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Initial public offerings of common stock: Essays on the role of the underwriter

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INITIAL PUBLIC OFFERINGS OF COMMON STOCK:
ESSAYS ON THE ROLE OF THE UNDERWRITER

by

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INTRODUCTION

An Initial Public Offering (IPO) is the first effort by a firm to raise capital in the equity market. The IPO market is characterized by a puzzling phenomenon. In an efficient market, securities issued by firms should command a fair price. Yet it appears that, on average, inital buyers of IPOs are over-compensated for the risk they accept. In other words, IPOs seem to be underpriced.[1]

Underpricing has important implications for the agents to the IPO market: the issuing firm, the investment banker and the investor. When an issue is underpriced, the issuer "leaves money on the table" in the sense that it does not get the full advantage of its ability to raise capital. For the investor, underpricing implies the existence of arbitrage opportunities. Finally for the investment banker who takes the firm public, systematic underpricing may have severe consequences: if an underwriter develops a reputation for underpricing issues, it is bound to lose market share as issuing firms gravitate towards investment bankers who have a record of fuller pricing.

The underpricing problem has been widely documented in the empirical literature and can be quite serious. A number

[1] Abnormal returns, in and of themselves, do not imply underpricing. Underpricing can only be assumed if the aftermarket is assumed (or shown) to be efficient.

of underpricing hypotheses have been proposed to explain this phenomenon but though many of these hypotheses have been tested with more or less success, no explanation prevails to date. A commonly held view however is that underwriters underprice new issues in order to insure a quick placement of the shares. Most importantly, empirical evidence has demonstrated the existence of differential pricing among classes of underwriters: issues originated by prestigious underwriters typically exhibit lower abnormal returns than those offered by their less reputable counterparts. Before exploring the implications of this proposition, however, it is important to elaborate somewhat on the role of the investment banker in an initial public offering.

A firm going public will typically select an underwriter to take it public. The contract between the issuer and the underwriter can take several forms. Some contracts entail only an advising and/or distribution function on the part of the investment banker. In that case, the banker will commit himself to exert his "best efforts" to place the issue. Most commonly, however, the investment banker will perform a risk-bearing or "insurance" function as well by underwriting the issue. This method of raising capital is called a "firm commitment" offering. In a firm commitment contract, the investment banker buys the entire issue from the firm at a discount from the offering price for resale to the public. Thus the underwriter provides the issuing firm with an explicit guarantee that it will receive the gross proceeds. In addition, the underwriter provides an implicit guarantee to potential investors of the value of the new shares. As Hansen [1986] and Titman/Trueman [1986] point out, issuers may have significant inside information about the firm's prospects so that an additional role of the underwriter is to signal to investors that the securities are fairly valued. Thus the underwriter not only bears the risk of holding inventories of unsold securities but also puts its reputation on the line with the purchasing public.

Thus the investment banker commonly has three functions: advising, risk-bearing, and marketing and distribution of the shares. The latter often requires that the investment banker directly intervene in the market in order to insure an orderly distribution of the issue and to provide a liquid market in which to sell the shares. Hence an additional role played by the underwriter is that of market-maker. The underwriter stabilizes the market by placing buy/sell orders in the aftermarket in order to prevent significant deviations from the offering price. Very little is known about the effects of stabilization. The examination of the potential effects of this practice along with an investigation of the existence of differential pricing among classes of investment bankers constitutes the body of this research.

It is important to state at the onset that this study neither questions nor seeks to explain the underpricing phenomenon: it is taken as given.[2] Rather, the present research concentrates on the role of the investment banker in the offering process and its possible influence as a determinant of abnormal initial returns. This study's goal is twofold: 1) to investigate the link between underwriter reputation and the initial returns realized by investors; 2) to examine the effect on returns of stabilization practices.

Several empirical studies have consistently reported that new stock issues underwritten by "reputable" investment bankers are less underpriced than those originated by their less established counterparts. Though it is clearly possible that prestigious investment bankers refrain from abusing their pricing prerogative for fear of damaging their reputation and incurring a loss of market share, this

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[2] A comprehensive study of IPO underpricing would require a long-term examination of price behavior. This research -like many prior empirical investigations- focuses on price behavior in the days immediately following the offering. This study can be viewed as an analysis of the rate-of-return on IPOs, whethet these excess returns are significantly positive or not.

hypothesis is not tested here. The following (non-exclusive) proposition is investigated: the prestige of an underwriter signals the market as to the riskiness of an issue. The *certification hypothesis* states that, ceteris paribus, the greater the prestige of the investment banker, the less risky an issue will be perceived to be by the market. Hence less underpricing is required to market the issue. The *market segmentation hypothesis* postulates that reputable investment banking houses are associated with low-risk issues only. Again, less underpricing is necessary to ensure a successful offering. Both hypotheses imply that prestige proxies for risk. The findings indicate that this is not the case: both prestige and risk are found to affect initial abnormal returns.

As mentioned above, very little is known about the effects of stabilization. Even though it is a fairly common practice, no prior study of IPO price behavior incorporates stabilization explicitly. This lack of scholarly interest is curious since stabilization is not likely to be neutral. Since underwriters appear to underprice new issues, it is conceivable that a trade-off exists between stabilization and underpricing. Both stabilization and underpricing help in the establishment of a secondary market for a new security. Hence, if an issue is stabilized, it is possible that less underpricing is required to develop the secondary market.

An attempt is made in this dissertation to formally model the effects of stabilization on stock returns. It is found that stabilization reduces the variance of returns in the aftermarket and that stabilized stocks exhibit lower average returns than non-stabilized stocks. Finally, the proposition that a potential trade-off exists between stabilization and underpricing is tested empirically, showing that indeed post-stabilization abnormal returns are lower.

The rest of this dissertation is organized as follows: Chapter I presents a description of the offering process and stresses the constraints put on issuers and investment bankers by the regulatory environment governing the sale of securities in the United States; Chapter II presents an extensive review of the theoretical and empirical literature dedicated to initial public offerings of equity; Chapter III deals with the effects of reputation and risk on the magnitude of abnormal returns; Chapter IV models stabilization and tests its effects empirically; Chapter V presents the conclusions and reflects on the topic undertaken.

CHAPTER I: THE OFFERING PROCESS[1]

A firm making a public offering of securities typically secures the services of an underwriter. Selection of an underwriter by a firm is done in either of two ways: competitive bidding or negotiated underwriting. Since the latter is used almost exclusively by firms going public, the following section deals with negotiated underwriting.

Three basic types of underwriting agreements can be employed.

1. A "firm commitment" agreement under which the underwriter agrees to purchase the whole issue from the firm at a discount from the offering price (the "spread") for resale to the public. Under this kind of agreement the underwiter generally forms a syndicate with other investments bankers to handle the purchase and distribution of the issue.

2. A "best efforts" agreement under which the underwriter agrees to sell as many of the registered shares as possible at an agreed-upon price. If some minimum number is not sold, the deal is canceled, and investors who bought are reimbursed. In such a contract, the amount of the proceeds

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1 For an extensive description of the offering process, see Smith [1977].

is not guaranteed by the underwriter. Unsold shares are returned to the issuer.

3. An "all-or-nothing" commitment which requires the underwriter to sell the entire issue at a given price, usually within thirty days; otherwise the underwriting agreement is voided.

The first step of negotiated underwriting begins with a series of meetings between the issuer and the investment banker where decisions as to the amount of capital, type of security, and other terms of the offering are discussed. When these questions are settled, the underwriter takes an active role in helping the firm prepare the registration statement required by the SEC. Before a firm can raise capital in the public equity market it must comply with a series of federal regulations set forth by the Securities Act of 1933. The Securities and Exchange Commission (SEC), which administers the Act, requires full disclosure of all pertinent facts about the company before it makes a public offering of new stock. The firm must file a lengthy registration statement with the SEC including a financial history, details of the existing business, proposed financing and use of proceeds.[2] A registration statement

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[2] There is one exception to this requirement: for Regulation A issues, i.e., issues of less than $1.5 million,

becomes effective on the 20th day after its filing date unless the SEC demands corrections for material omissions or misrepresentations. In that case, the offering is delayed until the deficiency is corrected. While the issue is in registration, no written sales literature other than a preliminary prospectus and "tombstone" advertisements are permitted by the SEC. The prospectus, which contains much of the information disclosed in the registration statement, is distributed to potential investors. The tombstone advertisement, which is the public announcement of a new issue of securities, is published in financial newspapers: it lists the members of the banking syndicate in order of their participation in the offering and some limited information about the issue. Oral selling efforts are permitted and underwriters obtain indications of interest from investors to buy at various prices. However, investors are not legally committed to buy and can renege on the deal after the offering is effective. For that reason, investment bankers often try to "oversell" the issue, i.e., obtain indications of interest for more shares than will be available through the offering. On the effective day of registration, the offering price is set, a price amendemnt is filed with the SEC and the offering gets underway.The "Rules of Fair Practice" of the National Association of

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the SEC allows the filing of a brief offering statement.

Security Dealers require that new issues must be offered at a fixed price and that a maximum offering price be announced two weeks in advance of the offering. Once a final offering price is filed with the SEC, the underwriters are precluded from selling the shares above this price. If all the indications of interest become orders for shares, the issue is oversold. In that case, the managing underwriter either sells the additionnal shares short and covers these short sales in the aftermarket or uses the over-allotment option if one was granted by the issuer. Many underwriting contracts contain such an option: it gives the members of the syndicate the right to buy additional shares (up to 15%) at the offering price. If the market price of the issue falls below the offering price, the SEC allows the managing underwriter to place a standing order with the specialist to buy the stock at the public offer price. This practice is known as stabilization and is permitted for a period of ten days. If stabilization is unsuccessful in shoring up the price of the security, the syndicate usually breaks and each member sells its shares at the market price. The syndicate is also broken if the managing underwriter feels that the issue cannot be sold at the offering price.

CHAPTER II: UNDERPRICING OF INITIAL PUBLIC OFFERINGS: A LITERATURE REVIEW

INTRODUCTION

One of the most puzzling phenomena in finance is the underpricing of Initial Public Offerings (IPOs), i.e., new issues of unseasoned common stocks. In a recent survey, Ibbotson, Sindelar, and Ritter [1988] report an average initial return of 16.37% for 8,668 new issues in 1960-1987. Many other studies have confirmed the existence of these apparently abnormal returns.[1] Although methodologies differ, particularly with regard to the length of time after the listing used to estimate the extent of underpricing, the consensus is that IPOs are underpriced, on average, by at least 10%. While earlier studies (e.g., Reilly/Hatfield [1969], Stoll/Curley [1970], Logue [1973]) simply document the existence of underpricing and suggest possible reasons for underpricing, subsequent work includes efforts to explain the variations of abnormal returns across firms and underwriters (Johnson/Miller [1988], Miller/Reilly [1987]. The most recent research attempts to model underpricing as an equilibrium phenomenon. These later studies are based on

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[1] Abnormal positive returns do not, in and of themselves, imply underpricing. Any abnormal returns can be attributed to underpricing only if the after-market is assumed or shown to be efficient.

hypotheses that may be losely classified as follows: 1) asymmetric information hypotheses; 2) insurance hypothesis; 3) "fads" hypothesis. Each one of these explanation is examined in turn below.

I. THEORIES OF UNDERPRICING

A. Asymmetric Information Hypotheses

These models rely on informational asymmetries among capital market agents to explain underpricing. They are successively examined according to the nature of the asymmetry.

1. Asymmetry of information among investors: Rock [1986], Beatty/Ritter [1986], Koh/Walter [1989], Carter/Manaster [1990].

Rock [1986] divides investors into two categories: informed investors who know the true value of the firm, ν, and uninformed investors who form expectations of ν based on incomplete information. In this model, informed investors only participate in the market if the price of the IPO is set below ν. As a result, uninformed investors are likely to be rationed in their demand for underpriced IPOs but find that their bids for overpriced IPOs are met in full. This winner's curse causes the uninformed investors to revise downwards their valuation of new shares and to participate in the market only if prices are "low enough" to compensate them for the bias in allocation. Hence in equilibrium the offering price must include a finite discount to attract uninformed investors to the market. Rock points out, however, that rationing per se is not sufficient to explain underpricing; it is also necessary to show that rationing occurs more often for "good" (underpriced) than "bad" (overpriced) shares.

An empirically testable implication of Rock's model is that in equilibrium uninformed investors earn the riskless rate, conditional on the rationing process associated with various issues.

Koh/Walter [1989] investigated that implication using data from the Singapore stock market. Using the size of an investor's application for subscription as a proxy for his information and simulating returns produced by each application their main conclusions are that (1) uninformed (small) investors' returns are not statistically different from the risk-free rate of return; (2) rationing is the main reason for abnormal returns on unseasoned issues and (3) rationing is shown to be applied more stringently in underpriced than in overpriced issues.

Thus Koh/Walter's study supports Rock's model.

On the other hand, Tinic [1988], finds no evidence of bias in rationing "good" issues in favor of informed investors (proxied by institutional investors in this case.) He also doubts that investors could become better informed than the issuer and its underwriter when there is no guarantee that they will receive enough underpriced issues to compensate for their information gathering costs. Welch (1989) argues that the winner's curse problem could be easily avoided if underwriters agreed to withdraw an issue or compensate uninformed investors if demand from informed investors is not forthcoming. This point was made by Ritter [1987] as well.

Beatty and Ritter [1986] extended Rock's analysis and demonstrated that expected underpricing is an increasing function of the uncertainty about the value of an issue. When uncertainty is high, investors who choose to incur the cost of becoming informed have a particular advantage over uninformed investors, and the discount necessary to entice uninformed investors in the market will be greater. Moreover they provide an explicit role for the investment banker in that they argue that investment bankers enforce an equilibrium level of underpricing because they have reputation capital at stake. Underwriters who, on average, underprice by more than the equilibrium amount would lose potential issuers as clients; those who persistently underprice too little would lose the uninformed investors. Beatty and Ritter tested their hypotheses by estimating an underpricing function and examining the changes in the market shares of forty - nine investment bankers from one time period to another. The results support their main contentions, i.e., that underpricing is an increasing function of ex ante uncertainty and that underwriters whose offerings have average initial returns not commensurate with their ex ante uncertainty lose subsequent market share.[2] However - as Tinic [19] emphasizes - the results also show that the statistical relationships used in this model have little explanatory power.

Carter and Manaster [1990] postulate that because investors have scarce resources to invest in information acquisition, they will specialize in gathering information for the most risky investments so that the greater the participation of informed investor capital, the greater the equilibrium underpricing. They further argue that since

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[2] Beatty/Ritter use two different proxies to measure uncertainty: the inverse of gross proceeds and the number of uses of proceeds listed in the prospectus. They argue that the inverse of gross proceeds captures the empirical regularity that smaller offerings are more speculative, on average, than larger offerings. The number of uses of proceeds as a proxy for ex-ante uncertainty is justified by the fact that the SEC requires detailed enumerations of the use of proceeds for speculative issues (generally issues of firms with little or no operating history) while being less demanding for issues originated by more established firms.

underpricing is costly to the issuing firm, low risk firms will attempt to reveal their low risk characteristic to the market through the choice of a prestigious underwriter.

2. Asymmetry of information between the issuer and the investment banker: Baron [1982], Muscarella/Vetsuypens [1989].

Baron [1982] focuses on informational asymmetry and conflict of interest between the investment banker and the issuer and derive optimal contracts based on the uncertainty associated with the issue and the degree of risk aversion of the issuer and the underwriter. Baron assumes that the investment banker has superior information about demand in capital markets so that the issuer optimally delegates the offer price decision to the banker. However, the investment banker bears substantial distribution costs and thus has an incentive to limit his selling effort by underpricing the issue. To address this moral hazard, the optimal contract between the issuing firm and the investment banker may involve underpricing to induce the banker to put forth the correct level of selling effort. Baron further contends that the incentive to underprice in order to reduce selling effort is greater for issues of unseasoned equities since the uncertainty surrounding these issues is greater than for new issues of seasoned equity.

As shown below, Baron's explanation of underpricing is not supported by empirical evidence .

Muscarella and Vetsuypens [1989] tested Baron's model by examining the initial public offerings of 38 investment banks that went public in the period 1980-1987 and marketed their own securities. Since the sample consisted of self-marketed IPOs so that the information asymmetry problem was not a issue, Muscarella/Vetsuypens postulated that these offerings should not be underpriced. Their analysis revealed, however, statistically significant abnormal returns on the first day of trading. Moreover, underpricing was more pronounced for offerings where the issuer-underwriter acted as the lead manager. Thus the results were inconsistent with Baron's model.

3. Asymmetry of information between the issuing firm and the investors: signalling models.

The signalling models start from the premise that the firm possesses superior information about its prospects. In order to reveal its "true" value to investors, the firm may use a variety of signals: owner retention in the firm (Leland/Pyle [1977]), dividend payments (Bhattacharya [1979]), choice of an auditor or underwriter (Booth/Smith [1986], Carter/Manaster [1990], Titman/Trueman [1986]) or underpricing at the initial public offering (Allen/Faulhaber [1989], Grinblatt/Hwang [1989], Welch [1989]).

Since the present review is concerned with IPO underpricing and the factors affecting underpricing, this section examines the literature dedicated to the latter two hypotheses (signalling through the choice of an intermediary and signalling by underpricing).

(1) Choice of a financial intermediary as a signal of firm quality: Booth/Smith [1986], Carter/Manaster [1990], Titman/Truemann [1986].

Early studies by McDonald/Fisher [1972], Logue [1973], Neuberger/Hammond [1974], Block/Stanley [1980] and Neuberger/LaChapelle [1983] consistently documented that stocks of firms brought public by prestigious underwriters exhibited lower abnormal returns in the after-market. While no formal explanation for this empirical regularity was attempted, these studies implied that investment banker prestige effectively communicates information to investors about a firm's future prospects. Recent work by Booth/Smith [1986], Carter/Manaster [1990] and Titman/Trueman [1986] provides some theoretical support for this argument. These models are outlined below.

Booth/Smith [1986] developed a theory of the role of the underwriter in certifying that issue prices are consistent with inside information about future earning prospects of the firm. In their model, underwriter's reputation plays the role of a bond posted to certify the "quality" of an issue.

Carter/Manaster [1990] demonstrated and successfully tested the proposition that low risk firms seek out prestigious underwriters to communicate to the market their low risk characteristic. Since reduced risk commands a lower compensation, issues brought public by reputable underwriters are less underpriced than those originated by their less prestigious counterparts.

Along the same lines, Titman/Trueman [1986] showed that an issuer with more favorable private information about his firm's end-of-period cash flow would choose a more prestigious underwriter than entrepreneurs with less favorable inside information.[9] They showed that, on average, equilibrium firm values are an increasing function of underwriter's prestige. Therefore, the more prestigious the underwriter, the higher the price that can be obtained for

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[9] Titman/Trueman's model deals explicitly with the choice of an auditor as a means to signal quality. They point out, however, that this model applies to the choice of an underwriter as well.

an issue and -assuming that information quality and risk are inversely related- the lower the abnormal return in the after-market. In both Carter/Manaster [1990] and Titman/Trueman [1986] models, low quality firms are deterred from profitably mimicking high-quality firms because the marginal benefit of imitation is lower than its marginal cost.

(2) Underpricing at the IPO as a signal of firm's quality: Allen/Faulhaber [1989], Grinblatt/Hwang [1989] and Welch [1989].

All three models share the feature that underpricing at the initial public offering is a signal that the firm is good. One appealing aspect of these models is that they are consistent with the rationale for underpricing offered by investment bankers, namely that investors will be more favorably disposed towards secondary issues of equity of firms whose initial public offering was underpriced. They also formalize Ibbotson's [1975] remark that issuers may want to "leave a good taste in investors' mouths' so that future underwritings from the same issuer could be sold at attractive prices".

In all three models, the sequence of events is similar: a partial offering of equity is made at a price below its expected market value, the true type of the firm (high- or low-quality) is then revealed and a subsequent offering of equity occurs. The main difference between these three papers is that in Grinblatt/Hwang [1989] and Welch [1989], nature fully reveals the true type of the firm while in Allen/Faulhaber [1989], investors infer firm's type by updating their beliefs.

Allen/Faulhaber's [1989] model characterizes the issuing process as follows: in the first stage the issuer sells a fraction of his equity at a price below its true value; in the second stage a dividend is paid and the issuer sells the remainder of his shares at a price reflecting the firm's true value. Investors do not observe directly the firm's quality: all they observe is the price at which the initial fraction of equity is offered and the dividend declared in the period following the offering. Investors then update their beliefs in a Bayesian manner so that they are more likely to believe that the firm is good if it was initially offered at a discount <u>and</u> subsequently pays out high dividends. Underpricing at the IPO -a cost to the issuer- is a credible signal to investors that the firm is good because only high-quality firms can expect to recoup this cost of signalling in the subsequent sale of their equity holding (i.e., at the seasoned offering). Low-quality firms know that they are less likely to pay high dividends in the future thus less likely to recoup the initial cost of underpricing and so cannot afford to signal.

Grinblatt/Hwang [1989] develop a two-parameter signalling model to analyze the underpricing of new issues. The issuer signals the firm's favorable future prospects by offering shares at a discount and by retaining some of the shares of the new issue in his personal portfolio. In a second stage, the retained fraction of equity is sold. This is a generalization of Leland/Pyle's [1977] model in which these authors demonstrate that the issuer's fractional holding of the firm's equity signals its expected future cash flows, with a higher fractional holding signalling larger cash flows. Grinblatt/Hwang prove that fractional holdings and underpricing discount are positively related and that the firm's value is an increasing function of the degree of underpricing. As in the previous model, signalling costs (underdiversification and underpricing) deter low-quality firms from imitating high-quality firms.

Welch [1989]shows that high-quality firms systematically underprice at the offering in order to obtain a higher value for the stock at the secondary offering. An important assumption of this model is that, unlike in Rock's [1986] study where firms reluctantly underprice in order to keep uninformed investors in the market, firms value underpricing as a signalling device. Another particular feature of this model is that low-quality firms incur not only an underpricing cost (as high-quality firms do) but also must expend resources to mimick high-quality firms' real activities. Nevertheless nature may reveal the firm's true type between the initial public offering and the seasoned offering. Low-quality firms are thus faced with a trade-off: either they invest in imitation but may lose that investment if their true type is revealed, or they reveal their true quality and forego the higher price they could have received for they equity at the secondary offering had their true type not been discovered. Welch shows that the cost of underpricing combined with the cost of imitation induces low-quality firms to declare their true type. Thus only high-quality firms underprice in order to receive a higher value for their firm in a subsequent equity offering.

These three models are highly theoretical and rely on fairly sophisticated equilibrium concepts to prove their argument. None of these models has been the subject of an in-depth empirical analysis. Welch [1989] provided some casual empirical support for his model by showing that of a sample of 1028 firms that went public during the period 1977-1982, 288 firms issued equity in the secondary market within a three-year period after the initial public offering and that their average proceeds from the secondary offering exceeded the average IPO proceeds. The author then tentatively concluded from these results that there is a relationship between the timing of seasoned equity offerings and the IPO and that initial public offerings appear to serve as an advertising device for seasoned equity issues.

One implication of these models is that there should exist a positive relationship between original underpricing discount and subsequent performance of the share in the after-market. Studies of aftermarket performance of IPOs [Tinic [1988], Ritter [1991]) show however that there does not appear to be a significant relationship between initial and after-market return.

B. The Insurance Hypothesis

Tinic [1988] examines the hypothesis that underpricing in the IPOs market serves as a form of insurance against legal liabilities and associated damages to the reputations of investment bankers. His study relies heavily on the regulatory environment governing the sale of securities. The Securities Act of 1933 requires investment bankers to conduct "due diligence" in the preparation of the registration statement. Issuers and underwriters alike are liable for omissions and/or misleading information contained in the registration statement. Given the dearth of verifiable information about start-up firms, it is clear that issuers and underwriters are exposed to considerable risk of legal liabilities. Tinic contends that large initial returns may reduce both the probability of a lawsuit and the conditional probability of an adverse judgement if a civil action is brought. Underpricing would also limit the amount of recoverable damages since the Securities Act fixes the maximum recoverable damage to the offer price. Thus an issuer buiyng insurance by underpricing its securities would face lower expected liabilities and lower compensation to the underwriter. The advantage of underpricing for the underwriter are obvious as well. The Securities Act of 1933 plays a pivotal role in Tinic's tests since it appears that prior to 1933 issuers and underwriters could fairly easily evade civil and criminal liability provisions due to the disparity of state laws.

Tinic's main testable hypothesis is that IPOs brought to market after 1933 should exhibit higher abnormal returns than those issued prior 1933. Several other propositions are also investigated: (i) underpricing varies inversely with the rank of the underwriter -a prestigious underwriter is assumed to possess superior expertise in originating IPOs-; (ii) underpricing is a decreasing function of the size and risk of the firm; (iii) prestigious underwriters avoid underwriting small and very speculative IPOs (there is a market segmentation). Tinic tests these hypotheses using two samples of IPOs: pre- and post-1933. The results confirm that the Security Act had a significant impact on the behavior of underwriters and on the underpricing of new issues. The most important -and original- finding of Tinic's study is that underpricing was noticeably more pronounced in the post-1933 sample. In addition, it appears that prestigious investment bankers priced IPOs more fully after 1933. Market segmentation was obvious in the post 1933 sample: small and highly speculative issues were overwhelmingly handled by non-prestigious underwriters. These results are consistent with some of the asymmetric information models examined above (in particular, Carter/Manaster [1990] and Titman/Trueman [1986].

Though attractive, Tinic's explanation of underpricing relies exclusively on the regulatory environment governing the sale of securities in the United States. There is some evidence, however, that the insurance hypothesis as an explanation of underpricing would not be correct within different legal and institutional frameworks. For instance, Jenkinson [1990], in his comparative study of IPO underpricing in the United States, the United Kingdom and Japan, argues that the insurance hypothesis cannot be used to explain the underpricing of U.K. IPOs. It appears that in the United Kingdom, the legal system is strongly biased in favor of the issuing firms and their advisors, providing them with extensive protection against lawsuits.[4]

C. The Fads Hypothesis

While the asymmetric information hypothesis and the insurance hypothesis (hereafter "mainstream" explanations) contend that IPOs are underpriced at the initial public offering, a recent line of research suggests that IPOs may be subject to valuation errors in early aftermarket trading. In contrast with the mainstream explanations for IPO underpricing which imply aftermarket efficiency since there are typically no abnormal returns for investors purchasing in the aftermarket, this new line of research allows for the possibility of inefficiencies in early trading and posits that the abnormal returns obtained by investors are the result of investors' overvaluation. For instance, De Bondt/Thaler [1985, 1987, 1989], argue that investors tend to overweight recent information so that stock prices temporarily depart from their underlying fundamental value. They find that overreaction manifests itself in dramatic reversals in prices for stocks that have experienced a

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[4] As an illustration, Jenkinson cites the defenses that can be used legally against claims for damages: "(i) that the defendent was unaware of any matter not disclosed; or (ii) that the defendent honestly and mistakenly failed to comply with or contravened the disclosure requirements; or (iii) that the failure to comply or the contravention was in respect of an immaterial matter or ought in the opinion of the court reasonably to be excused".

strong uni-directional trend. This suggests that IPOs could be experiencing mean-reverting fads, hence the "fads" hypothesis. Camerer [1989] hypothesizes that fads are more likely to occur if greater uncertainty surrounds the stock market value. Black [1986] proposes that in noisy markets, uninformed investors may trade on noise believing it to be meaningful information. In particular, investors may be over-optimistic in interpreting favorable primary sources of information so that the price of the security will deviate from its value.[5]

No empirical evidence supporting or rejecting the "fads" hypothesis is available. However two recent studies (Aggarwal/Rivoli [1990], Ritter [1991]) test whether or not IPO price behavior is consistent with the fad explanation.

Aggarwal/Rivoli [1990] use a sample of 1,598 firms that went public during the period 1977-1987 and examine their performance from offering date to 250 days after offering. They postulate that if the market is immediately efficient in valuing new issues, then returns to investors purchasing the securities at the close on the first day and holding them for 250 days will approximate the returns on the market

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[5] Conversely, investors will be over-pessimistic in interpreting unfavorable pieces of information.

index.[6] On the other hand, if IPOs are systematically overvalued in early trading, these returns should be negative. They found that the average market-adjusted returns from the close of the offering day to 250 days later is a highly significant -13.73% Moreover the authors find no evidence of positive abnormal results to investors purchasing at the offering price and holding for 250 days. They conclude that these results provide some support for the existence of fads.

Ritter [1991] examines the price behavior of 1,526 IPOs issues during 1975-1984 for three years following the offering. Unlike Aggarwal/Rivoli he finds that the average holding period return (measured from the first trading day closing price to the three-year anniversary) is 34.47%. However, a control sample of 1,526 listed stocks, matched by industry and market value, produces an average holding-period return of 61.86% providing strong evidence that IPOs underperform in the long run. Ritter also finds that younger companies, particularly those going public in heavy volume years perform even worse than average. Although underperformance is present across a wide range of industries, it is particulary pronounced in the natural

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[6] This implies of course that the systematic risk of the IPOs is approximately the same as that of the index. The authors note that positive market-adjusted returns would be expected on the basis of capital asset-pricing theory.

resources industry (oil and gas). Ritter concludes that this evidence is somewhat consistent with a scenario of firms going public when investors are overoptimistic about the future potential of certain industries. In other words, the fads hypothesis appears to be supported.

As mentioned earlier, the existence of fads in equity markets and in the IPO market is particular has not yet been proved nor disproved. Evidence from the studies by Aggarwal/Rivoli [1990] and Ritter [1991] points to investors' overoptimism but are not conclusive. Alternative explanations need to be explored.

II. CONCLUSION

Underpricing of Initial Public Offerings has been the focus of intensive research for more than two decades. Early research simply documents the phenomenon without attempting to explain it. Formalization of the problem has been the topic of the most recent line of work. Broadly speaking, most of the later studies attempt to explain IPO underpricing as a rational outcome in markets characterized by informational asymmetries. One important exception to this line of study contends that IPOs are not underpriced at the initial offering but are systematically overvalued by overoptimistic investors, thus implying a violation of standard rationality assumptions.

The debate is still open. None of the explanations for underpricing are entirely satisfactory or have been strongly supported by the data.

CHAPTER III: UNDERPRICING AND INVESTMENT BANKER PRESTIGE

INTRODUCTION

Over the past two decades a growing body of research has suggested that underwriters systematically underprice IPOs (Beatty/Ritter [1986], Booth/Smith [1986], Carter/Manaster [1990], Chalk/Peavy [1989], Logue [1973], McDonald/Fisher [1972], Neuberger/Hammond [1974], Neuberger/LaChapelle [1983]). A common explanation for this deliberate underpricing is based on Rock [1986], Beatty/Ritter [1986] and Carter/Manaster [1990] models of asymmetric information: in markets characterized by informational asymmetries among investors, informed investors have an advantage over uninformed investors when the uncertainty surrounding an issue is high. Underpricing is then necessary to keep uninformed investors in the market and this underpricing will be more pronounced the higher the uncertainty surrounding an issue.

Importantly, prior research consistently reports the existence of a differential performance of IPOs underwritten by different classes of investment bankers: it appears that prestigious underwriters underprice less than their less prestigious counterparts. The various explanations for this phenomenon can be loosely divided into three hypotheses.

(i) The "Certification" Hypothesis: Logue [1973] and Shiller [1990] suggest that investors may favor prestigious investment banking houses in their purchases of IPOs. In particular, Shiller [1990] hypothesizes that it is "plausible that underwriter reputation should matter since IPO investors generally do not do careful research." Carter/Manaster [1990] show that the level of investment banker prestige signals the market as to the riskiness of an issue: the greater the underwriter's prestige, the less risky the issue will be perceived by the market, therefore the lower the abnormal return required by investors.

(ii) The "Market Segmentation" Hypothesis: it posits that prestigious underwriters may deal only with issues of low-risk firms (Logue [1973], Johnson/Miller [1988], Tinic [1988], Titman/Trueman [1986]) hence if issues offered by reputable investment bankers are less underpriced, it is because there is less uncertainty regarding their value.

(iii) The "Insurance" Hypothesis: underwriters underprice to protect themselves from the risks of legal liabilities (Tinic [1988]). Tinic argues that non-prestigious underwriters do not possess the expertise in underwriting new issues that the major investment banking houses have, are less capitalized and only participate sporadically in the IPO market. They are thus more vulnerable to legal actions hence have a higher incentive to underprice.

The relationship between underwriter reputation and new issue pricing is of considerable interest to issuers and investors alike. Investors may choose to gravitate towards issues originated by prestigious investment bankers; issuers may select more prestigious underwriters to signal the quality of their firm to the market and obtain a higher price for their equity issue. Thus investment banker prestige and its implications deserve a careful examination.

Crucial to this analysis is how best to measure the level of prestige for a given underwriter. This is in part the object of Section I: a reputation measure based on investment bankers' IPO market share is developed and contrasted with the measure traditionally employed in studies of underwriter reputation. Both measures are used to analyze the relationship between issue risk (and the degree of underpricing) and prestige from the investor's point of view. Specifically, both the "certification hypothesis" and the "market segmentation" hypothesis are tested. The "certification hypothesis" predicts an inverse relationship between the degree of underpricing and underwriter prestige; it implies that investors perceive all issues offered by prestigious underwriters as being low-risk. If supported, this hypothesis suggests that, irrespective of other measures of true risk, prestige should be the only determinant of initial returns. The "market segmentation" hypothesis on the other hand posits that prestigious investment bankers systematically select low-risk IPOs, thus, if issues offered by prestigious underwriters are underpriced less it is because there is less uncertainty about their value. In either case, prestige would then proxy for risk. These two hypotheses are clearly extreme. If investors are rational, it is highly unlikely that other measures of true risk would not be a factor in their decision to subscribe to a particular IPO, as the "certification" hypothesis implies. It is equally unlikely that reputable underwriters deal exclusively with low-risk IPOs. Both underwriter reputation and ex-ante uncertainty are expected to determine initial abnormal returns.

Section II investigates the link between investment banker reputation and firm's risk level in the context of the signalling model of Titman/Trueman [1986] in which firms signal the quality of their inside information through the choice of a prestigious underwriter.

SECTION I: CERTIFICATION VERSUS MARKET SEGMENTATION

In this section, both the "certification" and the "market segmentation" hypotheses are investigated using a sample of 418 initial public offerings in the United State over the period 1987-1988. A new reputation variable is developed and compared with the measure usually employed in the empirical literature on investment bankers' reputation effects.

I. Data and Methodology

A. DATA

The sample includes all initial public offerings of common stock in the United States during the period 1987-1988 as identified from *Going Public:The IPO Reporter* and *Investment Dealers' Digest* subject to the following filters:

a. Regulation A[1] offerings are excluded.

b. Only issues underwritten on a firm-commitment[2] basis are considered[3].

c. Mutual funds, banks and Real Estate Investment Trusts are excluded. These firms are in fact repackaged assets which have had previous market valuation. Hence they do

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[1] Regulation A offerings do not exceed $ 1.5 million in aggregate in any one year and are not subjected by the SEC to the stringent disclosure requirements demanded for larger issues.

[2] In a firm commitment agreement,the banking syndicate purchases the entire issue at a discount from the offering price (the spread). The syndicate bears all the risk if the issue is unsuccessful or fails to sell quickly.

[3] Previous empirical research has shown that "best efforts" offerings exhibit substantially higher initial abnormal returns than "firm-commitment" offerings (Chalk/Peavy [1987], Aggarwal/Rivoli [1990]). Hence "best-efforts" offerings are excluded to avoid a possible upward bias in the calculation of the mean initial return.

not qualify as unseasoned issues.

d. Firms issuing units (stocks + warrants) are excluded.[4]

This selection produced a sample of 421 firms. Three of these 421 offerings were delisted shortly after trading started. The analyses were conducted twice, including and excluding these firms, with no difference in the results. Consequently, the results reported here are based on a sample of 418 stocks.

Data relevant to this and subsequent analyses (offering date and price, number of primary and secondary shares and underwriter identity) were obtained from the sources cited above. Daily stock prices were obtained from *Dow Jones News Retrieval Service* and checked for accuracy against OTC, NYSE and AMEX *Daily Stock Prices*. Since an overwhelming majority of stocks in the sample were traded on NASDAQ, the NASDAQ Over-The-Counter (OTC) composite index was selected to adjust for market variations.

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4 The exercise price of the warrant is tied to the offeringprice. In the case of unit offerings, the underwriter is usually granted warrants as part of the compensation. The incentive to underprice these particular offerings is thus great. Hence, excluding units from the sample removes the probable upward bias that they would introduce in the calculation of average returns.

B. MEASURE OF UNDERWRITER REPUTATION

Prior empirical analyses of the effect of investment banker reputation use a ranking of underwriters derived from Hayes' [1971] work on the hierarchy characterizing the investment banking world. According to Hayes, a rigid hierarchy governs the size of each investment banking house's participation in the underwriting of a new issue. This hierarchy is actually visible through the "tombstone" advertisement published in the financial sections of newspapers. In a tombstone advertisement, which is the announcement of a new issue of securities, underwriters are listed alphabetically whithin brackets called "bulge" (most prestigious), "major" (next most prestigious) and "submajor" and "subordinate" (least prestigious), respectively.[5] A firm's bracket position in the underwriting syndicate is of the utmost importance. Hayes notes that "a firm's standing in the syndicate hierarchy is considered by many within the industry as an approximate measure of its stature in the financial and business communities". Besides enjoying a more prestigious position than their lower brackets

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[5] In the "bulge" (most prestigious) bracket appear the firms that have traditionally had a leading role in Wall Street underwriting. The major bracket (next most prestigious) consists of investment banking houses that are heavily involved in underwriting but do not have yet the standing of the "bulge" bracket firms. The submajor and subordinate brackets (least prestigious) include firms with an extensive distribution capability.

counterparts, high-bracket firms also obtain more frequent and larger participation in the IPOs hence larger underwriting revenues.

The reputation measures used in previous studies are based on Hayes's classification, assigning ranks to underwriters according to their relative position tombstone advertisement. For instance, Johnson/Miller [1988] employs a ranking system of four tiers: the highest rank represents the "bulge" bracket, the medium rank the "major" bracket and the lowest rank the "sub-major" bracket; underwriters not represented in a bracket receive a rank of zero. Carter/Manaster [1990a, 1990b] (hereafter CM) utilize a ranking with 19 levels of prestige on a scale of zero (least prestigious) to nine (most prestigious), separated into units of 0.5.

Though Hayes's system is appealing it is not clear how many tiers of underwriters should be considered prestigious: in particular, underwriters belonging to the sub-major bracket tend to move in and out of that category according to the size of the offering and the distribution pattern sought by the managing underwriter.

Unlike prior research, the measure of prestige developed in this analysis is based on the annual dollar amount of IPO underwritten by each underwriter. The use of market share as a measure of reputation is motivated by

Hayes's [1971] implication that the size of an underwriter's security offerings is partially determined by its prestige.[6] IPO market share and prestige are thus assumed to be highly correlated.[7] It is important to note that this correlation (which is indeed high as demonstrated by the analysis below) is industry-specific.[8]

The reputation variable -CLASS- constructed in this study borrows from *Investment Dealers' Digest* ranking of investment bankers according to the dollar amount of IPOs they underwrite. *Investment Dealers' Digest* ranks investment banking houses from fifteen (highest) to one (lowest). Underwriters not included in *Investment Dealers' Digest* report are given a rank of zero. This measure is contrasted to CM measure which is constructed according to the list of underwriters -and associated rank- that the authors obligingly provide in their 1990 paper. The frequency distribution of IPOs by rank for both the CLASS

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[6] The choice of a volume-based measure of reputation was also strongly motivated by practical considerations: it is easy to collect since financial newspapers regularly rank underwriters on the basis of their market share. Constructing a measure based on Hayes's classification is a very long process since it involves the examination of the tombstone advertisement for each issue.

[7] A possible drawback of this measure is that volume effects cannot be dissociated from prestige effects.

[8] Application of the market share measure to the retail industry for instance would result in classifying Woolworth and Kmart as prestigious department stores.

and CM variables is shown in the appendix. The mean rank and the standard deviation for the CLASS measures are 4.66 and 5.52; for the CM measure, the mean rank equals 5.33 and the standard deviation 3.47. The coefficient of correlation between the two measures is .70, significant at the one percent level.

C. METHODOLOGY

The analysis is done in three steps:

1) the existence (and direction) of a relationship between returns and ex-ante uncertainty and between returns and underwriter prestige is investigated separately using univariate regressions of returns on the proxy for ex-ante uncertainty and of returns on each of the underwriter prestige variables;

2) the validity of the certification and market segmentation hypotheses are tested by including both proxies for ex-ante uncertainty and prestige in the regression equation;

3) additional control variables though to affect the magnitude of initial returns are included in the regression equation and the validity of both hypotheses reevaluated.

In order to compare the CLASS and CM variables, each measure is used in turn in each of the empirical models.

The models are tested for heteroscedasticity and the variance-covariance matrix of the estimates corrected appropriately.[9] J tests are then performed to examine the appropriateness of each model.[10]

1. Variables Definition

The independent variable -RETURN-is the market-adjusted first-day return on the ith IPO. It is defined as follows:

$$R_{it} = \left[\frac{P_{it} - P_{io}}{P_{io}}\right] - \left[\frac{M_t - M_{t-1}}{M_{t-1}}\right]$$

where P_{io} is the offering price of the ith IPO, P_{it} the closing bid price on the first day of trading or the lowest bid price when closing bid was not available, M_t the value of the OTC market index on offering date and M_{t-1} the value of that index on the day preceding the offering.[11] The mean first-day return in this sample is 6.50% (standard deviation 13.49%).[12]

[9] The test for heteroscedasticity is the Breusch-Pagan test; the variance-covariance matrix of the least-squares estimates is White's estimator (see 3. below).

[10] Davidson and McKinnon J test of model choice (Kmenta [1986]) (see 4. below).

[11] In the context of the Capital Asset Pricing Model, this definition does not account for risk in an optimal manner since it assumes that the coefficient of systematic risk, β, is equal to one. However, the absence of pre-offering data precludes the calculation of β. Since there is evidence that the betas of IPOs are greater than one (Ibbotson [1975]), returns as defined in equation (1) are biased upward.

[12] This mean return is much lower than the 8% - 20% range

The control variables in the multivariate regressions are the following[13]:

(i) SIZE: the dollar amount of the offering.

It has been suggested that prestigious investment bankers systematically underwrite larger issues than their less reputable counterparts (Logue [1973]). Additionally if larger size is synonymous with increased information therefore less ex-ante uncertainty about the value of the firm then one would expect to see a size effect independently of the reputation effect.

The mean and standard deviation of this variable are 29.487 million dollars and 54.45 million dollars, respectively.

(ii) SECSHS: the fraction of shares sold by insiders[14].

The presence and size of a secondary offering may be viewed by the market as a signal that the owners are unwilling to carry the risk of the firm once it becomes public, thus leading the underwriter to underprice more those issues including insider shares. Conversely, selling shareholders may be able to monitor the pricing process

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reported in prior empirical work. The lower average return is possibly due to the exclusion of units from the sample.

[13] These variables are commonly used in empirical tests of underpricing.

[14] Also called "secondary shares", these are shares sold by owners at the initial public offering, not newly issued shares.

closely and thus to obtain a higher price for the issue (Logue [1973]).

This variable has a mean of 11.56% and a standard deviation of 17.90%

(iii) STDEV: a proxy for the ex-ante uncertainty surrounding an issue. This is the standard deviation of daily returns over the first 21 days of trading (except offering day). A rationale for the use of this proxy is that stocks that exhibit great price volatility in the after market are bound to be ex-ante riskier (Ritter [1984])

The mean and standard deviation of this variable are 3.42% and 2.89%, respectively.

(iv) CRASH: a proxy for market conditions.

Since the sample covers firms going public over the period 1987-1988 and a market crash occurred in October 1987 this variable attempts to control for the behavior of the market as a whole. This variable is dichotomous; it takes the value 1 if the ith IPO was offered to the public before October 1987, 0 otherwise.

70.1% of the issues included in this sample were offered prior to October 1987.

2. Models Specification

The entire analysis is conducted using the least squares method.

The general model is as follows:

$$Y_i = \beta X_i + u_i$$

where Y_i is RETURN, u_i the disturbance term, and the X_is the explanatory variables in the following model specifications:

(Model 1) X = [CONSTANT, STDEV]

(Model 2) X = [CONSTANT, CLASS]

(Model 3) X = [CONSTANT, CM]

(Model 4) X = [CONSTANT, STDEV, CLASS]

(Model 5) X = [CONSTANT, STDEV, CM]

(Model 6) X = [CONSTANT, STDEV, CLASS, SIZE, SECSHS, CRASH]

(Model 7) X = [CONSTANT, STDEV, CM, SIZE, SECSHS, CRASH].

3. Heteroscedasticity Detection and Correction: Breusch-Pagan Test and White Estimator

The error terms in these models are unlikely to have constant variance because higher levels of prestige should correspond to a lower dispersion of abnormal returns[15]. Moreover, heteroscedasticity is likely to be reinforced by the fact that higher ex-ante uncertainty should be reflected in a greater dispersion of initial returns.

The problem with heteroscedasticity is that it biases inference procedures as follows: when the residuals e_i of the OLS model $Y_i = \beta x_i + e_i$ have constant variance then $S^2(X'X)^{-1}$, where $S^2 = (1/N-k) \sum \hat{e}_i^2$, is a consistent estimator of $Var(\hat{\beta})$, the variance-covariance matrix of the OLS estimators, $\sigma^2(X'X)^{-1}$. In the presence of heteroscedasticity however, $Var(\hat{\beta}) = (X'X)^{-1}(X'\Omega X)(X'X)^{-1}$ and $S^2(X'X)^{-1}$ is no longer consistent so that traditional significance tests cannot be applied. In order to detect the presence of heteroscedasticity, the Breusch-Pagan test

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15 The variance of returns for the highest and lowest categories of prestige in both reputation measures is displayed below:

CLASS	σ^2(Return)	CM	σ^2(Return)
15	.00657	9	.00508
0	.02420	0	.03390

is used; correction of the variance-covariance matrix of the OLS estimates is done by means of the White estimator.

(a) In the *Breusch-Pagan Test*, the hypothesis of homoscedasticity is tested against the alternative hypothesis:

$$H_1: \quad \sigma_i^2 = f(\gamma_0 + \gamma_1 Z_{i1} + \dots + \gamma_n Z_{in}) \qquad (i = 1,2,\dots,n)$$

The Z are typically the same as the explanatory variables of the regression equation. The test statistic for the Breusch-Pagan test involves applying the least squares method to:

$$\hat{e}_i^2 / \hat{\sigma}^2 = \gamma_0 + \gamma_1 Z_{i1} + \dots + \gamma_n Z_{in} + \nu_i$$

where $\hat{e}_i$ are the residuals from the least squares regression of Y on X and $\hat{\sigma}^2 = \Sigma \hat{e}_i^2 / n$. Under the null hypothesis, the ESS (explained sum of squares) of the regression above is asymptotically distributed $\chi^2_{(n)}$.

b) White [1980][16] showed that under heteroscedasticity, an acceptable (consistent) estimator of $(X'\Omega X)$ in

$$Var(\hat{\beta}) = (X'X)^{-1}(X'\Omega X)(X'X)^{-1}$$

is:

$$\hat{W}_i = (1/N)\Sigma \, \hat{e}_i x_i x_i'$$

and that $\hat{W}_i \Rightarrow (X'\Omega X)$ as $N \Rightarrow \infty$.

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[16] Spanos [1986], pp.465-467.

One important advantage to using White estimator is that one does not need to know the exact form of the heteroscedasticity.

4. Competing Models: The Davidson and McKinnon J Test of Model Choice

Two competing models are used in the analyses of the effects of underwiter prestige, one including CLASS as a proxy for investment banker's reputation, the other the CM variable. The problem is to choose among these two models. Davidson/McKinnon J Test sets the choice between the two models as a testing problem:

H_1: $E(Y) = X\beta$ where X includes CLASS

H_2: $E(Y) = Z\gamma$ where Z includes CM

The test involves applying the least squares method to:

$$Y = (1 - \alpha)X\beta + \alpha(Z\hat{\gamma}) + \varepsilon$$

where $\hat{\gamma} = (Z'Z)^{-1}Z'Y$ and obtaining an estimate of the coefficient α of $Z\hat{\gamma}$. A test of H_1 is simply the standard F test of the hypothesis that $\alpha = 0$. If H_1 is rejected, it does not necessarily mean that H_2 is the true model however. To make a statement about the validity of H_2, the roles of H_1 and H_2 must be reversed and the testing process repeated.

II. Results

Models 1 to 7 are estimated by the least squares method, tested for heteroscedasticity using the Breusch-Pagan test and reestimated using White's heteroscedasticity-corrected variance-covariance matrix. J tests are then conducted to determine the appropriateness of the models. Results are displayed in Tables I through IVA.

Table I: Least Squares Results[a]

Dependent Variable = RETURN

	Model 1	Model 1'[b]
CONSTANT	.0412**	.0412**
	(4.076)	(4.320)
STDEV	.6947**	.6947**
	(3.071)	(2.382)
N	418	
R^2	.022	
F(1,416)	9.431**	
Breusch-Pagan $\chi^2(1)$	53.00**	

** Significant at the .01 level

[a] t statistics in parentheses

[b] Heteroscedasticity-corrected

Table II: Least Squares Results[a]

Dependent Variable = RETURN

	Model 2	Model 3	Model 2'[b]	Model 3'[b]
CONSTANT	.0795**	.1077**	.0795**	.1077**
	(9.259)	(9.079)	(8.367)	(6.843)
CLASS	-.0031**		-.0031**	
	(-2.622)		(-2.783)	
CM		-.0080**		-.0080**
		(-4.294)		(-3.643)
N	418	418		
R^2	.016	.042		
F(1,416)	6.876**	18.442**		
Breusch-Pagan $\chi^2(1)$	16.631**	60.109**		

** Significant at the .01 level

a t statistics in parentheses

b heteroscedasticity-corrected

Table IIA: J TEST[a]

$$Y_1 = (1 - \alpha)X\beta + \alpha(Z\hat{\gamma}) + \varepsilon_1 \qquad \text{(Model 2')}$$
$$Y_2 = (1 - \alpha)Z\gamma + \alpha(X\hat{\beta}) + \varepsilon_2 \qquad \text{(Model 3')}$$

	Model 2'	Model 3'	Model 2'[b]	Model 3'[b]
CONSTANT	-.0097	.1267**	-.0097	.1267**
	(-.351)	(2.812)	(-.386)	(3.067)
CLASS	.0007		.0007	
	(.438)		(.533)	
$Z\hat{\gamma}$	1.0980**		1.0980**	
	(3.398)		(3.140)	
CM		-.0088**		-.0088**
		(-3.986)		(-3.140)
$X\hat{\beta}$		-.2286		-.2286
		(-.438)		(-.533)
N	418	418		
R^2	.043	.043		
F (2,415)	9.299**	9.299**		
Breusch-Pagan $\chi^2(2)$	63.992**	63.992**		

[a] t values in parentheses

[b] heteroscedasticity-corrected t values

**Significant at the .01 level

Table III: Least squares Results[a]

Dependent variable = RETURN

	Model 4	Model 4	Model 5[b]	Model 5[b]
CONSTANT	.0558**	.0843**	.0558**	.0843**
	(4.849)	(5.802)	(5.006)	(5.269)
STDEV	.6850**	.6128**	.6850**	.6128*
	(3.048)	(2.747)	(2.413)	(2.274)
CLASS	-.0031**		-.0031**	
	(-2.597)		(-2.755)	
CM		-.0075**		-.0075**
		(-4.062)		(-3.541)
N	418	418		
R^2	.038	.060		
F(2,415)	8.153**	13.140**		
Breusch-Pagan				
$\chi^2(2)$	64.079**	88.511**		

[a] t values in parentheses

[b] heteroscedasticity-corrected t values

**Significant at the .01 level

Table IIIA: J TEST[a]

$$Y_1 = (1 - \alpha)X\beta + \alpha(Z\hat{\gamma}) + \varepsilon_1 \qquad \text{(Model 4')}$$
$$Y_2 = (1 - \alpha)Z\gamma + \alpha(X\hat{\beta}) + \varepsilon_2 \qquad \text{(Model 5')}$$

	Model 4'	Model 5'	Model 4'[b]	Model 5'[b]
CONSTANT	-.0047	.0928**	-.0047	.1267**
	(-.206)	(2.637)	(-.221)	(2.925)
STDEV	-.0425	.7054	-.0425	.7054
	(-.132)	(1.705)	(-.129)	(1.710)
CLASS	.0004		.0004	
	(.266)		(.323)	
$Z\hat{\gamma}$	1.0632**		1.0632**	
	(3.106)		(2.960)	
CM		-.0080**		-.0080**
		(-3.106)		(-2.960)
$X\hat{\beta}$		-.1408		-.1408
		(-.266)		(-.323)
N	418	418		
R^2	.060	.060		
F (2,415)	8.764**	8.764**		
Breusch-Pagan $\chi^2(2)$	90.502**	90.502**		

[a] t values in parentheses

[b] heteroscedasticity-corrected t values

** Significant at the .01 level

Table IV: Least Squares Results[a]

Dependent Variable = RETURN

	Model 6	Model 7	Model 6[b]	Model 7[b]
CONSTANT	.0635**	.0878**	.0635**	.0878**
	(4.179)	(5.167)	(4.220)	(4.610)
STDEV	.6790**	.6244**	.6790**	.6244**
	(2.964)	(2.751)	(2.406)	(2.319)
CLASS	-.0027*		-.0027**	
	(-2.121)		(-2.343)	
CM		-.0076**		-.0076**
		(-3.656)		(-3.335)
SIZE	-.4511E-10	.2676E-10	-.4511E-10	.2676E-10
	(-.350)	(.210)	(-.795)	(.451)
SECSHS	-.0315	-.0077	-.0315	-.0077
	(-.850)	(-.206)	(-1.151)	(-.292)
CRASH	-.0058	-.0052	-.0058	-.0052
	(-.402)	(-.363)	(-.422)	(-.382)

N	418	418
R^2	.040	.060
F(5,412)	3.442**	5.270**
Breusch-Pagan		
$\chi^2(5)$	78.035**	93.998**

[a] t values in parentheses

[b] heteroscedasticity-corrected t values

*Significant at the .05 level

**Significant at the .01 level

Table IVA: J TEST[a]

$$Y_1 = (1 - \alpha)X\beta + \alpha Z\hat{\gamma} + \varepsilon_1 \qquad \text{(Model 6')}$$

$$Y_2 = (1 - \alpha)Z\gamma + \alpha X\hat{\beta} + \varepsilon_2 \qquad \text{(Model 7')}$$

	Model 6'	Model 7'	Model 6'[b]	Model 7'[b]
CONSTANT	-.0040	.0974*	-.0040	.0974**
	(-.145)	(2.184)	(-.169)	(2.453)
STDEV	-.0363	.7168	-.0363	.7168
	(-.110)	(1.570)	(-.110)	(1.638)
CLASS	.0004		.0004	
	(.233)		(.287)	
$Z\hat{\gamma}$	1.0526**		1.0526**	
	(2.967)		(2.909)	
CM		-.0080**		-.0080**
		(-2.967)		(-2.909)
$X\hat{\beta}$		-.1412		-.1412
		(-.233)		(-.287)
SIZE	-.6507E-11	.1529E-10	-.6507E-11	.1529E-10
	(-.051)	(.112)	(-.111)	(.226)
SECSHS	.0005	-.0121	.0005	-.0121
	(.013)	(-.288)	(.019)	(-.365)
CRASH	.0002	-.0061	.0002	-.0061
	(.013)	(-.411)	(.013)	(-.437)
N	418	418		
R^2	.060	.060		
F (2,415)	4.391**	4.391**		
Breusch-Pagan $\chi^2(2)$	96.509**	96.509**		

**Significant at the .01 level

[a] *t* values in parentheses

[b] heteroscedasticity-corrected *t* values

Analysis of the Results

The preliminary analysis undertaken by Models 1 and 2 shows that, consistent with previous studies, higher ex-ante uncertainty commands higher returns and issues originated by more prestigious underwriters exhibit lower initial returns (Tables II and III). Taken separately, both risk and prestige affect initial returns. A preliminary J test of model choice leads to the conclusion that the CM prestige variable outperforms the volume-based CLASS variable.

Results of the tests of the "certification" and the "market segmentation" hypotheses are presented in Tables IV and V. The coefficients of the proxy for risk and the proxies for prestige are consistently significant at the 1% level. Clearly, prestige is not a sufficient proxy for risk. Moreover, these findings indicate that neither the "certification" nor the "market segmentation" hypotheses can be accepted to the exclusion of the other.[17] Prestige alone is not sufficient to control for issue risk: although prestige may convey some indication about the risk of the issue, other factors are at play as well.[18] The risk proxy

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[17] It is interesting to note however that -everything else constant- the effect of ex-ante uncertainty on initial returns is very large while that of the prestige proxies is minimal. Even though both risk and prestige appear to play an important role in the determination of initial returns, the risk effect is much stronger.

[18] A similar result is found by Carter/Dark [1990]. They

reflects all other information about the uncertainty surrounding the issue that is correctly captured by the market. Similarly, there is no evidence that issue risk is the sole determinant of returns. Thus if prestigious underwriters underprice less than their less reputable counterparts, it is not just because they deal with lower risk issues. An alternative explanation for the existence of this differential pricing is that offered by Beatty/Ritter [1986]: prestigious investment bankers do not abuse their pricing prerogative for fear of damaging their reputation and incurring a loss of market share.

Heteroscedasticity is strongly present in all models as evidenced by the significant χ^2 values. However, the t values produced by the White estimator continue to be significant at the one percent level.

All J tests lead to reject the null hypothesis (H_1) that a model including the CLASS variable is the correct specification. When included in the regressions with the CLASS variable, the coefficient of $Z\hat{\gamma}$, the fitted values of the regression of RETURN on the CM variable is significantly different from zero in each model; conversely, $X\hat{\beta}$, the fitted values of the regression of RETURN on the CLASS

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explain it away however by arguing that the risk proxy -the standard deviation of daily returns in the after-market-, reflects the arrival of new information in the after-market, not the ex-ante uncertainty surrounding the issue, in effect contradicting their own justification for the use of the proxy. They maintain that that the direct relationship is between underwriter prestige and pre-offering uncertainty so that prestige is the main determinant of initial returns.

variable consistently fail to provide any explanatory power when used in conjunction with the CM variable.

The control variables introduced in Models 6 and 7 (SIZE, SECSHS, CRASH) do not provide any additional explanatory power[19].

In summary, this section presented an analysis of two popular hypotheses: (1) the "certification" hypothesis which implies that the greater the banker's prestige, the less risky the issue will be perceived by the market hence the lower the abnormal return required by investors to compensate them for bearing the risk of an issue; (2) the "market segmentation" hypothesis which predicts that prestigious investment bankers deal only with low-risk firms for which there is little risk in setting the offering price, so that the difference in pricing is assumed to be due only to issue-specific factors and is independent from prestige.

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[19] The lack of explanatory power of the SIZE and SECSHS variables may be due to the high correlation existing among these variables and the reputation proxies:
ρ(CLASS,SIZE) = .36 (significant at .01%)
ρ(CM,SIZE) =.36 (significant at .01%)
ρ(CM,SECSHS) = .26 (significant at .01%).
When the reputation variable (CLASS/CM) is excluded from the regression, the coefficient of issue size becomes statistically significant at 1%. Since it is negative, it may be indicative of a "firm size" effect: if large offerings are those of established firms (firms with an operating history), then the larger the offering, the more information it transmits to the public, hence reducing ex-ante uncertainty therefore reducing the required returns.

The findings of the analysis do not support either hypothesis at the exclusion of the other. Underpricing is shown to be both an increasing function of ex-ante uncertainty and a decreasing function of prestige. A plausible explanation for the existence of differential pricing among classes of underwriters is that reputable investment bankers are less likely to put their reputation at stake by consistently pricing IPOs much below their expected market value.

In contrast with previous empirical research, a new measure of reputation, based on investment bankers' annual IPO market share was constructed and contrasted with the traditional measure derived from the placement of underwriters in tombstone advertisements. However it consistently underperforms the traditional proxy used in the empirical literature dealing with underwriter prestige effects.

SECTION II. MARKET SEGMENTATION REVISITED: DO FIRMS SIGNAL THEIR QUALITY THROUGH THE CHOICE OF A PRESTIGIOUS UNDERWRITER ?

Firms going public face the problem of credibly communicating their true value to investors. While many characteristics of a new venture are observable (size of the venture, past performance as evidenced by sales and earnings, etc.) other relevant characteristics (e.g., management quality and future investment opportunities) are known to the entrepreneur only. Because issuers have obvious incentives for misrepresenting the quality of their inside information, investors view their claim with some degree of caution. To overcome this problem entrepreneurs must revert to specific actions to signal their quality to outsiders.

Several financial signalling models in which investors infer the value of the firm after the entrepreneur/manager takes an observable action have dealt with this asymmetric information problem. Signals include ownership retention in the firm (Leland /Pyle [1977]), dividend payments (Bhattacharya [1979]), underpricing of an initial public offering (Allen/Faulhaber [1989], Grinblatt/ Hwang [1989]) or the firm's choice of auditor and underwriter (Booth and

Smith [1986], Titman and Trueman [1986], Carter/Manaster [1990b]). In these models the selected signal(s) is (are) credible communication of inside information because the signal is costly and the marginal cost of false signalling exceeds its marginal benefit.

This section examines empirically Titman and Trueman [1986] (hereafter TT) model of asset valuation under asymmetric information.[20]

TT show that: (1) *the more favorable the owner's private information the higher the quality of the underwriter who brings the issue public and the higher the price at which the new issue can be sold;* (2) assuming that inside information quality and firm's risk are inversely related, then *the level of firm's risk determines the choice of underwriter*: lower-risk firms select more prestigious underwriters than higher risk firms.

Hypothesis (1) argues that underpricing and investment banker prestige are inversely related. This has been established in Section I and is widely supported by prior empirical work. Hence the most interesting testable implication of TT's model is hypothesis (2): the level of firm's risk determines the choice of underwriter. This is

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[20] Titman and Trueman's model deals with the issuer's choice of an auditor as a signal of quality. They point out however that this model is applicable to the choice of investment banker quality.

in fact a restatement of the "market segmentation" hypothesis: prestigious underwriters are associated with high-quality (low-risk) issues.

The results of this study do not support hypothesis (2). There is no evidence of a relationship between the selection of a reputable underwriter and firm's risk.

The rest of this section presents Titman/Trueman's model, the testing methodology and the results with their interpretation.

I. Theoretical Framework: Titman and Trueman Model

In TT's model, the entrepreneur has private information, x, about the firm's end-of-period cash flow, μ. Investors derive information, θ, from the registration prospectus that is prepared by the firm with the help of the underwriter.[21] The precision of this information is assumed to be an increasing function of the quality of the underwriter,[22] q. Moreover the entrepreneur's choice of investment banker quality is assumed to reveal the nature of his private information allowing investors to form a more precise estimate of μ. Thus TT 's main hypothesis is as follows: if the entrepreneur's optimal choice of underwriter quality, q^*, is a strictly increasing function of his information, x, then knowledge of q^* would enable investors to correctly infer the entrepreneur's information x. In equilibrium, $f(q^*)$, the investors' inference, would then equal x. Combined with θ, knowledge of q^* would allow investors to form a more precise estimate of μ. TT demonstrate that there exists a Pareto-dominant equilibrium inference schedule $f(q^*)$ that leads the entrepreneur to

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21 Investors also derive information from the financial statements prepared by the auditor.

22 Prestigious investment bankers are assumed to possess greater expertise in conducting "due-diligence" investigations; it is thus postulated that the information contained in the registration prospectus reflects this superior ability.

choose an optimal quality level, q^*, that correctly reveals his information. This is the one for which firms with the least favorable private information choose the least prestigious underwriters. Thus, the more favorable the information, the higher the quality chosen so that on average, equilibrium firm values are an increasing function of the underwriter's quality. Hence the choice of a prestigious underwriter should result in a higher market price for the issue. Crucial to this analysis is the fact that the marginal benefit of imitation is lower than its marginal cost, hence deterring low-quality firms from profitably mimicking high-quality firms.

II. Empirical Investigation

Whether the level of firm's risk determines the choice of an investment banker is tested by means of an ordered probit model. To facilitate the analysis, the reputation variables CLASS and CM are recoded to produce a ranking of underwriters on three tiers. As in the previous section, both reputation measures are included in the analysis.

1. Variables

The dependent variables in the analyses performed below are the modified reputation variables. Both reputation measures are recoded as shown in Table VI.

TABLE V: Modified Reputation Variables

Panel A: Y_1 = Modified CLASS[23]

Rank	Recoded value	Interpretation	n	%
0	0	least prestigious	215	51.4
1 - 9	1	more prestigious	92	22.0
10 - 15	2	most prestigious	111	26.6
			418	

Panel B: Y_2 = Modified CM[24]

Rank	Recoded value	Interpretation	n	%
0 - 4	0	least prestigious	129	30.9
5 - 7.5	1	more prestigious	139	33.2
8 - 9	2	most prestigious	150	35.9
			418	

---

23 The recoded values correspond to the following market shares:

Amount Underwritten ($ millions)	Rank
< 100	0
100 - 1000	1
> 1000	2

24 This ranking is derived by assigning a value of 2 to underwriters identified as being members of the bulge bracket, a value of 1 to members of the major bracket and a value of 0 to members of the subordinate brackets and non-members.

New variables, Y_1 and Y_2, are thus formed which take the values 0,1,2. The models are estimated first using the variable proxying for firm's risk, STDEV, alone as an independent variable, then including it in a multivariate analysis with offering size, proportion of secondary shares and issuing cost (underwriter spread plus percentage underpricing) to control for other factors affecting the choice of an underwriter.

Justification for the use of these control variables is as follows:

The SIZE of the offering is expected to increase the probability that an underwriter belonging to the highest category of prestige will originate the issue. Since reputable investment bankers have more experience in originating and marketing IPOs, it is assumed that issuers of large offerings will tend to select the most prestigious underwriters. The larger the issue, the higher the potential losses for the issuer if the stocks are not placed quickly hence the importance of selecting an experienced and well-connected investment banking house.

The proportion of shares sold by insiders, SECSHS, is expected to have the same effect. If selling owners attempt to maximize the return on their investment, they will select underwriters with more experience in bringing firms public.

The COST variable is the sum of underwriter's spread (expressed as a percentage of the offering price) and the first day raw return.[25] A justification for the construction of this variable is that issuers bear not only a direct cost (the spread) but also an indirect cost which is the degree of underpricing. It is expected that an entrepreneur's choice of a particular underwriter will vary inversely with the cost attached to that selection.

2. Ordered Probit Model

a) *Justification and Outline*

The independent variable is the probability that the ith IPO is brought to market by an underwriter belonging to a particular category of prestige: $P[Y_i = j]$, $(j = 0, 1, 2)$.

Use of a multinomial logit or probit would fail to account for the ordinal nature of the dependent variable. A least squares analysis would treat the difference between ranks 0 and 1 the same as the difference between ranks 1 and 2.[26] An ordered probit (or logit) model remedies these problems.

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[25] First-day raw returns, R_{i1}, are calculated as follows

$$R_{i1} = \left[P_{i1}/P_{io}\right] - 1$$

where P_{i1} is the closing bid at the end of the first day of trading (or lowest bid of the day if a closing value was not available) and P_{i0} the offering price of stock i.

[26] Greene (1990) p. 703.

The ordered probit model is as follows:[27]

$$Y_i^* = \beta' x_i + u_i \qquad (i = 0,1,2,\ldots,n)$$

Y^* is the underlying variable (reputation). Y^* is not observed but it is known which category j it belongs to.

It is observed that

$$\begin{aligned} Y_i &= 0 \text{ if } Y^* \leq 0 \\ &= 1 \text{ if } 0 \leq Y^* < \mu_1 \\ &= 2 \text{ if } \mu_1 \leq Y^* < \mu_2 \\ &\ldots \\ &= j \text{ if } \mu_{j-1} \leq Y^* \end{aligned}$$

where the μ's are free parameters that provide the ranking.

Defining $Z_{ij} = 1$ if Y_{ij} falls in the jth category

$= 0$ otherwise $\qquad (i=1,2,\ldots,n;\ j=1,2,\ldots,m)$

then $\qquad P[Z_{ij} = 1] = \Phi(\mu - \beta' x_i) - \Phi(\mu_{j-1} - \beta' x_i)$

where Φ is the cumulative standard normal. The likelihhod function for this model is:

$$L = \prod_{i=1}^{n} \prod_{j=1}^{m} [\Phi(\mu_j - \beta' x_i) - \Phi(\mu_{j-1} - \beta' x_i)]^{Z_{ij}}$$

and the log-likelihood function to be estimated:

$$\log L = \sum_{i=1}^{n} \sum_{j=1}^{m} Z_{ij} \log[\Phi(\mu_j - \beta' x_i) - \Phi(\mu_{j-1} - \beta' x_i)]$$

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[27]Maddala (1987) pp. 47-48.

Since j = (0,1,2) in this case, n = 418, and μ_o is normalized to zero,

$$\text{Prob}[Y_i = 0] = \Phi(-\beta' x_i)$$

$$\text{Prob}[Y_i = 1] = \Phi(\mu - \beta' x_i) - \Phi(-\beta' x_i)$$

$$\text{Prob}[Y_i = 2] = 1 - \Phi(\mu - \beta' x_i)$$

and the log-likelihood function:

$$\log L = \sum_{i=1}^{418} \Big[Z_{i0} \log[\Phi(-\beta' x_i)] + Z_{i1} \log[\Phi(\mu - \beta' x_i) - \Phi(-\beta' x_i)]$$

$$+ Z_{i2} \log[1 - \Phi(\mu - \beta' x_i)] \Big]$$

b) *Model Specification*

The following models are estimated by maximum likelihood:[28]

Model 1: $P[Y_{1i} = j] = f(\text{CONSTANT, STDEV})$

Model 2: $P[Y_{2i} = j] = f(\text{CONSTANT, STDEV})$

Model 3 $P[Y_{1i} = j] = f[\text{CONSTANT, SIZE, SECSHS, COST, STDEV}]$

Model 4 $P[Y_{2i} = j] = f[\text{CONSTANT, SIZE, SECSHS, COST, STDEV}]$

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[28] Y_{1i} refers to the modified CLASS variable, Y_{2i} to the modified CM variable.

3. Results

Tables VI through VII A present the maximum likelihood estimates produced by the estimation of Models 1 to 4, the predicted probabilities and the marginal effects of the significant independent variables.

TABLE VI. ORDERED PROBIT

Maximum Likelihood Estimates

Dependent Variable = Prob[Y_{1i} = j]

(modified CLASS variable)

	Model 1	Model 2
CONSTANT	.0171	-.2585
	(.193)	(-2.048)*
SIZE		.1036E-07**
		(11.150)
SECSHS		1.1077**
		(3.699)
COST		-1.5725**
		(-4.147)
STDEV	-.1573	1.0038
	(-.862)	(.469)
μ	.5907	.6952
N	418	418
Likelihood Ratio Index	.001	.107
χ^2(d.f)	.608 (1)	92.303** (4)

* Significant at the .05 level
**Significant at the .01 level

TABLE VI A: Predicted Probabilities[29]

(Actual frequencies in parentheses)

(%)

Outcome	Model 1		Model 2	
0	64.43	*(51.44)*	50.40	*(51.44)*
1	9.14	*(22.01)*	25.71	*(22.01)*
2	26.43	*(26.55)*	23.89	*(26.55)*

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[29] The predicted probabilities are calculated as follows:

$Prob[Y_i = 0] = \Phi(-\beta' x_i)$

$Prob[Y_i = 1] = \Phi(\mu - \beta' x_i) - \Phi(-\beta' x_i)$

$Prob[Y_i = 2] = 1 - \Phi(\mu - \beta' x_i)$

TABLE VI B: Marginal Effects of Significant Coefficients[ao]

(Model 2)

X_i	$\frac{\partial P[Y=0]}{\partial X_i}$	$\frac{\partial P[Y=1]}{\partial X_i}$	$\frac{\partial P[Y=2]}{\partial X_i}$
SIZE[a]	-.0040	.0009	.0031
SECSHS[b]	-.4419	.0984	.3435
COST[c]	-.6273	.1396	.4877

[a]for $ 1,000,000 increase

[b]for 1 % increase

[c]for 1 % decrease

[ao] The marginal effects are calculated as follows:

$\partial P[Y=0] / \partial x = -\phi(\beta' x)\beta$

$\partial P[Y=1] / \partial x = [\phi(-\beta' x) - \phi(\mu - \beta' x)]\beta$

$\partial P[Y=2] / \partial x = \phi(\mu - \beta' x)\beta$

where ϕ is the standard normal density, βs are the regression coefficients, and the regressors are fixed at their sample mean.

TABLE VII. ORDERED PROBIT

Maximum Likelihood Estimates

Dependent Variable = Prob[Y_{2i}= j]

(modified CM variable)

	Model 3	Model 4
CONSTANT	.6179**	.3540**
	(6.175)	(2.836)
SIZE		.1367E-07**
		(17.850)
SECSHS		1.6979
		(4.563)**
COST		-1.8510**
		(-4.928)
STDEV	-3.3978□	-.8659
	(-1.860)	(-.425)
μ	.8656	1.0581
N	418	418
Likelihood Ratio Index	.003	.141
χ^2(d.f)	3.199 (1)□	129.56** (4)

**Significant at the .01 level

□ Significant at the .10 level

TABLE VII A: Predicted Probabilities

(Actual frequencies in parentheses)

(%)

Outcome	Model 3	Model 4
0	30.85 (30.86)	25.46 (30.86)
1	33.58 (33.25)	40.08 (33.25)
2	35.57 (35.89)	34.46 (35.89)

TABLE VII B: Marginal Effects of Significant Coefficients

X_i	$\frac{\partial P[Y=0]}{\partial X_i}$	$\frac{\partial P[Y=1]}{\partial X_i}$	$\frac{\partial P[Y=2]}{\partial X_i}$
Model 3			
STDEV[c]	-1.1050	-.1610	1.2660
Model 4			
SIZE[a]	-.0044	-.0006	.0050
SECSHS[b]	-.5448	-.0805	.6253
COST[c]	-.5940	-.0877	-.6817

[a] for \$ 1,000,000 increase

[b] for 1 % increase

[c] for 1 % decrease

4. Analysis of the Results

(i) Models 1 and 2: dependent variable based on the modified CLASS (volume) measure.

In the univariate analysis represented by Model 1, the proxy for issue risk is not statistically meaningful. It is then not surprising to find that the explanatory power of this model is nil as evidenced by a LRI of .001 and a χ^2 value of 0.6. Thus it appears that firm's risk and the preference for an underwriter belonging to a particular category of prestige are not related: the signalling hypothesis is not supported.

The same remark obtains for Model 2: again, the proxy for firm's risk has no significance. The control variables SIZE, SECSHS and COST provide all the explanatory power. It is found that the larger the dollar amount of the issue, the higher the probability that an IPO will be originated by an underwriter belonging to the highest category of prestige.[31] As shown in Table VI B however, this increase is minimal (three tenths of one percent). The very high t-ratio on the coefficient of the SIZE variable suggests the presence of simultaneity: offering size determines investment banker

31 An increase in the dollar amount of the offering means that the probability that $P[Y_{1i} = 0]$ must decline thus that $P[Y_{1i} = 2]$ must increase.

prestige and vice-versa[92].

Finally, there is strong evidence that the presence and importance of secondary shares in the offering matter: an examination of the marginal effect of the SECSHS variable on the probabilities reveals that a 1% increase in the fraction of insiders shares to total shares causes a large 13.96 % increase in the probability that an IPO will be brought public by one of the most reputable investment banker. This result supports Logue's [1973] suggestion that selling insiders possess some degree of control in the firm's negotiations with underwriters[93]. Issuance costs (including underpricing) are negatively related to the choice preference of an underwriter. The marginal effect of a decrease in costs is extremely strong: a 1 % decrease in

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[92] Since annual dollar volume underwritten is the sorting device used to assign prestige categories, a high t-ratio is not surprising in Model 2. However, in Model 4, where the dependent variable is derived from the CM reputation variable (not based on dollar volume), the level of significance of the SIZE coefficent is even higher. This supports the existence of simultaneity. It may even be possible that offering size serves as a proxy for prestige.

[93] In particular, it may well be that selling shareholders are one of the main force driving the selection of a prestigious underwriters. Firms going public are often firms that were started with the help of venture capitalists. Venture capitalists usually control the board of directors of a firm (Copeland/Weston [1990]). Moreover, they often opt out of the venture once the firm goes public. The incentive to choose an experienced, reputable underwriter -one able to obtain a higher price for the offering- is thus very strong. Unfortunately, lack of information on the participation of venture capitalists in the firms included in this sample precludes an analysis of this hypothesis.

cost increases the probability that the issuer will select an investment banker belonging to the highest category of prestige by 48.77 %. Hence it appears that issuing costs are a main determinant in the underwriter selection decision.

In summary, neither the results of Model 1 nor those of Model 2 support the signalling hypothesis: underwriter selection and the level of firm risk are independent. This finding confirms the results of Section I: there is no evidence that reputable investment bankers are associated with low-risk issues. Offering size, issuance costs and proportion of insider shares provide the most explanatory power.

(ii) Models 3 and 4: dependent variable based on the modified CM measure.

Unlike in Model 1, the univariate analysis performed in Model 3 produces a statistically meaningful coefficient on the proxy for firm's risk. The level of significance is low however (10%). A likelihood ratio test of the hypothesis that this coefficient is zero confirms this results. There is thus weak evidence that the signalling hypothesis is supported. It appears that the construction of the dependent variable is important since its two different versions produce two different results. Although the explanatory power of the risk proxy is low, its marginal effect on the probabilities is very large: a 1% decrease in risk would cause a huge 126.6 % increase in the probability that one of the most prestigious underwriter would be selected.

The results of the multivariate analysis (Model 4) confirm those of Model 2. Again, the risk proxy is insignificant and the explanatory power is provided by the control variable SIZE, SECSHS and COST. As evidenced by the results displayed in Table VII B, the marginal effects of an increase in the proportion of insiders shares and a decrease in issuing costs are stronger than in Model 2.

To conclude, there is only scant evidence that Titman/Trueman's signalling hypothesis is supported. Moreover alternative measures of underwriter prestige -hence alternative specifications of the dependent variable- lead to different conclusions, at least in the univariate analyses.

The multivariate analyses unambiguously reject the signalling hypothesis: it appears that issuers select underwriters on the basis of the characteristics of the issue itself (amount, presence and importance of secondary shares in the offering) and on the cost of issuance (including expected underpricing).

III. CONCLUSION

This chapter has presented an analysis of the relationship between underwriter reputation and firm's risk from the point of view of both the investors and the issuers. Section I examined two popular hypotheses:

(1) the "certification" hypothesis which posits that investment banker's prestige guarantees that the issue is low risk;

(2) the "market segmentation" hypothesis which predicts that prestigious investment bankers deal only with low-risk offerings.

Neither hypothesis was supported by the results. It appears that underwriter prestige is not a sufficient statistic to control for issue risk; nor is there evidence that reputable investment bankers are involved in underwriting low-risk issues exclusively.

In contrast with previous empirical research, a new measure of reputation, based on investment bankers' annual IPO market share was constructed and contrasted with the traditional measure derived from the placement of underwriters in tombstone advertisements. However it consistently underperforms the traditional proxy used in the empirical literature dealing with underwriter prestige effects.

Section II examined the market segmentation hypothesis from the issuer's angle. Specifically, an empirical test of Titman/Trueman [1986] signalling hypothesis was conducted. Titman/Trueman argue that low risk firms signal their low-risk characteristic by systematically selecting prestigious underwriters to bring their firm public. Results were mixed. The signalling hypothesis was only weakly supported and this in only one of the models that were tested. Issue characteristics and issuance costs however were the main determinants of the issuer's choice of an investment banker. Hence a tentative conclusion is that the signalling hypothesis can be rejected. This result confirms those of the first section: there is no evidence that prestige efficiently control for risk.

The rejection of Titman/Trueman's signalling hypothesis must however be mitigated by the following consideration: proxying for the quality of inside information is extremely difficult. It is quite possible that Titman/Trueman (and this author) are misguided in assuming that inside information quality and low-risk are inversely related.

APPENDIX

FREQUENCY DISTRIBUTION OF REPUTATION MEASURES

Panel A: CLASS

RANK	n	%
15	22	5.3
14	24	5.7
13	1	1.2
12	21	5.0
11	27	6.5
10	16	3.8
9	28	6.7
8	10	2.4
7	7	1.7
6	12	2.9
5	5	1.2
4	9	2.2
3	10	2.4
2	24	1.0
1	7	1.6
0	215	51.4

N = 418

Mean = 4.66

Standard Deviation = 5.52

FREQUENCY DISTRIBUTION OF REPUTATION MEASURES

(continued)

Panel B: CM

RANK	n	%
9	93	22.2
8.5	--	--
8	57	13.6
7.5	31	7.4
7	33	7.9
6.5	7	1.7
6	9	2.2
5.5	12	2.9
5	47	11.2
4.5	--	--
4	9	2.2
3.5	1	2.4
3	5	1.2
2.5	--	--
2	6	1.4
1.5	5	1.2
1	--	--
0	103	24.6

N = 418

Mean = 5.34

Standard Deviation = 3.47

CHAPTER IV: THE UNDERWRITER AS MARKET-MAKER: STABILIZATION AND UNDERPRICING

INTRODUCTION

The Securities and Exchange Commission (SEC) makes it illegal to purchase and sell securities for the purpose of pegging their prices. There is one major exception to this rule: investment banking syndicates are authorized to engage in pegging practices during the distribution of underwritten new securities in order to keep the market price close to the fixed offering price. Price pegging is permitted for a period of ten days starting on the offering date. The reason advanced by the SEC for allowing pegging is that investment bankers have an obligation to provide existing owners with a ready market in which to sell their shares.[1]

Hence in addition to an advising, risk-bearing and marketing function, investment bankers commonly exercise a market-making function for a short time following the offering. Stabilization (price pegging) is conceivably not the only instrument available to the underwriter acting as a

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[1] Not all new issues undergo stabilization. Stabilization is not costless to the underwriting syndicate so that investment bankers may choose to let the stock trade on its own from the offering day. The decision to stabilize probably depends strongly on the relationship between issuer and underwriter.

market-maker.[2] Underpricing is another: the more underpriced an issue is, the higher the returns accruing to early buyers of IPOs, hence the more favorably disposed towards the new issue are investors likely to be. Thus two devices are available to the underwriter to establish a secondary market for a new issue: stabilization and underpricing. Since it is widely accepted that underwriters systematically underprice new issues to insure a successful offering, the occurrence of stabilization suggests a potential trade-off between stabilization and underpricing: if an issue is stabilized, it may not require as much underpricing as if it were not stabilized. Hence the post-stabilization excess returns may be lower for stabilized issues than for non-stabilized issues.

The mechanics of stabilization are as follows.

(i) If the issue is undersubscribed,there is a strong possibility that the stock price will fall in the aftermarket The underwriter would then place a stabilizing bid at or slightly below the offering price in order to

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[2] The term "stabilization" is usually employed to designate a situation in which the underwriter intervenes in the aftermarket to prevent the security price from falling below the offering price. However, in view of the SEC justification for allowing price pegging, the term "stabilization" will be used here to refer to all situations where the underwriter's intervention has the effect of reducing deviations from the offering price.

shore up the security price while pursuing its marketing effort; (ii) if the issue is oversubscribed, the underwriter will sell additional shares short at the offering price or will use the over-allotment option if one was granted by the issuer. The over-allotment option allows the underwriter to purchase additional shares from the issuing firm at a discount from the offering price. If there is excess demand for the stock, the underwriter will then fill it by selling the extra shares at the offering price.[3] Again, the effect will be to bring the market price closer to the offering price.

Though a fairly common practice, stabilization and its implications have received very little attention. To the best of my knowledge no theoretical model dealing with stabilization exists and only one empirical examination of stock prices (Hess/Frost [1982]) incorporates stabilization practices. However this study deals with the existence of price effects around new issues of seasoned stocks and is mainly concerned with the validity of the SEC rule of allowing underwriters to stabilize new issues.[4]

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[3] Once the offering price is set, the underwriter may not sell shares at a higher price than the offering price.

[4] Hess/Frost [1982] find no evidence of significant price movements caused by the issuance of seasoned securities hence no justification for allowing underwriters to stabilize an issue.

The analysis presented in this chapter is fundamentally different from Hess/Frost's study in that it deals with the effects of stabilization on the initial returns of unseasoned stocks. It is important to note that the present analysis is essentially exploratory. The absence of any theoretical framework as well as the lack of empirical evidence preclude a rigorous examination of the effects of stabilization.

As a first step in the analysis, it is formally shown that stabilization reduces the volatility of stock prices in the after-market. This result provides a theoretical justification for the construction of a test for stabilization. Since no data on stabilization was available, the results of the test motivate the construction of a proxy for stabilization to be used in the empirical analysis. The empirical investigation deals with the effects of stabilization on initial returns. In particular, it is postulated that the initial excess returns exhibited by stabilized issues will be lower than those displayed by non-stabilized issues.[5]

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[5] Initial returns must be understood as returns on the first day of free trading.

The rest of this chapter is organized as follows. In Section I, stabilization is formally modelled and the theoretical results illustrated by means of a simulation; a test for stabilization is then constructed. Section II presents the empirical analysis. Section III summarizes the results.

SECTION I: MODELLING STABILIZATION

This section formally models stabilization. Two possibilities are considered:

(i) The underwriter stabilizes whenever the market price of the stock deviates from the offering price; in this case, stabilization is said to be *symmetric*.
(ii) The underwriter stabilizes only in the case of negative (positive) deviations; stabilization is then *asymmetric*.

It is found that in either case, stabilization reduces the volatility of stock prices in the after-market.

I. Model

Let the net demand for stock i be represented by:

$$X_t = a_t - bP_t \qquad (1)$$

where X_t is the quantity demanded in the absence of stabilization, P_t the price of the stock, and a_t is a parameter fixed at time t and unknown at earlier times.
Let b = 1.[σ]

σ b is set equal to 1 for clarity of exposition. This simplification does not alter the results.

In equilibrium, $X_t = 0$ so that $P_t = a_t$.

This can be expressed in terms of one-period returns, R_t, as follows

$$R_t = \left[P_t \ / \ P_{t-1}\right] - 1$$

or

$$P_t = P_{t-1} \ (1 + R_t) \qquad (2)$$

Equivalently,

$$a_t = a_{t-1} \ (1 + R_t) \qquad (3)$$

In what follows, R_t will be treated as a fundamental return which conforms to an exogeneously given stochastic process.

CASE I: Symmetric Stabilization

It is assumed that the underwriter stabilizes the stock price around P_o by buying or selling stocks according to the following rule:

(i) $X_t \ (P_o) < 0$

If $X_t \ (P_o) < 0$ the underwriter buys a fraction $S = \alpha(-X_t)$ of the unsold shares at the offering price P_o. In equilibrium, $X_t + S = 0$, so that at t the stabilized price is:

$$P_t = (1 - \alpha) \ a_t + \alpha \ P_o \qquad (4)$$

(ii) $X_t(P_o) > 0$

If X_t $(P_o) > 0$ the underwriter either sells shares short or uses the overallotment option to fill the excess demand; he sells $S = -\alpha(X_t)$ at P_o .
In equilibrium $X_t + S = 0$ so that again equation (4) holds.

Proposition

If stabilization reduces price volatility in the after-market then the variance of stabilized returns is inferior to the variance of unstabilized returns. Moreover, as $\alpha \rightarrow 1$, stabilized returns decrease as α rises. The proof is established in terms of variance of prices.

Proof

Let R_t -- i.i.d (μ, σ^2).

(i) Variance of Unstabilized Prices

From (1):

$$P_t = P_{t-1} (1 + R_t)$$

then,

$$E \left[P_t \mid P_{t-1}\right] = P_{t-1} \left[1 + E (R_t)\right]$$

and the variance of unstabilized prices is such that:

$$\text{Var}\left[P_t \mid P_{t-1}\right] = \sigma_U^2 = \left[P_{t-1}\right]^2 \text{Var}\,(R_t) = \left[P_{t-1}\right]^2 \sigma^2$$

$$= \left[a_{t-1}\right]^2 \sigma^2 \quad (5)$$

(ii) Variance of Stabilized Prices

From (4):

$$P_t = (1 - \alpha)\, a_t + \alpha\, P_o$$

then,

$$P_t - P_{t-1} = (1 - \alpha)\, (a_t - a_{t-1})$$

and

$$P_t = P_{t-1} + (1 - \alpha)\, (a_t - a_{t-1})$$

Using (3):

$$P_t = P_{t-1} + (1 - \alpha)(a_{t-1}\, R_t)$$

so that

$$E\left[P_t \mid P_{t-1}\right] = P_{t-1} + (1 - \alpha)\, \left[a_{t-1}\, E\,(R_t)\right]$$

and the variance of stabilized prices is:

$$\text{Var}\left[P_t \mid P_{t-1}\right] = \sigma_S^2 = (1 - \alpha)^2 \left[a_{t-1}\right]^2 \sigma^2 \quad (6)$$

Clearly, if $0 < \alpha \leq 1$,

$$\sigma_S^2 < \sigma_U^2$$

Moreover, σ_S^2 declines as α rises.

CASE II: Asymmetric Stabilization

There are two subcases depending on whether the underwriter tries to prevent the stock price from falling below P_o or from rising above P_o.

(i) $X_t(P_o) < 0$: the underwriter stabilizes to support a weak price.

Then

$$P_t = \text{MAX}\left[(1 - \alpha)\, a_t + \alpha\, P_o;\ a_t\right] \tag{7}$$

and

$$P_t - P_{t-1} = \text{MAX}\left[(1 - \alpha)\, a_t + \alpha\, P_o;\ a_t\right] - \text{MAX}\left[(1 - \alpha)\, a_{t-1} + \alpha\, P_o;\ a_{t-1}\right] \tag{8}$$

$$= \alpha\left[\text{MAX}\,(P_o, a_t) - \text{MAX}\,(P_o, a_{t-1})\right] + (1-\alpha)(a_t - a_{t-1})$$

(ii) $X_t(P_o) > 0$: the underwriter stabilizes to prevent a price jump.

Then

$$P_t = \text{MIN}\left[(1 - \alpha)\, a_t + \alpha\, P_o;\ a_t\right] \tag{9}$$

and

$$P_t - P_{t-1} = \text{MIN}\left[(1-\alpha)\, a_t \quad + \alpha_0\, P_t;\ a_t\right] -$$

$$\text{MIN}\left[(1-\alpha)\, a_{t-1} + \alpha\, P_o;\ a_{t-1}\right]$$

$$= \alpha\left[\text{MIN}\,(P_o,\ a_t) - \text{MIN}\,(P_o,\ a_{t-1})\right]$$

$$+ (1-\alpha)(a_t - a_{t-1})$$

Unlike Case I, it is not immediatly obvious that stabilization (either on the downside or the upside) reduces the variance of prices in the after-market. The only statement that can be made with certainty from either (8) or (10) is that $|P_t - P_{t-1}|$ decreases as α increases. In order to show that, as in the case of symmetric stabilization, the effect of asymmetric stabilization is a reduction in variance of prices a simulation is performed.

II. SIMULATION

1. Modelling unstabilized prices

One thousand random returns (one hundred returns per day over a period of ten days)[7] from a log-normal distribution are generated. Let m be the number of returns and n the number the days, then

$m = 100,$

$n = 10,$

R_t is a 100 x 10 matrix,

and

$$\mathrm{Var}\left(R_t\right) = \sum_{t=1}^{n} \sum_{i=1}^{m} R_t^{(i)} \Big/ [(m \times n) - 1]$$

The unstabilized prices used to calculate the stabilized prices are obtained by making use of (3):

$a_t = a_{t-1} (1 + R_t),$

where $a_0 = P_0$ is arbitrarily set at 100.

---

[7] Stabilization is legally limited to a period of ten days starting with the offering day.

2. Modelling stabilized prices

From equations (7),

$$P_t = \text{MAX}\left[(1-\alpha)\, a_t + \alpha\, P_0;\ a_t\right]$$

or (9), it is clear that

$$P_t = f(a_t, P_o, \alpha)$$

so that

$$R^{*(i)}_t = \frac{P^{(i)}_t}{P^{(i)}_{t-1}} - 1$$

and

$$\text{Var}\left(R^*_t\right) = \sum_{t=1}^{n} \sum_{i=1}^{m} R^{*(i)}_t \;/\; [(m \times n) - 1]$$

Table I presents the results of the simulation.

TABLE I. SIMULATION RESULTS

Panel A: CASE I: Stabilization to support a weak price

α	$\bar{R}_t^*$	$Var(R_t^*)$
.1	.6042	4.2026
.2	.5850	4.0908
.3	.5748	4.0266
.4	.5686	3.9819
.5	.5647	3.9480
.6	.5624	3.9209
.7	.5612	3.8984
.8	.5608	3.8795
.9	.5601	3.8633

$\bar{R}_t = 1.6811$

$Var(R_t) = 4.7655$

TABLE I. SIMULATION RESULTS

(Continued)

Panel B: CASE II: Stabilization to prevent a price jump

α	$\bar{R}_t^*$	$Var(R_t^*)$
.1	.6465	4.4735
.2	.6105	4.1841
.3	.5728	3.8951
.4	.5329	3.6036
.5	.4903	3.3050
.6	.4438	2.9914
.7	.3918	2.6487
.8	.3304	2.2469
.9	.2499	1.7050

$\bar{R}_t = 1.6811$

$Var(R_t) = 4.7655$

Both panels A and B of Table I show that:

1° $\bar{R}_t^* < \bar{R}_t$

2° $\bar{R}_t^*$ decreases as α increases

3° $Var(R_t^*) < Var(R_t)$[8]

4° $Var(R_t^*)$ decreases as α increases

The stabilization model and the results of the simulation provide a motivation for the construction of a test to determine whether a particular issue has undergone stabilization. The results of the test are then used in the empirical investigation of Section II. The exposition follows.

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8 A test of the null hypothesis that $Var(R_t^*) = Var(R_t)$ against $Var(R_t^*) < Var(R_t)$ was conducted as follows: reject H_0 if $Var(R_t) / Var(R_t^*) < F_{\alpha',m-1,n-1}$, where $m = n = 1000$ and α' is 5%. In both Cases I and II, the calculated F value was greater than $F_{.05,999,999} = 1.00$ for each α so that H_0 was rejected.

III. TESTING FOR STABILIZATION

Let $t = 1,\ldots,N_1$ be the potentially stabilized period

$= N_1 + 1,\ldots, N_2$ be the period when stabilization is not allowed.

Let $R_t = \left[P_t - P_{t-1}\right] / P_{t-1}$ the return at time t.

R_t -- $(\mu, \sigma_1{}^2)$ at $t = 1,\ldots,N_1$

-- $(\mu, \sigma_2{}^2)$ at $t = N_1 + 1,\ldots,N_2$

$$\text{where } \sigma_1{}^2 = \frac{1}{N_1 - 1} \sum_{t=1}^{N_1} (R_t - R_{t-1})$$

$$\text{where } \sigma_2{}^2 = \frac{1}{N_2 - N_1 - 1} \sum_{t=N_1+1}^{N_2} (R_t - R_{t-1})$$

A test for stabilization would amount to the following test of equality of variance[9]:

H_0: $\sigma_1^2 = \sigma_2$

H_1: $\sigma_1^2 < \sigma_2$

---

[9] Since IPOs are characterized by a "thin" immediate after-market, it is likely that price volatility will be high in the days following the offering. The finding that $\sigma_1^2 < \sigma_2^2$ is then one indication that stabilization is taking place. However, the test of equality of variance as a test for stabilization remains imperfect. It is entirely possible that the test captures some non-stabilized issues for which $\sigma_1^2 < \sigma_2^2$. In particular, σ_2^2 could be greater than σ_1^2 due to the arrival in the market of negative information.

The test statistic is given by:

$$\sigma_2^2 / \sigma_1^2 \sim F_{\alpha,\, N_2 - N_1 - 1,\, N_1 - 1}$$

H_0 is rejected at the α level of significance if:

$$\sigma_2^2 / \sigma_1^2 < F_{\alpha,\, N_2 - N_1 - 1,\, N_1 - 1}$$

Since the SEC allows stabilization for a maximum period of ten days, the returns from day 1 (offering day) to day 10 belong to the potentially stabilized period. If there is systematic underpricing however then the returns on the first day of free trading have a different mean than in the other period. Thus, if the issue is not stabilized, the return at t=1 must be excluded from the calculation of the variance; if the issue is stabilized, it is the return at $t = N_1 + 1$ that must be discarded.[10] Since it is unclear which case applies, both returns must be discarded, so that the returns to be considered for the test are:

R_t at $t = 2,\ldots,N_1$

$t = N_1 + 2,\ldots,N_2$

---

[10] The first day of free trading is either the first day that a stock trades on a stock exchange if the issue is not stabilized or the first day that the stock is out of stabilization. For the sake of tractability, it is assumed that when an issue is stabilized, it is stabilized for the full ten-day period that is allowed by the SEC.

and the test becomes

$$\sigma_2^2 / \sigma_1^2 < F_{\alpha, N_2 - N_1 - 2, N_1 - 2}$$

An issue is deemed stabilized if H_0 is rejected at the α level of significance.

SECTION II: EMPIRICAL INVESTIGATION OF THE EFFECTS OF STABILIZATION

This section explores empirically the effects of stabilization practices on initial returns exhibited by unseasoned stocks.

Two propositions are examined.

(i) Given that underwriters generally underprice new issues, it is postulated that a trade-off exists between underpricing and stabilization. Post-stabilization initial returns should then be lower for issues having undergone stabilization than for issues free to trade on their own from the offering day onwards.[11]

(ii) The effects of ex-ante uncertainty on returns are examined in the context of stabilization. Prior empirical research reports the existence of a positive relationship between ex-ante uncertainty and initial returns (Beatty/Ritter [1986), Carter/Manaster [1990], Ritter [1984]). Thus it is of interest to investigate whether this relationship is the same for non-stabilized and for stabilized issues.

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[11] Initial returns are defined as being returns over the offering price on the first day that an issue is freed from stabilization, i.e., the eleventh day of trading since stabilization is legally allowed for a period of ten days. For the purpose of comparison, returns are defined in the same manner for non-stabilized issues.

I. METHODOLOGY

The empirical analysis is conducted using the sample of 418 IPOs described in Chapter III.

As a first step in the analysis, a univariate regression of initial returns is performed on a proxy for stabilization. Then, additional control variables thought to influence the magnitude of initial returns are introduced and the analysis performed anew. The same analysis is then conducted including a proxy for ex-ante uncertainty. Finally, the regressions are run including an interaction term to capture the potentially different effect on initial returns of the ex-ante uncertainty associated with stabilized issues.

1. Variables definition

(a)LNRET

The independent variable, initial returns, is defined as

$$LNRET = \ln (1 + R_{11})$$

where

$$R_{11} = \left[\left(P_{11} / P_o \right) - 1 \right] - \left[\left(M_{11} / M_0 \right) - 1 \right]$$

and

R_{11} is the return on stock i on the eleventh day of trading, P_{11} the closing bid of that day or the lowest bid of the day if a closing figure was not available, P_0 the offering price of stock i, M_{11} the closing value of the Over-The-Counter market index and M_0 the value of that index on offering day.

The use of the 11th day return as the initial return to be considered is as follows: since it is unknown whether the first day of "free" trading (no stabilization) is day 1 or day 11, it is best to choose day 11 as the first day that the stock trades on its own.

The logarithmic transformation is used in an effort to deal with the non-normality of returns.

The mean and standard deviation of this variable are 3.94 % and 16.34 %, respectively.

(b) STAB: the proxy for stabilization. It is constructed on the basis of the results of the test statistic σ_2^2 / σ_1^2 described in Section I.

Twenty-one returns (from day 1 to day 21) were available, with the returns from day 1 to day 10 belonging to the potentially stabilized period and returns from day 11 to day 21 being "free" returns. As exposed earlier it is unclear which of day 1 or day 11 is the first day of free trading so that returns pertaining to both those days were excluded from the calculation of σ_1^2 and σ_2^2. There remained thus 9 eligible returns in the potentially stabilized periods and 10 returns in the free period. Thus to test

$$H_0: \sigma_1 = \sigma_2$$

against

$$H_1: \sigma_1 < \sigma_2$$

where $\sigma_1^2 = \dfrac{1}{8} \sum_{t=2}^{10} (R_t - R_{t-1})$

and $\sigma_2^2 = \dfrac{1}{9} \sum_{t=12}^{21} (R_t - R_{t-1})$

the test statistic is given by:

$$\sigma_2^2 / \sigma_1^2 \;\text{--}\; F_{.05,\ 9,\ 8}$$

and H_0 is rejected at the .05 level of significance if:

$$\sigma_2^2 / \sigma_1^2 < F_{.05,\ 9,\ 8}$$

This variable is dichotomous: it takes the value of 1 if the null hypothesis, H_0, is rejected; it equals zero otherwise.

The results of the test indicate that 98 issues out of 418 -or 23.45% of the sample- are stabilized.

(c) STD12: a proxy for ex-ante uncertainty.

This variable is the standard deviation of daily returns from day 12 to day 21. The 11th day return was excluded from the calculation to avoid a possibly sharp price movement when a stabilized issue is let free to trade on its own.

As in Chapter 3, the motivation for the use of this proxy is that stocks that exhibit high price volatility in the after-market are bound to be ex-ante riskier (Ritter [1984]).

A positive relationship between this variable and initial returns is expected.

The mean of this variable is 3.55% and its standard deviation 4.35%

(d) STABSTD: this variable is the product of the STAB and STD12 variables.
This interaction term appears in the regressions to control for the effect on initial returns of the ex-ante uncertainty

associated with stabilized issues.
Coupled with the STAB variable, it is also used to test the stability of the regression coefficients across issues.

This variable has a mean of 1.41% and a standard deviation of 4.36%.

(e) Additional control variables: the other variables assumed to influence the magnitude of initial returns are the dollar amount of the offering (SIZE), the proportion of insider shares in the offering (SECSHS) and an underwriter reputation variable (CM), respectively. These three variables were described in Chapter 3.

Offering size is expected to be negatively related to the magnitude of abnormal returns: since larger offerings are often made by established firms it is assumed that the offering amount carries information about the firm that is valuable to investors.

The relationship between the proportion of insider shares in the offering and returns is ambiguous. It could be a negative signal to the market so that in order to sell the offering, the underwriter may have to underprice it strongly. On the other hand, Logue [1973] has argued that selling owners monitor the pricing process closely and are thus able to obtain a higher offering price. In this case, insider shares and returns would be negatively related.

As for the reputation variable it has been shown in Chapter III that issues originated by prestigious underwriters exhibit lower excess returns than those offered by less reputable investment banking houses.

2. Model Specification

The following model specifications are estimated by least squares:

(Model 1) LNRET = f(CONSTANT, STAB)

(Model 2) LNRET = f(CONSTANT, STAB, SIZE, SECSHS,CM)

(Model 3) LNRET = f(CONSTANT, STAB, STD12)

(Model 4) LNRET = f(CONSTANT, STAB, STD12, SIZE, SECSHS, CM)

(Model 5) LNRET = f(CONSTANT, STAB, STD12, STABSTD)

(Model 6) LNRET = f(CONSTANT, STAB, STD12, STABSTD, SIZE, SECSHS, CM)

Since higher ex-ante uncertainty should be reflected in a greater dispersion of initial returns, the error variance is likely to be heteroskedastic. To account for this problem the heteroscedasticity-consistent covariance matrix estimator proposed by White is used.

II. Results

Tables II to IV display the results of Models 1 through 6. An analysis of the results follows.

TABLE II. Least Squares Results[a]
Dependent variable = LNRET

	Model 1	Model 2	Model 1'[b]	Model 2'[b]
CONSTANT	.0507**	.0938**	.0507**..	.0938**...
	(5.586)	(6.176)	(5.320)	(4.661)
STAB	-.0483**	-.0500**	-.0483	-.0500**
	(-2.578)	(-2.692)	(-2.974)	(-3.074)
SIZE		.1447E-09		.1447E-09
		(.928)		(1.435)
SECSHS		-.0351		-.0351
		(-.768)		(-.998)
CM		-.0080**		-.0080**
		(-3.193)		(-2.827)
N	418	418		
R^2	.016	.046		
Breusch - Pagan $\chi^2_{(d.f)}$	7.95 (1)**	68.79 (4)**		
$F_{(d.f.)}$	6.65*(1,416)	5.00 (4,413) **		

* Significant at the .05 level
**Significant at the .01 level

[a] t-statistics in parentheses

[b] Heteroscedasticity-corrected

TABLE III. Least Squares Results[a]
Dependent variable = LNRET

	Model 3	Model 4	Model 3'[b]	Model 4'[b]
CONSTANT	.0476**	.0910**	.0475**	.0910**
	(4.508)	(5.585)	(4.995)	(4.701)
STAB	-.0520**	-.0531**	-.0520**	-.0531**
	(-2.628)	(-2.703)	(-2.848)	(-2.898)
STD12	.1120	.0929	.1120	.0929
	(.581)	(.486)	(.544)	(.436)
SIZE		.1497E-09		.1497E-09
		(.957)		(1.490)
SECSHS		-.0335		-.0335
		(-.731)		(-.953)
CM		-.0081**		-.0081**
		(-3.195)		(-2.898)
N	418	418		
R^2	.017	.047		
Breusch - Pagan $\chi^2_{(d.f)}$	30.69 (2)**	89.29 (5)**		
$F_{(d.f.)}$	3.49* (2,415)	4.04**(5,412)		

* Significant at the .05 level
**Significant at the .01 level

a t-statistics in parentheses

b Heteroscedasticity-corrected

TABLE IV. Least Squares Results[a]
Dependent variable = LNRET

	Model 5	Model 6	Model 5'[b]	Model 6'[b]
CONSTANT	.0358*	.0796**	.0358 *	.0796**
	(2.601)	(4.239)	(2.416)	(4.001)
STAB	-.0310	-.0341	-.0310	-.0341
	(-1.396)	(-1.359)	(-1.396)	(-1.536)
STD12	.5328	.4754	.5328	.4754
	(1.432)	(1.288)	(.927)	(.832)
STABSTD	-.5749	-.5212	-.5749	-.5212
	(-1.322)	(-1.211)	(-.951)	(-.864)
SIZE		.1560E-09		.1560E-09
		(.998)		(1.531)
SECSHS		-.0330		-.0330
		(-.721)		(-.935)
CM		-.0797**		-.0797**
		(-3.161)		(-2.830)
N	418	418		
R^2	.021	.050		
Breusch - Pagan $\chi^2_{(d.f)}$	82.64 (3)**	133.84 (6)**		
F (d.f.)	2.91* (3,414)	3.61**(6,411)		

* Significant at the .05 level

** Significant at the .01 level

[a] t-statistics in parentheses

[b] Heteroscedasticity-corrected

Analysis

(i) Models 1 & 2

The results show that stabilized issues exhibit lower initial returns than non-stabilized issues -4.83% lower in Model 1 and 5.00% lower in Model 2. Hence stabilization appears to reduce the effect of underpricing suggesting a trade-off between stabilization and underpricing. Consistent with the results of Chapter III, issues originated by more prestigious underwriters also exhibit lower initial returns.

(ii) Models 3 to 6

Results are mixed. In Models 3 and 4 ex-ante uncertainty plays no role in the determination of abnormal returns as evidenced by the lack of significance of the coefficients of the risk proxy in both regressions. The differential intercept (STAB) is statistically meaningful in both regressions, indicating as above that the effect of stabilization is to reduce the magnitude of initial returns. Again, the existence of a trade-off between stabilization and underpricing is supported: stabilized issues need to be underpriced less in order to establish a market. An alternative explanation for this finding is that investors forecast issue risk in the post-stabilization period based on information gathered during the stabilization period. Since stabilization has the effect of reducing risk, investors will then require a lower return in the post-stabilization period. In the fuller model (4), there is again evidence that underwriter reputation plays an important role in determining initial returns.

When the models are amended to include the differential slope variable (STABSTD) in the regression equation (Models 5 and 6), the results change drastically. First of all, heteroscedasticity increases significantly. Second, both the differential slope coefficient -STABSTD- and the differential intercept -STAB- lack explanatory power indicating that the regression equation holds for both types of issues, non-stabilized and stabilized. In order to further investigate this finding a F-test of the hypothesis that the coefficients of the STAB and STABSTD variables are simultaneously zero is conducted.[12] The null hypothesis is

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[12] The null hypothesis is:

$$H_0: \beta(STAB) = \beta(STABSTD) = 0$$

and the test:

$$F = [\ ESS\ /\ m\ ]\ /\ [\ RSS\ /\ (n\ -\ k)]$$

where ESS is the regression explained sum of squares and RSS the residual sum of squares, k is the number of parameters in the regression equation, m the number of linear restrictions and n the number of observations. H_0 is rejected at the α level of significance if $F > F_{\alpha,m,(n-k)}$. When applied to Model 5, the test produced a F value of 4.33 $< F_{.01,2,414}$.

accepted at the 1% level of significance in both Models 5 and 6, implying that the explanatory power of the model cannot be increased by splitting the sample between stabilized and non-stabilized issues and confirming the conclusions drawn from the individual insignificance of those coefficients.

As in the previous models, initial returns and ex-ante uncertainty appear to be independent. A test of the null hypothesis that the effect of ex-ante uncertainty on returns is the same across types of issues (stabilized and non-stabilized) leads to accept the null hypothesis at the 1% level thus reinforcing the conclusion that there is no link between ex-ante uncertainty and initial returns.[13]

Neither offering size nor the proportion of insider shares seem to have any influence on initial returns. This result however is strongly influenced by the correlation of these variables with the prestige variable. When the prestige variable (CM) is excluded from the regressions, the

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The F value for Model 6 was 4.39 < $F_{.01,2,411}$. Hence H_0 was accepted in both cases.

[13] To test the null hypothesis:

$$H_0: \beta(STD12) = \beta(STABSTD) = 0$$

the same F test as described above is used. In Model 5, the F value was 1.04 < $F_{.01,2,414}$; in Model 6 the test produced a F value of .85 < $F_{.01,2,411}$. Hence H_0 was accepted in both cases.

coefficient of the SECSHS variable becomes significant at 1%.[14] Since it is negative, it can be concluded that indeed, selling owners are able to obtain a higher offering price in their negotiations with underwriters.

In summary, the results from Models 1 to 6 appear to be influenced very strongly by the model specification, in particular by the introduction in the regression equation of the slope differential variable. However that variable is consistently found to lack explanatory power, reinforcing the finding that risk and returns are not related. Stabilization is not consistently found to reduce the magnitude of initial returns.

There are two possible reservations to that conclusion, one related to the construction of the sample, the second pertaining to the non-normality exhibited by daily returns.

1) Small firms have not been screened out of the sample. It is market folklore that low-priced stocks tend to be issued by highly speculative (low-capitalized) firms. Moreover some authors (Tinic [1988], Chalk/Peavy [1987]) have found evidence that these stocks exhibit significantly larger returns in the aftermarket than high-priced stocks. It is

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[14] The results are not reported here.

thus possible that the results are driven by the presence of these firms in the sample: these issues, being high-risk investments, need to be underpriced more in order to sell. Hence only severe underpricing would lead to the establishment of a secondary market for those issues and, arguably, stabilization would then have no influence on the magnitude of their initial returns. In other words, the potential trade-off between stabilization and underpricing would not obtain. To investigate this possibility, the analysis was replicated on a sample excluding first all issues with an offering price of $1.00 or less, then excluding issues priced below $3.00.[15] It was found that stabilization reduces initial returns in every case. The other results were unchanged.

2) The validity of the findings in this section hinges on the validity of the normality assumption. Since it has been shown that daily stock returns are not normally distributed but rather that their distribution is leptokurtic (Fama [1965]), the interpretation of the results must be viewed

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[15] It is not clear where the cut-off point between low- and high-priced stocks is. Chalk/Peavy [1987] refer to low-priced stocks as those priced at $1.00 or less, while Ross/Westerfield/Jordan [1991] put the cut-off point at less than $3.00. There were 10 issues priced at $1.00 or less and 21 issues priced below $3.00, so that the number of observations in the amended analyses was 410 and 397, respectively.

with some degree of caution. In an attempt to deal with the non-normality of returns, the analysis was repeated after exclusion of outliers from the sample.[10] While this technique is usually considered questionable, it nonetheless led to a change in the results. As with the correction for "small firms effect", it was found that stabilized issues exhibited significantly lower initial returns than non-stabilized issues. Again, the other results were unchanged.

Hence while the results are sensitive to both methodology and distributional assumptions, it appears that a trade-off exists between stabilization and underpricing: stocks having undergone stabilization exhibit lower initial excess returns than stocks free to trade on their own from the offering day onwards.

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[10] The exclusion criterion was as follows: reject R_{11} if $R_{11} \gtrless \bar{R}_{11} \pm 3\sigma$, i.e., if $R_{11} > .653541$ or $R_{11} < -.542859$. This rule led to discard 8 returns resulting in a final sample of 410 observations. In each model, skewness and kurtosis of the regressions residuals was drastically reduces: the skewness coefficient ranged from .62 to .64 and the kurtosis coefficient from 4.2 to 4.5. This must be compared with a skewness range of 1.2 to 1.7 and a kurtosis range of 6.5 to 7.2 when the full sample was used.

SECTION III: CONCLUSION

The SEC allows investment banking syndicates to intervene in the market to stabilize the price of new stock issues. Stabilization is legally limited to a period of ten days starting from offering date.

Very little attention has been paid to these practices so that its effects are not known. Moreover, stabilization data is, to the best of my knowledge, not available.

An attempt was made in this chapter to formally model stabilization and draw tentative conclusions about its effects. The theoretical model -and its illustrative simulation- showed that stabilization reduces the volatility of prices in the after-market; moreover stabilized issues consistently exhibit lower returns than issues whose price is not pegged. The finding that the variance of stabilized stock returns is less than non-stabilized stock returns provided a justification for the construction of a test for stabilization, namely an F test of differences of variance. The results of the test were then used to define the stabilization variable necessary to the empirical analysis.

Two questions were examined: 1) assuming that both stabilization and underpricing are means used by the underwriter to establish a secondary market for a new issue, it was postulated that a trade-off exists between stabilization and underpricing; 2) since prior research found a positive relationship between ex-ante uncertainty and the magnitude of excess returns, its effect was examined in the context of stabilization, i.e., it was investigated whether the effect of ex-ante uncertainty on excess returns is the same for both stabilized and non-stabilized issues.

The findings were mixed. Curiously, underpricing and ex-ante uncertainty appear to be independent. This is inconsistent with all prior work done on the subject. Methodology does not seem to be the problem since the proxy for risk used in this research has been shown to perform satisfactorily in previous studies. No explanation can be found for this result.
Despite the fact that the results appear to be sensitive to both methodology and distributional assumptions, there is evidence of a trade-off between stabilization and underpricing: stabilized stocks exhibit lower initial returns once free to trade on their own. Suggestions for further research include a cost/benefit analysis of stabilization for the underwriter. While guaranteeing a

liquid market to the issuer is probably a powerful means to build customer relationship, market-making is costly to the underwriter since it implies an increased use of resources.

CHAPTER V: CONCLUDING REMARKS

The purpose of this research has been to investigate several questions related to a much discussed puzzle in finance, i.e., the underpricing of Initial Public Offerings. In particular, the role of an important agent -the underwriter- in the public offering process was examined. Two aspects of this role, underwriter reputation and the underwriter as market-maker and their implications were the focus of attention.

Quantifying reputation and introducing it in a formal model provides a strong backing to the vague notion prevalent in the business community that " reputation is important". While this type of formal research has been performed before, it has often been done under very restrictive assumptions. Some authors even contended that underwriter reputation is the single most important factor in the determination of the returns accruing to early buyers of IPOs thus implying that investors are myopic. Under standard rationality assumptions, this should not be the case. It was indeed shown in this study that even though prestige is indeed an important element in investors' decision to buy IPOs, other factors such as risk are equally weighty.

Studying the role of the underwriter as market-maker helps to shed some light on the effects of this role. This particular function of the underwriter has received surprisingly little attention. While it is not clear why underwriters choose to intervene in the market for some issues and not others, one can postulate that this intervention depends on the underwriter willingness to build or maintain good customer relationships hence to ensure repeated business. Market-making by the underwriter provides a ready market in which to sell the shares thus increases the probability of a successful offering. A successful initial public offering is especially important if the issuing firm intends to make further offerings of equity (or debt) in the near future.

Suggestions for further research include performing a cost/benefit analysis of market-making by the underwriter and investigating whether there is a discernible pattern of occurrence of stabilization based on the characteristics of the issue. For instance, is stabilization more likely to occur for larger than for smaller issues? Also, the potential trade-off between stabilization and underpricing should be modelled formally.

Finally, it is important to note that even though underpricing was not treated directly in this research, it remains a nagging question. Why are IPOs underpriced ?

Are they underpriced? Almost all empirical analyses of IPO underpricing are based on the premise that IPOs exhibit the same risk as the market portfolio. While practical considerations,i.e., the absence of pre-offering data, motivate this assumption, there is some evidence that IPOs are in fact riskier than the market portfolio. Hence the "abnormal" returns found in the literature are biased upward.

While the consensus in the literature is that IPOs exhibit statistically significant abnormal returns, are they economically significant? The significant returns found in the literature are returns gross of transaction costs. Are returns net of transaction costs still "abnormal"? These questions need to be explored.

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