The economics of IPO stabilization, syndicates and naked shorts

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Abstract

Stabilization is the bidding for and purchase of securities by an underwriter immediately after an offering for the purpose of preventing or retarding a fall in price. Stabilization is price manipulation, but regulators allow it within strict limits - notably that stabilization may not occur above the offer price. For legislators and market authorities, a false market is a price worth paying for an orderly market. This paper compares the rationale for regulators' allowing IPO stabilization with its effects. It finds that stabilization does have the intended effects, but that underwriters also seem to have other motives to stabilize, including favouring certain aftermarket sellers and enhancing their own reputation and profits. A puzzling aspect of stabilization is why underwriters create 'naked short' positions which are loss-making to cover when, as is usual, the aftermarket price rises to a premium. We set up a model to show that the lead underwriter may profit from a naked short at the expense of the rest of the syndicate given the way commissions are apportioned between them. We argue that a naked short mitigates the misalignment of interests which stabilization causes between issuer and lead underwriter, although it does so at the expense of the non-lead underwriters.

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1. Introduction

Lead underwriters in equity initial public offerings (IPOs) and a variety of other securities offerings (including equity-linked instruments and certain types of non-convertible bonds) are, in most jurisdictions, permitted to stabilize the offered shares in the period immediately after the start of trading.[1] Stabilization, although a form of price manipulation, is allowed in these cases in order to reduce the volatility of the immediate aftermarket. For legislators and market authorities, the benefits of reduced volatility are thought to outweigh the disadvantages of creating a temporary false market, and hence may enhance market efficiency. Stabilization is typically carried out by the lead underwriter of the issue, who acts on behalf of all the underwriters. However, the incentives of the lead underwriter and of the remaining underwriters are, in practice, not completely aligned. In this paper we explore how such intra-syndicate conflicts can help to align the interests of the lead underwriter and the issuing company or vendor(s)[2] and also provide an explanation for the puzzle of why 'naked short' positions are frequently created in the stabilization account when determining the allocation of IPOs.

The standard approach to stabilization is for the lead underwriter, on behalf of all the underwriters, to start the stabilization period with negative inventory. Then, if the lead underwriter makes stabilization purchases, these reduce this short position. The short position is created by 'over-allotting' shares: the lead underwriter allots to investors more shares than she receives from the issuing company. If the share price declines below the issue price, and she makes stabilization purchases, profits accrue to the underwriters as the short position is reduced. On the other hand, if the price rises above the offer price, the underwriters are exposed to losses on the short position. In most equity offerings, underwriters are effectively indemnified against this loss by the issuing company, which grants them an over-allotment (or 'greenshoe') option. This allows the lead underwriter to buy a given number of additional shares – typically 15% of the original offering size – from the issuer during the stabilization period at the original offer price.

In many cases, however, the lead underwriter creates a short position which is greater than the size of the greenshoe. On this 'naked' short position the underwriters are unprotected

[1] In this paper, for simplicity, we assume that the lead underwriter and the stabilizing manager are the same bank. There are occasional exceptions to this in practice, for instance when there are multiple lead underwriters but a single stabilizing manager, but these are not relevant to the main arguments we explore.

[2] In this paper, 'issuer' or 'issuing company' will be taken to include 'vendor(s)'

against share-price movements: coverage below the offer price will result in profit, coverage above in loss. While the existence and exercise of greenshoe options are public knowledge, naked short positions are not. As with all other aspects of allotment, the extent of any naked short position remains a secret closely guarded by the lead underwriter. However, details tend to emerge when such positions result in a large loss for the underwriters, who often feel aggrieved with the lead underwriter for creating such a position on their behalf. One such case was the IPO of Travelers in March 2002. According to press reports, the lead underwriter Solomon Smith Barney created a naked short position of 10% of the deal size, beyond the 10% greenshoe option. This naked short had to be covered at a loss of $21 million when the price rose.[3]

The few academic studies that have had access to the details of stabilization activities confirm that naked shorts are common. The most direct evidence derives from two papers that analyze a dataset of US issues during the period May-July 1997. During this period the SEC requested copies of the stabilization records from several underwriters. Aggarwal (2000) focuses on IPOs and Boehmer and Fishe (2002) consider both IPOs and seasoned offerings. These papers report similar average naked short positions of 5.0% and 5.3% (of the original offer size) respectively for issues where the lead underwriter made short-covering transactions.

The risk associated with establishing a naked short obviously depends on the expected trading price at which such positions are closed out. There is extensive evidence that IPOs are on average underpriced, with average first day returns of 10-20% being typical in many countries (see Jenkinson and Ljungqvist, 2001, for a survey), but if the underwriter were able to predict after-market performance, then the risks could be reduced. However, of the 114 IPOs studied by Aggarwal, only 6 had first-day closing prices below the issue price[4], and in 45 issues the underwriter had established a naked short position.[5] In the vast majority of these cases, therefore, the underwriters would have incurred losses from the naked short if they had covered it at the first-day close.

The significant role played by naked short positions can also be inferred from the analysis of aftermarket trading in Ellis, Michaely and O'Hara (2000). Using a dataset of Nasdaq IPOs that took place between September 1996 and July 1997, the authors show that

[3] See Investment Dealers Digest, July 2002

[4] It is interesting that in only three of these was there any short position at the IPO.

[5] We are grateful to Reena Aggarwal for providing this information.

the lead underwriter is always the dominant market maker when trading begins, and that substantial inventory positions are accumulated. For instance, on average the lead underwriter has a net inventory position on the trading account of 3.8% after the first trading day, which rises to around 7% after two weeks. Furthermore, such purchases are much larger in cold issues than hot issues. These purchases, the authors suggest, are a direct measure of stabilization activities. The authors do not have information on the opening position of the stabilization account, but the evidence presented suggests that naked short positions are common. For instance, even for those issues that always traded above the issue price, positive inventories of around 3% are accumulated. Given that in such cases the over-allotment option will be exercised in full the likely explanation of such trading is to cover naked short positions. Equally, for those shares that always trade below the issue price – where significant market purchases should be taking place – the average net inventory position towards the end of the stabilization period of around 20% is considerably above the typical greenshoe of 15%. Again, this evidence suggests that naked short positions are commonplace and probably larger in cold issues.

The unresolved puzzle is why a naked short position is established at all when the vast majority of IPOs trade at a significant premium to the offer price. Zhang (2003) is one of the few papers to consider this puzzle, and suggests a model in which over-allocation at the IPO is part of the underwriters' marketing strategy. Drawing on prospect theory, Zhang argues that allocating larger holdings at the IPO can increase aftermarket demand, resulting in a trading price that is permanently higher.

In this paper we propose an alternative, and very simple, explanation for this puzzle by analyzing the economics of the underwriters. In particular, we focus on the fact that lead underwriters systematically take a greater share of the selling concession than of the underwriting in equity offerings. This reflects their ability to capture investor orders and their discretion over allocation on the one hand, and their desire to spread the underwriting risk widely with other banks on the other. As we explain in the next section, the different shares of selling concession and underwriting result in divergent pay-offs and conflicts of interest between underwriters and drive our explanation of naked shorts. Whilst the profits from selling concession for underwriters are obviously proportionate to the shares they are allotted, the potential losses (or profits) from the stabilization account – including covering any naked short position – are apportioned according to their share of *underwriting*. In our model the lead underwriter is willing to create naked short positions even when there is a considerable

risk that the share price will rise in the aftermarket. In essence, the lead underwriter is able to protect the additional selling concession on the over-allotted shares by exposing the underwriters as a whole to greater risk.

The disparity between the lead underwriter's share of selling concession and underwriting has been noted in previous papers. Chen and Ritter (2000) remark that "In a typical IPO, the vast majority of revenue and profits goes to the book manager … (who) receives at least a proportionate share of the management fee revenue, the vast majority of the selling concession revenue, and part of the net underwriting fee revenue. This item is typically a small number, and may even be negative if stabilization expenses are high" (p. 1122). However, obtaining systematic evidence on the lead underwriter's share of total transaction revenues is difficult: the only facts in the public domain are the underwriting shares of each underwriter and the aggregate split between selling concession, underwriting fees and management fees. The allocation of selling concession, and the outturn loss or profit from stabilization, are closely guarded secrets. Corwin and Schultz (2005), in their analysis of the role of underwriters, note that industry practice in the US in recent years has been for the lead underwriter to credit each underwriter with selling concession of 10% of its share of underwriting, which again implies that the lead underwriter (and, to a lesser extent, any co-managers) appropriate the vast majority of the fees. We present some evidence of our own, but the stylised figures used by Chen and Ritter – where the lead underwriter receives 76% of the selling concession but only underwrites 32% of the issue (Table V, p.1122-1123) – are, we believe, typical.

In addition to providing an explanation for why lead underwriters take naked short positions, we also discuss the effect of stabilization, with and without naked short positions, on the issuer. In practice, although an issuer may have some limited influence on pricing, the lead underwriter retains considerable discretion over the final issue price. We argue that the granting of an over-allotment option in the absence of a naked short position will tend to encourage underpricing. It is true that underwriters can actually profit from over-pricing by short-covering below the offer price, as Fishe (2002) assumes in his model; indeed, if the profits on short-covering exceed the commissions foregone by not exercising the greenshoe option overpricing can maximise overall returns to the lead underwriter. However, in US IPOs with gross spreads of around 7% we assume that any such immediate financial gains from covering a short position at a discount wider than 7% are more than offset by of the

negative reputational effects which, as Nanda and Yun (1997) find, operate even at 5% overpricing.

The establishment of a naked short position will, in general, provide a counter-balance to these economic incentives (as well as to the indirect – and sometimes not so indirect – benefits that might accrue from investors who are allotted underpriced shares). For if we rule out, on reputational grounds, an incentive to overprice, we show that the naked short increases the sensitivity of the lead underwriter's profits to the accuracy with which the issue is priced. This is not the case for the non-lead underwriters who – given the established fee structure and once we have ruled out deliberate overpricing – never have an incentive to establish a naked short position.

Therefore, we can say that the establishment of naked short positions improves the alignment of interests of the lead underwriter with those of the issuer and it does so at the expense of the non-lead underwriters. Also, once a naked short has been set up it *must* be covered by market purchases; therefore the naked short commits the lead underwriter to make short-covering purchases, which again is likely to be welcomed by the issuer. One of the policy conclusions of this paper is that issuers should seriously consider making the establishment of a naked short position an explicit pre-condition of their contract with the lead underwriter.

The remainder of this paper is structured as follows. In the next section we explain the way stabilization works, and the regulatory attitude towards stabilization. Then in section 3 we survey the various existing explanations for stabilization activities. In section 4 we introduce our model, and analyze the intra-syndicate conflicts and how they relate to the naked short puzzle. Section 5 concludes.

2. The regulation and mechanics of stabilization

2.1 Regulation and types of stabilization

Stabilization is a uniquely legalised form of market manipulation. As a 'safe harbor' from other securities laws that would otherwise be violated, it allows underwriters in an offering of securities to bid for and purchase securities in the immediate aftermarket in order to prevent or retard a decline in price and thereby facilitate the offering.[6] Stabilization is carried out by a single stabilization manager, who is usually the lead underwriter in the offering, and/or its agents. Stabilizing bids may be placed in the principal market on which the offering is made or on other markets and, within strict rules, the bids may be made for the securities themselves or related securities.

The rules governing stabilization activity vary between jurisdictions. Those followed most widely are Regulation M, Rule 104, of the Securities and Exchange Commission (SEC) and the Market Conduct Rules of the United Kingdom Financial Services Authority (FSA). The widespread compliance with these two sets of rules reflects two factors. First, the regulation of stabilization is extra-territorial. Regulators are concerned that a breach of the rules might affect the price of securities in their own jurisdiction, wherever that breach might be committed. Second, the SEC and FSA rules are generally more detailed than those governing other markets without contradicting them. By keeping to SEC or FSA rules, stabilizing managers can ensure, with minor exceptions, that they comply with stabilization rules in all jurisdictions. Both sets of rules are in many ways consistent with each other so that, for example, US and UK offerings can be stabilized according to 'home' and 'away' rules at the same time. Both the SEC and FSA regard compliance with each other's stabilization rules as an acceptable substitute for compliance with their own.

The SEC distinguishes three types of aftermarket activity: pure stabilization, syndicate short covering and penalty bids, but it only regulates the first. In pure stabilization the stabilizing manager[7] posts a stabilizing bid, visible to all market participants, within the rules outlined above. The SEC (and FSA) rules allow stabilization bids no higher than the lower of

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[6] For justifications of this safe harbor see Regulation M Rule 104 of the Securities and Exchange Commission release 38067, 1997, page 116; FSA Handbook, Market Conduct, MAR 2, paragraph 2.2.1; European Commission Regulation 2773/2003, page 1 paragraph 11

[7] The stabilizing manager is usually the lead underwriter of the transaction.

the offering price and of the level of any independent bid, and in any case not above the offering price. The SEC limits pure stabilization to the period before the syndicate 'breaks', i.e. before the distribution has been completed. In practice underwriters avoid using pure stabilization because it advertises that the distribution is incomplete and that the aftermarket may be weak.[8] We will not consider pure stabilization in this paper.

The second type of stabilization is called 'short covering' by the SEC: a short position is created when the underwriters allot more shares to investors than the underwriters receive from the issuer and any stabilization purchases reduce this short position. Short covering is not regulated by the SEC, except that the possibility that it will occur must be stated in a prospectus. However, the FSA applies the same price rules to short-covering stabilization purchases as it does to all stabilizing purchases and, in international offerings including those for US issuers, these price rules tend to be adhered to for syndicate short covering. As well as the rules on the price of stabilization bids, the FSA limits stabilization to 30 days after the start of trading. To insure the underwriters against price rises, the issuer customarily grants the underwriters an option (called a 'greenshoe' option after the name of the first company to grant one) allowing them to buy additional shares from the issuer at the offering price up to the end of the stabilization period. It is usual for the issuer to pay the full commissions on these additional shares to the extent that the option is exercised. Often underwriters also create a 'naked short' position beyond the greenshoe option. Coverage of this unprotected short position is at the underwriters' risk. The FSA, in line with European Union law, restricts the size of the greenshoe option to 15% of the initial offering size and the naked short position to 5%[9]. Stabilization through short covering, and the granting by the issuer of a greenshoe option, are widespread in the US, UK and international equity markets. The present paper will deal only with this form of stabilization[10].

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[8] See Aggarwal (2000).

[9] A greenshoe option of 15% and a naked short of 5% are, in fact, the typical amounts.

[10] The covering of a syndicate short position by market purchases does not always constitute stabilization. If the short position is covered above the offer price the intention is unlikely to be to stabilize. This is, first, because the need to support an offering is less when the aftermarket is strong and second, because stabilization rules only permit stabilization purchases up to the offer price. These rules apply explicitly to short-covering purchases in the UK. In the US they do not because, as we have seen, only pure stabilization is regulated by the SEC. Market practitioners report, however, that US stabilizing managers tend to adhere to the price rules of pure stabilization even when making short-covering purchases. When syndicate short positions are covered above offer price by market purchases, there is evidence that stabilizing managers try to reduce their market impact.

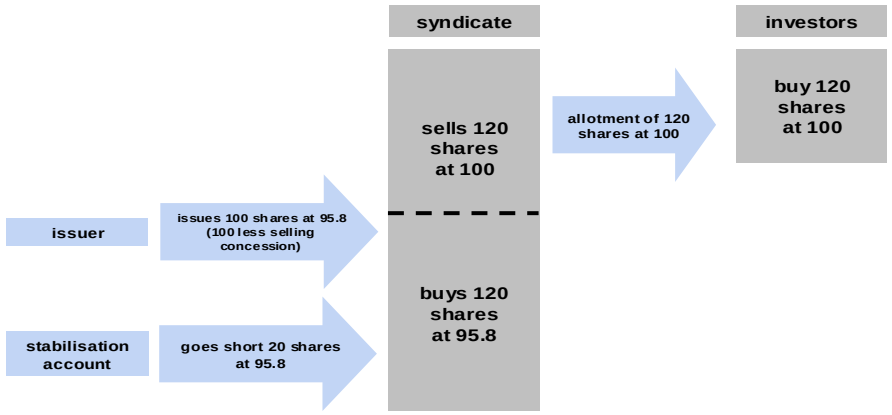
The third type of stabilization defined by the SEC is the use of penalty bids, whereby the lead underwriter may withhold selling concession from underwriters whose customers flip shares in the immediate aftermarket. The stabilizing effect here is deterrence. Penalty bids are used only in the US markets where the Depository Trust Corporation's IPO Tracking System allows flippers to be traced. We will not consider penalty bids in detail in this paper.

2.2 Mechanics of stabilization

The decision on how many shares to overallot to create a short position is taken by the lead underwriter, on behalf of all the underwriters, when the order-book has closed. Clearly the lead underwriter may only overallot when the offering is oversubscribed. The mechanics of short-covering are worked out through the stabilization account, which the lead underwriter establishes on behalf of the underwriting syndicate. On the initial offering (i.e. before over-allotment), shares are sold by the issuer to the underwriters at offer price less selling concession and the underwriters allot them to investors at offer price. In this way the underwriters receive the selling concession as a 'turn' out of the proceeds of the offering. The over-allotted shares, by contrast, are sold short by the stabilization account. However they are, like the shares in the initial offer, sold at less selling concession to the underwriters. The underwriters therefore receive the selling concession on the over-allotted shares whether the short position is covered by exercise of the greenshoe or by market purchases. In this paper we call the fraction of the total allotted shares that an underwriter receives the 'allotment fraction'. The diagram below shows how this works for an offering in which the gross spread (i.e. total fees to the underwriters) is 7%, broken down between underwriting commission, management commission and selling concession in the ratio 1:1:3; selling concession is therefore 4.2% of proceeds[11]. Each underwriter's allotment fraction is his share in this portion of the commissions. We assume an over-allotment of 20% of the initial offering size and an offer price of 100 in the diagram.

[11] This percentage and the breakdown are the standard for a typical US IPO (see Chen and Ritter (2000)).

Mechanics of overallotment



This leaves the stabilization account short of the over-allotted shares at offer price less selling concession, i.e. at a price of 95.8 in the diagram above. This short can be covered by exercise of the greenshoe option, and/or by market purchases. Market practice is that gains and losses on stabilization account are apportioned to each underwriter *pro rata* to his share in the underwriting of the offer (their 'underwriting fraction') rather than to his allotment fraction. Each underwriter's allotment and underwriting fractions may be different[12].

If the syndicate short position is covered by the exercise of the greenshoe option, the underwriting and management commission on the additional shares is paid to underwriters *pro rata* to their underwriting fraction and this is added to the share of selling concession that they already received when the shares were over-allotted, this latter share equating to each underwriter's allotment fraction. To this extent the apportionment of commissions on the additional shares replicates that of the commissions on the rest of the offering. If the syndicate short position is covered by market purchases any gain or loss is likewise distributed to underwriters *pro rata* to their underwriting fraction. However, since the stabilization account is already short of the over-allotted shares at offer price less selling concession, the gain/loss is computed against this price, not against the offer price itself. Suppose the syndicate short

[12] Losses on stabilization account are treated as 'expense overruns' along with other incidental costs of the offering.

position is covered at offer price, the stabilization account suffers a loss exactly equal to the selling concession that the underwriters have already made. If each underwriter's allotment fraction is equal to their underwriting fraction, his share of this amount will be identical to his share in the equal loss which stabilization account suffers as a result. However, if an underwriter's allotment and underwriting fractions are different, this is not the case. This mismatch leads to a redistribution of gains and losses among underwriters.

We return to this issue in section 4, where we show how each underwriter's gain/loss from stabilization activities when the short is covered by market purchases will equal their underwriting fraction of the total gain/loss on stabilization account plus the difference between their allotment and underwriting fractions of the selling concession on the over-allotted shares. However, before getting into the details of our model we first survey the existing literature on the effectiveness and possible motivations for stabilization.

3. A survey of the existing literature on IPO stabilization

In this section we survey the existing literature by separating the various possible motives for conducting stabilization. First, and most obviously, we look at whether prices are actually stabilized, before considering the underwriters' possible motives such as favouring particular clients, protecting their own reputations and maximising their profits.

3.1 Stabilizing prices

Regulators allow stabilization so that underwriters can prevent or delay a decline in price and thereby facilitate an offering. We would therefore expect weak offerings to have more short-covering than strong ones and this is in fact the case. Aggarwal (2000), using a sample of 137 IPOs from 1997, found that 79% of weak IPOs (i.e. whose price rose by no more than 5% on first day) had short-covering, while only 39% of strong offerings (whose price rose by more than 5%) did. The fact that there was short covering at all for IPOs which rose on the first day reflects two factors: first, the price may have declined below the offer price after the first day; and second, naked short positions have to be covered by market purchases, even if the price has risen above the offer[13]. Where there was short covering in

[13] Stabilizing managers must be careful that in closing out the naked short above the offer price they do not create a false market, as the stabilization safe harbour does not apply to purchases above the offer price. Consistently with this, Besio, Boehmer and Fishe (2002) find that stabilizing managers are more aggressive in

Aggarwal's sample, the amount was greater in weak than strong offerings: 14% of total offering size against 6%.

Underwriters defend the offer price itself more staunchly than lower levels. Lewellen (2003), using a sample of 1,422 firm commitment offerings on Nasdaq from 1996-1999, finds that if a stock opens at offer price, 6% of the offer is repurchased by market-makers (presumably the underwriters) before it is allowed to drop. By contrast if the share opens below the offer price the percentage is 2%.

But is stabilization effective in preventing or delaying declines in price? Some evidence suggests that stabilization does prevent price declines while other evidence seems to show that stabilization delays price declines but does not prevent them.

Taking prevention first, Lewellen (2003) finds that overpriced offerings with apparently less stabilization have stronger price declines than those with apparently more stabilization. And she finds that overpriced offerings that are stabilized do not show an immediate drop in price when stabilization is withdrawn. This suggests that stabilization has a permanent effect on price[14]. Lewellen points out that this could be explained in terms of a downward sloping demand for IPOs: stabilization reduces supply and sets the equilibrium between supply and demand higher. However, it is possible that underwriters only stabilize offerings they consider, rightly, to be undervalued by the market. In this case stabilization might just coincide with the moment when the market stopped undervaluing the stock. Aggarwal (2000) reports that in the few days after stabilization ends the stock price falls, but recovers thereafter, leading her to conclude that stabilization has a permanent, but delayed, effect.

On the other hand Boehmer and Fishe (2001) show that stabilization delays a decline in price but only by a few trades and that after these trades the share price is where it would have been anyway. Their analysis suggests that the price impact of a trade involving a stabilization bid is a fifth of that where there is no stabilization involved. They also find that 90% of the price reaction to a regular (non-stabilization) trade occurs within the next eight

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their short-covering trades for weak offerings than for strong offerings in the sense that their trades occur in clusters rather than in isolation. However, in another sense short-covering above the offer price aree more active than stabilizing purchases below: short-covering purchases in weak offerings tend to be seller-initiated, with the stabilizing manger passively on the bid, whereas those in strong offerings tend to be buyer-initiated as the stabilizing manager often has to buy in a rising market.

[14] Her evidence for stabilization is indirect: net selling volume is taken as a proxy for stabilization in the absence of direct data.

trades, but that the same reaction takes nineteen trades when the bid is from a stabilizing manager. Beyond 90%, the stabilizing bid has no additional impact[15]. Besio, Boehmer and Fishe (2002) find that, when short-covering purchases are clustered, they have a lasting effect on the equilibrium price of a stock, but that when they are dispersed any effect is immediately reversed.

Empirical studies have also shown that stabilization reduces price volatility, regardless of direction. Prabhala and Puri (1999) show that the one-day standard deviation of returns of stabilized IPOs is considerably smaller than for non-stabilized offerings: 5% versus 18% respectively in their sample of 41 IPOs from 1981-2. They also note that the price volatility of offerings which open at their offer price is far lower than for those opening above or below, and that this stickiness is also significant compared with that of secondary market stocks that open unchanged from the previous day. They report further that stabilized offerings remain less volatile for up to six weeks after the start of trading. Boehmer and Fishe (2002) find that the bid-offer spread narrows in stabilized IPOs, although this does not apply to seasoned offerings, a distinction that they attribute to the argument that underwriters aim to reduce trading costs for certain investors in IPOs more than in seasoned offerings.

However, stabilized IPOs have ex-ante characteristics that may make them less risky – and less volatile - anyway, whether there was stabilization or not. For example, Lewellen (2003) finds that stabilization occurs most in IPOs that are largest and have the lowest gross spread (i.e. commissions), while Prabhala and Puri (1999) show that more prestigious lead underwriters stabilize offerings more often and that offerings priced low in their indicative price ranges are more likely to be stabilized than those priced high in their ranges. As offer size, low commissions, underwriter reputation and final pricing low in the indicative range have all been shown to have negative correlation with the risk of an IPO, it may be that stabilized offerings were less likely to be volatile in the first place.

In additional to the motivation of preventing, or delaying a drop, in the aftermarket price during the immediate post-IPO period, lead underwriters may have other motives when conducting stabilization. The main motives suggested in the literature are of three main types: favouring certain clients, protecting reputation and maximising profits, and we consider each in turn.

[15] The implication of these findings for the shape of demand for IPOs would be that demand slopes downward in the very short term but that the demand ‘curve’ is horizontal, i.e. not limited, thereafter.

3.2 Favouring certain clients

Stabilization bids can be directed at certain clients. This is possible in markets where counterparty identity is disclosed or where anonymous orders, by their size, are likely to come from certain types of investor. Stabilization therefore allows the lead underwriter to favour investors or investor groups. Stabilization bids provide initial investors with an option to sell at an inflated price. Many commentators liken them to put options for this reason (e.g. Prabhala and Puri (1999)). As a method of rewarding investors, stabilization may be compared with the underpricing of IPOs; underpricing is the extent to which IPOs tend to jump in the immediate aftermarket, yielding initial investors an immediate gain. However, whereas underpricing rewards all investors, stabilization can be used to reward them selectively. Empirical studies have provided evidence to support this, although the evidence often shows different, even mutually exclusive, investor constituencies being favoured. Broadly speaking, some evidence points to preferential treatment of institutional investors and some to that of retail investors. Each of these bodies of evidence supports a different theoretical model of how IPOs work. Before looking at the evidence, let us look at these theories.

The theory that sees stabilization favouring institutional investors views institutions as providing the lead underwriter with useful information on the valuation of an offering. The underwriter, according to this theory, knows less about the right price for an offering than institutions know (in aggregate) and therefore he needs institutions to disclose their valuations to him. The 'information revelation' could be in the form of price limits on bids placed during the bookbuilding or through informal discussion between institutions and the lead underwriter. This theory, first formulated by Benveniste and Spindt (1989), assumes that institutions have well-informed valuations and that they reveal them truthfully to the lead underwriter. In return the lead underwriter gives institutions a more favourable allotment than retail investors. In practice this means that he gives institutional investors a bigger allotment proportionate to demand than retail investors: this is the only way the lead manager can discriminate if he cannot offer different prices to different investor types.[16] And he may give institutions who reveal particularly useful information, for example in the form of price-limited bids, better allotments than those who do not.[17] However, stabilization provides

[16] Some offerings, especially privatisations, have a different price for institutional and (usually domestic) retail investors.

[17] For a summary of these arguments, see Jenkinson and Ljunqvist 2001.

another way of rewarding institutions. The lead underwriter directs his stabilizing bids at institutions in general or at those who have revealed useful information in particular. These arguments are set out fully in Benveniste, Busaba and Wilhelm (1996)[18]. Underpricing and directed stabilization bids are not mutually exclusive means of rewarding institutions. Asquith, Jones and Kieschnick (1998) show that the return distribution of IPOs is best seen as a mixture of distributions, one of stabilized and one of underpriced IPOs, which would be consistent with underpricing and stabilisation both being used as reward mechanisms.

The opposing theory, which sees stabilization favouring retail investors, starts from a different conception of IPOs. This theory, which goes back to Rock (1986), regards retail investors, who are by nature uninformed, as necessary to the success of IPOs in general, because institutional investors do not have enough demand to support all IPOs on their own. However, uninformed investors suffer from the informational asymmetry with informed, institutional investors. For if they bid indiscriminately for all IPOs, as they will if they are uninformed, they will receive large allotments in cold IPOs and small allotments in hot IPOs. Suppose IPOs were priced on average at their fair value, i.e. with no 'IPO discount', but some were overpriced and some underpriced: then retail investors would lose money across all IPOs and they would withdraw from the market. Their much needed demand would not be available, so they must be incentivized to participate. One form of reward is the systematic underpricing of IPOs to offset this 'winner's curse'. Alternatively, the lead underwriter could direct stabilizing bids at retail investors and allow them to escape from poorly performing issues. Another explanation for directing stabilization bids at retail investors is to disguise the weakness of offerings, perhaps to encourage participation in future transactions. There is evidence that unsophisticated investors in particular engage in 'momentum' trading after IPOs, in which case stabilization might be effective deception (Lewellen 2003).

Turning to empirical evidence for these theories, stabilizing managers can crudely discriminate between institutional and retail investors by size even without knowing their identity because retail investors' orders tend to be smaller than institutions'. As for more subtle discrimination between one institution and another, Boehmer and Fishe (2001) have

[18] This paper also argues that stabilization is a bonding mechanism between institutions and underwriters in the sense that, if stabilization is costly, underwriters are incentivized to avoid the need for it. They do this by underpricing the offering, which is also in institutions' interests. However, this assumes that stabilization is costly for underwriters. As discussed later in this section, this is probably not the case.

shown how the activity of lead underwriters of IPOs on the NYSE is consistent with investor targeting.

The evidence in favour of the information-revelation theory takes small aftermarket orders as a proxy for retail selling and large orders as a proxy for institutional selling. Benveniste, Erdal and Wilhelm (1998) analyze 504 IPOs between 1993 and 1994 and show that, in stabilized offerings, small sell orders are significantly fewer than in non-stabilized offerings and that the number of large sell orders is significantly more in stabilized offerings. As we have seen, Aggarwal (2001) confirms that institutions flip more than retail investors, although she reports that both types of investors flip less in cold offerings; this would run counter to the notion that the stabilizing manager is targeting them because we would expect this targeting to be most valuable in weak offerings. She finds a correlation between sell order size and investor type, although not as much as assumed because institutions tend to break up their sell orders. She argues that retail may refrain from selling in cold offerings for fear of penalty bid provisions. This does not invalidate the targeting argument, but may explain it: as retail investors, rather than institutions, tend to be subject of penalty bids, their flipping is deterred in a way which is costly to the investor while institutional flow-back is facilitated by stabilization which valuable to the investor. And Boehmer and Fishe (2002), when comparing IPOs and seasoned equity offerings, note that while in the former stabilization trades are 13 times larger than non-stabilization trades, in seasoned offerings they are only six times larger. As more price uncertainty inheres in IPOs than in seasoned offerings, these findings are consistent with the idea that institutions are being rewarded for revealing information.

Proponents of the winner's curse theory point out that lead underwriters with large retail operations, which place significant amounts of IPOs with uninformed retail investors, stabilize more than 'institutional' banks (Lewellen (2003)). After controlling for other characteristics, she finds that retail banks buy back 11% more shares on day one for cold IPOs than other top 20 banks. She also notes that cold offerings are more heavily stabilized than hot offerings and that retail investors get more of cold offerings, although this is not a direct link between stabilization and retail investors.

3.3 Protecting reputation

Lead underwriters may also stabilize offerings to protect their reputation. There is evidence that lead underwriters of IPOs that fall sharply in the aftermarket lose market share and that the lead underwriters themselves lose market value beyond any offering-related losses. Beatty and Ritter (1986) showed how underwriters' share of the IPO market dropped

after they led poor[19] performing offerings, although the drop might have been linked to other changes in the underwriting industry in the sample period 1977-82. Nanda and Yun (1995) examined the effect of IPO aftermarket performance on the market value of the lead underwriter. They found that in their sample of 1,331 offerings between 1987 and 1991, where the price after one day and after one week was more than 5% below the offer price, the lead underwriter's stock suffered a negative return of minus 0.92% which was significant even after allowing for stabilization losses. Their calculation of the loss in market value assumes that stabilization of weak offerings was costly; later we show that stabilization of such offerings is in practice profitable. Nanda and Yun may therefore have overestimated the cost of stabilization and understated the loss of lead underwriter market value attributable to 'mispricing'. For offerings that rose between 10% and 20% in the aftermarket the lead underwriter's own shares rose 1.07%, again a significant jump. For aftermarket rises above 20% the wealth effects were insignificant. These findings are consistent with the argument that, by bringing poor performing IPOs to market, the lead underwriter's reputation for IPO activity suffers and that its own market value drops to reflect this. This argument is further supported by the fact that the wealth effects for other underwriters in the same sample are insignificant.

If the lead underwriter's reputation suffers by bringing IPOs that fall, it makes sense for lead underwriters to stabilize to protect their own reputation. Lewellen (2003) sees stabilization as an 'ex-post action aimed at protecting underwriter's reputation with investors.' She also produces evidence consistent with this view. For example, firms with better reputations (and larger firms) stabilize more than others. Also, firms stabilize more on days when the rest of the market is stable, and less when it is falling, which is explicable if lead underwriters' reputation suffers most if the drop in the IPO price cannot be attributed to the market. She explains her finding that retail banks stabilize more than institutional banks with the argument that retail investors are more likely than institutions to blame a lead underwriter for a fall in price. However, she also finds that the propensity to stabilize IPOs varies very significantly from one bank to another, even allowing for other characteristics. Of her top 20 lead underwriters ranked by their support for IPOs, one bank on average accumulated 25% of its IPOs while another only 2.6%. The heterogeneity of the results shows that reputation may only be a minor motive for price support.

[19] 'Poor performance' here means that the price of the IPO fell. Selling shareholders who are interested only in maximizing immediate proceeds might prefer 'poor performers'.

3.4 Maximizing underwriter profits

If stabilizing managers acquire positive inventory the activity can be very costly because it is precisely when stabilization is needed that the price of the share is weak. Many studies of stabilization have assumed that it is costly[20], but Aggarwal (2000) made clear that stabilization typically occurs by short-covering and not by taking positive inventory[21]. This is confirmed by our own market soundings. This changes the way the profits and losses from stabilization are viewed. If a short position can be closed out by exercise of the greenshoe option when the aftermarket is strong, the underwriters earn commissions on the additional shares issued; if the short position is covered by market purchases when the market price falls, the lead underwriter makes a trading profit because he has created the short position at a higher price (the offering price). Clearly stabilization and/or commissions from the greenshoe option can be an important source of revenues for the underwriters. Taking Aggarwal's 2000 sample, in the 42 (of 114) IPOs whose price rose by up to 5%, additional shares of around 7-8% of the initial offering were issued by exercise of the greenshoe option. Assuming that the gross spread was paid on these additional shares, the exercise of the greenshoe therefore increased commission income for the underwriters by the same percentage. In 33 of these 42 offerings some of the short position was covered by market purchases, yielding additional revenues to the underwriters equivalent to 1.25% of the commissions on the initial offering. In the 72 offerings which rose by more than 5%, an additional 13-15% of shares over and above the initial offering were issued, adding the same percentage to underwriters' commissions. On 28 of these 72 offerings this would have been offset by losses, equivalent to some 10% of initial gross commissions, incurred when the short position was covered above offer price, but even this is less than the extra commissions on the additional shares. In the whole sample, therefore, stabilization-related activities yield important incremental revenues. Aggarwal reports that in one IPO, with a first-day return of minus 15%, short-covering profits were 35% of gross commissions.

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[20] E.g. Benveniste and Wilhelm (1996). 'The effort [of stabilizing] is ordinarily undertaken by posting a stabilizing bid at the offer price in the secondary market for the new shares…the underwriter…bears the full marginal cost of providing price support in the secondary market'.

[21] Lead underwriters do sometimes acquire positive inventory by stabilizing. According to press reports, Goldman Sachs lost $15 million by taking a long stabilization position after the $855 million IPO for Lazard (Financial News, 26 May 2005).

There are suggestions that underwriters are motivated to stabilize by their own profitability. First, underwriters sometimes exercise at least part of the greenshoe option even when the share price is under the offer price and in some cases when the share price never rises above it. This would be in underwriters' interests if the fees earned by exercising the greenshoe option were higher than any trading profits that could be earned by short covering in the market (see Fishe (2002)). In this case the underwriters would face a choice between maximising direct revenues from the IPO and suffering wealth losses if the exercise of the greenshoe allowed the aftermarket to fall to reputation-damaging levels. If underwriters did exercise the greenshoe for profit in this way, it would represent a conflict with regulators' rationale for allowing stabilization. However, the exercise of the greenshoe in weak offerings may also reflect the desire of the issuer to enlarge the offer size by issuing more shares through the greenshoe option. Second, some authors (e.g. Chowdhry and Nanda (1996)) have linked the fact that stabilization occurs less in volatile offerings with underwriter profitability; for if we analyze stabilizing bids as put options granted by the lead underwriter to flipping investors, the value of this option increases with a volatile share price. If underwriters refrained from stabilizing volatile offerings, this would again violate the regulatory rationale for permitting stabilization. However, the initial short position against which stabilizing purchases are made and the greenshoe option indemnify the underwriters against the option risk of stabilization, and it is not necessarily against the underwriters' interests to allow investors to exercise this put option.

4. The economics of stabilization for syndicates and the 'naked short'

In this section we take a slightly different perspective on the stabilization issue, by focusing on the economics of stabilization from the viewpoint of the various parties in the underwriting syndicate. We suggest an alternative explanation for the naked short puzzle which derives from the fact that lead underwriters systematically take a greater share of the selling concession (their 'allotment fraction') than of the underwriting (their 'underwriting fraction') in equity offerings. This reflects their ability to capture investor orders and their discretion over allocation on the one hand, and their desire to spread the underwriting risk widely with other banks on the other. The different shares of selling concession and underwriting result in divergent pay-offs. While the profits from selling concession for underwriters are proportionate to their allotment fraction, the potential losses (or profits) from

the stabilization account – including covering any naked short position – are apportioned according to their underwriting fraction. As a result the lead underwriter is willing to create naked short positions even when there is a considerable risk that the share price will rise in the aftermarket. In essence, the lead underwriter is able to protect the additional selling concession on the over-allotted shares by exposing the underwriters as a whole to greater risk.

This has implications for the issuer. We argue that the granting of a greenshoe option in the absence of a naked short position encourages underpricing. It is true that underwriters can actually profit from over-pricing by short-covering below the offer price if short-covering profits are greater than the commissions on shares issued on exercise of the greenshoe option. However, we assume that any immediate financial gains from covering a short position at a discount wider than the gross spread (typically 7% for US IPOs) are more than offset by of the negative reputational effects which, as Nanda and Yun (1997) find, operate even at 5% overpricing. However, the establishment of a naked short position will provide a counter-balance to the incentive to underprice. Once we rule out an incentive to overprice, we show that the naked short increases the sensitivity of the lead underwriter's profits to the accuracy with which the issue is priced. This is not the case for the non-lead underwriters who – given the established fee structure and once we have ruled out deliberate overpricing – never have an incentive to establish a naked short position.

Therefore the establishment of naked short positions improves the alignment of interests of the lead underwriter with those of the issuer and it does so at the expense of the non-lead underwriters. Also, once a naked short has been set up it *must* be covered by market purchases; therefore the naked short commits the lead underwriter to make short-covering purchases, which again is likely to be welcomed by the issuer.

In the following sections we calculate the economics of stabilization activities for the underwriters. These economics include the gross spread on the greenshoe option, to the extent exercised, as well as gains and losses made as a result of the coverage of the syndicate short position by market purchases. The syndicate short position can take two forms: (i) the 'greenshoe short', i.e. the short position equal to the size of the greenshoe option, which is covered by exercise of the greenshoe option and/or by market purchases and (ii) the naked short, which is covered only by market purchases. We compare the economics under two scenarios, one without a naked short position and one with a naked short position. This allows us to show the costs and benefits of the naked short.

The key parameters for the calculation of the pay-offs from stabilization are as follows:

Ng	size of greenshoe short (and size of greenshoe option)
Np	market purchases against greenshoe short
Ns	size of naked short (and market purchases against naked short)
Fum	combined underwriting and management fee
Fs	selling concession
Ft	gross spread (= *Fum* + *Fs*)
D	average discount of market purchases to offer price (premium if negative)

Using this notation, the profit function for the underwriting group as a whole is:

$$Ps = NgFt + Np(D - Ft) + NsD \qquad (1)$$

This shows that the underwriters receive the gross spread on the greenshoe shares adjusted for the cost of any market purchases. When these purchases are made against the greenshoe short the adjustment reflects the difference between the purchase price and issue price and the fact that these purchases cause the underwriters to forego fees on the greenshoe. When they are made against the naked short they merely reflect the difference between the purchase price and issue price. Therefore, the profit function for each underwriter is:

$$Pl = Ub*Ps + (Ab-Ub)*(Ng+Ns)*Fs \qquad (2)$$

Each underwriter's gain/loss from stabilization activities when the short is covered by market purchases will thus equal his underwriting fraction of the total gain/loss on stabilization account plus the difference between their allotment and underwriting fractions of the selling concession on the over-allotted shares.

4.1 The economics of stabilization for the underwriters as a whole

We start by considering the economics for the underwriters as a whole in the absence of a naked short. In this case there is a greenshoe short which is covered by either the exercise of the greenshoe option and/or by market purchases, and the payoff for the underwriters is given by expression *(3)*:

$$NgFt + Np\,(D - Ft) \qquad (3)$$

This is expression *(1)* without a naked short term. The first term gives the gross spread on the exercise of the greenshoe. The second term combines with that any marginal return if the greenshoe short is covered by market purchases rather than by exercising the greenshoe option. If such purchases are made at a discount greater than the gross spread, the second term is positive; if purchases are made at a discount lower than the gross spread, it is negative. In this scenario $Np \leq Ng$. Furthermore, $Np = 0$ if $D < O$. That is, no market purchases against the greenshoe short take place above the offer price. These purchases would be costly for the underwriters directly and the opportunity of earning commissions on the greenshoe option would be foregone[22]. If *Np* is lower than *Ng*, the marginal gain or loss from short-covering, which is added to the gross spread on the greenshoe option, applies only to *Np*. On the rest of the greenshoe short $(Ng - Np)$, the underwriters earn the gross spread by exercising part of the greenshoe.

If the underwriters do establish a naked short position their payoff is represented by expression *(1)* above. Unlike *Np, Ns* may be positive even if $D < 0$ because market purchases are the only way to close the naked short. Such purchases are permitted provided that they do not have the effect of creating a false market. *Ns* is therefore both the number of shares in the naked short and the number of shares purchased to cover it.

Figure 1 provides an illustrative comparison of these two scenarios for a $100 million offer. In both scenarios we assume that, in line with market practice, the greenshoe option is for 15% of the base offer size, the gross spread is 7% of proceeds (including the greenshoe, if exercised) consisting of 4.2% selling concession and 2.8% underwriting/management commission. We also assume that, if $D \geq 0$, the underwriters make stabilization purchases equivalent to the entire greenshoe option. When there is no naked short these purchases are made entirely against the greenshoe short which is therefore fully covered and none of the greenshoe option is exercised. When there is a naked short we assume that 10% of the base offer is purchased in the market against the greenshoe short (leaving 5% to be exercised), and that the additional 5% is purchased against a naked short position. This allows us to compare the effect of the naked short on underwriters' economics while keeping the amount of stabilization constant. This model is conservative in light of Aggarwal (2000) who finds that, where there is after-market short-covering, the total short position averages around 20% of the

[22] Stabilizing purchases above the offer price would also infringe UK FSA rules.

initial offering size, the average over-allotment option around 15% and the average amount exercised around 10%.

Without a naked short the economics reflect the profit on market purchases up to the offer price and the gross spread on the greenshoe option above offer price. Note that the economics are zero where the market purchases are made at the offer price (i.e. where $D = 0$). With a 5% naked short the economics similarly reflect the profit on market purchases up to offer price, but to this is added gross spread on the amount of the greenshoe 'protected' by the naked short (5% in this case). Above offer price the gross spread on the full greenshoe option is earned, but this is reduced by a loss on the naked short which increases with the share-price. The economic difference between these scenarios up to the offer price equals the greenshoe commissions "protected" by the naked short. Above the offer price the difference equals the loss taken covering the naked short.

Under both scenarios the underwriters have a purely economic incentive to make stabilization purchases below a level equivalent to the gross spread on the greenshoe option and therefore to overprice the offering by more than this amount. The effect is increased by the presence of the naked short, coverage of which is profitable if the offering is overpriced. However, our analysis assumes that the lead underwriter avoids overpricing, in order to protect her reputation. Beatty and Ritter (1986) and Dunbar (2000) find a negative correlation between inaccurate pricing and underwriter market share. Nanda and Yun (1997) show how the market value of the lead underwriter (but not other underwriters) is significantly reduced when issues are over-priced. As noted in the previous section, they find that when lead underwriters bring IPOs with initial first-day returns of lower than a 5% discount to the offer price the market value of the lead underwriter experiences a significant negative excess return. In coming to this conclusion Nanda and Yun normalise for the decrease in the lead underwriter's market value that equates to the costs of stabilization itself and infer that the additional decrease reflects reputational damage to the lead underwriter. However, as Aggarwal (2000) shows, stabilization purchases do not entail the lead creating a long position but typically involve the covering of short positions, which would be profitable below the offer price. Nanda and Yun may therefore have understated the impact of overpricing on lead underwriter market value. Nanda and Yun also find no impact of overpricing on the market value of non-lead underwriters. This suggests that, in contrast to the other underwriters, the lead underwriter should be particularly keen to stabilize prices in weak offerings in order to avoid adverse reputational effects. If we rule out deliberate overpricing, the incentive for the

underwriters is in fact to underprice the offering where there is no naked short. For in that way they reduce the possibility that they will have to stabilize the share at levels close to or, worst of all, at the offer price and thereby lose the opportunity to earn the gross spread on the greenshoe shares.

However, where there is a naked short these incentives are altered in three respects. First, the underwriters gain more if stabilization purchases are made because the naked short protects an equivalent amount of the greenshoe option, on which they earn the gross spread. Second, the incentive to underprice is mitigated by the fact that coverage of the naked short is costly above the offer price. Indeed, the underwriters are incentivised to underprice the offering as little as possible to minimise losses from naked short covering. Third, the fact that the naked short must be covered by market purchases ensures that the offering will be stabilized if $D \geq 0$ rather than leaving this to the underwriters' discretion.

If we take the greenshoe and the naked short together, three incentives operate in conflict: (i) the incentive, on reputational grounds, to avoid overpricing; (ii) the economic disincentive to cover the greenshoe short at offer price and thereby lose greenshoe commissions (although this disincentive is reduced by the naked short); and (iii) the economic disincentive to underprice and thereby lose money by covering the naked short. The conflict between these incentives can be resolved by electing not to take a naked short (thus eliminating (iii)), in which case the underwriters' interests are served by deeply underpricing the offering. This explains why, for the underwriters as a whole, there is no incentive to take a naked short. Only if we separate the interests of the lead from the non-lead underwriters does a rationale for the naked short emerge.

4.2 Intra-syndicate conflicts of interest

Each underwriter's gain/loss from stabilization activities when the short is covered by market purchases equals their underwriting fraction of the total gain/loss on stabilization account plus the difference between their allotment and underwriting fractions of the selling concession on the over-allotted shares. Thus, underwriters whose allotment fraction exceeds their underwriting fraction gain at the expense of those whose underwriting fraction exceeds their allotment fraction.

In US and international IPOs the allotment fraction of lead underwriters (both sole and joint) is typically some 40 percentage points higher than their underwriting fraction. Press reports after the Goldman Sachs seasoned offering of August 2000 indicated that the bank had

allotted 100% of the shares while underwriting 45% of the offering[23]. Outside the US, the dataset of 27 European IPOs used in Jenkinson and Jones (2004) shows an average excess of the allotment fraction over the underwriting fraction for the lead underwriter(s) of around 40 percentage points. Market participants explain the disparity between lead underwriters' allotment and underwriting fractions as reflecting a desire to maximize selling concession and to spread transaction risk respectively. Transaction risk includes any firm-commitment underwriting as well as other costs which are apportioned pro-rata to underwriting, notably litigation risk and expense overruns including stabilization costs. In this paper we have used 80% and 40% as the allotment and underwriting fractions respectively; and, for the rest of the underwriters, 20% and 60% respectively.[24]

The lead underwriter's economics are based on the same parameters as for the underwriters as a whole, but also include the lead's different allotment and underwriting fractions, which we call *Ab* and *Ub*. Expression *(4)* gives the payoff for the lead underwriter in the absence of a naked short position:

$$NgAbFs + NgUbFum + NpUb\ (D - Ft) \qquad (4)$$

The first term gives the lead underwriter's 'turn' on the overallotted shares. The second term gives the management and underwriting commission on the greenshoe option. The third term combines these with any marginal gain or loss if any of the greenshoe short is covered by market purchases at prices different from the level where $D = Ft$. If such purchases are made at a discount greater than the gross spread, the third term is positive; if purchases are made at a discount lower than the gross spread, it is negative. If *Np* is lower than *Ng*, the marginal gain or loss from short-covering applies only to *Np*. On the rest of the greenshoe short (*Ng* – *Np*), the lead underwriter earns the gross spread by exercising part of the greenshoe.

When a naked short position is established additional terms are introduced into the payoff:

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[23] International Financing Review, 13 January 2001

[24] Many IPOs now have 'fixed economics' for junior underwriters, meaning that these underwriters earn a percentage of total fees for the entire offering, whether they generate allocable bids or not. However, fixed economics are still made up of fee components in line with the percentages shown. They are also calculated before expense overruns, including stabilisation costs, are charged to the underwriters and these charges are still made pro-rata to each underwriter's underwriting fraction.

$$NgAbFs + NgUbFum + NpUb\ (D - Ft) + NsAbFs + NsUb\ (D - Fs) \qquad (5)$$

The covering of the naked short, unlike the coverage of the greenshoe short, does not reduce the amount of the greenshoe option exercised. This expression simplifies to expression *(2)* above, repeated here.

$$Pl = Ub*Ps + (Ab\text{-}Ub)*(Ng+Ns)*Fs \qquad (2)$$

Figure 2 shows an illustrative comparison of expressions *(4)* and *(5)* for a $100 million offer, but this time for the lead underwriter alone. We have used the same values as for the previous chart, as well as *Ab* of 80% and *Ub* of 40%.

Without a naked short the economics reflect the gain on market purchases up to offer price and the gross spread on the greenshoe option above offer price. Note that even if the greenshoe short is covered entirely by market purchases at the offer price, the lead underwriter still makes a gain, whereas the underwriters as a whole break even, as we saw above. This reflects the advantage to the lead underwriter of earning her allotment fraction of the 'turn' while taking only her underwriting fraction of any losses from short-covering.

With a naked short the economics are similar to those on the coverage of the greenshoe short. Again the lead underwriter benefits from the mismatch between her allotment and underwriting fractions. Below offer price the effect of the naked short is to protect the greenshoe gross spread on an equivalent number of shares (5% of the initial offering size); but above the offer price there is an escalating loss when the naked short is covered at increasing prices. The economic difference between the two scenarios up to the offer price is the amount of the greenshoe commissions protected by the naked short. Above offer price the benefit of the naked short to the lead underwriter declines but the breakeven is not reached until the price of short-covering is 4.2% above offer price. This reflects the excess of the lead underwriter's allotment fraction over her underwriting fraction on the naked short.

The pay-off functions for the lead underwriter show how the conflict between incentives which we saw for the underwriters as a whole is resolved. The reputational incentive to avoid overpricing still operates. However, the two economic incentives have altered. The disincentive to price at fair value and stabilize the issue price is lower than for the underwriters as a whole because, even if the greenshoe short is covered at offer price, the lead underwriter still gains. This gain is increased when there is a naked short. And the coverage of

the naked short represents a net gain to the lead underwriter up to a premium to the offer price (4.2% in our scenario). In both these respects the interests of the lead underwriter and issuer can be seen to be aligned if we assume that the issuer's interest is the avoidance both of overpricing and of heavy underpricing. Since the lead underwriter has insights into the state of the order-book before she prices the offering, and given her discretion over pricing, she can elect to take a naked short when she is confident that she can underprice the offering moderately and gain from the naked short. As we explain below, this is achieved at the expense of the non-lead underwriters.

The calculation of the economics for the non-lead underwriters is similar to that for the lead underwriter: we just need to replace the lead underwriter's allotment and underwriting fractions. Figure 3 shows the economics for the non-lead underwriters for an offering with the same parameter values as above. The allotment fraction is thus 20% (i.e. 1 – *Ab*) and the underwriting fraction is 60% (i.e. 1-*Ub*).

With no naked short the economics fall below breakeven at a discount to offer price of over 3%. This is because, at levels near the offer price, the (high) underwriting fraction of the loss on stabilization account exceeds the (low) allotment fraction of the 'turn'. At levels above offer price the economics turn positive because here the non-lead underwriters earn all of their entitlement to the gross spread on the whole of the greenshoe option. A naked short, when covered at or below the offer price, spares them from covering an equivalent amount of the greenshoe short and therefore protects their entitlement to the gross spread on this portion. This takes the breakeven level at which short covering purchases are made higher, though still below offer price. Above the offer price the naked short is costly to cover and progressively diminishes the return of the non-lead underwriters. The economic differences between the two scenarios are that up to the offer price the excess return from the naked short reflects the greenshoe gross spread it protects, and that above the offer price the naked short causes the rest of the non-lead underwriters a loss which rises as the naked short is covered at progressively higher prices.

The non-lead underwriters' interests compare with those of the lead as follows. First, as Nanda and Yun (1997) found, reputational damage from mis-pricing falls on the lead underwriters, not the non-leads; therefore the lead's interests in avoiding overpricing conflict with theirs. Second, the lead-underwriter makes a gain if the shares are stabilized at the offer price, whereas the non-leads take a loss. However, with a naked short all underwriters are better off when this occurs and to this extent their interests are aligned in the presence of a

naked short. Third, the lead gains from the naked short if it is covered up to a premium of 4.2% to the offer price, whereas for the non-leads it is costly if covered at any level above offer price. The lead's interest in moderate underpricing is therefore costly to the non-leads.

4.3 Comparison of net payoffs to underwriters

Figure 4 compares the marginal benefit from taking a naked short to our three constituencies: the underwriters as a whole, the lead underwriter and the non-lead underwriters. The lead underwriter benefits from the naked short more than the rest of the underwriters in the following ways, all reflecting the favorable relationship between her allotment and underwriting fractions.

First, **if D > 0, the lead underwriter gains more** - below the offer price the naked short is more valuable to the lead underwriter than to the rest of the underwriters. For, with the naked short, the total overallotment is 20% of the base offer size rather than 15%. The lead underwriter benefits disproportionately from the overallotment by taking a high fraction of the 'turn'. This advantage weighs more heavily than the fact that the non-lead underwriters' (underwriting) fraction of the management and underwriting commissions on the 5% of the greenshoe protected by the naked short is greater than the lead underwriter's.

Second, **the lead underwriter's breakeven in taking a naked short is higher** - the lead underwriter's share in the loss from covering the naked short position is lower than for the rest of the underwriters, taking the breakeven between her fraction of this loss and her fraction of the 'turn' on the overallotment above the offer price, whereas for the rest of the underwriters the breakeven is below the offer price.

Third **if D < 0, the lead underwriter's share in the losses from short-covering grows more slowly** - the lead underwriter's share in the naked short loss increases in absolute terms more slowly than the rest of the underwriters's as the price of covering the naked short rises, because her underwriting fraction is lower than theirs.

All the examples used in this section reflect, we believe, reasonable assumptions regarding the underlying parameters. However, the differential payoffs to underwriters members will clearly be greater the larger the discrepancy between allocation and underwriting fractions, the larger the naked short position, and the larger the assumed stabilization purchases which would be expected by the issuer if the market price fell below the issue price.

4.4 Consistency with existing empirical evidence

To test our model we would need data on the size of naked shorts and on the price at which they were covered. We could then apply the underwriting and allotment fractions above to find the relative gains and losses of the lead and non-leads from the naked short at different values for *D*. In the absence of such data we can, however, take Aggarwal's sample (2000) and make plausible assumptions. This will illustrate that the distribution of gains and losses from naked short coverage is skewed heavily in favour of the lead so that, with certain caveats, the net outturn for the lead from naked shorts is on average positive even though in many cases these shorts are covered at a premium to issue price. Of her 114 IPOs 61 had short-covering in the aftermarket. Of these 33 had first-day closes of no more than 5% above the offer price and 28 had first-day closes above that level. For each of these sub-samples we know the gross spread: 7.10% and 6.91% respectively. We also know the profit/loss to the underwriters as a whole from short-covering: for the first sub-sample the underwriters as a whole made an average gain of 1.25% of the gross spread from short-covering and in the second sub-sample they made an average loss of 9.78% of the total gross spread. These percentages equate to fractions of the total offer sizes of 0.089% and minus 0.68% respectively. Let us examine each sub-sample in turn.

In the first sub-sample, where the first-day close was no more than 5% above the offer price, the average total short position was 21.55% of the base offer size. We assume that the greenshoe option was 15% of offer size, leaving a naked short of 6.55%. In the second sub-sample, where the first-day close was more than 5% above the offer price, the average total short position was 18.81%. Assuming, again, a 15% greenshoe option, the naked short would be 3.81%.

Based on these assumptions we may infer the average price (*D* in our model) at which the naked short was covered. In the first sub-sample *D* = 0.0136, i.e. coverage took place 1.36% below the offer price[25]; in the second *D* = minus 0.178, i.e. a premium to the offer price of 17.8%[26]. Note that these values for *D* are different from the first-day returns in Aggarwal's data set. For the first sub-sample the unadjusted first-day return was a premium of 0.68% and for the second sub-sample it was 19.41%. The difference between the average short-covering price and the first-day returns is not surprising: stabilization purchases

[25] D = 0.00089 (i.e. the p/l from short-covering as a fraction of base offer size)/naked short (i.e. 0.0655 of base offer size)

[26] D = -0.0068/0.0381

typically start at the first opening and may continue for weeks. Moreover, as Lewellen (2003) has pointed out, initial stabilization purchases tend to occur at the offer price itself, even for offerings that then trade up (perhaps reflecting the lead underwriter's desire to cover a naked short as cheaply as possible). Initial stabilization at the offer price would explain why the average value for *D* was in both Aggarwal's sub-samples lower than the first-day return.

Now we are in a position to calculate the shares of the lead underwriter in the profit/loss from covering the naked short. Using the same allotment fraction (*Ab*) and underwriting fraction (*Ub*) for the lead as in our model (i.e. 80% and 40% respectively), and the same split between selling concession on the one hand and management and underwriting commissions on the other (60:40) as in our model, we can use the formula *NsAbFs + NsUb (D – Fs)* to arrive at the lead-underwriter's profit/loss for the two sub-samples. For the profit/loss for the non-lead underwriters we substitute (1- *Ab*) and (1- *Ub*) in the same formula.

This gives us an average lead underwriter profit in the first sub-sample of 0.15% of the base offer size and a loss for the non-lead underwriters of 0.06% (i.e. the total of 0.089% shown above, allowing for rounding). For the second sub-sample we have a lead underwriter loss of 0.21% and a loss for the non-lead underwriters of 0.47% (the total loss of 0.067% shown above, allowing for rounding). The lead-underwriter's average profit in the first sub-sample (0.15% of base offer) is thus fractionally below her average loss in the second sub-sample (0.21%). In both sub-samples the non-lead underwriters suffer disproportionately from naked short-covering.

However, in our model we assume that naked short coverage, when it takes place at or below the offer price, is an alternative to coverage of the greenshoe short; and therefore that the coverage of the naked short protects the commissions on an equivalent amount of the greenshoe option. When calculating the lead underwriter's gain in the first sub-sample, therefore, we define her gains, not as direct gains from naked short coverage, but in terms of greenshoe commissions protected. The economic effect of naked short covering on the lead's economics is the same as the short-covering against the greenshoe short which would have taken place if there were no naked short and is therefore not part of the calculation of the net benefit of naked short coverage. As the number of shares on which the greenshoe commissions are protected equals the size of the naked short, the value of this protection for the lead underwriter can be shown as *NsAbFs + NsUbFum*. Taking the naked short in the first sub-sample of 6.55% of base offer size, we arrive at an amount of greenshoe commissions

protected by the naked short of 0.30% of the base offer size. This is slightly higher than the 0.21% loss to the lead underwriter in the second sub-sample. By contrast the non-lead underwriters' protected greenshoe commissions are worth 0.17% of the base offer size.

On our model, then, the lead would make an average net profit from naked short coverage in Aggarwal's first sub-sample of 0.30% of the base offer and in the second sub-sample a slightly smaller average net loss of 0.21%; this points to a positive outturn overall. The non-leads make a loss of 0.17% and 0.47% in each of the sub-samples respectively, a heavily negative outturn. Clearly we would need to examine the two sub-samples together to eliminate significant differences in the sub-samples and establish whether the average net outturn from a single sample of all offerings with short-covering was still positive for the lead. However, the analysis does at least demonstrate how, when calibrated using the existing sample of U.S. evidence, our model of stabilization profit/loss distribution is consistent with the lead underwriter increasing its profits by establishing a naked short position.

5. Discussion and conclusions

We find in this paper that the underwriters as a group have a purely economic interest in overpricing by more than the gross spread on the greenshoe option. This incentive is increased by the naked short. However, we assume that the lead underwriter tries to avoid overpricing for reputational reasons. In this case the underwriters as a group have an interest in underpricing to protect the greenshoe commissions. We find that the underwriters *as a whole* have no incentive to take a naked short: for once we rule out overpricing, the naked short and greenshoe taken together worsen the economics for the underwriters.

However, we find a rationale for the lead underwriter to take a naked short position if we disentangle her economics from those of the non-lead underwriters. We do this by analyzing their different shares in the outturn from over-allotment and syndicate short-covering, which reflect their shares in allotments and underwriting respectively in the offering as a whole. This analysis shows that the lead underwriter benefits from taking a naked short in IPOs with a normally split 7% gross spread so long as the naked short is covered at less than a 4.2% premium to the offer price. The lead underwriter can use her insights into the state of the order book to estimate the likely aftermarket trading level. Any aftermarket level below 4.2% (in our example) will make the naked short profitable for her; the expected aftermarket trading level at which she actually takes a naked short will clearly depend on the precision

with which this expectation is held. In addition, the lead who, unlike the other underwriters, gains even when the short is covered at offer price, sees this gain increased when there is a naked short.

On the assumption that the issuer's interests are to achieve modest underpricing and to defend the offer price if it comes under pressure, the naked short therefore aligns the issuer's interests with those of the lead underwriter. This alignment of interests comes at the expense of the non-lead underwriters whose economics are negative if the naked short is covered at any level above the offer price or if the offer price is defended by the stabilizing manager.

A key issue is whether the decision to establish a naked position is endogenous or pre-committed. To our knowledge, issuers rarely insist on the lead underwriter establishing a naked short position as part of their contract, although in the case of some privatisation offerings and others where the issuer has had unusual leverage, lead underwriters have been pressurized to 'go naked'.[27] On the other hand, we have heard of isolated cases where investment banks have expressed their willingness to take a naked short position when competing for the lead mandate. There may, therefore, be some cases where there is effectively a pre-commitment to take a naked short position.

In many cases, however, the naked short position and pricing are likely to be endogenous. While in such situations it is difficult to say anything about causality, our model shows how the lead underwriter's payoff function becomes more risky in the presence of a naked short position. However, given the lead underwriter's insight into the state of the order-book before pricing and allotment, she can minimise this risk by taking a naked short only in offerings where the aftermarket premium is unlikely to be high. We show how the lead underwriter's expected pay-off can be increased by taking a naked short and pricing the issue more fully.

Whether the naked short is pre-committed or endogenous, we can say that it improves the alignment of interests of the lead underwriter with those of the issuer at the expense of the non-lead underwriters. Also, once a naked short has been set up it *must* be covered by market purchases; therefore the naked short forces the lead underwriter to make short-covering purchases, which again is likely to be welcomed by the issuer. One of the policy conclusions

[27] The Goldman Sachs seasoned offering in August 2000 (see International Financing Review, 13 January 2001)and the IPO of Travelers Property Casualty Corp in 2002 (see footnote [2] above) both had very costly naked shorts, as reported in the press. In both cases the lead underwriter was an affiliate of the vendor.

of this paper is that issuers should seriously consider making the establishment of a naked short position an explicit pre-condition of their contract with the lead underwriter: this will make stabilization purchases more likely in the event of overpricing but, more importantly, it will limit underpricing. In both respects naked shorts enhance the accuracy of IPO pricing.

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Figure 1

Economics to the underwriting syndicate of establishing a naked short

This figure shows the overall syndicate profits from the exercise of the greenshoe and stabilisation activities combined under two scenarios: (A) the syndicate establishes a naked short position equivalent to 5% of the issue size and (B) there is no naked short position. The results are based upon the following assumptions: (i) the issue size is $100m and an additional 15% greenshoe option is available in both scenarios; (ii) if price is at or below offer price, syndicate buys 15% of offering in stabilisation at a single price; (iii) where there is a naked short, 5% of these purchases are made against the naked short and 10% against the greenshoe option and 5% of the greenshoe is exercised; (iv) where there is no naked short, 15% of purchases are made against the greenshoe option and none of the greenshoe is exercised; (v) where there is no stabilisation, the whole greenshoe is exercised and the 5% naked short is bought back if there is one; otherwise there are no market purchases; (vi) there is a 7% gross spread split 3:1:1 between selling: management: underwriting.

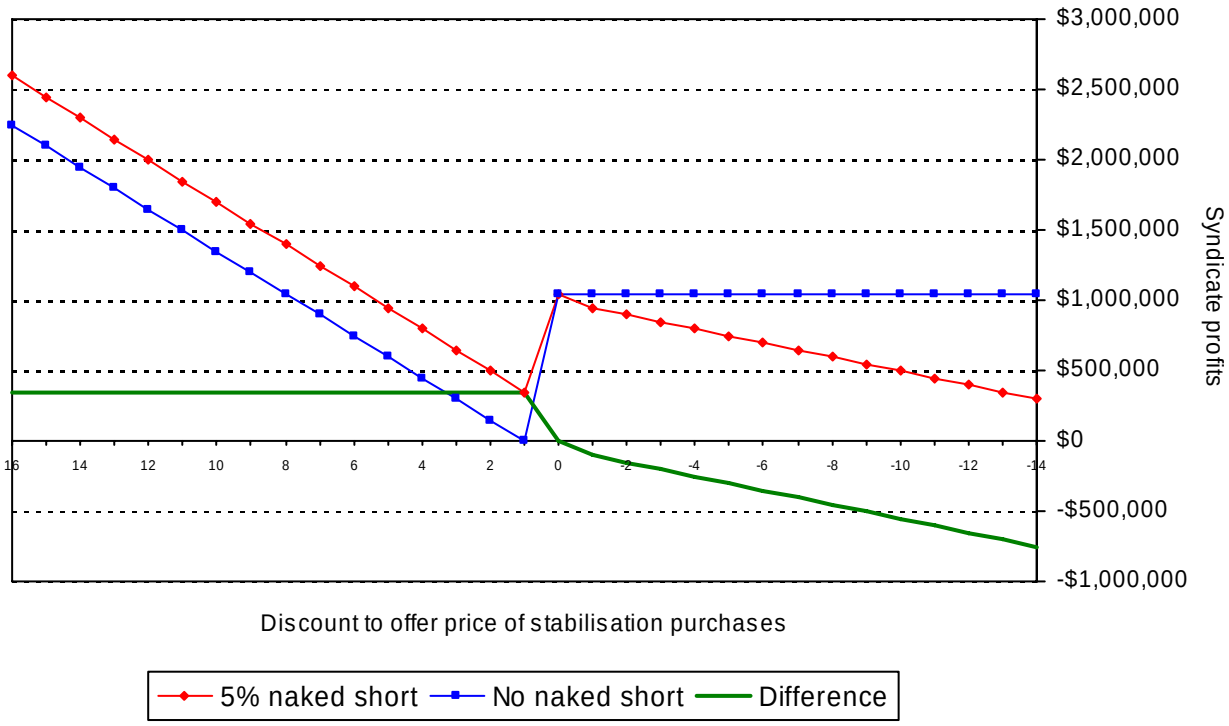

Figure 2

Economics to the lead underwriter of establishing a naked short

This figure shows the lead underwriter profits from the exercise of the greenshoe and stabilisation activities combined under two scenarios: (A) the syndicate establishes a naked short position equivalent to 5% of the issue size and (B) there is no naked short position. The results are based upon the following assumptions: (i) the issue size is $100m and an additional 15% greenshoe option is available in both scenarios; (ii) if price is at or below offer price, syndicate buys 15% of offering in stabilisation at a single price; (iii) where there is a naked short, 5% of these purchases are made against the naked short and 10% against the greenshoe option and 5% of the greenshoe is exercised; (iv) where there is no naked short, 15% of purchases are made against the greenshoe option and none of the greenshoe is exercised; (v) where there is no stabilisation, the whole greenshoe is exercised and the 5% naked short is bought back if there is one; otherwise there are no market purchases; (vi) there is a 7% gross spread split 3:1:1 between selling: management: underwriting; (vii) the lead underwriter share of allotments is 80% and the lead underwriter share of underwriting is 40%.

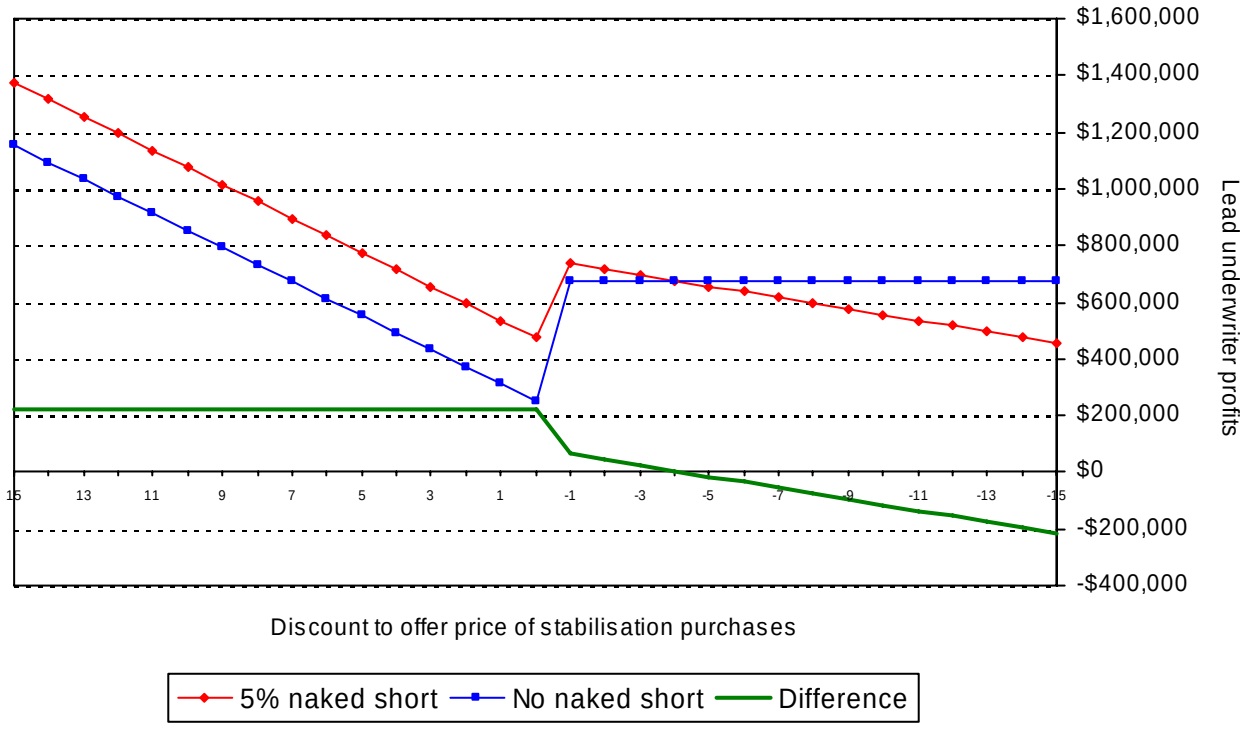

Figure 3

Economics to non-lead underwriters of establishing a naked short

This figure shows the profits of the non-lead underwriters from the exercise of the greenshoe and stabilisation activities combined under two scenarios: (A) the syndicate establishes a naked short position equivalent to 5% of the issue size and (B) there is no naked short position. The results are based upon the following assumptions: (i) the issue size is $100m and an additional 15% greenshoe option is available in both scenarios; (ii) if price is at or below offer price, syndicate buys 15% of offering in stabilisation at a single price; (iii) where there is a naked short, 5% of these purchases are made against the naked short and 10% against the greenshoe option and 5% of the greenshoe is exercised; (iv) where there is no naked short, 15% of purchases are made against the greenshoe option and none of the greenshoe is exercised; (v) where there is no stabilisation, the whole greenshoe is exercised and the 5% naked short is bought back if there is one; otherwise there are no market purchases; (vi) there is a 7% gross spread split 3:1:1 between selling: management: underwriting; (vii) the lead underwriter share of allotments is 80% and the lead underwriter share of underwriting is 40%.

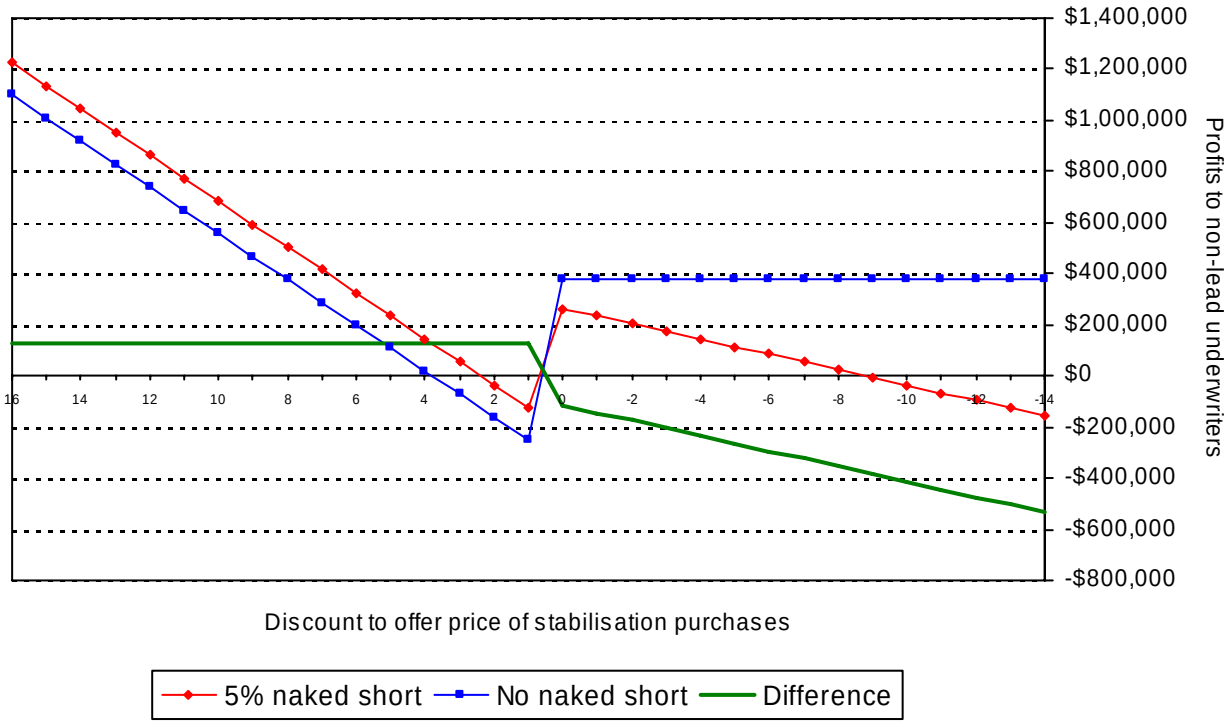

Figure 4

Net benefits/costs of the naked short

This figure shows the net benefits/costs to the underwriters from the exercise of the greenshoe and stabilisation activities combined when the syndicate establishes a naked short position equivalent to 5% of the issue size. The results are based upon the following assumptions: (i) the issue size is $100m and an additional 15% greenshoe option is available; (ii) if price is at or below offer price, syndicate buys 15% of offering in stabilisation at a single price; (iii) where there is a naked short, 5% of these purchases are made against the naked short and 10% against the greenshoe option and 5% of the greenshoe is exercised; (iv) where there is no naked short, 15% of purchases are made against the greenshoe option and none of the greenshoe is exercised; (v) where there is no stabilisation, the whole greenshoe is exercised and the 5% naked short is bought back if there is one; otherwise there are no market purchases; (vi) there is a 7% gross spread split 3:1:1 between selling: management: underwriting; (vii) the lead underwriter share of allotments is 80% and the lead underwriter share of underwriting is 40%.