Initial Public Offers in a Multiple Issue Framework: The Impact of Subsequent Equity Issues on Signalling by Underpricing and Retained Ownership

by

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Certificate of Originality

This thesis contains no material which has been submitted for the award of any degree or diploma in any university, or any material previously published unless due reference to that material is made.

Philip J. Lee

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Abstract

Firms that make an initial public offering of equity (IPO) generate enormous amounts of public interest, both as investments and as a puzzle. There are three documented anomalies relating to IPO markets. First, initial subscribers to an IPO earn abnormal returns between the subscription date and the first trade as a public security, referred to as underpricing. Second, there are cycles in both the volume and timing of IPOs. Third, IPOs underperform efficient market expectations for several years after listing. Financial economists have struggled with these puzzles over the years, mostly using single period models that focus solely on the events around the IPO. A number of potential explanations have been offered that view IPO firm actions within a multi period model. If IPO firms approach the equity market with a goal of raising more than just the initial issue, perhaps it is useful to also consider any subsequent (or seasoned) equity issue (SEO). SEOs themselves are the subject of an anomaly, as researchers have been unable to explain satisfactorily the generally negative market reactions to announcements of SEOs.

This thesis integrates these anomalies by considering them in a multiple issue framework, with the aim of providing a better understanding of the two new issue puzzles (i.e., those surrounding the IPO and SEO). Empirical tests are conducted to discriminate between the various competing multiple equity issue theories (e.g., signalling, market feedback and reputation acquisition hypotheses) by recognising that they have opposing theoretical predictions. Data from the Australian IPO market and the subsequent actions and returns of those firms in the ASX, are used to test these hypotheses. One important signalling mechanism, considered throughout this thesis, is the use of retained ownership by the entrepreneur.

The results of this study indicate a curvilinear relationship is present between retained ownership and IPO underpricing. This clarifies a controversy in the literature between two contrary theoretical predictions and the extant empirical evidence. This relationship has implications for the rest of this study and future research investigating IPO underpricing. It is also apparent that IPO underpricing and initial aftermarket returns are positively related.

IPO underpricing is also positively related to the probability of the firm making a SEO. However, the market reaction to a SEO issue announcement was not found to be significantly different from zero, contrary to previous studies of SEOs.

Overall, the results most strongly support the signalling hypothesis for IPO underpricing relative to alternate explanations.

Chapter 1.
Introduction and Motivation

An important event in the development of a public company is its debut in public equity markets. Commonly this is through an initial public offering of equity (IPO).[1] In the early stages of a company's history, it usually develops a concept and strategy through the use of debt and private equity, with the firm later choosing to access public equity markets to raise additional finance, often to fund growth.[2] From the researcher's point of view, IPOs are important as they represent an opportunity to observe strategic choices related to valuation and disclosure.

The financial economics literature has documented three anomalous empirical regularities with regard to IPOs.[3] First, issuers offer shares to subscribers at prices significantly below the subsequently revealed market value. This difference in price (or discount to initial subscribers) is usually termed underpricing. The existence of underpricing is anomalous when considered within an efficient market for securities, given that other firm's shares could be considered substitutes. Also, it is difficult to understand why existing owners would sell an interest to outsiders at discounted prices.

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1 This is also known as firms "going public". The definition of an IPO used in this thesis requires that a non-listed firm offers ordinary equity shares to the general public for the first time, and concurrently undertakes to become listed on a recognized bourse. Newly listed firms that result from either a private placement, a reconstruction of capital of a previously listed firm or a division of an existing firm's assets have been excluded in the empirical analysis of this thesis.

2 Jain and Kini (1999) note that post IPO firms have three potential long term outcomes. These are that the firm is successful and survives as a distinct entity, that it is less successful and fails or that it is acquired by another firm via takeovers or mergers.

3 See Ibbotson, Sindelar and Ritter (1988), Ibbotson, Sindelar and Ritter (1994), Loughran, Ritter and Rydqvist (1994) for summaries of the three IPO anomalies.

Empirical research has documented underpricing in many countries including Australia, USA, UK, New Zealand and Canada, as summarised in Appendix 1. Although underpricing has been shown to vary across institutional settings, as well as temporally within such settings, the persistence of this (and other new equity issues) phenomena has caused it to be termed a 'puzzle'.

Second, IPOs occur in cycles in both volume and level of underpricing. Both of these issues point to possible distortions in models of continuous efficient markets. If issuers are able to opportunistically time their issues to take advantage of investor sentiment, then another anomaly worthy of further investigation exists. Further, similar patterns (at least in terms of the volume of issues) can also be observed in the new issue market for seasoned equity. Plausible theories explaining this cyclical behaviour are rare.

Third, IPOs have been shown to perform poorly for the first several years of trading. In fact, the average return in several studies of long-run performance is sufficiently low (or negative) to leave financial commentators wondering why rational agents would choose to hold such securities.

Further, many of the theories offered to explain these three IPO anomalies are single period models, where issuers simply try to maximise the funds raised in an IPO (and their true worth is discovered at the end of the period). These have typically been tested in cross-sectional research designs that have only minimal explanatory power. However, some authors have added a time-series dimension to the explanation by considering the IPO as the initial step in a strategy of equity raising (i.e., a multiple issue framework). Here the goal of the entrepreneur is to maximise the capital acquisition from both the IPO

and subsequent equity offerings (SEOs).[4] Such models are consistent with anecdotal evidence of frequent returns to the capital market by firms making IPOs. Thus, a greater understanding of these phenomena may be obtained by examining the firm's program of equity raisings. SEOs themselves are part of the new equity puzzle because the announcement of a SEO has been shown to cause significant decreases in the market value of the firm.[5]

While the empirical evidence on initial underpricing is extensive, there are relatively few studies that examine IPOs and seasoned equity offers (SEOs) jointly. This thesis provides a comprehensive examination of these anomalies. This is achieved by considering a multiple issue framework to address the total new issue puzzle. Specifically, the research adds to our understanding of the issues (and controversies) related to IPOs and SEOs by using Australian data to investigate empirically a series of three relationships that have been suggested in the extant literature.

First, the relationship between IPO underpricing and retained ownership is evaluated as part of a combined signalling strategy. Implications from the use of retained ownership are considered within a multiple issue framework to evaluate the signalling by underpricing hypothesis. The results of the analysis indicate that a non-linear (i.e., curvilinear) relationship is found between retained ownership and IPO underpricing,

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4 For the purposes of this thesis, an SEO is defined as issues of ordinary equity that a listed firm may make subsequent to its IPO. In the empirical analysis of this thesis, I limit the types of equity issues considered to rights issues and private placements made by the firm. This is because these are the issue types that are most significant in terms of the number of shares issued, and where investors are making investment decisions. Equity issues excluded from such an SEO definition might include shares issued under the exercise of options, dividend re-investment plans and management or employee incentive plans.

5 Examples of this literature include Smith (1977), Asquith and Mullins (1986), Masulis and Korwar (1986) and Mikkelson and Partch (1986).

potentially integrating the two contrary theoretical predictions and clarifying the extant empirical evidence.

Secondly, the relationship between IPO characteristics (e.g., underpricing) and attributes of the first SEO are examined to evaluate the three competing hypotheses relating to strategies of multiple capital raising. These are the signalling, market feedback and reputation acquisition hypotheses. A key result is that IPO underpricing is positively associated with the probability that the IPO will be followed by a SEO. This same relationship could also indicate that firms that make multiple issues have higher underpricing, perhaps deliberately, which is consistent with them using underpricing as a signalling device. Most results support the signalling hypothesis over the alternate explanations.

Finally, post-IPO market (i.e., aftermarket) returns are used in an attempt to distinguish between the signalling, market feedback and reputation acquisition hypotheses, as they contain some differential predictions about the relationship between IPO characteristics and aftermarket returns. The results of this study find a positive relationship between IPO underpricing and aftermarket returns, but find there is little association between the aftermarket returns and SEO probability, timing or market reaction.

The organisation of the remaining chapters of this thesis is as follows. Chapters two and three contain a review the IPO literature, while in chapter four I develop testable hypotheses within a multiple issue framework. The data used in this study and the methods employed are described in chapter five, followed by the analysis and results in chapter six. Chapter seven contains my conclusions.

Chapter 2.
Review of the Underpricing Anomaly and Explanations Literature

The financial economics literature has examined many aspects of the anomaly commonly known as the underpricing of IPOs. While excellent summaries of the IPO phenomena have been given by Smith (1986), Ibbotson and Ritter (1995) and Ritter and Welch (2002), this chapter reviews some of the landmark developments in the literature, both empirical and theoretical, that form a basis for this thesis. A more complete description of this literature is given in Lee (2003). In Section 2.1 the empirical evidence on IPO underpricing is reviewed. This overwhelming evidence of an apparent anomaly with an efficient market framework has generated a demand for theories or explanations of why underpricing continues to occur. These explanations are grouped and reviewed within an agency framework in Section 2.2 under appropriate sub-headings. Recent directions in the IPO literature are examined in section 2.3, with several of these areas introducing behavioural explanations for underpricing and its variation. Section 2.4 contains a summary of our understanding of the IPO underpricing anomaly.

2.1 Evidence of the Existence of the Underpricing Anomaly.

In this section, important empirical evidence on the IPO anomaly is presented, for both the United States of America (US) and Australia. Many other countries also experience similar phenomena, the evidence on which is shown in Appendix 1, together with the results of many other studies. While the level of IPO underpricing varies between the samples tested, there is typically a large initial return that cannot be explained by the risk return predictions of the Capital Asset Pricing Model (CAPM) or similar efficient market models.

Early studies such as Reilly and Hatfield (1969) examined unseasoned new issues made in the US during the 1960s. During this period they found average underpricing

(measured from the date of issue until the first Friday after quotation) was 9.9%, with a highly, positively skewed distribution.

However, a problem with many of these early studies was that because the inter-temporal distribution of IPOs was clustered, each observation could not be considered to be independent for the purpose of statistical tests. King (1966) first showed that market-wide and industry factors are important determinants of security returns. Accordingly, IPO return observations can not be considered to be independent if they have been drawn from the same time period, because they will be jointly influenced by market-wide movements. This problem was first identified by Ibbotson (1975). He chose a sample period from 1960 to 1969, and after identifying all IPOs he randomly chose one issue from each month yielding a sample of 120 independent IPOs. From this sample he found a statistically significant average abnormal return of 11.4%. Ibbotson pointed out that far simpler return models gave similar results[6] and that beta risk adjustments explained very little of the underpricing result.

Ibbotson (1975) proposed (summarised) six potential scenarios that might explain the existence of underpricing:

(i) Regulators require underwriters to set the offering price below the expected value.

(ii) Issuers want to 'leave a good taste in investors' mouths' so as to be able to make secondary offerings to them on favourable terms.

(iii) Underwriters collude or choose to exploit individual issuers to the benefit of investors.

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6 Ibbotson (1975) reports that a raw return measure of underpricing yielded a 12.8% return, while a market adjusted measure (beta = 1) of underpricing resulted in a 12.4% return.

(iv) Underwriters underprice to minimise the risks of being caught with the issue unsold because the underwriting spread is insufficient to compensate them for their risks.

(v) Underwriters allocate underpriced issues to preferred clients, for which they are compensated via side-payments from the clients.

(vi) Issuers and underwriters feel that underpricing an issue is a form of insurance against legal suits.

These scenarios form the basis of several explanations of underpricing discussed in Section 2.2.

Ritter (1984) reports an average initial return of 18.8% for over 5,000 IPOs made during the period from 1960 to 1982. He also studied temporal underpricing compared to the volume of IPO transactions over the 23 year period, and showed that IPOs follow a cyclic pattern. Hot issue markets, with high underpricing and low volume, directly proceed a period of high volume, low underpriced offerings. This pattern appeared at least four times in the 23 years. This led to a closer examination of the hot issue market of 1980, defined as January 1980 until March 1981. During this period IPOs were, on average, underpriced by 48.8%, while for the rest of the period 1977-82 average underpricing was only 16.3%.

Ritter (1984) tested an explanation for this extraordinary temporal variation in underpricing based on the premise that there is a positive (stationary) relationship[7] between the level of risk and the expected initial return. Temporal variation in underpricing is suggested to be due to changes in the riskiness of firms making offerings.

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[7] Rock's (1982, 1986) model suggests that this relationship should be heteroscedastic, as there should be more uncertainty about riskier issues.

To test this explanation for the increase in underpricing around hot markets (i.e., that a greater proportion of risky firms go public during these periods), proxies for risk must be developed. Ritter (1984) suggested proxying firm risk using the *ex ante* 'accounting' measures of age of the firm, book value of equity, annual sales or the firm's ex post stock market returns. However, risk proxies are unable to explain the difference in underpricing between hot and cold issue markets. This led Ritter (1984) to re-examine his data to find the source of the high underpricing. He found that it was securities in the 'natural resources' sector that caused the hot issues results. Ritter (1984, p.228) states:

> "The evidence is clear: except during the hot issue market of 1980, natural resource issues had the same relation between risk and expected initial return as did non-natural resource issues. For the 15 month period comprising the hot issue market of 1980, however, the natural resource issues had much higher average initial returns."

Ritter (1984) concluded that the main source of the high underpricing in hot markets is not purely due to the changing risk composition of IPOs. He proposed and tested some alternative hypotheses that are discussed in Sections 2.2.2 and 2.2.4.

Ibbotson, Sindelar and Ritter (1988) extended the Ritter (1984) study by including issues made between January 1983 and December 1987. The authors included several more cycles (discussed by Ritter (1984)) into the timeseries, one of which is the period around the October 1987 stock market crash. During this 28 year period Ibbotson *et al.* (1988) studied 8,668 IPOs which raised $83,984 million in gross proceeds with an average underpricing of 16.37%.

Over this long time period Ibbotson *et al.* (1988) observe several interesting patterns in the behaviour of firms going public. Firstly, a cycle in the level of monthly underpricing is evident, with a first order autocorrelation of 0.62 between successive months. This suggests that the average market underpricing moves in trends rather than randomly. A similar pattern existed for the number of firms going public (volume), with autocorrelation of 0.88. Secondly, periods of high underpricing and low volume are

followed by periods of high volume with lower underpricing some six to 12 months later.[8]

Loughran and Ritter (2003) consider how underpricing has changed over time. They find that during the 1980s the initial return was 7%, and that this doubled to nearly 15% between 1990-1998. During 1999-2000 the internet bubble saw average underpricing of 65%. They propose a number of explanations for the changes in underpricing, which will be considered in Section 2.3.2.

In Australia, an early study of IPO underpricing was by Finn and Higham (1988). The sample consisted of 93 new issues by industrial firms made between July 1966 and June 1978. The market adjusted return from subscription to the first day of listing was shown to be 29.2%. Finn and Higham point out that in Australia an IPO return includes any premium attributable to becoming listed on a stock exchange. This issue-cum-stock exchange listing effect is created as firms usually list on a stock exchange as part of the process of 'going public' as there is not an active over-the-counter (OTC) market in operation. In a subsequent study of the Australian IPO market, Lee, Taylor and Walter (1996b) obtained prospectus details for all 266 industrial IPO listed on the Australian Stock Exchange(s) between January 1976 and December 1989 and found raw underpricing of 16.41% and market adjusted returns of 11.86%.

Ibbotson, Sindelar and Ritter (1994) covered a 33 year period from 1960 to 1992 and a staggering 10,626 IPOs, and found underpricing to vary temporally, with yearly average returns of between -17.82% and 55.86%. The average across the entire 33 years was 15.26%. When the returns were partitioned by the value of sales, smaller firms had significantly larger initial returns.

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8 For a sub-sample of 2,439 firms (1975 - 1984 in "Going Public: The IPO Reporter"), Ibbotson *et al.* (1988) vividly documented the inverse relationship between investor uncertainty (measured by annual sales) and the level of underpricing.

An international comparison of IPO underpricing conducted by Loughran, Ritter and Rydqvist (1994) documented that underpricing exists in each of the 25 countries examined. They found that the level of underpricing varies from country to country, with the main dimensions for this variation being threefold:

(i) the selling mechanism used,

(ii) the characteristics of firms which use the equity market, and

(iii) institutional constraints or practices such as discriminatory allocation of IPO shares.

2.2 Explanations of Underpricing

The widespread empirical evidence on the high initial return on IPOs is anomalous in the context of an efficient capital market. Many researchers have attempted to explain this anomaly. The potential, competing explanations can be broken down into a number of groups. Most of these are derived from an agency framework but some are derived from a behavioural perspective.

2.2.1 Rational Expectations

The most widely cited explanation for the IPO anomaly is offered by Rock (1986), who develops an equilibrium model of new issue underpricing based on rational behaviour of market participants in the presence of asymmetric information. He argues that if the level of demand is not observable (as is the case in the IPO market), then (offer) price alone is unable to communicate important 'insider' information to the market. This provides an opportunity for knowledgeable or 'informed' investors to profit from investment in information search by bidding for mispriced (underpriced) securities. It also leads to an explanation of IPO underpricing as an equilibrium economic consequence in a rational new issues market, given the existence of asymmetric information.

Rock (1986) divides the investment community into two groups. The first group consists of investors who undertake costly information search and are better able to determine the true value of a firm's securities. This group is termed informed investors. The other group, which includes the firm issuing the securities and its investment banker/underwriter, are termed uninformed investors. Informed investors, due to their superior information, are able to distinguish between IPO issues that are underpriced and overpriced. Rationally, these investors only submit purchase orders for the underpriced issues. Uninformed investors on the other hand are unable to distinguish between the expected outcome of new issues and will submit purchase orders for both types of issues, assuming they believe that they are investing in a 'fair game'.

Rock's (1986) equilibrium model shows uninformed investors participate in the new issues market by buying any excess supply of 'good issues' and taking all of the 'bad issues'. It follows that uninformed investors' participation causes rationing to take place, and that rationing will be biased against them, because of information asymmetry. Rock argues that uninformed investors face a winner's curse where they are allocated a large proportion of 'bad issues' and a small proportion of 'good issues'.

Given the winner's curse applies to uninformed investors, Rock (1986, p.192) argues:

> "This bias in allocation causes uninformed investors to revise downward their valuation of the new shares. Therefore, to attract uninformed investors to the offering, the issuer must price the shares at a discount, which can be interpreted as compensation for receiving a disproportionate number of overpriced stocks."

The discount offered by issuers to attract uninformed investors explains the existence of underpricing (measured as a mean result) as an equilibrium outcome caused by a bias in rationing and asymmetric information. If rationing is taken into account, the implication is that the uninformed investor will earn the riskless rate of return, and IPOs will not be issued at a discount to uninformed investors. This equilibrium result will also hold for the informed investors if the costs of becoming informed (information search) are equal

the expected gains received from applications for underpriced IPOs, after rationing is considered.

Rock's (1986) model can not be tested in most regulatory environments since rationing can not be publicly observed. Koh and Walter (1989) directly test Rock's winner's curse in the Singapore IPO market. The Singapore regulatory regime, while under the general principles of British Law, has two unusual features. The first is that firms wishing to make public issues must pass rigorous tests of firm quality before permission is granted for them to list on the Stock Exchange of Singapore Limited (SES), which is the only organised trading exchange. Thus, the SES effectively screens IPO firms before they make an IPO. Secondly, the method of allocation of IPO shares in Singapore means that all investors who apply for a given quantity of shares in an IPO have an equal probability of receiving an allocation (i.e., rationing is performed on the basis of a ballot or on a pro-rata allocation within each application quantity). Koh and Walter (1989) show that underpricing in Singapore is at similar level to other countries, but if adjustments are made for the rationing process, all but one of the investor categories receives an insignificant return. Only the smallest investor category (1,000 shares) earned an abnormal return, and this could be due to the shareholder spread requirement of the SES.[9]

The equilibrium underpricing model developed in the appendix of Beatty and Ritter (1986) is based on the model in Rock (1982), in which the number of investors who choose to become informed is endogenous. They show that underpricing increases with *ex ante* uncertainty (risk). This proposition is then empirically tested using two proxies for *ex ante* uncertainty about the value of an issue. These are:

(i) the log of one plus the number of uses of the proceeds listed in the prospectus, and

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9 Lee, Taylor and Walter (1999) extended this work. They show the severity of the rationing problem is compounded by demand expansion for underpriced IPO issues.

(ii) the inverse of the gross proceeds of the issue.

The first variable proxies for *ex ante* uncertainty, primarily due to requirements of the Securities Exchange Commission[10] (SEC) in the US. The SEC requires more detailed disclosures on the use of the proceeds in a speculative issue, while established issuers are given more freedom. This counteracts the firm's natural reluctance to disclose this information as it would either give competitors proprietary information or open the firm to litigation if the funds are not used for the stated purposes. The second variable proxies for *ex ante* uncertainty, based on the empirical regularity that smaller issues are more speculative than large equity raisings. Beatty and Ritter (1986) show that both variables were highly significant in explaining underpricing.

Beatty and Ritter (1986) also suggest that investment bankers enforce an equilibrium model of underpricing.[11] As first time issuers do not have a reputation in the capital markets, and they may be playing a 'single shot' game, they have an incentive to act opportunistically in the pricing of securities. The capital market, knowing this is likely, will refuse to deal directly with the firm. The issuers therefore hire investment bankers with some reputation in the marketplace to certify the pricing of an issue. If three conditions hold, investment bankers can be shown to have an incentive to maintain equilibrium in the IPO market. They are:

(i) investment bankers are uncertain of the value of stocks once they start trading,

(ii) investment bankers must have non-salvageable reputation capital at stake, on which a return can be earned, and

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10 In the US the Securities and Exchange Commission's Regulation S-K cover the disclosure requirements of the non-financial portions of the prospectus.

11 The terms investment banker and underwriter are interchangeable in this discussion. While the two identities are distinct, in the IPO market the investment banker or an associated firm usually act as the underwriter.

(iii) reputation capital (and the associated return) of the investment bank will diminish if disequilibrium issue pricing is undertaken.

Hence, if an investment banker sets the price of issues too high on average, investors should be suspicious of issues brought to the market by that investment banker, thereby losing its distribution lines (customers). If an investment banker prices the issue too low on average, firms wishing to go public (but at the lowest possible cost) will look to other investment bankers to handle the issue, thereby losing clients (products). This led Beatty and Ritter (1986) to propose that underwriters whose offerings have average initial returns that are not commensurate with their *ex ante* uncertainty lose subsequent market share. They test this proposition by dividing their sample into two sub-periods to examine if underwriters who 'cheat' on the issue pricing equilibrium loose market share. They classify the errors in pricing for each underwriter as the average standardised residual between the actual underpricing, and the value that is predicted by their model of underpricing based on *ex ante* uncertainty. Beatty and Ritter (1986) show that the group of investment banking firms[12] with the highest absolute error in pricing suffered a greater loss of market share than underwriters closer to the underpricing equilibrium, and that this difference is statistically significant. However, as both groups had lost market share due to increased competition from 'major bracket investment banking firms', it is clear that such a pricing equilibrium is only one of the determinants of the underwriters' market share.

Baron (1982) also developed a model in which underpricing is an expected (rational) outcome. Baron's model explains the conditions under which the advising and

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12 The 49 underwriters who participated in at least four IPOs in the first sub-period (483 offerings) were ranked by their average standardised residuals in Beatty and Ritter (1986, Table 1). The 24 underwriters with the largest residuals were considered 'off the line' performers, while the remaining 25 firms were expected to maintain their market share.

distribution services of investment bankers[13] will be used (demanded) by security issuers. The analysis starts with a proposition that there is an information asymmetry, in which the investment banker possesses (or obtains) superior information[14] (relative to the issuer) about the demand for the issue. In this situation, risk averse participants are shown to reach an optimal contract where the pricing decision is delegated to the investment banker (after setting a minimum value) as well as the distribution responsibility (given a suitable incentive compensation). A major factor in the analysis that yields an optimal contract is the issuer's inability to monitor the distribution effort expended by the investment banker (i.e., with a low issue price, less effort is required by the investment banker to sell the issue). The issue price set by the investment banker is shown to be below the issue price that would have been set by a fully informed issuer. Baron (1982) suggests that this (rent) transfer to the investment banker is a compensation for the additional information they supply about the demand for the issue.[15]

Baron's model also shows that as uncertainty about the value of an issue increases:

(i) issuers will accept a lower issue price (greater underpricing), and

(ii) issuers will have a greater demand for the advising services of an investment banker.

This analysis provides a description of why securities are issued at a discount (underpriced) and why unseasoned issues are discounted more than seasoned issues.

A clever test of Baron's (1982) model is presented by Muscarella and Vetsuypens (1989). This paper used 38 IPOs of investment banking firms (who participated in the

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13 In contrast, the demand for the underwriting services of investment bankers is modelled by Baron and Holmstrom (1980). In their model there is asymmetric information between issuers and investment bankers.

14 The source of the superior information possessed by investment bankers is their knowledge of the conditions prevailing in the securities market.

15 Biais, Bossaerts and Rochet (2002) come to conclusions similar to those of Baron (1982) when determining an optimal IPO mechanism. In their model a uniform price is optimal, with a price function that is a downward sloping relative to the quantity allocated to retail investors. An informational rent is found to be earned by informed market agents and intermediaries.

distribution of their own shares) to see if underpricing is eliminated (or minimised) as the Baron (1982) model would predict. Self-marketed investment banking firms, where the issuer and the investment banker are one and the same, would not be subject to the information asymmetry that Baron (1982) argues explains the existence of IPO underpricing. Thus, for these firms one would expect underpricing to be lower. However, for a sample of self-marketed investment banking firms that they study, the level of underpricing (7.12%) is consistent with the underpricing of other IPOs.[16] In fact for a sub-sample of 17 firms that acted as the lead manager in their own underwriting syndicate, Muscarella and Vetsuypens found that underpricing was significantly higher (13.23%) than the average. This evidence casts doubt over the completeness of the explanation for underpricing offered by Baron (1982). Habib and Ljungqvist (2001) sound a caution over the ability to generalise from the results of Muscarella and Vetsuypens's (1989), without controls for the total cost (wealth loss) of the issue.

2.2.2 Institutional Explanation

Several other explanations have been advanced for underpricing that rely on some institutional aspect of the securities market, in particular the new issue market.

While Ritter (1984) found that risk-return relationship in the IPO market (i.e., underpricing) is generally consistent temporally, he looks to other models of underpricing to explain the market during periods of unusually high underpricing (i.e., hot issue markets). One explanation explored by Ritter (1984) is that the high underpricing of natural resource stocks around 1980, was the result of an institutional lag. An institutional lag is created when the issue price was appropriate when it was set, but

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[16] The sample was drawn from the period between 1970 and 1987. Prior to 1970 the New York Stock Exchange required its members (underwriting firms) to be privately held. The National Association of Security Dealers (NASD) prohibited its members from undertaking a firm commitment underwriting of its own stock prior to 1972.

there are large increases in the returns on similar stocks during the time lag between price setting and listing.[17] However, Ritter then dismisses this explanation after finding that the industry return over the institutional lag period carried insignificant explanatory power.[18]

Another institutional explanation considered by Ritter (1984) is the monopsony power hypothesis. Under this hypothesis underwriters intentionally underprice issues and allocate the shares to preferred clients, thus earning additional profits. Underwriters could only achieve such a practice because they had power over the market, possibly due to lack of competition caused by market segmentation. Ritter noted that many of the natural resource stocks were concentrated in one regional centre (Denver) where several regional underwriters dominated the marketplace. These firms were argued to create the high underpricing of the natural resource IPOs.

Another form of market segmentation is the cause of underpricing in a study by Mauer and Senbet (1992). They see IPOs as unique assets that trade in a segmented market prior to listing. The inability of the secondary market to span primary markets leads to differential pricing (i.e., underpricing) which is dissipated as market wide trading commences.

Recently a number of institutional explanations, some concerning unsavoury business practices, have been considered to contribute to underpricing. Loughran and Ritter (2003) suggest that ‘analyst lust’ and ‘corruption’ hypotheses might help explain extreme underpricing levels and changes. These will be considered in more detail in Section 2.3.2.

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[17] This explanation is supported by evidence in Lowry and Schwert (2002) who call it sequential learning and link it to the existence of bubbles.

[18] The Natural Resources Index (NRI) was used to proxy for the security returns on natural resource stocks.

Finn and Higham (1988) argue that institutional factors peculiar to Australia are important determinants of the underpricing they report. These include:

(i) the initial issue-cum-listing effect,

(ii) the listing requirements of the Australian Stock Exchanges,

(iii) the vesting of allotment rights with stock brokers, and

(iv) barriers to entry in the stock broking industry.

It follows from Finn and Higham's explanation that after deregulation in the Australian securities industry (April 1987) underpricing should be eliminated or at least reduced. Lee *et al.* (1996b) perform tests of underpricing in Australia for a period that includes both the pre- and post deregulated marketplace. They do not find temporal underpricing results consistent with Finn and Higham's (1988) institutional explanation.

2.2.3 Insurance Premium

Tinic (1988) argues that US underwriters create IPO underpricing as an implicit insurance policy against adverse litigation under the Securities Act of 1933. The SEC regulations (section 11) impose the duty of conducting 'due-diligence' investigations on the investment banker, to ensure the accuracy of the (IPO) prospectus against false or misleading information or material omission. This exposes the investment banker (who is usually the underwriter) and everyone else responsible for the production of the prospectus to legal suits and damage to their reputations. The maximum penalty under the Act for violations is the issue price of the shares. This creates an incentive to reduce the potential cost of suits by lowering the issue price, all other things being equal. Although this seems to be simplistic, Tinic goes further to say that lower quality (fringe) underwriters bear a higher risk of suits, due to their inexperience or inability to undertake complete due-diligence investigations. Support for the insurance hypothesis is reported in Tinic (1988), where the level of underpricing after the Securities Act of 1933 is greater than before 1933. Less rigorous investigations were required prior to 1933. Further,

Tinic shows that while the level of underpricing for high quality underwriters between the periods is similar, the underpricing for low quality underwriters increases when the risk of law suits increases. This evidence suggests that the 'insurance against legal liability' hypothesis is a significant explanator of underpricing in the post 1933 period, as well as of the change in the level of underpricing between the 1920s and the 1960s, at least in the US.

2.2.4 Speculative Bubble

A speculative bubble is another hypothesised explanation for the existence of IPO underpricing. In this explanation issues are appropriately priced, but excessive demand for the securities causes investors to bid up the value of the issue in the immediate aftermarket. Presumably, other securities traded in the market do not act as substitutes for the heavily demanded IPO security. The rapid price appreciation could also be caused by market rigging or price manipulation by market participants (including the underwriter).[19]

Shiller (1988, 1990) suggests a speculative bubble or fad as a partial explanation for underpricing. He argues that as underpricing returns are not accessible to all investors due to rationing, the expectations of efficient markets need not be violated. Under a semi-rational framework, Shiller suggests that, from time to time, underwriters act as impresarios (impresario hypothesis) by acting opportunistically to exploit investor fads. By lowering the price of an IPO a perception of excess demand is created, allowing the underwriter to take more firms public (usually within a particular market segment).

In a similar vein, Welch (1992) considers how (information) cascades may affect IPO pricing, effectively creating a speculative bubble (see Section 2.2.8). The speculative

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[19] See Tinic (1988), footnote 4.

bubble hypothesis has a clear prediction about the efficiency of the IPO securities in the aftermarket - that the bubble will burst when investors realise the securities are over-valued and thereafter sharp price declines will occur.

Tinic (1988) concludes that the aftermarket performance of IPOs is similar to the returns expected for seasoned issues, and this means that the aftermarket is efficient. He therefore rejects the speculative bubble explanation. Ritter (1984) also considers the speculative bubble explanation for his highly underpriced natural resource IPOs. The returns on the natural resource IPOs studied by Ritter show no signs of a bubble bursting, as they are consistent with changes in an appropriate market index movements.[20]

2.2.5 Signalling Explanations

A number of authors have suggested that the information asymmetry underlying IPO underpricing can be attenuated through the use of signalling mechanisms.[21] In these models it is presumed that entrepreneurs have an informational advantage over other market participants, and that entrepreneurs of high quality firms have an incentive to distinguish themselves from low quality firms in order to attract financing on the most favourable terms. This implies that there is competition for capital and hence, it is in the firm's interest to signal its 'true' value in order to obtain the maximum possible benefits of diversification and access to capital.[22]

These entrepreneurs are unable to credibly inform the market participants of their quality in a cost efficient way without disclosing proprietary information. On the other hand, potential investors are able to observe the actions of entrepreneurs and thereby infer the

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[20] The Natural Resource Index (NRI) was an indice created by combining two Standard and Poor's component price series that reflected the oil industry (producers and services).

[21] Leland and Pyle (1977), Booth and Smith (1986) and Benveniste and Spindt (1989) are all examples of how signalling may reduce underpricing.

[22] This holds for shareholders (owner/managers) whose wealth is typically undiversified.

quality of their firm. Thus signalling as an indirect form of information transfer overcomes the moral hazard problem that may be present in a direct information transfer.

Leland and Pyle (1977) develop one such model. In this model investors observe the proportion of the firm that the entrepreneur retains as a signal of the entrepreneur's belief about the firm's future performance. They show that while signalling causes the entrepreneurs to incur (welfare) costs by inducing them to hold larger ownership in their firm, the resulting (optimal) allocation of funds to projects (issuers) would be the same as if barriers to information transfer were removed.

Leland and Pyle (1977) derive the signalling equilibrium in which retained ownership of an entrepreneur (termed α) in an IPO is positively related to the firms expected quality (for all situations where $\alpha > 0$). Finally, Leland and Pyle (1977) use signalling to explain the existence of financial intermediaries as experts in discovering firm specific private information.

Gale and Stiglitz (1989) highlight that the Leland and Pyle (1977) model relies on the fact that the entrepreneur has only one opportunity to sell his equity, and that this is an unreasonable assumption (given an active participation in the securities) unless the entrepreneur undertakes not to sell his securities.[23] Further, entrepreneurs will choose to differentiate themselves only when uncertainty is high. One of the explanations suggested by Ibbotson (1975), as discussed in Section 2.1, was that underpricing could be a credible signalling mechanism so as to 'leave a good taste in the investors' mouths'[24], which could be recovered in future capital raisings. Developments of the Ibbotson (1975) and Leland and Pyle (1977) models into a multi-period equilibrium are considered in more depth in Section 4.4.1.

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[23] Courteau (1995) finds that a commitment to additional voluntary retention of pre-IPO shares is a complementary signal to that provided through retained ownership.

[24] See Ibbotson (1975) pp. 264. This is also termed as "leaving some money on the table" in commercial circles. It is also interesting to note that this reasoning is in violation of the Efficient Markets Hypothesis. The term "burning money" was later coined to describe signalling through underpricing.

2.2.6 Reputation Effects

A number of explanations for IPO underpricing (or the variation therein) have been proposed which are based on signalling through the reputation effects of either auditors, underwriter/broker, investment banker or venture capitalists. By hiring quality professionals, IPO firms may differentiate themselves from lower quality firms. Alternatively, a single firm can develop a reputation of its own in the new issue market [Maritz (1992)]. In the following section some aspects of these models are explored.

2.2.6.1 Auditor Reputation

The information asymmetry between issuers and investors may be mitigated to some extent through the use of the services of an auditor. IPO prospectuses are required to be audited (investigating accountant) before an issue proceeds. The auditor checks the accuracy of the information as well as ensuring the disclosure of all required material. When this auditing work is of a high quality, uncertainty regarding IPO value is reduced. This signalling role is recognised by Dopuch and Simunic (1982, p.40) who argue that:

> "The economic role of auditor credibility is to overcome an information asymmetry between top management and potential buyers of a firm's shares, where the asymmetry concerns top management's motivations and intentions."

Titman and Trueman (1986) develop a model in which the choice of a high quality auditor forms a separating equilibrium.[25] Owners of high quality firms achieve higher proceeds from the IPO if they invest in (more expensive) high quality auditors. The high quality auditor certifies the financial statements of the IPO because of a greater level of accuracy (i.e., precision). Bachar (1989) argues that Titman and Trueman's separating equilibrium will only occur if the high quality auditor performs more (quality and/or

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[25] Titman and Trueman (1986) acknowledge that other signals like retained ownership and underwriter quality are alternative signalling methods, which may be used as either complimentary or alternative disclosure techniques.

quantity) auditing and hence discovers 'new' information which is not known by the issuer. Bachar (1989) also notes that only a partial equilibrium may result as the auditor, having seen the issuer's signal (audit quality choice), will infer the quality of the information provided by the issuer is high, leading to an incentive to do less auditing work.

Datar, Feltham and Hughes (1991) model the auditor's role in an IPO as a monitor of the information content of the issuer's disclosures (i.e., the prospectus). Under this model risky issuers, rather than high quality issuers, choose high quality auditors as the marginal benefits will be greater.

Balvers, McDonald and Miller (1988) view the choice of a high quality auditor as an appeal for credibility rather than one for additional information search. Further, they argue that auditor quality is a signal of the underwriter quality, which is more difficult to observe. Potential investors are argued to be more concerned with the quality of the underwriter associated with an IPO issue. Their results confirm that both auditor and underwriter quality are negatively related to underpricing and that the relative importance of one variable decreases as the other increases (i.e., they are substitutes to some extent).

Taylor (1991) tests the relationship between audit quality and underpricing in the Australian context. He finds that (for industrial companies) high quality auditors, using three proxy measures, are associated with IPO issues which have relatively low underpricing[26]. Taylor also provides results consistent with Balvers *et al*. (1988), in that the choice of a high quality auditor is relatively more important where a lower quality underwriter is marketing the IPO.

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[26] Beatty (1989) finds no significant relationship between underpricing and auditor quality.

2.2.6.2 Banker / Broker / Underwriter Reputation

Another signalling mechanism available to firms wishing to issue IPO securities is through the reputation of the selected investment banker and/or underwriter. A firm hiring a high quality investment banker thus receives certification as to the accuracy of the valuation of the offering and that the firm is not trading on private information in making the issue. A high quality investment banker is presumed to be efficient in information search, even to the extent that the investment banker may know more about the value of a business than the proprietors [Baron (1982)]. High quality investment bankers also have a costly non-salvageable investment in reputational capital.

Booth and Smith (1986) develop a certification hypothesis, which states that underwriters play an important role in reducing *ex ante* uncertainty by certifying (through their reputation) that potentially adverse inside information has been reflected in the issue price.

Ritter (1987) argues that the investment banker not only collects, certifies and distributes private information held by the proprietors of an IPO firm, but also collects and distributes information about the market demand for an issue. These roles are greater in firm commitment underwriting agreements, where price testing takes place prior to setting the issue price. He also argues a role for over-allotment options in certifying the value of an issue.

Carter and Manaster (1990) test whether prestigious underwriters are associated with firms having less valuation uncertainty (i.e., a smaller standard deviation of underpricing) and whether prestigious underwriters are associated with firms having less price run-up (underpricing plus returns in the first two weeks of trading). Carter and Manaster (1990) define quality on a zero (low) to nine (high) scale, developed by examining the rankings of underwriters in ‘tombstone’ announcements in the Wall Street Journal. The results

confirm that underwriter prestige is significantly negatively related to both valuation uncertainty and price run-up.[27]

Evidence of a weak inverse relationship between broker/underwriter quality and underpricing is found by Taylor (1991). In contrast to Carter and Manaster (1990), Taylor classifies a broker/underwriter as high quality (on a binary scale), if the firm is:

(i) majority owned by a bank; or

(ii) among the top six underwriters by market share; or

(iii) a national (rather than state-based) firm.

The certification hypothesis suggested by Booth and Smith (1986) was empirically tested by Maritz (1992). The decision to employ a high quality underwriter to certify the quality of an IPO is seen as a benefit to high quality issuers. Lower quality issuers will choose (or be accepted by) lower quality underwriters. Maritz suggests that high quality issuers may face a trade-off in choosing their underwriter. As explained above they can 'rent' some reputation by hiring a high quality underwriter, or if they expect to make future issues, it may be to their advantage to develop firm specific reputation in the new issues markets. Maritz shows that his measure of reputation acquisition is greater for firms who selected a lower quality underwriter at its IPO.

Banking arrangements may form an important element in the valuation decision. James (1987) finds (positive) abnormal returns in security prices following the announcement of new bank lending arrangements, in contrast to most other capital raisings (see Smith (1986)). Banks, being inside debt providers, may provide a certification role in the case of new security issues. Banks can demand and receive private information on the firm's prospects and other value relevant information, which can not credibly conveyed to the market without loosing its proprietary value. The monitoring of loans by banks, to

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[27] Carter (1992) considered both bond and equity subsequent issues, and found them to be negatively associated with IPO underpricing and firm risk, while being positively associated with underwriter reputation.

ensure acceptable performance, may further reduce the moral hazard problem associated with the issuance of equity. The hypothesis tested in Slovin and Young (1990) follows this reasoning, suggesting that underpricing is lower for firms with banking relationships (lower uncertainty). Their results show that bank debt or line of credit arrangements are significantly negatively related to underpricing, even after controlling for type of underwriting, the size of the issue and retained ownership. Slovin and Young (1990) also show that the choice of underwriting agreement type (best efforts or firm commitment) can be modelled using the significant variables of bank debt and line of credit.

James and Weir (1990) develop a model in which issuing firms have the choice of developing banking arrangements prior to making an IPO. High quality issuers can, at a cost, apply and receive a bank borrowing arrangement, which can be observed by potential investors. This reduces uncertainty and required issue discounting. Low quality issuers face a risk that the bank's assessment of the firm's value will be low, and the arrangement will be declined. For the firms in their sample that had banking arrangements, underpricing was significantly lower than for firms without any arrangements (9% / 31%). James and Weir also find a similar result to the presence of long-term debt, and this does not support a hypothesis of a unique role for bank debt. Further the size of the debt agreement is unrelated to underpricing with an unexecuted credit agreement giving the same effect as an actual borrowing. The borrowing arrangements are examined to see if they are proxying for an omitted variable such as assets in place, age of the firm or sales history. While age and sales are significant predictors of the existence of bank arrangements, they were insignificant when included in the regressions of underpricing.

It appears that the investment banker reputation is an important factor is certifying the quality of an IPO, but it clearly interacts with other signalling and reputation effects.

2.2.6.3 Venture Capitalist Reputation

Venture capitalists are another potential source of verification of IPO value. Venture capitalists offer certain private firms intermediate financing as well as managerial and technical expertise in return for equity stake in the venture. As these businesses mature, the venture capitalist introduces the firm to the equity market and reduces its direct control. IPOs that are venture capitalist backed should, therefore be able to approach the market with less uncertainty and lower issuing costs (including underpricing), all other things being equal. In effect the venture capitalist, being a repeat participant in the new issues market, vouches for the IPO through its acquired reputational capital.

The role of venture capitalists is examined by Barry, Muscarella, Peavy and Vetsuypens (1990). They conclude that the better monitoring services provided by the venture capitalist led to lower IPO underpricing. Post IPO, the venture capitalists if found to hold a concentrated equity position, serve on the board of directors and maintain their investment in the newly listed firms.

Megginson and Weiss (1991) compared a sample of venture capitalist backed IPOs with a matched sample of non venture backed IPOs to examine issue costs.[28] They found that the venture capitalist backed IPOs have some discriminating characteristics, in that they tend to be raising larger amounts of capital, have larger equity components in their financial structure and are younger than their control firms. Megginson and Weiss (1991) find that the presence of a venture capitalist reduces issuance costs, through both the initial return (underpricing) and the spread required by the underwriter. These results are far stronger than those found by Barry *et al.* (1990), as a result of the power of the matched pairs design and the focus on the industries in which venture capitalists operate. It should also be noted that venture backed IPOs are also associated with the use of

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[28] Matching is primarily on industry classification (SIC code), as Ritter (1984) shows that industry may be a significant factor in underpricing and that venture capitalists tend to only operate in certain industries.

higher quality underwriters and auditors, further mitigating the uncertainty of the issue. The venture capitalist is also shown to hold a considerable stake in the IPO prior to and following the issue (retained ownership) which strengthens the certification the venture capitalist brings to the IPO firm.

In contrast, tests of Australian venture capital backed IPO by da Silva Rosa, Velayuthen and Walter (2003), do not find underpricing of these firms to be less than underpricing of non-venture capital backed IPOs.

2.2.6.4 Issuing Firm Reputation

Maritz (1992) develops a model for the acquisition of issuing firm reputation which is based on a multi-period extension to the Myers and Majluf (1984) model of capital raising. The Myers and Majluf (1984) model shows that in a 'single shot' game (i.e., a single equity issue), there are optimal (opportunistic) issue strategies. Under such a model there are deadweight losses (i.e., costs imposed by wary purchasers). Maritz's assumes that issuers have an infinite issuing horizon (or at least an unknown but finite issue horizon). This means the issuing firm can be assessed and disciplined by the market over a number of issues. The Pareto superior 'trigger strategy' Maritz (1992) develops allows the deadweight costs to the firm to be reduced.

2.2.7 Information Gathering and the Partial Adjustment Phenomenon

In Benveniste and Spindt (1989) an information asymmetry between the investment community and the firm (and underwriter) exists, where individuals in the community may hold value relevant private information. The underwriters' task, given his goal is to maximise issue proceeds, is to get these informed investors to truthfully reveal their information. The underwriter has several tools available to him (discriminatory pricing, discriminatory allocation and a two stage issue process), which Benveniste and Spindt

(1989) show can be used to gather information from investors and thereby maximise IPO issue proceeds. Underwriters may also provide a service to IPO firms that Benveniste and Spindt (1989) call 'arm twisting'. Underwriters, unlike issuing firms, can pool IPOs and allocate the equity to regular investors. This gives rise to a situation in which the underwriter can extract full information disclosure from 'regulars', and even coerce the 'regulars' into accepting overpriced issues by threatening to cut their allocations in future issues.

In issues for which positive information is gathered (and offer price is revised upwards), the truthful disclosures made by investors may be compensated through larger allocations of shares. But given the limits on the number of shares available they may also be partially rewarded through the issue price not fully reflecting (not increasing to) the indicated true value. The incomplete adjustment in price to the gathered information is known as the partial adjustment phenomenon of offer price.[29]

Where the information gathering process described above discovers favourable information and demand, one possible result might be expansion of the supply of shares available through the exercise of over-allotment options held by the underwriter of the issue.[30] The use of over-allotment options is found by Hansen, Fuller and Janjigian (1987) to increase the costs of the issue by one percent of the gross proceeds. These over-allotment options may be a form of insurance against some clients reneging on indications of interest. If the underwriter (in a firm commitment agreement) allocates only the number of shares available in the prospectus, there is a risk that some clients may renege and the underwriter may be left holding the shares and bearing inventory

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[29] Partial adjustment phenomenon was first discussed by Ibbotson *et al.* (1988).

[30] Over-allotment options occur when the company issuing new equity grants an option to the underwriter (or syndicate), giving it the right to purchase additional shares beyond the number registered in the prospectus. The over-allotment may be ten to 15 percent of the number of shares on issue. Over-allotment options are also known as green shoe options since this sort of arrangement was first used for an equity issue by the Green Shoe Company.

costs. However, if the underwritter over-allocates the shares, the costs of reneging clients can be eliminated.

The book-building hypothesis and the use of the over-allocation option is examined by Hanley (1993). She examines the process by which the offer price is set and revised, from the preliminary offer price range required by the SEC in the 'red herring' prospectus to the final offer price, as well as considering revisions to the supply of shares offered (and the over-allotment option).[31] These offering characteristics are then compared to the pre-issue information gathering activities of underwriters. Where favourable information is gathered in the pre-selling period from potential investors, upward revisions of the offer price are expected to occur, with the reverse being true for unfavourable information.[32]

The empirical results of Hanley (1993) support the Benveniste and Wilhelm (1990) model, with underpricing being positively related to revisions in the offer price through the pre-selling period. This means that the offer price only partially adjusts for the information revealed by potential investors. Changes in the number of shares offered in an issue are also positively related to offer price revisions, being the proxy for the information received by investors. One of the conclusions drawn by Hanley (1993) is that issuers (jointly with underwriters) prefer to compensate potential investors for the information they divulge through underpricing rather that increased allocations, because the latter dilutes the original owners' residual claims on the firm.

Testing the Benveniste and Spindt (1989) model, the share allocation process of underwriters, or more specifically their discriminatory power, is investigated by Ljungqvist and Wilhelm (2002). They find that IPO share allocations worldwide favour

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[31] The red herring prospectus is filed with the SEC to obtain official approval and is also used as a pre-selling document. The SEC requires (in Regulation S-K) that the offer price range included in this document must be a 'bona fide estimate' of the final offer price.

[32] Upward revisions from the mid-point of the preliminary offer price range in the red herring prospectus.

institutional investors, and that the participation of institutional investors promotes price discovery, thereby reducing issuance costs.

Hanley and Wilhelm (1995) obtain a sample of data[33] that allow them to test the coercive powers of underwriters. In this hypothesis, underwriters coerce informed (institutional) investors to supply their information, either favourable of unfavourable, and to invest in all issues offered to them on a *quid pro quo* basis. Further, in order to receive an allocation in future IPOs, the informed investor may be called on to take a proportion of issues where the demand is weak. In this situation informed investors willingly disclose any adverse information they hold during the pre-selling period, which might reduce the final issue price. The Hanley and Wilhelm (1995) evidence shows that institutions receive a similar proportion of both good and bad issues, but that the gains on the good issues more than compensate institutions for the losses on the bad issues.[34] It also supports the book-building hypothesis that underpricing has a role in extracting information about the IPO. They argue that the winner's curse model of Rock (1986) does not fit the empirical facts. Lee *et al.* (1999) disagree, pointing to the fact that information on the rationing process (rather than just allocations) is required to test Rock's model.

Lee *et al.* (1999) use the transparent issuing environment in Singapore to discover alternate interpretations of the Hanley and Wilhelm (1995) experiment. Lee *et al.* (1999) use a sample of 91 IPOs[35] for which both the application and allocation details of the issue were publicly disclosed. Information advantage is proxied by the size of an application, as informed investors will be more likely to invest in underpriced issues than

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33 Hanley and Wilhelm (1995) use a sample of 38 IPO handled by one lead underwriter and obtain allocation details - specifically the proportions of the issue allocated to four investor groups, i.e., domestic institutions, foreign institutions, retail and external retail investors.

34 This further assumes that the identities of these institutional groups are identical for each issue.

35 Note that these IPO are from all underwriters, not just one firm, and form the basis of the entire market in Singapore. Thus practices which might be unique to any one financial institution (underwriter) are eliminated.

their uninformed counterparts. When allocations are examined, Lee *et al.* (1999) find results that are similar to that of Hanley and Wilhelm (1995), but when the application data and the rationing implicit in the process of going from applications to allocations is also considered, quite a different result becomes apparent.

Large (informed) investors have a demand expansion function far more responsive to changes in underpricing than small investors. Informed investors can spot bargains. Thus, informed investors face better odds of receiving an allocation in a bargain issue notwithstanding that their rationing is more severe than for small investors. This results in the implications of Rock's (1986) model being confirmed (i.e., large investors swamp out small investors on the most underpriced issues while they withdraw from unattractive issues, leaving the small investor with the winners' curse).

2.2.8 Information Cascades and Market Conditions

The rational pricing of IPOs may depend on the behaviour and perceptions of potential IPO investors. Welch (1992) models the pricing decision in a setting in which an IPO is sold sequentially to a group of investors.[36] In this model, if investors who are approached later in the sequence are able to observe the purchasing decisions of those investors approached before them, their investment decisions may become contingent on the issue's prior success.[37] Early investors make their decisions based on information available to them, while later investors tend to discount their own (private) information in favour of the implied information of those who precede them.[38] This means that an investor may choose to invest in issues for which he has negative information, or abstain from an issue in which he has positive valuation information.

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[36] This implies issues do not open and close on one day, or that subscriptions are filled as they are received.

[37] Underwriters have reputational incentives to truthfully disclose prior sales.

[38] The actual information of the earlier investors is not available, but its signal can be implied.

In this setting the order in which sales occur, combined with information 'learned' from predecessors forms a cascade which may swamp the available information set. An IPO priced to attract early investors, in a cascade, will be highly successful while another IPO scorned by early investors is likely to fail. Welch (1992) shows that underpricing is a rational response by issuers to avoid the risk of the issue failing completely. He also shows that it may be Pareto optimal for issuers to use fixed price issues (priced to cause a cascade) rather than use variable price issues (i.e., auctions or tenders).

Welch (1992) claims that underwriters are at less of an information disadvantage, where they can use cascades to overcome the situation where some investors hold negative private information. Further, the underwriter should choose to segregate investors to limit the direct transfer of information.

This model, like the winners' curse, is able to explain overpriced IPO issues as well as underpriced ones. Aftermarket prices aggregate total information in determining value, unlike the underwriters' segregated market. Thus the (full-subscription) issue price may be above or below the aftermarket price.

Finally, the Welch (1992) model of cascades in IPOs also explains how some issues can be withdrawn (fail) notwithstanding that there is positive (albeit inside) information. If the issuer is unable to communicate favourable inside information the issue price set may be unattractive to the investors first approached, and given a cascade, other investors may decline the offer. The underwriter may be forced to withdraw the issue due to 'adverse market-conditions'.

2.2.9 Tax Minimisation

The effect of personal taxes is considered by Dandapani, Dossani, Prakash and Reside (1992) to be a motive for entrepreneurs to deliberately underprice an IPO. They identify

the asymmetric taxation treatment of capital gains and ordinary income in the US prior to the 1986 tax reforms to be a cause of underpricing. They argue that where:

(i) there is differential personal taxation (i.e., capital gains are taxed at a lower rate than ordinary income),

(ii) the entrepreneur sets the IPO issue price, and

(iii) the entrepreneur retains a significant proportion of the ownership (through purchasing shares at the issue price),

there is an opportunity for the entrepreneur to maximise his wealth through underpricing. If the entrepreneur fully prices the issue and receives his benefits for the promotion via salary, royalties or dividends, his benefits are realised and are taxable. If on the other hand he receives his benefits through a lower purchase price of IPO shares then he receives unrealised capital gains which are only taxable when they are realised, and possibly at a lower rate of taxation. Some evidence of this tax explanation is documented by Dandapani, Dossani, Prakash and Reside (1992) through a reduction in underpricing after the Tax Reform Act of 1986, when the differential on personal taxation was removed.

This tax-based motive was further explored by Reside, Robinson, Prakash and Dandapani (1994), who also control for other factors associated with underpricing. Using a multivariate regression model of underpricing, they find a significant coefficient on a dummy variable for change in taxation law.

2.3 Recent Directions in the IPO Literature

A number of new directions have appeared in the IPO literature in the past two to three years. Two of them to be discussed here deal with measurement (or perception) of underpricing, and explanations of recent trends in IPO underpricing. Behavioural patterns (cognitive psychology) and actions have been introduced for owners, managers, venture capitalists and investment bank/underwriters, to aid our understanding of their choices.

2.3.1 Measurement Issues

The issue of IPO underpricing measurement has recently been questioned. Traditionally IPO returns are viewed from the point of view of (new) investors (i.e., the return to subscribers to the IPO, usually without considering rationing). Alternatively, we can view the IPO process from the original owners' point of view. For the owner, underpricing is an opportunity cost. If the owners were to sell one hundred percent of the firm, this cost would be fully realised. But on the other hand if the owners does not sell the entire firm, they would incur the cost via a dilution effect on their holdings.

Habib and Ljungqvist (2001) model the owners' decisions in bringing the firm public. IPO underpricing[39] is traded off against the marketing costs (i.e., promotion and underwriter choices) in ways to optimise the flotation costs. They conclude that issuers will have differential incentives to reduce underpricing, based on their retained ownership, secondary sales[40] and participation in the issue. Habib and Ljungqvist (2001) suggest that wealth loss is a more appropriate measure of an IPO's success when viewed from the existing owners' point of view. In Taylor and Whittred (1998) the use of a

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39 They dub this "headline" underpricing.

40 Secondary sales are shares being sold by existing owners, not the issuing firm. These "used" shares do not raise capital for the IPO firm.

dual class security design[41] can be seen as optimal where existing owner/managers have human capital specific to the firm. This allows control to be maintained while offering external investors an equity interest, and provides an alternative to the use of retained ownership.

Prospect theory is introduced as an explanation for underpricing by Loughran and Ritter (2002). Prospect theory suggests that an individual's behavioural perceptions influence how they think about or deal with gains and losses. An owner/entrepreneur may 'anchor' their expectations on the (expected) issue price, thereby determining their own wealth (from their retained ownership). If market values are above the issue price, the owner/entrepreneur sees an unexpected wealth gain, rather than the opportunity cost (loss) from selling some of their shares at a price that is below market price. By combining (or integrating) these two wealth effects, the issuer may be 'happy' to have left too much value on the table in the sense of underpricing. Therefore owners (with retained ownership) may view underpricing (even in large amounts) as good news.

2.3.2 Trends in Underpricing

Another direction in the literature is to explain why underpricing has changed over time, particularly during the years 1999-2000 which are often referred to as the internet boom or 'dot.com bubble'. To this point, changes in underpricing have been explained by three hypotheses: the changing risk composition hypothesis, the realignment of incentives hypothesis, and the changing issuer objective function hypothesis.

The first hypothesis (changing risk composition) is based on the presumption that the initial return (underpricing) is related to the risk of the issuer. Therefore if the riskiness of firms making IPOs has increased (say in 1999-2000) then underpricing should be

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41 During the time of this study Australia had a second board market that allowed management shares to have superior voting rights.

higher. While Loughran and Ritter (2003) find some evidence of an association between changes in risk and underpricing, they conclude that changing risk is only a minor factor explaining changes in underpricing.

Ljungqvist and Wilhelm (2003) introduce the realignment of incentives hypothesis as an explanation for the changes in underpricing. Under this hypothesis, changes in the structure of the IPO offer has reduced the incentive of decision makers[42] to seek higher issue prices (i.e., lower underpricing). Ljungqvist and Wilhelm (2003) suggest that reductions in insider ownership (particularly that of CEOs), more fragmented ownership, less use of secondary sales by insiders and increased use of 'directed share programs'[43] contributed to the increase in underpricing during 1999-2000.

The changing issuer objective function hypothesis of Loughran and Ritter (2003) suggests that, holding other firm and issue specific attributes constant, issuers may have become less concerned with avoiding underpricing (during the internet bubble), and more interested in seeking other outcomes. Loughran and Ritter (2003) discuss two of these alternate objectives, being the analyst lust hypothesis and the corruption hypothesis. In the analyst lust hypothesis issuers are more interested in hiring a lead underwriter with a highly ranked analyst to cover the firm, than they are about choosing an underwriter so as to minimise underpricing. If analyst coverage is important to the IPO then this might explain a willingness to leave money on the table. The corruption hypothesis might also explain excessive underpricing, under which IPO firm decision makers are co-opted into a sub-optimal issue process by side-payments from underwriters. Underwriter practices, such as one known as 'spinning'[44], became prevalent amongst some segments of the IPO

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42 These are the decision makers of the issuing firm.

43 Directed share programs allowed specified persons the right to purchase shares at the IPO price. Examples of such persons include family, friends, employees, suppliers and the venture capitalist.

44 These types of practices have been the focus on numerous financial press articles during 1997-2002. Spinning refers to a situation where the executives (or venture capitalists) of a potential IPO firm are offered an allocation of "cheap" shares in other "hot" IPO as an inducement. A trading account could be set-up for potential customers following an initial deposit, with trading authority being assigned to

market in the late 1990s, whereby various investment banks (underwriters) would bid for an upcoming IPO by offering favours to its decision makers rather than offering competitive fees, service or pricing. Under these kinds of conditions, IPO firm managers may forgo higher issue prices for their own private gain.

The recent directions in the IPO literature discussed in this section highlight several key points. Firstly, in both the measurement of underpricing and the consideration of incentives for IPO decision makers, retained ownership is a key concept. This thesis deals with the interaction between retained ownership, underpricing and subsequent equity activity. Section 5.3 considers underpricing and adjustments to its measurement, concluding that the use of retained ownership as a control variable is appropriate, given the environment of the tests. The second point raised relates to extreme variations in underpricing in recent years. As this thesis deals with a sample from an earlier period, one in which underpricing is more stable, the literature dealing with the changing levels of underpricing has been considered but will not form part of the current investigation.

2.4 Summary

Empirical studies of the IPO underpricing anomaly show a persistent but temporally varying initial return to IPO subscribers which exceeds the expected returns to investors in an efficient market. This chapter has examined numerous explanations for this phenomenon, and concludes that no one explanation provides a complete solution for all situations where IPO underpricing is observed. The interaction between various models, causes and beliefs seem to be important, with behavioural aspects being combined with rational expectations and agency motivations. Signalling, market feedback and reputation arguments form the foundation of the current research work.

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the broker/underwriter firm. Shares in other IPOs would be purchased and then flipped immediately in the aftermarket for a quick windfall profit.

Chapter 3.
Review of the Long-Run and Timing Anomalies Literature

Two other anomalies have been widely documented in the IPO literature. These are outlined in Ibbotson *et al.* (1994). First, IPO firms have long-run returns that are abnormally poor, given the predictions of the efficient market hypothesis. Second, there is distinct temporal clustering of IPOs. While this clustering *per se* is not an anomaly, clustering due to opportunistic behaviour in the issuance of equity would be inconsistent with the operation of an efficient market. In Section 3.1 the empirical evidence on the long-run performance of IPOs is reviewed. The poor IPO performance calls into question some of the IPO underpricing theories. Some explanations that have been offered for this abnormally poor performance are considered in Section 3.2. Evidence of the time clustering of IPO issues and explanations for this phenomenon are reviewed in Sections 3.3 and 3.4 respectively. The Section 3.5 contains a summary of our understanding of these additional IPO anomalies.

3.1 Evidence of the Existence of Long-Run Decline

Investment in IPOs, given an expectation of competitive and efficient markets, should earn a risk adjusted return comparable with other market investments. In most countries the empirical evidence is inconsistent with this expectation. On average IPOs have extremely poor returns for three to five years after listing. In this section a review of the evidence of this anomaly provides a starting point from which the post-listing activities of the IPO firms can be considered.

3.1.1 Post IPO Market Returns in the United States

Ritter (1991) provides empirical evidence of IPO aftermarket performance. Taking a sample of 1,526 IPOs during the period 1975 to 1984, Ritter calculates underpricing (14.32%) and reports the return an investor would receive on a portfolio of IPOs held for a three year period.[45] IPOs offered raw returns of 34.47%, but a (matched) portfolio returned 61.86%, leaving adjusted IPO returns of -27.39%. Ritter identified that in the second, third and fourth year after listing the aftermarket performance of his sample was extremely poor. In years one and five after listing, IPOs tend to hold their ground on an adjusted basis.[46] Ritter finds underperformance is more pronounced for small firms with short operating histories and speculative firms such as those in high technology industries.

Aggarwal and Rivoli (1990) examine the trading patterns during the first year[47] of the IPO's exchange listing. They find a return of -13.73%, contrary to expectations in an efficient market. This result is robust with respect to year of issue, size of issue, issue price and underwriter quality. A similar return is calculated from issue price to first anniversary. This is also negative (-5.45 %) and is similarly robust. Aggarwal and Rivoli (1990) consider the possibility that the initial (underpricing) return is a residual from an aftermarket inefficiency or overvaluation. They interpret their evidence as being consistent with an overvaluation and/or a fad explanation.

A larger sample of IPOs were studied by Loughran and Ritter (1995), who use 4,753 issues from 1970 to 1990. They find that the phenomenon of underperformance is persistent over this extended period. The first five years of listing show abnormal

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45 Ritter's holding period return implicitly assumes monthly re-balancing as each months' return are equally weighted in the calculation. The transaction costs of such a strategy would be prohibitive, and its use exaggerates the result relative to a buy and hold strategy. This is because in Ritter's re-balancing, firms that appreciate are sold and the funds invested in the firms that depreciate in value.

46 See Ibbotson (1975) p.252.

47 This first year is actually the first 250 trading days using daily data.

returns, with IPO returns of 15.7% compared to the control firm's 66.4%, giving a wealth relative of 0.70. (The respective figures for three year after listing are 8.4%, 35.3% and 0.80) The annualised IPO return is 5.1%, compared to a government bond rate of 7.0% or portfolio of comparable stocks of 11.8%. Loughran and Ritter (1995) found that the poor IPO returns are not due to size and market to book effects. Although underperformance appears within 18 months of the issue, there is no evidence of underperformance in the first six months.

Ibbotson *et al.* (1994) claim those IPO firms that issue in high volume years, (see Section 3.3 on time clustering) perform worse in the aftermarket than those issuing in low volume years. Established firms are argued to perform satisfactorily, in contrast to start-up firms.

The price performance of closed-end investment funds also appears anomalous, with the shares (units) in such firms selling at a discount to the sum of their investments. Weiss (1989) compared closed-end fund IPOs with a similar (control) group of IPOs. She found that the closed-end funds yield a lower initial return than the control IPO group, and that they trade at significant discounts within the first 120 days of listing.[48] The factors cited as the primary differentiating (and significant) features of the two groups were the underwriter spread (selling fee), which was larger for closed-end funds, and much lower levels of institutional ownership. These factors suggest that the closed-end funds have a retail clientele who require (and pay for) diversification services, explaining the discount to net asset value.

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48 The mean discount (cumulative index adjusted return) is -15.054%, with the Bond funds, United States Stock funds and Foreign funds showing discounts of -6.207%, -23.217% and 17.735% respectively after 120 days of listing. Her control group discount was 0.55%, this being insignificantly different from zero.

3.1.2 International Evidence of Post IPO Market Returns

The international evidence provides additional support for the finding that IPOs offer (on average) abnormally poor return performance for at least three years after the issue. Appendix 1 contains a comprehensive tabulation of IPO long-run return studies from around the world.

Loughran *et al.* (1994) compile information on the aftermarket performance[49] of nine national equity markets. Six of these exhibit negative adjusted returns over a three year period. In Japan, Korea and Sweden IPOs outperform market indices. Evidence of underperformance is also available for several European countries, some of these studies being reviewed in the remainder of this section.

Levis (1993) investigates the long-run performance of 712 IPOs that listed on the London Stock Exchange between 1980 and 1988. He documents underpricing of approximately 14.3% and calculates monthly returns for 36 months after listing. The cumulative adjusted return is between -8.31% and -22.96%, with the range depending on the choice of market index. The smallest abnormal return reported in Levis (1993) corresponds to a small firm index measure, hence some of the abnormal return measurement may be due to inappropriate index adjustments. These results are similar to Ritter (1991) and suggest the long-run decline is not due to institutional arrangements particular to the US.

The long-run returns of IPOs issued in the emerging capital markets of Latin America are documented in Aggarwal, Leal and Hernandez (1993). They study three IPO markets (Brazil, Chile and Mexico), and although their results are somewhat mixed, they conclude that overall their evidence is consistent with more developed capital markets. The short-run analysis found mean underpricing to be 78.5%, 16.3% and 2.8% for Brazil,

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[49] The studies in Loughran *et al.* (1994) Table 7 all use three year equally weighted buy and hold strategies and are adjusted for market index movements.

Chile and Mexico respectively. These mean results need to be cautiously interpreted due to small sample size, high variance and high rates of inflation in the three countries.

The long-run analysis showed a three year return of -47.0% for Brazil and -23.7% for Chile. The wealth relatives were 0.67 and 0.83 respectively. The one year returns on Mexican IPOs were -19.6%, with a wealth relative of 0.81.

Finnish IPOs studied by Keloharju (1993) also exhibit a negative drift over the first three years of seasoning. The study considers 80 Finnish IPOs issued between 1984 and 1989. It is interesting that this study, unlike many others, covers a period in which the market index declined (i.e., a bearish market). The return after 36 months of listing is shown to be -26.4%. This decline is shown to be temporally stable through the study period. Risk mis-specifications are insufficient to explain the observed returns. The choice of market index and the inclusion of small firms were found to have some influence on the results. Keloharju (1993) concludes that his sample's long-run returns are similar to those documented in the US.

The long-run evidence most pertinent to the current study is provided by Lee *et al*. (1996b) on the Australian IPO market. They study the long-run returns of IPOs over a one, two and three year period, and report a three year return to a buy-and-hold strategy for IPOs of -51.581%.[50] This result is consistent with the poor performance in the US and internationally. It is implausible that risk adjustments and different weighting schemes can explain the poor performance. Lee *et al*. (1996b) show that the survival rate of the IPO sample is far lower than that of the population of listed firms, and this exacerbates the loss incurred by IPO investors. Univariate examination of the one year long-run return shows significant relationships with firm size and a proxy for the level of informed demand. Smaller IPOs tend to perform better, while firms with stronger informed demand (less delay in listing) have superior one year returns. These

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50 This figure excludes the underpricing return.

relationships lose their significance as the return window is expanded to two or three years.

A surprising result is that the two and three year returns are negatively related to the level of retained ownership, with the strength of this relationship seeming to increase with seasoning. A pure signalling role for retained ownership (initially) predicts a positive relationship. A possible explanation for this result is that the strength of the retained ownership signal may be reduced through subsequent issues of shares (SEOs).

Da Silva Rosa, Velayuthen and Walter (2003) did not find post listing underperformed for a sample containing both venture capital backed and non-venture capital backed Australian IPOs, suggesting that the poor long-run return performance evidence might be time period specific.

In contrast to their Australian evidence, Lee, Taylor and Walter (1996a) find normal long-run performance for Singapore IPOs. They study all 132 IPOs issued on the Stock Exchange of Singapore (SES) from its incorporation in 1973 through to the end of 1992. Allocation details were available for 128 of these issues, allowing a rationing adjusted initial return to be calculated. The average raw underpricing was found to be 31.39%.[51] Once this return is adjusted for the effect of rationing (via balloting and pro-rata procedures) the initial returns are less than one percent and are insignificantly different from a risk-free rate. This result is consistent with the rational expectations model of Rock (1986).

The long-run returns for Singaporean IPOs in Lee *et al*. (1996a) are quite different from other national settings, in that they report IPOs performance matches market returns, consistent with an efficient capital market.[52] In interpreting this result Lee *et al*. (1996a)

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51 When all costs of subscription are considered, the compound return was approximately 25%.

52 Lee *et al*. (1996a) report IPO performance after market adjustment is slightly positive with a 750 day wealth relative of 1.008.

note that strict listing requirements on the SES restrict prospective IPOs to less risky firms, and no Singaporean IPO failed during the study period. The authors note that these institutional features help to enforce an efficient market result, but impose the costs of monitoring and limited access to equity markets for riskier firms.

3.1.3 Operating Performance of IPOs Post Listing

An alternate way of reviewing the post-issue performance of IPOs is to consider operating performance measures from published accounting reports, which allow investors to break down information asymmetries.

A significant decline in operating performance measures are found by Jain and Kini (1994) during the five years following the IPO issue. They report that two key measures of performance, operating return on assets and operating cash flows to total assets, decline for the first three years on both a raw and industry adjusted basis. Decomposing this result, sales and capital expenditures are shown to have significantly increased, however asset turnover significantly decreased. This indicates that market share and investment have increased, but that efficiency and resource utilisation have been lost. IPOs are also found to have significantly higher price-earnings (P/E) and market to book ratios at the time of issue than the industry median. These ratios decline (statistically significantly) over the following five years. The same result is found for earnings per share (EPS) ratios, confirming a decrease in earnings and that it is not an artefact of falling share prices.

Jain and Kini (1994) partition their results in order to provide evidence on two alternate hypotheses. Firstly they partition on the level of ownership retained by entrepreneurs (and venture capitalists) to test agency explanations of the poor performance. The sample of 682 IPOs was split at the median retained ownership. Significant differences are found between the groups on most measures. Both groups underperformed the industry control, though the high retained ownership group performed better than the low

ownership group. Secondly, they partition on the median level of initial underpricing. No significant difference between groups was detected, thus a 'signalling through underpricing' hypothesis is not supported.

Mikkelson and Shah (1993) also study the post issue performance of IPOs and reach similar overall conclusions to Jain and Kini (1994), but with several exceptions. Most notably Mikkelson and Shah (1993) find that initial underpricing and subsequent operating performance are inversely related. This suggests that firms with ex-post poor performances are underpriced more, possibly through a conscious decision of the underwriter. IPO firms with an established operating history (five years of sales) are found to have performance measures close to that of their industry, leaving underperformance to the smaller start-up firms. The conclusion is that the performance of start up firms reflect the normal activities of firms at this stage of development. A contrary result is found with regard to the level of secondary sales by pre-offering shareholders and operating performance (i.e., higher secondary sales are associated with better performance). This result may be caused by the proxy capturing an age effect rather than the agency costs of reduced insider ownership.

The accounting choices made by firms prior to their IPO are studied by Aharony, Lin and Loeb (1993). They argue that there is an opportunity and an incentive for the entrepreneur to choose income increasing accounting techniques in the years prior to an IPO. Using the total accounting accruals approach, they estimate the unexpected standardised total accruals as a proxy for discretionary accruals.[53] Their results for the total sample of 229 firms are weak, suggesting some limited earnings management for the year directly preceding the IPO.[54] This result was found to be associated with smaller firms and firms with high leverage. While IPO firms that choose a combination

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53 The accruals were standardised by the average total assets employed in the period in order to adjust accruals for the high growth rates observed in IPOs.

54 The sample suffered from an extreme survivorship bias due to sampling technique, data requirements and exclusions.

of prestigious auditor and underwriter had high operating cash flows and did not use accounting accruals to increase reported income, the reverse was true for the remainder.

Stronger evidence of earnings management prior to an IPO is found by Friedlan (1994). He also proxies discretionary accruals made by management as the unexpected standardised total accruals, but standardises using annual sales rather than average total assets as in by Aharony *et al.* (1993). Friedlan (1994) finds that IPO firms use discretionary accruals to increase reported income only in the most recent set of financial statements included in the prospectus.[55] A tendency to use accruals to report a profit rather than a loss is also detected. Alternate explanations for the growth in accruals such as mismeasurement and underlying economic growth are examined and refuted. Further earnings management is observed because the initial accruals are not reversed in the first year after listing. They are reversed in the subsequent two years, suggesting that management is trying to report favourable earnings in the first reporting period after listing.

3.1.4 IPO Underpricing and Post Listing Returns

Affleck-Graves, Hegde and Miller (1996) investigate the relationship between IPO initial returns (underpricing) and trading returns in the immediate aftermarket (20 days post-listing). They find that underpriced IPOs have positive aftermarket returns (2.46%) while overpriced IPOs had negative aftermarket returns (-4.42%). They find these differences disappear after three months. The persistence of returns (pre- and post IPO) are found to be consistent with price momentum or drifts following informational events of the type discussed in Jegadeesh and Titman (1993). Price stabilisation by underwriters and frictions caused by informationally fragmented (asymmetric) markets

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55 These may be from either an interim or annual report.

are attributed as the cause of the observed relationship. Share market feedback would be an alternate explanation.

Rajan and Servaes (2003) provide indirect evidence of a relationship between underpricing and post-listing returns. They show that their measures of 'feedback risk'[56] are highly (positively) correlated with underpricing and, as predicted, are significant (negatively correlated) determinants in a quadratic function explaining the adjusted returns of IPO stocks for three years following listing. They suggest that some irrational behaviour in the IPO market can partially explain all three IPO anomalies: underpricing, poor long-run returns, and time clustering of IPOs.

Lee *et al.* (1996b) used Australian data and found a positive relationship between underpricing and long-run returns. Using regressions that specifies the functional form of the long-run returns as a measure of underpricing and underpricing squared, they found that the relationship might be curvilinear, appearing as a hump-shaped function (i.e., the majority of issues exhibited a positive but decreasing relationship between initial and subsequent returns). Their results allow the rejection of the 'speculative bubble' or 'fad' explanations, and are consistent with either underpricing being a signal of firm value, or the market feedback model of Rajan and Servaes (2003).

3.2 Explanations of the Long-Run Decline

There are relatively few explanations for the abnormally poor post listing performance of IPO securities. The two explanations put forward by Ibbotson *et al.* (1994) are termed 'Excessive Optimism' and 'Impresarios'.

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56 The proxy used to measure feedback risk is the median abnormal turnover on the second trading day for all firms going public in the same month as the IPO firm. The second day (normal) turnover is modelled as a function of size, the standard deviation of the stock's return over 100 days, the absolute price movement from offer to open and its square, two measures of investor sentiment and several industry dummies.

In the excessive optimism theory, greater uncertainty about an IPO can lead to a larger spread between investors with optimistic and pessimistic views on the value of the firm. Optimistic investors have higher valuations, and are therefore more likely to be purchasers of IPO shares (at the time of the prospectus and in the aftermarket). Over time, more information about the firm becomes available and the information asymmetry or uncertainty reduces. A narrowing of the spread and a drop in share prices may ensue.[57] This line of argument is extended by Aggarwal and Rivoli (1990) who suggest fads as an explanation of the long-run drift in IPO returns.

A fad is a period of investor over-optimism which causes temporary overvaluation (i.e., valuation above an 'intrinsic value'). Aggarwal and Rivoli (1990) suggest fads are more likely in the IPO market because:

(i) estimation of the true intrinsic value is more difficult with IPOs,

(ii) as riskier securities, IPOs may attract noise traders whose actions may not conform to the rationality assumptions of efficient markets,

(iii) as IPO investments are often speculative, investors tend to be less risk-averse which leads to greater variation in security valuation, and

(iv) the limited volume of IPO shares available (around listing) may cause the marginal IPO purchaser to have the highest valuation, as shown by Miller (1977).

The impresario hypothesis in Ibbotson *et al.* (1994) suggests that investment bankers choose to underprice certain IPOs in order to create a 'special' atmosphere surrounding the issue. This hypothesis was first introduced by Shiller (1988, 1990). The impression of excess demand, even if it is artificially induced by setting the offer price low, causes

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[57] In this model underpricing may be an artifact of this optimism as in the speculative bubble arguments in Section 2.2.4. Also see Miller (1977) for a discussion of the mechanisms operating in uncertainty resolution.

high initial returns and a high return in the immediate aftermarket, but this is not sustained over time.

Some alternate explanations for post listing returns of IPOs are proposed by Aggarwal and Rivoli (1990). One alternative is that secondary equity markets undervalue IPOs in the aftermarket. This possibility is discounted as it has little appeal in a competitive market. As investors are allowed to take short positions in IPOs in some institutional settings, the expected usefulness of this explanation is reduced. A second alternative is that studies finding an IPO drift have failed to correctly capture the risk premium. However, in some empirical studies the risk premium would have to be significantly negative for this explanation to hold. The third explanation offered is more plausible. Aggarwal and Rivoli (1990) suggest that there are institutional practices that cause the observed return patterns. These practices come in a number of forms, but often the purpose is to limit the supply of IPO shares available for early trading. In one practice underwriters try to place (allocate) IPOs to investors with 'strong hands'. Such investors will commit to hold on to the shares for some time, as compared to a 'weak hands' investor or 'flipper' who will sell out to take profits after listing. A strong hands investor brings stability to the firm, allowing it a chance to adapt to being a public company, while the lower volume helps price support for the shares during the 'lock-up' period. Underwriter syndicate members who are ex-post found to have placed IPO shares with a 'flipper' may have their commissions revoked as a disciplinary measure. In another market practice, the allocation of shares in an IPO issue is said to be subject to an agreement to purchase a given number of shares in the aftermarket as a form of price support.

If these practices exist and their effect is to limit the volume of shares available to be traded during the first year, the resulting pattern of returns may be similar to those observed. However, the first year trading volumes observed by Aggarwal and Rivoli (1990) are not consistent with this explanation. They find that after the first few days the

trading volume is relatively constant while price declines. There was also not a noticeable increase in volume when the 'lock-up' period ends.

The model of IPO issues developed by Rajan and Servaes (2003) suggests that two previously identified risk factors help explain the long-run decline in the aftermarket. Market sentiment, as measured by an IPO's industry market-to-book ratio relative to the market wide market-to-book ratio, is considered to cause price-insensitive demand for the IPO which results in the initial price being above its intrinsic value. Thus market sentiment suggests that at certain points of time, investors have a propensity to be over-optimistic and thereby overpay for the stocks in an industry. Tests in this study show that the 'sentiment' proxy explains a significant proportion of the observed post-listing returns. While this is interesting, it is also of concern as it suggests that an *ex ante* variable can predict future returns. Limits on the ability of investors to short sell IPOs in the aftermarket may mitigate this problem. Rajan and Servaes (2003) further model the long-run return as a negative function of 'feedback' risk. The effect of feedback traders[58] on the initial aftermarket price, causes a long term decline in the returns of the firm.

Jain and Kini (1994) hypothesise that there are three possible causes for the poor post-issue operating performance of IPOs. First, the transition to public ownership and the reduction in management ownership (entrepreneurs) leads to increased agency costs. Second, managers may choose to undertake window-dressing of the accounting numbers prior to the public issue in order to make the issue more attractive. The outcome of such actions in subsequent periods is abnormally poor performance. Finally, issuers may time their issues to coincide with a period of operating performance which is abnormally good, which managers know cannot be sustained.

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58 The demand from feedback traders, who are also known as trend chasers, is based on the feedback risk factor (see Section 3.1.4 footnote) and past price movements.

Studies of the post listing returns of IPOs have documented a persistent underperformance for up to three years following listing. Some results appear to contain a sample specific element, but on the whole the result remains anomalous. Explanations bases on fads, over-optimism and risk have been proposed.

3.3 Evidence of the Existence of Time Clustering

The third anomaly surrounding IPOs has to do with the clustering of IPO issues through time. Firms are able to choose the time at which they make an IPO. Trade-offs between low levels of equity funding, issuing debt or foregoing investment opportunities are balanced against the ability and cost of accessing equity markets. As shown in the following section, much of the empirical evidence demonstrates that the temporal distribution of IPOs is not uniform.

One of the earliest studies of temporal distribution of IPO was performed by Ibbotson and Jaffe (1975). They found significant serial dependence in the number of IPOs that occur in a given month during the 1960s.[59] There were two periods (1960-1962 and 1968-1970) with high volumes of IPOs, with other periods showing markedly less activity. The average abnormal underpricing was also found to be serially dependent with 'hot issue markets'[60] preceding each of the high IPO volume periods. However, Ibbotson and Jaffe (1975) were unable to find any statistical relationship between these hot markets and the volume of IPOs. A hot issue market during 1980 is described by Ritter (1984). He also finds periods of high underpricing followed by high volume, but shows that the 1980 hot market is driven by natural resource stocks.

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59 First order auto-correlation of 0.83.

60 These are periods in which the average initial return is abnormally high. Ibbotson and Jaffe (1975) calculate the average monthly returns and then define hot issue months to be those where the monthly return is greater than the mean. The first order autocorrelation was 0.744 and a random walk process was rejected.

Ibbotson *et al.* (1994) demonstrate that there are patterns in the number of IPOs per month. Months with a heavy (high) volume of IPOs are almost always followed by another month of heavy volume. The first order auto-correlation between monthly IPO volume is 0.89, and shows distinct temporal clustering of IPOs. These swings are related to the patterns of IPO underpricing documented in the 33 year period studied.[61]

Loughran and Ritter (1995) find that one cause of long-run underperformance of IPOs is that issuers are able to time their IPOs with peaks in market valuation. The disproportionate occurrence (i.e., higher volume) of IPOs before market downturns gives the observed pattern, such as in Ibbotson *et al.* (1994). Loughran and Ritter (1993) estimate this timing effect reduces the effective cost of issuing equity by five percent. Another eight percent reduction is a combination of a two to four percent market to book effect, the remainder being IPO underperformance or mis-valuation. This leaves a two percent return on IPOs from a normal expected return of 15% on stocks of similar size. Loughran and Ritter (1993) show that the ability to time issues saves the firm eight percent on its equity funding costs.[62]

3.3.1 International Evidence of Time Clustering

International evidence by Loughran *et al.* (1994) suggests that IPOs correspond with 'windows of opportunity' for 14 of the 15 countries they examine.[63] A regression of the volume of IPOs is performed to examine whether these windows of opportunity are related to growth phases in the business cycle or level of the stock market index (which

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61 Brailsford, Heaney, Powell and Shi (2000) use a regime switching modelling technique to identify hot and cold IPO markets. They find a leading relationship between IPO underpricing and volume of about six months, consistent with market conditions influencing would be IPO issuers.

62 These results are based on "headline" underpricing.

63 This was tested with a simple correlation between the number of IPOs and the inflation adjusted stock market index. Countries were required to have at least 18 years data to be included. Fourteen countries out of fifteen had a positive correlation (thirteen significant at the 10% level).

affect the cost of raising equity funds). The proxies for growth opportunities (three year growth in GDP or GNP) are not useful in explaining IPO activity in general, but the stock price level was found to be significant. This indicates that equity funds may have been raised to take advantage of the relative cost of capital, rather than to invest in future growth opportunities.

Further, the level of activity in the IPO market is shown to be negatively related to movements in the market indices for the subsequent year in ten of the 14 countries studied, although this result is not statistically significant.[64] This leads Loughran *et al.* (1994) to conclude that there is some weak evidence that private firms are successful at timing their issues to coincide with market peaks.

3.4 Explanations of Time Clustering

There are few direct explanations for the clustering of IPOs through time. Ibbotson *et al.* (1994) in their review paper highlight three possible explanations; namely changes in firm risk, positive feedback or 'momentum' strategies, and windows of opportunity. Ibbotson and Jaffe (1975) argue that the total cost (premia) to the issuing firm can be reduced if the IPO is issued in a 'cold issue' market, assuming aftermarket returns are normal. Ex-post we know the long-run returns are poor, so the alternate scenario is more likely to hold (i.e., firms should issue in hot issue markets notwithstanding the high initial discount).

Ritter (1984) recommends that issuers take advantage of the pricing opportunities available following a hot issue market. In these periods, issues are priced at higher (market to book) multiples, resulting in larger capital raisings or smaller proportions of

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[64] The adjusted R^2 for these regressions are extremely low or negative for all but one country. The exception is Taiwan.

the firm being offered.[65] Under these conditions a relatively high equity valuation may be obtained, explaining the observed high IPO volumes.

Several propositions are raised by Loughran *et al.* (1994) that might explain the correlation of IPO timing with market conditions, without invoking opportunism. For example, there may be some periods in a normal business cycle in which investment opportunities are superior. During these periods of hot investment possibilities, firms seek external financing to take advantage of these projects. It is also likely that during these buoyant periods share prices will be higher to reflect optimistic investor expectations. Alternately, if there is a positive association between high market prices and stock market turnover (activity), then market liquidity may influence new equity raisings. Thus, IPO issuers may appear to be acting opportunistically by issuing their IPO, when they are merely responding to market forces.[66]

Tests of the model in Rajan and Servaes (2003) show that the number of firms making an IPO is significantly associated with their market sentiment proxy. If market sentiment is clustered temporally, IPOs might also cluster. Feedback risk is empirically found to be a negative decreasing curvilinear function of the number of IPOs in a given month. This is consistent with the model and its assumptions (i.e., underwriters act exclusively in the best interests of issuers) or the effect of market practices (e.g., limited short selling).

Myers and Majluf (1984) considered the problems firms face when they choose to raise capital. Their pecking order theory suggests that managers will follow some form of opportunism when selecting external equity sales. Lucas and McDonald (1990) and Korajczyk, Lucas and McDonald (1991) offer explanations for the share price behaviour

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65 It appears that underwriters are slow to adjust the price multiples of the IPOs they offer (at least in rising markets) with respect to prevailing market conditions.

66 Lowry and Schwert (2002) re-examine the relationship between IPO clustering and observed underpricing. They find that it is the firm specific information discovered in the pre-listing period that contributes to underpricing, and that if positive information is discovered, increasing underpricing, other firms (possibly in the same industry) are attracted to the IPO market by its revelation.

around and the timing of equity issues, respectively. Together they predict that equity issues will follow periods of rising market prices, that issuers will have experienced a run-up in returns, and that they will occur in periods during which asymmetric information differences are relatively unimportant.

The opportunistic hypothesis of IPO timing is investigated by Brown (1970). He empirically reviews the 1963 SEC finding that small, new ventures that issue an IPO during a 'receptive market' (hot market) perform poorly, in that they are more likely to fail. The hypothesis developed by Brown (1970) is that during receptive market periods, firms with lower marginal return projects will be able to make IPOs. It is suggested that these firms are more likely, given adverse economic conditions, to fail than firms with higher return projects brought to the market in less receptive market states. While this hypothesis might help to explain both the long-run return and clustering phenomena of IPOs, the evidence in Brown (1970) contradicts the model. The failure rate evidence shows that firms making an IPO in unreceptive or high cost markets are more likely to fail. The explanation offered is that these firms may not be able to raise sufficient capital at their IPO, and this undercapitalisation causes solvency problems. Foster-Johnson, Lewis and Seward (2000) find underestimation of the failure rate of IPOs, particularly in hot markets, contributes to the explanation of IPO market cycles and the underperformance of IPOs in the aftermarket.[67]

3.5 Summary

In this chapter the literature relating to two other anomalous features of the IPO marketplace, the poor long-run performance of IPOs and the temporal clustering of IPOs

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[67] Hensler, Rutherford and Springer (1997) model the firm characteristics associated with IPO firm failure. They conclude that IPO will survive longer if they larger, older, had more underpricing or retained ownership. Firm risk reduces the expect firm life as does being a member of certain industry groups.

are reviewed. Poor long-run performance of IPOs has been documented in numerous environments and time periods. There is also evidence of temporal clustering of IPOs into ‘hot’ markets (often following periods of high underpricing). Explanations for these anomalies have often been founded upon opportunistic actions such as timing the issue to be at the top of the earnings hump, windows of opportunity and fads.

However, searching for explanations of each of the three IPO anomalies individually (or even together) may not provide a complete understanding of the issues. If firms see access to capital market as a continuous rather than a discrete event, then future capital raisings need also to be considered. Additional insight might be gained through linking of these three anomalies with subsequent equity raisings via a multi-period model of IPO activity, such as the one presented in the next chapter.

Chapter 4.
Hypothesis Development

This chapter develops the hypotheses tested in this thesis. Prior to developing these hypotheses, background literature on the performance of newly listed firms through time and the effect of seasoned issues of new securities is reviewed. The chapter begins in Section 4.1 with a review of the long-run drift phenomenon, while new equity issue effects are discussed in Section 4.2. In Sections 4.3 and 4.4 the relationships hypothesised between initial public offerings and seasoned equity offerings are explored. Testable hypotheses on the effect of seasoned equity offerings are developed in Section 4.5, and the chapter concludes with Section 4.6.

4.1 Long-Run Drift of Newly Listed Firms

The long-run performance of newly listed firms may be characterised by a downward drift. This finding is broader than just an IPO phenomenon, as it also exists for firms transferring exchanges. In countries where there are several equity exchanges, firms frequently choose to change their trading from one exchange to a larger or more prestigious exchange. In the US, firms often make their IPO on smaller or less prestigious markets such as NASDAQ, before applying for listing on the American Stock Exchange (ASE) or New York Stock Exchange (NYSE).[68] Evidence suggests that newly listed firms on the NYSE and ASE perform abnormally poorly for some time. This result is anomalous, particularly because such a listing normally causes positive stock price reactions.

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[68] Literature on the effect of changes in exchange listing includes Ule (1937), Van Horne (1970), McConnell and Sanger (1984), Sanger and McConnell (1986) and McConnell and Sanger (1987).

In one of the most thorough investigations of the phenomenon, McConnell and Sanger (1987) document the post-listing drift for 3,482 common stocks that listed on the NYSE between 1926 and 1982. They find poor performance for the first two months of listing, with the market adjusted monthly returns being -1.45% and -0.59%, both of which are significantly below zero. It is unlikely that these results are caused by an artefact of the data.[69] A number of ad-hoc theories developed by market participants (also known as 'streetlore') were investigated and dismissed, with several showing results opposite to prediction.[70] An important issue is that these return patterns are independent of the new issues return patterns discussed in Section 4.2.

One explanation for the negative returns on listing is that the risk of the stock is lower after listing, thus market adjustment causes the drift. This is investigated by Bhandari, Grammatikos, Makhija and Papaioannou (1989), who find that risk is higher initially and decreases within the first few months as the firm undergoes a seasoning process. If the return on the market is positive, this means that prior studies may have underestimated the poor performance of these securities on a risk adjusted basis.

Dharan and Ikenberry (1995) re-examine the long-run negative drift in an attempt to rule out several possible biases and to determine the type of firm susceptible to drift. Their tests control for size and market-to-book effects, as these have been shown to be associated with return series in several studies.[71] Although adjusting the return series

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69 The data peculiarities dismissed as causing the negative returns include a few peculiar sub-periods, a few outlier observations, and biases in the first trading price.

70 The streetlore explanations dismissed as causing the negative returns include:
- the loss of market-maker support (from previous market),
- peculiarities of the NYSE,
- firms issuing new equity shortly after listing,
- insiders 'dumping' the stock, and
- a 'correction' to the initial market 'overreaction'.

71 For example Fama and French (1992) and (1993) , Lakonishok, Shleifer and Vishny (1994) and Barber and Lyon (1997).

for these effects reduces the drift phenomenon, the pattern continues and is significant.[72] Next, effects of equity issues (both IPO and SEO) are controlled for with a similar drift phenomenon being observed.

Dharan and Ikenberry (1995) develop a hypothesis that firms act opportunistically in seeking a new listing. Under this hypothesis, firms apply for listing changes at a time when their performance is at a peak, because at this time they have the greatest chance of being accepted to the more prestigious exchange. The entrance rules of the ASE and NYSE generally discriminate against small and/or regional firms.[73] Therefore, a prediction and testable hypothesis is that the opportunistic behaviour and the associated drift will be most prevalent in small firms or firms without a broad appeal to investors nationwide.[74] Dharan and Ikenberry (1995) find that these firms did indeed take the opportunity to time their listing application. This decision of management, like other corporate finance decisions, may be prompted by windows of opportunity which led to the observed phenomenon.

4.2 New Equity Issue Effects

The behaviour of firms which make new equity offerings and their motivations form an important background to any study which considers elements of equity issues. Given that a firm has chosen to issue equity and selected an issue method, there are still a number of elements of new equity issues which deserve some attention.[75] First is a market reaction

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[72] For the sample of listings studied by Dharan and Ikenberry (1995) made between 1973 and 1990, the size and market-to-book CAR for 36 months is -7.02% (size only adjusted -12.84%).

[73] For example, the financial "guidelines" require minimum profit levels (for several years) and equity values measured in millions of dollars rather than as a ratio which would correct for size. The distribution of shareholders and trading volume "guidelines" also disadvantage smaller firms.

[74] These firms bear the greatest risk that they may not meet the listing requirements in the future.

[75] The method used to issue securities can be one of the following: rights offerings, underwritten offers (both firm commitment and best efforts), competitive (or negotiated) bid contracts, or shelf registrations. Factors important to the choice of method of issue as outlined in Smith (1977) include

is observed following the firms' announced intention to issue new equity. Empirical evidence is reviewed in Section 4.2.1 along with some explanations for this phenomenon. In Section 4.2.2, the market performance of these issuing firms is considered, while other observations regarding SEOs are discussed in Section 4.2.3.

4.2.1 Seasoned Equity Issue Announcement Effects

On average the announcement of a SEO is accompanied by a negative abnormal two day return of -3.14% according to Smith's (1986) summary.[76] Numerous studies have documented this persistent and significant market reaction to news of new financing. Mikkelson and Partch (1986) find a two day return of –3.56% for public offerings of common stock on a sample size of 80 issues, while Kalay and Shimrat (1987) find an announcement return of –3.36% using a larger sample of 455 observations. For Australian SEO issues, Dehnert (1991) studied a group of 160 rights issues and finds that the market reaction to the announcement is only –1.2%. While this is lower than the US evidence for public offerings, Dehnert (1991) reports that this is in-line with US rights issues.

Barclay and Litzenberger (1988) use intraday price data to examine market response to announcements of new equity issues. They find that there is abnormally high trading volume and a -1.3% average return in the 15 minutes following the announcement. In

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costs of issuance, institutional details and the benefits of bonding and monitoring provided by underwriters. A summary of the considerations a firm makes in the choice of security type to be issued is provided by Smith (1986).

76 This summary is a collection of base studies, some of the details from which are: Masulis and Korwar (1986) report a -3.25 % two day abnormal return. The returns are more negative where management sells their own shares or where the share price run-up in the 60 days prior to the announcement is greater. Asquith and Mullins (1986) show the two day abnormal return to be -2.7% (-3% for primary equity offerings). The offer dilution (decrease in market value as proportion of issue size) is 31% on average for primary offerings and 78% for secondary offerings. The announcement period return (APR) was shown to be positively related to the cumulative excess return in the 11 months preceding the issue, and negatively related to the size of the issue in proportion to the size of the firm. The APR was not found to be a leverage or tax effect, nor were transaction costs able to explain the reduction in market value.

the hour prior to the announcement a small negative return is also detected. Most of the negative return was reversed following the issue.

Bayless and Chaplinsky (1996) provide evidence that shows that the announcement varies temporally with hot and cold issue markets. During hot markets the two day return is shown to be –2.0% while in cold markets this increases to –3.3%. This confirms earlier evidence by Choe, Masulis and Nanda (1993) of the existence of favourable windows of opportunity to issue equity.

4.2.2 Long-Run Returns Following Seasoned Equity Issues

Not all of the price effects of seasoned equity issues occur during the announcement and issue period. There is some evidence of a continued decline in the market value, contrary to the notion of efficient markets. The evidence on long-run returns for firms that choose to make a SEO is similar to that for IPOs, as discussed in Section 3.1. Spiess and Affleck-Graves (1995) study a sample of firms making SEOs and find they substantially underperform a matched group of non-issuing firms.[77] This underperformance remains unexplained even after controlling for trading system, issue size, firm age and market-to-book ratios effects.[78] Given the similarity in post-issue performance of SEOs and IPOs, Spiess and Affleck-Graves (1995) argue that the high issue prices of equity offerings (and the timing thereof) contribute to underperformance. The implication is that managers use firm-specific information to identify 'windows of opportunity', in which investors are willing to overpay for a firm's equity, and can take advantage of these opportunities. However, the market apparently does not accurately respond to the equity

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[77] The sample is drawn from firms making a seasoned equity offering on either NYSE, AMEX or NASDAQ during the 1975 to 1989 period. Only primary seasoned offerings are included (i.e., excluded are utilities, joint security offerings and insider or secondary sales). The sample size is 1,247 offerings made by 974 firms.Matching occurred based on industry and then on size, in order to control for the most likely factors affecting stock performance.

[78] Underperformance is more severe for young and/or NASDAQ traded firms.

issue announcement signals in a timely manner, but waits for additional information before re-evaluating the firm.[79] The conclusion is that an equity issue announcement (or IPO issue) is not a complete and fully revealing signal, which leads to a negative drift over time.

Loughran and Ritter (1995) document that the stock returns following a SEO are very similar to the returns following an IPO.

A number of recent studies question the evidence on poor returns post equity (both IPO and SEO) issues. Brav, Geczy and Gompers (2000) suggest that post IPO returns are not abnormally low when compared with a benchmark matched on firm size and market-to-book ratios, while SEO firms only rarely underperform the benchmark tests. They also use a Fama and French (1993) three factor model to capture the joint covariation in the IPO returns. They conclude that the observed post issue phenomenon simply reflects a more pervasive return pattern, which is generally present in small, low market-to-book firms. In Eckbo, Masulis and Norli (2000), the explanation for the underperformance (after matching on size and market-to-book) following an SEO is due to risk mismeasurement. As equity issuers lower their leverage through the issue, they lower their inherent risk and therefore their expected return. Matching these firms with non-issuing firms may therefore not be appropriate, leading to a failure of the matched firm technique to properly control for risk

4.2.3 Other Attributes of Seasoned Equity Issues

The timing of SEOs is investigated in Slovin, Sushka and Bendeck (1994). They find that firms tend to issue their first SEO in a rising market, and following a period in which

[79] This could also be described as a market under-reaction to the news release.

the stock price has significantly appreciated.[80] This is followed, on the announcement of the SEO, by an average price drop of 2.9%. This might be interpreted as managers timing their SEO to maximise proceeds.

The results in Loughran and Ritter (1997) confirm that operating results are improving prior to an SEO issue, but deteriorate markedly after the issue. They suggest that, at SEO valuations, investors may be capitalising transitory performance as the expectation of future performance. Investors may discover a more accurate estimate of permanent performance for capitalisation once post listing 'accounting' performance is available. This is consistent with the evidence in Loughran and Ritter (1995) that underperformance does not occur in the first six months after the issue.

4.3 IPOs and SEOs

One reason suggested for firms going public is that they wish to have (ongoing) access to finance in equity markets. An IPO firm accesses public equity on its floatation, but unless it is able to raise sufficient equity funds for future operations, it will need to make SEOs. These subsequent offerings may be priced quite differently from the IPO issue. At the SEO, investors know the value of the firm and some of the initial uncertainty about the firm has been resolved. Parsons and Raviv (1985) explain why seasoned offers are nevertheless priced below the prevailing market price. Typically and optimally, SEOs are priced via a discount from current market value to induce investors to subscribe to the issue.[81]

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[80] The cumulative excess return over the preceding six months was 29% or 20% on a market adjusted basis.

[81] For rights issues and private placements this is often in the order of three to five percent, which may be equivalent to the costs of a fully underwritten offering.

Garfinkle (1993), Welch (1989), Jegadeesh, Weinstein and Welch (1993) and Slovin *et al.* (1994), all document that some IPO firms return to the capital market. [82] [83] [84] [85] Some firms do this within a few years of their initial issue.[86] This supports the anecdotal evidence that issuers regularly access equity markets. This has led financial researchers to view an IPO as the first stage in the firm's strategy to raise finance. Thus, the equity finance for a firm may be raised in one, two or more equity offerings. By thus expanding the timeframe, a more complete examination of the IPO phenomena is possible.

Welch (1989, 1996) develops a number of equilibrium IPO issuing strategies employing the details of both the initial and subsequent equity offers. These equilibria are:

(i) a pooling equilibrium. In this outcome investors can not identify high and low quality firms, as both types of firm raise enough capital at the IPO to undertake future operations and hence need not return to the equity capital markets,

(ii) a first-best separating equilibrium. High quality firms need not underprice at the IPO, because low quality firms voluntarily disclose their quality. This is because the costs of imitating of high quality firms combined with a high probability of their true quality being discovered (prior to a SEO) is prohibitively costly, and

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[82] Garfinkle (1993) finds 101 subsequent equity issues by following the 494 sample IPOs for seven years after their IPO date. This is a 20.4% return rate.

[83] In Welch (1989) there are 288 firms (making 395 issues) of the 1,028 IPO firms that make a subsequent issue (28.0%). Welch (1996) uses data only for firms (574 firms) that make both an IPO and SEO between 1973 and 1992. Of the 4,500 IPO he examines, 1,118 make an SEO in the following ten years (24.8% re-issue). The sample size is reduced due to data requirements and eliminating firms that were not underpriced.

[84] Jegadeesh, Weinstein and Welch (1993) identify 411 SEOs from 1,985 IPOs between 1980 and 1989, which reflects a return rate of 22.2% within a three to nine year period.

[85] Slovin *et al.* (1994) examine 175 industrial firms that have a first seasoned issue following an IPO that traded in NASDAQ between 1971 and 1988 (IPO between 1971 and 1986). They find that the mean time between IPO and SEO for this group is 3.3 years (median 2.0 years).

[86] Welch (1996) comments that the modal time is one year and the average is three years.

(iii) a signalling (underpricing) equilibrium. High quality firms underprice their IPO and undertake (costly) operating activities. Low quality firms on the other hand could mimic the IPO underpricing (by selling shares at a low, though true, value) but these would not undertake operations. Therefore, investors can separate firms on the basis of their operating activities. Only high quality firms recover costs by making an SEO on favourable terms. Welch (1996) extends this analysis by suggesting that high quality firms can further identify their quality by waiting longer (cash starvation of operations) for 'realisation' or 'revelation' of their quality before making an SEO.

In considering the equity financing of firms, we should view the IPO and SEOs as related events in an overall strategy. Slovin, Sushka and Hudson (1990) also consider the inter-relation of equity issues with the firm's debt issues.

Maritz (1992) analyses another aspect of the relationship between IPO and SEOs. He hypothesises that some firms have an agenda of multiple equity offerings over time, and that it is efficient for these firms to develop a reputation for fairly pricing issues (i.e., not acting opportunistically) rather than renting reputation from a high quality underwriter.

4.4 Multiple Issue Models (IPO and SEO) - Theories and Evidence

In the following sections the theorised relationships between the outcomes of issuers' actions at an IPO and SEOs are considered. Key empirical results are also outlined.

4.4.1 Signalling Hypotheses

Many of the theories of IPO and SEO behaviour fall under the general heading of signalling hypotheses. The basis of these hypotheses (as discussed in Section 2.2.5) is

that issuing firms have an incentive to signal their superior quality. Superior quality is known by insiders (owners, managers, promoters and entrepreneurs) but not by investors. The firm may mitigate this information asymmetry by signalling its superior quality. In the following sections the signalling theories (Section 2.2.5) are explored in more detail for a multi-issue setting.

4.4.1.1 Signalling through Underpricing

Ibbotson (1975) first identified that the IPO discount could be a credible signal of good faith. He posited a need to underprice new issues to 'leave a good taste in the investors' mouths'. The underpricing cost could be recovered if positive expectations about the firm are realised. This induces the need for SEOs, at which time retained ownership can be reduced and firm specific risk can be further diversified away. This is a costly (and therefore credible) signal, because expectations may not be fulfilled.

An equilibrium signalling model of this type is developed by Allen and Faulhaber (1989) in which underpricing and retained ownership signal a firm's quality to the marketplace. Firms with positive information about prospects choose to underprice their IPO when certain separating equilibrium conditions apply (i.e., where there is information asymmetry, uncertain firm quality and good prospects for IPO firms). Under other circumstances Allen and Faulhaber (1989) predict that all types of firms will form a pooling equilibrium, in which underpricing would be neither rational nor expected.

In the multi-period model outlined by Allen and Faulhaber (1989), high quality firms underprice because they recover the initial loss ('burning money' and 'leaving a good taste in investors' mouths') by making future offers on attractive terms after their 'true' quality is revealed.[87] Allen and Faulhaber argue that underpricing is both a credible and efficient signal, as monitoring is costless because the direct recipient of the benefit is the

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[87] The revelation of quality is through a Bayesian learning process based on dividend announcements.

investor. Further, underpricing may reduce lawsuits (see Section 2.2.3) and may be a type of advertising.

Allen and Faulhaber (1989, p.306) claim that the only way to discriminate between alternative signalling models is with reference to the empirical data. They suggested that their model is consistent with the puzzling results of 'hot markets' in Ritter (1984) and cyclical patterns of IPO in Ibbotson and Jaffe (1985) and Ibbotson *et al*. (1988). This model however, does not explain the evidence of consistent underpricing over long periods and in different institutional settings.

The testable implications of the Allen and Faulhaber (1989) model are suggested as future extensions of their work:

(i) firms which do not return to the capital market (reasonably quickly) after an IPO will be less underpriced than firms that do make subsequent equity issues. Further, the benefit from underpricing deteriorates the longer a firm takes to make a subsequent issue, and

(ii) the elasticity of the proportion of the firm offered $(1 - \alpha)$ with respect to the amount raised (issue size) is less than one in the presence of underpricing (i.e., retained ownership is a more effective signal in the presence of (high) underpricing).

Underpricing and retained ownership are considered to be complementary (and/or alternative) signalling methods by Grinblatt and Hwang (1989). Their model extends the Leland and Pyle (1977) analysis by considering two unobserved attributes of firm quality (mean and variance) which require two signals from an entrepreneur. Grinblatt and Hwang (1989) show that a risk-averse issuer (entrepreneur) can maximise the level of funds raised through underpricing and retained ownership signals. In this model, as in Allen and Faulhaber (1989), the entrepreneur diversifies over two time periods. At time

0 there is an IPO and at time 1 there is a probability (r) that the true value of the firm is discovered (and its payoff variance). At time 2 the entrepreneur makes a subsequent issue (or a private sale of his own stock) and leaves the business in the hands of the new owners.[88] After testing several specific case situations, Grinblatt and Hwang (1989) derive a general (separating) equilibrium model of signalling (firm quality) with retained ownership and underpricing that provides the following implications:

(i) underpricing can be an equilibrium result,

(ii) entrepreneurs making IPO issues have an incentive to make subsequent equity offerings,

(iii) firm value (above the lowest quality firm's value) is proportional to the probability of the firm quality being discovered (r), and a given degree of retained ownership and underpricing,

(iv) the relationship between retained ownership (α) and the mean firm value depends on the variability of the firm's operating cash flows, and

(v) the price volatility in the aftermarket is high for underpriced firms.[89]

There are in total eight testable implications of the Grinblatt and Hwang (1989) model, and these are summarised in Appendix 3 panel A. Four of these are consistent with Leland and Pyle (1977), one is consistent with Beatty and Ritter (1986) and three which are unique to their model.

Welch (1989) models the underpricing decision as an outcome of a firm's new issue strategy. He develops three equilibrium solutions (pooling, announcement and

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88 An example of a pure entrepreneur is demonstrated in Allen and Faulhaber's (1989) footnote 7, where the founders of Apple Computer sold out their project to new investors with the required 'marketing hype'.

89 The first three of these propositions are consistent with the model in Welch (1989).

underpricing) which depend on the proportion of high quality firms in the market and the probability that low quality firms (imitating high quality firms) will be discovered by the market. In one of these states, high quality firms will choose to underprice (and undertake advertising or certification activities) in order to separate themselves from low quality firms. In this state low quality firms would find it prohibitively costly to mimic high quality firms, who can recover their signalling costs in subsequent (seasoned) issues.[90]

Welch's (1989) model also assumes information asymmetry between the entrepreneur and potential investors. Investors gather inferences about the entrepreneur's private information through observation of the IPO issue price, the proportion of the firm offered at the IPO, the firm's investment in (high quality) operations, and the value of high (and low) quality firms and the proportion of high quality firms in the new issues market.

Participants are assumed to be risk-neutral and the entrepreneur's utility is proportional to the funds raised through the IPO and subsequent equity issues. Five of the implications from the Welch (1989) model are presented in Appendix 3 panel B. Briefly, these are that:

(i) positive underpricing is an expected outcome, given that some firms choose an underpricing equilibrium,

(ii) expected underpricing is positively related to the proportion of low quality firms in the issuing market (uncertainty),

(iii) IPO firms issue a substantial amount of equity through SEOs,

(iv) underpricing is a positive function of the value of high quality firms and the probability that low quality firms will be discovered as such, and

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90 Spiess and Pettway (1997) are unable to find support for the signalling via underpricing hypothesis, when considering the benefit of signalling net of the cost of employing the signal.

(v) underpricing should be positively related to the market reaction to an SEO announcement.

These implications form the basis of the tests in both Jegadeesh et al. (1993) and Welch (1996), with some support in the former and more in the latter.

The evidence in Michaely and Shaw (1994) does not support the hypothesis of signalling via underpricing. They find that observed underpricing is negatively related to probability of a SEO issue and negatively related to market reaction to a SEO announcement. Further they find a negative relationship between their retained ownership variable and underpricing. These results appear to be at odds with other studies, and therefore suggest that all research in this area should be carefully reviewed.

4.4.1.2 Signalling through Retained Ownership

The retention of a proportion of ownership in an IPO by promoters and managers was first considered as a signalling mechanism, within a single issue setting, by Leland and Pyle (1977). Their work has been extended into a multi-period, multi-issue setting by several authors, but of primary interest here are models linking retained ownership with SEOs.[91]

Gale and Stiglitz (1989) show that unless a signal of retaining ownership is credible, then all firms will choose a pooling equilibrium when uncertainty is low.[92] This follows because mimicking (low value) firms who use a combination of underpricing and retained ownership to signal at the IPO date, can at a later date reduce their ownership

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91 These include Gale and Stiglitz (1989), Welch (1989), Jegadeesh et al. (1993) and Welch (1996).

92 A credible signal of retained ownership might include a commitment not to sell equity beyond legal requirements (i.e., in the United States beyond that imposed by Rule 144 of the Security Act of 1933).

through open market sales or through a secondary offer in a SEO.[93] Gale and Stiglitz (1989) do not consider the costs of operations used by Welch (1989) to discriminate between firm quality. As stated earlier, in the Gale and Stiglitz (1989) model entrepreneurs will choose to differentiate themselves only when uncertainty is high, or the costs of mimicking are sufficiently high.

Slovin *et al.* (1994), while confirming the significant relationship between the underpricing signal and market reaction to an SEO, are unable to find a similar result for retained ownership while controlling for underpricing.

The evidence in Slovin *et al.* (1994) shows that where insiders' shares are sold as part of an SEO, there is a significant negative market reaction. This suggests that a sell-down of retained ownership (insiders) may be a negative signal. This is consistent with both Leland and Pyle (1977) and Gale and Stiglitz (1989).

4.4.1.3 Signalling through Waiting to Reissue

The use of waiting to reissue as a signalling device was first introduced by Lucas and MacDonald (1990), with firms exercising patience in the timing of their subsequent equity issues. In Welch (1996) the time firms wait before returning to the equity markets for an SEO is an attribute of the signalling strategy of promoters and managers. A delay in seeking financing is assumed to be costly. High quality firms will wait longer for their real quality to be revealed, knowing they will be compensated through a more favourable market reaction to the SEO at a (probably) higher issue price. Waiting to issue equity is costly to the firm since it must forego the benefits of adequate and timely finance.

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[93] Speiss and Pettway (1997) and Espenlaub and Tonks (1998) specifically include sales of insider shares (on market) as an alternative to making a SEO.

Welch (1996) defines a separating equilibrium in terms of the time a firm waits before making a secondary equity issue. A calibration of Welch's model predicts that, firstly, the value of signalling for a high quality firm is two to three times that of a low quality firm that does not use signalling. Secondly, that each year there is about a 30% chance that the market will discover an issuer's true quality and finally, those issuers waiting for funds lose 15% of their value through waiting to be 'discovered'. The signal provided by waiting to re-issue is also related to the retained ownership signal. Gale and Stiglitz (1989) suggest that both the absolute and relative costs of waiting determine the value of an insider's commitment not to sell their equity in the firm.

4.4.1.4 Signalling through External Monitoring (Debt and Capital Structure)

Firms may find it beneficial to develop relationships with financial intermediaries prior to entering the capital markets. In Section 2.2.6.2 the relationship between banks or bank debt and IPO underpricing was discussed. Intermediary relationships may therefore signal reduced uncertainty, lower contracting costs and help build firm reputation. James and Weir (1990) show that banking relationships reduce uncertainty, mitigating one driver of underpricing. Slovin *et al.* (1990) show that lower uncertainty, through intermediary relationships, mitigates the negative share price reaction to SEOs.[94]

4.4.1.5 Signalling through Reputation (Underwriter / Auditor)

Reputational effects have been found to be important signals of IPO underpricing (see Section 2.2.6). When multi-issue equity raisings are considered, changes in reputation as well as the level of reputational capital may signal firm quality and thereby help explain market reactions. Consider a low quality issuer that mimics high quality issuers by

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[94] However, Slovin *et al.* (1994) find an insignificant relationship between the market reaction to the SEO and either the presence of a defined banking relationship or the amount of private secured debt issued by the firm.

employing underwriters/auditors with significant reputational capital for its IPO. When this firm makes an SEO, it might be more difficult to find high quality underwriters/auditors willing to be associated with the equity offering.

Slovin *et al.* (1994) show that issuers, who choose a SEO underwriter of lower quality than that at the IPO, have a significantly negative share price response to a SEO announcement. However, they highlight that it is quite rare for this to occur, so the evidence might not be robust. For issuers who choose an underwriter of equal or greater quality there was no significant relationship between underwriter reputation and SEO market reaction.

James (1992) investigates whether underwriters develop long term relationships with IPO clients. By following IPO post listing, he finds that a group of them make subsequent issues (most of these being equity issues). This group of issuers has lower IPO underpricing, and usually uses the same investment bank for the subsequent issue. James (1992) believes this lower spread (underpricing) is a deliberate act for an underwriter who expects return business.

Auditor reputation and its interaction with underwriter is investigated by Lee, Stokes, Taylor and Walter (2003). They find that auditor (quality) choice is important for IPOs where the auditor confirms financial forecasts and disclosures. Trade-offs between auditor choice and risk or retained ownership are confined to situations where the underwriter is not ranked as high quality and for smaller IPO issues. This indicates the close interaction between auditor and underwriter reputation for IPOs.

4.4.2 Market Feedback Hypothesis

Jegadeesh *et al.* (1993) offer an alternative explanation for the interaction of IPOs and SEOs. They suggest that the issuing firms are simply responding to the market reaction (demand) to their unique investment opportunity. If a firm receives positive feedback

from the marketplace (via underpricing and positive post-listing performance), then it is in the interests of the firm to expand the scale of operations. Thus the announcement of the SEO is the culmination of the market's feedback to the firm on its current projects. The role of underpricing in signalling is called into question in the market feedback hypothesis. Rather than being a deliberate signal from an entrepreneur, underpricing might be seen as the result of an underestimation of the firm's marginal return in the calculation of issue price.

A similar feedback explanation is suggested in Rajan and Servaes (2003). They model investors in three categories that they call rational speculators, passive investors and trend chasers. They find that it is investor sentiment and feedback risk that explains the patterns in IPO underpricing and aftermarket returns.

The informational cascades in Welch (1992) are also a form of market feedback. Given a fixed price during the issue period, a cascade changes the demand for an issue. As discussed in Section 2.2.8, investors observe the actions of other investors in the determination of price. Thus potential investors may be more influenced by the actions of others rather than their own private information, leading to excess demand and strong aftermarket returns. If this is observed by entrepreneurs, they may choose to increase their issued equity, or bring forward planned future capital raisings.

4.4.3 Reputation Acquisition Hypothesis

The model in Maritz (1992), as discussed in Section 2.2.6.4, is a multi-period extension of the Myers and Majluf (1984) model of capital raising, in which issuing firms acquire a reputation for not acting opportunistically in the new issues market. This model explains the behaviour of firms that plan to make a series of SEOs.

Maritz (1992) argues that firms with higher underpricing have greater amounts of *ex ante* uncertainty. This uncertainty at the initial issue will cause issuers to price at a minimum

firm value, leading to underpricing.[95] Maritz further maintains that this uncertainty remains unresolved even beyond several subsequent issues and will cause greater price protection at the SEO announcement. Hence high underpricing is associated with larger negative SEO returns.

Aftermarket returns on the other hand, which Maritz terms post-offer underpricing, are seen to be the market's discovery of the firm's true value. IPO firms can develop a reputation for not trading on insider information when making equity issues and this is proxied by the 30 day aftermarket return in Maritz (1992).

The sample of IPOs used by Maritz comes from the Securities and Exchange Commission's Registered Offering Statistics database over the period 1970 to 1986, but he uses only a tiny proportion (4%) of this total sample in his tests. His main finding is that the market reaction to a SEO announcement is positively related to the firm's aftermarket return, after controlling for size and the time between issues. Maritz also finds some evidence of an inverse relationship between underpricing and SEO reaction, after controlling for issue size, post-offer returns and the time between issues.

4.4.4 Revelation of Quality Hypothesis

An alternative to the signalling equilibrium is a pooling equilibrium in which firms of all qualities choose not to differentiate themselves. This option is considered by Welch (1989) and Allen and Faulhaber (1989) as one possible equilibrium, but under certain conditions they find that the signalling equilibrium to be Pareto dominant. Nevertheless, it is important to recognise that while high quality firms might pool for an IPO issue, they are able to wait until the market discovers their true quality before accessing the equity markets again.

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95 This is the "Market for Lemons" argument from Akerlof (1970).

Under the pooling equilibrium, it is also possible that a firm's patience in waiting to reissue is a device to maximise total proceeds in a multiple issue framework. This 'revelation of quality' hypothesis would provide similar predictions to the signalling through waiting to reissue theory in Section 4.4.1.3, with regard to delay to reissue and market return measures. The key difference is that IPO underpricing, and any other signalling device, would not be required and therefore no predictable relationship should be evident. This is one of the main issues in Jegadeesh *et al.* (1993), when they compare the pooling (and market feedback) hypothesis to the signalling hypothesis. Jegadeesh *et al.* (1993) use aftermarket returns as an alternative to IPO underpricing in their SEO tests, as under the alternatives to the signalling model, IPO underpricing does not have a unique role or meaning. Welch (1996) extends this approach by providing a calibration of the model that predicts that firm quality has a 30% probability of being revealed each year and that waiting costs issuers about 15% of their value per year. He is also able to present some empirical support for his predictions.

4.5 Testable Hypotheses within a Multiple Issue Framework

In this section a number of testable hypotheses are developed within a multiple issue framework, as a means of contrasting the alternate explanations of the actions of firms which make equity issues. Notwithstanding that some of the models in the preceding sections have been empirically tested, there are a number of discriminating tests that can be performed by considering subsequent equity issues. Firstly, there are a number of propositions that consider the role of signalling via underpricing, and its interaction with retained ownership and the immediate aftermarket returns. These are considered in Section 4.5.1. Next, the probability of a firm making a SEO can be investigated to see if the determinants are consistent with either the signalling, market feedback or reputation acquisition hypotheses; this is contained in Section 4.5.2. Modelling the time elapsed between the IPO and the first SEO is then considered in Section 4.5.3, to examine if it is

IPO signals or market performance that determines the SEO timing. Finally, Section 4.5.4 contains the tests of the determinants of market reaction to a SEO announcement.

4.5.1 Tests of Underpricing, Retained Ownership and Aftermarket Return

The multiple issue framework (i.e., IPO, aftermarket and SEO) is an important contribution in the IPO literature, as it allows the complex interaction of signalling and strategic choices to be investigated. Interactions between IPO underpricing, retained ownership and the immediate aftermarket returns are considered in the following sections.

4.5.1.1 Underpricing and Retained Ownership

The relationship between underpricing and the proportion of the firm retained by initial owners has been the focus of many theoretical models and numerous empirical tests. Following the Leland and Pyle (1977) model, retained ownership is considered a signal of firm quality, and a factor that may mitigate the need to underprice at the time of the IPO. Thus the predicted relationship (and conventional wisdom) between underpricing and retained ownership is negative. This prediction may be limited to an environment with a single period model with a single signalling mechanism.

Allowing for multiple signalling mechanisms (i.e., mean and variance of the firm's performance) within a multi-period model, Grinblatt and Hwang (1989) find (their proposition six) that there should be a positive relationship between underpricing and retained ownership holding the riskiness of the firm constant. This is not to say that underpricing is not a signal, but that it is not a complete signal. Empirically there appears to be mixed results on the direction of this relationship. Using multiple controls for risk Lee *et al.* (1996b) observe a strong positive relationship between underpricing and retained ownership in the Australian IPO market.

Thus, given the uncertainty in the literature on the direction of the relationship between IPO underpricing and retained ownership, together with the availability of multiple signalling mechanisms, the first task at hand is to determine the nature of this relationship for the Australian environment. One solution would be to allow a non-linear or curvilinear relationship between IPO underpricing and retained ownership.[96] This allows both the negative and positive relationships to be present at the same time (i.e., a negative relationship that is changing at a positive rate). This might be observed as either a 'U' shaped parabolic function.[97]

The first hypothesis is therefore:

H1: There is a negative relationship between the initial return and the proportion of the firm retained by the initial owners of IPO firms, but the rate of change of this relationship is positive.

This could significantly contribute to our understanding of the interaction between these signalling mechanisms and explain the somewhat anomalous empirical results of Lee *et al.* (1996b).

The next step is to consider how the firm's subsequent equity issues affect the above relationship. There does not seem to be any reliable way to measure (or proxy) the firm's intent to make SEOs at the time of the IPO, so we must rely on the observed actual SEO as an indication of the firm's intent at the IPO to issue an SEO in the future. There are

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96 How and Low (1993) found a positive relationship between retained ownership and firm value, as well as a possible non linear function that they describe as an "N" shape. They were unable to confirm a positive relationship between IPO underpricing and firm value, which together with their first result would be consistent with Lee *et al.* (1996b), primarily due to inconsistencies that arose from alternate measurements of firm value. In a contemporaneous study, Boehmer (1993) also finds an "N" shaped function between insider holdings of IPOs and firm value. The downward sloping section of the relationship is inconsistent with a signalling role for retained ownership, but he does not directly consider the effect of underpricing. He does indicate the importance of controlling for firm size.

97 Alternatively, it could also be a "hump" shaped function where the positive relationship changes at a negative rate. This relationship is equally valid and also supports the hypotheses. An alternative to a curvilinear relationship might be a stratified relationship, where it is for example, negative below some value of retained ownership and positive above another.

two problems with this approach, first there are firms who intended to make SEOs but are restrained from doing so due to market conditions, firm profitability, being taken over or delisted from the stock exchange. There might also be firms who signal their quality and don't end-up requiring a SEO issue. The second problem is that there might be firms who did not intend to make a SEO at the time of the issue (and therefore did not use an underpricing signal), but later found themself with either the opportunity or need to make a SEO. Both of these cases will add noise to tests in a multiple issue framework.

If firms are signalling their quality and intend to make a subsequent SEO issue through underpricing, it would follow that these firms have greater underpricing on average than other IPOs.

Hypothesis 2 is therefore:

H2: IPO firms that subsequently make a SEO have higher underpricing on average than other IPO firms.

In the preceding section retained ownership in an IPO is a positive signal in response to an information asymmetry. A signal is not credible unless it is costly and binding [see Jensen and Meckling (1976) with regard to bonding activities], hence Gale and Stiglitz (1989) criticise retained ownership as a credible signalling device. They argue the entrepreneur has the ability to dispose of any retained shares immediately after the IPO.

In Australia, the use of escrow restrictions limits the trading of vendor securities and this may mitigate some of the criticism.[98]

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98 De Giorgio (2000) studies escrow requirements in Australia, finding the ASX applies a restricted security status on a discretionary basis. There are a number of criteria used in deciding whether to apply an escrow restriction to vendor shares, which are based on ownership structure, asset type/structure and a "profits test", which can be found in chapter nine (and appendix 9B) of the ASX Listing Rules. Escrow can also be applied on the shares of seed capitalists, employees and others persons, with the enforcement period being either 12 or 24 months. De Giorgio (2000) found that firms that passed the profits test did not have their shares escrowed. Technically, Corporations Law refers to "Restricted Securities" but the ASX refers to these as escrowed securities.

Entrepreneurs may still choose to ‘cash out’ by selling their equity early, but if this occurs before all uncertainty about the value of the firm is resolved they will not receive the full value for that equity.

Further, the retained ownership signal should be more important for firms that subsequently make a SEO.

The supplemental hypothesis 2a is therefore:

H2a: Retained ownership as a signalling device will be significant in explaining the underpricing of firms that subsequently make SEOs, and not significant for firms that do not make SEOs.

4.5.1.2 Underpricing and Aftermarket Return

The relationship between underpricing and measures of aftermarket return provides an opportunity to discriminate between the competing explanations of IPO behaviour. The IPO signalling hypothesis suggests that good firms (through signalling) reduce their aftermarket uncertainty and increase their returns. Thus underpricing and aftermarket returns are positively related. The market feedback hypothesis also implies a positive relationship for these variables, but for a different reason (i.e., because the entrepreneur has under-estimated his project’s return values).

Therefore it is proposed that there is a positive relationship between the initial return and subsequent period returns for IPO firms. Further, it is hypothesised that the relationship will be stronger for those firms that require additional equity financing. Using only firms that had SEOs (within a given period) may introduce bias, as other firms may have planned to make SEOs but were unable to do so due to external factors such as market conditions.

The third hypothesis is therefore:

H3: There is a positive relationship between the initial return and initial aftermarket returns, and this relationship will be greater for IPO firms which subsequently make SEOs.

The relationship between underpricing and measures of aftermarket return has been tested by many researchers (e.g., Ritter (1991), Jegadeesh *et al.* (1993) and Lee *et al.* (1996b)). While most researchers use a similar measure for initial return, many different measures and time frames have been used to measure subsequent performance. Each of the various return periods describes a different attribute of the firm's interaction with the marketplace. For instance, the short period following initial listing (20 days as used by Jegadeesh *et al.* (1993)) may capture an information signal or market feedback being given to an issuing firm, following the commencement of public trading. A market measure for a period prior to an SEO announcement, on the other hand, may measure a run-up in stock price indicating a window of opportunity for equity issuance. A longer run measure, such as that used by Lee *et al.* (1996b), indicates the firm's cumulative performance compared to the market.

For these reasons only the initial (or immediate) aftermarket returns are considered here, with short periods (30, 60 and 90 days) following listing being examined. This should capture any initial market feedback for the firm.

4.5.2 Probability of an SEO

The decision to issue extra equity, and the timing of such a decision, is governed by a number of factors including the proportion of the firm retained. Within a multiple issue framework, the greater the retained equity at the IPO, the larger is the opportunity and

need to make a SEO to fund future projects. Of course some firms are able to generate the required capital through (retained) earnings or positive cashflows.[99]

If the IPO firm is required to return to the equity market, this imposes market discipline on the firm. This discipline could be particularly severe where additional funds are to be raised from existing shareholders through a rights issue (SEO).[100] Retained ownership and underpricing combine to reduce the proceeds from the IPO, and with limited initial equity being raised, firms with profitable investment projects may be starved of capital. Listing gives access to public equity markets, so a SEO can mitigate this problem through the proceeds from the secondary issue. Retained ownership is therefore expected to be positively associated with the likelihood of a firm making a SEO.

IPO underpricing and aftermarket returns have also been proposed as measures of the likelihood that an IPO firm will make a SEO. While many researchers have used these return measures, there is disagreement over the empirical findings and the way these support the various multi-issue models.

The multiple issue models that were identified in Section 4.4 suggest a number of relationships between returns and SEO occurrence. Firstly, underpricing can be a signal of firm value at the IPO (e.g., see Section 4.4.1). While deliberate underpricing may convince investors of the firm quality, it reduces the amount of equity capital raised and makes it more expensive. To recover these costs, the firm must take advantage of the opportunity to issue seasoned equity. A test of the signalling hypothesis is that underpricing is positively associated with the likelihood of a firm making an SEO issue.

The signalling hypothesis does not explicitly consider the stock return after listing, but the market feedback hypothesis (Section 4.4.2) provides a theoretical link. Recall that in

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99 It is possible that a firm is not recording operating profits, but a positive cashflow from the underlying business allows growth.

100 The use of a rights issue for an SEO is very uncommon in the US, as most are publicly underwritten offers. In Australia rights issues are the common way to raise SEO funds.

the market feedback hypothesis the entrepreneur becomes aware of the true value of the firm through market returns. Positive aftermarket returns indicate to the manager that project expansion is feasible through a SEO. This suggests that firms with superior initial aftermarket returns have a greater likelihood of making an SEO.

Hypothesis four is therefore:

H4: IPO firms are more likely to make an SEO where there is high retained ownership, greater underpricing and better initial aftermarket returns.

While both the signalling and the market feedback hypothesis have similar predictions (except for the aftermarket returns) and both explain the occurrence of SEOs, they differ as to the reasons that motivate this event.

4.5.3 Tests of the Time to a Secondary Equity Offering

The firms' choice of when to issue an SEO is also an important component in a multiple issue strategy. Welch (1996) argues that it is the total proceeds of the IPO and SEO that should be maximised, and that the value of the firm deteriorates when an SEO is delayed. Firms that have signalled through underpricing need to wait until their true quality has been revealed (or low quality firms have been discovered) before they can issue the SEO on favourable terms. In the absence of early disclosure[101] of their quality, the highest quality firms will differentiate themselves by using larger underpricing at the IPO and will wait longer to issue their SEO, since the total payoff will compensate them for following that strategy. This suggests a positive relationship between IPO underpricing and the time delay before an SEO issue. If the firm's (high) quality is discovered early

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[101] Early disclosure may occur through a random event, and may not be related to the firm's actions.

(e.g., through post listing news or other disclosures including annual financial reports), then waiting additional time before re-issuing would not make sense.[102]

Jegadeesh *et al.* (1993) derive with the opposite relationship to Welch (1996). They argue firms which signal through underpricing return to the equity market sooner than those that did not use such a signalling method. Due to the lower proceeds from the IPO with additional underpricing, it was also argued that delaying a SEO would be more costly to the signalling firms. Therefore, this suggests that there is a negative relationship between IPO underpricing and the time elapsed before a SEO is issued.

Again, the early revelation of its quality means a firm need no longer wait to issue a SEO, (i.e., high quality firms that are revealed early are able to reissue early and can avoid additional value decay).[103] Another way in which the early revelation of quality might be detected is by using a run-up measure of stock performance. Thus positive aftermarket returns would be associated with less delay in reissuing. This is consistent with the market feedback hypothesis (i.e., positive market returns bring forward planned SEOs, or create new opportunities for an SEO).

Therefore the fifth hypothesis is that:

H5: The elapsed time from the IPO to the first SEO is negatively related to IPO underpricing and IPO initial aftermarket returns.

The immediate aftermarket returns are supplemented with several other return measures for this analysis. Three run-up returns are examined, being the 30, 60 and 90 day cumulative abnormal returns, measured up to ten days prior to the SEO announcement.

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[102] Welch (1996) shows that the mean time to SEO for his sample is three years (mode one year) and Australian SEOs tend to follow a similar pattern, indicating it is quite likely that the firm's quality has been discovered. Furthermore, Welch (1996) in footnote 31 on page 249 indicates that if he limits the maximum time to SEO to be three years, he also finds a negative relationship between underpricing and time to SEO.

[103] In fact the total value of the issues would decrease if the firm continued to wait.

Next a cumulative abnormal return measure, from listing up to the first seasoned equity offer is used to capture firm run-up and any market discovery period. This measure is a return over a period of variable length, so it has been standardised into an equivalent annual rate of return during the period.

4.5.4 Tests of Market Price Reaction to SEO Announcements

A number of factors will be considered in this section, which may be determinants of the market price reaction to a SEO announcement. Specifically, these are retained ownership, IPO underpricing, aftermarket returns and time to SEO.

First, the level of retained ownership may be a determinant of the price reaction to the announcement of a SEO. Jensen and Meckling (1976) argue that high ownership concentration by the entrepreneur (owner manager) leads to the convergence of the interests of owners and managers and the maximisation of firm value. A SEO, which reduces that ownership proportion, would therefore reduce firm value. On the other hand, Williamson (1975) believes that a high level of ownership can led to management entrenchment, thus SEOs should increase firm value. Stultz (1988) combines both hypotheses into one proposition that depends on the relative level of ownership.

The magnitude of the market (price) reaction to an announcement of a SEO can be considered from the viewpoint of investor surprise. Investors in a firm with large retained ownership will expect the firm to make SEOs to continue funding projects. Therefore the SEO will not be a surprise and need not signal negative (cashflow) information. On the other hand, firms with low retained ownership (which have not used other methods to inform investors of equity requirements) will surprise the market with a SEO, and these might indicate cashflow difficulties. This would suggest that the price reaction at the announcement of a SEO would be positively related to the level of retained ownership at the IPO.

Jegadeesh *et al.* (1993) have a similar hypothesis that links price reaction to IPO underpricing. They argue that firms with higher IPO returns are more likely to return to the seasoned issues market, and therefore the market should be less surprised by the announcement of such an action. It would follow then, that the level of IPO underpricing is positively related to the price reaction at the announcement of a SEO.

It is interesting to note that Welch (1996) contains evidence that contradicts the Jegadeesh *et al.* (1993) propositions about the expected timing of a SEO, which indicates the above hypothesis, may have an inverse relationship.[104]

An opportunity to discriminate between the multiple issue model hypotheses arises by examining the share price reaction to the announcement of an SEO. Under the signalling hypothesis the SEO announcement price reaction will be more favourable (less unfavourable) for higher levels of underpricing and for positive aftermarket returns. These two relationships also hold for the market feedback hypothesis. The reputation acquisition hypothesis on the other hand implies a negative relationship between SEO announcement reaction and IPO underpricing, while agreeing that aftermarket returns are positively related to the market reaction at the SEO.

If the sign on the IPO underpricing coefficient is reliably negative, the data may provide some support for the reputation acquisition hypothesis rather than the signalling or market feedback alternatives.

Given an observed SEO date (and thereby the SEO delay factor) within an equilibrium model such as Welch (1996), predictions can be made as to the market reaction to an announcement. The earlier the SEO occurs, the less likely it is that firm value decay, due to capital starvation, will occur. The market price, being an unbiased estimate of all possible future outcomes, will include the possibility of capital starvation (funding) costs

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104 Using a larger sample, but more importantly without the three year limit for firms to re-issue, Welch (1996) finds a positive relationship between underpricing and the time elapsed before an SEO issue.

that will be reduced with the SEO announcement. Therefore, shorter observed delays in reissuing equity will be associated with more favourable share price reactions to the SEO announcement.

In the preceding analysis the effects of IPO underpricing, retained ownership and aftermarket returns have been ignored. Introducing these factors the sixth hypothesis becomes:

H6: The price reaction at the announcement of a SEO will be more favourable for firms with higher retained ownership, higher IPO underpricing, higher aftermarket returns and shorter elapsed time from the IPO to the first SEO.

4.6 Summary of Hypotheses on SEOs

In this chapter a number of hypotheses have been developed in regard to the SEO within a multiple issue model of capital acquisition. These hypotheses fall into four categories:

(i) IPO underpricing (as a signalling mechanism) and its interaction with retained ownership and immediate aftermarket returns,

(ii) factors surrounding the decision to make a SEO,

(iii) timing of a SEO, and

(iv) share price reaction to the announcement of a SEO.

Early in the chapter some relevant evidence on the effects of new equity issues and the long-run drift of newly listed firms was presented in order to calibrate the expectations of the multiple issue framework. The following chapter examines the data used to test these hypotheses, while the results of those tests are discussed in the subsequent chapter.

Chapter 5.
Data Considerations

In this chapter, the data considerations of this thesis are discussed. In order to be able to test the hypotheses developed in chapter four, a number of databases (some unique) needed to be built. To allow for temporal variation, a database of IPOs over a 20 year period was collected. These IPOs were then observed for a period in excess of five years, with all capital raisings being recorded in a second database. A third database was developed to provide share returns for these companies over a 26 year period. This chapter begins with the sample selection and data collection processes that were used. Next, the calculation methods employed are discussed, together with descriptive statistics for the data. Statistical test procedures are explained in the final section of the chapter.

5.1 Sample Selection

The sample employed in this study consists of Australian IPOs which listed on the main industrial board of the Australian Stock Exchange Limited[105] (ASX), as identified from ASX annual reports. These reports contain an annual summary of all deletions and additions to the official list. This information was supplemented by the 'Additions' list in the monthly journal of ASX and the sequential computer master file held by Stock Exchange Research Limited.[106] These sources were inspected for IPOs from January 1976 to December 1995 inclusive. New listings, which are a result of capital reconstructions and/or private[107], rather than public, equity placements, were excluded. These are often referred to as equity carve-outs or spin-offs. Companies listed on the mining and resources board of the exchange were also excluded as these firms are usually

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105 The Australian Stock Exchange and its predecessors - the member exchanges of the Australian Associated Stock Exchanges - Sydney Stock Exchange, Melbourne Exchange, etc.

106 The resources of Stock Exchange Research Limited are known as STATEX.

107 Care was taken to remove all firms that used Information Memoranda or other non-issue methods to list, as well as eliminating Spin-offs and Equity Carve-Outs.

highly speculative in nature, and their IPOs have been shown by Taylor (1991) to behave in a manner dissimilar to industrial IPOs. This process identified a total of 436 Australian industrial IPOs. Of these, a subset of firms (266) are the same as used by Lee *et al.* (1996b). They report similar evidence for their sub-sample to that shown in this chapter in tables 5.1, 5.2 and 5.4.

The temporal distribution of the sample can be seen in figure 5.1.
It is clear from inspection that there is temporal clustering, particularly during 1985-1987 and again in 1993-1994 when 'hot' issue markets are obvious.

5.2 Data Collection

In this thesis, as with any empirical research project, data collection (and its accuracy) is a very important issue. Three types of data were required: IPO prospectus data; share price data; and SEO issue data. The following sub-sections deal with each of these.

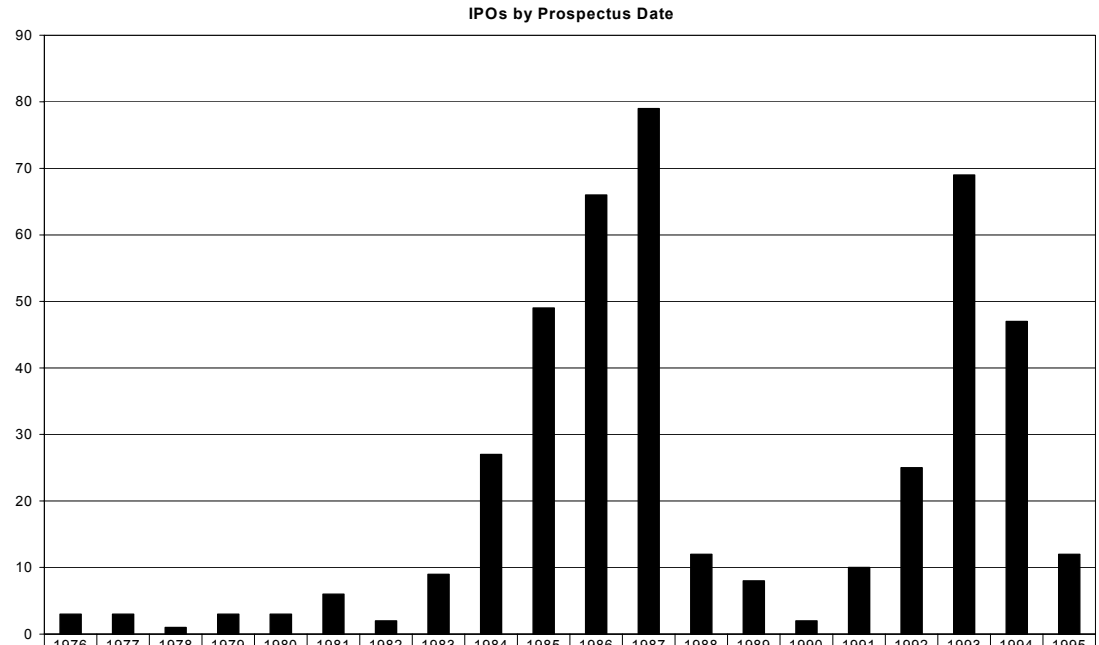
5.2.1 Prospectus Data

The prospectus for each IPO was obtained, and the following data were manually collected:

- Issue details, dates and amounts,
- Underwriter, investigating accountant (auditor) and other expert identities,
- Retained ownership,
- Pro-forma financial information (i.e., balance sheet) post IPO,
- Forecast earnings and other forward looking data disclosed,
- Operating history details (i.e., years of operation and losses incured),
- Asset-in-place and growth option measures.

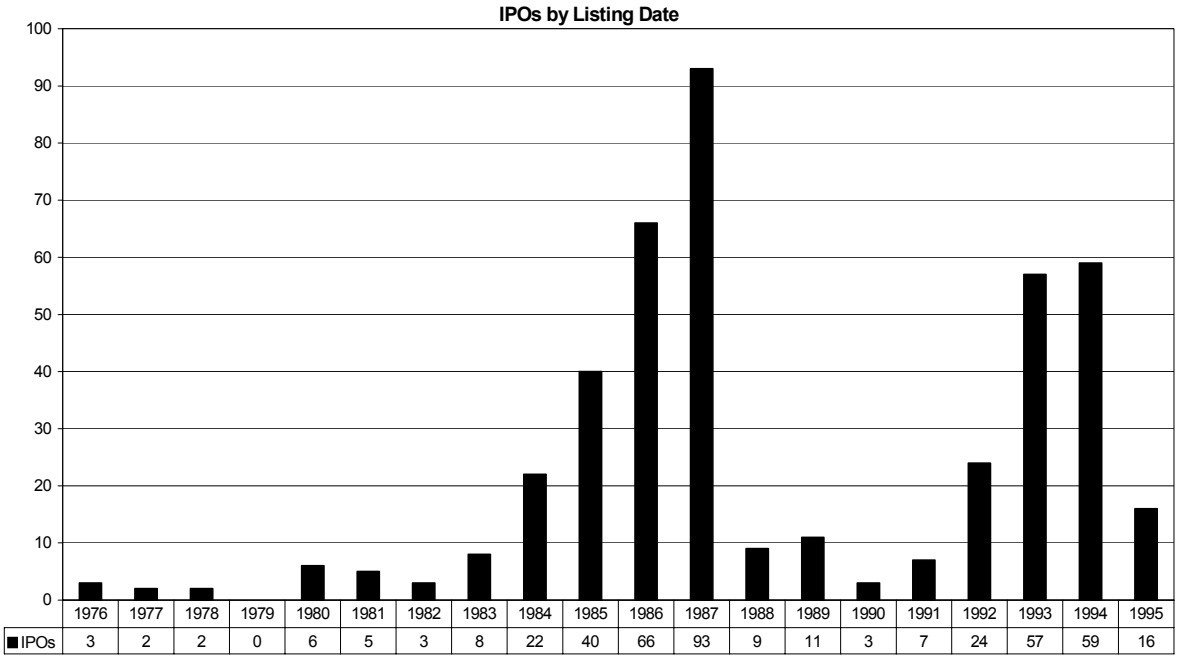
Figure 5.1 Time Distribution of IPOs

Panel A: Temporal distribution by prospectus date for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.



	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
IPOs	3	3	1	3	3	6	2	9	27	49	66	79	12	8	2	10	25	69	47	12

Panel B: Temporal distribution by listing date for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.



	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
IPOs	3	2	2	0	6	5	3	8	22	40	66	93	9	11	3	7	24	57	59	16

Data collection sheets were then double keyed and compared before running data integrity tests including cross-checking, range, extreme, and summation tests.

One calculated variable that was also included in the data was the 'delay to listing', being the time from prospectus registration to listing commencing. Of course this is an ex-post measure, and can only be observed when the firm has completed its offering and a listing date has been set.

Descriptive statistics for key measures are shown in table 5.1.

Table 5.1 Descriptive Statistics of the IPO Sample

Descriptive statistics for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Variable[(a)]	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
Issue Size	39.7	174.8	2,450.0	18.0	6.8	3.3	0.2
Total Assets	331.3	4,568.2	94,720.0	45.0	19.0	9.2	0.5
Operating History	5.3	4.1	10.0	10.0	5.0	1.0	0.0
Time to Listing	55.2	25.6	207.0	62.0	49.0	39.0	17.0
Standard Deviation	13.05	10.12	138.55	16.46	10.62	7.01	1.61
Growth Options	0.686	0.323	1.000	0.996	0.789	0.452	0.000
Retained Ownership	48.3	26.0	93.5	67.0	51.5	33.4	0.0

(a)

Issue Size = equity issue size ($ millions).
Total Assets = total assets after initial equity issue ($ millions)
Operating History = length of prior operating history (years)
Time to Listing = time between prospectus registration and exchange listing (days)
Standard Deviation = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Options = proportion of the subscription price per share represented by growth options
Retained Ownership = proportion of the equity retained by previous owners (percent)

5.2.2 Share Price Data

Complete daily price histories were collated for each IPO sample company, requiring the collection of share price information through the period from 1976 to 2002, thus allowing the measurement of market reaction for all event dates after listing. This required tracking companies through name changes, acquisitions and other security changes. Each firm was followed until either it was suspended subsequent to delisting, merged with or was taken over by another firm, or undertook a structural change that would invalidate subsequent data.[108]

Share price data were obtained from a number of sources. Firstly, as some of the observations date back to 1976, some data had to be manually collected. Generally this was because companies delisted prior to the beginning of computerised sources (1981) or because of missing observations. The sources used were the Sydney Stock Exchange's own 'quote sheets' (i.e., daily summaries of trading) or from daily newspapers in the state of listing.[109] These price histories were collected and then keyed before being scanned and checked for outliers. The second source of price data was Statex (ASX) computer records. This source provided daily (and monthly) share prices from the full computerisation of the stock exchange up to 1996 when the system ceased. The third source was the Core Research Data provided by SIRCA.[110] This source was used for price information from June 1997 to December 2002. All daily price histories contain

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108 Firms are delisted from the ASX for a number of reasons, such as at the request of directors, failure to pay listing fees, failure to comply with listing rules, and the appointment of a liquidator or receiver/manager.

109 This was where the quote sheets were either not available, or the stock traded on another Australian exchange.

110 Securities Industry Research Centre of Asia-Pacific (SIRCA) provides to member universities the Core Research Data (CRD) for Australian companies. CRD consists of summaries of the automated trading system (SEATS) of the ASX. This source was found to provide reliable share price information post 1992.

the last actual trade per day rather than bid-ask mid-points. Where there were no actual trades on a given day the prior day's price is used.[111]

Unlike an earlier study by Finn and Higham (1988) who only used Sydney Stock Exchange share prices, the procedure used here searches across trading data from all member exchanges to ensure that initial returns are based on the first day closing price.[112]

As many IPOs delist prior to the end of the price collection period, careful investigations were made to determine whether the last trade price was indicative of the cash return available to stockholders.[113] Where delisting reflected bankruptcy or other forms of financial distress, full loss of the investment was recorded as the terminal return.

The final database contains 885,944 daily price records for the 436 IPOs in the sample. All daily price data subsequent to listing were adjusted for capitalisation changes and dividends using dilution factors in the usual manner. Software was written to collect, track and adjust the prices, as well as calculating daily price relatives (PriceRels). As part of this activity all daily returns with an absolute value greater than 20% were verified, to ensure that these observations did not represented a missing or incorrect dilution factor (i.e., capitalisation change adjustment). Difficulties with the information sources used meant that an enormous amount of effort was expended in cross-checking and verification activities to provide reliable data.

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111 This process is known as forward filling the price series.

112 The ASX comprises the Sydney, Melbourne, Brisbane, Adelaide, Perth and Hobart exchanges.

113 For example, if delisting occurred due to takeover, investors were assumed to have received the offer price.

5.2.3 SEO Data

The procurement of SEO data for Australian firms caused some difficulty. A number of collection methods were tried from databases (e.g., Statex) and publications, but each proved to be too inaccurate or incomplete. The issue of 'What is an SEO?' is also a relevant issue in an Australian context. As it is not common in Australia to make stand-alone secondary issues of shares, the context needs to be broadened to include rights issues and private placements. To achieve this a complete capital history record for each firm was developed. Starting with the shares on issue following the IPO and adding all new issues of shares, reconciliations were performed each time an IPO firm disclosed its number of shares on issue. At a minimum, this is disclosed in each year's annual report, often listing the new issues. ASX keeps all company announcements and reports (now all digitised), and these announcements were manually searched to produce the company capital histories. Each new issue of shares was dated and classified into the following categories:

- Rights issues,
- Bonus issues,
- Issued from the exercise of options,
- Issued under dividend re-investment plans,
- Private placements,
- Issued under an employee share plan,
- Issued by a call on partly-paid shares,
- Issued by way of a share split,
- Issued under a capital reconstruction,
- Following the conversion of another type of security,
- Other new issues.

While all of these categories were required for a complete capital history, only rights issues and private placements were considered as SEO issues.

The data were collected and stored in a custom database, from which it could be interrogated and analysed. Details collected include the date the issue was first announced, the date of the issue, the number of shares issued, the reason for the issue and its category, the issue price or any consideration received, as well as some notes on the

issue. Once completed, this database contained information on 4,382 share issues made by the 436 IPO firms. In the first part of the SEO analysis, the size of each issue was determined relative to the number of outstanding shares at the issue date. Having looked at the distribution of all SEO issues a filter was applied to remove issues being less that five percent (5%) of the outstanding shares.[114] Issues smaller than this limit were deemed to have not had a significant impact on existing shareholders, or to have not been a realistic means of raising capital per se. Details of the SEOs used in this thesis are given and discussed in Section 5.6.

5.3 Underpricing Measurement

There are a number of ways to calculate a measure of underpricing. This section describes the methods used in this thesis and some descriptive statistics on those measures.

Simple raw underpricing returns were calculated as:

$$R_i = (P_i - S_i) / S_i \qquad (1)$$

so that R_i is the return of firm i's share, calculated as the difference between the last sale price on the day of initial listing (P_i) and the subscription price (S_i), divided by the subscription price.

The raw underpricing measure above assumes all return is due to unique risks. However, this may overstate the return as market movements are a determinant of total return. Accordingly adjustments for this source of variance are undertaken. Market adjusted returns (R'_i), which are analogous to adjustments via the zero-one version of the familiar market model, are calculated as:

$$R'_i = R_i - R_m \qquad (2)$$

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[114] Rights issues of greater than 1 for 20 exceed the five percent limit.

Descriptive statistics for both the raw and adjusted measures of underpricing are presented in table 5.2.

Table 5.2 Descriptive Statistics for Underpricing Measures

Descriptive statistics for unadjusted and market index adjusted measures of underpricing for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Underpricing Measure	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
Unadjusted[(a)]	14.9	29.9	240.0	20.0	8.0	0.0	-50.0
Market Index Adjusted[(b)]	11.2	30.1	243.8	18.2	5.6	-4.6	-49.4

(a)
Calculated as closing sale price on first day of listing divided by subscription price per share, minus unity and then multiplied by 100.

(b)
Calculated as per the unadjusted underpricing in **(a)** less the market index value on the listing date divided by the market index on the prospectus registration date minus unity and then multiplied by 100.

The index chosen for market adjustment (R_m) was the All Ordinaries Accumulation Index for issues after 1 January, 1980 (the inception of the index). Prior to that, the Statex Actuaries Accumulation Index was used. These market adjustments noticeably lower estimated underpricing, meaning that IPOs typically occur during periods of rising markets.[115]

As described in Section 2.3.1, a number of alternate measurements of underpricing are possible. Habib and Ljungqvist (2001) refer to simple underpricing as 'headline' underpricing, suggesting it was too simple (because of retained ownership and secondary

115 Of course, to the extent that the systematic risk of the security exceeds one, the zero-one version of the market model will overstate the extent of "abnormal" returns, if Rm is positive.

sales) to capture the wealth implications of the issue process. Loughran and Ritter (2002) use prospect theory and suggest IPO underpricing needs to be adjusted for dilution effects (caused by retained ownership) and unexpected gains/losses.

Alternatively, the effects of retained ownership (and secondary sales) could be incorporated into an initial return measure by re-scaling to work out the effective underpricing across all shares. As secondary sales were prohibited in the early period of this study, and relatively few issues included here (with a few notable exceptions) have included secondary sales, this adjustment has not been pursued in the current research. Adjustments for retained ownership effectively re-scale traditional underpricing measures by retained ownership.[116] As retained ownership is already included as a control whenever underpricing is analysed in this research, such adjustments have effectively been made.

Considering the temporal clustering of IPOs and the distribution of underpricing returns, Table 5.3 presents the average underpricing and number of IPOs in the sample by year.[117] Witness some large monthly underpricing observations (e.g., 1983-1986 and 1992-1993), which precede periods of 'hot markets' (e.g., 1985-1987 and 1993-1994), which is exactly what we would expect to see given the findings of Ibbotson *et al.* (1988).

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116 Consider a measure of equivalent underpricing across all shares (EUPAAS) equal to underpricing divided by one minus the retained ownership. A EUPAAS measure has been used in some of the robustness tests in Appendix 5.

117 Average monthly underpricing is presented in Appendix 5 Table A5.3.

Table 5.3 Temporal Distribution of Underpricing

Temporal distribution of market index adjusted underpricing for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Number	Average Underpricing
1976	3	8.98
1977	2	26.77
1978	2	2.17
1979	0	0.00
1980	6	14.36
1981	5	1.74
1982	3	11.25
1983	8	20.10
1984	22	15.08
1985	40	21.63
1986	66	16.45
1987	93	3.45
1988	9	17.47
1989	11	0.46
1990	3	0.56
1991	7	8.42
1992	24	12.10
1993	57	12.95
1994	59	8.67
1995	16	9.84
Avg.	436	11.24

5.4 Long Run Return Measurement

Long-run returns for each IPO are estimated for one, two and three years following listing. First, daily returns (PriceRels) were cumulated to form monthly returns, which are then adjusted for the return on the All Ordinaries Accumulation Index. The month one return is for the first month following listing, excluding initial underpricing. The monthly returns are then cumulated through time to generate long run buy-hold returns. As discussed in Section 5.2.2, where a firm delists and there was some economic return to investors, the assumption is that such proceeds were invested in the market index for subsequent periods. Thus, giving no further market adjusted abnormal returns.

Table 5.4 reports descriptive statistics for both an unadjusted and a market adjusted (abnormal) returns over one, two and three year holding periods. Note that while the unadjusted mean returns are (just) positive, the adjusted returns are severely negative in accordance with Ritter (1991), Lee *et al.* (1996b) and other studies of long-run IPO performance.

Table 5.4 Descriptive Statistics for Long-Run Return Measures

Panel A: Descriptive statistics for long-run average Buy-Hold (unadjusted) returns subsequent to listing for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. All numbers are reported as percentage returns. For firms delisted prior to three years, the return will be the return for the listed period, including any appropriate terminal returns.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
One year average returns	5.0	86.2	1314.5	30.9	-8.3	-33.3	-100.0
Two year average returns	5.5	129.4	1488.2	29.2	-16.6	-58.1	-100.0
Three year average returns	0.6	106.2	824.8	40.0	-25.5	-76.5	-100.0

Panel B: Descriptive statistics for long-run average market index adjusted returns subsequent to listing for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. All numbers are reported as percentage returns. Reinvestment in the market index is assumed for firms delisted prior to three years. For failed firms, market movements after the failure date cause the return to be greater than 100%.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
One year average returns	-8.6	75.2	1220.1	12.7	-18.6	-41.3	-101.4
Two year average returns	-21.8	85.9	1010.3	1.0	-34.9	-66.9	-104.7
Three year average returns	-33.1	67.4	365.7	-5.9	-48.9	-84.1	-104.7

5.5 Aftermarket Return Measurement

In order to test some of the hypotheses developed in chapter four, some measures of post-listing performance are needed. What is required is a measure to capture market reaction or feedback during the first few months of post-listing seasoning, as opposed to the long-run returns. The hypotheses to be tested suggest these measures are only needed for IPO firms that go on to make an SEO issue.

Three measures of aftermarket return are calculated from the share price and returns data described in Section 5.2.2, being the cumulative abnormal buy-hold from the end of the first day of listing to the end of 30^{th}, 60^{th} and 90^{th} day of listing respectively. These aftermarket return measures, being abnormal returns, have been adjusted for market movements by the All Ordinaries Accumulation Index. Descriptive statistics for these aftermarket cumulative abnormal returns (AMCARs) are presented in table 5.6, since the statistics presented are dependent on the choice of SEO sample used.

5.6 SEOs and SEO Market Reaction Measurements

The choice of SEO definition is an important consideration in this study. While the method of data collection of SEOs is described in Section 5.2.3, the actual choice of sample events is considered in this section. The hypotheses to be tested here refer to the first SEO issued by the firm.[118] IPO firms often make multiple share issues (all types) through time, with more than one meeting the filter criteria of Section 5.2.3. Thus only the first SEO would be considered. Nevertheless, that still leaves three SEO samples:

- first rights issues,
- first private placements, or
- first rights issue or private placement.

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[118] An exception being the reputation acquisition hypothesis of Maritz (1992), which requires multiple SEO issues.

It is worth noting that for most of the firms in this sample there was a restriction on the size of private placements. Firms could issue up to ten percent of their issued capital in any one year via private placements, but any larger amount needed to be approved at a general shareholder meeting. In an attempt to avoid mis-specifying the SEO event, all three samples are used in testing the hypotheses.

For each SEO issue events, an event date needs to be specified. Where possible the first date that (a credible) announcement is made to the market is used, otherwise the actual date of the issue is used as the event date.[119] In a very few cases no public announcement is made or it follows the issue by a considerable time period. It appears that in these cases the firms were not complying with ASX listing rules.

The temporal distribution of these SEO events is reported in table 5.5[120] and graphically displayed in figure 5.2. There are some differences based of the SEO event definition. For the rights issues sample, there is a period of intense activity (i.e., 'hot market') for the five years centred on 1987, and then again in 1996, 1997 and 1999. In the 1993 to 1995 period there is also a moderately high level of rights issues. When the SEO definition is based on private placements (or either rights or private placements) there a more pronounced clustering in the 1995 to 1989 period and then again in 1993 to 1996 period from the evidence in table 5.5.

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119 The source of all information on SEO events was the relevant company file maintained by the ASX. It should contain copies of all public announcements made by the company such as placements or rights issues. The reason that I specify that an announcement must be credible is that some SEOs seem to have preliminary disclosures with subsequent events proving the issue never proceeded or the early announcement details were so inaccurate as to be useless. Furthermore, for private placements, it was often the case that the first information released to the market about a private placement was that it has been made and was now complete. Hence in many cases the actual issue date (which is usually the same as the date the ASX is notified via an Appendix 3B notice) seems to be when the market discovers information on the new issue.

120 This information is supplemented by monthly temporal distributions in Appendix 5 Table A5.5.

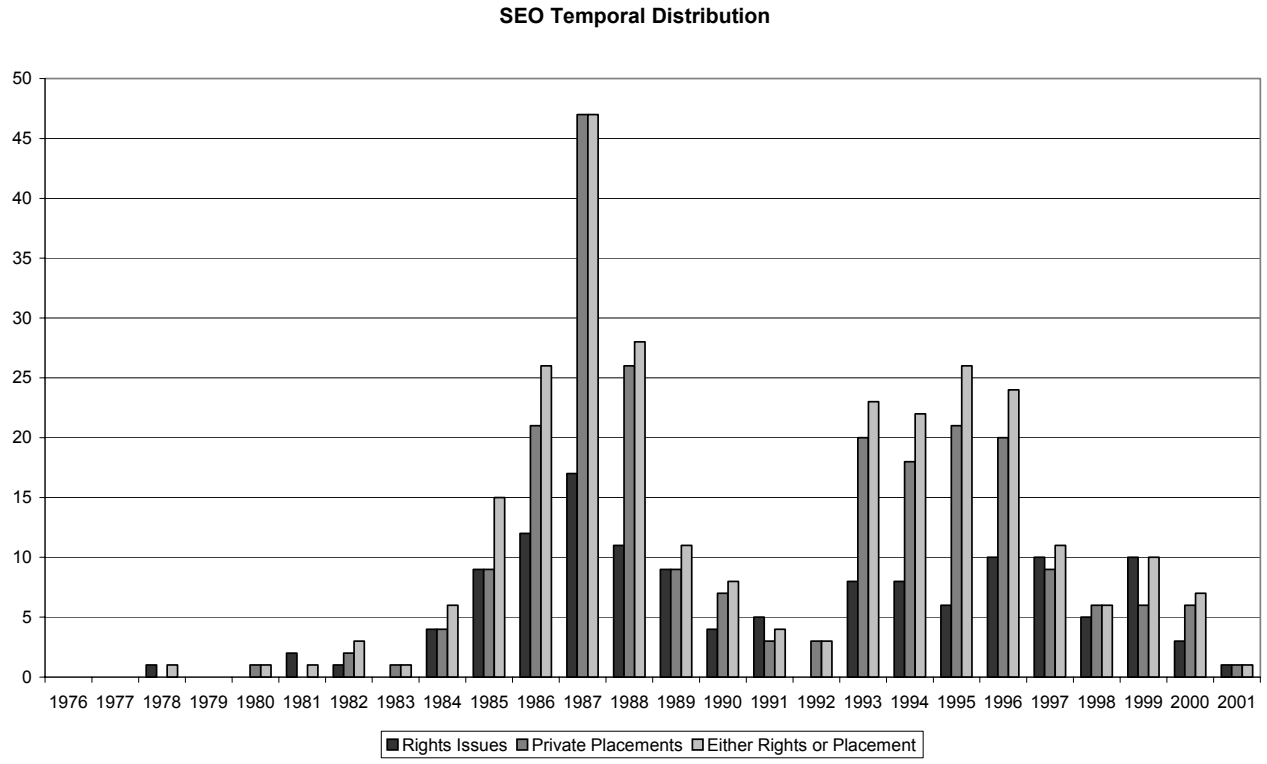
Table 5.5 Time Distribution of SEOs

Temporal distribution by announcement date for first seasoned equity offers made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. There are 136 rights issues, 240 private share placements and 285 issues of either a rights issue or private placement. In each case the issue must be greater than or equal to 5% of issued shares at the time of the issue.

Year	Rights	Placements	Rights/Placement
1976	0	0	0
1977	0	0	0
1978	1	0	1
1979	0	0	0
1980	0	1	1
1981	2	0	1
1982	1	2	3
1983	0	1	1
1984	4	4	6
1985	9	9	15
1986	12	21	26
1987	17	47	47
1988	11	26	28
1989	9	9	11
1990	4	7	8
1991	5	3	4
1992	0	3	3
1993	8	20	23
1994	8	18	22
1995	6	21	26
1996	10	20	24
1997	10	9	11
1998	5	6	6
1999	10	6	10
2000	3	6	7
2001	1	1	1
Total	136	240	285

Figure 5.2 SEO Temporal Distribution

Temporal distribution by announcement date for first seasoned equity offers made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. There are 136 rights issues, 240 private share placements and 285 issues of either a rights issue or private placement. In each case the issue must be greater than or equal to 5% of issued shares at the time of the issue.



To test a market feedback or momentum explanation for the occurrence of an SEO, a measure of firm specific market sentiment or 'run-up' is needed. Three measures used are all cumulative abnormal returns up to ten working days prior to the SEO event date, with measurement windows of 30, 60 and 90 working days.[121] Another measure tested is the total cumulative abnormal return from listing date until ten working days prior to the SEO event date. Each of these measures uses the share price data and returns described in Section 5.2.2 with a zero-one market model using the All Ordinaries Accumulation Index adjustment, on a buy-hold basis. Table 5.6 shows the descriptive statistics of these measures.

The run-up measures indicate that there is on average some positive market sentiment prior to the SEO announcement. This could indicate either market feedback or opportunistic choices by management in timing issues to maximise the proceeds. Alternatively it could be that the run-up windows chosen are either too long (i.e, catching other events), too short or mis-specified.

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[121] In measuring working days (or trading days) public holidays are forward filled. Thus there are always five working days per calendar week.

Table 5.6 IPO and SEO Characteristics

Descriptive statistics for sample firms with (and without) an SEO – Time to SEO, Aftermarket Performance and SEO Run-up.

Panel A: Descriptive statistics for 136 first seasoned equity offers, measured as rights issues of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
AMCAR30*	-1.39	19.44	94.02	4.18	-3.20	-12.48	-37.64
AMCAR60	-1.22	26.19	134.70	6.58	-4.23	-15.72	-58.71
AMCAR90	-0.17	40.62	220.31	10.28	-7.46	-22.62	-57.65
TSEO_DAY	1162.8	893.1	4558.0	1829.5	936.0	480.5	14.0
TSEO_WDA	831.4	637.9	3256.0	1307.5	669.0	343.5	10.0
PERCENTK	49.30	48.12	400.00	61.00	33.33	20.00	6.64
RUP30	9.58	59.58	589.06	12.14	0.92	-8.93	-60.08
RUP60	18.19	140.14	1576.20	18.63	4.07	-11.19	-71.62
RUP90	17.60	131.17	1455.02	22.08	2.77	-19.94	-72.01
RUNUP	0.05	151.46	1525.37	21.99	-19.64	-58.80	-96.43
ARUNUP	19.38	296.71	3418.94	9.65	-7.07	-21.97	-227.01

In this panel AMCAR30* has 133 observations.

Panel B: Descriptive statistics for 240 first seasoned equity offers, measured as share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
AMCAR30*	-2.18	19.26	94.02	7.19	-4.78	-14.34	-39.12
AMCAR60	-0.96	26.49	134.70	10.11	-4.02	-18.06	-58.71
AMCAR90	-0.96	37.48	220.31	12.28	-7.20	-22.62	-58.93
TSEO_DAY	875.9	737.1	3787.0	1172.5	626.0	354.5	20.0
TSEO_WDA	626.6	526.4	2705.0	838.5	448.0	254.0	16.0
PERCENTK	58.99	247.12	3456.52	38.38	10.01	9.19	5.00
RUP30	5.85	24.17	139.83	13.17	1.49	-7.42	-36.64
RUP60	7.95	35.52	219.24	15.19	1.02	-9.44	-50.89
RUP90	12.22	60.35	495.61	14.71	1.23	-13.44	-66.05
RUNUP	-5.19	75.26	551.12	14.49	-16.41	-49.40	-98.57
ARUNUP	7.60	92.67	736.57	12.04	-7.77	-23.79	-236.76

In this panel AMCAR30* has 238 observations.

Table 5.6 Continued…

Panel C: Descriptive statistics for 285 first seasoned equity offers, measured as either rights issues or share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
AMCAR30*	-1.90	18.79	94.02	6.49	-3.40	-13.86	-39.12
AMCAR60	-0.75	25.84	134.70	10.13	-3.88	-16.49	-58.71
AMCAR90	-1.02	36.87	220.31	11.73	-6.94	-22.43	-58.93
TSEO_DAY	896.3	794.2	4102.0	1161.0	607.0	335.0	14.0
TSEO_WDA	641.1	567.3	2930.0	831.0	435.0	241.0	10.0
PERCENTK	44.62	95.37	1059.77	40.14	16.67	9.81	5.00
RUP30	7.02	43.70	589.06	10.81	1.20	-7.53	-60.08
RUP60	11.34	98.77	1576.20	14.41	1.48	-9.43	-71.62
RUP90	14.83	102.58	1455.02	15.06	1.26	-13.32	-72.01
RUNUP	0.02	116.49	1525.37	15.64	-13.56	-47.61	-98.57
ARUNUP	16.04	218.92	3418.94	11.81	-6.23	-23.73	-227.01

In this panel AMCAR30* has 282 observations.

Panel D: Descriptive Statistics for 151 IPOs that made neither a rights issues or share placements, out of a total of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	Standard Deviation	Maximum	75th percentile	Median	25th percentile	Minimum
AMCAR30	-3.28	19.79	102.80	2.77	-4.50	-14.38	-63.40
AMCAR60	-2.76	27.83	161.50	5.64	-5.53	-15.39	-73.87
AMCAR90	-4.63	33.24	188.27	8.53	-6.03	-22.51	-89.74

Aftermarket Performance: Each measure is adjusted for the market (All Ordinaries) index expressed as a percentage.

AMCAR30 Thirty day cumulative abnormal return from the day of listing.
AMCAR60 Sixty day cumulative abnormal return from the day of listing.
AMCAR90 Ninety day cumulative abnormal return from the day of listing.

Time to SEO: The number of days (delay) between listing and an SEO.

TSEO_DAY The number of calendar days between the IPO Listing date and the SEO announcement.
TSEO_WDA The number of working days between the IPO Listing date and the SEO announcement.

SEO Size: SEO issue size relative to number of shares outstanding prior to the issue.

PERCENTK SEO size as a percentage of issued capital.

Run-up to SEO: Each measure is adjusted for the market (All Ordinaries) index expressed as a percentage.

RUP30 Thirty day cumulative abnormal return up to ten days prior to the SEO announcement.
RUP60 Sixty day cumulative abnormal return up to ten days prior to the SEO announcement.
RUP90 Ninety day cumulative abnormal return up to ten days prior to the SEO announcement.
RUNUP Total cumulative abnormal return from the IPO to ten days prior to the SEO announcement.
ARUNUP RUNUP converted to be an equivalent annual rate of return.

In order to determine the market reaction to a SEO announcement event, a number of short window return measures are calculated. They are:

- CARM1_1 The cumulative abnormal return from one day prior to the SEO announcement to one day after the announcement,
- CARM5_5 The cumulative abnormal return from five days prior to the SEO announcement to five days after the announcement, and
- CARM10_10 The cumulative abnormal return from ten days prior to the SEO announcement to ten days after the announcement.

Again, each of these measures uses the share price data and returns described in Section 5.2.2 with a zero-one market model using the All Ordinaries Accumulation Index adjustment, on a buy-hold basis. The descriptive statistics for these metrics, for each of the SEO samples, is reported in Table 5.7.

The market reactions measured here are on average neutral for the shorter windows and mildly positive for the minus ten days to plus ten days window. In all cases the market reactions reported here are not statistically different from zero using parametric and non-parametric tests. This is unlike the usual market reaction for seasoned equity issues which is in the order of minus two to three percent. The reason for this result could be because the firms are all recent IPOs, and/or because of the definition of a SEO used here. Helwege and Liang (1996) provide evidence to support such a conclusion. They find that IPO firms do not generally follow the pecking order theory of raising additional capital, rather preferring to issue new equity in situations where they would be expected to issue debt. If IPO managers are not seen as acting opportunistically when they choose an equity issue (SEO), then the expectation on the market reaction to such news becomes unclear. That is, SEOs for this group of firms need not be bad news.

Table 5.7 SEO Announcement Market Reactions

Panel A: Descriptive Statistics for 136 first seasoned equity offers, measured as rights issues of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	**Standard Deviation**	**Maximum**	**75th percentile**	**Median**	**25th percentile**	**Minimum**
CARM1_1	0.11	9.02	80.26	1.44	-0.36	-2.59	-24.43
CARM5_5	0.48	13.97	85.22	5.12	0.18	-5.62	-55.07
CARM10_10	2.19	17.87	83.05	8.79	0.66	-6.27	-48.40
	Students t-test for mean is zero		**Probability of t-test**	**Number not equal to zero**	**Signed Rank Test**		**Probability of sign test**
CARM1_1	0.14		0.89	136	-651.00		0.16
CARM5_5	0.40		0.69	136	91.00		0.84
CARM10_10	1.43		0.16	136	588.00		0.20

Panel B: Descriptive Statistics for 240 first seasoned equity offers, measured as share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	**Standard Deviation**	**Maximum**	**75th percentile**	**Median**	**25th percentile**	**Minimum**
CARM1_1	0.46	5.75	29.71	1.26	-0.16	-1.56	-21.68
CARM5_5	0.14	12.39	50.52	4.69	-0.76	-5.39	-46.53
CARM10_10	0.57	18.66	94.28	7.43	-0.54	-8.78	-50.01
	Students t-test for mean is zero		**Probability of t-test**	**Number not equal to zero**	**Signed Rank Test**		**Probability of sign test**
CARM1_1	1.25		0.21	237	-530.50		0.62
CARM5_5	0.18		0.86	240	-1045.00		0.33
CARM10_10	0.47		0.64	240	-482.00		0.66

Panel C: Descriptive Statistics for 285 first seasoned equity offers, measured as either rights issues or share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

	Mean	**Standard Deviation**	**Maximum**	**75th percentile**	**Median**	**25th percentile**	**Minimum**
CARM1_1	0.40	5.58	29.71	1.37	-0.16	-1.72	-21.68
CARM5_5	0.61	12.90	85.22	4.70	-0.28	-5.47	-35.10
CARM10_10	0.79	18.09	83.05	7.48	-0.39	-8.37	-50.01
	Students t-test for mean is zero		**Probability of t-test**	**Number not equal to zero**	**Signed Rank Test**		**Probability of sign test**
CARM1_1	1.21		0.23	282	-937.50		0.50
CARM5_5	0.79		0.43	285	-1080.50		0.44
CARM10_10	0.73		0.46	285	-195.50		0.89

Market Reactions to SEOS: Each measure is adjusted for the market index (in most cases the All Ordinaries Accumulation Index) expressed as a percentage.

CARM1_1 The cumulative abnormal return from one day prior to the SEO announcement to one day after the announcement.

CARM5_5 The cumulative abnormal return from five days prior to the SEO announcement to five days after the announcement.

CARM10_10 The cumulative abnormal return from ten days prior to the SEO announcement to ten days after the announcement.

Jegadeesh *et al*. (1993) also document that the SEO market reaction is less for the first SEO following an IPO. They find a market reaction of -1.16%, which is lower than comparative SEO studies in the US. Recall also that Dehnert (1991) found Australian SEOs to have less of a negative reaction than US firms, probably due to institutional features of the Australian market place.

If the SEO announcement reaction is not present (at least for this sample where the SEO follows the IPOs) the implications of the signalling hypothesis may become ambiguous. This is an important finding for both this study and in this area of research generally.

5.7 Underpricing Tests

In order for the tests of underpricing to be efficient, appropriate controls for known determinants must be included in the regression analysis. The controls used here follow from the earlier work of Lee *et al.* (1996b). These are two alternate measures of size (i.e., total assets or issue size), three risk measures (i.e., years of operation, growth options and standard deviation of monthly returns), delay to listing, and retained ownership.[122] All regression results have had their t-statistics adjusted for heteroskedasticity in the manner described by White (1980).

5.8 SEO Issue Tests

There are two types of SEO issue tests performed in this thesis. Firstly, tests of the observed probability of an IPO firm making an SEO. This is tested through the use of logit analysis, where the existence of a SEO issue for a firm is indicated with a binary variable (i.e., a dummy) taking a value of one. Secondly, tests of the delay or time between the IPO and SEO are tested via regression analysis on a sub-set of firms that actually did make an SEO. The dependent variable is duration in days between the IPO and the SEO. Additional controls are added in the form of retained ownership and firm volatility. Retained ownership seems an important control given their relationship with IPO underpricing developed in hypotheses H1 and H2. The volatility or risk of the firm is included as more volatile operations make it more likely that the firm requires additional funding.

The results from this analysis are also adjusted using the heteroskedastic-consistent covariance matrix suggested by White (1980).

5.9 Market Reaction Tests

For tests of market reaction, regression analysis is used. Two additional control variables are introduced for these tests. The first control (Standard Deviation) is a risk proxy, measured as the volatility of the first 12 monthly returns. Firms with higher volatility can be expected to have larger announcement effects. The second control (PercentK) is a measure of the SEO size relative to the existing number of shares in the firm. While only SEOs greater than five percent have been included in the analysis, the variation in SEO offer size seems an important control. Smaller SEOs may not be news worthy and may in fact be expected. Large SEOs on the other hand may transmit other information to investors. The results here have also had their t-statistics White's adjusted.

5.10 Summary

This chapter began with a description of the sample selection and data collection procedures employed in this thesis. These procedures led to the develop a number of unique databases from carefully screened or hand collected information, which are required to test the hypotheses developed in chapter four. Gathering and verifying the appropriate data is important, as the integrity of the results will be dependent upon the quality of the data used.

Next, the chapter described the data and calculation methods used, before concluding by outlining the test procedures. The results of these tests are the focus of chapter six.

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122 For most of the analysis total assets is used as the measure of size, with models incorporating issue size being located in Appendix 5.

Chapter 6.
Analysis and Results

In this chapter the analysis and results of the testable hypotheses developed in chapter four are examined. The relationship between underpricing and retained ownership is explored in Section 6.1, while relationships of underpricing and aftermarket returns are considered in Section 6.2. Section 6.3 contains tests of the probability of a IPO firm returning to the capital market with a SEO, while the timing of that choice is considered in Section 6.4. Tests of the market reaction to an announcement of a SEO are contained in Section 6.5. Section 6.6 considers validity threats to the current study, with the final section being a summary of the chapter.[123]

6.1 Underpricing and Retained Ownership

As considered in Section 4.5.1.1 there are different theoretical predictions (i.e., positive versus negative) on the relationship between underpricing and retained ownership. A simple explanation suggests that the retained ownership signal mitigates the need to use an underpricing signal, thereby being negatively related. Where adequate controls for the level of risk have been undertaken, the relationship is expected to be positive. If retained ownership is high (e.g., greater than 90 percent), then the underpricing cost to the firm may be small across the total number of shares in the firm, which later can be issued at close to market value (i.e., high underpricing when combined with high retained ownership will still give a low overall cost of issuing shares). Hence competing incentives and effects mean the relationship is more complex than a linear relationship, and it is modelled here as a curvilinear function.

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123 In order to aid the flow of the discussion in this chapter, a set of abbreviations is provided here for the description of the level of statistical significance. They are:
@@@ indicated statistical significance at the one percent (rejection) level,
@@ indicated statistical significance at the five percent (rejection) level,
@ indicated statistical significance at the ten percent (rejection) level.

The first hypothesis of this thesis (H1) states that a negative relationship exists between underpricing and retained ownership, but that the rate of change of this relationship is positive.

While some previous studies have shown a positive relationship between underpricing and retained ownership, it will be useful to test that relationship on the current data set.

Tables 6.1 begins the analysis, with a model similar to Lee *et al.* (1996b) in columns one and two. Some familiar results appear, with retained ownership being positively associated with underpricing, and the time to listing (Delay) variable negatively associated with underpricing.[124] Differences include that the years of operation (Years Op.) variable is no longer significant, and the standard deviation of monthly returns (Std.Dev.) becoming significantly positively associated with underpricing. The positive significant relationship between retained ownership and underpricing was confirmed in simple univariate analysis (unreported), but the results to this point have imposed a linear relationship between the variables. In order to test the specification of the model, a Ramsey's Reset test was performed introducing a squared term, which indicated a curvilinear relationship might be present.[125] In fact it appears to be a concave or 'U' shaped parabolic function. Visual inspection confirmed this, with a short (truncated at zero) left arm and a long upward sloping right arm towards the one hundred percent retained ownership. It might best be described as a 'tick'. In table 6.1 columns three and four, a squared term of retained ownership enters into the analysis. The results show a negative relationship[@@] between retained ownership, together with a positive relationship[@@@] between retained ownership squared and underpricing.

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124 Aggarwal, Krigman and Womack (2002) also report a positive association between managerial retained ownership and underpricing. Their model explaining underpricing is driven by managers attempting to maximise the value of their shares when they sell them at the expiration of the lock-up period. Deliberate underpricing provides momentum to share price increases and analyst following, so as to strategically achieve their goal.

125 The Ramsey's Reset test statistics indicated a value of 7.6 for both the F-statistic and the Log likelihood ratio, both of which would be significant at less than the one percent level.

Table 6.1 Underpricing and Retained Ownership

Regression tests of the relationship between underpricing and retained ownership for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. Three measures of SEOs are used in this table: they are rights issues, private placements and the first instance of either a rights issue or private placement. In each case, the SEO issue must be greater than or equal to 5% of existing shares at the time of the issue. White's adjusted student *t* statistics (t-stat) are below each estimate. (436 observations)

Model [a]	MUP	MUP	MUP[b]	MUP[b]	MUP[b]	MUP[b]	MUP[b]
Intercept	12.270	18.651	30.697	28.516	17.488	20.040	13.220
t-stat	0.698	1.062	1.865**	1.683**	1.076	1.215	0.783
Sample1					10.454		
t-stat					3.744***		
Sample2						7.385	
t-stat						2.884***	
Sample3							9.737
t-stat							3.835***
Total Assets	0.190		-0.576		-0.092	-0.125	0.053
t-stat	0.229		-0.733		-0.119	-0.160	0.067
Issue Size		-0.169		-0.478			
t-stat		-0.196		-0.569			
Std. Dev.	0.313	0.306	0.336	0.339	0.356	0.321	0.343
t-stat	2.040**	2.001**	2.242**	2.252**	2.343***	2.176**	2.296**
Growth Opt.	-1.641	-1.751	-1.856	-1.472	-0.955	-2.221	-1.560
t-stat	-0.366	-0.397	-0.418	-0.332	-0.219	-0.502	-0.353
Delay	-0.282	-0.284	-0.286	-0.285	-0.278	-0.272	-0.266
t-stat	-4.500***	-4.527***	-4.571***	-4.551***	-4.562***	-4.478***	-4.412***
Years Op.	-0.263	-0.240	-0.110	-0.126	-0.054	-0.114	-0.070
t-stat	-0.705	-0.641	-0.295	-0.336	-0.149	-0.308	-0.190
Ret. Owner.	20.139	19.482	-31.046	-30.357	-32.765	-37.782	-37.910
t-stat	3.498***	3.057***	-1.878**	-1.817**	-1.988**	-2.197**	-2.241**
R.O. Squared			61.689	59.831	65.006	68.103	68.962
t-stat			2.788***	2.696***	2.972***	2.987***	3.062***
F Value	9.341	9.339	9.511	9.491	10.152	9.284	9.909
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.1032	0.1032	0.1205	0.1202	0.1441	0.1322	0.1408

Table notes on following page

Table 6.1 Continued…

(a)

Dependent Variable is underpricing measured as MUP,
where,
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
Issue Size = equity issue size ($ millions).
Total Assets = total assets after initial equity issue ($ millions)
Years Op. = length of prior operating history (years)
Delay = time between prospectus registration and exchange listing (days)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Opt. = proportion of the subscription price per share represented by growth options
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)

(b)

These regression are specified in a curvilinear form (with respect to retained ownership) after visual inspection data and using the Ramsey's Reset test to confirm the functional form.

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

An explanation here is that for low levels of retained ownership, increases in retained ownership are associated with lower underpricing as in Leland and Pyle (1977). At higher levels of underpricing, additional retained ownership is associated with greater underpricing. Here there are two potential explanations. Firstly, it could be that risk is being adequately controlled for and the positive relationship of Grinblatt and Hwang (1989) is coming into play. The alternative (or a complementary) explanation is that the higher levels of retained ownership indicate some form of testing the market value of the firm at the IPO ('dipping one's toes into the water'), which would later be followed by a SEO once the firm's value was set by the market.[126] This is an important result as it

126 Classic cases of this sort of behaviour include the Australian federal governments' privatisation of the Commonwealth Bank and Telstra.

clears up some controversy over the sign of the relationship between retained ownership and IPO underpricing, as well as explaining the previous empirical results.[127]

This relationship can be extended as in the second hypothesis (H2), which states that IPO firms that subsequently make an SEO have higher underpricing on average than other IPO firms. This is first tested in table 6.1 columns five to seven, by including the SEO issue dummy variable for the three measures of SEO issues. These columns show a positive effect for those firms that made SEOs@@@. Other things being equal, the IPO firms that made a SEO had seven to ten percent higher IPO underpricing than those firms that did not. This finding would be consistent with either the signalling or market feedback hypotheses.

By partitioning the IPO into two groups, based on whether or not they make SEO issues, analysis can be undertaken to observe the relationship between underpricing and retained ownership controlling for SEO activity. This is the essence of hypothesis H2a, which states: retained ownership as a signalling device will be significant in explaining the underpricing of firms that subsequently make SEOs, and not significant for firms that do not make SEOs. The analysis reported in Table 6.2 addresses this issue.

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127 In tests using the EUPAAS measure of underpricing, retained ownership is unrelated to underpricing. This is not surprising since the EUPAAS adjustment has removed the effect of retained ownership, but using this approach retained ownership is restricted from interacting with other explanatory variables.

Table 6.2 Underpricing and Retained Ownership

Regression tests of the relationship between underpricing and retained ownership, partitioned by whether that made an SEO issue, for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. Three measures of SEOs are used in this table, they are rights issues, private placements and the first instance of either a rights issues or private placements. In each case, the SEO issue must be greater than or equal to 5% of existing shares at the time of the issue. White's adjusted student *t* statistics (t-stat) are below each estimate.

Panel A: Underpricing vs. Retained Ownership and control variables.

Model [(a)]	Rights Issues		Private Placements		Either Rights or Private Placement	
SEO Issuers	Yes	No	Yes	No	Yes	No
Observations	136	300	240	196	285	151
Intercept	-21.389	33.118	26.327	27.462	16.437	26.519
t-stat	-0.566	1.863**	1.072	1.602*	0.714	1.407*
Total Assets	2.301	-0.915	-0.366	-0.588	0.185	-0.782
t-stat	1.147	-1.133	-0.318	-0.719	0.167	-0.940
Std. Dev.	0.452	0.320	0.381	0.182	0.371	0.284
t-stat	3.540***	0.989	2.056**	1.045	2.076**	1.467*
Growth Opt.	3.134	-2.076	-1.978	-2.866	-0.579	-2.205
t-stat	0.369	-0.409	-0.297	-0.595	-0.098	-0.445
Delay	-0.255	-0.267	-0.288	-0.230	-0.286	-0.202
t-stat	-3.058***	-3.423***	-3.116***	-2.887***	-3.495***	-2.277**
Years Op.	-1.253	0.477	-0.443	0.574	-0.402	0.807
t-stat	-1.696**	1.181	-0.796	1.387*	-0.813	1.874**
Ret. Owner.	-14.364	-41.439	-41.621	-14.709	-33.530	-29.530
t-stat	-0.558	-1.985**	-1.486*	-0.840	-1.454*	-1.472*
R.O. Squared	70.273	66.141	95.255	18.776	81.454	33.897
t-stat	1.946**	2.444***	2.587***	0.907	2.572***	1.462*
F Value	6.729	5.170	7.367	3.363	8.280	2.543
Prob.(F)	0.0001	0.0001	0.0001	0.0021	0.0001	0.0170
Adjusted R^2	0.2290	0.0889	0.1572	0.0782	0.1521	0.0672

Table notes follow Panel C.

Table 6.2 Continued…

Panel B: Underpricing vs. Retained Ownership and control variables.

Model [(a)]	Rights Issues	Private Placements	Either Rights or Placement
Intercept	19.913	28.525	22.208
t-stat	1.213	1.7613**	1.3046*
Sample1	1.078		
t-stat	0.223		
Sample2		-2.716	
t-stat		-0.477	
Sample3			-1.704
t-stat			-0.324
Total Assets	-0.130	-0.462	-0.193
t-stat	-0.171	-0.613	-0.252
Std. Dev.	0.355	0.350	0.359
t-stat	2.3652***	2.4825***	2.5006***
Growth Opt.	-0.073	-2.790	-1.392
t-stat	-0.017	-0.647	-0.318
Delay	-0.271	-0.270	-0.261
t-stat	-4.4915***	-4.5261***	-4.4529***
Years Op.	-0.043	0.048	0.030
t-stat	-0.120	0.134	0.083
Ret. Owner.	-36.299	-16.396	-28.998
t-stat	-1.7787**	-0.916	-1.3653*
D1*RO	6.856		
t-stat	0.216		
D2*RO		-28.159	
t-stat		-0.857	
D3*RO			-8.573
t-stat			-0.282
R.O. Squared	61.357	21.163	34.422
t-stat	2.3146**	1.000	1.4054*
D1*ROSq	21.155		
t-stat	0.475		
D2*ROSq		77.583	
t-stat		1.8367**	
D3*ROSq			51.615
t-stat			1.3156*
F Value	8.624	9.196	9.318
Prob.(F)	0.0001	0.0001	0.0001
Adjusted R^2	0.1491	0.1585	0.1605

Table 6.2 Continued…

Panel C: Distributional statistics for interactive dummies in panel B.

	Variable	SEO Issuer (=1)	Mean	Standard Deviation
Sample1				
	Ret. Owner.	0	0.4879	0.2649
		1	0.4715	0.2485
	R.O. Squared	0	0.3080	0.2294
		1	0.2836	0.2076
Sample2				
	Ret. Owner.	0	0.4403	0.2916
		1	0.5175	0.2251
	R.O. Squared	0	0.2784	0.2398
		1	0.3183	0.2068
Sample3				
	Ret. Owner.	0	0.4483	0.2936
		1	0.5011	0.2383
	R.O. Squared	0	0.2866	0.2454
		1	0.0308	0.2101

(a)

Dependent Variable is underpricing measured as MUP,
where,
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
Total Assets = total assets after initial equity issue ($ millions)
Years Op. = length of prior operating history (years)
Delay = time between prospectus registration and exchange listing (days)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Opt. = proportion of the subscription price per share represented by growth options
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
D1*RO = interaction effect between Sample1 and Retained Ownership (decimal)
D2*RO = interaction effect between Sample2 and Retained Ownership (decimal)
D3*RO = interaction effect between Sample3 and Retained Ownership (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
D1*ROSq = interaction effect between Sample1 and Retained Ownership squared (decimal)
D2*ROSq = interaction effect between Sample2 and Retained Ownership squared (decimal)
D3*ROSq = interaction effect between Sample3 and Retained Ownership squared (decimal)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

The first and second columns of panel A in table 6.2, partition the firms by whether they made a rights issue SEO. Here the results are interesting, if not supportive of the hypothesis. First, the time to listing (Delay) variable is highly significant for both SEO issuers and non-issuers. Next, the risk measure (Std.Dev.) and the age (Years Op.) variables are only statistically significant for the SEO issuer partition. Now turning to the relationship at the focus of the test, retained ownership. There is a negative relationship[@@] between retained ownership and IPO underpricing for only the non-issuer sample. There is evidence of a positive relationship between the retained ownership squared variable and IPO underpricing in both groups, but the statistical significance is higher in the non-issuer group (one percent level) than for the SEO issuer group (five percent level). It is interesting to note that the explanatory power of the SEO issuers model here is two and a half times as powerful as that in explaining IPO underpricing.

Now turning to the second definition of SEO issue activity (i.e., private placements), relevant results are in table 6.2, panel A, columns three and four. There are some similarities here, but focusing on the variables of interest, there is evidence to support the hypothesis. Retained ownership (and its square) are both significant[128] for the SEO issuers and not significant for the non-issuers. This suggests that retained ownership is more important in the signalling of firms who use private placements rather than rights issues. At the beginning of this thesis the choice of SEO definition was set being unsure if there was a signalling difference between the three alternate measures. It now appears there is a difference, with firms signalling with higher retained ownership preferring a private placement SEO issue. This makes considerable sense since with high retained ownership a pro-rata (such as a rights issue) issue would be expensive to existing owners, while they would not need to contribute to a private placement issue. The results for the third definition of SEO activity in the remaining columns of panel A of table 6.2 deal

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128 The level of significance is ten percent for Retained ownership and at the one percent level for retained ownership squared.

with the combined definition of either the first rights issue or private placement. The waters have been somewhat muddied here with possibly weak support for hypothesis H2a, via higher levels of significance on the retained ownership squared variable.

In the next part of the analysis, the higher levels of underpricing associated with re-issuers is reviewed to see if it is a shift in the function or an interaction between the retained ownership variables and the SEO choice. If it is the latter, a rate of change variable, being the retained ownership variables multiplied by an issue type dummy, will be statistically significant.[129] This analysis is in table 6.2 panel B. Basically the partitions in panel A have been combined and a dummy and some interaction terms have been added. In each of the models in this panel, the SEO issue dummy is no longer significant. The interaction terms for retained ownership (D1*RO, D2*RO and D3*RO) are also statistically insignificant, but the interaction terms for the private placement group and the either private placement or rights issue group are statistically significant. For private placements the statistical significance is at the five percent level, while the combined group is statistically significant at the one percent level. Again, there appears to be an interaction effect for private placements but not rights issue SEOs. For the rights issue SEO group then, it appears that there is greater underpricing, a curvilinear relationship between underpricing and retained ownership, but there is no rate of growth interaction between retained ownership and SEO issuers. In the private placement SEO issuers group, the interaction between retained ownership and the SEO issue dummy (issuer intent) seems more important in explaining underpricing than either of the retained ownership measures on their own or the SEO issuer dummy. The type of SEO is likely to therefore be important in a multiple issue environment.

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129 When using these interactive dummy terms within statistical tests, it is important to check the distributional attributes of both sub-groups of the underlying variable. It is acceptable for the means to vary, but the standard deviations of both sub-groups must be similar to ensure the statistical inferences are valid. Dietrich, Muller and Riedl (2002) highlight this problem as it pertains to the accounting conservatism literature. Table 6.2 panel C gives the distributional statistics for the interactive dummies in this case. While no testing is performed, the two groups showing similar standard deviations allowing the analysis to proceed without significant bias being introduced.

Evidence presented here therefore, provides strong support for both hypotheses H1 and H2, while H2a is supported for the private placement definition of SEO issuing activity.

6.2 Underpricing and Aftermarket Returns

The third of the hypotheses considers the relationship between the initial IPO returns and the stock returns in the immediate aftermarket. As initial IPO returns are on average underpriced, the relationship investigated here is between underpricing and aftermarket returns. Under the IPO signalling hypothesis, underpricing is a signal of the firm's quality and the market discovers the true quality of the IPO in the aftermarket. Therefore, a positive relationship is expected. Under the market feedback hypothesis the positive relationship (between underpricing and aftermarket returns) is because the entrepreneur has underestimated the firm's true returns. Thus this relationship can be tested, but the test will not differentiate between these two explanations.

Hypothesis H3 states that there is a positive relationship between the initial return and initial aftermarket returns, and that this relationship will be greater for IPO firms which subsequently make seasoned equity offerings. Table 6.3 tests these propositions using three measures of aftermarket return. The first three columns in Panel A are simple univariate tests of the relationship between IPO underpricing and aftermarket returns. All three models show support for H3 through a statically significant positive relationship between underpricing and all measures of aftermarket return. The test statistics (student-t's) are between 2.618 and 3.509, with all being statistically significant at the one percent level. The relationship seems strongest for the longest of the aftermarket measures (i.e., 90 days).

Table 6.3 Underpricing and Aftermarket Return

Regression tests of the relationship between underpricing and aftermarket return for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. White's adjusted student *t* statistics (t-stat) are below each estimate.

Panel A: Underpricing vs. aftermarket return and other control variables.

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	12.008	11.527	11.636	28.996	27.648	26.992
t-stat	8.052***	8.051***	8.247***	1.774**	1.682**	1.672**
AMCAR30	0.295			0.256		
t-stat	3.000***			2.799***		
AMCAR60		0.202			0.158	
t-stat		2.618***			2.255**	
AMCAR90			0.176			0.138
t-stat			3.509***			2.911***
Total Assets				-0.336	-0.459	-0.406
t-stat				-0.424	-0.585	-0.528
Std. Dev.				0.291	0.291	0.196
t-stat				2.223**	2.227**	1.418*
Growth Opt.				-0.863	-0.525	0.317
t-stat				-0.199	-0.127	0.077
Delay				-0.318	-0.270	-0.264
t-stat				-4.866***	-4.343***	-4.226***
Years Op.				-0.302	-0.222	-0.293
t-stat				-0.802	-0.610	-0.810
Ret. Owner.				-24.567	-26.580	-24.134
t-stat				-1.512*	-1.637*	-1.467*
R.O. Squared				54.122	56.812	54.754
t-stat				2.524***	2.623***	2.485***
F Value	15.654	14.219	19.718	10.634	9.653	10.027
Prob.(F)	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0328	0.0295	0.0413	0.1514	0.1373	0.1424

Table notes follow Panel D.

Table 6.3 Continued…

Panel B: Underpricing vs. aftermarket return, SEO issuers (sample1) and other control variables.
For this panel, first seasoned equity offers are measured as rights issues of greater than or equal to 5% of existing shares at the time of the issue. 136 firms out of the 436 observations therefore issue SEOs.

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	9.074	8.575	8.818	16.641	14.642	14.237
t-stat	5.147***	5.102***	5.283***	1.035	0.900	0.896
Sample1	9.490	9.459	9.000	9.674	10.342	9.937
t-stat	2.967***	3.028***	2.874***	3.428***	3.764***	3.563***
AMCAR30	0.288			0.268		
t-stat	2.956***			2.467***		
D1*AMR30				-0.066		
t-stat				-0.342		
AMCAR60		0.201			0.163	
t-stat		2.669***			2.101**	
D1*AMR60					-0.021	
t-stat					-0.139	
AMCAR90			0.171			0.149
t-stat			3.410***			2.284**
D1*AMR90						-0.047
t-stat						-0.466
Total Assets				0.094	0.017	0.064
t-stat				0.121	0.022	0.085
Std. Dev.				0.307	0.310	0.242
t-stat				2.329***	2.432***	1.526*
Growth Opt.				0.132	0.338	0.877
t-stat				0.031	0.083	0.212
Delay				-0.304	-0.262	-0.258
t-stat				-4.698***	-4.351***	-4.244***
Years Op.				-0.240	-0.163	-0.229
t-stat				-0.660	-0.462	-0.645
Ret. Owner.				-26.706	-28.370	-25.925
t-stat				-1.623*	-1.747**	-1.572*
R.O. Squared				57.888	60.171	57.852
t-stat				2.684***	2.803***	2.641***
F Value	12.776	12.105	14.470	9.847	9.205	9.445
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0517	0.0486	0.0583	0.1700	0.1587	0.1626

Table 6.3 Continued…

Panel C: Underpricing vs. aftermarket return, SEO issuers (sample2) and other control variables.
For this panel, first seasoned equity offers are measured as private placements of greater than or equal to 5% of existing shares at the time of the issue. 240 firms out of the 436 observations therefore issue SEOs.

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	6.977	6.558	6.818	18.398	17.289	16.919
t-stat	4.387***	4.238***	4.448***	1.114	1.043	1.043
Sample2	9.140	9.019	8.732	7.276	7.339	7.096
t-stat	3.379***	3.345***	3.238***	2.728***	2.859***	2.766***
AMCAR30	0.293			0.210		
t-stat	3.038***			1.864**		
D2*AMR30				0.077		
t-stat				0.453		
AMCAR60		0.199			0.111	
t-stat		2.669***			1.658**	
D2*AMR60					0.080	
t-stat					0.639	
AMCAR90			0.171			0.130
t-stat			3.493***			2.411***
D2*AMR90						0.008
t-stat						0.089
Total Assets				0.110	-0.018	0.020
t-stat				0.137	-0.023	0.026
Std. Dev.				0.273	0.270	0.181
t-stat				2.178**	2.170**	1.247
Growth Opt.				-1.205	-0.873	-0.067
t-stat				-0.279	-0.211	-0.016
Delay				-0.305	-0.259	-0.252
t-stat				-4.787***	-4.287***	-4.159***
Years Op.				-0.306	-0.215	-0.292
t-stat				-0.812	-0.593	-0.808
Ret. Owner.				-30.779	-33.258	-30.760
t-stat				-1.823**	-1.970**	-1.792**
R.O. Squared				60.053	63.273	61.092
t-stat				2.722***	2.839***	2.688***
F Value	13.1830	12.3500	14.8730	9.2710	8.5390	8.7410
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.053	0.050	0.060	0.161	0.148	0.151

Table 6.3 Continued…

Panel D: Underpricing vs. aftermarket return, SEO issuers (sample3) and other control variables. For this panel, first seasoned equity offers are measured as either rights issues or private placements of greater than or equal to 5% of existing shares at the time of the issue. 285 firms out of the 436 observations therefore issue SEOs.

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	5.100	4.702	4.948	12.890	11.024	10.833
t-stat	2.815***	2.671***	2.836***	0.769	0.650	0.647
Sample3	10.573	10.426	10.209	9.484	9.717	9.535
t-stat	4.053***	4.007***	3.924***	3.550***	3.804***	3.696***
AMCAR30	0.286			0.133		
t-stat	2.982***			1.134		
D3*AMR30				0.182		
t-stat				1.125		
AMCAR60		0.195			0.054	
t-stat		2.629***			0.892	
D3*AMR60					0.157	
t-stat					1.413*	
AMCAR90			0.169			0.082
t-stat			3.483***			1.627*
D3*AMR90						0.073
t-stat						0.918
Total Assets				0.206	0.115	0.153
t-stat				0.260	0.147	0.196
Std. Dev.				0.293	0.291	0.184
t-stat				2.335***	2.342***	1.270
Growth Opt.				-0.410	0.020	0.849
t-stat				-0.095	0.005	0.206
Delay				-0.297	-0.254	-0.247
t-stat				-4.663***	-4.217***	-4.098***
Years Op.				-0.252	-0.152	-0.222
t-stat				-0.675	-0.427	-0.616
Ret. Owner.				-31.485	-34.073	-31.742
t-stat				-1.881**	-2.050**	-1.874**
R.O. Squared				61.528	65.088	63.142
t-stat				2.806***	2.954***	2.803***
F Value	14.435	13.548	16.166	9.820	9.208	9.293
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0586	0.0545	0.0652	0.1696	0.1587	0.1601

Table 6.3 Continued…

Panel E: Distributional statistics for interactive dummies in panel B to D.

	Variable	SEO Issuer (=1)	Mean	Standard Deviation
Sample1				
	AMCAR30	0	-2.8141	19.0124
		1	-1.3949	19.4374
	AMCAR60	0	-1.5451	26.7314
		1	-1.2225	26.1851
	AMCAR90	0	-3.2274	33.1883
		1	-0.1688	40.6217
Sample2				
	AMCAR30	0	-2.6243	19.0276
		1	-2.1765	19.2559
	AMCAR60	0	-2.0361	26.6376
		1	-0.9613	26.4924
	AMCAR90	0	-3.8841	33.3122
		1	-0.0958	37.4760
Sample3				
	AMCAR30	0	-3.2753	19.7874
		1	-1.8978	18.7907
	AMCAR60	0	-2.7646	27.8299
		1	-0.7450	25.8416
	AMCAR90	0	-4.6340	33.2354
		1	-1.0226	36.8669

(a)

Dependent Variable is underpricing measured as MUP,
where,
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
Total Assets = total assets after initial equity issue ($ millions)
Years Op. = length of prior operating history (years)
Delay = time between prospectus registration and exchange listing (days)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Opt. = proportion of the subscription price per share represented by growth options
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)

Table 6.3 Continued…

D1*AMR30 = interactive dummy between Sample1 and AMCAR30 (percent)
D1*AMR60 = interactive dummy between Sample1 and AMCAR60 (percent)
D1*AMR90 = interactive dummy between Sample1 and AMCAR90 (percent)
D2*AMR30 = interactive dummy between Sample2 and AMCAR30 (percent)
D2*AMR60 = interactive dummy between Sample2 and AMCAR60 (percent)
D2*AMR90 = interactive dummy between Sample2 and AMCAR90 (percent)
D3*AMR30 = interactive dummy between Sample3 and AMCAR30 (percent)
D3*AMR60 = interactive dummy between Sample3 and AMCAR60 (percent)
D3*AMR90 = interactive dummy between Sample3 and AMCAR90 (percent)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

In columns four to six of table 6.3 panel A, multivariate analysis of the relationship is investigated by adding the other variables used to explain IPO underpricing in earlier models. The results show that the positive relationship[@@@] between underpricing and measures of aftermarket return continues for the 90 day measure, is somewhat diminished for the 60 day metric[@@] and is insignificant for the 30 day measure. This suggests that underpricing is positively related to the aftermarket return.

Panels B and C of table 6.3 deal with the second part of hypothesis H3, which suggests that the positive relationship IPO underpricing and aftermarket returns should be stronger for those firms that make SEOs. While there is a problem using observed actual SEO as an indication of the entrepreneur's intention at the IPO, this stronger relationship will be tested using actual SEO issues.

Three measures of SEO issues, as discussed in Section 5.6, are used in panels B to D respectively. In each of these panels a binary variable or dummy is added to the tests in panel A, where the value of one indicates the firm did make an SEO issue, given its respective definition. In models four to six of panels B through D, an interaction term (interactive dummy) is also added to examine whether it is a shift in the relationship or a

change in the rate of association between underpricing and aftermarket returns for SEO issuers.[130]

In all cases the SEO issue dummy is associated[@@@] with higher underpricing. In panel B (for rights issues), the aftermarket returns are positively associated[@@@] with underpricing even in the presence of the SEO dummy. But when the interactive dummies are introduced they have no statistical significance, and the statistical significance of the 60 and 90 day aftermarket return measures is reduced. [@@] In panels C and D similar patterns appear with the interactive dummies simply detracting significance from the aftermarket return variables. In only one case is the interactive dummy (D3*AMR60) significant in a statistical sense.[@]

Table 6.3 provided evidence to allow the confirmation of the first part of hypothesis H3, in that underpricing is positively associated with the immediate aftermarket returns. Although SEO issuing firms were not found to have a stronger association between underpricing and aftermarket returns, they were found to have higher underpricing. This evidence is consistent with both the signalling and market feedback explanations.

6.3 Tests of the probability of an SEO

The signalling and market feedback hypotheses provide testable propositions as to which firms are expected to make a SEOs. In this section the (observed) probability or choice to make an SEO is modelled as a function of the firm's retained ownership, underpricing and aftermarket returns. Given a higher portion of the firm is retained by existing owners, less new capital is generated at the IPO. Managers are then more likely to be required to return to the capital market to raise investment funds. This gives rise to a

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130 The distributional statistics for the interactive dummies is analysed and the results shown in table 6.3 panel E. The standard deviations between sub-groups look quantitatively similar.

prediction that those firms with higher retained ownership at the IPO are more likely to make a SEO. Note that secondary sales of existing shares have been excluded from the definitions of SEO issues used here.

IPO firms that perform well in the aftermarket, are all other things considered, more likely to return to the market and make SEO issues. For one thing the proceeds of the issue for these firms should be greater (controlling for the number of shares issued) than for firms that have not performed well post-listing. This can be considered as a way of lowering the cost of capital or minimising the dilutive effects of additional capital.

By including the aftermarket return, the test is extended to differentiate between the signalling and market feedback hypotheses. Supporting the market feedback hypothesis, a positive relationship is inferred between aftermarket return and the probability of a SEO. Together, the above points led to the fourth hypothesis (H4) which states that IPO firms are more likely to make an SEO, where there is high retained ownership, greater underpricing and better initial aftermarket returns. The results of the analysis for hypothesis H4 are given in table 6.4.

Beginning by reviewing the results for retained ownership, when the SEO definition is only rights issues (table 6.4 panel A), no statistically significant relationship is detected if retained ownership (and its square) are the only explanatory variables. Once the IPO underpricing is included in the model, retained ownership squared becomes statistically significant at the five percent level with a negative coefficient. It is hard to interpret this result as underpricing has a positive sign, but it is insignificant. All that can be said of this result is that retained ownership has a decreasing effect on the probability of a rights issue SEO as the level of retained ownership increases.

Table 6.4 SEO Issues

Logit analysis of the observed probability of firms making SEOs for a sample of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. The probability of an SEO is modelled as a function of underpricing, retained ownership and aftermarket returns. Three measures of aftermarket return are used: 30, 60 and 90 days. Each panel is for a different definition of SEO issues. Reported figures are the parameter estimate with a chi-squared statistic and probability estimate displayed respectively below. All panels have 436 observations.

Panel A: Probability of an SEO issue (Sample1) as a function of retained ownership, underpricing and measures of aftermarket returns. In this panel SEO issues are taken to be rights issues that are greater than or equal to 5% of existing shares at the time of the issue.

Model [(a)]	1	2	3	4	5	6
Intercept	-0.675	-0.890	-0.950	-1.002	-0.952	-0.950
χ^2	9.81	11.47	12.81	13.75	12.86	12.80
Probability	0.002***	0.001***	0.000***	0.000***	0.000***	0.000***
Ret. Owner.	-0.243	1.658	1.998	2.141	1.975	2.008
χ^2	0.38	1.62	2.26	2.51	2.20	2.28
Probability	0.540	0.203	0.133	0.113	0.138	0.131
R.O. Squared		-2.357	-3.225	-3.359	-3.203	-3.233
χ^2		2.35	4.06	4.28	3.99	4.07
Probability		0.125	0.044**	0.039**	0.046**	0.044**
MUP			0.012	0.013	0.013	0.012
χ^2			11.22	10.97	11.19	10.43
Probability			0.001***	0.001***	0.001***	0.001***
AMCAR30				0.001		
χ^2				0.06		
Probability				0.807		
AMCAR60					-0.002	
χ^2					0.16	
Probability					0.688	
AMCAR90						0.001
χ^2						0.03
Probability						0.856
Overall χ^2	304.45	302.04	526.24	518.69	526.08	526.21
Probability	0.0027	0.0031	0.0013	0.0017	0.0011	0.0011

Table 6.4 Continued…

Panel B: Probability of an SEO issue (Sample2) as a function of retained ownership, underpricing and measures of aftermarket returns. In this panel SEO issues are taken to be private placements that are greater than or equal to 5% of existing shares at the time of the issue.

Model [(a)]	1	2	3	4	5	6
Intercept	-0.354	-0.826	-0.878	-0.859	-0.878	-0.878
χ^2	2.97	10.29	11.45	10.87	11.45	11.42
Probability	0.085*	0.001***	0.001***	0.001***	0.001***	0.001***
Ret. Owner.	1.159	5.164	5.433	5.303	5.432	5.458
χ^2	9.40	17.35	18.71	17.64	18.66	18.80
Probability	0.002***	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.881	-5.550	-5.429	-5.549	-5.570
χ^2		11.82	14.52	13.79	14.50	14.59
Probability		0.001***	0.000***	0.000***	0.000***	0.000***
MUP			0.012	0.012	0.012	0.012
χ^2			8.76	8.60	8.47	7.85
Probability			0.003***	0.003***	0.004***	0.005***
AMCAR30				-0.001		
χ^2				0.01		
Probability				0.918		
AMCAR60					0.000	
χ^2					0.00	
Probability					0.988	
AMCAR90						0.001
χ^2						0.14
Probability						0.711
Overall χ^2	316.63	304.61	568.01	565.21	568.01	567.87
Probability	0.0006	0.0023	0.0000	0.0000	0.0000	0.0000

Table 6.4 Continued…

Panel C: Probability of an SEO issue (Sample3) as a function of retained ownership, underpricing and measures of aftermarket returns. In this panel SEO issues are taken to be either rights issues or private placements that are greater than or equal to 5% of existing shares at the time of the issue.

Model [(a)]	1	2	3	4	5	6
Intercept	0.266	-0.116	-0.177	-0.209	-0.176	-0.175
χ^2	1.65	0.23	0.52	0.71	0.51	0.51
Probability	0.199	0.630	0.471	0.399	0.474	0.475
Ret. Owner.	0.777	4.335	4.679	4.785	4.687	4.698
χ^2	4.06	12.54	14.02	14.44	14.05	14.09
Probability	0.044**	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.412	-5.274	-5.366	-5.282	-5.290
χ^2		9.46	12.70	12.99	12.72	12.75
Probability		0.002***	0.000***	0.000***	0.000***	0.000***
MUP			0.018	0.018	0.017	0.017
χ^2			12.69	12.28	12.12	11.57
Probability			0.000***	0.001***	0.001***	0.001***
AMCAR30				0.001		
χ^2				0.06		
Probability				0.814		
AMCAR60					0.001	
χ^2					0.03	
Probability					0.862	
AMCAR90						0.001
χ^2						0.09
Probability						0.770
Overall χ^2	307.79	298.35	532.88	529.60	532.85	532.80
Probability	0.0018	0.0048	0.0006	0.0006	0.0006	0.0006

Table 6.4 Continued…

(a)

Dependent Variable is the observed probability of a firm making an SEO being measured as one of the following: Sample1, Sample2 or Sample3,
where,

Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

When the definition of SEO issues is based on private placements (panel B) or either a rights issue or private placement (panel C), a strong positive relationship can be observed between retained ownership and the probability of an SEO. Further, these results are statistically significant at the one percent level in all but one case, where five percent significance is encountered. The retained ownership squared variable is statistically significant in all cases at the one percent level in a negative (offsetting) direction. This is evidence consistent with hypothesis H4.

The insignificant result for rights issues may be due to the restrictive definition applied. Managers are not required to make rights issues to raise funds, private placements and even private placements that are in exchange for non-cash assets (e.g., investments of projects) may be more efficient. Recall the discussion of the restrictions on private placements mentioned in Section 5.6.

Next, looking at the IPO underpricing measure as an indicator of the probability of an SEO, in every case (panel A, B and C) there is evidence of a strong positive

relationship@@@ between the probability of an SEO and underpricing. These results support hypothesis H4. Jegadeesh *et al.* (1993) previously found a similar positive relationship between IPO underpricing and the probability of a firm making an SEO issue, but Garfinkle (1993) could not find any association between these variables.[131]

Finally, completing the analysis of the probability of an SEO, consideration is given to aftermarket return measures as a predictor of SEO activity. Using a 30, 60 and 90 day measurement of aftermarket return, all results are statistically insignificant, with the directional indication even changing between measures and regressions. Therefore this portion of hypothesis H4 can not be confirmed. But since this prediction was unique to the market feedback hypothesis, this evidence may draw into question the applicability of that hypothesis. In earlier research, Jegadeesh *et al.* (1993) were able to find a positive association with their measures of aftermarket return. Given the earlier finding in this work that underpricing and aftermarket returns are positively associated with underpricing, one would have expected the flow-on effect to be evident, but the relationship must be less direct or in some way dampened by the control variables (e.g., retained ownership).

6.4 Time between the IPO and the first SEO

The timing of an SEO (or the time delay between the IPO and the first SEO) is the focus of hypothesis H5. This hypothesis states that elapsed time from the IPO to the first SEO is negatively related to IPO underpricing and IPO initial aftermarket returns. Analysis of these propositions is contained in table 6.5, firstly on a univariate basis in panel A, followed by multivariate analysis in the remainder of the table.

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131 Cook and Officer (1996) also found a positive relationship between underpricing and the probability of firms making a SEO, for a group of reverse LBOs that made an IPO and then a SEO within one year of the IPO.

For the univariate analysis on the rights issue sub-sample, the evidence shows a negative relationship between IPO underpricing and the time delay to the first SEO issue which is statistically significant at the one percent level. The longest of the aftermarket return measures has a negative relationship[@@@] to the time delay to SEO, while the other aftermarket return measures have insignificant t-statistics. It is possible that these other two aftermarket return measures are too short to capture an early revelation of quality. A control variable, standard deviation of monthly returns, has a negative relationship[@@@] with the time to SEO measure. This could be interpreted as more volatile firms having their true quality revealed earlier and therefore SEOs are issued sooner after the IPO. One result, which is consistent across all definitions of SEO activity, is that the annualised abnormal return (ARUNUP) measure is negatively associated[@@@] with the time to an SEO. This indicates that firms that perform better (using a market measure) return sooner to raise more capital.

When the definition of an SEO is based on a private placement, IPO underpricing, standard deviation of monthly returns and aftermarket return measures are all statistically insignificant in explaining the time delay. The 60 and 90 day run-up measures are positively associated[@@@] with the time to SEO. This result is contrary to the hypothesis (H5), indicating that firms with higher run-up prior to their SEO have waited longer to re-issue. These run-up measures have a causation problem as the return window is defined relative to the SEO event date, making it difficult to consider whether the return window performance determines the entire time delay from IPO to SEO.

Table 6.5 Determinants of Time to SEO

Regression analysis of the time (delay) before an SEO is issued for sub-samples of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995, that did make an SEO issue. The time to SEO or delay can only be measured for those firms making a SEO, so the number of observations varies. Three measures of SEOs are used in this table; they are rights issues, private placements and rights issues or private placements. In each case, the issue must be greater than or equal to 5% of issued shares by the 436 IPOs.

Panel A: Univariate analysis of time to SEO. Student t statistics are White's adjusted.

$$TSEO\_DAY = \alpha + \beta\, Determinant + \varepsilon$$

Determinant (a)	Obs.	α	t(α)	β	t(β)	F Value	Prob.(F)	Adj. R^2
Time to Rights Issue SEO								
MUP	136	1265.46	13.910***	-5.77	-3.104***	5.706	0.0183	0.0337
Std. Dev.	136	1342.77	12.688***	-13.82	-2.768***	5.809	0.0173	0.0344
AMCAR30	133	1179.06	15.320***	-0.15	-0.046	0.001	0.9694	-0.0076
AMCAR60	136	1160.93	15.255***	-1.50	-0.647	0.258	0.6123	-0.0055
AMCAR90	136	1162.19	15.419***	-3.34	-2.995***	3.162	0.0776	0.0158
RUP30	136	1152.43	15.206***	1.08	0.518	0.696	0.4056	-0.0023
RUP60	136	1165.21	15.223***	-0.13	-0.278	0.060	0.8071	-0.0070
RUP90	136	1164.58	15.199***	-0.10	-0.187	0.031	0.8603	-0.0072
ARUNUP	136	1167.69	15.278***	-0.25	-4.488***	0.966	0.3274	-0.0003
Time to Private Placement SEO								
MUP	240	884.12	16.153***	-0.53	-0.243	0.152	0.6973	-0.0036
Std. Dev.	240	937.30	13.903***	-4.38	-1.214	1.147	0.2853	0.0006
AMCAR30	238	876.63	18.143***	-0.01	-0.004	0.000	0.9962	-0.0042
AMCAR60	240	874.66	18.475***	-1.33	-0.792	0.543	0.4619	-0.0019
AMCAR90	240	874.48	18.513***	-1.51	-1.184	1.420	0.2345	0.0018
RUP30	240	870.89	17.555***	0.86	0.407	0.190	0.6634	-0.0034
RUP60	240	848.16	18.294***	3.49	2.343***	6.938	0.0090	0.0242
RUP90	240	846.99	18.398***	2.37	3.236***	9.307	0.0025	0.0336
ARUNUP	240	883.45	18.529***	-0.99	-2.951***	3.729	0.0547	0.0113
Time to either a Rights Issue or Private Placement SEO								
MUP	285	907.05	16.728***	-0.72	-0.341	0.255	0.6137	-0.0026
Std. Dev.	285	1023.19	15.829***	-9.46	-3.034***	4.981	0.0264	0.0138
AMCAR30	282	902.49	18.996***	0.08	0.032	0.001	0.9746	-0.0036
AMCAR60	285	895.60	19.089***	-0.93	-0.572	0.259	0.6110	-0.0026
AMCAR90	285	894.09	19.176***	-2.16	-1.904**	2.871	0.0913	0.0065
RUP30	285	892.00	18.890***	0.61	0.428	0.320	0.5718	-0.0024
RUP60	285	895.82	19.136***	0.04	0.085	0.008	0.9309	-0.0035
RUP90	285	889.88	19.087***	0.43	0.598	0.887	0.3470	-0.0004
ARUNUP	285	901.04	19.175***	-0.30	-2.905***	1.899	0.1693	0.0032

Table 6.5 Continued…

Panel B: Multivariate analysis of time to SEO for the rights issue (Sample1) definition of SEO issuers. White's adjusted student t statistics (t-stat) are below each estimate. Models have 136 observations, except for model 2 which has 133 observations.

Model	1	2	3	4	5	6	7	8
Intercept	1508.32	1580.49	1509.64	1494.72	1570.72	1623.12	1596.13	1592.24
t-stat	8.161***	8.702***	8.175***	8.056***	9.335***	8.999***	9.097***	8.440***
MUP	-6.53	-6.94	-6.43	-6.29	-5.88	-6.18	-6.21	-6.27
t-stat	-3.125***	-3.189***	-3.075***	-3.045***	-2.971***	-3.120***	-3.186***	-3.042***
Std. Dev.	-9.57	-10.34	-9.61	-8.11	-25.05	-26.18	-25.04	-19.55
t-stat	-2.206**	-2.205**	-2.217**	-1.589*	-4.033***	-3.297***	-3.468***	-2.399***
Ret. Owner.	-1726.70	-1933.11	-1740.18	-1749.70	-1412.00	-1543.01	-1488.88	-1610.39
t-stat	-1.732**	-1.940**	-1.746**	-1.758**	-1.439*	-1.563*	-1.519*	-1.600*
R.O. Squared	2501.90	2726.67	2511.53	2505.12	2257.39	2404.27	2360.53	2417.43
t-stat	1.870**	2.028**	1.876**	1.866**	1.746**	1.855**	1.822**	1.822**
AMCAR30		0.46						
t-stat		0.154						
AMCAR60			-0.76					
t-stat			-0.383					
AMCAR90				-1.23				
t-stat				-0.886				
RUP30					5.07			
t-stat					4.211***			
RUP60						2.01		
t-stat						2.972***		
RUP90							2.04	
t-stat							3.137***	
ARUNUP								0.55
t-stat								1.801**
F Value	3.818	3.487	3.047	3.114	5.224	4.363	4.301	3.413
Prob.(F)	0.0057	0.0055	0.0124	0.0109	0.0002	0.0011	0.0012	0.0063
Adjusted R^2	0.0771	0.0861	0.0705	0.0726	0.1353	0.1108	0.1089	0.082

Table 6.5 Continued…

Panel C: Multivariate analysis of time to SEO for the Private Placement (Sample2) definition of SEO issuers. White's adjusted student t statistics (t-stat) are below each estimate. Models have 240 observations, except for model 2 which has 238 observations.

Model	1	2	3	4	5	6	7	8
Intercept	1329.38	1329.59	1328.87	1312.24	1324.99	1246.78	1216.67	1311.73
t-stat	8.109***	8.093***	8.102***	7.891***	8.010***	8.095***	7.728***	7.860***
MUP	-0.38	-0.34	-0.20	-0.16	-0.38	-0.43	-0.18	-0.20
t-stat	-0.173	-0.155	-0.091	-0.074	-0.174	-0.195	-0.082	-0.094
Std. Dev.	-4.90	-4.86	-4.66	-3.42	-4.92	-5.00	-5.32	-3.56
t-stat	-1.340*	-1.328*	-1.308*	-0.808	-1.340*	-1.302*	-1.340*	-0.941
Ret. Owner.	-1816.47	-1813.15	-1838.95	-1839.64	-1803.16	-1584.36	-1514.41	-1832.40
t-stat	-2.761***	-2.780***	-2.807***	-2.812***	-2.737***	-2.552***	-2.410***	-2.762***
R.O. Squared	1762.59	1753.19	1777.57	1774.79	1749.77	1576.36	1553.32	1798.40
t-stat	2.493***	2.496***	2.523***	2.528***	2.475***	2.318**	2.271**	2.532***
AMCAR30		-0.25						
t-stat		-0.101						
AMCAR60			-1.36					
t-stat			-0.814					
AMCAR90				-1.32				
t-stat				-0.868				
RUP30					0.33			
t-stat					0.162			
RUP60						3.02		
t-stat						2.159**		
RUP90							2.12	
t-stat							2.913***	
ARUNUP								-0.92
t-stat								-2.498***
F Value	2.172	1.705	1.846	1.921	1.736	2.784	3.184	2.380
Prob.(F)	0.0729	0.1342	0.1048	0.0917	0.1272	0.0183	0.0084	0.0394
Adjusted R^2	0.0192	0.0147	0.0174	0.0189	0.0152	0.0360	0.0437	0.0281

Table 6.5 Continued…

Panel D: Multivariate analysis of time to SEO for either a rights issue or private placement (Sample3) definition of SEO issuers. White's adjusted student t statistics (t-stat) are below each estimate. Models have 285 observations, except for model 2 which has 282 observations.

Model	1	2	3	4	5	6	7	8
Intercept	1317.28	1355.97	1316.92	1301.86	1337.42	1365.98	1342.74	1316.16
t-stat	9.432***	9.757***	9.433***	9.206***	9.920***	9.824***	10.247***	9.011***
MUP	-0.96	-1.03	-0.85	-0.65	-0.89	-0.96	-0.81	-0.95
t-stat	-0.459	-0.482	-0.396	-0.304	-0.424	-0.454	-0.389	-0.458
Std. Dev.	-8.64	-9.11	-8.56	-7.18	-13.38	-15.10	-16.01	-8.53
t-stat	-2.928***	-2.992***	-2.921***	-2.022**	-3.266***	-3.654***	-4.351***	-1.873**
Ret. Owner.	-1993.22	-2103.76	-2000.57	-2015.29	-1872.27	-1915.29	-1834.29	-1993.99
t-stat	-3.051***	-3.238***	-3.071***	-3.104***	-2.972***	-3.025***	-2.930***	-3.061***
R.O. Squared	2301.13	2403.04	2303.76	2303.69	2191.22	2256.01	2206.53	2301.67
t-stat	2.856***	2.985***	2.861***	2.863***	2.783***	2.854***	2.809***	2.863***
AMCAR30		-0.05						
t-stat		-0.019						
AMCAR60			-0.69					
t-stat			-0.425					
AMCAR90				-1.47				
t-stat				-1.081				
RUP30					2.24			
t-stat					2.005**			
RUP60						1.13		
t-stat						2.388***		
RUP90							1.39	
t-stat							3.188***	
ARUNUP								-0.01
t-stat								-0.040
F Value	4.028	3.490	3.241	3.462	3.887	3.934	4.555	3.211
Prob.(F)	0.0034	0.0045	0.0073	0.0047	0.0020	0.0018	0.0005	0.0078
Adjusted R^2	0.0409	0.0424	0.0380	0.0415	0.0484	0.0491	0.0589	0.0375

Table 6.5 Continued…

(a)

Dependent Variable is time to SEO measured as TSEO_DAY,
where,
TSEO_DAY = the number of calendar days between the IPO Listing date and the SEO announcement (days)
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)
RUP30 = thirty day cumulative abnormal return up to ten days prior to the SEO announcement (percent)
RUP60 = sixty day cumulative abnormal return up to ten days prior to the SEO announcement(percent)
RUP90 = ninety day cumulative abnormal return up to ten days prior to the SEO announcement (percent)
ARUNUP = annualised total cumulative abnormal return from the IPO to ten days prior to the SEO announcement (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

Using the third definition of SEO activity, either a rights issue or a private placement, only three statistically significant relationships are found, each being negatively related to the time delay to an SEO. Being similar to the rights issue group, they are standard deviation of monthly returns (at the one percent level), the 90 day aftermarket return (at the five percent level) and the annualised abnormal return (at the one percent level).

The multivariate analysis confirms and strengthens these results. In each model IPO underpricing, standard deviation of monthly returns, retained ownership and its square are included with one of the post listing return metrics. In table 6.5 panel B, the time to rights issue SEOs has a negative relationship[@@@] with IPO underpricing, standard deviation of monthly returns (varies between one, five and ten percent level) and retained ownership (five and ten percent level). The retained ownership squared variable is statistically significant at the five percent level with a positive coefficient. None of the immediate aftermarket return measures are statistically significant, but the three run-up

measures are all positively associated[@@@] with the time delay before an SEO. The annualised abnormal return is also positively associated[@@] with time to SEO. It is worth noting that the addition of control variables has reversed the sign of the relationship on this variable.

The multivariate models of time to a private placement SEO show a strong negative relationship[@@@] with retained ownership, while retained ownership squared has a positive association (statistically significant at the five percent level for two cases and at one percent level for all other cases). Standard deviation of monthly returns has a weak association, with four of the eight models being statistically significant at the ten percent level for a negative relationship. The 60 day run-up measure has a positive association[@@] with the time delay to an SEO, while the 90 day run-up measure also has a positive association[@@@]. The annualised abnormal return has now changed its sign to be negatively associated[@@@] with time to SEO, consistent with the univariate analysis. None of the models in this panel support a relationship between IPO underpricing and the time delay to a SEO.

The final panel of table 6.5 (panel D) looks at the third definition of SEO activity, being the first issue of either a rights issue of a private placement. Examination of this panel reveals that the time to a SEO is negatively statistically associated with standard deviation of monthly returns (for one model at the five percent level and the remainder at the one percent level) and retained ownership[@@@], while being positively associated with retained ownership squared[@@@], the 30 day run-up[@@], 60 day run-up[@@@] and 90 day run-up[@@@]. The annualised abnormal return measure and IPO underpricing are statistically insignificant in this panel.

In summary, the rights issue sample of SEOs using univariate analysis supports hypothesis H5, with IPO underpricing and the 90 day immediate aftermarket being negatively associated with the time to an SEO. Previous research by Maritz (1992), Jegadeesh *et al.* (1993) and Welch (1996) found a negative association between

aftermarket returns and the time delay from IPO to SEO, but only Welch (1996) found a positive relationship between underpricing and SEO delay.

In the multivariate analysis for this group underpricing still has a negative association, but the aftermarket returns are statistically insignificant. Further, the run-up and annualised return measures now become positively associated with the re-issue delay. The private placement definition of SEOs offers no support for the hypothesis being tested, and using the combined definition of SEOs the univariate analysis supports the hypothesis but the multivariate analysis does not. Therefore support for hypothesis H5 is limited to the rights issue sample of SEOs.

One possible explanation is that most of the firms waited long enough for their true quality to be discovered, given that in excess of three quarters of the sample wait in excess of a calendar year. Note also that the delay for rights issues is on average (nearly 50 percent) longer than that for private placements. Also, as private placements may contain private disclosures, perhaps in these cases the need to wait to re-issue is circumvented.

6.5 Share Market Reaction to an SEO Announcement

A number of tests can be performed on the market reaction to the SEO issue announcement. One test that would discriminate between the multi-issue explanations would be one using IPO underpricing. The signalling and market feedback hypotheses predict a positive relationship between SEO market reaction and underpricing, while the reputation acquisition hypothesis predicts an inverse relationship. Combining this with other market reaction test predictions gives hypothesis H6.

Hypothesis H6 states that the price reaction at the announcement of a SEO issue will be more favourable for firms with higher retained ownership, higher IPO underpricing, higher aftermarket returns and shorter elapsed time from the IPO to the first SEO. These

relationships are investigated on a univariate basis in table 6.6 and on a multivariate basis in table 6.7. A number of return windows were experimented with in an attempt to discover which one might capture the market reaction to this news event best, unfortunately all the model and event window combinations have low explanatory power (less than 3%).

Notwithstanding this, a number of interesting results are found, but as they are mostly in the multivariate analysis, only an abbreviated (tabular) discussion of the univariate results is included here.

Results in table 6.6 that are statistically significant and consistent with the hypothesis include associations between the market reaction and:

Variable	**Association**	**Panel**	**Window (days)**	**Statistically significant**
Underpricing	Positive	B C	10 10	Five percent level Ten percent level
Retained Ownership Squared	Positive	A	20	Ten percent level
30 day aftermarket return	Positive	B C	20 20	Ten percent level Ten percent level
60 day aftermarket return	Positive	B	20	Ten percent level
90 day aftermarket return	Positive	B C	20 10	Ten percent level Ten percent level

Previous research consistent with these results include Jegadeesh *et al.* (1993) and Slovin *et al.* (1994) who found a positive association between the market reaction and IPO underpricing[132], with the later study also finding a positive relationship with retained ownership. Maritz (1992) documented a positive association between aftermarket returns and SEO announcement market reactions.

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132 Note that this result is not found for the rights issue definition of SEO activity.

Results statistically significant but inconsistent with the hypothesis include associations between the market reaction and:

Variable	Association	Panel	Window (days)	Statistically significant
Underpricing	Negative	A	2	Ten percent level
30 day aftermarket return	Negative	A	10	Five percent level
60 day aftermarket return	Negative	A	10	Ten percent level

A negative association between IPO underpricing and the SEO market reaction was also found by Maritz (1992).

Other statistically significant results for market reaction include:

Variable	Association	Panel	Window (days)	Statistically significant
Standard Deviation of Monthly returns	Negative	B B B	2 10 20	Ten percent level Ten percent level Ten percent level
Annualised abnormal return	Positive	A A C	10 20 10	One percent level Five percent level One percent level
SEO as a percent of capital	Negative	A A C C C	10 20 2 10 20	One percent level One percent level Five percent level One percent level One percent level
30 day run-up	Positive	A B	10 2	Ten percent level Five percent level
60 day run-up	Positive	A B C	10 2 10	One percent level Five percent level One percent level
90 day run-up	Positive	A B	10 2	One percent level Ten percent level

One variable associated with the market reaction to the SEO announcement, but not present in hypothesis being tested, seems to be the measure of SEO as a percent of capital (PERCENTK). This is a measure of the relative size of the SEO to the equity base of the firm.

Table 6.6 Univariate analysis of Market Reaction to SEO Announcement

$$\textit{Market Reaction to SEO} = \alpha + \beta\,\textit{Determinant} + \varepsilon$$

Univariate regression analysis of the market reaction at the announcement of an SEO issue, for sub-samples of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995, that did make an SEO issue. The SEO market reaction only be measured for those firms that made an SEO, so the number of observations varies. Three measures of SEOs are used in this table; they are rights issues (panel A), private placements (panel B) and either rights issues or private placements (panel C). In each case, the issue must be greater than or equal to 5% of issued shares by the 436 IPOs.

Notes to the following panels.

(a)

Dependent Variable is market reactions to SEO announcement, measured as one of the following: CARM1_1, CARM5_5 or CARM10_10,
where,

CARM1_1 = the cumulative abnormal return from one day prior to the SEO announcement to one day after the announcement adjusted for the market index (percent)
CARM5_5 = the cumulative abnormal return from five days prior to the SEO announcement to five days after the announcement adjusted for the market index (percent)
CARM10_10 = the cumulative abnormal return from ten days prior to the SEO announcement to ten days after the announcement adjusted for the market index (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
TSEO_DAY = The number of calendar days between the IPO Listing date and the SEO announcement (days)
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)
RUP30 = thirty day cumulative abnormal return up to ten days prior to the SEO announcement (percent)
RUP60 = sixty day cumulative abnormal return up to ten days prior to the SEO announcement(percent)
RUP90 = ninety day cumulative abnormal return up to ten days prior to the SEO announcement (percent)
ARUNUP = annualised total cumulative abnormal return from the IPO to ten days prior to the SEO announcement (percent)
PERCENTK = the number of shares issued in the SEO as a proportion of the number of shares on issue before the SEO (percent)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

Table 6.6 Continued…

Panel A: Rights Issues. Student t statistics are White's adjusted.

Determinant	Obs.	α	t(α)	β	t(β)	F Value	Prob.(F)	Adj. R^2
CARM1__1								
TSEO_DAY	136	-0.25	-0.273	0.00	0.433	0.122	0.7276	-0.0065
MUP	136	0.48	0.489	-0.02	-1.374*	0.708	0.4017	-0.0022
Ret. Owner.	136	-1.91	-1.332*	4.28	1.166	1.885	0.1721	0.0065
R.O. Squared	136	-1.62	-1.381*	6.10	1.164	2.697	0.1029	0.0124
Std. Dev.	136	0.14	0.134	0.00	-0.095	0.002	0.9675	-0.0075
AMCAR30	133	0.11	0.142	-0.02	-0.751	0.242	0.6233	-0.0058
AMCAR60	136	0.08	0.109	-0.02	-0.918	0.467	0.4956	-0.0040
AMCAR90	136	0.11	0.138	0.00	-0.476	0.061	0.8052	-0.0070
RUP30	136	0.19	0.236	-0.01	-1.122	0.411	0.5223	-0.0044
RUP60	136	0.15	0.190	0.00	-0.772	0.206	0.6508	-0.0059
RUP90	136	0.17	0.205	0.00	-0.813	0.325	0.5697	-0.0050
ARUNUP	136	0.11	0.136	0.00	0.069	0.000	0.9917	-0.0075
PERCENTK	136	-0.08	-0.101	0.00	0.493	0.053	0.8190	-0.0071
CARM5_5								
TSEO_DAY	136	-0.99	-0.630	0.00	1.006	0.880	0.3499	-0.0009
MUP	136	1.11	0.730	-0.04	-1.027	0.844	0.3600	-0.0012
Ret. Owner.	136	-0.21	-0.110	1.48	0.403	0.093	0.7614	-0.0068
R.O. Squared	136	-0.47	-0.251	3.35	0.667	0.332	0.5653	-0.0050
Std. Dev.	136	-0.69	-0.457	0.09	1.210	0.970	0.3264	-0.0002
AMCAR30	133	0.31	0.260	-0.10	-1.828**	2.356	0.1272	0.0102
AMCAR60	136	0.41	0.342	-0.06	-1.456*	1.754	0.1877	0.0056
AMCAR90	136	0.48	0.405	0.01	0.145	0.038	0.8453	-0.0072
RUP30	136	0.25	0.208	0.02	1.639*	1.402	0.2385	0.0030
RUP60	136	0.23	0.194	0.01	5.210***	2.556	0.1122	0.0114
RUP90	136	0.21	0.171	0.02	4.925***	2.936	0.0889	0.0141
ARUNUP	136	0.34	0.286	0.01	9.618***	3.407	0.0671	0.0175
PERCENTK	136	2.72	2.078**	-0.05	-2.665***	3.344	0.0697	0.0171
CARM10_10								
TSEO_DAY	136	1.77	0.739	0.00	0.192	0.044	0.8347	-0.0071
MUP	136	1.97	1.051	0.01	0.328	0.060	0.8076	-0.0070
Ret. Owner.	136	-0.43	-0.181	5.56	1.166	0.804	0.3714	-0.0015
R.O. Squared	136	-0.24	-0.107	8.57	1.312*	1.341	0.2489	0.0025
Std. Dev.	136	1.42	0.828	0.06	1.127	0.256	0.6137	-0.0055
AMCAR30	133	2.26	1.452*	-0.03	-0.350	0.102	0.7498	-0.0068
AMCAR60	136	2.18	1.428*	-0.01	-0.107	0.009	0.9246	-0.0074
AMCAR90	136	2.19	1.434*	0.01	0.215	0.041	0.8393	-0.0072
RUP30	136	2.13	1.368*	0.01	0.558	0.060	0.8076	-0.0070
RUP60	136	2.18	1.398*	0.00	0.173	0.003	0.9556	-0.0074
RUP90	136	2.16	1.376*	0.00	0.417	0.020	0.8882	-0.0073
ARUNUP	136	2.15	1.402*	0.00	2.139**	0.127	0.7218	-0.0065
PERCENTK	136	4.97	2.894***	-0.06	-2.617***	3.179	0.0768	0.0159

Table 6.6 Continued…

Panel B: Private Placements. Student t statistics are White's adjusted.

Determinant	Obs.	α	t(α)	β	t(β)	F Value	Prob.(F)	Adj. R^2
CARM1__1								
TSEO_DAY	240	0.95	1.708**	0.00	-1.031	1.230	0.2685	0.0010
MUP	240	0.37	0.908	0.01	0.507	0.301	0.5839	-0.0029
Ret. Owner.	240	1.15	1.031	-1.33	-0.711	0.646	0.4224	-0.0015
R.O. Squared	240	0.82	1.118	-1.13	-0.652	0.392	0.5317	-0.0025
Std. Dev.	240	0.90	1.915**	-0.03	-1.548*	0.953	0.3300	-0.0002
AMCAR30	238	0.58	1.608*	0.01	0.568	0.290	0.5909	-0.0030
AMCAR60	240	0.47	1.286*	0.01	0.875	0.651	0.4204	-0.0015
AMCAR90	240	0.47	1.272	0.01	0.616	0.355	0.5520	-0.0027
RUP30	240	0.61	1.561*	-0.03	-1.797**	2.727	0.1000	0.0072
RUP60	240	0.59	1.578*	-0.02	-1.770**	2.465	0.1178	0.0061
RUP90	240	0.59	1.541*	-0.01	-1.594*	2.770	0.0973	0.0074
ARUNUP	240	0.46	1.249	0.00	0.041	0.003	0.9553	-0.0042
PERCENTK	240	0.52	1.373*	0.00	-0.839	0.415	0.5200	-0.0025
CARM5__5								
TSEO_DAY	240	0.85	0.680	0.00	-0.742	0.552	0.4584	-0.0019
MUP	240	-0.71	-0.794	0.06	1.804**	6.055	0.0146	0.0207
Ret. Owner.	240	-1.09	-0.611	2.39	0.741	0.449	0.5036	-0.0023
R.O. Squared	240	-0.35	-0.277	1.57	0.480	0.163	0.6867	-0.0035
Std. Dev.	240	1.21	1.143	-0.08	-1.380*	1.230	0.2685	0.0010
AMCAR30	238	0.49	0.645	0.04	0.976	1.062	0.3037	0.0003
AMCAR60	240	0.17	0.220	0.03	0.911	0.983	0.3224	-0.0001
AMCAR90	240	0.17	0.218	0.03	1.246	1.820	0.1786	0.0034
RUP30	240	0.43	0.537	-0.05	-1.014	2.232	0.1365	0.0051
RUP60	240	0.33	0.421	-0.02	-0.579	1.052	0.3060	0.0002
RUP90	240	0.32	0.396	-0.01	-0.974	1.165	0.2816	0.0007
ARUNUP	240	0.09	0.112	0.01	0.655	0.673	0.4127	-0.0014
PERCENTK	240	0.26	0.316	0.00	-0.534	0.341	0.5598	-0.0028
CARM10__10								
TSEO_DAY	240	0.72	0.359	0.00	-0.094	0.011	0.9171	-0.0042
MUP	240	0.37	0.273	0.01	0.448	0.146	0.7026	-0.0036
Ret. Owner.	240	2.22	0.713	-3.19	-0.607	0.352	0.5534	-0.0027
R.O. Squared	240	1.93	0.900	-4.29	-0.864	0.539	0.4637	-0.0019
Std. Dev.	240	2.38	1.556*	-0.13	-1.406*	1.555	0.2136	0.0023
AMCAR30	238	1.02	0.855	0.09	1.595*	2.117	0.1470	0.0047
AMCAR60	240	0.64	0.536	0.08	1.415*	2.896	0.0901	0.0079
AMCAR90	240	0.65	0.544	0.08	1.439*	6.928	0.0090	0.0242
RUP30	240	0.48	0.427	0.02	0.195	0.093	0.7612	-0.0038
RUP60	240	0.57	0.510	0.00	-0.003	0.000	0.9955	-0.0042
RUP90	240	0.64	0.546	-0.01	-0.185	0.074	0.7862	-0.0039
ARUNUP	240	0.49	0.417	0.01	0.569	0.579	0.4474	-0.0018
PERCENTK	240	0.96	0.789	-0.01	-1.120	1.864	0.1734	0.0036

Table 6.6 Continued…

Panel C: Either Rights Issues or Private Placements. Student t statistics are White's adjusted.

Determinant	Obs.	α	t(α)	β	t(β)	F Value	Prob.(F)	Adj. R^2
CARM1__1								
TSEO_DAY	285	0.60	1.220	0.00	-0.444	0.293	0.5889	-0.0025
MUP	285	0.37	0.999	0.00	0.199	0.049	0.8255	-0.0034
Ret. Owner.	285	1.10	1.218	-1.39	-0.891	0.999	0.3184	0.0000
R.O. Squared	285	0.78	1.232	-1.24	-0.772	0.616	0.4334	-0.0014
Std. Dev.	285	0.51	1.196	-0.01	-0.408	0.079	0.7795	-0.0033
AMCAR30	282	0.51	1.587*	0.01	0.526	0.247	0.6198	-0.0027
AMCAR60	285	0.41	1.241	0.01	0.830	0.598	0.4402	-0.0014
AMCAR90	285	0.41	1.243	0.01	0.896	0.663	0.4161	-0.0012
RUP30	285	0.45	1.327*	-0.01	-1.186	0.725	0.3953	-0.0010
RUP60	285	0.42	1.260	0.00	-0.983	0.193	0.6608	-0.0028
RUP90	285	0.44	1.314*	0.00	-1.097	0.644	0.4231	-0.0013
ARUNUP	285	0.40	1.202	0.00	0.245	0.021	0.8861	-0.0035
PERCENTK	285	0.66	1.817**	-0.01	-1.994**	2.813	0.0946	0.0063
CARM5__5								
TSEO_DAY	285	0.28	0.246	0.00	0.317	0.140	0.7089	-0.0030
MUP	285	-0.02	-0.018	0.04	1.348*	3.264	0.0719	0.0079
Ret. Owner.	285	-0.13	-0.089	1.47	0.547	0.210	0.6470	-0.0028
R.O. Squared	285	0.06	0.053	1.76	0.572	0.232	0.6301	-0.0027
Std. Dev.	285	0.10	0.079	0.04	0.454	0.299	0.5851	-0.0025
AMCAR30	282	0.71	0.930	0.02	0.474	0.275	0.6005	-0.0026
AMCAR60	285	0.62	0.819	0.02	0.656	0.620	0.4316	-0.0013
AMCAR90	285	0.65	0.857	0.04	1.597*	4.113	0.0435	0.0108
RUP30	285	0.49	0.639	0.02	0.788	0.832	0.3624	-0.0006
RUP60	285	0.45	0.594	0.01	3.384***	3.090	0.0798	0.0073
RUP90	285	0.50	0.656	0.01	0.833	0.885	0.3476	-0.0004
ARUNUP	285	0.48	0.638	0.01	4.311***	4.705	0.0309	0.0129
PERCENTK	285	1.49	1.887**	-0.02	-3.365***	6.217	0.0132	0.0180
CARM10__10								
TSEO_DAY	285	-0.81	-0.504	0.00	1.118	1.748	0.1872	0.0026
MUP	285	0.75	0.609	0.00	0.073	0.004	0.9498	-0.0035
Ret. Owner.	285	1.62	0.672	-1.66	-0.405	0.135	0.7139	-0.0031
R.O. Squared	285	1.36	0.730	-1.88	-0.426	0.135	0.7141	-0.0031
Std. Dev.	285	2.31	1.470*	-0.11	-1.137	1.365	0.2436	0.0013
AMCAR30	282	1.04	0.967	0.08	1.412*	2.021	0.1563	0.0036
AMCAR60	285	0.82	0.772	0.05	1.203	1.335	0.2489	0.0012
AMCAR90	285	0.82	0.773	0.03	1.253	1.425	0.2337	0.0015
RUP30	285	0.82	0.771	-0.01	-0.271	0.046	0.8303	-0.0034
RUP60	285	0.77	0.723	0.00	0.216	0.012	0.9146	-0.0035
RUP90	285	0.85	0.795	0.00	-0.408	0.156	0.6927	-0.0030
ARUNUP	285	0.77	0.713	0.00	0.729	0.055	0.8142	-0.0033
PERCENTK	285	2.35	2.122**	-0.04	-3.837***	9.986	0.0017	0.0307

The initial multivariate analysis was run, and then partitioned using several variables (asset size[133], annualised abnormal return and PERCENTK) to check robustness of the analysis. One interesting thing that appeared when partitioning into three groups based on PERCENTK, was that the relationship between underpricing and market response seemed to vary in the sub-partitions.

This led to the introduction of stratified variables (for both IPO underpricing and PERCENTK) in the main multivariate analysis. The stratified variable is removed from the analysis and replaced (in this case) with three new variables. The first new variable, takes the value of the removed variable when the stratifying variable (PERCENTK in this case) has a value in the lowest third of observations, otherwise a zero is recorded. This is repeated in a similar fashion for the second and third new variables, when the stratifying variable is in the middle and upper third of the distribution respectively. These stratified variables allow the multivariate analysis of the whole sample to display succinctly the intricacies learnt for the partitioning of the data. The analysis described above is presented in table 6.7 for the ten day return window, while results for the two and 20 day return windows are in Appendix 5.

In table 6.7 panel A, using the rights issue definition of a SEO issue, underpricing (in the small SEO stratification) is negatively associated[@@] with the market reaction to a SEO announcement, rather than in the predicted positive manner. However, the coefficients increase (and the significance decreases) as the relative size of the SEO (PERCENTK) increases, showing an interaction between SEO size and underpricing as a signalling mechanism. The retained ownership squared variable is statistically significant in models one to three at the ten percent level, but this is not apparent in the other models.

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133 When confining the analysis to the largest third of IPO based on the asset size at the IPO date, the explanatory power of the models rises quite sharply (up to about 27 percent R^2, using PERCENTK, retained ownership and its square, standard deviation of monthly returns and a run-up measure). These results seem to be limited to private placement issues.

Table 6.7 Multivariate analysis of Market Reaction to SEO Announcement

Regression analysis of the market reaction at the announcement of an SEO issue, for sub-samples of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995, that did make an SEO issue. The SEO market reaction only be measured for those firms that made an SEO, so the number of observations varies. Three measures of SEOs are used in this table; they are rights issues (panel A), private placements (panel B) and rights issues or private placements (panel C). In each case, the issue must be greater than or equal to 5% of issued shares by the 436 IPOs. White's adjusted student t statistics (t-stat) are below each estimate.

Analysis using alternate event windows of two and 20 days are contained in Appendix 5, Table A6.7.

Table notes:

(a) Dependent Variable is market reactions to SEO announcement, measured as CARM5_5,
where,
CARM5_5 = the cumulative abnormal return from five days prior to the SEO announcement to five days after the announcement adjusted for the market index (percent)
TSEO_DAY = The number of calendar days between the IPO Listing date and the SEO announcement (days)
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
MUP Sml.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the lowest third of observations, otherwise taking a value of zero (percent)
MUP Med.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the middle third of observations, otherwise taking a value of zero (percent)
MUP Lrg.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the upper third of observations, otherwise taking a value of zero (percent)
PERCENTK = the number of shares issued in the SEO as a proportion of the number of shares on issue before the SEO (percent)
SEO Sml.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the lowest third of observations, otherwise taking a value of zero (percent)
SEO Med.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the middle third of observations, otherwise taking a value of zero (percent)
SEO Lrg.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the highest third of observations, otherwise taking a value of zero (percent)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)
ARUNUP = annualised total cumulative abnormal return from the IPO to ten days prior to the SEO announcement (percent)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

Table 6.7 Continued…

Panel A: Multivariate analysis of market reaction at the announcement of an SEO issue, for the rights issue (Sample1) definition of SEO issuers. Dependant variable is a ten day window around event date (CARM5_5). Models have 136 observations, except for model 1 that has 133 observations.

Model	1	2	3	4	5	6	7
Intercept	0.66	0.55	0.19	0.72	1.47	1.56	2.03
t-stat	0.171	0.153	0.054	0.197	0.402	0.430	0.552
MUP Sml.I	-0.10	-0.11	-0.11	-0.11	-0.11	-0.11	-0.10
t-stat	-2.143**	-2.148**	-1.828**	-1.804**	-1.835**	-1.894**	-1.757**
MUP Med.I	-0.07	-0.07	-0.07	-0.08	-0.08	-0.08	-0.07
t-stat	-1.282	-1.275	-1.382*	-1.516*	-1.580*	-1.510*	-1.465*
MUP Lrg.I	-0.03	-0.01	-0.02	-0.02	-0.02	-0.02	-0.02
t-stat	-0.416	-0.221	-0.388	-0.366	-0.341	-0.320	-0.319
Std. Dev.	0.15	0.15	0.16	0.10	0.03	0.02	-0.02
t-stat	2.065**	2.021**	1.765**	0.934	0.205	0.128	-0.229
Ret. Owner.	-18.48	-14.87	-13.84	-12.86	-12.45	-12.06	-11.78
t-stat	-1.277	-1.070	-0.987	-0.957	-0.919	-0.896	-0.865
R.O. Squared	28.72	24.63	23.71	23.19	23.25	23.10	22.40
t-stat	1.553*	1.369*	1.286*	1.277	1.274	1.271	1.235
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	0.608	0.622	0.652	0.446	0.397	0.377	0.502
SEO Sml.I	0.07	0.05	0.06	0.05	0.05	0.04	0.04
t-stat	0.297	0.216	0.248	0.215	0.206	0.179	0.163
SEO Med.I	-0.03	-0.03	-0.03	-0.03	-0.02	-0.03	-0.03
t-stat	-0.243	-0.281	-0.230	-0.229	-0.220	-0.270	-0.265
SEO Lrg.I	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05	-0.05
t-stat	-2.243**	-2.444***	-2.398***	-2.510***	-2.382***	-2.384***	-2.447***
AMCAR30	-0.10						
t-stat	-2.007**						
AMCAR60		-0.06					
t-stat		-1.381*					
AMCAR90			-0.01				
t-stat			-0.193				
RUP30				0.01			
t-stat				0.618			
RUP60					0.01		
t-stat					1.465*		
RUP90						0.02	
t-stat						1.597*	
ARUNUP							0.01
t-stat							2.565***
F Value	1.103	1.025	0.883	0.902	0.982	1.013	1.058
Prob.(F)	0.3648	0.4286	0.5593	0.5406	0.4667	0.4392	0.4008
Adjusted R^2	0.0085	0.0020	-0.0097	-0.0080	-0.0015	0.0010	0.0047

Table 6.7 Continued…

Panel B: Multivariate analysis of market reaction at the announcement of an SEO issue, for the private placement (Sample2) definition of SEO issuers. Dependant variable is a ten day window around event date (CARM5_5). Models have 240 observations, except for model 1 that has 238 observations.

Model	1	2	3	4	5	6	7
Intercept	-1.80	-2.05	-1.62	-1.31	-1.68	-1.75	-2.08
t-stat	-0.572	-0.649	-0.505	-0.385	-0.478	-0.512	-0.658
MUP Sml.I	0.08	0.09	0.09	0.09	0.09	0.09	0.09
t-stat	1.111	1.362*	1.309*	1.321*	1.355*	1.362*	1.390*
MUP Med.I	0.03	0.02	0.02	0.04	0.04	0.04	0.03
t-stat	0.414	0.345	0.284	0.584	0.593	0.548	0.497
MUP Lrg.I	0.07	0.07	0.07	0.07	0.07	0.07	0.07
t-stat	2.052**	2.057**	2.068**	2.141**	2.098**	2.092**	2.007**
Std. Dev.	-0.11	-0.09	-0.13	-0.09	-0.09	-0.09	-0.10
t-stat	-1.955**	-1.640*	-1.934**	-1.523*	-1.557*	-1.535*	-1.710**
Ret. Owner.	15.21	14.89	15.26	12.21	12.87	13.16	14.51
t-stat	1.427*	1.394*	1.436*	1.118	1.140	1.179	1.364*
R.O. Squared	-18.25	-18.35	-18.51	-15.84	-16.71	-17.05	-18.33
t-stat	-1.605*	-1.606*	-1.632*	-1.370*	-1.425*	-1.464*	-1.618*
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.491	-0.481	-0.438	-0.486	-0.424	-0.434	-0.397
SEO Sml.I	0.16	0.10	0.08	0.12	0.14	0.13	0.13
t-stat	0.588	0.359	0.310	0.446	0.503	0.494	0.480
SEO Med.I	0.18	0.19	0.19	0.17	0.19	0.19	0.20
t-stat	1.246	1.350*	1.348*	1.102	1.247	1.309*	1.412*
SEO Lrg.I	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.420	-0.420	-0.418	-0.367	-0.308	-0.298	-0.264
AMCAR30	0.03						
t-stat	0.785						
AMCAR60		0.03					
t-stat		0.838					
AMCAR90			0.04				
t-stat			1.638*				
RUP30				-0.04			
t-stat				-0.823			
RUP60					-0.01		
t-stat					-0.381		
RUP90						-0.01	
t-stat						-0.431	
ARUNUP							0.01
t-stat							0.718
F Value	1.258	1.222	1.396	1.270	1.188	1.168	1.229
Prob.(F)	0.2503	0.2732	0.1758	0.2431	0.2965	0.3104	0.2684
Adjusted R^2	0.0118	0.0101	0.0179	0.0123	0.0086	0.0077	0.0104

Table 6.7 Continued…

Panel C: Multivariate analysis of market reaction at the announcement of an SEO issue, for either rights issue or private placement (Sample3) definition of SEO issuers. Dependant variable is a ten day window around event date (CARM5_5). Models have 285 observations, except for model 1 that has 282 observations.

Model	1	2	3	4	5	6	7
Intercept	-0.50	-0.73	-0.62	-0.43	0.34	-0.31	0.56
t-stat	-0.201	-0.305	-0.258	-0.178	0.141	-0.130	0.231
MUP Sml.I	0.07	0.07	0.07	0.07	0.07	0.07	0.07
t-stat	0.947	0.944	0.901	0.955	0.953	0.942	1.000
MUP Med.I	0.01	0.01	-0.01	0.01	0.00	0.01	0.00
t-stat	0.232	0.103	-0.218	0.172	0.064	0.158	0.014
MUP Lrg.I	0.03	0.03	0.03	0.03	0.03	0.03	0.03
t-stat	0.909	0.862	0.812	0.931	0.983	0.967	0.900
Std. Dev.	0.05	0.05	0.02	0.02	-0.05	0.01	-0.07
t-stat	0.660	0.639	0.247	0.232	-0.573	0.096	-0.887
Ret. Owner.	2.31	2.29	3.36	2.72	3.06	2.73	3.36
t-stat	0.229	0.231	0.342	0.282	0.314	0.279	0.348
R.O. Squared	-3.46	-3.08	-3.73	-3.49	-3.34	-3.17	-3.95
t-stat	-0.295	-0.267	-0.325	-0.310	-0.291	-0.276	-0.349
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	0.613	0.641	0.710	0.556	0.452	0.505	0.612
SEO Sml.I	-0.13	-0.12	-0.13	-0.12	-0.13	-0.12	-0.14
t-stat	-0.451	-0.423	-0.498	-0.420	-0.461	-0.437	-0.499
SEO Med.I	0.03	0.04	0.04	0.03	0.03	0.03	0.03
t-stat	0.274	0.398	0.449	0.334	0.288	0.314	0.311
SEO Lrg.I	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
t-stat	-3.046***	-2.896***	-2.583***	-2.978***	-2.763***	-3.023***	-2.590***
AMCAR30	0.00						
t-stat	-0.037						
AMCAR60		0.01					
t-stat		0.344					
AMCAR90			0.04				
t-stat			1.271				
RUP30				0.02			
t-stat				0.682			
RUP60					0.02		
t-stat					2.232**		
RUP90						0.01	
t-stat						0.926	
ARUNUP							0.01
t-stat							2.654***
F Value	0.964	0.989	1.207	1.023	1.249	1.048	1.401
Prob.(F)	0.4798	0.4568	0.2819	0.4262	0.2548	0.4046	0.1721
Adjusted R^2	-0.0014	-0.0004	0.0080	0.0009	0.0095	0.0018	0.0153

The 30 and 60 day aftermarket returns, though statistically significant at the ten percent level are not in the hypothesised direction. More interestingly, in all models the largest third of SEO issues (based on PERCENTK) have a negative relationship[@@@] with the market reaction (in one case the significance is at the five percent level). Indicating that these largest rights issues are greeted as bad news by the market. The 60 and 90 day run-up measures are positively associated[@] with market reaction. Lastly for this panel, the annualised abnormal return metric is positively associated[@@@] with market reaction.

Equivalent analysis for two and 20 day return windows appear in Appendix 5 and show quantitatively similar results. For the two day window around the announcement date[134] there is no support of hypothesis H6, with IPO underpricing for medium and large SEO issues (based on PERCENTK) being again negatively associated with the announcement effect. An interesting result is found with respect to IPO underpricing, when using a 20 day event window.[135] For smaller SEOs, underpricing is negatively associated[@@] with market reaction, but for the largest SEOs it is positively associated[@] with market reaction. The above relationships between underpricing and market reaction, for the rights issue group, provide support for the signalling and market feedback hypotheses via the positive relationships and support for the reputation acquisition hypothesis from the negative associations.

Panel B of table 6.7 shows the results for the private placement definition of a SEO issue, with some support for hypothesis H6. The stratified underpricing variable is positively associated with the SEO market reaction for both the smaller[@] and larger[@@] SEO stratifications. Again, this is support for the signalling and market feedback hypotheses. In models one to three, retained ownership is positively related[@] to market reaction, while retained ownership squared is negatively associated[@] in all models. The last piece of

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134 See Appendix 5 panel A6.7A1.

135 See Appendix 5 panel A6.7B1.

support for the hypothesis being tested is that the 90 day aftermarket return is positively associated[@] with the market reaction.[136]

For the equivalent two day return window[137] the stratified underpricing variable for larger SEO issues is again positively associated[@] in all regressions with the market reaction. This set of results are the only time that the delay to SEO has a negative association[@] with SEO market reaction, supporting hypothesis H6. The final point of interest is that the three market run-up measures (30, 60 and 90 day) have a negative association[@] with market reaction in this set of results.

Turning to the results for the combined definition of SEO issue activity in panel C, a negative association[@@@] is found between market reaction and the largest (third) of SEO issue sizes. Other statistically significant findings for these panel include a positive relationships between the SEO market reaction and the 60 day run-up measure (panel C model five[@@]) and annualised abnormal return (panel C model eight[@@@]). The two and 20 day return window analysis generated quantitatively similar results.[138]

The relative SEO size variable has been shown to be quite important in explaining the SEO announcement return, with size telling us different things depending on the SEO method used. Maritz (1992) previously documented a negative size effect on the SEO announcement return.

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136 Appendix 5 panel A6.7B2 has similar results for the 20 day returns window, with the three measures of aftermarket return (30, 60 and 90 day) being positively associated with market reaction to a SEO, which are statistical significance at the five, ten and five percent levels respectively.

137 See Appendix 5 panel A6.7A2.

138 Appendix 5 panel A6.7A3 also shows a negative association between the two day market reaction and the largest (third) of SEO issue sizes that is statistically significant at the five percent level. For the 20 day window in panel A6.7B3, the above relationship is significant at the one percent level. Furthermore, in this sample positive relationships are found between the SEO market reaction and the 90 day aftermarket return (panel A6.7B3 model three[@]) and the time delay to SEO variable (panel A6.7B3 models two[@] and three[@]).

Generally then, tables 6.6 and 6.7 have only found sporadic support for hypothesis H6, despite quite extensive analysis. There was a definite lack of consistency on retained ownership, time to SEO and aftermarket return variables, with even the directional indication of the relationship varying across the regressions. With this weak evidence hypothesis H6 can not be confirmed with an acceptable level of confidence.

Previous studies have also not had clear conclusions from this type of test. Jegadeesh *et al.* (1993) and Slovin *et al.* (1994) both found positive associations between underpricing and SEO market reaction, while Maritz (1992) found the association to be negative. Slovin et al. (1994) also found retained ownership to be positively correlated and insider selling to be negatively correlated with SEO market reaction. Additional results from Maritz (1992) show aftermarket returns and the time to an SEO to be positively associated with the market reaction to an SEO.

There are a number of potential problems with this analysis that might explain this null result. Firstly, the return windows may not be capturing the true market reaction, but the use of alternate windows covering up to a 20 day period should have caught any market reaction. The tests are not helped by the fact that the SEO announcement return could not be statistically distinguished from zero.

Next, perhaps these SEO events are so far removed (in a temporal sense) from the IPO that any signalling, market feedback or reputation effect has been lost. Finally, other factors (both modelled and excluded) may be swamping the hypothesised effects. The poor explanatory power of the tests suggests that there must be some other omitted factor or factors driving the market reactions, possibly some type of firm specific news.

6.6 Validity Threats

As with any investigation, particularly an empirical one, there are a number of threats to the validity of the analysis. First of all the model or theory may be incorrect or incomplete. Often models oversimplify the world in order to make a problem tractable, but in so doing miss a critical relationship. The theoretical works underpinning this study have provided, although carefully checked, inconsistent predictions, thus one validity threat results from the model selection chosen here.

Another validity threat comes from the specifications of the variables (i.e., proxies) chosen to capture theoretical concepts. In order to minimise these threats, several alternate specifications were chosen for key concepts. Three measures of SEO issues, seven measures of aftermarket return and three measures of SEO market reaction are used. Alternate variable specifications (both dependent and independent) and partitioning analysis have also been undertaken to check the robustness of the analysis. For example, different measures of size, underpricing and risk have been used, as well as partitioning on measures of firm size and SEO size. Further unreported analysis can be found in Appendix 5.

Omitted variables are another source of risk, but as always it is not clear at present what those variables might.

6.7 Summary of Results

This chapter has presented the empirical tests of the hypotheses derived in this thesis. Hypotheses H1 was supported, indicating a curvilinear relationship is present between IPO underpricing and retained ownership, that starts as negative but that has a positive rate of change for incremental retained ownership. This finding brings together two opposing predictions and some prior empirical inconsistencies. Firms that make SEO issues were found to have higher underpricing, as was proposed in hypothesis H2. The

supplemental hypothesis H2a which contended that retained ownership was a signalling device only for firms making SEOs was only supported for the private placement definition of SEO issuing activity.

IPO underpricing was found to be positively associated with the immediate aftermarket returns, in a manner consistent with first part of hypothesis H3. Although SEO issuing firms were not found to have a stronger association between underpricing and aftermarket returns, they were found to have higher underpricing. This result is consistent with both the market feedback and signalling hypotheses.

Tests of hypothesis H4 showed support for the hypothesis in that the probability of an IPO making a SEO was positively associated with retained ownership[139] and IPO underpricing, while it is negatively associated with retained ownership squared. There was no evidence that aftermarket returns were associated with the probability of an SEO, contrary to the market feedback hypothesis.

The time delay between the IPO and SEO was found to be negatively associated with both underpricing and the 90 day measure of aftermarket returns[140], but only for the rights issue sample of SEOs. Perhaps private placements, due to their nature, do not need to wait for their quality to be revealed before they can be issued, contrary to the signalling hypothesis.

Only limited success was found in explaining the market's reaction to an IPO firm announcing its first SEO issue. While a number of relationships were discovered, none of them could be considered robust. The relative size of the SEO and its interaction with other variables was found to be important.

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139 With the exception of rights issues, where retained ownership was found to have a weak negative associated with the probability of an SEO.

140 The aftermarket returns were significant in the univariate analysis but not in the multivariate analysis.

One finding which is clearly important for future research is that the results achieved are dependent upon the choice (or definition) of what constitutes an SEO. Not all subsequent issues have the same implications for the probability and timing of SEOs, or indeed for their market reaction.

Chapter 7.
Summary and Conclusions

This thesis analysed the relationships between IPO underpricing, retained ownership, share market responses and the choices surrounding SEO issues within a multiple issue framework.

A number of competing explanations deal with these issues and the current study attempts to test and discriminate between these explanations.

The main findings drawn from this thesis are:

1. IPO underpricing and retained ownership are found to have a curvilinear relationship. The function has a negative association with a positive rate of change. This curvilinear relationship is important as it clears up a controversy between two contrary theoretical predictions and the empirical evidence. Thus, the evidence here supports the signalling hypothesis. As underpricing is greater for those firms making SEOs, this provides further evidence of interaction between these variables.[141]

2. IPO underpricing and aftermarket returns are positively related. This is predicted by both the signalling and market feedback hypotheses.

3. IPO underpricing is positively related to the probability of the firm making a SEO, as is retained ownership.[142] Aftermarket return measures are not related to the probability of the firm making a SEO. This evidence supports the signalling hypothesis, but not the market feedback hypothesis, as the latter would predict the aftermarket return to be an important determinant of SEO activity.

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141 But not an interaction effect that changes the rate of association between the variables. In this case the shift in the function (higher underpricing) is the interaction being discussed.

142 Retained ownership squared was found to be negatively associated with the probability of the IPO firm making a SEO issue.

4. For SEOs made via rights issues, the time delay from listing is inversely related to IPO underpricing, retained ownership and market volatility. Retained ownership squared, on the other hand, has a positive association. This is supportive of the signalling hypothesis. Immediate aftermarket return measures showed some negative association with SEO delay in univariate tests, but these were insignificant in the multivariate tests. Therefore a market feedback prediction of a shorter time delay to SEO for firms with larger aftermarket returns is weakly supported, but not in the case of private placements. For SEOs made by private placement, only the control variables showed statistically significant relationships.

5. Analysis of the market reaction to a SEO issue announcement led to some interesting results. Firstly, the SEO market reaction was not found to be significantly different from zero. The negative reaction to a SEO announcement that has often been documented in empirical studies is not present for this sample. Careful data collection and extensive data checking delivered an insignificant announcement reaction. While this result is not completely unexpected or unique, it does give insight into the investors' expectations for firms which had previously made an IPO. Unfortunately, this minimal reaction leaves little in total to be explained (except cross-sectional variation) in the tests of market reaction to a SEO announcement. Perhaps the SEO is expected or even welcomed, given IPO (and even signalling) choices.

6. The results for the market reaction to a SEO are somewhat contradictory. For SEOs made by private placement, positive relationships are found (depending on SEO size) between IPO underpricing and the market reaction to a SEO issue. Generally, the reverse relationship was found for rights issue SEOs. In some cases (table 6.7 panel C), a stratified underpricing variable is both positively and negatively impacting on the SEO reaction depending on the size of the issue. These results are puzzling. Rights issues and private placements must have different interpretations by market participants for which the theories do not differentiate. The relationship

between aftermarket returns and SEO market reaction suffer the same difficulties, with different definitions and models giving different results. Both of these points deserve exploration in future research.

7. No robust or meaningful relationship was found between the market reaction to the SEO announcement and the SEO delay. The prediction of such a relationship comes from the signalling model. It is likely that other factors are more influential on market reaction than this delay variable. Hence, additional controls may be required.

8. The control variables in the regressions of market reaction to the SEO announcement showed some explanatory power (i.e., issue size, volatility and abnormal run-up return measures). These too may be further explored.

This thesis has examined the events surrounding equity issues by IPO firms. Both IPO and SEO issues are combined within a multiple issue framework, to analyse questions related to the strategy or motivation behind the structure and timing of these equity issues. Competing explanations for these events raise a series of predictions that are formed into testable hypotheses. While some weak support is found for predictions from each of the alternate explanations, the evidence in its entirety supports, and is consistent with, the signalling through IPO underpricing hypothesis. Tests on the timing and market reaction to a SEO were performed but did not yield conclusive results. These results help clarify the existing literature that contains conflicting empirical evidence on the signalling, market feedback and reputation acquisition hypotheses. Finally, the analysis has provided a resolution for inconsistencies in opposing theories and empirical results of the relationship between IPO underpricing and retained ownership. The resolution revolves around the relationship not being a linear, monotonic one, but rather it is found to be a curvilinear relationship incorporating both positive and negative associations.

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Appendices

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Appendix 1
Selected IPO Literature

YEAR	AUTHOR	COUNTRY	PERIOD	SAMPLE SIZE	DETAILS	UNDERPRICING
1966	King					
1969	Reilly & Hatfield	U.S.	1963-1965	53	# (1 Week)	9.90%
			1963-1965	53	# (1 Month)	8.70%
			1963-1965	53	# (1 Year)	43.70%
1970	Stoll & Curley	U.S.	1957, 59 & 63	205	# Small Frims (SEC Reg.A)	60.60%
		U.S.	1957, 59 & 63	205	# (Truncated)	42.40%
		U.S.	1957	44	# (Truncated)	28.20%
		U.S.	1959	149	# (Truncated)	48.90%
1970	Furst	U.S.	1960-1965	198	#	
1970	Van Horne	U.S.	1960-1967	140	#	
1970	Neuberger & Hammond	U.S.	1960-1969	205	#	17.00%
1972	McDonald & Fisher	U.S.	1969	142	#	28.50%
			1969	32	# (UP >= 50%)	95.70%
			1969	8	# (UP >= 100%)	181.50%
1973	Reilly	U.S.	1963-1965	53	#	9.90%
		U.S.	1966	62	#	10.20%
1973	Logue	U.S.	1965-1969	250	#	41.70%
		U.S.	1965-1969	83	# High Qual. UWs	20.80%
		U.S.	1965-1969	167	# Low Qual. UWs	52.10%
1975	Bear & Curley	U.S.	1969	140	#	12.90%
		U.S.	1969	140	# (weighted)	9.50%
1975	Ibbotson	U.S.	1960-1969	120	#	11.40%
1975	Ibbotson & Jaffe	U.S.	1960-1970	-8	#	12.64%
1975	Block & Stanley	U.S.	1974-1978	102	#	5.96%
1977	Ying, Lewellen, Schlarbaum & Lease	U.S.	1966-1968	248	#	4.40%
1978	Reilly	U.S.	1972-1975	486	#	10.90%
1983	Neuberger & La Chapelle	U.S.	1975-1980	377	#	27.70%
1984	Ritter	U.S.	1978-1982	1028	#@	26.50%
1984	Ritter	U.S.	Jan'80-Mar'81	325	#@	48.40%
1984	Ritter	U.S.	1978-1982 (less'80&'81)	703	#@	16.30%
1984	Ritter	U.S.	1960-1982	5000+	#@	18.80%
1984	McConnell & Sanger	U.S.	1966-1977	319	#	3.80%
1984	McConnell & Sanger	U.S.	1966-1977	319	#	5.80%
1986	Beatty & Ritter	U.S.	1977-1982	1028	#@	14.10%
1987	Chalk & Peavy	U.S.	1975-1982	649	#	21.65%
1987	Chalk & Peavy (FC)	U.S.	1975-1982	572	#	19.58%
1987	Chalk & Peavy (BE)	U.S.	1975-1982	77	#	37.04%
1988	Johnson & Miller	U.S.	1981-1983	962	#	10.40%
1988	Ibbotson, Sindelar & Ritter	U.S.	1960-1987	8668	#	16.37%
1988	Lam	U.S.	1980-1986	435	#	29.00%
1988	Tinic (early sample)	U.S.	1923-1930	70	#	5.17%
1988	Tinic (late sample)	U.S.	1966-1971	134	#	11.07%
1988	Balvers, McDonald & Miller	U.S.	1981-1985	1182	#	7.80%
1989	Muscarella & Vetsuypens	U.S.	1970-1987	38	# (self-marketed)	7.12%
		U.S.	1983-1987	1184	# (working paper)	7.60%
1989	Beatty	U.S.	1975-1984	2215	#	22.10%
1991	Ritter	U.S.	1975-1984	1526	#	14.32%
					# (3 year Adj.)	-27.39%

1971	Shaw	Canada	1956-1963	50		Negitive
1987	Jog & Riding	Canada	1971-1983	100	#	9.33%
1987	Jog & Riding	Canada	1976-1983	51	# (Mkt.Adj)	11.50%
1976	Davis & Yeomans	U.K.	1965-1971	174		6.50%
1981	Buckland, Herbert & Yeomans	U.K.	1965-1975	287		9.70%
1987	Allen & Davidson	U.K.	1980-1984	34		
1974	McDonald & Jacquillat	France				
1981	Hadjia	Australia			#	
1983	Noti & Hadjia	Australia	1972-1980	47	#	20.80%
1986	Depiazzi	Australia	1979-1985	54		22.00%
1988	Adams	Australia	1984-1986	42		50.00%
1988	Finn & Higham	Australia	1966-1978	93	#	29.20%
1990	How	Australia	?		#	
1991	How, Izan & Monroe	Australia	?		#	
1993	Lee, Taylor & Walter	Australia	1976-1989	266	#	16.41%
					# (Mkt.Adj)	11.86%
1985	Skeggs	N.Z.	1973-1983	62	#	19.90%
1992	Vos & Cheung	N.Z.	1979-1991	149	#	28.77%
1984	Dawson	Singapore	1979-1983	39		39.40%
1985	Koh & Tee	Singapore	1973-1984	62		33.80%
1986	Wong & Chiang	Singapore	1975-1984	64		36.80%
1989	Koh & Walter	Singapore	1973-1987	?	#	26.80%
1984	Dawson	Hong Kong	1979-1983	21		13.80%
1984	Dawson	Malaysia	1979-1983	21		166.60%
1986	Wong & Chiang	Malaysia	1975-1984	64		104.50%

1982	Baron	@
1986	Rock	@
1989	Grinblatt & Hwang	@
1989	Welch	@
1989	Allen & Faulhaber	@

1977	Leland & Pyle
1986	Booth & Smith
1986	Titman & Trueman

= Empirical Results
@ = Theoretical Work

Appendix 2
IPO Underpricing Relationships

Panel A: Relationship between Underpricing and After Market Returns

Author/s	Variable	Relationship to Aftermarket
Welch (1989)	Underpricing	Positive[143]
Allen & Faulhaber (1989)	Underpricing	
Booth & Smith (1986)	Underpricing	
Grinblatt & Hwang (1989)	Underpricing	
Rock (1986) Beatty & Ritter (1986)	Underpricing	
Maritz (1990)	Underpricing	
Jegadeesh, Weinstein & Welch (1991)	Underpricing	

Panel B: Relationship between Underpricing and SEO Announcement Price Reaction

Author/s	Variable	Relationship to SEO Ann.	Results
Welch (1989)	Underpricing	Positive	
Allen & Faulhaber (1989)	Underpricing	Positive	
Booth & Smith (1986)	Underpricing	Positive	
Grinblatt & Hwang (1989)	Underpricing	Negative	
Rock (1986) Beatty & Ritter (1986)	Underpricing	Negative	
Maritz (1990)	Underpricing Aftermarket	Negative Positive	Confirmed Confirmed
Jegadeesh, Weinstein & Welch (1991)			
	Underpricing Aftermarket	Positive Positive	Confirmed Insignificant

143 Welch (1989) at p.441 states that underpriced issues should have low aftermarket (residual) uncertainty, which can be interpreted to mean less negative performance due to revelation of its true type.

Appendix 3
Implications from IPO Signalling Models

Panel A: Grinblatt and Hwang (1989)

Proposition Number	Variable 1	Sign	Variable 2	Holding Constant
1	σ^2	-	α	UP
2	V_f	+	σ^2	α
3	V_f	+	α	σ^2
4	α	-	σ^2	V_f
5	UP	+	σ^2	α
6	UP	+	α	σ^2
7	V_f	+	UP	α
8	V_f	+	UP	σ^2

UP Underpricing
V_f Value of the Firm
α Retained Ownership
σ^2 Variance of the Firm's Cash Flows

Panel B: Welch (1989) Selected implications

Implication Number	Variable 1	Sign	Variable 2	Notes
1	UP	+		In the underpricing Equilibrium
2	UP	+	h	
3	IPOs	often issue	SEOs	
4	Sold	+	V_f(high)	
		+	C	
		-	r	
		-	V_f(low)	
	UP	+	V_f(high)	
		+	r	
8	UP	+	SEO Announcement	

UP Underpricing
Sold Proportion of the firm sold at IPO rather than SEO. (1 – retained ownership)
Q_f Quality of the Firm
V_f Value of the Firm
h Proportion of High Quality Firms in the Issue Market (uncertainty)
SEOs Seasoned Equity Offerings follow Initial Public Offers (IPOs)
C Cost of imitation by low quality firms
r Probability of detection for low quality firms

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Appendix 5
Additional Analysis and Tables

Table A5.0 Time Distribution of IPOs

Panel A: Temporal distribution by prospectus date for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976			1		1		1						3
1977					1					1	1		3
1978							1						1
1979											1	2	3
1980								1			2		3
1981	1		1		1		1			1		1	6
1982					1						1		2
1983				1		2		1	2		2	1	9
1984		1	2	4	3	3	2	1		3	5	3	27
1985		1	3	1	4	2	2	5	5	7	13	6	49
1986	4	3	3	3	10	7	3	3	3	9	6	12	66
1987	3	3	8	6	11	19	11	9	7	2			79
1988			1			4		1	2		2	2	12
1989	1	2	1				1		1	1	1		8
1990				2									2
1991				1	1		1		2	2	2	1	10
1992		1	2	2	1	6	1	1	3	3	3	2	25
1993		2	2	4	2	7	2	11	2	15	16	6	69
1994		8	6	6	6	4	2	3	1	6	3	2	47
1995		1	1		3	1	1	1		3	1		12
Total	9	22	31	30	45	55	29	37	28	53	59	38	436

Table A5.0 Continued …

Panel B: Temporal distribution by listing date for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976				1			1	1					3
1977						1					1		2
1978	1								1				2
1979													0
1980	1	2							1			2	6
1981			1		1		1			1		1	5
1982			1				1					1	3
1983						1	1	1	1	2		2	8
1984			2	1	4	1	2	1	3	1	3	4	22
1985	4	2	1		3	2	3	3	5	3	6	8	40
1986	10	5	4	3	4	6	8	3	5	2	7	9	66
1987	9	6	3	4	7	7	15	16	8	13	4	1	93
1988		1					1	4		1		2	9
1989			6	1				2			1	1	11
1990	1				1		1						3
1991								1	1		3	2	7
1992	2		1	1	2	1	4	2	3	2	2	4	24
1993	1	1	2	3	1	2	3	9	4	8	9	14	57
1994	10	4	3	7	9	6	5	2	2	2		9	59
1995	1	3		1		4	1		1		1	4	16
Total	40	24	24	22	32	31	47	45	35	35	37	64	436

Table A5.3 Temporal Distribution of Underpricing

Temporal distribution of market index adjusted underpricing for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
1976				16.8			5.5	4.7					8.98
1977						34.9					18.6		26.77
1978	6.0								-1.6				2.17
1979													0.00
1980	26.9	-4.1							28.3			19.6	14.36
1981			20.6		-3.7		0.9			-11.7		2.6	1.74
1982			0.4				24.6					8.7	11.25
1983						5.5	39.4	0.2	52.9	36.4		-5.0	20.10
1984			98.9	7.7	8.0	18.3	-11.9	8.7	-7.1	61.4	-12.7	22.3	15.08
1985	29.1	16.8	1.4		38.9	46.4	1.9	34.3	15.8	72.0	15.2	1.2	21.63
1986	-1.0	-10.2	-9.3	4.3	51.2	63.5	15.9	10.7	-4.5	21.3	29.2	22.4	16.45
1987	4.4	48.5	16.3	-14.4	2.2	14.1	-6.5	-6.2	-11.3	4.6	18.6	38.2	3.45
1988		8.7					9.2	9.7		64.6		17.9	17.47
1989			6.0	4.7				-13.7			6.5	-15.1	0.46
1990	5.4				-0.1		-3.7						0.56
1991								17.6	17.2		10.0	-2.9	8.42
1992	32.1		1.9	-4.2	24.0	-13.2	12.6	9.8	0.6	15.1	3.0	21.5	12.10
1993	-7.2	10.0	-0.2	14.9	18.5	31.1	4.6	11.1	26.5	12.8	8.5	15.1	12.95
1994	17.4	25.0	11.2	15.3	2.9	-2.7	9.2	-12.8	3.4	-3.7		7.4	8.67
1995	37.2	0.3		-25.0		38.0	1.5		9.4		-12.3	-1.6	9.84
Avg.	11.30	16.05	12.62	4.85	14.30	26.33	4.24	3.84	4.73	18.04	12.34	11.76	11.24

Table A5.5 Time Distribution of SEOs

Panel A: Temporal distribution by announcement date for 136 first seasoned equity offers, measured as rights issues of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976													0
1977													0
1978					1								1
1979													0
1980													0
1981		1	1										2
1982											1		1
1983													0
1984	1		1							1		1	4
1985	2	2		1	1		1				1	1	9
1986	2	2		3		1	1		1	1	1		12
1987	1	3	3	4	1	1	2	1			1		17
1988	1	1			2	1	2	1	1		1	1	11
1989		1		1	2			1		1	3		9
1990					1			1			2		4
1991				1	1					2		1	5
1992													0
1993			1					1		1	5		8
1994		1	1	4	1						1		8
1995			1		1	1		2			1		6
1996		2			3				1		2	2	10
1997	2	2				1	1		3			1	10
1998		1						1		2	1		5
1999			1	1	1	2	2			1		2	10
2000	1				1				1				3
2001						1							1
Total	10	16	9	15	16	8	9	8	7	9	20	9	136

Table A5.5 Continued …

Panel B: Temporal distribution by announcement date for 240 first seasoned equity offers, measured as share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976													0
1977													0
1978													0
1979													0
1980												1	1
1981													0
1982					1	1							2
1983												1	1
1984		1				1			1			1	4
1985			1	1	2		1	2	1			1	9
1986	1	2			1	2	3	1	1	2	5	3	21
1987	4	2	8	4	4	4	4	2	5	3	5	2	47
1988	2	1	4	2	2	3	2	3	1	3	1	2	26
1989	1	1	2	1				1	1	2			9
1990		1			1	1	1			2	1		7
1991			1			1		1					3
1992						1	1					1	3
1993			2		1	3	2	1	3	2	1	5	20
1994		2	2	4	1			2	3			4	18
1995	1	1	2	1	2	1	1		2	4	4	2	21
1996	2			2	1	1		1	1	4	5	3	20
1997	2	1	1	1		2	1					1	9
1998		1		1	1		1			1		1	6
1999					1		2		1	1		1	6
2000		1	1	1		2					1		6
2001								1					1
Total	13	14	24	18	18	23	19	15	20	24	23	29	240

Table A5.5 Continued …

Panel C: Temporal distribution by announcement date for 285 first seasoned equity offers, measured as either rights issues or share placements of greater than or equal to 5% of issued shares, made by the 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995.

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1976													0
1977													0
1978					1								1
1979													0
1980												1	1
1981			1										1
1982					1	1					1		3
1983												1	1
1984		1	1			1			1	1		1	6
1985	2	2	1	2	3		1	1	1			2	15
1986	2	4		2	1	1	4	1	2	1	5	3	26
1987	3	3	9	4	4	3	5	2	4	3	6	1	47
1988	3	1	3	2	2	3	4	2	1	3	1	3	28
1989	1	2	1	1	1				1	2	2		11
1990		1				1	1	1		1	3		8
1991			1	1	1	1							4
1992						1	1					1	3
1993			2		1	3	2	2	3	2	3	5	23
1994		3	3	4	2			2	3		1	4	22
1995	1	1	2	1	3	2	1	2	2	4	5	2	26
1996	2	1		2	3	1		1	2	4	6	2	24
1997	2	2	1	1		2	1		2				11
1998		2		1	1					1		1	6
1999				1	2	1	2		1	1		2	10
2000		1	1	1		2			1		1		7
2001								1					1
Total	16	24	26	23	26	23	22	15	24	23	34	29	285

Table A6.1 Underpricing and Retained Ownership

Regression tests of the relationship between underpricing and retained ownership for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. Three measures of SEOs are used in this table: they are rights issues, private placements and the first instance of either a rights issue or private placement. In each case, the SEO issue must be greater than or equal to 5% of existing shares at the time of the issue. White's adjusted student *t* statistics (t-stat) are below each estimate. (436 observations)

Panel A6.1A: (Variation: Dependant variable is UP)

Model [a]	UP	UP	UP[b]	UP[b]	UP[b]	UP[b]	UP[b]
Intercept	0.145	0.184	0.273	0.251	0.161	0.196	0.137
t-stat	1.123	1.400*	2.177**	1.959**	1.287*	1.547*	1.059
Sample1					0.088		
t-stat					4.379***		
Sample2						0.053	
t-stat						2.784***	
Sample3							0.075
t-stat							3.944***
Total Assets	-0.001		-0.006		-0.002	-0.003	-0.001
t-stat	-0.130		-1.010		-0.337	-0.478	-0.205
Issue Size		-0.003		-0.005			
t-stat		-0.464		-0.797			
Std. Dev.	0.002	0.002	0.002	0.002	0.002	0.002	0.002
t-stat	1.401*	1.375*	1.589*	1.613*	1.802**	1.506*	1.651**
Growth Opt.	-0.024	-0.024	-0.026	-0.022	-0.018	-0.028	-0.023
t-stat	-0.750	-0.738	-0.801	-0.676	-0.572	-0.886	-0.734
Delay	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
t-stat	-4.650***	-4.678***	-4.709***	-4.693***	-4.719***	-4.606***	-4.547***
Years Op.	0.000	0.001	0.002	0.001	0.002	0.002	0.002
t-stat	0.154	0.200	0.544	0.484	0.739	0.538	0.672
Ret. Owner.	0.144	0.136	-0.210	-0.204	-0.225	-0.259	-0.264
t-stat	3.583***	3.027***	-1.752**	-1.684**	-1.886**	-2.112**	-2.181**
R.O. Squared			0.427	0.408	0.455	0.473	0.484
t-stat			2.823***	2.702***	3.059***	3.078***	3.189***
F Value	10.686	10.711	10.555	10.515	11.803	10.189	11.088
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.1179	0.1181	0.1333	0.1328	0.1657	0.1446	0.1565

Table notes on following page

Table A6.1 Continued…

Panel A6.1B: (Variation: Dependant variable is EUPAAS)

Model [(a)]	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS
Intercept	13.703	16.759	16.981	18.453	12.014	14.162	11.607
t-stat	1.525*	1.655**	1.786**	1.765**	1.215	1.519*	1.215
Sample1					3.931		
t-stat					3.051***		
Sample2						1.953	
t-stat						1.578*	
Sample3							2.994
t-stat							2.256**
Total Assets	-0.151		-0.287		-0.105	-0.168	-0.094
t-stat	-0.367		-0.680		-0.244	-0.410	-0.227
Issue Size		-0.331		-0.384			
t-stat		-0.692		-0.791			
Std. Dev.	0.147	0.144	0.151	0.150	0.158	0.147	0.153
t-stat	1.994**	1.974**	2.091**	2.094**	2.431***	2.039**	2.158**
Growth Opt.	-3.029	-2.915	-3.068	-2.867	-2.729	-3.164	-2.976
t-stat	-1.467*	-1.445*	-1.482*	-1.416*	-1.334*	-1.524*	-1.442*
Delay	-0.131	-0.131	-0.131	-0.132	-0.129	-0.128	-0.125
t-stat	-3.579***	-3.598***	-3.597***	-3.598***	-3.558***	-3.521***	-3.475***
Years Op.	0.164	0.173	0.192	0.193	0.213	0.191	0.204
t-stat	0.926	0.957	1.048	1.036	1.180	1.046	1.125
Ret. Owner.	-1.298	-2.102	-10.403	-10.663	-11.050	-12.185	-12.514
t-stat	-0.420	-0.594	-1.014	-1.019	-1.080	-1.167	-1.218
R.O. Squared			10.974	10.277	12.221	12.670	13.210
t-stat			1.098	1.045	1.233	1.239	1.312*
F Value	6.020	6.075	5.362	5.392	5.805	4.976	5.331
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0648	0.0654	0.0656	0.066	0.0812	0.0681	0.0738

Table A6.1 Continued…

Panel A6.1C: (Variation: Using Issue Size instead of Total Assets)

Model [a]	MUP	MUP	MUP[b]	MUP[b]	MUP[b]	MUP[b]	MUP[b]
Intercept	12.270	18.651	30.697	28.516	14.011	17.900	10.824
t-stat	0.698	1.062	1.865**	1.683**	0.818	1.050	0.613
Sample1					10.525		
t-stat					3.732***		
Sample2						7.436	
t-stat						2.913***	
Sample3							9.797
t-stat							3.858***
Total Assets	0.190		-0.576				
t-stat	0.229		-0.733				
Issue Size		-0.169		-0.478	0.100	-0.010	0.189
t-stat		-0.196		-0.569	0.119	-0.012	0.220
Std. Dev.	0.313	0.306	0.336	0.339	0.359	0.323	0.345
t-stat	2.041**	2.001**	2.242**	2.252**	2.361***	2.187**	2.308**
Growth Opt.	-1.641	-1.751	-1.856	-1.472	-0.901	-2.148	-1.605
t-stat	-0.366	-0.397	-0.418	-0.332	-0.207	-0.487	-0.366
Delay	-0.282	-0.284	-0.286	-0.285	-0.277	-0.271	-0.265
t-stat	-4.500***	-4.527***	-4.571***	-4.551***	-4.535***	-4.459***	-4.389***
Years Op.	-0.263	-0.240	-0.110	-0.126	-0.067	-0.123	-0.077
t-stat	-0.705	-0.641	-0.295	-0.336	-0.184	-0.331	-0.208
Ret. Owner.	20.139	19.482	-31.046	-30.357	-31.952	-37.304	-37.431
t-stat	3.498***	3.057***	-1.878**	-1.817**	-1.916**	-2.145**	-2.187**
R.O. Squared			61.689	59.831	64.469	67.610	68.965
t-stat			2.788***	2.696***	2.949***	2.936***	3.034***
F Value	9.341	9.339	9.511	9.491	10.152	9.282	9.913
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.1032	0.1032	0.1205	0.1202	0.1441	0.1322	0.1408

Table A6.1 Continued…

(b)

Dependent Variable is underpricing measured as either MUP, UP or EUPASS
where,
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
UP = underpricing measured as the natural log of the underpricing price relative minus the natural log of the pre-listing market movement price relative (log return)
EUPASS = underpricing measured as MUP * (1 – RO) (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
Issue Size = equity issue size ($ millions).
Total Assets = total assets after initial equity issue ($ millions)
Years Op. = length of prior operating history (years)
Delay = time between prospectus registration and exchange listing (days)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Opt. = proportion of the subscription price per share represented by growth options
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)

(b)

These regression are specified in a curvilinear form (with respect to retained ownership) after visual inspection data and using the Ramsey's Reset test to confirm the functional form.

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

Table A6.2 Underpricing and Retained Ownership

Regression tests of the relationship between underpricing and retained ownership, partitioned by whether that made an SEO issue, for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. Three measures of SEOs are used in this table, they are rights issues, private placements and the first instance of either a rights issues or private placements. In each case, the SEO issue must be greater than or equal to 5% of existing shares at the time of the issue. White's adjusted student *t* statistics (t-stat) are below each estimate.

Panel A6.2A: (Variation: Dependant variable is UP).

Model [(a)]	Rights Issues		Private Placements		Either Rights or Private Placement	
SEO Issuers	Yes	No	Yes	No	Yes	No
Observations	136	300	240	196	285	151
Intercept	-0.176	0.305	0.241	0.247	0.168	0.223
t-stat	-0.651	2.206**	1.329*	1.675**	0.982	1.374*
Total Assets	0.018	-0.009	-0.004	-0.006	0.000	-0.007
t-stat	1.235	-1.382*	-0.483	-0.907	-0.001	-1.019
Std. Dev.	0.003	0.001	0.002	0.001	0.002	0.002
t-stat	3.445***	0.401	1.443*	0.675	1.425*	1.143
Growth Opt.	0.034	-0.035	-0.031	-0.027	-0.020	-0.022
t-stat	0.586	-0.929	-0.666	-0.681	-0.476	-0.504
Delay	-0.002	-0.002	-0.002	-0.002	-0.002	-0.002
t-stat	-3.021***	-3.642***	-3.101***	-3.131***	-3.482***	-2.548***
Years Op.	-0.006	0.005	-0.001	0.006	-0.001	0.009
t-stat	-1.283*	1.641*	-0.268	1.839**	-0.254	2.260**
Ret. Owner.	-0.089	-0.276	-0.273	-0.128	-0.217	-0.246
t-stat	-0.465	-1.849**	-1.407*	-0.884	-1.346*	-1.484*
R.O. Squared	0.481	0.458	0.634	0.177	0.539	0.301
t-stat	1.931**	2.508***	2.664***	1.027	2.624***	1.564*
F Value	7.203	6.432	7.284	4.479	8.264	3.545
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0015
Adjusted R^2	0.2434	0.1128	0.1554	0.1110	0.1518	0.1061

Table notes follow Panel F.

Table A6.2 Continued…

Panel A6.2B: (Variation: Dependant variable is UP).

Model [(a)]	Rights Issues	Private Placements	Either Rights or Placement
Intercept	0.176	0.251	0.195
t-stat	1.404*	2.000**	1.494*
Sample1	0.030		
t-stat	0.761		
Sample2		-0.013	
t-stat		-0.299	
Sample3			0.000
t-stat			0.007
Total Assets	-0.002	-0.005	-0.003
t-stat	-0.382	-0.858	-0.468
Std. Dev.	0.002	0.002	0.002
t-stat	1.780**	1.701**	1.771**
Growth Opt.	-0.012	-0.032	-0.022
t-stat	-0.395	-1.017	-0.699
Delay	-0.002	-0.002	-0.002
t-stat	-4.654***	-4.646***	-4.581***
Years Op.	0.002	0.002	0.002
t-stat	0.775	0.932	0.901
Ret. Owner.	-0.245	-0.130	-0.229
t-stat	-1.673**	-0.906	-1.355*
D1*RO	0.036		
t-stat	0.154		
D2*RO		-0.163	
t-stat		-0.684	
D3*RO			-0.019
t-stat			-0.084
R.O. Squared	0.430	0.184	0.294
t-stat	2.404***	1.075	1.491*
D1*ROSq	0.143		
t-stat	0.465		
D2*ROSq		0.474	
t-stat		1.629*	
D3*ROSq			0.280
t-stat			1.004
F Value	9.826	9.483	9.869
Prob.(F)	0.0001	0.0001	0.0001
Adjusted R^2	0.1687	0.1632	0.1694

Table A6.2 Continued…

Panel A6.2C: (Variation: Dependant variable is EUPAAS).

Model [(a)]	Rights Issues		Private Placements		Either Rights or Private Placement	
SEO Issuers	Yes	No	Yes	No	Yes	No
Observations	136	300	240	196	285	151
Intercept	-5.485	19.619	22.721	6.477	17.600	5.342
t-stat	-0.330	1.686**	1.591*	0.598	1.347*	0.444
Total Assets	0.953	-0.453	-0.601	0.170	-0.279	0.083
t-stat	1.087	-0.920	-1.048	0.344	-0.489	0.161
Std. Dev.	0.278	0.028	0.150	0.123	0.151	0.148
t-stat	6.144***	0.274	1.635*	1.293*	1.761**	1.358*
Growth Opt.	-1.499	-2.809	-3.300	-2.828	-3.136	-1.866
t-stat	-0.385	-1.170	-1.284*	-0.887	-1.302*	-0.505
Delay	-0.129	-0.118	-0.135	-0.108	-0.140	-0.090
t-stat	-3.076***	-2.396***	-3.200***	-1.816**	-3.630***	-1.288*
Years Op.	-0.224	0.342	-0.017	0.493	0.003	0.623
t-stat	-0.669	1.591*	-0.070	1.806**	0.012	2.130**
Ret. Owner.	6.987	-17.710	-9.788	-8.369	-6.128	-17.183
t-stat	0.552	-1.313*	-0.569	-0.667	-0.464	-1.151
R.O. Squared	-4.832	18.906	15.479	3.283	9.447	13.922
t-stat	-0.353	1.470*	0.981	0.258	0.749	0.940
F Value	4.205	3.175	3.762	2.538	4.324	1.833
Prob.(F)	0.0003	0.0030	0.0007	0.0161	0.0001	0.0852
Adjusted R^2	0.1425	0.0484	0.0748	0.0523	0.0757	0.0374

Table A6.2 Continued…

Panel A6.2D: (Variation: Dependant variable is EUPAAS).

Model [(a)]	Rights Issues	Private Placements	Either Rights or Placement
Intercept	12.938	16.533	14.384
t-stat	1.272	1.850**	1.488*
Sample1	0.341		
t-stat	0.078		
Sample2		-1.413	
t-stat		-0.270	
Sample3			-1.056
t-stat			-0.219
Total Assets	-0.108	-0.250	-0.148
t-stat	-0.251	-0.633	-0.360
Std. Dev.	0.157	0.156	0.157
t-stat	2.360***	2.136**	2.197**
Growth Opt.	-2.498	-3.296	-2.863
t-stat	-1.235	-1.603*	-1.394*
Delay	-0.128	-0.128	-0.125
t-stat	-3.528***	-3.551***	-3.493***
Years Op.	0.218	0.229	0.217
t-stat	1.210	1.243	1.202
Ret. Owner.	-16.980	-10.319	-18.646
t-stat	-1.267	-0.800	-1.178
D1*RO	19.133		
t-stat	1.071		
D2*RO		0.338	
t-stat		0.016	
D3*RO			11.662
t-stat			0.587
R.O. Squared	18.100	5.456	15.613
t-stat	1.423*	0.414	0.990
D1*ROSq	-18.977		
t-stat	-1.040		
D2*ROSq		10.300	
t-stat		0.514	
D3*ROSq			-5.051
t-stat			-0.260
F Value	4.782	4.329	4.512
Prob.(F)	0.0001	0.0001	0.0001
Adjusted R^2	0.0800	0.0711	0.0747

Table A6.2 Continued…

Panel A6.2E: (Variation: Using Issue Size instead of Total Assets).

Model [(a)]	Rights Issues		Private Placements		Either Rights or Private Placement	
SEO Issuers	Yes	No	Yes	No	Yes	No
Observations	136	300	240	196	285	151
Intercept	-40.971	35.241	25.958	29.352	14.525	29.002
t-stat	-1.082	1.854**	1.038	1.534*	0.616	1.350*
Issue Size	3.547	-1.073	-0.360	-0.723	0.304	-0.961
t-stat	1.673**	-1.201	-0.292	-0.742	0.256	-0.934
Std. Dev.	0.456	0.316	0.383	0.177	0.372	0.275
t-stat	3.826***	0.967	2.077**	1.016	2.095**	1.417*
Growth Opt.	1.682	-1.394	-1.780	-2.336	-0.679	-1.400
t-stat	0.197	-0.278	-0.269	-0.480	-0.116	-0.282
Delay	-0.253	-0.268	-0.288	-0.230	-0.286	-0.203
t-stat	-3.091***	-3.422***	-3.112***	-2.899***	-3.489***	-2.284**
Years Op.	-1.257	0.471	-0.449	0.575	-0.405	0.811
t-stat	-1.704**	1.170	-0.806	1.358*	-0.818	1.837**
Ret. Owner.	-9.213	-41.456	-41.461	-14.803	-33.214	-29.775
t-stat	-0.361	-1.976**	-1.473*	-0.824	-1.431*	-1.449*
R.O. Squared	72.831	63.379	94.248	16.927	81.836	31.574
t-stat	2.106**	2.336***	2.543***	0.822	2.568***	1.380*
F Value	6.937	5.191	7.366	3.375	8.284	2.562
Prob.(F)	0.0001	0.0001	0.0001	0.0020	0.0001	0.0162
Adjusted R^2	0.2354	0.0894	0.1572	0.0786	0.1522	0.0679

Table A6.2 Continued…

Panel A6.2F: (Variation: Using Issue Size instead of Total Assets).

Model [(a)]	Rights Issues	Private Placements	Either Rights or Placement
Intercept	17.358	28.682	21.495
t-stat	1.001	1.686**	1.196
Sample1	1.137		
t-stat	0.235		
Sample2		-2.743	
t-stat		-0.480	
Sample3			-1.680
t-stat			-0.317
Total Assets	0.008	-0.491	-0.162
t-stat	0.009	-0.590	-0.191
Std. Dev.	0.358	0.351	0.360
t-stat	2.376***	2.486***	2.506***
Growth Opt.	0.009	-2.477	-1.263
t-stat	0.002	-0.575	-0.290
Delay	-0.270	-0.270	-0.260
t-stat	-4.469***	-4.518***	-4.440***
Years Op.	-0.053	0.043	0.025
t-stat	-0.148	0.118	0.068
Ret. Owner.	-35.681	-16.239	-28.775
t-stat	-1.735**	-0.899	-1.345*
D1*RO	6.859		
t-stat	0.216		
D2*RO		-28.226	
t-stat		-0.859	
D3*RO			-8.607
t-stat			-0.283
R.O. Squared	60.789	19.712	33.795
t-stat	2.291**	0.937	1.392*
D1*ROSq	21.118		
t-stat	0.474		
D2*ROSq		77.801	
t-stat		1.842**	
D3*ROSq			51.659
t-stat			1.317*
F Value	8.623	9.195	9.316
Prob.(F)	0.0001	0.0001	0.0001
Adjusted R^2	0.1491	0.1585	0.1605

Table A6.2 Continued…

(a)

Dependent Variable is underpricing measured as MUP, UP or EUPAAS
where,
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
UP = underpricing measured as the natural log of the underpricing price relative minus the natural log of the pre-listing market movement price relative (log return)
EUPASS = underpricing measured as MUP * (1 – RO) (percent)
Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
Issue Size = equity issue size ($ millions).
Total Assets = total assets after initial equity issue ($ millions)
Years Op. = length of prior operating history (years)
Delay = time between prospectus registration and exchange listing (days)
Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)
Growth Opt. = proportion of the subscription price per share represented by growth options
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
D1*RO = interaction effect between Sample1 and Retained Ownership (decimal)
D2*RO = interaction effect between Sample2 and Retained Ownership (decimal)
D3*RO = interaction effect between Sample3 and Retained Ownership (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
D1*ROSq = interaction effect between Sample1 and Retained Ownership squared (decimal)
D2*ROSq = interaction effect between Sample2 and Retained Ownership squared (decimal)
D3*ROSq = interaction effect between Sample3 and Retained Ownership squared (decimal)

*** Significant at the 1 per cent level for a one tailed t-test
** Significant at the 5 per cent level for a one tailed t-test
* Significant at the 10 per cent level for a one tailed t-test

Table A6.3 Underpricing and Aftermarket Return

Regression tests of the relationship between underpricing and aftermarket return for 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. White's adjusted student *t* statistics (t-stat) are below each estimate.

Panel A6.3A: (Variation: Dependant variable is UP).

Model	UP	UP	UP	UP	UP	UP
Intercept	0.087	0.083	0.084	0.264	0.251	0.243
t-stat	8.093***	8.013***	8.249***	2.148**	2.014**	1.981**
AMCAR30	0.002			0.002		
t-stat	3.158***			2.821***		
AMCAR60		0.002			0.001	
t-stat		2.979***			2.409***	
AMCAR90			0.001			0.001
t-stat			4.315***			3.468***
Total Assets				-0.004	-0.005	-0.005
t-stat				-0.731	-0.878	-0.801
Std. Dev.				0.001	0.001	0.001
t-stat				1.435*	1.383*	0.653
Growth Opt.				-0.019	-0.016	-0.008
t-stat				-0.614	-0.529	-0.269
Delay				-0.003	-0.002	-0.002
t-stat				-5.118***	-4.477***	-4.349***
Years Op.				0.000	0.001	0.000
t-stat				0.041	0.252	0.000
Ret. Owner.				-0.166	-0.178	-0.154
t-stat				-1.391*	-1.499*	-1.289*
R.O. Squared				0.375	0.392	0.371
t-stat				2.536***	2.645***	2.473***
F Value	15.923	15.304	23.720	11.741	10.588	11.416
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0334	0.0318	0.0496	0.1659	0.1499	0.1608

Table notes at end of table.

Table A6.3 Continued…

Panel A6.3B: (Variation: Dependant variable is UP) (sample1).

Model	UP	UP	UP	UP	UP	UP
Intercept	0.062	0.058	0.060	0.160	0.140	0.136
t-stat	4.867***	4.731***	4.941***	1.299*	1.125	1.109
Sample1	0.081	0.081	0.077	0.082	0.088	0.085
t-stat	3.583***	3.639***	3.487***	4.076***	4.402***	4.223***
AMCAR30	0.002			0.002		
t-stat	3.132***			2.406***		
D1*AMR30				0.000		
t-stat				-0.239		
AMCAR60		0.002			0.001	
t-stat		3.079***			2.130**	
D1*AMR60					0.000	
t-stat					-0.032	
AMCAR90			0.001			0.001
t-stat			4.236***			2.541***
D1*AMR90						0.000
t-stat						-0.194
Total Assets				-0.001	-0.001	-0.001
t-stat				-0.130	-0.203	-0.143
Std. Dev.				0.002	0.002	0.001
t-stat				1.644*	1.673**	0.825
Growth Opt.				-0.011	-0.009	-0.002
t-stat				-0.358	-0.288	-0.071
Delay				-0.003	-0.002	-0.002
t-stat				-4.926***	-4.490***	-4.376***
Years Op.				0.001	0.001	0.001
t-stat				0.227	0.446	0.206
Ret. Owner.				-0.183	-0.193	-0.171
t-stat				-1.528*	-1.634*	-1.429*
R.O. Squared				0.405	0.420	0.400
t-stat				2.753***	2.881***	2.696***
F Value	14.874	14.643	18.435	11.275	10.555	11.116
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0604	0.0590	0.0742	0.1921	0.1801	0.1887

Table A6.3 Continued…

Panel A6.3C: (Variation: Dependant variable is UP) (sample2).

Model	UP	UP	UP	UP	UP	UP
Intercept	0.051	0.048	0.050	0.189	0.176	0.172
t-stat	3.902***	3.744***	3.965***	1.510*	1.391*	1.375*
Sample2	0.066	0.065	0.063	0.052	0.052	0.051
t-stat	3.293***	3.266***	3.161***	2.653***	2.758***	2.687***
AMCAR30	0.002			0.002		
t-stat	3.198***			1.798**		
D2*AMR30				0.000		
t-stat				0.403		
AMCAR60		0.002			0.001	
t-stat		3.055***			1.592*	
D2*AMR60					0.001	
t-stat					0.593	
AMCAR90			0.001			0.001
t-stat			4.331***			2.372***
D2*AMR90						0.000
t-stat						0.298
Total Assets				-0.001	-0.002	-0.002
t-stat				-0.207	-0.350	-0.289
Std. Dev.				0.001	0.001	0.001
t-stat				1.346*	1.275	0.463
Growth Opt.				-0.022	-0.019	-0.011
t-stat				-0.692	-0.614	-0.351
Delay				-0.003	-0.002	-0.002
t-stat				-5.009***	-4.399***	-4.267***
Years Op.				0.000	0.001	0.000
t-stat				0.031	0.268	0.007
Ret. Owner.				-0.210	-0.226	-0.202
t-stat				-1.727**	-1.866**	-1.649**
R.O. Squared				0.417	0.438	0.417
t-stat				2.779***	2.913***	2.731***
F Value	13.208	12.808	16.803	10.132	9.261	9.855
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0535	0.0515	0.0677	0.1745	0.1596	0.1691

Table A6.3 Continued…

Panel A6.3D: (Variation: Dependant variable is UP) (sample3).

Model	UP	UP	UP	UP	UP	UP
Intercept	0.033	0.030	0.033	0.140	0.121	0.118
t-stat	2.241**	2.094**	2.266**	1.099	0.936	0.921
Sample3	0.082	0.081	0.079	0.073	0.075	0.074
t-stat	4.130***	4.095***	4.014***	3.717***	3.923***	3.853***
AMCAR30	0.002			0.001		
t-stat	3.146***			1.025		
D3*AMR30				0.001		
t-stat				1.161		
AMCAR60		0.001			0.000	
t-stat		3.024***			0.852	
D3*AMR60					0.001	
t-stat					1.394*	
AMCAR90			0.001			0.001
t-stat			4.345***			1.538*
D3*AMR90						0.001
t-stat						1.192
Total Assets				0.000	-0.001	0.000
t-stat				-0.037	-0.130	-0.077
Std. Dev.				0.002	0.001	0.001
t-stat				1.507*	1.441*	0.509
Growth Opt.				-0.016	-0.012	-0.003
t-stat				-0.507	-0.402	-0.115
Delay				-0.002	-0.002	-0.002
t-stat				-4.894***	-4.340***	-4.217***
Years Op.				0.000	0.001	0.001
t-stat				0.183	0.458	0.225
Ret. Owner.				-0.219	-0.236	-0.214
t-stat				-1.813**	-1.970**	-1.767**
R.O. Squared				0.432	0.455	0.438
t-stat				2.896***	3.061***	2.889***
F Value	15.510	15.033	19.140	10.906	10.144	10.674
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0629	0.0606	0.0770	0.1865	0.1737	0.1819

Table A6.3 Continued…

Panel A6.3E: (Variation: Dependant variable is EUPAAS).

Model	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS
Intercept	4.302	4.145	4.228	16.832	15.941	15.226
t-stat	6.311***	6.369***	6.585***	1.782**	1.697**	1.632*
AMCAR30	0.102			0.081		
t-stat	2.708***			2.139**		
AMCAR60		0.077			0.054	
t-stat		3.018***			2.147**	
AMCAR90			0.086			0.065
t-stat			4.592***			3.647***
Total Assets				-0.214	-0.247	-0.207
t-stat				-0.504	-0.591	-0.500
Std. Dev.				0.138	0.136	0.085
t-stat				1.907**	1.781**	1.408*
Growth Opt.				-2.824	-2.613	-2.038
t-stat				-1.368*	-1.296*	-1.007
Delay				-0.147	-0.126	-0.121
t-stat				-3.764***	-3.481***	-3.364***
Years Op.				0.133	0.154	0.105
t-stat				0.699	0.836	0.595
Ret. Owner.				-8.725	-8.879	-7.130
t-stat				-0.842	-0.874	-0.708
R.O. Squared				8.911	9.310	7.689
t-stat				0.874	0.937	0.779
F Value	9.072	10.085	23.027	5.893	5.357	6.362
Prob.(F)	0.0027	0.0016	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0183	0.0205	0.0482	0.0831	0.0742	0.0898

Table A6.3 Continued…

Panel A6.3E: (Variation: Dependant variable is EUPAAS) (sample1).

Model	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS
Intercept	3.123	2.962	3.114	12.256	11.045	10.612
t-stat	3.752***	3.708***	3.892***	1.252	1.130	1.100
Sample1	3.816	3.788	3.557	3.597	3.892	3.716
t-stat	2.805***	2.839***	2.704***	2.715***	3.019***	2.886***
AMCAR30	0.099			0.084		
t-stat	2.662***			1.901**		
D1*AMR30				-0.019		
t-stat				-0.246		
AMCAR60		0.077			0.056	
t-stat		3.126***			2.057**	
D1*AMR60					-0.008	
t-stat					-0.137	
AMCAR90			0.084			0.062
t-stat			4.673***			2.925***
D1*AMR90						0.002
t-stat						0.053
Total Assets				-0.055	-0.068	-0.039
t-stat				-0.127	-0.159	-0.092
Std. Dev.				0.144	0.143	0.093
t-stat				2.180**	2.091**	1.509*
Growth Opt.				-2.461	-2.288	-1.748
t-stat				-1.192	-1.147	-0.855
Delay				-0.141	-0.123	-0.119
t-stat				-3.629***	-3.448***	-3.328***
Years Op.				0.155	0.175	0.128
t-stat				0.830	0.968	0.729
Ret. Owner.				-9.495	-9.552	-7.868
t-stat				-0.912	-0.941	-0.785
R.O. Squared				10.281	10.573	9.005
t-stat				1.006	1.071	0.923
F Value	8.331	8.882	15.071	5.477	5.171	5.909
Prob.(F)	0.0003	0.0002	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0328	0.0350	0.0608	0.0939	0.0875	0.1014

Table A6.3 Continued…

Panel A6.3G: (Variation: Dependant variable is EUPAAS) (sample2).

Model	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS
Intercept	3.027	2.878	3.050	14.346	13.221	12.507
t-stat	2.918***	2.855***	3.045***	1.554*	1.436*	1.373*
Sample2	2.317	2.300	2.135	1.670	1.881	1.706
t-stat	1.769**	1.766**	1.652**	1.265	1.494*	1.335*
AMCAR30	0.102			0.108		
t-stat	2.691***			1.610*		
D2*AMR30				-0.049		
t-stat				-0.639		
AMCAR60		0.076			0.058	
t-stat		3.039***			1.453*	
D2*AMR60					-0.008	
t-stat					-0.163	
AMCAR90			0.084			0.081
t-stat			4.553***			2.341***
D2*AMR90						-0.029
t-stat						-0.680
Total Assets				-0.112	-0.132	-0.093
t-stat				-0.274	-0.326	-0.232
Std. Dev.				0.136	0.133	0.095
t-stat				1.850**	1.734**	1.386*
Growth Opt.				-2.904	-2.716	-2.201
t-stat				-1.407*	-1.341*	-1.082
Delay				-0.142	-0.122	-0.117
t-stat				-3.676***	-3.404***	-3.301***
Years Op.				0.132	0.152	0.103
t-stat				0.697	0.827	0.583
Ret. Owner.				-10.335	-10.624	-8.777
t-stat				-0.980	-1.027	-0.856
R.O. Squared				10.456	10.965	9.184
t-stat				1.002	1.078	0.909
F Value	6.143	6.650	12.962	4.957	4.495	5.346
Prob.(F)	0.0023	0.0014	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0233	0.0253	0.0521	0.0839	0.0744	0.0908

Table A6.3 Continued…

Panel A6.3H: (Variation: Dependant variable is EUPAAS) (sample3).

Model	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS	EUPAAS
Intercept	2.192	2.073	2.253	12.010	10.850	10.407
t-stat	1.779**	1.728**	1.881**	1.273	1.148	1.108
Sample3	3.231	3.164	3.014	2.797	2.978	2.851
t-stat	2.279**	2.246**	2.152**	1.930**	2.199**	2.058**
AMCAR30	0.100			0.054		
t-stat	2.662***			0.806		
D3*AMR30				0.039		
t-stat				0.506		
AMCAR60		0.075			0.022	
t-stat		3.055***			0.647	
D3*AMR60					0.049	
t-stat					1.085	
AMCAR90			0.084			0.048
t-stat			4.622***			1.479*
D3*AMR90						0.023
t-stat						0.570
Total Assets				-0.050	-0.072	-0.041
t-stat				-0.120	-0.174	-0.099
Std. Dev.				0.139	0.135	0.081
t-stat				1.961**	1.803**	1.280
Growth Opt.				-2.701	-2.445	-1.874
t-stat				-1.313*	-1.211	-0.908
Delay				-0.140	-0.121	-0.116
t-stat				-3.619***	-3.370***	-3.255***
Years Op.				0.147	0.175	0.127
t-stat				0.772	0.960	0.710
Ret. Owner.				-10.771	-11.178	-9.413
t-stat				-1.031	-1.100	-0.933
R.O. Squared				11.099	11.851	10.212
t-stat				1.073	1.190	1.029
F Value	7.425	7.848	14.189	5.158	4.867	5.570
Prob.(F)	0.0007	0.0004	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0289	0.0305	0.0572	0.0878	0.0816	0.0951

Table A6.3 Continued…

Panel A6.3I: (Variation: Using Issue Size instead of Total Assets).

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	12.008	11.527	11.636	28.848	26.062	25.495
t-stat	8.052***	8.051***	8.247***	1.729**	1.560*	1.540*
AMCAR30	0.295			0.257		
t-stat	3.000***			2.818***		
AMCAR60		0.202			0.158	
t-stat		2.618***			2.259**	
AMCAR90			0.176			0.138
t-stat			3.509***			2.914***
Issue Size				-0.343	-0.390	-0.340
t-stat				-0.407	-0.469	-0.413
Std. Dev.				0.291	0.293	0.198
t-stat				2.229**	2.246**	1.430*
Growth Opt.				-0.631	-0.215	0.593
t-stat				-0.146	-0.052	0.145
Delay				-0.318	-0.269	-0.263
t-stat				-4.855***	-4.328***	-4.209***
Years Op.				-0.308	-0.234	-0.304
t-stat				-0.814	-0.641	-0.836
Ret. Owner.				-24.410	-26.058	-23.645
t-stat				-1.483*	-1.586*	-1.418*
R.O. Squared				53.114	55.334	53.433
t-stat				2.475***	2.552***	2.420***
F Value	15.654	14.219	19.718	10.633	9.643	10.018
Prob.(F)	0.0001	0.0002	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0328	0.0295	0.0413	0.1514	0.1372	0.1423

Table A6.3 Continued…

Panel A6.3J: (Variation: Using Issue Size instead of Total Assets) (sample1).

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	9.074	8.575	8.818	15.080	11.693	11.488
t-stat	5.147***	5.102***	5.283***	0.898	0.695	0.689
Sample1	9.490	9.459	9.000	9.708	10.405	9.996
t-stat	2.967***	3.028***	2.874***	3.409***	3.750***	3.552***
AMCAR30	0.288			0.268		
t-stat	2.956***			2.471***		
D1*AMR30				-0.066		
t-stat				-0.345		
AMCAR60		0.201			0.163	
t-stat		2.669***			2.104**	
D1*AMR60					-0.021	
t-stat					-0.141	
AMCAR90			0.171			0.149
t-stat			3.410***			2.287**
D1*AMR90						-0.047
t-stat						-0.469
Issue Size				0.186	0.184	0.222
t-stat				0.220	0.221	0.268
Std. Dev.				0.309	0.313	0.245
t-stat				2.341***	2.457***	1.543*
Growth Opt.				0.064	0.321	0.827
t-stat				0.015	0.079	0.201
Delay				-0.304	-0.262	-0.257
t-stat				-4.681***	-4.331***	-4.221***
Years Op.				-0.244	-0.173	-0.237
t-stat				-0.668	-0.487	-0.666
Ret. Owner.				-26.382	-27.706	-25.319
t-stat				-1.586*	-1.687**	-1.515*
R.O. Squared				58.038	59.987	57.817
t-stat				2.704***	2.804***	2.643***
F Value	12.776	12.105	14.470	9.849	9.208	9.450
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0517	0.0486	0.0583	0.1700	0.1587	0.1627

Table A6.3 Continued…

Panel A6.3K: (Variation: Using Issue Size instead of Total Assets) (sample2).

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	6.977	6.558	6.818	18.692	16.270	15.531
t-stat	4.387***	4.238***	4.448***	1.119	0.974	0.937
Sample2	9.140	9.019	8.732	7.267	7.362	7.125
t-stat	3.379***	3.345***	3.238***	2.742***	2.886***	2.790***
AMCAR30	0.293			0.210		
t-stat	3.038***			1.863**		
D2*AMR30				0.077		
t-stat				0.453		
AMCAR60		0.199			0.111	
t-stat		2.669***			1.661**	
D2*AMR60					0.080	
t-stat					0.640	
AMCAR90			0.171			0.130
t-stat			3.493***			2.416***
D2*AMR90						0.008
t-stat						0.086
Issue Size				0.098	0.038	0.099
t-stat				0.116	0.046	0.120
Std. Dev.				0.273	0.271	0.182
t-stat				2.182**	2.185**	1.257
Growth Opt.				-1.279	-0.866	-0.088
t-stat				-0.297	-0.211	-0.022
Delay				-0.305	-0.259	-0.251
t-stat				-4.781***	-4.278***	-4.146***
Years Op.				-0.303	-0.219	-0.296
t-stat				-0.802	-0.600	-0.816
Ret. Owner.				-30.878	-33.041	-30.474
t-stat				-1.803**	-1.931**	-1.752**
R.O. Squared				60.396	63.154	61.056
t-stat				2.716***	2.809***	2.663***
F Value	13.183	12.350	14.873	9.271	8.539	8.741
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0534	0.0496	0.0600	0.1607	0.1477	0.1511

Table A6.3 Continued…

Panel A6.3L: (Variation: Using Issue Size instead of Total Assets) (sample3).

Model	MUP	MUP	MUP	MUP	MUP	MUP
Intercept	5.100	4.702	4.948	13.101	9.993	9.535
t-stat	2.815***	2.671***	2.836***	0.759	0.575	0.551
Sample3	10.573	10.426	10.209	9.475	9.741	9.564
t-stat	4.053***	4.007***	3.924***	3.553***	3.823***	3.712***
AMCAR30	0.286			0.133		
t-stat	2.982***			1.132		
D3*AMR30				0.182		
t-stat				1.123		
AMCAR60		0.195			0.054	
t-stat		2.629***			0.898	
D3*AMR60					0.156	
t-stat					1.412*	
AMCAR90			0.169			0.082
t-stat			3.483***			1.636*
D3*AMR90						0.072
t-stat						0.913
Issue Size				0.204	0.178	0.232
t-stat				0.238	0.212	0.276
Std. Dev.				0.292	0.291	0.185
t-stat				2.340***	2.359***	1.282*
Growth Opt.				-0.552	-0.063	0.737
t-stat				-0.129	-0.016	0.181
Delay				-0.297	-0.254	-0.247
t-stat				-4.657***	-4.208***	-4.085***
Years Op.				-0.248	-0.154	-0.224
t-stat				-0.662	-0.430	-0.618
Ret. Owner.				-31.600	-33.891	-31.513
t-stat				-1.861**	-2.011**	-1.834**
R.O. Squared				62.149	65.353	63.492
t-stat				2.815***	2.941***	2.793***
F Value	14.435	13.548	16.166	9.820	9.210	9.296
Prob.(F)	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
Adjusted R^2	0.0586	0.0545	0.0652	0.1695	0.1588	0.1602

Table A6.3 Continued…

(a)

Dependent Variable is underpricing measured as MUP, UP or EUPAAS

where,

MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)

UP = underpricing measured as the natural log of the underpricing price relative minus the natural log of the pre-listing market movement price relative (log return)

EUPASS = underpricing measured as MUP * (1 – RO) (percent)

AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)

AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)

AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)

Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)

Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)

Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)

Issue Size = equity issue size ($ millions).

Total Assets = total assets after initial equity issue ($ millions)

Years Op. = length of prior operating history (years)

Delay = time between prospectus registration and exchange listing (days)

Std. Dev. = standard deviation of monthly returns for the twelve months post listing (percent)

Growth Opt. = proportion of the subscription price per share represented by growth options

Ret. Owner. = proportion of the equity retained by previous owners (decimal)

R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)

D1*AMR30 = interactive dummy between Sample1 and AMCAR30 (percent)

D1*AMR60 = interactive dummy between Sample1 and AMCAR60 (percent)

D1*AMR90 = interactive dummy between Sample1 and AMCAR90 (percent)

D2*AMR30 = interactive dummy between Sample2 and AMCAR30 (percent)

D2*AMR60 = interactive dummy between Sample2 and AMCAR60 (percent)

D2*AMR90 = interactive dummy between Sample2 and AMCAR90 (percent)

D3*AMR30 = interactive dummy between Sample3 and AMCAR30 (percent)

D3*AMR60 = interactive dummy between Sample3 and AMCAR60 (percent)

D3*AMR90 = interactive dummy between Sample3 and AMCAR90 (percent)

*** Significant at the 1 per cent level for a one tailed t-test

** Significant at the 5 per cent level for a one tailed t-test

* Significant at the 10 per cent level for a one tailed t-test

Table A6.4 SEO Issues

Logit analysis of the observed probability of firms making SEOs for a sample of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995. The probability of an SEO is modelled as a function of underpricing, retained ownership and aftermarket returns. Three measures of aftermarket return are used: 30, 60 and 90 days. Each panel is for a different definition of SEO issues. Reported figures are the parameter estimate with a chi-squared statistic and probability estimate displayed respectively below. All panels have 436 observations.

Panel A6.4A: (Variation: Underpricing variable is UP) (Sample1).

Model [(a)]	1	2	3	4	5	6
Intercept	-0.675	-0.890	-0.954	-1.007	-0.956	-0.954
χ^2	9.81	11.47	12.80	13.77	12.86	12.80
Probability	0.002***	0.001***	0.000***	0.000***	0.000***	0.000***
Ret. Owner.	-0.243	1.658	1.993	2.129	1.959	1.991
χ^2	0.38	1.62	2.23	2.46	2.15	2.22
Probability	0.540	0.203	0.136	0.117	0.143	0.136
R.O. Squared		-2.357	-3.328	-3.456	-3.296	-3.327
χ^2		2.35	4.27	4.48	4.18	4.27
Probability		0.125	0.039**	0.034**	0.041**	0.039**
UP			2.017	2.047	2.074	2.022
χ^2			15.67	15.47	15.76	14.82
Probability			0.000***	0.000***	0.000***	0.000***
AMCAR30				0.001		
χ^2				0.02		
Probability				0.887		
AMCAR60					-0.002	
χ^2					0.30	
Probability					0.586	
AMCAR90						0.000
χ^2						0.00
Probability						0.972
Overall χ^2	304.45	302.04	521.76	514.16	521.46	521.76
Probability	0.0027	0.0031	0.0019	0.0026	0.0018	0.0018

Table A6.4 Continued…

Panel A6.4B: (Variation: Underpricing variable is UP) (Sample2).

Model [(a)]	1	2	3	4	5	6
Intercept	-0.354	-0.826	-0.863	-0.843	-0.863	-0.863
χ^2	2.97	10.29	11.10	10.51	11.09	11.08
Probability	0.085*	0.001***	0.001***	0.001***	0.001***	0.001***
Ret. Owner.	1.159	5.164	5.377	5.252	5.379	5.406
χ^2	9.40	17.35	18.40	17.36	18.37	18.51
Probability	0.002***	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.881	-5.473	-5.357	-5.475	-5.497
χ^2		11.82	14.20	13.49	14.19	14.28
Probability		0.001***	0.000***	0.000***	0.000***	0.000***
UP			1.479	1.485	1.476	1.431
χ^2			8.57	8.38	8.27	7.64
Probability			0.003***	0.004***	0.004***	0.006***
AMCAR30				0.000		
χ^2				0.00		
Probability				0.959		
AMCAR60					0.000	
χ^2					0.00	
Probability					0.974	
AMCAR90						0.001
χ^2						0.16
Probability						0.692
Overall χ^2	316.63	304.61	569.11	566.34	569.11	568.96
Probability	0.0006	0.0023	0.0000	0.0000	0.0000	0.0000

Table A6.4 Continued…

Panel A6.4C: (Variation: Underpricing variable is UP) (Sample3).

Model [(a)]	1	2	3	4	5	6
Intercept	0.266	-0.116	-0.158	-0.190	-0.157	-0.157
χ^2	1.65	0.23	0.42	0.59	0.41	0.41
Probability	0.199	0.630	0.519	0.443	0.521	0.521
Ret. Owner.	0.777	4.335	4.642	4.751	4.654	4.664
χ^2	4.06	12.54	13.80	14.22	13.84	13.88
Probability	0.044**	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.412	-5.235	-5.331	-5.248	-5.254
χ^2		9.46	12.52	12.82	12.55	12.58
Probability		0.002***	0.000***	0.000***	0.000***	0.000***
UP			2.141	2.132	2.121	2.100
χ^2			14.21	13.72	13.59	13.03
Probability			0.000***	0.000***	0.000***	0.000***
AMCAR30				0.002		
χ^2				0.07		
Probability				0.789		
AMCAR60					0.001	
χ^2					0.04	
Probability					0.834	
AMCAR90						0.001
χ^2						0.09
Probability						0.761
Overall χ^2	307.79	298.35	532.81	529.55	532.76	532.71
Probability	0.0018	0.0048	0.0006	0.0006	0.0006	0.0006

Table A6.4 Continued…

Panel A6.4D: (Variation: Underpricing variable is EUPAAS) (Sample1).

Model [(a)]	1	2	3	4	5	6
Intercept	-0.675	-0.890	-0.994	-1.048	-0.995	-0.992
χ^2	9.81	11.47	13.39	14.31	13.42	13.34
Probability	0.002***	0.001***	0.000***	0.000***	0.000***	0.000***
Ret. Owner.	-0.243	1.658	1.830	2.000	1.819	1.848
χ^2	0.38	1.62	1.91	2.20	1.88	1.94
Probability	0.540	0.203	0.167	0.138	0.170	0.164
R.O. Squared		-2.357	-2.604	-2.760	-2.590	-2.624
χ^2		2.35	2.77	3.03	2.73	2.81
Probability		0.125	0.096*	0.082*	0.098*	0.094*
EUPAAS			0.021	0.021	0.021	0.020
χ^2			7.39	7.24	7.37	6.67
Probability			0.007***	0.007***	0.007***	0.010***
AMCAR30				0.003		
χ^2				0.22		
Probability				0.643		
AMCAR60					-0.001	
χ^2					0.04	
Probability					0.835	
AMCAR90						0.001
χ^2						0.09
Probability						0.769
Overall χ^2	304.45	302.04	530.77	523.13	530.73	530.69
Probability	0.0027	0.0031	0.0008	0.0011	0.0007	0.0007

Table A6.4 Continued…

Panel A6.4E: (Variation: Underpricing variable is EUPAAS) (Sample2).

Model [(a)]	1	2	3	4	5	6
Intercept	-0.354	-0.826	-0.886	-0.864	-0.885	-0.883
χ^2	2.97	10.29	11.44	10.79	11.40	11.35
Probability	0.085*	0.001***	0.001***	0.001***	0.001***	0.001***
Ret. Owner.	1.159	5.164	5.270	5.173	5.289	5.320
χ^2	9.40	17.35	17.80	16.95	17.87	18.04
Probability	0.002***	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.881	-5.035	-4.952	-5.060	-5.092
χ^2		11.82	12.40	11.86	12.48	12.62
Probability		0.001***	0.000***	0.001***	0.000***	0.000***
EUPAAS			0.014	0.014	0.014	0.013
χ^2			3.41	3.17	3.18	2.73
Probability			0.065*	0.075*	0.075*	0.099*
AMCAR30				0.001		
χ^2				0.06		
Probability				0.801		
AMCAR60					0.001	
χ^2					0.09	
Probability					0.760	
AMCAR90						0.002
χ^2						0.47
Probability						0.495
Overall χ^2	316.63	304.61	574.83	572.08	574.74	574.36
Probability	0.0006	0.0023	0.0000	0.0000	0.0000	0.0000

Table A6.4 Continued…

Panel A6.4F: (Variation: Underpricing variable is EUPAAS) (Sample3).

Model [(a)]	1	2	3	4	5	6
Intercept	0.266	-0.116	-0.183	-0.213	-0.179	-0.179
χ^2	1.65	0.23	0.55	0.73	0.53	0.52
Probability	0.199	0.630	0.458	0.392	0.467	0.469
Ret. Owner.	0.777	4.335	4.448	4.604	4.483	4.502
χ^2	4.06	12.54	12.88	13.54	13.04	13.13
Probability	0.044**	0.000***	0.000***	0.000***	0.000***	0.000***
R.O. Squared		-4.412	-4.608	-4.761	-4.654	-4.671
χ^2		9.46	10.13	10.63	10.29	10.35
Probability		0.002***	0.002***	0.001***	0.001***	0.001***
EUPAAS			0.020	0.020	0.019	0.019
χ^2			5.74	5.48	5.29	4.85
Probability			0.017**	0.019**	0.022**	0.028**
AMCAR30				0.004		
χ^2				0.43		
Probability				0.512		
AMCAR60					0.002	
χ^2					0.31	
Probability					0.580	
AMCAR90						0.002
χ^2						0.47
Probability						0.493
Overall χ^2	307.79	298.35	542.72	539.12	542.40	542.23
Probability	0.0018	0.0048	0.0002	0.0002	0.0002	0.0002

Table A6.4 Continued…

(a)

Dependent Variable is the observed probability of a firm making an SEO being measured as one of the following: Sample1, Sample2 or Sample3,
where,

Sample1 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a rights issue (dummy)
Sample2 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a private placement (dummy)
Sample3 = a binary variable where a value of one indicates the firm issued an SEO, where the definition of an SEO is a either a rights issue or a private placement (dummy)
MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)
UP = underpricing measured as the natural log of the underpricing price relative minus the natural log of the pre-listing market movement price relative (log return)
EUPASS = underpricing measured as MUP * (1 – RO) (percent)
Ret. Owner. = proportion of the equity retained by previous owners (decimal)
R.O. Squared = proportion of the equity retained by previous owners, squared. (decimal squared)
AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)
AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)
AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)

*** Significant at the 1 per cent level
** Significant at the 5 per cent level
* Significant at the 10 per cent level

Table A6.5 - This table has been excluded for space constraints. It is available from the author on request. The four panels are repeated three times each. Alternate definitions of underpricing (UP and EUPAAS) and time to SEO are tried.

Table A6.6 - This table has been excluded for space constraints. It is available from the author on request. The three panels are repeated three times each. Alternate definitions of underpricing (UP and EUPAAS) and time to SEO are tried.

Table A6.7 Multivariate analysis of Market Reaction to SEO Announcement

Regression analysis of the market reaction at the announcement of an SEO issue, for sub-samples of 436 Australian industrial initial public offers of ordinary equity made between January 1976 and December 1995, that did make an SEO issue. The SEO market reaction only be measured for those firms that made an SEO, so the number of observations varies. Three measures of SEOs are used in this table; they are rights issues, private placements and rights issues or private placements. In each case, the issue must be greater than or equal to 5% of issued shares by the 436 IPOs. White's adjusted student t statistics (t-stat) are below each estimate.

Table layout:

Panel	CARM1_1	CARM10_10
Rights Issues	A6.7A1	A6.7B1
Private Placements	A6.7A2	A6.7B2
Either Rights issue of Private Placement	A6.7A3	A6.7B3

These are alternate market reaction windows to Table 6.7 (which used a ten day window CARM5_5).

Table notes:

Parts of this table has been excluded for space constraints. Those parts are available from the author on request. The three panels are repeated three times each. Alternate definitions of underpricing (UP and EUPAAS) are tried, as well as the partitioning that led to the stratified sample.

(a) Dependent Variable is market reactions to SEO announcement, measured as either CARM1_1 or CARM10_10, where,

CARM1_1 = the cumulative abnormal return from one day prior to the SEO announcement to one day after the announcement adjusted for the market index (percent)

CARM10_10 = the cumulative abnormal return from ten days prior to the SEO announcement to ten days after the announcement adjusted for the market index (percent)

TSEO_DAY = The number of calendar days between the IPO Listing date and the SEO announcement (days)

MUP = underpricing measured as underpricing minus the pre-listing market movement (percent)

MUP Sml.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the lowest third of observations, otherwise taking a value of zero (percent)

MUP Med.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the middle third of observations, otherwise taking a value of zero (percent)

MUP Lrg.I = Stratified variable of MUP, taking the value of MUP for firms where their relative SEO size (PERCENTK) is in the upper third of observations, otherwise taking a value of zero (percent)

PERCENTK = the number of shares issued in the SEO as a proportion of the number of shares on issue before the SEO (percent)

SEO Sml.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the lowest third of observations, otherwise taking a value of zero (percent)

SEO Med.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the middle third of observations, otherwise taking a value of zero (percent)

SEO Lrg.I = Stratified variable of PERCENTK, taking the value of PERCENTK for firms where their relative SEO size (PERCENTK) is in the highest third of observations, otherwise taking a value of zero (percent)

AMCAR30 = thirty day cumulative abnormal return from the day of listing (percent)

AMCAR60 = sixty day cumulative abnormal return from the day of listing (percent)

AMCAR90 = ninety day cumulative abnormal return from the day of listing (percent)

ARUNUP = annualised total cumulative abnormal return from the IPO to ten days prior to the SEO announcement (percent)

*** Significant at the 1 per cent level for a one tailed t-test

** Significant at the 5 per cent level for a one tailed t-test

* Significant at the 10 per cent level for a one tailed t-test

Table A6.7 Continued…

Panel A6.7A1: Multivariate analysis of market reaction at the announcement of an SEO issue, for the rights issue (Sample1) definition of SEO issuers. Dependant variable is a two day window around event date (CARM1_1). Models have 136 observations, except for model 1 that has 133 observations.

Model	1	2	3	4	5	6	7
Intercept	2.96	2.53	2.43	1.93	2.04	1.99	2.65
t-stat	0.651	0.595	0.583	0.451	0.490	0.484	0.595
MUP Sml.I	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
t-stat	-1.210	-1.190	-1.149	-1.161	-1.152	-1.134	-1.152
MUP Med.I	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
t-stat	-1.491*	-1.442*	-1.520*	-1.367*	-1.406*	-1.434*	-1.463*
MUP Lrg.I	-0.07	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
t-stat	-1.575*	-1.634*	-1.615*	-1.671**	-1.640*	-1.649**	-1.594*
Std. Dev.	0.02	0.03	0.03	0.07	0.06	0.07	0.01
t-stat	1.045	1.202	0.927	1.551*	1.239	1.347*	0.096
Ret. Owner.	-9.02	-8.11	-7.72	-8.41	-8.08	-8.22	-7.53
t-stat	-0.726	-0.694	-0.672	-0.752	-0.711	-0.721	-0.674
R.O. Squared	19.23	17.93	17.60	17.92	17.70	17.75	17.48
t-stat	1.008	0.990	0.981	1.013	0.994	0.997	0.989
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.405	-0.308	-0.292	-0.077	-0.190	-0.171	-0.322
SEO Sml.I	-0.22	-0.21	-0.20	-0.19	-0.20	-0.20	-0.21
t-stat	-1.122	-1.109	-1.104	-1.045	-1.089	-1.081	-1.100
SEO Med.I	-0.11	-0.10	-0.10	-0.10	-0.10	-0.10	-0.10
t-stat	-1.040	-1.038	-1.028	-1.024	-1.034	-1.020	-1.034
SEO Lrg.I	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02	-0.02
t-stat	-0.977	-0.966	-0.945	-0.884	-0.969	-0.967	-0.967
AMCAR30	-0.02						
t-stat	-0.752						
AMCAR60		-0.02					
t-stat		-0.746					
AMCAR90			0.00				
t-stat			0.045				
RUP30				-0.01			
t-stat				-1.345*			
RUP60					0.00		
t-stat					-0.991		
RUP90						-0.01	
t-stat						-1.126	
ARUNUP							0.00
t-stat							0.441
F Value	0.760	0.749	0.721	0.770	0.742	0.752	0.727
Prob.(F)	0.6790	0.6896	0.7165	0.6695	0.6961	0.6867	0.7109
Adjusted R^2	-0.0204	-0.0209	-0.0233	-0.0191	-0.0214	-0.0206	-0.0228

Table A6.7 Continued…

Panel A6.7A2: Multivariate analysis of market reaction at the announcement of an SEO issue, for the private placement (Sample2) definition of SEO issuers. Dependant variable is a two day window around event date (CARM1_1). Models have 240 observations, except for model 1 that has 238 observations.

Model	1	2	3	4	5	6	7
Intercept	2.24	1.92	2.03	2.38	2.28	2.35	1.92
t-stat	1.181	1.004	1.062	1.229	1.152	1.159	1.005
MUP Sml.I	0.00	0.01	0.00	0.00	0.00	0.00	0.00
t-stat	0.548	0.616	0.498	0.307	0.475	0.483	0.499
MUP Med.I	-0.02	-0.02	-0.02	-0.02	-0.01	-0.02	-0.02
t-stat	-1.188	-1.238	-1.169	-0.788	-0.697	-0.805	-0.974
MUP Lrg.I	0.03	0.03	0.03	0.03	0.03	0.03	0.03
t-stat	1.405*	1.354*	1.353*	1.431*	1.349*	1.289*	1.394*
Std. Dev.	-0.03	-0.03	-0.04	-0.03	-0.03	-0.03	-0.03
t-stat	-1.340*	-1.408*	-1.508*	-1.273	-1.325*	-1.260	-1.240
Ret. Owner.	-2.22	-2.93	-3.00	-4.44	-4.40	-4.52	-3.32
t-stat	-0.338	-0.444	-0.457	-0.679	-0.657	-0.664	-0.506
R.O. Squared	0.09	1.23	1.32	2.66	2.42	2.36	1.53
t-stat	0.014	0.193	0.208	0.424	0.377	0.366	0.243
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-1.377*	-1.224	-1.215	-1.214	-1.054	-1.019	-1.220
SEO Sml.I	0.02	0.05	0.05	0.06	0.06	0.06	0.07
t-stat	0.248	0.480	0.528	0.523	0.605	0.537	0.656
SEO Med.I	0.08	0.10	0.10	0.09	0.09	0.09	0.10
t-stat	1.164	1.385*	1.390*	1.144	1.287*	1.263	1.399*
SEO Lrg.I	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.863	-0.742	-0.684	-0.695	-0.614	-0.569	-0.579
AMCAR30	0.01						
t-stat	0.793						
AMCAR60		0.01					
t-stat		0.980					
AMCAR90			0.01				
t-stat			1.078				
RUP30				-0.02			
t-stat				-1.633*			
RUP60					-0.01		
t-stat					-1.495*		
RUP90						-0.01	
t-stat						-1.288*	
ARUNUP							0.00
t-stat							0.045
F Value	0.905	0.871	0.884	1.020	0.969	0.989	0.808
Prob.(F)	0.5363	0.5694	0.5571	0.4294	0.4752	0.4575	0.6323
Adjusted R^2	-0.0044	-0.0060	-0.0054	0.0009	-0.0014	-0.0005	-0.0089

Table A6.7 Continued…

Panel A6.7A3: Multivariate analysis of market reaction at the announcement of an SEO issue, for either rights issue or private placement (Sample3) definition of SEO issuers. Dependant variable is a two day window around event date (CARM1_1). Models have 285 observations, except for model 1 that has 282 observations.

Model	1	2	3	4	5	6	7
Intercept	2.34	1.83	1.90	1.76	1.80	1.76	1.96
t-stat	1.564*	1.256	1.314*	1.196	1.217	1.221	1.299*
MUP Sml.I	0.00	0.01	0.00	0.00	0.00	0.00	0.00
t-stat	0.510	0.575	0.446	0.377	0.450	0.439	0.493
MUP Med.I	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03	-0.03
t-stat	-1.419*	-1.562*	-1.541*	-1.150	-1.188	-1.151	-1.315*
MUP Lrg.I	0.01	0.01	0.01	0.01	0.01	0.01	0.01
t-stat	0.681	0.682	0.702	0.745	0.750	0.723	0.760
Std. Dev.	0.00	0.00	-0.01	0.02	0.01	0.02	-0.01
t-stat	-0.071	-0.015	-0.339	0.500	0.268	0.480	-0.188
Ret. Owner.	-3.06	-3.28	-3.24	-3.98	-3.70	-3.87	-3.53
t-stat	-0.587	-0.637	-0.636	-0.779	-0.720	-0.748	-0.690
R.O. Squared	1.71	2.36	2.37	2.92	2.64	2.71	2.54
t-stat	0.320	0.443	0.446	0.549	0.492	0.505	0.476
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.669	-0.502	-0.467	-0.408	-0.462	-0.406	-0.507
SEO Sml.I	-0.11	-0.08	-0.07	-0.06	-0.06	-0.06	-0.07
t-stat	-1.158	-0.783	-0.752	-0.624	-0.650	-0.622	-0.681
SEO Med.I	0.01	0.03	0.02	0.02	0.02	0.02	0.02
t-stat	0.166	0.585	0.562	0.554	0.538	0.558	0.517
SEO Lrg.I	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
t-stat	-2.273**	-1.887**	-1.807**	-2.065**	-2.077**	-1.996**	-1.992**
AMCAR30	0.01						
t-stat	0.627						
AMCAR60		0.01					
t-stat		1.017					
AMCAR90			0.01				
t-stat			1.070				
RUP30				-0.01			
t-stat				-1.033			
RUP60					0.00		
t-stat					-0.563		
RUP90						0.00	
t-stat						-0.880	
ARUNUP							0.00
t-stat							0.335
F Value	0.861	0.785	0.799	0.776	0.726	0.759	0.722
Prob.(F)	0.5792	0.6548	0.6415	0.6639	0.7132	0.6805	0.7170
Adjusted R^2	-0.0055	-0.0084	-0.0079	-0.0087	-0.0107	-0.0094	-0.0109

Table A6.7 Continued…

Panel A6.7B1: Multivariate analysis of market reaction at the announcement of an SEO issue, for the rights issue (Sample1) definition of SEO issuers. Dependant variable is a 20 day window around event date (CARM10_10). Models have 136 observations, except for model 1 that has 133 observations.

Model	1	2	3	4	5	6	7
Intercept	5.09	4.17	4.08	3.96	3.10	3.48	3.59
t-stat	0.922	0.801	0.791	0.725	0.571	0.641	0.656
MUP Sml.I	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15	-0.15
t-stat	-2.181**	-2.193**	-2.164**	-2.110**	-2.075**	-2.072**	-2.109**
MUP Med.I	0.02	0.03	0.03	0.03	0.03	0.03	0.03
t-stat	0.280	0.365	0.387	0.335	0.390	0.347	0.332
MUP Lrg.I	0.08	0.09	0.08	0.08	0.08	0.08	0.08
t-stat	1.239	1.388*	1.376*	1.331*	1.304*	1.307*	1.333*
Std. Dev.	0.08	0.09	0.10	0.10	0.18	0.15	0.14
t-stat	1.186	1.258	1.118	0.663	0.982	0.837	0.807
Ret. Owner.	-25.69	-22.30	-22.33	-22.11	-22.81	-22.61	-22.43
t-stat	-1.404*	-1.249	-1.255	-1.269	-1.296*	-1.292*	-1.271
R.O. Squared	39.60	35.74	35.71	35.52	35.66	35.63	35.74
t-stat	1.631*	1.500*	1.503*	1.506*	1.505*	1.505*	1.510*
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	-0.114	0.001	-0.009	0.024	0.111	0.072	0.032
SEO Sml.I	0.24	0.24	0.24	0.24	0.25	0.25	0.25
t-stat	0.763	0.784	0.792	0.814	0.830	0.829	0.814
SEO Med.I	-0.11	-0.12	-0.12	-0.11	-0.11	-0.11	-0.11
t-stat	-0.808	-0.887	-0.885	-0.880	-0.878	-0.867	-0.87
SEO Lrg.I	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06	-0.06
t-stat	-2.270**	-2.350***	-2.343***	-2.330***	-2.346***	-2.344***	-2.372***
AMCAR30	-0.04						
t-stat	-0.505						
AMCAR60		-0.01					
t-stat		-0.299					
AMCAR90			-0.01				
t-stat			-0.249				
RUP30				0.00			
t-stat				-0.099			
RUP60					-0.01		
t-stat					-0.742		
RUP90						-0.01	
t-stat						-0.490	
ARUNUP							0.00
t-stat							-0.420
F Value	0.994	1.016	1.015	1.011	1.047	1.026	1.018
Prob.(F)	0.4560	0.4361	0.4370	0.4409	0.4100	0.4281	0.4349
Adjusted R^2	-0.0005	0.0013	0.0012	0.0009	0.0038	0.0021	0.0014

Table A6.7 Continued…

Panel A6.7B2: Multivariate analysis of market reaction at the announcement of an SEO issue, for the private placement (Sample2) definition of SEO issuers. Dependant variable is a 20 day window around event date (CARM10_10). Models have 240 observations, except for model 1 that has 238 observations.

Model	1	2	3	4	5	6	7
Intercept	1.43	1.19	2.54	0.60	1.06	1.27	1.14
t-stat	0.262	0.217	0.465	0.108	0.184	0.221	0.207
MUP Sml.I	0.03	0.05	0.04	0.04	0.04	0.04	0.05
t-stat	0.383	0.745	0.616	0.694	0.666	0.664	0.733
MUP Med.I	0.02	0.00	-0.01	0.04	0.04	0.04	0.04
t-stat	0.233	0.050	-0.107	0.629	0.643	0.661	0.534
MUP Lrg.I	0.04	0.03	0.02	0.04	0.04	0.04	0.04
t-stat	1.038	0.893	0.767	1.207	1.179	1.157	1.116
Std. Dev.	-0.17	-0.16	-0.28	-0.16	-0.15	-0.15	-0.17
t-stat	-1.751**	-1.684**	-3.134***	-1.614*	-1.576*	-1.598*	-1.948**
Ret. Owner.	12.17	12.36	13.41	10.82	9.77	9.19	10.33
t-stat	0.674	0.673	0.745	0.587	0.514	0.491	0.569
R.O. Squared	-18.48	-18.94	-19.34	-17.93	-16.83	-16.38	-17.78
t-stat	-1.054	-1.064	-1.108	-1.000	-0.925	-0.913	-1.004
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	0.065	0.110	0.202	0.064	0.044	0.076	0.171
SEO Sml.I	0.04	-0.08	-0.13	0.07	0.06	0.05	0.04
t-stat	0.092	-0.202	-0.324	0.188	0.148	0.138	0.088
SEO Med.I	0.32	0.33	0.32	0.36	0.34	0.34	0.35
t-stat	1.404*	1.440*	1.442*	1.560*	1.494*	1.480*	1.532*
SEO Lrg.I	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01
t-stat	-1.256	-1.330*	-1.441*	-1.041	-1.064	-1.069	-1.043
AMCAR30	0.10						
t-stat	1.686**						
AMCAR60		0.09					
t-stat		1.527*					
AMCAR90			0.12				
t-stat			1.935**				
RUP30				0.03			
t-stat				0.395			
RUP60					0.00		
t-stat					0.086		
RUP90						0.00	
t-stat						-0.056	
ARUNUP							0.01
t-stat							0.808
F Value	0.947	1.058	1.784	0.762	0.732	0.731	0.831
Prob.(F)	0.4964	0.3962	0.0576	0.6780	0.7075	0.7085	0.6088
Adjusted R^2	-0.0025	0.0027	0.0348	-0.0111	-0.0125	-0.0126	-0.0078

Table A6.7 Continued…

Panel A6.7B3: Multivariate analysis of market reaction at the announcement of an SEO issue, for either rights issue or private placement (Sample3) definition of SEO issuers. Dependant variable is a 20 day window around event date (CARM10_10). Models have 285 observations, except for model 1 that has 282 observations.

Model	1	2	3	4	5	6	7
Intercept	2.92	2.11	2.38	2.44	2.96	2.40	3.04
t-stat	0.772	0.569	0.648	0.643	0.772	0.637	0.802
MUP Sml.I	0.01	0.02	0.02	0.02	0.02	0.02	0.02
t-stat	0.179	0.287	0.224	0.241	0.238	0.232	0.274
MUP Med.I	-0.04	-0.04	-0.05	-0.02	-0.02	-0.02	-0.02
t-stat	-0.484	-0.474	-0.607	-0.214	-0.289	-0.203	-0.301
MUP Lrg.I	0.00	0.00	0.00	0.01	0.01	0.01	0.01
t-stat	0.102	0.093	0.118	0.324	0.357	0.331	0.305
Std. Dev.	-0.07	-0.07	-0.10	-0.08	-0.13	-0.07	-0.14
t-stat	-0.702	-0.665	-1.055	-0.639	-0.939	-0.569	-1.055
Ret. Owner.	2.96	3.48	3.99	2.65	2.95	2.45	3.08
t-stat	0.204	0.243	0.281	0.186	0.207	0.171	0.216
R.O. Squared	-6.24	-6.32	-6.53	-5.76	-5.73	-5.50	-6.08
t-stat	-0.394	-0.405	-0.421	-0.372	-0.369	-0.353	-0.392
TSEO DAY	0.00	0.00	0.00	0.00	0.00	0.00	0.00
t-stat	1.173	1.287*	1.351*	1.225	1.178	1.245	1.262
SEO Sml.I	-0.34	-0.32	-0.31	-0.28	-0.29	-0.28	-0.29
t-stat	-0.859	-0.819	-0.815	-0.728	-0.747	-0.722	-0.760
SEO Med.I	0.00	0.01	0.01	0.00	0.00	0.00	0.00
t-stat	-0.024	0.101	0.088	0.009	-0.013	0.011	-0.003
SEO Lrg.I	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04	-0.04
t-stat	-3.676***	-3.460***	-3.294***	-3.653***	-3.536***	-3.667***	-3.457***
AMCAR30	0.07						
t-stat	1.236						
AMCAR60		0.05					
t-stat		1.057					
AMCAR90			0.05				
t-stat			1.366*				
RUP30				0.01			
t-stat				0.282			
RUP60					0.01		
t-stat					0.958		
RUP90						0.00	
t-stat						0.157	
ARUNUP							0.01
t-stat							1.191
F Value	1.412	1.389	1.476	1.296	1.347	1.292	1.367
Prob.(F)	0.1668	0.1777	0.1402	0.2262	0.1985	0.2287	0.1883
Adjusted R^2	0.0159	0.0148	0.0181	0.0113	0.0133	0.0112	0.0140