NEW ZEALAND IPO UNDERPRICING:
THE REPUTATION FACTOR

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Abstract
This paper reviews the major work done to explain the underpricing of initial public offerings (IPOs) of common stocks. Difficulties with the existing theories are also reviewed. The work of Tinic (1988) which suggests that IPO underpricing results from the need for "legal insurance" is tested and no such effect can be found. A simple framework is then developed which points to the reputation capital of investment bankers as the major cause of IPO underpricing. Empirical findings from the sample of IPOs in New Zealand are consistent with the implications of the model.
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INTRODUCTION

Underpricing of initial public offerings (IPOs) of common stocks has been documented in a number of studies. An investor who subscribes to an IPO at the offer price and sells soon after the shares are publicly traded can earn on average an excess return of more than 15% in the United States (Smith 1986), and more than 28% in both the Australian (Finn and Higham 1988) and New Zealand (Cheung and Vos 1990) share markets. A number of theories have evolved to explain the peculiar observation. The major contributions to understanding IPOs and their detractors are reviewed.

Tinic (1988) suggests that legal liability contributes to underpricing. The legal environment of New Zealand provides a chance to test Tinic's "legal insurance" effect. This paper examines Tinic's work and compares the legal environment of IPOs in New Zealand with that in the United State and presents the New Zealand empirical evidence which casts doubt on Tinic's "legal insurance" effect.

A postulate that IPO underpricing is a consequence of the reputation capital of investment bankers is presented. This is due to the potential damage to the reputation of an investment banker caused by pricing the issue at or above the expected value of the after market price distribution outweighing the extra income which can be earned. The implications of this hypothesis, which are consistent with most of the findings in previous works, are also tested with a sample of IPOs in New Zealand.
THEORIES OF IPO UNDERPRICING

Asymmetric Information Between Issuer and Investment Banker
Baron (1982) assumes information asymmetry between the issuer and the investment banker. He argues that the investment banker knows more about the demand of the IPO issue in the capital market than the issuer, hence it will be optimal for the issuer to delegate the offer price decision to the banker. Moreover, the issuer is unable to monitor perfectly the distribution effort expended by the banker. The offer price determined under such a setting will be lower than the one which would prevail in the absence of the information asymmetry and/or the observability problems.

Baron's study does not address why issuers do not choose a banker who has a record of pricing unseasoned issues more fully. In other words, the issue of why underpricing is not eliminated by competition among investment bankers is not resolved. Also Baron's hypothesis is not supported by empirical evidence. Muscarella and Vetsuypens (1989) examine the IPOs of 38 investment banking firms which went public in 1970-1987. These bankers also participated in the distribution of their own IPOs. The information asymmetry and observability problems should disappear in such instances. However, statistically significant underpricing comparable to other IPOs was still present in these self-marketed offerings.

Asymmetric Information Amongst Investors
Instead of information asymmetry between investment banker and issuer, Rock (1986) assumes asymmetric information amongst investors. He classifies investors into two groups: the informed and the uninformed. The informed
investors are those who have superior information about the realized values of unseasoned issues and will subscribe to the issues only when they are underpriced. The uninformed investors are those who do not acquire information and subscribe to IPOs indiscriminately. In this model, when an IPO is overpriced, only the uninformed investors will participate and subscribe to the issue. However, when an IPO is underpriced, both types of investors participate and rationing of shares may occur due to oversubscription. The uninformed investors will thus receive proportionately fewer of the "good" issues and more of the "bad" issues than the informed investors. This will discourage the uninformed investors from participating in the new issue market unless the offer price falls far enough below the expected realized price to compensate for the bias in shares allocation.

Ritter (1984) develops an implication based on Rock's model to explain the "hot issue" market of 1980 in the United States, a period when the initial return of IPOs averaged about 48%, as compared to an average of about 15% in other periods. One of the implications of Rock's model is that high-risk IPOs should be more underpriced than low-risk ones since the informed investors have a larger informational advantage over the uninformed who would then demand a lower offer price as compensation. Hence, a hot issue market can be explained if a large proportion of high-risk firms went public during a particular period of time.

Beatty and Ritter (1986) also build on Rock's model to demonstrate the relationship between the expected underpricing of an IPO and the uncertainty of investors regarding its value. Moreover, they argue that such underpricing equilibrium is enforced by the investment banker, who has reputation capital at stake. The investment banking firm would lose either potential investors if it does not underprice enough or issuers if it underprices too much.
Tinic (1988) observes that as oversubscribed offerings are typically divided into many small allocations, the potential return from becoming informed may not justify the associated costs. It is not convincing to assume that some investors can be better informed about the value of an unseasoned issue than the issuer and the investment banker when there is no guarantee that they can be allocated enough of the underpriced shares to compensate for their information gathering costs. Besides, it is not clear why issuers would pay for uninformed participation. If informed investors have limited resources, the uninformed can simply pay and invest through the informed investors to avoid the mistake of subscribing to overpriced issues. This is one of the reasons why investment funds and investment services are set up to serve uninformed investors.
Underpricing as a Signalling Device

Allen and Faulhaber (1989) suggest that promising firms signal their type by underpricing their IPOs, and investors know only the best can recoup the cost of the signal from subsequent issues. The idea is that underpricing the IPO would leave a good taste in investors' mouths so that future issues from the same issuer could be sold at attractive prices.

The signalling hypothesis has neglected some fundamental issues. As in Rock's model, the investment banker is there only to market and distribute the shares, with no decision-making role to play. This is unlikely since an investment banker also has reputation and money at stake in underwriting an IPO. Moreover, to assume that the cost of signalling can be recouped from subsequent issues is to assume a certain degree of market inefficiency, i.e. that subsequent shares of the firm can be sold at higher than expected prices than shares of equivalent risk. In addition, there is nothing to prevent the type of opportunistic behaviour of IPO investors which drives them to purchase the unseasoned shares in the first place. The fact that they have taken the first tasty bite for a discounted price does not guarantee they will pay a premium for the second bite, when there are equally tasty delicacies around for a lower price. There is no reason or obligation for the investor to compensate the firm for the signalling cost.
UNDERPRICING AS INSURANCE AGAINST LEGAL LIABILITIES

Tinic's (1988) Study

Tinic (1988) explores one of the ideas pointed out in Ibbotson (1975) that IPO underpricing constitutes a form of insurance against legal suits. Tinic argues that the United States Securities Act of 1933 requires the investment banker to conduct "due-diligence" investigation for false or misleading information about the prospects of the issuer as well as for material omissions in the registration statement. It also allows the purchasers of an IPO issue to sue, in case of false or inadequate information, every person who signed the registration statement, every member of the board of directors or every partner in the issuing firm, every accountant, appraiser, consultant and investment banker associated with the offering. The maximum damage recoverable is limited to the offer price plus reasonable compensation for the plaintiff's litigation costs and any punitive damages sought. Moreover, the Act extends the statutory liabilities to "controlling persons" of the underwriters and hence may not be avoided by the bankruptcy of the firm. In such a legal environment, the potential liabilities can have substantial financial consequences for both issuers and investment bankers. Hence, Tinic proposes that underpricing is an efficient form of implicit insurance for the issuer and the investment banker to protect themselves against potential legal losses and the associated damages to their reputations.

One obvious implication of Tinic's conjecture is that the post-1933 IPOs should be on average more underpriced than the pre-1933 IPOs. Another prediction is that after the enactment of the Act, IPOs of speculative firms employing fringe investment bankers should be more underpriced than IPOs of promising firms underwritten by major experienced investment bankers whose exposure to
potential legal liabilities is low. These implications were tested with a sample of
IPOs issued before and a sample issued after the 1933 United States Securities
Act. Tinic found that the average initial excess returns of the post-1933 sample (11.06\%) is significantly higher than the pre-1933 sample (5.17\%). By grouping
the investment bankers into ranked (major) and non-ranked (fringe), he found no
significant relationship between the magnitude of underpricing and the quality of
the investment banker for the pre-1933 sample, while the post-1933 sample has
shown a significant difference - 6.16\% for the ranked bankers and 14.27\% for the
non-ranked bankers. These results are consistent with the legal liability
hypothesis.

Tinic’s argument together with his empirical results are rather convincing for the
sample of United States data. If legal insurance is the major cause of
underpricing, one would expect similar results in a country like New Zealand
which has rules and regulations parallel to those of the United States.

In New Zealand, the principal legislative control of IPOs is the Securities Act
1978, which gained full legal status when the Securities Regulations 1983 were
put in place. The critical date establishing the potential for "legal insurance"
underpricing thus becomes September 1, 1983. As discussed later, empirical tests
show that the change in the law is not sufficiently significant to explain IPO
underpricing for the sample of IPOs in New Zealand. There are several possible
explanations for this finding. While the legal changes in New Zealand were
significant, there was, under the Companies Act, legal recourse prior to the change
in the law. The changes in the law in the United States, therefore, may have been
more significant.
Before empirically examining IPO underpricing in New Zealand, it is helpful to understand a reputation based model as having explanatory significance as one factor driving IPO underpricing.

**A REPUTATION MODEL OF UNDERPRICING**

Reputation of investment bankers has been cited as a factor in IPO underpricing, albeit a subsidiary one, in both Beatty and Ritter (1986) and Tinic (1988). Beatty and Ritter establish the underpricing result using Rock’s information asymmetry framework, then argue that the underpricing equilibrium is enforced by investment bankers who have their reputation capital at stake. Tinic proposes underpricing as a form of insurance against legal liabilities and the associated damages to the reputations of investment bankers, but concentrates on the legal liabilities aspect without examining the implications of the reputation side. The idea that the reputation capital of investment bankers is the primary force which drives IPO underpricing needs further explanation.

**The Setting and the Issuer's Consideration**

In the model proposed here, it is assumed that the issuer is risk averse and hence demands an underwritten issue. Suppose both issuer and investment banker know and agree that the possible outcomes of the realized market price $P$ of the issue have a symmetric density function with mean $P_e$ and standard deviation $\sigma$. Also assume that the issuer has a "reservation" price $P_{\text{min}}$ below which the issue will not proceed. In other words, the issuer demands a minimum net dollar proceed of $P_{\text{min}} \cdot N$, where $N$ is the number of shares offered. With an offer price $P_o$, the underwriter charges an all-inclusive commission rate of $C(P_o)$ per share. The expected per share cost to the issuer given $P_o$, or $E(H/P_o)$, is:
\[ E(H/P_o) = (P_e - P_o) + C(P_o) \cdot P_o \]  

(3)

The cost to the issuer has two components, the commission \( C(P_o) \cdot P_o \) paid to the underwriter plus the expected cost of the underpricing \((P_e - P_o)\). The issuer may be willing to trade off a higher commission rate with a lower expected cost of underpricing if the underwriter is willing to underwrite the issue at a higher offer price.

*The Underwriter's Consideration*

Suppose the entire IPO issue is underwritten by the underwriter. The pay-off to the underwriter, as developed in Appendix A, results from balancing extra commission revenue and risk of under-subscription.

The underwriter, by setting the offer price at \( P_e \) rather than \( P_o \), can extract part of the additional proceeds received by the issuer \( N \cdot (P_e - P_o) \) in the form of a higher commission, \( N \cdot (C(P_e) \cdot P_e - C(P_o) \cdot P_o) \). In return, the underwriter is assuming a higher risk of losing future income due to a tarnished reputation, in the amount of \( \Pr(P_o<P<P_e) \cdot R \), should the realized market price turn out to be lower than the offer price. In other words, the underwriter will consider the cost and benefit of underpricing. If the expected cost of extra risk of a damaged reputation outweighs the benefit of extra income, the issue will be underpriced. The implications of this reputation hypothesis will be examined in the section below.

**EMPIRICAL FINDINGS IN THE NEW ZEALAND MARKET**

*Data*
All 188 new share issues from 1979 through 1991 were identified from the annual reports of the New Zealand Stock Exchange. The offer prices were gathered from the weekly newsletters published by the New Zealand Stock Exchange, the prospectuses of the issues, and newspaper reports around the time of offerings. The share prices after listing were extracted from the Shareprice Data Base maintained by the University of Waikato. The market index used is the University of Waikato share index, which is a value weighted composite index with a base of 1000 in 1979. Out of the 188 new issues, 39 have data items which could not be located. The remaining 149 firms form the final sample. This sample encompasses a broad distribution across industries.

**Methodology**

The excess return $X_{it}$ is computed for each IPO $i$ in each time period $t$. $X_{it}$ is defined as:

$$X_{it} = W_{it} - W_{mt}$$

where $W_{it}$ and $W_{mt}$ are respectively the returns on unseasoned issue security $i$ and the market index over the time period $t$. The two time periods used are the periods from offer date to list date and list date to one month hence. The average excess return $X_t$ is then defined as the simple arithmetic average of all $X_{it}$s for time period $t$:

$$X_t = \frac{1}{n} \sum_{i=1}^{n} X_{it}$$

(2)

Since the returns of this sample of IPOs are only market-adjusted but not risk-adjusted, the average excess return from list date to one month hence is also
calculated to examine if the underpricing result is simply due to the riskiness of this particular portfolio of firms. T-values are computed to test the null hypothesis that the X_{it}s have zero means assuming they are normally distributed.

In addition, the sample is partitioned into the 1979-83 and 1984-91 sub-periods to test the effect of the Securities Regulations as mentioned in Part 3 b above on the degree of underpricing in New Zealand. A t-test is used to see if the means of the two sub-samples are significantly different, assuming the X_{it}s are normally distributed with unknown and different variances (Dixon and Massey 1951). It is necessary to assume different variances for the two sub-periods since the environment for the financial industry in New Zealand has undergone substantial changes since 1984 after the Labour government took control. A series of financial reform policies were introduced to deregulate the banking and finance sector, fostering a regime with greater volatility than before.\textsuperscript{ii}

\textit{Empirical Results}

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|}
\hline
\textbf{Time Period} & \textbf{X}_t (\%) & \textbf{t-Value} & \textbf{# of +ves} & \textbf{# of -ves} \\
\hline
Offering date to list date & 28.77 & 6.49\* & 106 & 43 \\
List date to one month hence & -1.45 & -0.73 & 56 & 93 \\
\hline
\end{tabular}
\caption{Summary Statistics of IPO's Price Performance in New Zealand in the period 1979-91}
\label{tab:1}
\end{table}

* significant at the 0.05 level
Summary statistics for the full sample are presented in Table 1. The average amount of underpricing from offer date to list date is 28.77%, significant at the 0.05 level. Of the 149 market-adjusted returns, 106 were positive from offer date to list date. Ninety-three of the market-adjusted returns were negative from list date to one month hence, but the average excess return of -1.45% was not significantly different from zero.

Ten firms in the sample have identical offer and list date prices. They were likely to be thinly traded firms with no transactions taking place in the first days of trading. However, this cannot be ascertained since there is no data available on volume of trades. Hence these firms are included in the sample. The exclusion of these firms would raise the degree of underpricing by about 3%, rendering the underpricing results more significant.

Table 2 provides a summary of the dollar values of the mis-pricing. For the 149 unseasoned issues, the average issue size was $14,018,019 and on average

<table>
<thead>
<tr>
<th>Sample</th>
<th># of Firms</th>
<th>Average Issue Size (offer price times # of shares)</th>
<th>Average $NZ Amount Underpriced (Overpriced)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underpriced Issues</td>
<td>106</td>
<td>15,369,271</td>
<td>4,902,482</td>
</tr>
<tr>
<td>Overpriced Issues</td>
<td>43</td>
<td>10,687,027</td>
<td>(1,295,187)</td>
</tr>
<tr>
<td>All Issues</td>
<td>149</td>
<td>14,018,019</td>
<td>3,113,893</td>
</tr>
</tbody>
</table>
$3,113,893 was "earned" per issue by investors who bought at the offer price and sold at list date. When these 149 issues are separated into underpriced and overpriced issues, the average amount underpriced is $4,902,482 per issue for the 106 underpriced issues while the average amount overpriced is $1,295,187 per issue for the 43 overpriced issues.

Table 3

T-test for the Difference in Means of Underpricing in Pre- and Post-Securities Regulations Period in New Zealand

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Pre-S.R. X1 (%)</th>
<th>Post-S.R. X2 (%)</th>
<th>Difference (%)</th>
<th>T-value</th>
<th>D.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Offering date to list date</td>
<td>21.19</td>
<td>30.23</td>
<td>9.04</td>
<td>0.85</td>
<td>38</td>
</tr>
<tr>
<td>List date to one month hence</td>
<td>-4.57</td>
<td>-0.85</td>
<td>3.72</td>
<td>1.07</td>
<td>70</td>
</tr>
</tbody>
</table>

Table 3 presents results of t-tests for the two sub-periods before and after the introduction of the Securities Regulations in late 1983. The 1979-83 sample consists of 24 observations while there are 125 IPOs in the 1984-91 sample. Although IPOs on average were more underpriced in 1984-91 than in 1979-83, the difference was not statistically significant even at the 0.20 level. Hence Tinic's (1988) legal insurance explanation is not supported by data in the New Zealand stock market.

Some Implications and Empirical Results of the Reputation Hypothesis

One consistent finding in various studies is that "risky" issues (as measured by ex-post data) are more underpriced than less risky ones. This finding is consistent
with the reputation hypothesis. Other things being equal, given two IPOs which differ only in their standard deviations, an underwriter needs to underprice the one with a larger standard deviation more in order that the expected damage to its reputation remains the same. For instance, by setting the offer price at one standard deviation below the mean in order to reduce the probability of a damaged reputation, an underwriter would have to set a lower price for the issue with the larger standard deviation.

Size of issue is used here as a proxy for risk. All 149 issues were ranked by issue size from the smallest to the largest issue. The average degree of underpricing is compared between the lower quartile and the upper quartile. A procedure similar to the one used in Table 3 is employed to test the equality of the means from the two quartiles. The difference between the two means, shown in Table 4, is significantly different from zero at the 0.1 level, supporting the reputation hypothesis.
Table 4

T-test for the Difference in Means of Underpricing between the Lower Quartile and Upper Quartile of Issues Ranked by Issue Size

<table>
<thead>
<tr>
<th>Time Period</th>
<th>Upper Quartile $X_t$ (%)</th>
<th>Lower Quartile $X_t$ (%)</th>
<th>Difference (%)</th>
<th>T-value</th>
<th>D.F.</th>
</tr>
</thead>
<tbody>
<tr>
<td>offering date to list date</td>
<td>20.39</td>
<td>39.16</td>
<td>18.77</td>
<td>1.47</td>
<td>55</td>
</tr>
</tbody>
</table>

The reputation hypothesis also implies that other things being equal, the same issue will be more underpriced if underwritten by a more prestigious underwriter than a fringe underwriter, since the expected cost of a damaged reputation is larger for the prestigious underwriter. This may seem at odds with Tinic's (1989) finding that the prestigious underwriters have priced IPOs more fully than the fringe underwriters in the post-1933 period in the United States. However, his data also indicated market segmentation whereby prestigious underwriters avoided speculative small issues during that same period. In other words, it is likely that prestigious underwriters underpriced their IPOs less than fringe underwriters because the IPO issues they underwrote were less risky, rather than because the potential threat of legal liabilities was less for prestigious underwriters.

We were able to trace the names of underwriters in 80 IPOs in our sample.iii These 80 IPOs were sorted by their issue size and put into four groups of equal number. The first group consisted of the smallest 20 issues while the fourth group consisted of the 20 largest. Again size of the issue was used as a proxy for risk. Since the reputation of underwriter at the time of issue was the variable of concern, two IPO underwriters "league tables" covering the periods 1979-85 and
1986-91 were constructed, using the total size of issues underwritten as the criteria. The rank was used as a proxy for the reputation of the underwriter for that IPO. For instance, Fay Richwhite Co. was assigned a reputation index of 10 for the IPOs underwritten in the 1979-85 period since Fay Richwhite was ranked 10th in terms of the total size of issues underwritten in that period. Appendix B contains the league tables and the rank of underwriters in the two periods.

Least squares linear regressions were performed for each group as well as for the whole sample of 80 IPOs with the reputation index as the independent variable and the percentage amount of underpricing as the dependent variable. The results, summarized in Table 5, present evidence that for small issues the degree of underpricing is positively correlated with the reputation of the underwriter. Regression results show that the dependence is significant at the 0.01 level for the group with the smallest issue size, marginally significant at the 0.1 level for the next smallest size group, while it is non-existent for the third and fourth groups with the larger issue size. The coefficient is also insignificant for the sample as a whole.
### Table 5

**Relationship of Underpricing and Underwriters' Reputation for Issues of Different Sizes**

<table>
<thead>
<tr>
<th>Range of Issue Size ($NZ000s)</th>
<th>Group I</th>
<th>Group II</th>
<th>Group III</th>
<th>Group IV</th>
<th>Whole Sample</th>
</tr>
</thead>
<tbody>
<tr>
<td>$100-3,962</td>
<td>0.27</td>
<td>0.10</td>
<td>0.01</td>
<td>0.06</td>
<td>0.009</td>
</tr>
<tr>
<td>$3,989-7,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$7,000-12,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$12,400-280,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$100-280,000</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

| X-Coefficient              | 0.023    | 0.006    | -0.009    | -0.017    | 0.0043       |
| T-Statistics               | 2.57     | 1.35     | -0.43     | -1.03     | 0.82         |
| Degrees of Freedom         | 18       | 18       | 18        | 18        | 78           |

If reputable underwriters are more cautious towards riskier than safer issues, and fringe underwriters are equally aggressive in all IPOs, then the above results are expected. For small and risky issues, the difference in pricing between the two types of underwriters would be significant, reflecting the larger expected cost of a damaged reputation of the prestigious underwriters. However, the pricing difference would be much smaller and hence more difficult to detect for large and safe issues. In the extreme case where there is no risk whatsoever of overpricing an IPO issue, both types of underwriters would price the issue fully and charge the issuer the highest commission possible, and no difference in pricing would be detected. Another important consideration is that although there are differences in the reputation capital of underwriters in New Zealand, the difference is much less distinct than in other larger economies. The expected benefit (in the form of extra commission income) of pricing a large issue more fully may well overwhelm any expected cost of damaged reputation. Therefore one would expect to find a more prominent reputation effect in a sample of IPOs in the United States since...
there are more "giant" underwriters with a huge amount of reputation capital at stake. In any case the sample of IPO data in New Zealand does cast additional doubt on Tinic's legal insurance argument\textsuperscript{iv} and provides support for the reputation hypothesis.

Other studies have also provided empirical evidence that reputations of underwriters matter. Beatty and Ritter (1986) have documented the relationship between underwriters’ mispricing of unseasoned issues and the subsequent change in their market shares. It was found that underwriters who priced the issues too high or too low from the market norm lost on average 22% of their market shares subsequently. Shiller (1990) has conducted questionnaire surveys among IPO investors in the United States to study the underpricing phenomenon. His surveys documented a strong concern among investors regarding the reputation of underwriters and stockbrokers of IPO issues. Of the respondents 57% said they would be more likely to buy an IPO underwritten by a particular investment bank or investment bank consortium. Only 26% of the sample of respondents said they had done calculations to compare the fundamental value of an issue to the offer price. Shiller (1990 p.63) commented, "IPO investors were generally repeat purchasers of IPOs and communicated extensively with others about IPOs, so that the reputation of the underwriter may well have an effect on subsequent underwriter profits...Each issuing firm would rather that underwriters did not underprice its issue, but may find that it has no good alternative to dealing with firms that have a policy of underpricing; underwriters without this policy would have so much lower reputation that the price at which the issue could be sold would be even lower."
CONCLUSION

The studied sample of IPOs in the New Zealand sharemarket was found to exhibit significant underpricing (28.77%) which is comparable with other studies. In addition, Tinic's legal insurance effect is tested given the similarities in the United States Securities Act of 1933 and the New Zealand 1983 Securities Regulations regarding the control of IPOs. There is no significant difference in the degree of IPO underpricing before and after the implementation of the regulations in New Zealand. This result casts doubt on the general validity of Tinic's argument.

A reputation model of underpricing is also developed. The empirical evidence in New Zealand is consistent with the implications of the reputation hypothesis. Further investigations in other markets of reputation as the primary cause of underpricing would yield fruitful results.
APPENDIX A

The pay-off, $I$, to the underwriter given a particular offer price $P_o$ is:

$$I = \begin{cases} 
C(P_o) \cdot P_o \cdot N + (1-d(P_o)) \cdot (P-P_o) \cdot N & \text{if } P \geq P_o \\
C(P_o) \cdot P_o \cdot N + (1-d(P_o)) \cdot (P-P_o) \cdot N - R & \text{if } P < P_o 
\end{cases} \quad (4)$$

Where

- $R =$ present value of future cash flows lost as a result of tarnished reputation due to the issue being overpriced
- $N =$ number of shares issued
- $d(P_o) =$ investors' demand for the unseasoned issue given an offer price $P_o$, expressed as a percentage of total number of shares offered. Hence $0 \leq d(P_o) \leq 1$.

The expected income to the underwriter, given the same $P_o$, is:

$$E(I/P_o) = Pr(P \geq P_o) \cdot \{C(P_o) \cdot P_o \cdot N + (1-d(P_o))(P^{\geq P_o}-P_o) \cdot N\}$$

$$+ Pr(P<P_o) \cdot \{C(P_o) \cdot P_o \cdot N + (1-d(P_o))(P^{< P_o}-P_o) \cdot N-R\} \quad (5)$$

$$= C(P_o) \cdot P_o \cdot N + (1-d(P_o)) \cdot N \cdot Pr(P \geq P_o) \cdot (P^{\geq P_o}-P_o)$$

$$+ Pr(P<P_o) \cdot (P^{< P_o}-P_o) \cdot Pr(P<P_o) \cdot R \quad (6)$$

where $P^{\geq P_o} = E(P/P \geq P_o)$ and $P^{< P_o} = E(P/P < P_o)$

Similarly, the expected income given an offer price $P_e$ is:
\[ E(I/P_o) = C(P_o) \cdot P_o \cdot N - Pr(P<P_o) \cdot R \]  

(7)

since \( Pr(P=P_e) \cdot (P^{\infty}-P_e) + Pr(P<P_e) \cdot (P^{\infty}-P_e) = 0 \) for a symmetric distribution with mean \( P_e \).

Further, assume that the underwriter will not choose an offer price \( P_o \) above \( P_e \). In other words, the underwriter will not intentionally overprice the issue. This is of obvious interest to the underwriter in order to protect against the underwriting risk and also the risk of losing confidence among investors. Therefore the underwriter has to decide on an offer price \( P_o \) between \( P_{\min} \) and \( P_e \). We could gain some insights into the decision making process by looking at the difference in expected income if the issue is being priced at \( P_o \) rather than \( P_e \) (\( P_{\min} < P_o < P_e \)):

\[
E(I/P_o)-E(I/P_e) = Pr(P_o<P<P_e) \cdot R \\
+ (1-d(P_o)) \cdot N \cdot \{Pr(P<P_o) \cdot (P^{\infty}-P_o) + Pr(P<P_o) \cdot (P^{\infty}-P_o)\} \\
- N \cdot \{C(P_e) \cdot P_e - C(P_o) \cdot P_o\} \\
\]  

(8)

The second term is likely to be insignificant for "extreme" values of \( P_o \). For low levels of \( P_o \) (close to \( P_{\min} \)), demand for the shares will be high and \( d(P_o) \) will be close to 1. For values of \( P_o \) close to \( P_e \), the expression \( Pr(P<P_o) \cdot (P^{\infty}-P_o) + Pr(P<P_o) \cdot (P^{\infty}-P_o) \) will be close to zero. The idea is that when an issue is clearly underpriced it is likely to be fully subscribed, and there is minimal underwriting risk involved. When the issue is priced close to its expected value, the expected deviation from the offer price of the unsold shares held by the underwriter is close to zero no matter what \( d(P_o) \) is. Hence, in cases where the degree of underpricing is significant (e.g. in Australia and New Zealand where on
average IPOs are underpriced by almost 30%), it would be safe to drop the second term to simplify the expression. The expression then reduces to:

$$E(I/P_o)-E(I/P_e) = \Pr(P_o<P<P_e)\cdot R - N\cdot \{C(P_e)\cdot P_e - C(P_o)\cdot P_o\}$$  \hspace{2cm} (9)
## APPENDIX B

### 1979-1985 IPO UNDERWriters LEAGUE TABLE IN NEW ZEALAND

<table>
<thead>
<tr>
<th>UNDERWRITER</th>
<th>TOTAL AMT UNDERWRITTEN</th>
<th>RANK</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.I.C. FINANCE LTD.</td>
<td>2,020,280</td>
<td>1</td>
</tr>
<tr>
<td>HAMILTON, HINDIN, GREENE</td>
<td>2,400,000</td>
<td>2</td>
</tr>
<tr>
<td>APEX GROUP LTD.</td>
<td>3,320,000</td>
<td>3</td>
</tr>
<tr>
<td>BROADBANK INVESTMENTS LTD.</td>
<td>5,500,000</td>
<td>4</td>
</tr>
<tr>
<td>CBA MERCHANT FINANCE LTD.</td>
<td>7,000,000</td>
<td>5</td>
</tr>
<tr>
<td>RENOUF CORPORATION LTD.</td>
<td>7,000,000</td>
<td>6</td>
</tr>
<tr>
<td>HENDRY HAY MCINTOSH LTD.</td>
<td>7,500,000</td>
<td>7</td>
</tr>
<tr>
<td>JORDAN SANDMAN SMYTHE LTD.</td>
<td>7,508,657</td>
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</tr>
<tr>
<td>FORSYTH BARR &amp; CO.</td>
<td>7,950,000</td>
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<tr>
<td>FAY RICHWHITE &amp; CO. LTD.</td>
<td>9,611,000</td>
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<tr>
<td>CHARTER CORPORATION LTD.</td>
<td>10,100,200</td>
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<tr>
<td>MORROW &amp; BENJAMIN LTD.</td>
<td>11,000,000</td>
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<tr>
<td>INVESTMENT FINANCE CORP LTD.</td>
<td>11,500,000</td>
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</tr>
<tr>
<td>CHALLENGE CORPORATE SERVICES LTD.</td>
<td>12,000,000</td>
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<tr>
<td>FRANCIS, ALLISON, SYMES &amp; CO.</td>
<td>15,000,000</td>
<td>15</td>
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<tr>
<td>JARDEN &amp; CO.</td>
<td>23,201,000</td>
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<tr>
<td>N.Z.I. SECURITIES LTD.</td>
<td>29,250,000</td>
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<tr>
<td>BUTTLE WILSON &amp; CO.</td>
<td>37,441,250</td>
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<tr>
<td>SOUTH PACIFIC MERCHANT FINANCE LTD.</td>
<td>57,999,900</td>
<td>19</td>
</tr>
<tr>
<td>UNDERWRITER</td>
<td>TOTAL AMT UNDERWRITTEN</td>
<td>RANK</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>------------------------</td>
<td>------</td>
</tr>
<tr>
<td>A.I.C. FINANCE LTD.</td>
<td>1,200,000</td>
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</tr>
<tr>
<td>N.Z.I. SECURITIES LTD.</td>
<td>1,500,000</td>
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<tr>
<td>MORROW &amp; BENJAMIN LTD.</td>
<td>2,799,900</td>
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<tr>
<td>ARTHUR BARNETT LTD.</td>
<td>3,234,813</td>
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<td>GREVILLE &amp; CO.</td>
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<td>FAS MACQUARIE LTD.</td>
<td>5,250,000</td>
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<tr>
<td>CHARTER CORPORATION LTD.</td>
<td>5,600,367</td>
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<td>PAINE BELCHER LTD.</td>
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<tr>
<td>HAMELYN GROUP LTD.</td>
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<td>9</td>
</tr>
<tr>
<td>FRANCIS, ALLISON, SYMES &amp; CO.</td>
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<tr>
<td>D.F.C.</td>
<td>10,368,000</td>
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<tr>
<td>PEMBROKE SECURITIES</td>
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</tr>
<tr>
<td>HENDRY HAY MCINTOSH LTD.</td>
<td>12,999,995</td>
<td>13</td>
</tr>
<tr>
<td>AMP FINANCIAL CORPORATION LTD.</td>
<td>13,250,000</td>
<td>14</td>
</tr>
<tr>
<td>BAIN &amp; COMPANY</td>
<td>13,500,000</td>
<td>15</td>
</tr>
<tr>
<td>WALLIS, GOSNEY, SPARY &amp; SINCLAIR</td>
<td>16,000,000</td>
<td>16</td>
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<tr>
<td>NEW ZEALAND EQUITIES LTD.</td>
<td>17,700,000</td>
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</tr>
<tr>
<td>JORDAN SANDMAN SMYTHE LTD.</td>
<td>20,000,000</td>
<td>18</td>
</tr>
<tr>
<td>RENOUF CORPORATION LTD.</td>
<td>40,489,250</td>
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<tr>
<td>PDL HOLDINGS LTD.</td>
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<tr>
<td>WHITEMAN &amp; CO.</td>
<td>72,000,000</td>
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<tr>
<td>BUTTLE WILSON &amp; CO.</td>
<td>85,221,500</td>
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<tr>
<td>ORD O'CONNOR GRIEVE</td>
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<tr>
<td>JARDEN &amp; CO.</td>
<td>215,190,000</td>
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<tr>
<td>FAY RICHWHITE &amp; CO. LTD.</td>
<td>316,750,000</td>
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</tr>
</tbody>
</table>
NOTES

i. These items include, among others, the issue size, offer price, and date of offering. These offerings scatter across years and industries and are likely to be random.


iii. These names were obtained from IPO records kept in the New Zealand Stock Exchange. These records were incomplete, but no systematic selection bias was detected since these issues represented a cross-section of industries and were scattered across the sample period.

iv. In fact, if prestige was less prominent for investment bankers in the United States before the 1930s, and was only built up slowly in the later years of the century, Tinic’s findings are consistent with the reputation hypothesis. The difference in the degree of underpricing before and after 1933 may then be simply a result of the larger total reputation capital of investment bankers accumulated over the years in the post-1933 era.
REFERENCES


