Comment", American Economic Review, December 1967, pp.1262-63.
- Roll, R., "A Critique of the Asset Pricing Theory's Test; Part I: On The Past and Potential Testability of The Theory", Journal of Financial Economics, March 1977, pp.129-76.
- Ross, S.A., "The Current Status of the Capital Asset Pricing Model (CAPM)", The Journal of Finance, June 1978, pp.885- 902.
- Rubenstein, M., "The Fundamental Theorem of Parameter Preference Security Valuation", Journal of Financial and Quantitative Analysis, January 1973, pp.61-9.
- Sakakibara, S., "Tests of the Capital Asset Pricing Model: Comparison of NYSE and Tokyo Stock Exchange", Investment, Osaka Securities Exchange, June 1981, pp.2-33.
- Sanekata, K., "Administrative Guidance and the Anti-Monopoly Law", Law in Japan, vol. 10, 1977, pp.65-80.
- Schwartz, E., and J.R. Aronson, "Some Surrogate Evidence in Support of the Concept of Optimal Financial Structure", The Journal of Finance, March 1967, pp.10-8.
- Scott, D.F., Jr., "Evidence on the Importance of Financial Structure", Financial Management, Summer 1972, pp.45-50.
- , and J.D. Martin, "Industry Influence on Financial Structure", Financial Management, Spring 1976, pp.67-73.
- Stiglitz, J.E., "A Re-examination of the Modigliani-Miller Theorem", American Economic Review, December 1969, pp.784-93.
- , "Some Aspects of the Pure Theory of Corporate Finance: Bankruptcies and Take-Overs", Bell Journal of Economics and Management Science, 1972, pp.458-82.
- , "On The Optimality of The Stock Market Allocation of Investment", Quarterly Journal of Economics, 1972, pp.25-60.
- , "Taxation, Corporate Financial Policies, and the Cost of-Capital", Journal of Public Economics, 1973, pp.1-34.
- , "On The Irrelevance of Corporate Financial Policy", American Economic Review, December 1974, pp.851-66.

- Sudo, K., "Waga Kuni Kabushiki Toshi Shintaku no Performansu (The Performance of National Mutual Trust Funds)", Japan Securities Research Institute, Technical Paper 42, 1977.
- Suzuki, Y., Money and Banking in Contemporary Japan, New Haven: Yale University Press, 1980.
- The Tax Bureau, Ministry of Finance, An Outline of Japanese Taxes, 1979, Tokyo: The Ministry of Finance, 1980.
- Terada, T., "Gendai Toshi Seisaku to Toshi Shintaku no Kihon Mondai (The Basic Problem Between Modern Investment Strategy and Mutual Funds)", Shoken Toshi Shintaku Geppo, November 1976.
- , "Toshi Bunseki no Juyo Kadai", Shoken Anaristo Journal, March 1977.
- Tobin, J., "Liquidity Preference as Behaviour Towards Risk", Review of Economic Studies, February 1958, pp.65-86.
- Tsujita, T., Securities Regulation in Japan, Tokyo: University of Tokyo Press, 1970.
- Ueno, H., "The Conception and Evaluation of Japanese Industrial Policy", Japanese Economic Studies, Winter 1975, pp.6-38.
- Vogel, E.F., Japan's New Middle Class, Berkeley: University of California Press, 1963.
- Wakasugi, T., K. Nishina and M. Tsuchiya, Trends in Profitability for Japanese Industrial Corporations, Paper Presented at London Conference on Rates of Return on Capital, September 1980.
- Wallich, H.C. and M.I. Wallich, "Banking and Finance", in H. Patrick and H. Rosovsky (ed.), Asia's New Giant, Washington: The Brookings Institute, 1976.
- Weston, J.F., "A Test of Cost of Capital Propositions", The Southern Economic Journal, October 1963, pp.105-12.
- Yoshino, M.Y., Japan's Managerial System: Tradition and Innovation, Boston: MIT Press, 1975.

