THE UNDERPRICING OF UNSEASONED NEW ISSUES OF COMMON STOCK

by

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ABSTRACT

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The study is primarily concerned with the verification, and subsequent explanation, of the existence of the phenomenon of new issue underpricing.

The primary purposes of the research conducted in this study were to: (1) determine if investors may earn excess returns on new issues by purchasing at the prevailing market price in the immediate after-market rather than at the offer price, (2) develop a simultaneous equation model to explain underpricing, percentage cash spread, and the relationship between the two using various firm, issue, and market characteristics, and (3) analyze the effects of institutional constraints concerning percentage cash spread on the relationship between underpricing and percentage cash spread.

The examination of excess returns indicates that efficiency prevails in the new issues market beginning with the second trading day. Therefore, investors purchasing new issues in the immediate after-market may expect to not earn excess returns.

The results of the estimation of the econometric model using the entire sample of new issues does not indicate a simultaneous relationship between underpricing and cash spread. However, in order to analyze the effects of the institutional constraint on percentage cash spread, it is hypothesized that the most severely underpriced issues are most seriously affected by constraint. The sample is divided into quartiles on the basis of magnitude of underpricing and the econometric model is estimated separately for each quartile. The upper quartile exhibits a recursive relationship suggesting that percentage cash spread is first set and underpricing is adjusted accordingly to lessen risk of distribution and thereby compensate for the lower level of percentage cash spread. A simultaneous relationship does occur in the middle quartiles, but the relationship is positive indicating that higher percentage cash spread offerings also experienced greater underpricing. These results furnish evidence that new issues are affected by institutional constraints on percentage cash spread and the guidelines could be the cause of a portion of the underpricing occurring in the new issues market.

DEDICATION

In memory of my father, Mr. , whose first concern was always the welfare and happiness of his children. A man with the wisdom and strength to allow us the freedom to roam in search of our dreams as well as the compassion to extend a helping hand when we may have strayed a bit too far.

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Chapter I

INTRODUCTION

An initial public offering of common stock, hereafter referred to as a new issue, entails the sale of common stock to the public by a company that previously did not have an active public market for its stock.

Existence of Underpricing

The proliferation of new issues during the late 1960s, early 1970s, and early 1980s spawned a substantial amount of research directed at the efficiency of the new issues market. These studies generally assessed the average market-adjusted excess return earned on a sample of new issues during the first week, month and year following the offering when the purchase of the new issues occurred at the registered offer price. The results, which generally substantiate the existence of positive mean excess returns during the first week, are attributable to one of two possible scenarios. The first is that new issues are underpriced, on average. The second is that investors consistently over-value new issues, on average. New issue market research generally provides stronger support for the first scenario in that significant departures from efficiency in the aftermarket are not observed. In other words, there is no evidence of a downward adjustment in the price of new common stock issues subsequent to the offering, the result expected under the second scenario. The average first week excess return is found to be not sigificantly different from either the average first month excess return or the average first year excess return. Therefore, the positive average market-adjusted excess return earned during the first week is attributed entirely to the underpricing of new issues. This evidence also supports the contention that the market-adjusted excess return due to underpricing is entirely captured by the end of the first week of trading.

Statement of Problem

The fundamental problem is the existence of underpricing in itself. In an efficient market we would not expect that excess returns could be earned, on average, by investing in new issues. However, given the existence of the underpricing of new issues, the problem now becomes one of isolating the economic variables which account for differences in the magnitude of underpricing among new issues and thereby possibly explain its very existence.

Assessment of After-Market Efficiency

One purpose of the current study is to calculate and analyze the first week excess returns in order to demonstrate that the excess return attributable to the underpricing of new issues is entirely captured by the end of the offer day. This task will be accomplished by showing that the expected value of the excess return on new issues is equal to zero for the second, third, fourth, and fifth trading days.

Underpricing and the Negotiation Process

Although the existence of new issue underpricing has been supported by the results of the studies of new issue market efficiency and widely accepted in the academic community, a suitable rationale for the existence of this apparent market inefficiency has been elusive. The current study will present an econometric model of the new issues market which explains underpricing as an integral part of the negotiation process engaged in by the issuer and the underwriting syndicate (hereafter the underwriter) when setting the offer price of the new stock and the level of direct cash compensation.

The direct cash compensation per share to the underwriter is the cash spread between the offer price and the price the underwriter pays the corporation for the purchase of each share. The cash spread is intended to compensate the underwriter for the costs involved in distributing the new shares and in underwriting the risk associated with a common stock offering. In a firm underwritten offering the underwriter actually purchases the shares from the issuing company and resells the shares to the public, thus assuming all risk involved in the distribution of the securities. The greater the magnitude of underpricing, the lower should be distribution risks and, ceteris paribus, the lower should be the required cash spread. More severe underpricing should lessen the probability of a prolonged distribution period which, in turn, lowers the expected costs and risk involved in the distribution of the securities. On the other hand, underpricing of a new issue represents an opportunity cost to the issuer of the stock in that the level of proceeds accruing to the issuer decreases as a result. Consequently, we expect the issuer to negotiate a lower level of cash spread in those instances in which underpricing occurs.

The issuer and underwriter reach agreement concerning the level of these two principal components of underwriting costs concurrently some time just before the offering. The negotiated fee setting process is thus conducive to the existence of a simultaneous relationship between cash spread and underpricing.

Institutional Constraints on the Negotiation Process

In a world devoid of governmental or institutional restrictions concerning the level of direct cash compensation to the underwriter, a simultaneous relationship between cash spread and underpricing may prevail. However, institutional guidelines concerning the amount of underwriter compensation considered to be "fair and reasonable" may alter the nature of the relationship between underpricing and cash spread.

Logue (40) was the first to recognize the existence of institutional constraints and the potential impact of these constraints on the relationship between underpricing and percentage cash spread. His hypothesis was that a limitation on allowable percentage cash spread would penalize smaller offers, perhaps not enabling the underwriter to both cover fixed costs and be adequately compensated for assuming the risk involved in the offering. Therefore, Logue asserted that smaller offers would be more severely underpriced under these conditions in order to lessen the risk of the offering so that the maximum allowable percentage cash spread does constitute adequate compensation for the underwriter.

One such guideline is imposed by the Committee on Corporate Financing of the National Association of Securities Dealers (NASD). If the terms of a particular offer are deemed by the committee to be "unfair and unreasonable" the agreement between the issuer and the underwriter must be renegotiated and resubmitted for approval. Failure to comply with the renegotiation request by NASD may subject the managing underwriter to suspension or expulsion from NASD. Expulsion from NASD imposes extremely serious consequences on the underwriter because a NASD member may not join any underwriting syndicate which includes a dealer who has been suspended from NASD. Therefore, expulsion from membership in NASD could curtail future underwriting activity by the excluded underwriter.

Although the specific guidelines are not published by NASD, their existence may still affect the negotiation process and the relationship between cash spread and underpricing. Given that the underwriter's experience with similar offers is sufficient to allow for negotiation of the maximum allowable compensation, the relationship between underpricing and cash spread may become recursive rather than simultaneous, at least for certain types of offers which have extremely high cash spread. For example, in the case where the estimated maximum allowable compensation is not sufficient to compensate the underwriter for the risk of distribution the simultaneous nature of the decision-making process may dissipate. The underwriter may first establish the percentage cash spread at or near the estimated maximum allowable level and subsequently adjust the magnitude of the underpricing accordingly as a means of compensating for the insufficient cash spread.

"The sole test to be applied by the committee in determining fairness and reasonableness is whether the referred to arrangements, terms and conditions, when taking into consideration all elements of compensation and all of the surrounding circumstances and relevant factors, appear fair and reasonable in each case." (49). The fact that NASD's Committee on Corporate Financing considers all forms of compensation, both direct and indirect, in determining the fairness and reasonableness of the underwriting agreement limits the potential of circumventing limitations on cash spread through the substitution of indirect forms of compensation. However, the potential for trade-offs between total compensation and underpricing still remains. "The Committee does not, however, attempt to pass upon or evaluate the merits of any issue of securities or the fairness of the public offering price, and, therefore, any determination made by the Committee should not be construed as having a reflection, either favorable or unfavorable, upon the securities being offered." (49). Since NASD does not attempt to determine a "fair and reasonable" offer price for each new issue, potential to alter the magnitude of the underpricing to compensate for the limitations on direct and indirect forms of compensation still exists.

The final purpose of this study is to present an analysis of the effect of the institutional guidelines concerning percentage cash spread on the nature of the negotiation process and the relationship between underpricing and percentage cash spread.

Organization of the Dissertation

Chapter II reviews the previous research concerning the efficiency of the new issues market. Chapter III analyzes the distribution and timing of excess returns of the sample of new issues employed in the study. The development of the regression model and the justification for the inclusion of each of the explanatory variables is presented in Chapter IV. Results of the estimation of the model are presented and interpreted in Chapter V. Finally, the conclusions of the study are outlined and presented in Chapter VI along with the limitations of the study and suggestions in terms of the direction of future research.

Chapter II

SURVEY OF PRIOR RESEARCH

The existence of the underpricing of unseasoned new issues of common stock has been well documented in the literature (5, 28, 29, 30, 43, 52, 57, 58, 59, 75). Although the magnitude of underpricing varies greatly among these studies, short-run average excess returns are generally found to be significantly positive. Table 1 presents the statistics relating to the level of average excess returns reported in previous studies of the new issues market.

Methodological Differences Among Studies

A portion of the discrepancy in the reported magnitude of mean excess returns among studies may possibly be attributed to differences in methodology such as the exclusion of dividends (30, 44, 52, 57, 58, 59), the elimination of observations with missing price quotations (44, 52, 57, 59), differences in the market index used in calculating excess returns, or differences in the time period encompassed by the studies.

A study by Walker and Petty (81) which concerns financial differences between large and small firms reports that 74% of the small firms in the sample made no distribution in the form of dividends in the year preceding the offering. There-

TABLE 1

AVERAGE EXCESS RETURNS OF PREVIOUS STUDIES

STUDY	TIME PERIOD	NUMBER OF ISSUES	EXCESS RETURNS FROM POINT OF ISSUE	
			1 WEEK	1 MONTH
McDonald-Fisher	1969	142	28.5%	34.6%
Ibbotson	1960-69	128		11.4
Reilly	1972-75	486	10.9	11.6
Logue	1965-69	250		41.7
Neuberger-Hammond	1965-69	816	17.1	19.1
Block-Stanley	1974-78	102	5.9	3.3
Neuberger-LaChapelle	1975-80	118	27.7	33.6

fore, it may be that the return in the form of cash dividends received on the market portfolio substantially exceeds the return in the form of dividends on the typical new issue thus biasing upward the calculated excess rate of return on new issues. The inconsistent treatment of dividend returns may thus contribute to the discrepancies among new issue studies concerning reported mean excess returns.

Elimination of those new issues with price quotations missing subsequent to the offering can also create an upward bias in the calculation of the mean excess return on a sample of new issues. Missing subsequent price quotations can be the result of bankruptcy or a general lack of interest in the new issue resulting in a low level of liquidity. The failure to consider such contingencies in the analysis of the mean excess returns can impart an upward bias in favor of positive initial performance of new issues. These issues may in fact have consistently declined in value from the outset of trading, and their systematic exclusion from the computations thus eliminates some potentially large negative excess returns from the analysis. A study by Reilly (58) examined the effects of including those observations with missing price quotations subsequent to the offering. Reilly found that the inclusion of these issues in the analysis did not result in substantial reductions in the magnitude of mean excess returns. However, the median excess return was substantially lowered by the additional observations with missing price quotations. In fact, the median excess return from the offer date to the fourth Wednesday following the offering actually became negative when the additional observations were included in the analysis.

Prevailing market conditions may differ among studies of new issue market efficiency due to differences in the time period encompassed by the analysis. Differences in the prevailing market conditions may also explain some of the disparity in reported mean excess returns. Reilly (57) also compared the average new issue price performance during rising and declining markets finding little difference. However, he later reported in (58) that the mean excess returns during a declining market, although positive, are substantially lower than the mean excess returns found during a rising market.

An additional methodological consideration which could account for a part of the disparity in reported average excess returns concerns the market index employed in the calculation of excess returns. While the majority of studies utilized the market-adjusted returns approach in calculating excess returns, it should be noted that this approach implicitly assumes that the systematic risk of each new issue is equal to the systematic risk of the market portfolio employed in the calculation. The various market indices used in calculating market-adjusted excess returns include the Dow Jones Industrial Average (58, 59), the Standard & Poor's 500 Index (30), the Standard & Poor's 425 Index (75), the National Quotation Board Over-the-Counter Index (5, 53, 58) and an equally-weighted arithmetic average of the returns on the New York Stock Exchange stocks (28). One study (59) also employed the return on a randomly selected Over-the-Counter stock in place of the return on the market in the excess return calculation. Although excess return calculations using different market indices (58, 59) report differences in the average excess returns between the two methods of computation, the magnitude of the differences appears to be relatively small.

Market price data for new issues is generally available only on a weekly or monthly basis. Therefore, the reported initial excess return is calculated either over the period from the offer date to the end of the offer week (5, 44, 52, 58, 59) or from the offer date to the end of the offer month (28, 39). In either case, the result is the averaging of excess returns over a variable number of trading days. In the case of weekly price observations, the number of trading days from offer date to first price observation may vary from one to five. Therefore, one-day, two-day, three-day, four-day and five-day excess returns are being compared across all new issues in a given sample. When monthly price observations are used in computing the mean excess return, the initial observation period may vary from one to twenty trading days in length. None of the studies of new issue price performance reviewed here analyze the effect of this procedure on the reported average excess returns.

Although the above-mentioned methodological considerations may partially account for the divergence in reported mean excess returns among studies, it is unlikely that these methodological differences can account for the full magnitude of observed new issue underpricing.

Explanations of Underpricing - Speculation

Many of the proposed explanations for the existence of new issue underpricing are speculative in nature and have not been subjected to empirical testing. The principal reason for the existence of underpricing espoused in the literature is that underpricing lessens the risk of a prolonged distribution period for the issue (39, 40, 41, 58, 59). Underpricing is viewed as a liquidity concession on the part of the underwriter to provide incentive for investors to switch from holding existing securities to holding the new issue (40, 41) and potentially shortening the distribution period. A shorter distribution period lessens the costs and exposure to risk of the underwriter during the underwriting process. One cost reducing aspect of a shorter distribution period concerns the opportunity cost of holding an inventory of the securities (40, 41). An issue which sells quickly does not tie up the relatively limited capital base of the underwriter (59). Underpricing the stock in order to quickly sell the issue is also viewed as a means of avoiding an expensive investor search and the need for engaging in costly post-offering price stabilization activities (40, 41, 58, 59). A shorter distribution period is also thought to lessen the probability of a loss on the inventory of securities held by the underwriter as a consequence of adverse market movements (40, 41).

Underwriter uncertainty concerning the market's evaluation of past and future potential earnings streams is also considered as a factor contributing to both the existence and magnitude of new issue underpricing (58, 59). The combination of this uncertainty and the desire to avoid a lengthy distribution period may result in an even more severe level of underpricing.

Underpricing is also considered to be a method for the underwriter to gain favor with investors by providing immediate capital gains on the investment (39). Furthermore, it has been contended (36) that capital gains realized by selected investors as a result of the underpricing are in effect rebates from the underwriter to large consumers of other investment banking services.

An additional explanation for the existence of underpricing is that institutional limitations on the amount of direct cash compensation provide incentive for underpricing (39). It is possible that the maximum amount of direct cash compensation does not both fully compensate the underwriter for the offering risk involved and allow the underwriter to recoup the fixed costs of underwriting the issue. Since underpricing will both reduce the risk of an unsuccessful offer and enhance the profitability of potential forms of non-cash compensation such as warrants, underpricing is then explained as a means of underwriter compensation that supplements the institutionally restricted direct cash compensation.

Given that a particular new issue is underpriced, the issuing firm does not receive the maximum amount of proceeds from the offering. That is, the investor realizes initial excess returns on the security because the security is priced below its efficient price. The failure of issuers to be distressed by the prospect of underpricing is generally explained as an attempt to ensure the satisfaction of the new stockholders because corporations do not attempt to fulfill all of their planned capital needs in the initial offering (58, 59). Issuers may believe that future stock may be issued at a higher price to a satisfied stockholder group thus amortizing the initial public offering premium over subsequent issues (40, 58, 59).

Another possible reason for the lack of corporate complaints about the existence of underpricing involves the cost of alternative forms of financing (40). Although the issuer of an initial public offering is paying a premium via underpricing to issue the new equity, alternative means of raising capital, such as the sale of additional debt, may be even more costly. The final factor which supposedly mitigates complaints from the corporation concerning the level of underpricing involves the receipt of stock options by corporate executives (58, 59). The options generally have exercise prices close to the original offering price. Therefore, underpricing may virtually assure the profitability of these options.

The above-mentioned reasons given in the literature for both the existence and the acceptability of new issue underpricing are, as stated earlier, merely speculative and have not been subjected to empirical testing. The authors of these studies do not attempt to explain the phenomenon of significant underpricing in terms of issue, firm and market characteristics.

Explanations of Underpricing - Empirical Examinations

Differences in firm, issue, and market characteristics among new issues may account for a large part of the dispersion in the distribution of underpricing observed among new issues. One issue characteristic which has been scrutinized as a possible partial explanation for the degree of dispersion among new issue excess returns is the underwriter (5, 44, 52, 53). The typical issue being examined is whether a significant difference in mean excess returns exists among new issues underwritten by various categories of underwriters. McDonald and Fisher (44) analyzed the mean excess returns on new issues underwritten by four underwriters, each of which were involved in at least four initial public offers, to determine whether underwriters exhibit different behavior in setting offer prices. A significant difference in the mean first-week return was found between the two most active new issue underwriters. Beyond these observed differences, the primary finding is the lack of concentration of unseasoned new issues among underwriters.

Neuberger and Hammond (52) also examined differences in mean excess returns among underwriters but over a much longer period of time than the McDonald and Fisher study. Consequently, the sample size is much larger and contains 48 underwriters. They conclude that there is a significant difference in the excess return of underwriter's portfolios of unseasoned new issues from the date of issue to one week or one month later. However, the excess return from the end of the first week to the end of the first month is not significantly different from zero. This result suggests that any short-run adjustment of price occurs during the first week, a conclusion consistent with the findings of previous studies.

Neuberger and Hammond also classified underwriters as either prestigious or non-prestigious according to the method defined by Hayes (24). Their sample contained 25 underwriters classified as non-prestigious. New issues were classified into quartiles on the basis of excess returns and the number of prestigious and non-prestigious in each quartile was analyzed. The number of prestigious underwriters was found to be definitely skewed to the lower quartiles leading the authors to conclude that prestigious underwriters experience lower price appreciation than less prestigious underwriters.

Block and Stanley (5) defined a prestigious underwriter as a firm belonging to one of the top three categories of the tombstone ranking as described by Hayes (24). Prestigious underwriters not only had inferior performance relative to non-prestigious underwriters, but they actually showed negative excess returns. The difference in the mean excess return of the two classifications of underwriters was found to be significantly different from zero.

Neuberger and LaChappelle (53) analyzed the difference in performance among three classifications of underwriters. In addition to the previously defined prestigious and non-prestigious classifications, all underwriters who managed new issues with an initial offer price of one dollar or less were included in the analysis. Their results rejected the null hypothesis of no significant difference among the mean excess returns of the three underwriter groups. The mean excess return generally exhibited an inverse relationship with underwriter prestige with the mean excess return on the additional classification dramatically greater than the mean excess return of the prestigious and non-prestigious groups. Significant differences between underwriters diminish in the aftermarket time periods (one month and one year following the offering). However, unlike McDonald and Fisher, the difference in mean excess returns from the first week to the first month among the groups was found to be significant. The difference in mean excess return from the first month to the first year among the groups was not found to be statistically significant, however.

A second issue characteristic found in the literature is the effect of secondary issues on mean excess returns. Unlike a primary issue in which proceeds accrue to the corporation, the proceeds of a secondary issue accrue solely to the stockholders. A combination issue is comprised of both primary and secondary shares.

Neuberger and Hammond (52) calculated both the mean excess returns on secondary issues and the mean excess returns on non-secondary issues. The non-secondary category included both primary and combination issues. The mean excess return on secondary issues was found to be approximately one-half of the mean excess return on non-secondary issues leading the authors to assert that their results support the notion that stockholders can indeed demand a higher public offering price for the issue.

Explanations of Underpricing - Econometric Models

Two studies of the market for unseasoned new issues of common stock do attempt to explain underpricing in economic terms. Logue (39) presented a single equation regression model to explain the excess return during the first month after issue. Logue employed various issue and market characteristics as independent variables in the underpricing equation. Included among his independent variables are both cash and non-cash compensation. Although neither coefficient was found to be statistically significant, Logue emphasized that the coefficient of cash compensation is nearly significant and of high magnitude hinting that a trade-off may exist between direct cash compensation and first month performance. Logue tested the trade-off hypothesis with a simultaneous model and obtained poor results. Possibly the poor results were obtained in the simultaneous model estimation because simultaneity between underpricing and percentage cash spread, if it exists at all, may only exist in those ranges of the data where NASD limitations on percentage cash spread do not constitute a binding constraint. Logue (40) states that the NASD restriction on direct cash compensation is a fixed percentage of the issue size which he claims would penalize smaller offers by allowing a lesser maximum dollar amount of cash compensation. If the allowable dollar amount of cash compensation is not sufficient to cover the fixed costs on smaller issues, it might be expected that smaller offerings are more severely underpriced. However, the NASD manual (49) states that the maximum allowable percentage of cash spread varies inversely with the size of the issue, which would tend to alleviate this problem.

In a subsequent study (41), Logue and Lindvall utilized a two equation, simultaneous model to identify factors affecting both the offer price and dollar cash spread, as well as trade-offs which may exist between the two variables. The simultaneous equation model specified offer price and dollar cash spread as endogenous variables rather than the under-pricing and percentage cash spread used by Logue in his single equation model. In addition to the obvious difficulties involved in attempting to explain the price of a firm's common stock as the authors do with their offer price equation, there are some other apparent difficulties with their approach. Logue and Lindvall hypothesize a trade-off between offer price and cash spread. While they do find significant simultaneity between the two variables, it may be a result of the institutional guidelines concerning total cash compensation as a percentage of issue size. Thus, the findings may be the result of a mathematical relationship rather than the result of an economic relationship. For example, assume that the allowable percentage of direct cash compensation is a constant where

$$\text{PCTCOMP} = \frac{\text{TOTAL DIRECT CASH COMPENSATION}}{\text{TOTAL GROSS PROCEEDS}}$$

$$= \frac{\text{\$ CASH SPREAD} \times \text{NUMSHRS}}{\text{OFFER PRICE} \times \text{NUMSHRS}}$$

$$= \frac{\text{\$ CASH SPREAD}}{\text{OFFER PRICE}}$$

Therefore, the higher the offer price, the larger the dollar cash spread the underwriter is allowed to take. This relationship does not necessarily suggest a relationship between cash spread and the risk of a prolonged distribution period which Logue and Lindvall claim increases with offer price. The authors contend that a higher offer price leads to greater risk of a prolonged distribution period. This assumes that the aftermarket efficient price of two issues with the same offer price is the same, which is not necessarily true. For example, if the offer price of each of two new issues of unseasoned common equity is $50 and the expected aftermarket efficient price of issue one is $55 and that of issue two is $60, it may be expected that issue two will face lower risk of a prolonged distribution period due to the greater percentage underpricing, ceterus paribus. The Logue and Lindvall model, because it ignores such differences in the magnitude of underpricing, suggests the same risk of a prolonged offer period for both issues which is not the case.

Finally, if risk of a prolonged offer period varies directly with the offer price, the underwriter could lessen such risk by implementing a stock split preceding the offer date. In an efficient market, however, a stock split will not affect the length of the anticipated distribution period.

Chapter Summary

The literature concerning new issues market efficiency is in general agreement in supporting both the existence of underpricing and the efficiency of the after-market. Although many speculative explanations of underpricing have been proposed, most have not been empirically tested. The studies which have attempted to explain differences in the magnitude of underpricing among new issues merely examine the influence of a single variable in isolation. Although several econometric investigations using multiple regression techniques have been conducted, a satisfactory explanation for the existence of underpricing has yet to be uncovered.

Chapter III

EXCESS RETURNS ON NEW ISSUES

This chapter provides a detailed description of the distribution of excess returns on new issues of common stock. Excess returns are calculated for four separate, non-overlapping one week holding periods. The distribution of excess returns for each holding period is presented and analyzed. The analysis is undertaken to ascertain whether the typical new issue realizes excess returns significantly different from zero during the first week (offer date to first week following the offering), assuming the security is purchased at the offer price. Additional analysis of first, second, third, and fourth week excess returns assuming purchase of the security at the prevailing market price is then performed to determine whether the typical new issue experiences excess returns significantly different from zero in the aftermarket.

Definition of Excess Returns - Prior Studies

The definition of excess returns employed in the majority new issue price performance research is a simple market-adjusted excess return calculated as follows:

$$XR_{IPS} = (P_{IS} / P_{IP}) - (P_{MS} / P_{MP})$$

$$= (1 + SR_{IPS}) - (1 + SR_{MPS})$$

$$= SR_{IPS} - SR_{MPS}$$

where P_{IP} = price of security I at time of purchase

P_{IS} = price of security I at time of sale

P_{MP} = level of NASDAQ OTC market index at time of purchase of security I

P_{MS} = level of NASDAQ OTC market index at time of sale of security I

SR_{IPS} = simple return on security I from time of purchase to time of sale

SR_{MPS} = simple return on NASDAQ OTC market index from time of purchase of security I to time of sale of security I

XR_{IPS} = excess return on security I from time of purchase to time of sale

The above definition of excess returns excludes a risk adjustment because of the difficulty of identifying security specific risk on new issues; recall that historical market price data seldom exists. The assumption implicit in this calculation is that the systematic risk of each individual new issue is exactly equal to the systematic risk of the market index.

Since the vast majority of new issues are traded in the Over-the-Counter market, the use of daily price quotations in the analysis of new issue price performance becomes exceedingly difficult. Daily price quotations for OTC securities are unavailable on magnetic tape and are otherwise both very tedious and costly to obtain. As a result, researchers resort to the utilization of weekly price quotations in their analyses of new issues market efficiency.

Following other studies, the first after-market price quotation used in this research is the market price at the close of trading on the first Friday following the offering. Subsequent after-market price quotations are also taken at the close of trading on the second, third, and fourth Fridays following the offering. The first week excess return calculation assumes that the new issue is purchased at the offer price on the offer date and sold at the closing market price on the first Friday following the offering. The second week excess return is calculated from the closing market price on the first Friday following the offering to the closing market price on the second Friday following the offering. Calculation of the third week and fourth week excess returns follow in similar fashion in that the security is assumed to be purchased at the closing market price on Friday of the preceding week and held for a period of one week. Descriptive statistics concerning the distribution of weekly excess returns by the week relative to the offering are contained in Table 2.

TABLE 2

DISTRIBUTION OF SIMPLE EXCESS RETURNS
ONE WEEK HOLDING PERIODS
ALL ISSUES

WEEK	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
First	425	.0332	.1236	.2596	2.998	.0001	<.01
Second	424	-.0087	-.0059	.0867	.541	.0076	<.01
Third	424	-.0093	-.0051	.0800	.711	.0061	<.01
Fourth	420	-.0119	-.0041	.0950	2.077	.0023	<.01

The average first week excess returns for the current sample presented in Table 2 are comparable to the results of other studies presented in Table 1. The most favorable comparison in terms of the magnitude of average excess returns is with the Reilly study (58) which involves a similar sample size but encompasses a different period of time. The Block-Stanley paper (5) and the Neuberger-LaChappelle piece (53) cover a similar period of time but incorporate much smaller sample sizes which may account for some of the discrepancy.

The p-values of either the Kolmogorov D statistic or the Shapiro-Wilk W statistic (sample sizes < 51) presented in column 7 of table 1 rejects the null hypothesis that the excess returns for any of the relevant holding periods are drawn from a normally distributed population. Consequently, the typical t-test for a population mean significantly different from zero is inappropriate, and the p-value of the Wilcoxon Signed Rank test statistic is presented in column 7. The Wilcoxon Signed Rank test is a nonparametric test employed in testing the null hypothesis that the median of the population distribution is not significantly different from zero. In the case where it is appropriate to assume that the distribution is symmetric, the Wilcoxon Signed Rank test is a test of the null hypothesis that the mean of the population distribution is not significantly different from zero. However, the interpretation of the test results in this study will be restricted to the former case due to the magnitude of the skewness coefficient of the first week excess returns.

The Wilcoxon Signed Rank test for each of the four holding periods leads to the conclusion that the median excess returns are significantly from zero. However, the median excess return for the first week holding period is positive, while the median excess return for each of the three remaining holding periods is negative.

Definition of Excess Returns - Current Study

Following Fama (16), this study examines changes in log price rather than simple price changes. Fama cites three principal reasons for using changes in log price rather than simple price changes. First, the change in log price is the continuously compounded yield from holding the security for a given holding period. Second, Fama states that a study by Moore (47) concludes that the variability of simple price changes for a given stock is an increasing function of the price level of the stock. The results of the study indicate that taking the logarithm neutralizes most of the price level effect. And third, Fama asserts that for changes between +15 percent and -15 per cent the change in log price is very close to the percentage price change, and for many purposes it is convenient to look at the data in terms of percentage price changes.

The work of Fama (16) supports the conclusion that distributions of daily excess returns are substantially nonnormal. Distributions of daily returns were found to be more peaked and had fatter tails than the normal distribution. Fama (16) states that the symmetric nonnormal members of the stable class of distributions have the leptokurtic property observed in daily common stock returns. Nonnormal symmetric stable distributions are more peaked and assign higher probabilities to extreme observations than normal distributions.

An appealing property of stable distributions in the context of this study is that they are by definition stable or invariant under addition. That is, if continuously compounded daily returns on a stock are random drawings from a stable distribution, then weekly and monthly continuously compounded returns have stable distributions of the same "type" as the daily returns. This property holds because weekly and monthly continuously compounded returns are simply the sums of the individual daily returns. The operational importance of this property is that if distributions of continuously compounded daily returns are stable and nonnormal, distributions of returns for intervals longer than a day have about the same degree of leptokurtosis as the distribution of daily returns. The property of weekly continuously compounded returns being merely the sum of the individual daily continuously compounded returns becomes important in subsequent analyses of first week excess returns. Therefore, continuously compounded returns will be employed in subsequent analyses.

For the purpose of this study, the continuously compounded rate of return on the individual security is calculated for each of the four relevant holding periods described earlier. The calculation of the continuously compounded rate of return on the security is conducted in the following manner.

<u>Continuously Compounded Rate of Return on Security I</u>

(1) $$P_{IS} = P_{IP}\, e^{CR_{IPS}}$$

where P_{IP} = price of security I at time of purchase

P_{IS} = price of security I at time of sale

CR_{IPS} = continuously compounded return on security I from time of purchase to time of sale

Dividing both sides of (1) by P_{IP} gives

(2) $$P_{IS} / P_{IP} = e^{CR_{IPS}}$$

And finally, taking the natural log of both sides of (2) yields

(3) $$\ln (P_{IS} / P_{IP}) = \ln (1 + SR_{IPS}) = CR_{IPS}$$

Therefore, if SR_{IPS} is the simple return on security I for a given holding period, then the continuously compounded return over the corresponding holding period is $\ln(1 + SR_{IPS})$. The difference between SR_{IPS} and $\ln(1 + SR_{IPS})$ is always positive and increases the further SR_{IPS} is from zero in either the positive or negative direction. The use of continuously compounded excess returns thus has the effect of pulling in the right tails of the distribution of excess returns and stretching out the left tails. The degree of positive skewness of the distributions is therefore reduced by the use of continously compounded excess returns.

The continuously compounded rate of return on the market is calculated in the same manner and is thus defined as $\ln(1 + SR_{MPS})$. The excess return on a particular new issue for a specific holding period is defined as the difference between the continuously compounded rate of return on the security and the continuously compounded rate of return on the market index. The excess return may thus be expressed as follows:

$$XR_{IPS} = \ln(1 + SR_{IPS}) - \ln(1 + SR_{MPS})$$

where XR_{IPS} = excess return on security I from time of purchase to time of sale

$\ln(1 + SR_{IPS})$ = continuously compounded rate of return on security I from time of purchase to time of sale

$\ln(1 + SR_{MPS})$ = continuously compounded rate of return on the NASDAQ OTC market index from time of purchase of security I to time of sale of security I

Analysis of Weekly Excess Return Distributions

Table 3 contains descriptive statistics of the distribution of excess returns for each of the four holding periods examined in the study. The use of continuously compounded returns in the excess returns calculation has reduced the skewness of the distribution as expected. However, the assumption of normality, or even symmetry, of the distributions remains inappropriate. Therefore, the Wilcoxon Signed Rank test is once again employed to test the null hypothesis that the median of each population distribution is not significantly different from zero. The test results indicate that the median of the population distribution for each of the four holding periods is significantly different from zero. The median of the first week excess return distribution is positive, while the median of the excess return distribution for each of the remaining holding periods is negative.

The overall conclusion concerning the magnitude and timing of excess returns on new issues is that positive excess returns are earned on the typical new issue assuming purchase at the offer price and sale at the closing market

TABLE 3

DISTRIBUTION OF CONTINUOUSLY COMPOUNDED EXCESS RETURNS
ONE WEEK HOLDING PERIODS
ALL ISSUES

WEEK	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
First	425	.0316	.0960	.1879	1.845	.0001	<.01
Second	424	-.0087	-.0099	.0865	-0.014	.0034	<.01
Third	424	-.0094	-.0083	.0784	0.311	.0025	<.01
Fourth	420	-.0118	-.0082	.0897	1.028	.0009	<.01

KRUSKAL-WALLIS TEST

First, Second, Third and Fourth Week Excess Returns

H_0: The four distributions are identical.

H_1: Not all the distributions are the same.

Test Statistic: $H = 124.41406$

Rejection Region: $H > 7.81472$ $(\chi^2_{.05,3})$

Conclusion: Reject H_0 in favor of H_1

price on the first Friday following the offering. However, the investor purchasing the typical new issue at the closing market price on the first Friday subsequent to the offering does not earn positive excess returns over a one week holding period. Likewise, purchase of the typical new issue at the closing market price on either of the next two Fridays with the intention of holding the security for one week does not yield positive excess returns.

The next step in the analysis of the excess return distributions is to determine whether the first, second, third, and fourth week excess return samples may be considered to have been drawn from the same population distribution. Examination of the p-values of the Kolmogorov D statistics permits the rejection of the null hypothesis that the samples of excess returns are drawn from populations which are normally distributed. Therefore, a Kruskal-Wallis test, which is a nonparametric test of the hypothesis that the four excess return samples are drawn from identical distributions (55), is appropriate. The results of the Kruskal-Wallis test are presented in Table 3 and warrant rejecting the null hypothesis that the distributions of first week, second week, third week, and fourth week excess returns are identical. The problem now becomes one of determining which of the excess return samples, if any, are drawn from identical population distributions. The specific test utilized here is a distribution-free multiple comparisons test based on Kruskal-Wallis Rank Sums (25). The experimentwise error rate will be controlled at an α-level of .05 and the pairwise comparisons are each controlled at and α-level of approximately .004.

The results of the nonparametric multiple comparisons procedure indicate that the distribution of the first week excess returns sample is significantly different from each of the other three excess return distributions. However, no significant differences among the distributions of second, third, and fourth week excess returns are revealed by the multiple comparisons technique, indicating that these week's excess return samples may be considered to have been drawn from the same population distribution. In contrast, the first week excess return sample is drawn from an altogether different population distribution.

<u>First Week Excess Return Calculation - Potential Problems</u>

One of the issue specific characteristics to be explained by the econometric model proposed in this study concerns the observed differences in the magnitude of first week excess returns among new issues of common stock. Therefore, it is imperative that the excess returns be calculated in a manner which permits direct comparisons to be made among all new issues in the sample. The length of the holding period may be one day, one week, one year or any other relevant time period for that matter. The point is that the length of the holding period should be identical for each new issue in the sample if direct comparisons of excess returns are to be made among observations. Unfortunately, this has not been the case in previous studies of excess returns in the new issues market.

The fundamental problem of non-uniform holding periods is a result of the timing of after-market price quotations used in studies of the new issues market. The practice of utilizing weekly market price quotations causes a problem in the first week excess return calculation which may significantly bias the calculation of average excess returns earned during the first week.

As previously outlined, the first after-market price quotation used in new issue studies is generally the market price at the close of trading on the first Friday following the offering. Consequently, the first available after-market price quotation occurs on the same day of the week across all new issues in the sample. However, new issues are actually occurring each trading day of the week, Monday through Friday. Therefore, the first week excess return on an initial public offering occurring on Monday, for example, entails an excess return earned over the course of five trading days. Conversely, the first week holding period of a new issue occurring on Friday consists of only one trading day. The direction of the bias, if any, in the mean excess return calculation is dependent upon the sign of the daily average excess returns subsequent to the first day of trading in the security.

In order to examine the effect of pooling Monday, Tuesday, Wednesday, Thursday, and Friday new issues on the analysis of first week excess returns, the sample is divided into five mutually exclusive groups. The new issues in the sample which experienced five trading days from the offer date until the first after-market price quotation are placed in the Monday grouping. Those new issues outstanding for four trading days until the first after-market price quotation are included in the Tuesday subset. The Wednesday, Thursday, and Friday groups are thus comprised of those new issues in existence for three, two, or one trading days, respectively, until the first after-market price quotation.

Analysis of First Week Excess Return Distribution

Descriptive statistics concerning the distribution of first week excess returns by the day of the week on which the offer took place are presented in Table 4. The basic concern is whether the excess returns of each of the five distinct groups may be considered to have been drawn from identical population distributions. If so, then it is appropriate to pool the five groups into one sample as has been the practice in prior research. However, if any of the five samples is concluded to have been drawn from a different population distribution, pooling of the five groups for the further analysis of excess returns earned during the first week would be inappropriate.

The null hypothesis that the five samples of first week continuously compounded excess returns are drawn from identical population distributions is not rejected based on the results of the Kruskal-Wallis test presented in Table 4. That is, the five samples of first week continuously compounded excess returns may be considered to have been drawn from the same population distribution.

As mentioned at the outset of the analysis, the continuously compounded excess return for the first week is simply the sum of the continuously compounded returns for each of the trading days within the week. The first week excess return calculation for Monday new issues assumes that the new issue is sold at the closing market price on Friday of that week. The continuously compounded weekly excess return on a Monday new issue is equal to the sum of the continuously compounded daily excess returns earned on Monday, Tuesday,

TABLE 4

DISTRIBUTION OF FIRST WEEK EXCESS RETURNS
BY OFFER DAY OF THE WEEK

OFFER DAY	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
Mon	9	.1571	.1574	.1821	-0.193	.0440	.958*
Tues	134	.0549	.1169	.1996	1.164	.0001	<.01
Wed	119	.0342	.0991	.2135	2.446	.0001	<.01
Thur	134	.0180	.0660	.1365	1.107	.0001	<.01
Fri	29	.0109	.1063	.2176	2.148	.0322	<.01*

KRUSKAL-WALLIS TEST

First Week Excess Returns by Offer Day of the Week

H_0: The five distributions are identical.

H_1: Not all the distributions are the same.

Test Statistic: $H = 4.05615$

Rejection Region: $H > 9.48773$ $(\chi^2_{.05,4})$

Conclusion: Fail to reject H_0

Wednesday, Thursday, and Friday. Similarly, the continuously compounded weekly excess return on a Tuesday new issue is equal to the sum of the continuously compounded daily excess returns earned on Tuesday, Wednesday, Thursday, and Friday. Consequently, the calculation of the continuously compounded weekly excess return on Monday new issues includes the continuously compounded daily excess return earned during one additional trading day. Comparison of the distribution of continuously compounded weekly excess returns for the Monday group of new issues with the distribution of continuously compounded weekly excess returns for the Tuesday group of new issues, when both are drawn from the same population distribution, indicates that the expected value of the continuously compounded daily excess returns on the fifth trading of the Monday subsample must equal zero. Similarly, it may be concluded that the expected value of the continuously compounded daily excess returns on the fourth trading day is zero if the continuously compounded weekly excess returns on the sample of Tuesday new issues and the continuously compounded weekly excess returns on the sample of Wednesday new issues may be considered to have been drawn from the same population distribution. Therefore, since it is established that the Monday, Tuesday, Wednesday, Thursday, and Friday samples of continuously compounded weekly excess returns are drawn from identical population distributions, the expected values of continuously compounded daily excess returns for the second, third, fourth, and fifth trading days are each equal equal to zero. Consequently, the observed excess returns are attributed to the underpricing of new issues rather than to consistent subsequent over-valuation of new issues by market participants.

Analysis of Second Week Excess Return Distribution

The analysis of the excess returns for the second week holding period also lend support to the rejection of the hypothesis of the initial over-valuation of new issues. Table 5 contains descriptive statistics of the distribution of continuously compounded weekly excess returns for the second week holding period by the day of the week on which the offer took place.

It has been shown that the excess return for the first week holding period is merely the sum of the excess returns for the individual trading days within the first week holding period. Likewise, it has been shown that the excess return for the second week holding period is simply the sum of the excess returns for the individual trading days within the second week holding period. However, the continuously compounded weekly excess return for the second week holding period on a Friday new issue is equal to the sum of the con-

TABLE 5

DISTRIBUTION OF SECOND WEEK EXCESS RETURNS BY OFFER DAY OF THE WEEK

OFFER DAY	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
Mon	9	-.0047	-.0271	.0983	-1.011	.5536	.468*
Tues	134	-.0055	-.0020	.0812	0.449	.3384	<.01
Wed	119	-.0068	-.0115	.0880	-0.170	.1480	>.15
Thurs	133	-.0178	-.0143	.0873	-0.061	.0113	<.01
Fri	29	-.0143	-.0139	.0995	-0.245	.4754	.274*

KRUSKAL-WALLIS TEST

Second Week Excess Returns by Offer Day of the Week

H_0: The five distributions are identical.

H_1: Not all the distributions are the same.

Test Statistic: H = 1.39575

Rejection Region: H > 9.48773 ($\chi^2_{.05,4}$)

Conclusion: Fail to reject H_0

tinuously compounded daily excess returns for the second, third, fourth, fifth, and sixth trading days. In contrast, the continuously compounded weekly excess return for the second week holding period on a Thursday new issue is equal to the sum of the continuously compounded daily excess returns for the third, fourth, fifth, sixth, and seventh trading days. In similar fashion, the second week holding period for a Wednesday, Tuesday, or Monday new issue begins with the fourth, fifth, or sixth trading day, respectively.

Now consider two feasible patterns of the occurrence of negative excess returns subsequent to the first trading day, both of which would lend credence to the initial over-valuation argument. The first pattern entails an abrupt adjustment, with the negative excess return occurring in its entirety on the second trading day. In other words, the continuously compounded daily excess return on the second trading day is negative and the continuously compounded daily excess return for subsequent trading days are not significantly different from zero. If this were the actual sequence of events it would be expected that the distribution of second week continuously compounded excess returns for Friday new issues, which includes the second trading day, would be significantly different from the distribution of second week excess returns for issues occurring on one of the four remaining trading days, which do not include the second trading day. The results of a Kruskal-Wallis test of the equality of the population distributions of the five second week excess return samples are presented in Table 5.

The fact that the null hypothesis of the equality of the five population distributions cannot be rejected suggests that the inclusion of the continuously compounded daily excess returns earned on the second trading day in the second week excess return calculation does not induce a significant negative bias. This result certainly casts much doubt upon the likelihood of an abrupt negative adjustment in excess returns occurring on the second trading day.

The second conceivable pattern of negative excess returns to be considered consists of a more gradual adjustment with negative average excess returns occurring over trading days two through five and average excess returns not significantly different from zero occurring thereafter. Under this hypothesized scenario the number of negative excess returns included in the first week excess return calculation decreases as the number of trading days in the first week decreases. The second week excess return calculation thus obviously experiences the exact opposite effect under the currently assumed conditions. Therefore, the first week average excess return would decrease and the second week excess return would increase as the number of trading days in the first week increases, given the existence of a gradual excess return adjustment. Under these circumstances, it would be expected that Friday new issues would exhibit the strongest negative correlation between first week excess returns and second week excess returns. The correlation between the first week and second week excess returns should also become less negative as the number of trading days in the calculation of the first week excess returns increases if the assumption of a gradual adjustment is correct.

Once again, since the excess returns are not considered to have been drawn from normally distributed populations we resort to a nonparametric measure of association between random variables from any bivariate population which is termed the Kendall tau coefficient of rank correlation. It is applicable in exactly the same sampling and inference situations as the Spearman coefficient of rank correlation but has several advantages (20). The Kendall tau coefficient of rank correlation approaches normality more rapidly and a p-value based on this statistic is more reliable in samples of moderate size. The Kendall tau is considerably easier to interprete and may, in fact, be interpreted in either of two ways. "Two observation pairs, say (X_i, Y_i) and (X_j, Y_j), are called concordant if the direction of difference is the same with X as with Y; that is, $X_i < X_j$ whenever $Y_i < Y_j$, or $X_i > X_j$ whenever $Y_i > Y_j$. They are called discordant when the direction of difference is not the same. Thus the Kendall tau coefficient can be interpreted as the number of discordant pairs, divided by the total number of distinguishable pairs, or equivalently as the excess of the proportion of concordant pairs over the proportion of discordant pairs." (20). The Kendall tau is an unbiased estimator of a parameter denoted by τ , and defined as the probability of concordance minus the probability of disconcordance.

Table 6 contains the Kendall tau coefficients of rank correlation between first and second week excess returns by the day of the week on which the offer took place.

The Kendall tau coefficient of rank correlation between first week and second week excess returns for Friday new issues is negative as would be expected under the second hypothesized sequence of daily excess returns. In addition, the correlation coefficient becomes less negative as the number of trading days from the offer date to the first Friday following the offering increases, a result which is consistent with the prediction associated with the second excess return scenario. However, the fact that none of the correlation coefficients approach a reasonable level of significance erodes any confidence in either their sign or mag-

TABLE 6

KENDALL TAU COEFFICIENTS
CORRELATION BETWEEN FIRST AND SECOND WEEK EXCESS RETURNS
BY OFFER DAY OF THE WEEK

OFFER DAY	KENDALL TAU COEFFICIENT	SIGNIFICANCE LEVEL
Monday	0.16667	.5316
Tuesday	0.02615	.6540
Wednesday	-0.00684	.9122
Thursday	-0.00775	.8948
Friday	-0.02463	.8512

nitude. As a result, the correlation coefficients offer little support for the hypothesis of gradual negative adjustment of excess returns.

Analysis of Third and Fourth Week Excess Return Distributions

In order to further investigate the possibility of introducing any biases into the calculation procedure, similar analysis is performed on the third and fourth week excess returns. Descriptive statistics concerning the third week and fourth week excess returns are presented in Tables 7 and 8, respectively. The associated Kruskal-Wallis test follow each of the tables.

The results of both the Kruskal-Wallis test associated with the third week excess returns and the Kruskal-Wallis test associated with the fourth week excess returns confirm that no bias in the excess return calculation is carried forward into the succeeding weeks.

Chapter Summary

The results of the analysis of the excess returns for the sample of new issues employed in this study are in general agreement with the results of previous previous research. That is, the results support the existence of underpricing as well as the efficiency of the after-market. However, the

TABLE 7

DISTRIBUTION OF THIRD WEEK EXCESS RETURNS
BY OFFER DAY OF THE WEEK

OFFER DAY	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
Mon	9	-.0575	-.0336	.1270	-0.220	.4492	.802*
Tues	134	-.0055	-.0017	.0812	0.508	.8069	<.01
Wed	119	-.0014	-.0020	.0782	0.385	.7703	>.15
Thurs	133	-.0158	-.0157	.0743	-0.021	.0161	.018
Fri	29	-.0199	-.0223	.0648	1.506	.0737	<.01

KRUSKAL-WALLIS TEST

Third Week Excess Returns by Offer Day of the Week

H_0: The five distributions are identical.

H_1: Not all the distributions are the same.

Test Statistic: $H = 4.40161$

Rejection Region: $H > 9.48773$ $(\chi^2_{.05,4})$

Conclusion: Fail to reject H_0

TABLE 8

DISTRIBUTION OF FOURTH WEEK EXCESS RETURNS
BY OFFER DAY OF THE WEEK

OFFER DAY	N	MEDIAN	MEAN	STD DEV	SKEW	H_0: MED=0 PROB> |S|	H_0: NORM PROB>D or PROB<W*
Mon	9	-.0572	-.0417	.0756	1.029	.1551	.118*
Tues	133	-.0084	-.0119	.0861	0.317	.1109	.010
Wed	116	-.0149	-.0193	.0754	0.523	.0067	>.15
Thurs	133	-.0020	.0070	.1012	1.096	.4263	<.01
Fri	29	-.0246	-.0069	.1003	3.085	.7109	<.01*

KRUSKAL-WALLIS TEST

Fourth Week Excess Returns by Offer Day of the Week

H_0: The five distributions are identical.

H_1: Not all the distributions are the same.

Test Statistic: $H = 9.20117$

Rejection Region: $H > 9.48773$ $(\chi^2_{.05,4})$

Conclusion: Fail to reject H_0

chapter provides a refinement in the analysis of the timing of after-market efficiency by demonstrating that new issues market efficiency prevails on the second trading day and beyond.

Chapter IV

DEVELOPMENT OF THE MODEL

In this chapter an econometric model of the underwriting process of initial public offerings of common stock is presented. Various firm, issue and market characteristics associated with the offer are introduced as exogenous variables in the model to explain observed differences in the magnitudes of underpricing and percentage cash spread, the principal costs incurred by the issuer in a firm underwritten initial public offering of common stock.

Framework of the Model

The sample of initial public offerings to be employed in this study is comprised entirely of negotiated offerings. In a negotiated underwriting the issuer first selects an underwriter and negotiates the specific terms of the offer, i.e., the cash spread and offer price. The negotiation process takes place just prior to the offering and the cash spread and offer price are determined concurrently. Consequently, the potential exists for tradeoffs between these two variables in the process of negotiating the final terms of the initial public offering. The cash spread is intended to compensate the underwriter for the distribution and risk associated with holding an inventory of the securities for several days. If lowering the offer price below the perceived intrinsic value of the security results in a reduction in the risk of holding the inventory of securities, the underwriter should require a lower level of cash compensation. The potential for tradeoffs between cash spread and underpricing suggests that the underwriting process of initial public offerings of common stock may best be described in the simultaneous equation framework.

THE PROPOSED SIMULTANEOUS EQUATION MODEL

$$\begin{aligned} \text{PCTCOMP} = \; & \alpha_1 + \gamma_{11}\,\text{UNDPRICE} + \beta_{11}\,\text{lnTOTREG} \\ & + \beta_{12}\,\text{UNDDUMI} + \beta_{14}\,\text{lnNUMEQ} \\ & + \beta_{16}\,\text{WARDUMI} + \beta_{17}\,\text{WARDUMS} \\ & + \varepsilon_1 \end{aligned}$$

$$\begin{aligned} \text{UNDPRICE} = \; & \alpha_2 + \gamma_{22}\,\text{PCTCOMP} + \beta_{21}\,\text{lnTOTREG} \\ & + \beta_{22}\,\text{UNDDUMI} + \beta_{23}\,\text{UNDDUMS} \\ & + \beta_{25}\,\text{PCTUNSEQ} + \beta_{28}\,\text{SDEVOTC} \\ & + \beta_{29}\,\text{PCTSEC} + \varepsilon_2 \end{aligned}$$

VARIABLE DEFINITIONS

Endogenous Variables

PCTCOMP = percentage cash spread

UNDPRICE = first week excess return

Exogenous Variables

lnTOTREG	=	natural logarithm of total registration in real terms (1977 dollars)
UNDDUMI	=	intercept dummy representing underwriter classification (0 - ranked in top 25 underwriters in dollar volume of negotiated equity underwritten during year of offering 1 - not ranked in top 25 underwriters in dollar volume of negotiated equity underwritten during year of offering)
UNDDUMS	=	slope dummy representing interaction of UNDDUMI and lnTOTREG (UNDDUMI * lnTOTREG)
lnNUMEQ	=	natural logarithm of total number of new equity contracts outstanding during the month of the offering
PCTUNSEQ	=	total dollar amount of new unseasoned equity contracts outstanding during the month of the offering as a percentage of the total dollar amount of all new equity contracts (seasoned and unseasoned) outstanding during the month of the offering
WARDUMI	=	intercept dummy representing the issuance of warrants to the underwriter (0 - no warrants issued to the underwriter 1 - warrants issued to the underwriter)
WARDUMS	=	slope dummy representing interaction of WARDUMI and lnTOTREG (WARDUMI * lnTOTREG)
SDEVOTC	=	standard deviation of daily rates of return on the NASDAQ OTC index during the month preceding the offering
PCTSEC	=	number of secondary shares in the offering as a percentage of the total number of shares in the offering

Endogenous Variables

The endogenous variable representing cash spread is expressed as a percentage of the offer price. Restating the cash spread in terms of a percentage of the offer price provides a measure of standardization across all new issues in that the variable now represents cash spread per dollar of proceeds. In addition, the institutional limitations on cash spread are stated in terms of percentage cash spread. Therefore, calculation of the variable representing cash spread in this manner will facilitate the analysis of the effects of the institutional guidelines on the negotiation process.

The endogenous variable representing underpricing is the first week excess return described in Chapter III. The assumption is that the closing market price on the first Friday following the offering represents the per share intrinsic value of the security at that point in time. Therefore, if the offer price is such that the return on the security from the offer date to the end of the first week exceeds the return on the NASDAQ OTC index over the corresponding time period, the new issue is considered to be underpriced. Since the underpricing variable is in the form of a rate of return, or the price appreciation per dollar of offer price, a degree of standardization is achieved thus enhancing the validity of comparisons among the individual new issues in the sample.

Segmentation of the sample into quartiles according to the level of percentage cash compensation reflects an inverse relationship between the level of percentage cash spread and mean first week excess returns for the first two quartiles. However, the opposite effect is witnessed with respect to the latter two quartiles. The relationship between percentage cash spread and underpricing could possibly be altered in the upper quartiles by the institutional guidelines concerning percentage cash spread. If the allowable percentage cash spread is not sufficient to fully compensate the underwriter for the costs and risks involved in the distribution, the underwriter may resort to greater underpricing as a means of risk reduction. In addition, although the allowable percentage cash spread varies inversely with the offer size in recognition of the existence of fixed costs in underwriting, smaller offers may still be penalized by an arbitrarily low setting of the institutional limitation on percentage cash spread.

QUARTILE	N	AVERAGE REAL TOT REG	AVERAGE PCT COMP	AVERAGE EXCESS RET
1	98	16134.17	6.88	9.52
2	99	7406.16	7.51	5.83
3	100	4083.01	8.60	7.08
4	110	2334.27	10.07	16.11

Exogenous Variables - PCTCOMP equation

Size

Size of the new issue has been widely used to explain differences in the level of percentage cash spread observed among new issues of common stock. Logue and Lindvall (41) included the number of shares in the offering as an explanatory variable in their cash spread equation. They hypothesized that the influence of the number of shares in the offering on cash spread is negative due to economies of scale in investment banking, i.e., because of fixed costs percentage cash spread falls as the size of the offering increases. Furthermore, Logue and Lindvall maintain that larger issues may require lower average search costs and be easier to market given that institutional investors may consider larger issues but tend to avoid smaller ones. For these reasons, the hypothesized sign of lnTOTREG in the percentage cash spread equation is negative.

Inspection of the sample data lends support to the inclusion of issue size in the percentage cash spread equation. Dividing the sample into quartiles according to the dollar value of the total registration in real terms (1977 dollars) suggests an inverse relationship between the real dollar value of total registration and percentage compensation.

QUARTILE	N	AVERAGE REAL TOT REG	AVERAGE PCT COMP
1	101	1744.83	9.73%
2	102	3478.23	8.81
3	102	6347.55	7.61
4	102	17656.59	7.13

Underwriter Prestige

Type of underwriter is an issue characteristic which may explain some of the variation in the magnitude of percentage cash spread observed among new issues of common stock. Given that scale economies exist and the smaller or less prestigious underwriters are more likely to underwrite smaller offers, then on average the percentage compensation charged by these non-prestigious underwriters will be greater, ceteris paribus. Furthermore, if prestigious underwriters are more proficient in the distribution process due to their experience and well-developed channels of distribution, it is expected that lower percentage cash compensation will result. Therefore, because it is anticipated that smaller underwriters require a higher level of percentage cash compensation, the sign of the coefficient of UNDDUMI in the percentage cash spread equation is expected to be positive.

Perusal of the sample data below appears to substantiate this notion.

CATEGORY	N	AVERAGE REAL TOT REG	AVERAGE PCT COMP
--------	---	------------	--------
RANKED	203	11388.56	7.56%
UNRANKED	222	3615.26	9.01

Underwriters are ranked according to the dollar value of total securities underwritten during the offer year with bonus credit given to the lead underwriter. "Concentration in the securities business has traditionally been measured by the dollar volume of managed or comanaged securities underwritten. This measure is thought to indicate the market power exercised by industry participants. The behavior of banking participants appear to support this view; for example, firms undertake considerable effort to propel themselves into leading positions with respect to total dollars of managed underwritings. Although management fees are often split equally among two or more comanagers, designation as the manager who will be 'running the books' is highly valued for its superior client-contact position and its patronage control over the rest of the syndicate. Thus, industry listings of banks' financing volume often award a special bonus volume credit to the lead manager of a syndicate to recognize the special value of exercising control over the disposition of underwritten securities." (25).

Institutional Investor publishes a list of the top twenty-five underwriters ranked according to the total dollar volume of negotiated equity underwritings with bonus credit given for being the lead underwriter. If the lead underwriter of a particular new issue appears on this list of top twenty-five firms in the year during which the offer took place, the underwriter is classified into the first category. Alternatively, the lead underwriter of a particular new issue is classified into the second category if not included in the list of the top twenty-five firms in the year of the offering.

Unseasoned Equity Contracts

The number of unseasoned equity contracts outstanding during the offer month is a market characteristic also used by Logue and Lindvall (41) in their cash spread equation. Once again, Logue and Lindvall assert that the expected sign of the coefficient is uncertain. An increase in the number of competing contracts may have a positive influence on cash spread if the increase poses marketing difficulties for the underwriter. Alternatively, if the increase in the number of competing contracts is the result of increased demand for new issues, the opposite effect on cash spread will prevail. An additional consideration not mentioned by Logue and Lindvall concerns the effect on the percentage cash spread of possible economies of scale in the formation of syndicates. In months when a large number of new equity contracts are coming to market the possibility of an existing syndicate distributing multiple new issues may increase. Any fixed costs involved in the formation of a new syndicate may be avoided on the additional issues and, as a consequence, lower average percentage cash spread may be observed during such periods of increased market activity. However, the confounded relationship between the number of new equity contracts outstanding and percentage cash spread causes the hypothesized sign of the coefficient of lnTOTNUM in the percentage cash spread equation to be ambiguous.

Warrants

The issuance of warrants to the underwriter is an additional issue specific characteristic which may partially account for discrepancies among new issues regarding the level of percentage cash spread. Since warrants are a form of noncash compensation substitute for additional direct cash compensation, it is expected that a negative relationship between percentage cash spread and the issuance of warrants exists. On the other hand, the issuance of warrants may be more prevalent on issues with relatively high cash compensation. The awarding of non-cash compensation such as warrants to the underwriter may be employed as a means of circumventing limitations on percentage cash compensation. Consequently, the hypothesized sign of the coefficient of WARDUMI is uncertain, a priori, because of the opposing possibilities concerning the circumstances surrounding the issuance of warrants.

A comparison of the percentage cash spread of issues in the sample which included warrants and the percentage cash spread of those which did not include warrants supports the latter hypothesis.

	N	AVERAGE REAL TOT REG	AVERAGE PCT COMP
WARRANTS	167	3123.14	9.46%
NO WARRANTS	240	10241.11	7.53

Given the smaller mean total registration of those issues involving warrants, smaller offer size of those issues with warrants may be confounding the results. Nevertheless, given the difference in mean percentage compensation between the two types of new issues, including a variable recognizing the issuance of warrants appears to be justified.

Interaction of Warrants and Size

A final explanatory variable is included in the percentage cash spread equation to reflect the effect of any interaction between the issuance of warrants and the size of the offer. If warrants are employed as a means of circumventing institutional limitations on percentage cash spread, it might be expected that the relationship between the issuance of warrants and the percentage cash spread would diminish as the size of the offer increases because fixed cost coverage becomes less of a factor. The sign of the coefficient of WARDUMS is thus hypothesized to be negative in this instance. On the other hand, if the issuance of warrants is perceived as an acceptable substitute for additional percentage cash spread, no impact on the relationship between the issuance of warrants and the percentage cash spread would be expected as offer size varies. In this case the sign of the coefficient of WARDUMS would not be significantly different from zero.

Exogenous Variables - UNDPRICE equation

Size

The size of the new issue is one issue characteristic which may explain a portion of the differences in the magnitude of underpricing observed among new issues of common stock. Two different size variables have entered econometric models in prior studies. Logue (39) employed the total dollar value of the offering in a model to explain underpricing, Logue perceiving this variable to be a surrogate for firm size, and hence the relative bargaining power of the issuer. He also speculated that underwriters may perceive large offerings as being easier to sell, and spark more interest among investment bankers. For these reasons, Logue hypothesized a negative relationship between the size of the offering and underpricing. The coefficient of this variable was found to be negative and statistically significant in Logue's work, a result supporting his contention.

A later study by Logue and Lindvall (41) used the number of shares in the offering to explain the offer price of the new issue. They hypothesized that the greater the number of shares, the more liquid the post-offering market, and the greater the rise in the stock price. On the other hand, a larger offering may entail greater search for investors on the part of the underwriter who must market a greater number of shares. Underpricing of the new issue may lessen the need for search by making the shares attractive to a greater number of investors. Therefore, if larger offerings require more intensive search, a positive relationship between offer size and underpricing may result. Given the conflicting hypotheses concerning the relationship between offer size and underpricing, the sign of the coefficient of lnTOTREG in the underpricing equation is ambiguous, a priori.

A preliminary examination of the sample data shows that the average excess returns for the smallest offers is quite large compared to the others.

QUARTILE	N	AVERAGE REAL TOT REG	AVERAGE EXCESS RET
1	101	1744.83	14.93%
2	102	3478.23	7.43
3	102	6347.55	6.57
4	102	17656.59	10.34

Underwriter Prestige

Block and Stanley (5), McDonald and Fisher (44), Neuberger and Hammond (52) and Neuberger and LaChapelle (53) generally report evidence of differences among classes of underwriters in terms of average excess returns. Underwriters are usually classified as prestigious or non-prestigious as defined by Hayes (24). The prestigious category has generally experienced smaller average excess returns than the non-prestigious classification. The differential may be due, in part, to differences between the average size of offers underwritten by prestigious underwriters and the average size of the offers underwritten by non-prestigious underwriters. However, the non-prestigious underwriters may underwrite riskier issues in general and this may also account for a portion of the observed discrepancy between the mean excess returns experienced by the two classes of underwriters. Logue

(39) included underwriter prestige in his model intended to explain underpricing. He hypothesized that an inverse relationship between underwriter prestige and the magnitude of underpricing experienced on new issues of common stock because prestigious underwriters are more selective in their underwritings. Hence, there may be lower risk in setting the offer price due to lower risk inherent in the firm. If such issues generate substantial underwriting interest, prestigious underwriters may be expected to price the issue nearer its intrinsic value. Also, investor confidence in prestigious underwriters may permit the offer price to be set higher, or nearer its true value, and still ensure a successful offering. The results reported by Logue indicate a negative, but not statistically significant, coefficient on the variable representing underwriter prestige.

The hypothesized sign of the coefficient of UNDDUMI in the UNDPRICE equation is positive suggesting that smaller underwriters must accept smaller, riskier issues and may possess less expertise in pricing new issues due to less extensive experience.

A cursory analysis of the sample data once again offers support for the inclusion of a variable representing different classifications of underwriters into the model. The mean first week excess returns of the sample data for each category of underwriter suggests an association between excess returns and the category of underwriter and endorses the inclusion of such a variable in the model. The statistics also confirm that the average total registration of the issues underwritten by high volume, larger underwriters is greater. If larger underwriters may be construed as being more prestigious, the results presented here are somewhat consistent with the findings of other studies.

CATEGORY	N	AVERAGE REAL TOT REG	AVERAGE EXCESS RET
Ranked	194	11388.56	8.22%
Unranked	213	3615.26	11.25

<u>Interaction of Warrants and Size</u>

The UNDDUMS variable is included in the UNDPRICE equation in order to detect the influence of possible interaction between the type of underwriter and the size of the offering. The sign of the coefficient of this variable is unknown, a priori. If larger issues are more difficult to market it would be expected that the difference in the magnitude of underpricing between issues underwritten by small underwriters and issues underwritten by large underwriters could become more pronounced as the offer size increases. On the other hand, if larger issues are inherently less risky, the opposite situation could prevail.

Outstanding Equity Contracts

The number and dollar amount of competing issues outstanding during the month in which the new issue is being offered are two market characteristics which have been included as explanatory variables in previous econometric models. Logue (39) rationalized that a large number of unseasoned equity issues outstanding during the offer month of each new issue may induce greater competition among underwriters, making them more conservative in their estimate of the price that may be obtained for a particular new issue under these conditions. Logue suggests that if competition is a matter of concern to underwriters, they will be more likely to underprice new issues. The coefficient was in fact positive but very small in magnitude and not statistically significant casting some doubt on the reliability of the sign of the coefficient.

Logue and Lindvall (41) also included the number of unseasoned common stock offerings outstanding during the month of the offering stating that a large number of competing contracts may suggest the advent of marketing difficulties for the underwriter. In this case, a positive relationship between the number of competing new issues and the magnitude of underpricing would result. On the other hand, if investors are actively seeking to invest in unseasoned issues, the number of new issues is likely to increase as a result of increased demand. The greater demand for new issues may ease the marketing task and thus result in an inverse relationship between the level of underpricing and the number of competing new issues. The coefficient of the number of competing new issues in the Logue and Lindvall equation was negative but not statisically significant.

Hansen, Pinkerton and Young (22) incorporate a variable representing the condition of the primary equity market at the time of the offer to explain underpricing. The variable employed by the authors is the natural logarithm of new equity contracts in excess of one million dollars in real terms (January, 1971 dollars) outstanding at the time of the offering. Their rationale is that increased difficulty in marketing the new shares may be the result of an increase in the number of competing new equity contracts. A deeper level of underpricing may thus be negotiated in an effort to enhance the marketability of the new issue under these conditions. On the other hand, if there are industry wide economies of scale to the formation of syndicates, reduced underpricing should result from the formation of an increased number of syndicates. The sign of the coefficient of this variable was found to be positive and statistically significant, a result in support of the first hypothesis.

The variable representing competition to be employed in the UNDPRICE equation is the total dollar amount of unseasoned new equity contracts as a percentage of the total dollar amount of all new equity contracts outstanding during the offer month. The hypothesized sign of the coefficient of this variable is negative. As new issues comprise a greater percentage of the new equity contracts outstanding, there is less competition from seasoned issues resulting in lower underpricing on unseasoned issues. Also, an increase in the percentage of the total dollar amount of new equity comprised of unseasoned issues could signal the advent of a period of increased demand for unseasoned equity. The result of the increased demand for unseasoned equity would be a lower level of underpricing.

Market Volatility

An additional variable included in the underpricing equation reflects the volatility of the market prior to the offering and is taken as the standard deviation of daily rates of return on the NASDAQ OTC market index for the month preceding the offer month. Greater volatility in the stock market during the time of the offer increase the risk of large adverse price movements during the offer period which could affect the success of the offering. Deeper underpricing may be employed as a means of enhancing the potential success of the offering. Therefore, the hypothesized sign of the coefficient of SDEVOTC is positive.

Dividing the sample into quartiles on the basis of the standard deviation of daily rates of return on the NASDAQ OTC index supports the notion of a positive relationship between the volatility of the market index and the mean first week excess returns.

QUARTILE	N	AVERAGE REAL TOT REG	AVERAGE EXCESS RET
1	102	7742.02	6.98%
2	102	6856.89	8.60
3	102	6302.86	10.75
4	101	8390.60	12.92

Percentage of Secondary Shares

The final variable included in the UNDPRICE equation is the percentage of the offering comprised of secondary shares. The hypothesized sign of the coefficient of this variable is negative. If corporate insiders are perceived by investors to be in possession of insider knowledge concerning future prospects of the firm, and they are willing to sell their shares at the offer price, the offer price must be close to the true intrinsic value of the security. Consequently, it is anticipated that the sign of the coefficient of PCTSEC will be negative.

The statistics below exhibit a negative relationship between underpricing and the percentage of the offering which is secondary. The sample could not be divided equally into four quartiles because 209 of the issues did not involve secondary shares.

QUARTILE	N	AVERAGE REAL TOT REG	AVERAGE EXCESS RET
1-2	209	5382.49	12.12%
3	82	8636.10	9.80
4	82	10096.12	4.93

<u>Summary of Hypothesized Signs of Coefficients</u>

<u>PCTCOMP equation</u>

UNDPRICE - uncertain

lnTOTREG - negative

UNDDUMI - positive

lnNUMEQ - uncertain

WARDUMI - uncertain

WARDUMS - negative

<u>UNDPRICE equation</u>

PCTCOMP - uncertain

lnTOTREG - uncertain

UNDDUMI - positive

UNDDUMS - uncertain

PCTUNSEQ - negative

SDEVOTC - positive

PCTSEC - negative

Chapter V

RESULTS OF MODEL ESTIMATION

Estimation Technique - Three-Stage Least Squares

The proposed model is over-identified, and will be estimated by using three-stage least squares regression. Three-stage least squares simultaneously estimates all the parameters by applying generalized least squares to both of the structural equations and thereby incorporating the variance-covariance matrix of the error terms of each equation into the parameter estimates of the multiple regression equation. The third stage of the procedure thus entails the re-estimation of the structural equation parameters incorporating, in the framework of generalized least squares, the estimated variances and covariances of the residuals of the structural equation generated in the second stage of estimation.

Sample Selection

Statistics concerning the size of the sample employed in this study in relation to the size of the entire new issues market during the corresponding time period are presented in Table 9.

TABLE 9

SAMPLE AS A PERCENTAGE OF ALL NEW ISSUES DURING PERIOD

NUMBER

YEAR	SAMPLE	TOTAL	PERCENT OF TOTAL
1977	10	58	17.24
1978	20	70	28.57
1979	33	110	30.00
1980	91	281	32.38
1981	213	578	36.85
1982	58	322	18.01

TOTAL REGISTRATION
($000,000)

YEAR	SAMPLE	TOTAL	PERCENT OF TOTAL
1977	64	197	32.48
1978	178	296	60.13
1979	236	545	43.30
1980	1,030	1,667	61.78
1981	2,377	3,317	71.66
1982	801	1,691	47.36

AVERAGE TOTAL REGISTRATION
($000,000)

YEAR	SAMPLE	TOTAL
1977	6.40	3.40
1978	8.90	4.23
1979	7.15	4.95
1980	11.32	5.93
1981	11.16	5.74
1982	13.81	5.25

The sample selection process began by first obtaining a list of all new issues occurring during the years 1977 through 1982 from the Registered Offering Statistics data tape (79) prepared by the U.S. Securities and Exchange Commission. The next step in the data collection process involved securing the after-market prices corresponding to each of the new issues on the preliminary list. Commercial and Financial Chronicle, which publishes the Friday closing market price for Over-the-Counter securities, is the source of the after-market prices used in this study. At this point, a new issue is deleted from the sample only if the market price on the first Friday following the offering was not reported in Commercial and Financial Chronicle. However, this criterion caused the sample to be reduced to the present level of 425 new issues. Given that the average total registration of the new issues in the sample is nearly twice that of the new issues market as a whole, it is apparent that reporting of after-market prices by Commercial and Financial Chronicle is primarily restricted to larger issues.

Sources of Endogenous Variable Data

PCTCOMP

The variable PCTCOMP is the cash spread per dollar of offer price and is calculated by dividing the total dollar cash spread by the total registration of the offering. Both of these figure were obtained from the Registered Offering Statistics data tape (79).

UNDPRICE

The variable UNDPRICE is calculated as described in Chapter III. The offer price employed in the calculation was obtained from the Registered Offering Statistics data tape (79) and the after-market prices were collected from various issues of Commercial and Financial Chronicle (50). The level of the NASDAQ OTC index was secured from various issues of the Standard & Poor's Daily Stock Price Record: Over-the-Counter (74).

Sources of Exogenous Variable Data

lnTOTREG

The variable lnTOTREG is the natural logarithm of the real total registration of the offering. Total registration is simply the number of shares in the offering multiplied by the offer price per share. This figure is secured from the Registered Offering Statistics data tape (79) and is expressed in thousands of dollars. The total registration was converted to real terms through the use of the Consumer Price Index collected from various issues of Business Statistics (78) with January, 1977 as the base month.

UNDDUMI

The rankings of underwriters in terms of the volume of negotiated equity underwritten during the year are employed in the forming the dummy variable UNDDUMI. The rankings are published in Institutional Investor (31) and are derived using a bonus-credit-to-lead-manager formula. Each co-manager in an underwriting is given a proportionate share of the credit, but the lead manager (the firm running the books) is given a double share. The value of UNDDUMI is zero for a particular new issue if the underwriter is ranked in the top twenty-five during the offer year. If the underwriter is not ranked in the top twenty-five during the offer year UNDDUMI is equal to one.

UNDDUMS

The variable UNDDUMS is calculated by multiplying UNDDUMI by lnTOTREG. Therefore, if the underwriter is ranked in the top twenty-five by Institutional Investor (31), UNDDUMS is equal to zero. Conversely, if the underwriter is not ranked in the top twenty-five by Institutional Investor (31), UNDDUMS is equal to lnTOTREG.

lnNUMEQ

The variable lnNUMEQ is the natural logarithm of the total number of new equity contracts outstanding during the month of the offering. This figure was obtained from various issues of the S.E.C. Monthly Statistical Review (79).

PCTUNSEQ

The variable PCTUNSEQ is the total dollar amount of new unseasoned equity contracts outstanding during the offer month divided by the total dollar amount of all new equity contracts (seasoned and unseasoned) outstanding during the offer month. All total dollar amounts were procured from the S.E.C. Monthly Statistical Review (79).

WARDUMI

The variable WARDUMI is equal to zero if the offering did not involve the issuance of warrants to the underwriter. If the offer involved the issuance of warrants to the underwriter the value of WARDUMI is one.

WARDUMS

The variable WARDUMS is calculated by multiplying WARDUMI by lnTOTREG. Consequently, if the offering did not involve the issuance of warrants to the underwriter WARDUMS is equal to one. On the other hand, if the offering did involve warrants issued to the underwriter WARDUMS is equal to lnTOTREG.

SDEVOTC

The variable SDEVOTC is equal to the standard deviation of the daily rates of return on the NASDAQ OTC market index during the month preceding the offering. The level of the NASDAQ OTC market index is obtained from the Standard & Poor's Daily Stock Price Record: Over-the-Counter (74).

PCTSEC

The variable PCTSEC is equal to the number of secondary shares in the offering divided by the total number of shares in the offering. Both of these share figures were obtained from the Registered Offering Statistics data tape (79).

Descriptive Statistics Concerning Regression Variables

Descriptive statistics concerning the distribution of both the exogenous and endogenous variables employed in the proposed model are presented in Table 10.

Correlations Between Regression Variables

The Kendall tau coefficients of rank correlation for all endogenous and exogenous variables in the model are presented in Table 11. Examination of the Kendall tau coefficients of rank correlations does not reveal any relationships, at least on the pairwise level, which would cause severe multicollinearity problems.

TABLE 10

DISTRIBUTION OF REGRESSION VARIABLES

	MEAN	STD DEV	MIN	Q1	MED	Q3	MAX
PCTCOMP	.083	.013	.050	.072	.079	.100	.125
UNDPRICE	.098	.190	-.218	-.015	.034	.164	1.097
lnTOTREG	8.485	.874	6.414	7.864	8.436	9.058	11.368
lnNUMEQ	4.162	.507	2.397	3.871	4.276	4.584	4.787
PCTUNSEQ	.194	.093	.007	.115	.186	.272	.372
SDEVOTC	6.133	2.835	.459	3.963	5.847	7.655	16.369
PCTSEC	.172	.229	.000	.000	.000	.334	1.000

DUMMY VARIABLE STATISTICS

ISSUE CHARACTERISTIC	N	AVERAGE lnTOTREG
Warrants Issued	167	7.83
Warrants Not Issued	240	8.93
Underwriter Ranked	194	9.02
Underwriter Not Ranked	213	8.00

TABLE 11

KENDALL CORRELATION COEFFICIENTS

VARIABLE	PCTCOMP	EXRET	lnTOTREG	UNDDUMI	UNDDUMS	lnNUMEQ	WARDUMI	WARDUMS	SDEVOTC	PCTSEC	PCTSEC
PCTCOMP	1.00000	0.04142	-0.62930	0.48804	0.23996	-0.01106	0.00934	0.58706	0.43145	-0.00988	-0.36157
	(.0000)	(.2210)	(.0001)	(.0001)	(.0001)	(.7484)	(.7857)	(.0001)	(.0001)	(.7705)	(.0001)
UNDPRICE	0.04142	1.00000	-0.01282	0.02655	-0.01035	0.02985	-0.09053	0.06837	0.05709	0.08248	-0.05609
	(.2210)	(.0000)	(.6993)	(.5129)	(.7714)	(.3771)	(.0072)	(.0920)	(.1189)	(.0130)	(.1190)
lnTOTREG	-0.62930	-0.01282	1.00000	-0.49603	-0.08822	-0.00680	-0.02883	-0.53577	-0.25435	0.02006	0.33113
	(.0001)	(.6993)	(.0000)	(.0001)	(.0133)	(.8406)	(.3922)	(.0001)	(.0001)	(.5459)	(.0001)
UNDDUMI	0.48804	0.02655	-0.49603	1.00000	0.80419	0.00094	0.02966	0.47606	0.38528	-0.03622	-0.31779
	(.0001)	(.5129)	(.0001)	(.0000)	(.0001)	(.9818)	(.4714)	(.0001)	(.0001)	(.3725)	(.0001)
UNDDUMS	0.23996	-0.01035	-0.08822	0.80419	1.00000	0.00985	0.03655	0.26268	0.36024	-0.03473	-0.16813
	(.0001)	(.7714)	(.0133)	(.0001)	(.0000)	(.7860)	(.3122)	(.0001)	(.0001)	(.3301)	(.0000)
lnNUMEQ	-0.01106	0.02985	0.00680	0.00094	0.00985	1.00000	0.47018	0.10581	0.10663	0.18936	-0.04829
	(.7484)	(.3771)	(.8406)	(.9818)	(.7860)	(.0000)	(.0001)	(.0104)	(.0042)	(.0000)	(.1875)
PCTUNSEQ	0.00934	-0.09053	-0.02883	0.02966	0.03655	0.47018	1.00000	0.10694	0.10231	0.06467	-0.07852
	(.7857)	(.0072)	(.3922)	(.4714)	(.3122)	(.0001)	(.0000)	(.0094)	(.0059)	(.0551)	(.0315)
WARDUMI	0.58706	0.06837	-0.53577	0.47606	0.26268	0.10581	0.10694	1.00000	0.86207	0.04123	-0.43161
	(.0001)	(.0920)	(.0001)	(.0001)	(.0001)	(.0104)	(.0094)	(.0000)	(.0001)	(.3100)	(.0001)
WARDUMS	0.43145	0.05709	-0.25435	0.38528	0.36024	0.10663	0.10231	0.86207	1.00000	0.04457	-0.33187
	(.0001)	(.1189)	(.0001)	(.0001)	(.0001)	(.0042)	(.0059)	(.0001)	(.0000)	(.2240)	(.0001)
SDEVOTC	-0.00998	0.08248	0.02006	-0.03622	-0.03473	0.18936	0.06467	0.04123	0.04457	1.00000	-0.04785
	(.7705)	(.0130)	(.5459)	(.3725)	(.3301)	(.0000)	(.0551)	(.3100)	(.2240)	(.0000)	(.1839)
PCTSEC	-0.36157	-0.05609	0.33113	-0.31779	-0.16813	-0.04829	-0.07852	-0.43161	-0.33187	-0.04785	1.00000
	(.0001)	(.1190)	(.0001)	(.0001)	(.0000)	(.1875)	(.0315)	(.0001)	(.0001)	(.1839)	(.0000)

Results of Model Estimation

The structural parameter estimates, standard errors, and p-values resulting from the first, second, and third stages of the estimation of the simultaneous equation model and the coefficients of the analytically derive reduced forms are presented in Tables 12, 13, 14, and 15, respectively. The analytically derived reduced forms are presented because of the difficulty of interpreting the structural coefficients of simultaneous equation systems with multiple endogenous variables in the individual structural equations. One of the assumptions in interpreting an individual structural coefficient is that all other variables remain the same with a given change in the exogenous variable. However, values of other endogenous variables will vary if the system is truly simultaneous. A simultaneous equation formulation is not conducive to analyzing individual equation separately and independently of other equations in the system, especially if the point of the analysis is the assessment of the net impacts of changes in exogenous variables. The analytically derived reduced forms allow us to assess the net impact of a change in an exogenous variable on an endogenous variable. Since each endogenous variable is expressed as a function of exogenous variables the analytically derived reduced forms may also be used for predicting the values of endogenous variables.

TABLE 12

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
FIRST STAGE ESTIMATES
ALL OFFERINGS

	DFE - 397			DFE - 397		
	F RATIO - 111.9000			F RATIO - 4.4900		
	PROB>F - 0.0001			PROB>F - 0.0001		
	R-SQUARE - 0.7173			R-SQUARE - 0.0924		
	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
CONSTANT	0.12832	.0069	.0001	-0.31940	.1811	.0786
lnTOTREG	-0.00560	.0007	.0001	0.03391	.0186	.0695
UNDDUMI	0.00372	.0099	.7086	0.83248	.2603	.0015
UNDDUMS	-0.00012	.0011	.9166	-0.09821	.0309	.0016
lnNUMEQ	-0.00050	.0009	.5855	0.03987	.0240	.0985
PCTUNSEQ	-0.00685	.0046	.1425	-0.41827	.1220	.0007
WARDUMI	0.03743	.0106	.0002	-0.20212	.2778	.4674
WARDUMS	-0.00333	.0012	.0099	0.02954	.0336	.3805
SDEVOTC	0.00005	.0001	.6517	0.00340	.0034	.3251
PCTSEC	-0.00317	.0017	.0700	-0.07227	.0457	.1150

TABLE 13

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
SECOND STAGE ESTIMATES
ALL OFFERINGS

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	DFE - 400			DFE - 400		
	F RATIO - 162.1700			F RATIO - 5.1800		
	PROB>F - 0.0001			PROB>F - 0.0001		
	R-SQUARE - 0.7087			R-SQUARE - 0.0834		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				3.7055	2.4459	.1306
UNDPRICE	0.01312	.0071	.0689			
CONSTANT	0.13034	.0066	.0001	-0.72742	.4034	.0721
lnTOTREG	-0.00591	.0007	.0001	0.06251	.0263	.0180
UNDDUMI	0.00262	.0008	.0037	0.65580	.2324	.0050
UNDDUMS				-0.07783	.0271	.0044
lnNUMEQ	-0.00097	.0007	.1709			
PCTUNSEQ				-0.26916	.0987	.0067
WARDUMI	0.03539	.0094	.0002			
WARDUMS	-0.00312	.0011	.0064			
SDEVOTC				0.00548	.0032	.0894
PCTSEC				0.07037	.0478	.1423

TABLE 14

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
THIRD STAGE ESTIMATES
ALL OFFERINGS

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				3.6654	2.4324	.1326
UNDPRICE	0.01521	.0071	.0333			
CONSTANT	0.13031	.0065	.0001	-0.69637	.4023	.0843
lnTOTREG	-0.00607	.0006	.0001	0.06037	.0262	.0220
UNDDUMI	0.00255	.0008	.0046	0.58906	.2246	.0091
UNDDUMS				-0.07000	.0262	.0080
lnNUMEQ	-0.00065	.0006	.3418			
PCTUNSEQ				-0.28610	.0966	.0033
WARDUMI	0.03191	.0089	.0004			
WARDUMS	-0.00271	.0010	.0125			
SDEVOTC				0.00530	.0030	.0830
PCTSEC				-0.08777	.0452	.0532

TABLE 15

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
ANALYTICALLY DERIVED REDUCED FORMS
ALL OFFERINGS

	PCTCOMP	UNDPRICE
	COEFFICIENT	COEFFICIENT
CONSTANT	0.12678	-0.23164
lnTOTREG	-0.00545	0.04037
UNDDUMI	0.01218	0.63373
UNDDUMS	-0.00112	-0.07413
lnNUMEQ	-0.00068	-0.00252
PCTUNSEQ	-0.00460	-0.30299
WARDUMI	0.03379	0.12386
WARDUMS	-0.00287	-0.01051
SDEVOTC	0.00008	0.00561
PCTSEC	-0.01413	-0.09295

INTERPRETATION OF PARAMETER ESTIMATES

PCTCOMP Equation

UNDPRICE coefficient

The coefficient of UNDPRICE is positive and significantly different from zero suggesting that the level of percentage cash compensation increases as the magnitude of underpricing increases.

lnTOTREG coefficient

The coefficient of lnTOTREG is negative, as hypothesized, and significantly different from zero suggesting that percentage cash spread decreases as the size of the offering increases. This result supports the existence of economies of scale in the underwriting of new issues.

UNDDUMI coefficient

The coefficient of UNDDUMI is positive, as hypothesized, and significantly different from zero suggesting that smaller underwriters charge higher percentage cash spread. This result provides some evidence in support of the notion that smaller underwriters are involved with issues which are possibly riskier and more difficult to distribute. The possibility that smaller underwriters are, in general, less experienced and have less well-developed channels of distribution is also supported by this result.

lnNUMEQ coefficient

The coefficient of lnNUMEQ is negative but not significantly different from zero. The fact that the coefficient is not significantly different from zero decreases confidence in the sign of the coefficient. Therefore, the coefficient of lnNUMEQ does not offer support for either increased difficulty of marketing new issues in crowded capital markets or economies of scale in syndicate formation under the same market conditions.

WARDUMI coefficient

The coefficient of WARDUMI is positive and significantly different from zero suggesting that percentage cash spread is higher on those new issues involving the issuance of warrants. This finding presents evidence in support of the utilization of warrants as an indirect means of providing additional compensation to the underwriter.

WARDUMS coefficient

The coefficient of WARDUMS is negative, as hypothesized, and significantly different from zero suggesting that the difference in percentage cash spread between offerings involving warrants and those not involving warrants declines as offer size increases. Presumably, this occurs because fixed cost coverage becomes less of a factor as offer size increases.

UNDPRICE Equation

PCTCOMP coefficient

The coefficient of PCTCOMP is positive and but not significantly different from zero. The lack of statistical significance diminishes confidence in the sign of the coefficient, making interpretation difficult.

lnTOTREG coefficient

The coefficient of lnTOTREG is positive and significantly different from zero. This result offers support for the notion that larger offerings are more difficult to market and are underpriced in order to lessen the necessity of intensive and costly investor search.

UNDDUMI coefficient

The coefficient of UNDDUMI is positive, as hypothesized, and significantly different from zero indicating that new issues underwritten by smaller underwriters are more severely underpriced. This result supports the hypothesis that smaller underwriters accept smaller, riskier issues and are possibly less proficient in the pricing of new issues as a result of relative inexperience.

UNDDUMS coefficient

The coefficient of UNDDUMS is found to be negative and significantly different from zero indicating that the difference in the magnitude of underpricing between the two types of underwriters decreases as offer size increases. This result suggests either that larger offers are inherently less risky, small underwriters are more proficient at pricing larger offerings or larger issuers are able to negotiate a lower level of underpricing.

PCTUNSEQ coefficient

The coefficient of PCTUNSEQ is negative, as hypothesized, and significantly different from zero indicating that as unseasoned issues comprise a greater proportion of all new equity contracts outstanding, the magnitude of underpricing decreases. This presumably results from either less competition from seasoned issues or more demand for unseasoned issues.

SDEVOTC coefficient

The coefficient of SDEVOTC is positive, as hypothesized, but not significantly different from zero at the .05 level. The sign of the coefficient suggests that the magnitude of underpricing increases with the volatility of the OTC market. However, the lack of statistical significance limits the strict interpretation of this coefficient.

PCTSEC coefficient

The coefficient of PCTSEC is negative, as hypothesized, and very close to being statistically significantly at the .05 level. The sign of the coefficient implies that the magnitude of underpricing becomes less severe as the percentage of the offering comprised of secondary shares increases, presumably because insiders would be reluctant to sell thir shares unless the offer price were close to the intrinsic value of the security. Although the strict interpretation of the coefficient is limited at the .05 level, the p-value is not so large as to completely destroy confidence in the sign of the coefficient.

Relationship Between PCTCOMP and UNDPRICE

The coefficient of UNDPRICE in the percentage cash spread equation is significantly different from zero while the coefficient of PCTCOMP in the underpricing equation is not significantly different from zero. The positive and statistically significant coefficient of UNDPRICE in the PCTCOMP equation suggests that as new issues are more severely underpriced they command a progressively higher level of percentage cash spread. However, the fact that the coefficient of PCTCOMP in the UNDPRICE equation is not statistically significant does not suggest that the reverse is true for the entire sample. In other words, as new issues command a higher level of percentage cash spread underpricing does not necessarily increase progressively. PCTCOMP may not be able to explain UNDPRICE in the higher levels of PCTCOMP because PCTCOMP is not variable in the true sense near the institutional guidelines. The level of PCTCOMP may be fixed comfortably below the perceived institutional guidelines and UNDPRICE is then adjusted according to the costs and risk involved in the distribution of the issue. The result also suggests that the institutional limitation on percentage cash spread may be a binding constraint on only a portion of the new issues in the sample. Specifically, those new issues which experienced underpricing of a larger magnitude are also expected to involve higher percentage cash spread. Conceivably, these are the new issues which are likely to have been constrained by the institutional limitation on percentage cash spread and were thereby induced to resort to further underpricing of the new issue, thus lessening the risk involved in distribution. Conversely, there are new issues in the sample which involved a relatively high level of percentage cash spread but did not experience underpricing of relatively great magnitude. This type of new issue, in all likelihood, is not affected by the institutional limitation on percentage cash spread.

Definition of the RSTUDENT Statistic

In order to test the hypothesis that new issues that are more severely underpriced are the ones most seriously affected by the institutional limitations on percentage cash spread the sample is segmented on the basis of the relative magnitude of the distance between the actual underpricing and the underpricing predicted by the first stage UNDPRICE equation. The simultaneous equation model will then be estimated separately for each of the subsamples to analyze the nature of the relationship between percentage cash spread and underpricing at different levels of underpricing. Rather than utilizing the raw residual from the first stage UNDPRICE equations to form the subsamples a form of standardization, or scaling, of the residuals is performed yielding studentized residuals which have constant variance. A special type of studentized residual, called RSTUDENT, will be employed as the basis for segmenting the sample and the description of the calculation of this statistic begins below.

The variance of the i th residual is equal to

$$V(\varepsilon) = \quad (1 - h_{ii})$$

where h_{ii} is the i th diagonal element of H, the so-called hat matrix. The hat matrix is the matrix which maps the vector of observed values into the vector of fitted values and is defined as

$$H = X\,(X'X)^{-1}\,X'$$

and

$$\hat{Y} = H\,Y$$

The studentized residual is expressed as

$$e_i^{*} = \frac{e_i}{s(1 - h_{ii})^{1/2}}$$

and the RSTUDENT statistic is almost identical to the studentized residual except that the i th data point is removed when estimating the residual variance. The RSTUDENT statistic is expressed as

$$e_i^* = \frac{e_i}{s_{(i)}(1 - h_{ii})^{1/2}}$$

with (i) signifying the omission of the i th data point.

The distribution of the RSTUDENT statistic for the sample used in this study are presented in Table 16.

The sample is divided into quartiles on the basis of the RSTUDENT statistic for the purpose of estimating the model separately for each of the quartiles in order to detect any differences in the relationship between PCTCOMP and UNDPRICE for those issues which are more severely underpriced. The first quartile contains those issues with actual underpricing furthest below the predicted level (RSTUDENT le -.6049). The second quartile contains issues with actual underpricing still below the predicted level, but closer to the predicted level than those in the first quartile (RSTUDENT gt -.6049 and le -.2370). The third quartile contains some issues whose actual underpricing is below the predicted level and some issues with actual underpricing above the predicted level (RSTUDENT gt -.2370 and le .3529). The fourth quartile contains those issues with actual underpricing furthest above the predicted level (RSTUDENT gt .3529).

TABLE 16

DISTRIBUTION OF RSTUDENT STATISTICS
FIRST STAGE UNDPRICE EQUATION

	MEAN	STD DEV	MIN	Q1	MEDIAN	Q3	MAX
RSTUDENT	.0022	1.008	-1.942	-.604	-.237	.352	5.154

Descriptive Statistics Concerning Regression Variables by RSTUDENT quartile

Descriptive statistics concerning the distribution of both the exogenous and endogenous variables employed in the proposed model for each RSTUDENT quartile are presented in Table 17.

The legitimacy of pooling the four RSTUDENT quartiles, which occurred in the preliminary estimation of the simultaneous equation model, is now examined through the utilization of the Chow-Fisher test. The Chow-Fisher test is a test for the stability of the regression coefficients when the model is estimated separately using mutually exclusive subsets of a sample. In this case, the sample is divided on the basis of the RSTUDENT quartile. Specifically, the primary interest lies in determining whether it is appropriate to pool either of the extreme RSTUDENT quartiles (1 or 4) with the central RSTUDENT quartiles (2 and 3).

First, the appropriateness of pooling RSTUDENT quartile 4 with RSTUDENT quartiles 2 and 3 is examined by performing a Chow-Fisher test on each of the reduced-form equations of the model. The results of the Chow-Fisher tests are presented in Tables 18 and 19.

The results of the Chow-Fisher tests indicate that pooling quartiles 2, 3 and 4 is appropriate when estimating the

TABLE 17

DISTRIBUTION OF REGRESSION VARIABLES
BY RSTUDENT QUARTILE

	MEAN	STD DEV	MIN	Q1	MED	Q3	MAX
PCTCOMP							
Q1	.085	.013	.050	.074	.085	.100	.100
Q2	.081	.012	.060	.072	.079	.095	.110
Q3	.080	.012	.059	.072	.075	.085	.125
Q4	.084	.013	.060	.072	.080	.100	.120
UNDPRICE							
Q1	-.049	.060	-.218	-.081	-.042	-.006	.072
Q2	.008	.049	-.098	-.020	.001	.034	.142
Q3	.084	.072	-.053	.025	.074	.131	.263
Q4	.349	.199	.024	.214	.309	.432	1.097
lnTOTREG							
Q1	8.260	.979	6.414	7.637	8.059	8.892	11.368
Q2	8.557	.758	6.994	8.079	8.470	9.011	10.817
Q3	8.650	.777	7.058	8.059	8.669	9.186	11.214
Q4	8.475	.927	6.521	7.700	8.509	9.091	10.720
lnNUMEQ							
Q1	4.231	.449	2.944	3.886	4.290	4.604	4.787
Q2	4.115	.513	2.639	3.778	4.110	4.663	4.787
Q3	4.155	.492	2.890	3.784	4.290	4.553	4.787
Q4	4.148	.568	2.397	3.871	4.290	4.668	4.787
PCTUNSEQ							
Q1	.190	.087	.025	.121	.186	.261	.372
Q2	.195	.091	.012	.115	.196	.274	.372
Q3	.200	.101	.035	.112	.199	.299	.372
Q4	.191	.093	.007	.123	.177	.285	.372
SDEVOTC							
Q1	6.337	2.711	1.745	4.516	5.862	7.681	14.959
Q2	5.884	3.180	.459	3.477	5.147	7.439	16.369
Q3	5.983	2.743	1.798	3.610	5.810	7.793	14.926
Q4	6.322	2.689	.544	4.489	6.572	7.972	14.987
PCTSEC							
Q1	.080	.152	.000	.000	.000	.114	.800
Q2	.216	.244	.000	.000	.175	.404	1.000
Q3	.220	.250	.000	.000	.120	.419	1.000
Q4	.172	.233	.000	.000	.000	.302	1.000

TABLE 18

CHOW-FISHER TEST - PCTCOMP EQUATION

H_0: $\alpha_1^{(4)} = \alpha_1^{(23)}$

$\beta_1^{(4)} = \beta_1^{(23)}$

$\beta_2^{(4)} = \beta_2^{(23)}$

$\beta_3^{(4)} = \beta_3^{(23)}$

$\beta_4^{(4)} = \beta_4^{(23)}$

$\beta_5^{(4)} = \beta_5^{(23)}$

$\beta_6^{(4)} = \beta_6^{(23)}$

$\beta_7^{(4)} = \beta_7^{(23)}$

$\beta_8^{(4)} = \beta_8^{(23)}$

$\beta_9^{(4)} = \beta_9^{(23)}$

H^1: At least one of the pairs of corresponding parameter estimates are not equal

Test Statistic: $F = .9804$

Rejection Region: $F > 1.8300$ $(F_{.05/10/285})$

Conclusion: Fail to reject H_0

TABLE 19

CHOW-FISHER TEST - UNDPRICE EQUATION

H_0: $\alpha_1^{(4)} = \alpha_1^{(23)}$

$\beta_1^{(4)} = \beta_1^{(23)}$

$\beta_2^{(4)} = \beta_2^{(23)}$

$\beta_3^{(4)} = \beta_3^{(23)}$

$\beta_4^{(4)} = \beta_4^{(23)}$

$\beta_5^{(4)} = \beta_5^{(23)}$

$\beta_6^{(4)} = \beta_6^{(23)}$

$\beta_7^{(4)} = \beta_7^{(23)}$

$\beta_8^{(4)} = \beta_8^{(23)}$

$\beta_9^{(4)} = \beta_9^{(23)}$

H^1: At least one of the pairs of corresponding parameter estimates are not equal

Test Statistic: $F = 47.5066$

Rejection Region: $F > 1.8300$ ($F_{.05/10/285}$)

Conclusion: Reject H_0 in favor of H_1

reduced form equation pertaining to percentage cash spread. However, pooling quartiles 2, 3 and 4 is not appropriate when estimating the reduced form equation pertaining to underpricing. Therefore, pooling quartiles 2, 3 and 4 does not appear to be appropriate in the context of a simultaneous equation regression model because the estimate of UNDPRICE obtained from the reduced form is employed in the second stage of estimation.

Second, the appropriateness of pooling RSTUDENT quartile 1 with RSTUDENT quartiles 2 and 3 is examined by performing a Chow-Fisher test on each of the reduced-form equations of the model. The results of the Chow-Fisher tests are presented in Tables 18 and 19.

Once again, the results of the Chow-Fisher tests indicate that pooling quartiles 1, 2 and 3 is appropriate when estimating the reduced form equation pertaining to percentage cash spread but is not appropriate when estimating the reduced form equation pertaining to underpricing. Therefore, pooling quartiles 1, 2 and 3 does not appear to be appropriate in the context of a simultaneous equation regression model because the estimate of underpricing is utilized in the second stage of estimation.

TABLE 20

CHOW-FISHER TEST - PCTCOMP EQUATION

H_0: $\alpha_1^{(1)} = \alpha_1^{(23)}$

$\beta_1^{(1)} = \beta_1^{(23)}$

$\beta_2^{(1)} = \beta_2^{(23)}$

$\beta_3^{(1)} = \beta_3^{(23)}$

$\beta_4^{(1)} = \beta_4^{(23)}$

$\beta_5^{(1)} = \beta_5^{(23)}$

$\beta_6^{(1)} = \beta_6^{(23)}$

$\beta_7^{(1)} = \beta_7^{(23)}$

$\beta_8^{(1)} = \beta_8^{(23)}$

$\beta_9^{(1)} = \beta_9^{(23)}$

H^1: At least one of the pairs of corresponding parameter estimates are not equal

Test Statistic: $F = .8833$

Rejection Region: $F > 1.8300$ $(F_{.05,10,285})$

Conclusion: Fail to reject H_0

TABLE 21

CHOW-FISHER TEST - UNDPRICE EQUATION

H_0: $\alpha_1^{(1)} = \alpha_1^{(23)}$

$\beta_1^{(1)} = \beta_1^{(23)}$

$\beta_2^{(1)} = \beta_2^{(23)}$

$\beta_3^{(1)} = \beta_3^{(23)}$

$\beta_4^{(1)} = \beta_4^{(23)}$

$\beta_5^{(1)} = \beta_5^{(23)}$

$\beta_6^{(1)} = \beta_6^{(23)}$

$\beta_7^{(1)} = \beta_7^{(23)}$

$\beta_8^{(1)} = \beta_8^{(23)}$

$\beta_9^{(1)} = \beta_9^{(23)}$

H^1: At least one of the pairs of corresponding parameter estimates are not equal

Test Statistic: $F = 52.9191$

Rejection Region: $F > 1.8300$ $(F_{.05/10/285})$

Conclusion: Reject H_0 in favor of H_1

Given the results of the above Chow-Fisher tests, the simultaneous equation regression model will be estimated separately for each of the four RSTUDENT quartiles.

The structural parameter estimates, standard errors, and p-values from the first, second, and third stages of estimation of the model and the coefficients of the analytically derived reduced forms for each quartile are presented in Tables 22 through 37.

Results of Model Estimation by RSTUDENT Quartile

Concentrating on the coefficients of the endogenous variables in the third stage of estimation for each quartile reveals differences among the quartiles in terms of the relationship between PCTCOMP and UNDPRICE. For the lower and upper quartiles, those with underpricing furthest below expected and furthest above expected, respectively, the coefficient of PCTCOMP in the UNDPRICE equation is positive and statistically significant for both the upper and lower quartiles. However, the coefficient of UNDPRICE in the PCTCOMP equation is not found to be statistically different from zero for either quartile. The results concerning the upper quartile suggest that for the most severely underpriced issues a recursive relationship between PCTCOMP and UNDPRICE occurs. In other words, the percentage cash spread is first determined and the magnitude of underpricing is adjusted ac-

TABLE 22

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
FIRST STAGE ESTIMATES
RSTUDENT QUARTILE 1

DFE	-	91	DFE	-	91
F RATIO	-	3.1500	F RATIO	-	1.5600
PROB>F	-	0.0024	PROB>F	-	0.1391
R-SQUARE	-	0.2376	R-SQUARE	_	0.1336

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
CONSTANT	0.09158	.0068	.0001	-0.34461	.2765	.2159
lnTOTREG	-0.00279	.0006	.0001	0.03401	.0262	.1990
UNDDUMI	-0.05073	.0209	.0175	1.54689	.8479	.0714
UNDDUMS	0.00555	.0023	.0188	-0.17622	.0938	.0637
lnNUMEQ	0.00087	.0010	.3873	0.03853	.0407	.3471
PCTUNSEQ	-0.00000	.0051	.9997	-0.33847	.2095	.1097
WARDUMI	-0.03045	.0223	.1773	-1.00352	.9062	.2711
WARDUMS	0.00321	.0024	.1922	0.12075	.0991	.2264
SDEVOTC	-0.00005	.0001	.6826	0.00591	.0056	.2998
PCTSEC	0.00285	.0016	.0832	-0.05932	.0659	.3705

TABLE 23

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
SECOND STAGE ESTIMATES
RSTUDENT QUARTILE 1

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	DFE - 94			DFE - 93		
	F RATIO - 2.3600			F RATIO - 1.3500		
	PROB>F - 0.0359			PROB>F - 0.2368		
	R-SQUARE - 0.1311			R-SQUARE - 0.0920		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				21.8144	24.669	.3788
UNDPRICE	-0.01843	.0112	.1050			
CONSTANT	0.08585	.0089	.0001	-2.3199	2.3035	.3165
lnTOTREG	-0.00200	.0008	.0231	0.0991	.0703	.1622
UNDDUMI	-0.00159	.0017	.3555	2.8785	.7523	.1038
UNDDUMS				-0.3196	.1920	.0993
lnNUMEQ	0.00099	.0010	.3689			
PCTUNSEQ				-0.2744	.1977	.1684
WARDUMI	-0.06084	.0280	.0327			
WARDUMS	0.00668	.0031	.0355			
SDEVOTC				0.0091	.0057	.1152
PCTSEC				-0.1266	.1015	2154

TABLE 24

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
THIRD STAGE ESTIMATES
RSTUDENT QUARTILE 1

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				3.7360	1.8740	.0491
UNDPRICE	0.02582	.0199	.1985			
CONSTANT	0.13194	.0166	.0001	-0.90061	.3138	.0051
lnTOTREG	-0.00712	.0015	.0001	0.06633	.0205	.0017
UNDDUMI	0.00246	.0021	.2579	0.54294	.1444	.0003
UNDDUMS				-0.06605	.0170	.0002
lnNUMEQ	0.00180	.0015	.2549			
PCTUNSEQ				-0.13937	.0679	.0429
WARDUMI	0.01157	.0176	.5132			
WARDUMS	-0.00041	.0021	.8472			
SDEVOTC				-0.00110	.0020	.5875
PCTSEC				-0.04372	.0393	.2697

TABLE 25

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
ANALYTICALLY DERIVED REDUCED FORMS
RSTUDENT QUARTILE 1

	PCTCOMP	UNDPRICE
	COEFFICIENT	COEFFICIENT
CONSTANT	0.12029	-0.45120
lnTOTREG	-0.00598	0.04397
UNDDUMI	0.01823	0.61107
UNDDUMS	-0.00188	-0.07310
lnNUMEQ	0.00199	0.00744
PCTUNSEQ	-0.00398	-0.15424
WARDUMI	0.01280	0.04784
WARDUMS	-0.00045	-0.00169
SDEVOTC	-0.00003	-0.00121
PCTSEC	-0.00124	-0.04838

TABLE 26

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
FIRST STAGE ESTIMATES
RSTUDENT QUARTILE 2

	DFE - 92			DFE - 92		
	F RATIO - 17.8300			F RATIO - 60.8900		
	PROB>F - 0.0001			PROB>F - 0.0001		
	R-SQUARE - 0.6356			R-SQUARE - 0.8563		
	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
CONSTANT	0.12152	.0162	.0001	-0.37688	.0410	.0001
lnTOTREG	-0.00494	.0016	.0042	0.03218	.0042	.0001
UNDDUMI	0.00423	.0257	.8699	0.80166	.0651	.0001
UNDDUMS	0.00064	.0030	.8336	-0.09456	.0077	.0001
lnNUMEQ	0.00009	.0020	.9640	0.03464	.0051	.0001
PCTUNSEQ	-0.00474	.0115	.6817	-0.36251	.0291	.0001
WARDUMI	0.04488	.0276	.1077	-0.18745	.0698	.0087
WARDUMS	-0.00414	.0033	.2144	0.02836	.0083	.0011
SDEVOTC	-0.00004	.0002	.8784	0.00432	.0006	.0001
PCTSEC	-0.00698	.0039	.0795	-0.07528	.0099	.0001

TABLE 27

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
SECOND STAGE ESTIMATES
RSTUDENT QUARTILE 2

DFE	- 95	DFE	- 94
F RATIO	- 26.0000	F RATIO	- 13.8800
PROB>F	- 0.0001	PROB>F	- 0.0001
R-SQUARE	- 0.6215	R-SQUARE	- 0.5083

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				4.3308	1.0988	.0002
UNDPRICE	0.00423	.0205	.8369			
CONSTANT	0.12330	.0146	.0001	-0.83814	.1834	.0001
lnTOTREG	-0.00547	.0015	.0007	0.05852	.0123	.0001
UNDDUMI	0.00108	.0018	.5515	0.56147	.1222	.0001
UNDDUMS				-0.06598	.0144	.0001
lnNUMEQ	0.00005	.0015	.9744			
PCTUNSEQ				-0.23259	.0528	.0001
WARDUMI	0.04359	.0238	.0709			
WARDUMS	-0.00391	.0028	.1753			
SDEVOTC				0.00589	.0014	.0001
PCTSEC				-0.03980	.0246	.1102

TABLE 28

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
THIRD STAGE ESTIMATES
RSTUDENT QUARTILE 2

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				3.9691	1.0281	.0002
UNDPRICE	0.03717	.0188	.0510			
CONSTANT	0.12548	.0136	.0001	-0.78217	.1783	.0001
lnTOTREG	-0.00708	.0014	.0001	0.05772	.0123	.0001
UNDDUMI	0.00014	.0017	.9376	0.56815	.0983	.0001
UNDDUMS				-0.06670	.0115	.0001
lnNUMEQ	0.00313	.0011	.0076			
PCTUNSEQ				-0.25704	.0437	.0001
WARDUMI	-0.00002	.0164	.9987			
WARDUMS	0.00121	.0019	.5322			
SDEVOTC				0.00422	.0009	.0001
PCTSEC				-0.06402	.0169	.0003

TABLE 29

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
ANALYTICALLY DERIVED REDUCED FORMS
RSTUDENT QUARTILE 2

	PCTCOMP	UNDPRICE
	COEFFICIENT	COEFFICIENT
CONSTANT	0.113091	-0.33329
lnTOTREG	-0.00578	0.03474
UNDDUMI	0.02493	0.66712
UNDDUMS	-0.00290	-0.07824
lnNUMEQ	0.00367	0.01457
PCTUNSEQ	-0.01120	-0.30152
WARDUMI	-0.00002	-0.00009
WARDUMS	0.00141	0.00563
SDEVOTC	0.00018	0.00495
PCTSEC	-0.00279	-0.07509

TABLE 30

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
FIRST STAGE ESTIMATES
RSTUDENT QUARTILE 3

	PCTCOMP EQUATION			UNDPRICE EQUATION		
DFE	91			91		
F RATIO	41.6300			55.7700		
PROB>F	0.0001			0.0001		
R-SQUARE	0.8046			0.8465		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
CONSTANT	0.12859	.0109	.0001	-0.41675	.0582	.0001
lnTOTREG	-0.00474	.0011	.0001	0.04755	.0059	.0001
UNDDUMI	0.04171	.0178	.0219	0.80941	.0950	.0001
UNDDUMS	-0.00456	.0021	.0338	-0.09305	.0112	.0001
lnNUMEQ	-0.00266	.0016	.1004	0.03140	.0085	.0004
PCTUNSEQ	-0.00569	.0071	.4295	-0.41230	.0381	.0001
WARDUMI	0.08979	.0219	.0001	-0.00139	.1167	.9905
WARDUMS	-0.00997	.0027	.0004	0.00585	.0143	.6847
SDEVOTC	0.00019	.0002	.3198	0.00430	.0012	.0006
PCTSEC	-0.00294	.0026	.2753	-0.07260	.0142	.0001

TABLE 31

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
SECOND STAGE ESTIMATES
RSTUDENT QUARTILE 3

	DFE -		94	DFE -		93
	F RATIO -		63.8500	F RATIO -		45.4700
	PROB>F -		0.0001	PROB>F -		0.0001
	R-SQUARE -		0.8030	R-SQUARE -		0.7739
	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				2.7762	1.0007	.0067
UNDPRICE	0.03061	.0106	.0052			
CONSTANT	0.14301	.0098	.0001	-0.65027	.1564	.0001
lnTOTREG	-0.00665	.0010	.0001	0.06248	.0099	.0001
UNDDUMI	0.00249	.0013	.0760	0.63311	.1314	.0001
UNDDUMS				-0.07248	.0152	.0001
lnNUMEQ	-0.00267	.0011	.0231			
PCTUNSEQ				-0.30601	.0401	.0001
WARDUMI	0.09541	.0206	.0001			
WARDUMS	-0.01082	.0025	.0001			
SDEVOTC				0.00584	.0013	.0001
PCTSEC				-0.09090	.0171	.0001

TABLE 32

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
THIRD STAGE ESTIMATES
RSTUDENT QUARTILE 3

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				2.72253	.9978	.0076
UNDPRICE	0.03476	.0106	.0015			
CONSTANT	0.13899	.0097	.0001	-0.65602	.1560	.0001
lnTOTREG	-0.00692	.0010	.0001	0.06348	.0098	.0001
UNDDUMI	0.00193	.0013	.1655	0.68176	.1226	.0001
UNDDUMS				-0.07821	.0142	.0001
lnNUMEQ	-0.00120	.0010	.2676			
PCTUNSEQ				-0.29851	.0386	.0001
WARDUMI	0.07749	.0193	.0001			
WARDUMS	-0.00848	.0023	.0005			
SDEVOTC				0.00556	.0012	.0001
PCTSEC				-0.08713	.0156	.0001

TABLE 33

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
ANALYTICALLY DERIVED REDUCED FORMS
RSTUDENT QUARTILE 3

	PCTCOMP	UNDPRICE
	COEFFICIENT	COEFFICIENT
CONSTANT	0.12833	-0.30663
lnTOTREG	-0.00520	0.04930
UNDDUMI	0.02830	0.75882
UNDDUMS	-0.00300	-0.08638
lnNUMEQ	-0.00132	-0.00360
PCTUNSEQ	-0.01146	-0.32971
WARDUMI	0.08558	0.23301
WARDUMS	-0.00936	-0.02550
SDEVOTC	0.00021	0.00614
PCTSEC	-0.00334	-0.09623

TABLE 34

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
FIRST STAGE ESTIMATES
RSTUDENT QUARTILE 4

	DFE -		92	DFE -		92
	F RATIO -		32.9700	F RATIO -		6.7600
	PROB>F -		0.0001	PROB>F -		0.0001
	R-SQUARE -		0.7633	R-SQUARE -		0.3980
	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
CONSTANT	0.12702	.0150	.0001	-0.22914	.3509	.5155
lnTOTREG	-0.00594	.0016	.0004	0.03607	.0374	.3375
UNDDUMI	0.00097	.0173	.9551	1.10184	.4041	.0077
UNDDUMS	0.00041	.0020	.8378	-0.13131	.0476	.0070
lnNUMEQ	0.00050	.0017	.7808	0.09913	.0419	.0201
PCTUNSEQ	-0.01038	.0095	.2823	-0.79884	.2238	.0006
WARDUMI	0.02850	.0178	.1147	-0.11191	.4173	.7892
WARDUMS	-0.00208	.0021	.3331	0.02468	.0500	.6232
SDEVOTC	0.00004	.0003	.9005	-0.00174	.0076	.8205
PCTSEC	0.00055	.0037	.8824	-0.21974	.0870	.0133

TABLE 35

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
SECOND STAGE ESTIMATES
RSTUDENT QUARTILE 4

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	DFE - 95			DFE - 94		
	F RATIO - 50.9700			F RATIO - 7.2000		
	PROB>F - 0.0001			PROB>F - 0.0001		
	R-SQUARE - 0.7630			R-SQUARE - 0.3491		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				9.3257	4.1851	.0282
UNDPRICE	0.00430	.0076	.5755			
CONSTANT	0.12418	.0136	.0001	-1.26769	.7218	.0823
lnTOTREG	0.00545	.0014	.0002	0.10618	.0504	.0380
UNDDUMI	0.00457	.0017	.0107	0.92849	.4021	.0232
UNDDUMS				-0.11539	.0466	.0152
lnNUMEQ	-0.00054	.0012	.6669			
PCTUNSEQ				-0.38477	.1870	.0424
WARDUMI	0.02852	.0163	.0835			
WARDUMS	-0.00216	.0019	.2657			
SDEVOTC				0.00623	.0071	.3836
PCTSEC				-0.24146	.0885	.0077

TABLE 36

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
THIRD STAGE ESTIMATES
RSTUDENT QUARTILE 4

	PCTCOMP EQUATION			UNDPRICE EQUATION		
	PARM EST	STD ERR	P>|T|	PARM EST	STD ERR	P>|T|
PCTCOMP				9.8122	4.1561	.0203
UNDPRICE	0.00677	.0075	.3742			
CONSTANT	0.12269	.0134	.0001	-1.27728	.7177	.0784
lnTOTREG	-0.00567	.0013	.0001	0.10359	.0499	.0409
UNDDUMI	0.00467	.0017	.0089	0.84076	.3845	.0313
UNDDUMS				-0.10543	.0446	.0202
lnNUMEQ	0.00013	.0012	.9131			
PCTUNSEQ				-0.43306	.1827	.0198
WARDUMI	0.02459	.0154	.1157			
WARDUMS	-0.00176	.0018	.3358			
SDEVOTC				0.00638	.0067	.3459
PCTSEC				-0.22276	.0845	.0099

TABLE 37

INITIAL PUBLIC OFFERINGS
SIMULTANEOUS REGRESSION MODEL
ANALYTICALLY DERIVED REDUCED FORMS
RSTUDENT QUARTILE 4

	PCTCOMP	UNDPRICE
	COEFFICIENT	COEFFICIENT
CONSTANT	0.12215	-0.07864
lnTOTREG	-0.00532	0.05136
UNDDUMI	0.01109	0.94966
UNDDUMS	-0.00076	-0.11293
lnNUMEQ	0.00013	0.00136
PCTUNSEQ	-0.00314	-0.46387
WARDUMI	0.02633	0.25845
WARDUMS	-0.00188	-0.01849
SDEVOTC	0.00004	0.00683
PCTSEC	-0.00161	-0.23861

cordingly. This result supports the hypothesis that the most severely underpriced issues are the ones most affected by the limitation on percentage cash spread. A recursive relationship alos occurs between PCTCOMP and UNDPRICE in the lower quartile. However, I am able to offer no reasonable economic interpretation of this phenomenon at this time.

In the middle quartiles, those with actual underpricing close to predicted underpricing, the coefficient of each of the endogenous variables is positive and statistically significant, suggesting that issues in these quartiles which involved higher percentage cash spread also experienced higher underpricing. This result presents evidence that issues in these quartiles are also affected by the limitation on percentage.

Chapter VI

CONCLUSIONS, LIMITATIONS AND SUGGESTIONS

The study has presented some evidence concerning underpricing and the negotiation process of new issues.

In Chapter III I argue in support in support of the efficiency of the new issues market subsequent to the first trading day. The implication of these results is that only those investors able to purchase new issues at the offer price may expect to earn excess returns; investors purchasing new issues at the prevailing after-market price may expect not to earn excess returns on new issues. Although the analysis of Chapter III does support the notion of efficiency in the after-market for new issues, more conclusive proof about the efficiency of the new issues market requires the analysis of daily rates of return on new issues.

The results of Chapter V provide evidence that the institutional limitations on percentage cash spread have an effect on the magnitude of underpricing. I would have more confidence in this conclusion if the stock issues rejected initially by NASD which were renegotiated, resubmitted and subsequently survived the scrutiny of the Committee on Corporate Financing of NASD could be identified. This information would at least permit a comparison of the magnitude of the underpricing between offers which initially exceeded the compensation guidelines and those which did not. However, even with this improvement in the sample, grey areas still remain due to uncertainty concerning those offers whose percentage cash compensation is set artificially lower in order to avoid an involvement with NASD and the threat of renegotiation. In this case, underpricing exists because of the constraint but such offers are indistinguishable from offers which do not require artificially low percentage cash spread and thus possibly did not involve underpricing.

An additional factor which complicates the analysis is that all forms of compensation, both direct and indirect, are considered in deciding upon the fairness and reasonableness of the underwriter compensation. One indirect means of compensating the underwriter is through the issuance of warrants. The issuance of warrants was represented in the model by a dummy variable and it was found that percentage cash spread was higher on those those issues involving warrants. However, an improved method of incorporating the effect of warrants on underpricing and the negotiation process is to actually use a valuation method rather than a dummy variable approach. Valuation of the warrants would provide a finer delineation among offers in terms of total compensation and perhaps provide more explanatory power.

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