# VALUATION ERRORS AT THE TIME OF SECURITY ISSUANCE AND THE MARKET TIMING THEORY OF CAPITAL STRUCTURE

# VALUATION ERRORS IN EQUITY AND THE MOTIVES FOR ISSUING CONVERTIBLE DEBT

By

JOHANNA KOETER-KANT

Bachelor of Science Equivalent
Open Universiteit
Heerlen, The Netherlands
1993

Master of Business Administration
Oral Roberts University
Tulsa, Oklahoma
1996

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
In partial fulfillment of
The requirements for
The degree of
DOCTOR OF PHILOSOPHY
August 2003

VALUATION ERRORS AT THE TIME OF SECURITY ISSUANCE AND THE MARKET TIMING THEORY OF CAPITAL STRUCTURE

VALUATION ERRORS IN EQUITY AND THE MOTIVES FOR ISSUING CONVERTIBLE DEBT

Thesis Approved:

W. Gary Simpson
Thesis Advisor

Ramesh P. Rao

Lee C. Adkins

Timothy J. Pettibone
Dean of the Graduate College

# ACKNOWLEDGMENTS

I would like to thank all the people who have supported and encouraged me to complete this dissertation. First of all, I wish to express my sincere gratitude to my research advisor Dr. Bill Elliott who has guided this work with many useful suggestions whenever I was in need. I will always be grateful for his commitment, guidance and friendship. I would like to thank my committee Chair Dr. Gary Simpson, and the other committee members Dr. Ramesh Rao and Dr. Lee Adkins for their valuable comments and dedication to this project. I would also like to thank Dr. Janice Jadlow for always making the impossible possible for me.

A special thanks goes to Dr. David Dyson who inspired me to start my graduate studies. His advice and support have been invaluable and helped me preserve during difficult times.

To my husband Paul, I thank you for your unwavering support through this endeavor. Your encouragement, understanding, and love made it possible for me to achieve one of the many goals set for myself. I love you dearly.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

CHAPTER 1

*Valuation Errors at the Time of Security Issuance and*

*the Market Timing Theory of Capital Structure*

## *A. Introduction*

Over the years, several theories regarding the determinants of capital structure have been posited and tested. Starting in 1959, Modigliani and Miller were the first to address the capital structure issue in a scientific way. Under very strict assumptions they showed that in a world without taxes the value of the firm and its cost of capital are unaffected by its capital structure, i.e. capital structure is irrelevant to the value of the firm. Later, in 1963 they relaxed the no tax assumption and concluded that the value of the firm is increased by the use of leverage because interest on debt is a deductible expense. Although, the M&M models do not apply to realistic market conditions, after all no firm will have 100% leverage in order to fully maximize the benefits of a tax shield, they instigated the start of an extensive line of research in the area of capital structure.

Up till this date the firm's capital structure choice has basically been tackled in three main theories. First, the pecking order theory in which the firm will issue the cheapest securities first which usually implies that the firm prefers to use internal to external financing, and debt to equity financing (Myers, 1984; Myers and Majluf, 1984). Second, the static tradeoff theory in which a firm makes gradual adjustments over time toward an optimal target capital structure. Third, the market timing theory (Baker and

Wurgler, 2002), in which capital structure is the cumulative outcome of past attempts to time the equity market. The purpose of this essay is to extent the research in capital structure by further examining the market timing hypothesis.

Recent literatures suggest that the debt/equity choice is based on factors other than a target capital structure. Hovakimian, Opler, and Titman (2001) find evidence that suggests target capital structure considerations are much more important when firms repurchase securities rather than issue, and that stock prices play an important role in determining a firm's financing choice. Baker and Wurgler (2002) find that current capital structure is strongly related to past market values. Their results are most consistent with the market-timing hypothesis of capital structure, which asserts that capital structure is the cumulative outcome of past attempts to time the equity market.

In this paper the robustness of the market timing hypothesis of capital structure is tested simultaneously against the pecking order and static trade off theories. The method used is similar to D'Mello and Shroff (2000) in their analysis of misvaluation for firms making stock repurchases. First, I test whether misvaluation of equity is a significant determinant in the security issuance decision, after controlling for the factors that proxy for the static trade off theory and pecking order theory of capital structure. In addition to the debt/equity choice, management must also make a decision between public issuance and private placement. Many previous studies have examined the debt vs. equity choice or the private vs. public placement decision separately. Typically, most of these studies analyze the abnormal return patterns around the announcement day to determine whether asymmetric information is the driving force behind the issuance decision. By following the D'Mello and Shroff method this study instead uses a direct measure of valuation that allows for separating out those firms that are over and under valued. The intent of the paper is to extend the existing literature on capital structure, and in particular the market timing hypothesis, by examining valuation effects on the debt-equity choice, as well as the public-private placement choice. The results are most consistent with the market timing hypothesis of capital structure, however, the results do not provide evidence that there is a single model of capital structure that dominates in the security issuance decision.

Second, a model designed by Shyam-Sunder and Myers (1999) to test the pecking order hypothesis, and more recently extended by Frank and Goyal (2003) is examined. Specifically, the model analyzes the relationship between net debt issues and the firm's financing deficit. The pecking order theory implies a close to one-to-one relationship between these variables. Shyam-Sunder and Myers find evidence in support of the pecking order hypothesis, while Frank and Goyal's results are less supportive of pecking order. The Frank and Goyal result is explored in light of market timing and the evidence indicates that the sensitivity of debt issues to the financing deficit is directly related to the degree to which equity is overvalued. Using Frank and Goyal's version of the SSM model, the financing deficit variable is interacted with a measure of valuation. For this sample of issuing firms, it appears that the deviation from a one-to-one result found by FG is primarily driven by misvaluation. The results are more consistent with the Baker and Wurgler (2002) market timing hypothesis.

The paper proceeds as follows: Section B reviews the literature and develops the hypotheses, Section C discusses the data and method, Section D reports the results and is followed by concluding remarks in Section E.

### *B. Capital Structure Theories; Literature Review*

#### *1. Pecking Order Theory*

A firm's security issuance choice is often explained by the pecking order theory. In a pecking order framework a firm avoids issuing equity due to high asymmetric information surrounding this security, compared to its alternatives. Firms therefore prefer to use internal before external financing, and debt before equity financing. In an attempt to solve the capital structure puzzle Myers (1984) developed the following pecking order for making financing decisions.

1. Firms prefer internal sources of funds.
2. Firms adapt their dividend payout policies to reflect their anticipated investment opportunities, although dividends are sticky and target payout ratios are only gradually adjusted to shifts in the extent of valuable investment opportunities.
3. Sticky dividend policies, plus unpredictable fluctuations in profitability and investment opportunities, mean that internally generated cash flows may be more or less than investment outlays. If it is less, the firm draws down its cash balance or marketable securities portfolio. If it is more, the firm pays off debt or invests in cash or marketable securities. If the surplus persists, the firm may gradually increase its target payout ratio.
4. If external financing is required, firms issue the safest security first: They start with debt, then possibly hybrid securities such as convertible bonds, then possibly equity as last resort.

Important implications of the Myers pecking order theory are the following; (a) the firm has no target debt/equity ratio; (b) there are two types of equity, internal and external, with the former having priority for new financing and the later being a last resort; and (c) as a consequence, each firm's debt/equity mix reflects its cumulative requirements for external financing. In summary, according to the pecking order theory a firm's financing mix is just the result of its past profitability, dividend policy, and investment opportunities. Myers finds empirical support for the pecking order theory, however he points out that this is merely a description of companies' financing behavior and it does not explain why such behavior may be optimal or even desirable.

One theoretical explanation for the observed pecking order behavior is offered by the literature on managerial capitalism. This theory asserts that managers would rather use internal than external sources of funds in order to avoid disciplinary actions of the capital market.[1] A second rationale for pecking order behavior may be found in the notion of maximizing shareholders wealth. The costs associated with issuing new securities might reduce existing shareholders' wealth, especially when managers have more favorable information about the firm's future cash flows than do investors. A large body of finance literature based on this idea of asymmetric information has provided a strong foundation for the pecking order theory. In an environment where firm managers and (future) investors do not have the same information about the firm's future cash flows, the firm's equity may be substantially undervalued. If managers faced with this situation act on behalf of existing shareholders, they would choose to issue debt instead of equity after they have exhausted their internal financing capacity.

Myers and Majluf (1984) developed an equilibrium model of the issue-investment decision under the assumptions that firm managers have superior asymmetric

[1] See Jensen and Meckling (1976) for a discussion on capital structure and agency costs.

information, which they cannot credibly reveal to the market, and that issuance of new equity is their only source of funding for the new project. They show that under certain conditions managers may decide to forego a positive NPV project, rather than issue equity. The other side of this argument suggests that if managers decide to issue equity, they must perceive this equity to be significantly overvalued. Investors realize this and therefore the value of the firm is expected to decrease after the announcement of a firm's plan to issue equity. A dynamic version of the pecking order theory postulates that firm managers may choose to issue equity when asymmetric information is low in order to build financial slack for future investment opportunities. Consistent with the pecking order theory are the early studies by Masulis and Korwar (1986), Asquith and Mullins (1986), and Mikkelson and Partch (1986). They observe that issues of seasoned equity are interpreted as bad news by investors. They find significantly negative announcement date effects on equity prices. Other researchers have studied the effects of debt issues on stock prices using the argument that issuance of new debt should reduce the information asymmetry.[2] However, they did not find significant positive cumulative returns. Masulis (1980) looked at debt for equity and equity for debt exchanges and found significant cumulative abnormal returns (CARs) for both cases. Although the CARs had the expected opposite signs, they were of a different magnitude which provided evidence in favor the Myers and Majluf signaling hypothesis. In general, these empirical studies indicate that leverage increasing capital structure changes have a positive impact on firm value, while leverage decreasing capital structure changes have a negative impact on a

[2] See Dann and Mikkelson (1984) and Eckbo (1986).

firm's stock price or value. The empirical findings in these studies support the pecking order theory.[3] Many other studies have utilized the asymmetric information theory in order to explain the choice between public issuance or private placement of both debt and equity. The general consensus is that corporations issue equity in the public market place when the market overvalues this equity and issue other forms of securities when equity is undervalued. In general, empirical studies show that issuance of public equity generates a share price drop in the order of 3% and firms that issue public debt have abnormal returns that are not significantly different from zero.[4] On the other hand, empirical studies concerning the placements of private equity and debt document significant positive returns.[5]

Cooney and Kalay (1993) extend the Myers and Majluf (1984) study by allowing for negative NPV projects. They show that the rejection of a project does not necessarily mean undervaluation of equity, but might simply be because it is a bad project. Hertzel and Smith (1993) modify the Myers and Majluf framework by adding private placement of equity as an additional source of capital acquisition. They show that private placement of equity by undervalued firms can alleviate the costs associated with asymmetric information, therefore corporations might choose private placement over public issuance

---

[3] See Leland and Pyle (1977) and Ross (1977) for a development of models where choice of capital structure is used to signal information to (potential) investor.

[4] Frank and Goyal (2000) find non-significant impact on stock prices for debt issues. Eckbo (1986) reports non-significant abnormal returns for straight debt issues, but significant negative effects when convertible debt is issued.

[5] Szewczyk and Varma (1991) report the stock price effects of announcements of private debt placements for a sample of public utilities and find that the issuance of private debt is associated with significantly positive abnormal returns. Hertzel and Smith (1993), and Wruck (1989) document significant positive returns after private equity announcements. Goh, Gombola, Lee, and Liu (1999) examine earnings forecast revisions by analysts after the announcement of private equity placements by firms. Their findings suggest that positive stock price reactions are explained by favorable information on improved short-term earnings prospects for the firm.

when it enables existing shareholders to retain a larger fraction of the firm. They report significant positive abnormal returns associated with the announcement of privately placed equity.[6] Empirically, the pecking order theory has been tested extensively, but the results are mixed and there is no conclusive evidence that pecking order better describes financing behavior than does the static trade off theory of capital structure.

### 2. *Static Tradeoff Theory*

In a static tradeoff framework, firm managers try to sustain an optimal target capital structure. A firm will substitute debt for equity or equity for debt until the value of the firm is maximized and the optimal capital structure is obtained. This optimal is determined by considering the tradeoffs between the benefits (interest tax shields) and costs (costs of financial distress) of debt. However, random events within or outside the firm may temporarily shift the corporation away from its optimal target. Assuming that the target capital structure is stable, one would expect to see mean reverting behavior with regard to the debt/equity mix, i.e., the level of debt ratio is not driven by the need for external funds but is the result of trying to obtain the optimal level of debt.

In more recent studies the pecking order model is tested against the static tradeoff theory. Syam-Sunder and Myers (1999) examine debt financing patterns through time to test which theory best describes the observed data for mature public companies. Their results indicate that the pecking order model explains more of the time series variance in actual debt-ratios than a target adjustment model. First, they regress financing deficit on the amount of net debt. In testing the sensitivity of changes in net debt to a firm's

---

[6] For more extensions of the Myers and Majluf model see also Krasker (1986), Brennan and Kraus (1987), Noe (1988), Narayanan (1988), and Zechner (1990).

financing deficit, the pecking order theory implies a close to one-to-one relation. Second, to test the target adjustment model net debt is regressed on the difference between the firm's target and actual debt. Both models prove to explain the variation in net debt, although the pecking order model seems to be a far better fit. When both specifications are nested into one model, the target adjustment coefficient still remains significant, but again the pecking order variable seems superior in explaining changes in the debt ratio. In addition, they test both models on simulated data based on the pecking order or the conditional target model. The pecking order model can be easily rejected when false, while the target adjustment model cannot be rejected, even when false. In summary, their results indicate that pecking order theory better describes firms' financing behavior than does the static trade off theory. Chrinko and Singha (2000) refute the Syam-Sunder/Myers result by pointing out that the pecking order model used is not an identity due to excluding the equity issues from the financing hierarchy. Consequently, their model tests a joint hypothesis of the financing hierarchy and the proportion of equity issued. Frank and Goyal (2003) also examine the Syam-Sunder/Myers result and report contrary results. They find that net equity issues have a far closer relation with financing deficit than do net debt issues, and therefore reject the pecking order theory. They also report evidence of mean reversion in debt levels, consistent with the tradeoff theory. Researchers have not been able to conclusively identify one single model of capital structure that dominates in the security issuance choice.

### *3. Market Timing Theory*

A survey of 392 CFOs by Graham and Harvey (2000) finds limited support for the pecking order and tradeoff theories. According to this survey, market timing seems to be a more important aspect in corporate financial policy. In support of that view Hovakimian, Opler, and Titman (2001) find evidence that suggests that capital structure considerations are much more important when firms repurchase securities rather than issue, and that stock prices play an important role in determining a firm's financing choice. Baker and Wurgler (2002) find that current capital structure is strongly related to past market values. These results are more consistent with the market-timing theory of capital structure.

Timing of debt and equity offers appears to be an important factor when management makes decisions about acquiring additional external capital.[7] Past research has focused on several determinants in an attempt to explain this timing behavior. One argument for the timing of equity offers is that during periods of economic expansion more profitable investment opportunities are available. Choe, Masulis and Nanda (1993) reason that the adverse selection effects of equity issuance a firm faces during these expansions will be smaller than during contractions, resulting in a higher frequency of equity offering during expansions. Indeed, their evidence indicates that the frequency of equity offers relative to debt offers rises during these periods. Korajczyk, Lucas and McDonald (1991) argue that asymmetric information has implications for the timing of equity issues. They look at the arrival of information using earnings releases and find

---

[7] See Graham and Harvey (2001).

that time varying adverse selection affects timing and pricing of equity issues. The stock price fall at equity issue announcements is increasing in time since the last information release. If a firm delays the issue of equity by one month after the last information release, on average the stock price will suffer an additional loss of 0.44%. Bayless and Chaplinsky (1996) link the decision to issue equity with the cost of equity in order to search for 'windows of opportunity' during which it is most favorable for a firm to issue equity. They find evidence for the existence of high volume equity markets (hot markets) and low volume equity markets (cold markets). Their results indicate that average price reactions in hot markets are significantly less negative, while price reactions in cold markets are significantly more negative than at other times. Jung, Kim, and Stulz (1996) use actual long-term post issue abnormal returns as a proxy for management's expectations of future performance to compare the agency, pecking order, and timing model. Although their results find support for the agency and pecking order model, the timing model finds almost no support at all.

In a more recent study, Baker and Wurgler (2002) use market-to-book ratios to look at the impact of market timing in the short-run and long-run.[8] They report evidence that low leverage firms issue securities when market values, i.e., market-to-book values, are high and high leverage firms issue when market values are low. They interpret their results such that capital structure is the cumulative outcome of past attempts to time the equity market. They offer two possible explanations for this view on capital structure. The first, consistent with the Myers and Majluf asymmetric information hypothesis

[8] In a previous paper Baker and Wurgler (2000) also found evidence in support of the timing hypothesis using aggregate equity and debt issue data from 1927-1996.

assuming rational managers and investors, reasons that adverse selection may vary across firms or time and is inversely related to market-to-book ratio. Firms do not revert to their target capital structure because the costs of not doing so are small. The second theory assumes that managers believe that they can time the equity. Managers use market-to-book ratio as a proxy for misvaluation by investors and issue equity when they perceive that investors have overvalued the firm. The evidence from long-run studies of equity issuance supports the market timing hypothesis rather than the asymmetric information hypothesis.[9]

### 4. *Measuring Misvaluation*

A key problem with the studies of misvaluation is that they utilize market-to-book as the measure of misvaluation. Indeed, Baker and Wurgler (2002) recognize that this variable also is interpreted as a measure of growth opportunities. In order to separate out growth opportunities from over-valuation it is necessary to call upon long run studies which relate market-to-book to long run returns and generally find that high market-to-book firms tend to underperform low market-to-book firms (La Porta, 1996; Frankel and Lee, 1998). Lee, Myers and Swaminathan (1999) find that market-to-book ratios explain about 0.33% of the variation in the real return in the Dow 30 stocks over a one to 18 month time horizon. They conclude that market-to-book ratios really have little economic predictability of stock returns. This result is broadly consistent with Kothari and Shanken (1997) who find that while market-to-book ratios have some predictive

---

[9] See Loughran and Ritter (1995).

power over the 1926-1991 time period, their predictivity is substantially reduced in the 1946-1991 subperiod. Instead of market-to-book ratios, Lee et al. find that a valuation measure that incorporates time-varying interest rates and earnings (the residual income model) has significant predictive ability (over 20% of the variation in the real return of the Dow 30) and is therefore arguably a far better measure of misvaluation.

D'Mello and Shroff (2000) use the residual income model to estimate the intrinsic value of the stock compared to the market price as a measure of misvaluation, and find that firms that repurchase equity securities via tender offers are undervalued. Jindra (2000) uses a similar method and finds firms issuing seasoned equity are significantly overvalued. This paper seeks to examine directly the impact of equity valuation relative to price on the security issuance decision by using a residual income model to measure equity value. This approach has the advantage over the use of market-to-book ratios in that it allows us to separate out the effects of growth opportunities, asymmetric information and pure misvaluation, which cannot be achieved through the use of market-to-book ratios alone. I then aim to examine the choice of securities in light of the extant theories of capital structure, including the market timing hypothesis, using this method of measuring misvaluation.

The analysis has three basic approaches. The first approach will seek to determine what, if any valuation differences in equity exist for different types of security issuance. In the analysis a sample of public debt, private debt and public equity issuances will be studied.[10] Consistent with market timing, the expectation is that firms issue equity when equity is most overvalued. When equity is undervalued I would expect the firm to issue

[10] Due to paucity of data on companies issuing equity in the private market, these issues are omitted from the analysis.

debt securities. Second, the security issuance decision is modeled as a function of misvaluation and proxies for factors that would lead to security issuances based upon the pecking order and static trade off theories. In essence, I am running a horse race in which all theories have an opportunity to reveal their relative impact on the security issuance decision. As a result, the study is not restricted to finding results in favor of just one theory – it is perfectly plausible that all the theories may be operating together at some time. Third, the Frank and Goyal (2003) study is extended by including a direct measure of misvaluation. If the degree of misvaluation determines the security decision choice the expectation is to see the relation between net debt and financing deficit to be much stronger for undervalued firms than for overvalued firms, i.e. overvalued firms are more likely to issue equity, while undervalued firms issue debt. The following section discusses the data and method, specifically the variables used to capture the various capital structure theories.

## *C. Data and Method*

### *1. Sample Selection*

The initial sample consists of all non-financial, U.S. firms that issued public seasoned equity, public non-convertible debt, and private non-convertible debt, during the period 1981-1999. Financial companies are excluded from the sample due to the highly regulated environment in which they operate. File/issue dates and issue specific variables are obtained from Securities Data Corporation's (SDC) Global New Issues database[11]. All firms are required to have relevant data available on the Center for Research in Security Prices database (CRSP) and Standard and Poor's Research Insight annual database (COMPUSTAT). Further, issuances of firms with multiple offers during the sample period must be separated by at least three years. In the event that there are less than three years between offers, only the first issue is allowed into the sample.[12]

**Table 1**
**Summary Statistics by Year**

Total sample of all U.S. non-financial firms with the required data available on CRSP and COMPUSTAT issuing public equity, public non-convertible debt or private non-convertible debt between January 1981 and December 1999. Issues done by the same company in the subsequent 10 days after the issue date are combined into one issue. Issues done by the same company within three years of the issue date, but not in the subsequent ten days are deleted from the sample.

| Year | Total number of issues | Public equity | Public debt | Private debt |
|---|---|---|---|---|
| 1981 | 5 | 3 | 0 | 2 |
| 1982 | 135 | 73 | 29 | 33 |
| 1983 | 143 | 110 | 14 | 19 |
| 1984 | 39 | 16 | 6 | 17 |
| 1985 | 96 | 31 | 39 | 26 |
| 1986 | 113 | 40 | 39 | 34 |
| 1987 | 76 | 38 | 11 | 27 |
| 1988 | 86 | 14 | 16 | 56 |
| 1989 | 95 | 32 | 18 | 45 |
| 1990 | 90 | 26 | 20 | 44 |
| 1991 | 145 | 68 | 38 | 39 |
| 1992 | 123 | 54 | 50 | 19 |
| 1993 | 129 | 64 | 39 | 26 |
| 1994 | 88 | 40 | 24 | 24 |
| 1995 | 114 | 56 | 30 | 28 |
| 1996 | 129 | 59 | 46 | 24 |
| 1997 | 117 | 59 | 34 | 24 |
| 1998 | 111 | 43 | 49 | 19 |
| 1999 | 31 | 5 | 26 | 0 |
| Total | 1865 | 831 | 528 | 506 |

[11] The file date is used as the issue announcement date. Random sampling from the sample revealed that the announcement date falls on or within one day of the file date. For those firms where the file date cannot be obtained, mostly private debt issues, the issue date is used.
[12] Except in the case of multiple debt issues that occur within 10 days, in which case the proceeds of the issues are combined and the first file date is used.

The valuation model requires one year of accounting data (from COMPUSTAT) prior to, and at least three years after the announcement date. In unreported results the valuation model is also estimated using four and five years of data following the issue date.[13] The market price is the average of the closing price (CRSP) for the two days prior to the announcement date. The total sample contains 1865 security issuances which are divided into the following three sub-samples; (1) 831 public equity issues, (2) 528 public debt issues, and (3) 506 issues of private debt. Table 1 shows the number of issues for each type of security for each year of the sample.

The number of public equity issues ranges from a low of 14 in 1988 to a high of 110 in 1983.[14] Public debt issues range from 6 in 1984 to 50 in 1992, while private debt issues range from 17 in 1985 to 56 in 1988.

### 2. *Variables to Control for the Market Timing Hypothesis*

The key variable required to measure the market timing theory is some measure of over or under valuation at the time of security issuance. Other studies that have examined this theory have relied on post issue returns, market activity or market-to-book ratios to proxy for misvaluation. In this paper misvaluation is directly measured using the method employed by D'Mello and Shroff (2000) and Jindra (2001) who use the ratio of intrinsic value to current market price. Use of this valuation ratio has several advantages. First, there is no need to rely on the market model and the well documented potential problems relating to the use of daily stock returns in event studies can be avoided.[15] Second, previous literature has not only documented abnormal performance in the short-run, but also in the long run. The residual income model allows for capturing

---

[13] The results for the four and five year valuation model are qualitatively similar to the reported results.
[14] 1981 and 1999 actually have fewer issues in the sample simply because of data constraints.
[15] See Brown and Warner (1980, 1985), Corrado and Zivney (1992), and MacKinlay (1997) for a detailed discussion on the use of daily stock returns in event studies.

both, short run and long run effects. Last, assuming perfect foresight by managers allows the use of ex-post data, avoiding reliance on estimates used in event study methodology. I do acknowledge that using ex-post data does not exempt me from the possibility that management may manipulate accounting data and therefore influence the results. However, this problem is ameliorated in two different ways. First, the valuation ratio is scaled by a similar ratio computed for a matching firm (matched on 3-digit SIC code and market capitalization).[16] Second, the valuation ratio is scaled by the average valuation ratio for the subject firm from the two years prior to the issue.

To find the intrinsic value of the security, a residual income model (RIM) is utilized using perfect foresight as adopted by D'Mello and Shroff (2000), and Jindra (2000). Jindra points out that evidence indicates that the valuation techniques based on earnings yield lower valuation errors compared to those based on dividends or cash flows.[17] Ohlson (1990, 1991, 1995) demonstrates that the use of the Residual Income Model is identical to the use of the Dividend Discount Model in determining the value of equity. However, the use of accounting numbers in the RIM makes the model easier for practical implementation. Lee, Myers, and Swaminathan (1999) examine the intrinsic value of the Dow 30 stocks and provide evidence that V/P ratios, where V is based on a residual income valuation model, have more predictive power in forecasting future returns than book-to-market ratios (B/P), earnings-to-price ratios (E/P), and dividend yield (D/P).

[16] The capitalization of the matching firm must be within 200% of the sample firm's capitalization. If a 3-digit match is not found a 2-digit match is used. Further, it is a requirement that the matching firm does not issue any type of security within 250 trading-days around the file/issue date.
[17] See Kaplan and Ruback (1995), Penman and Sougiannis (1998), Kim and Ritter (1999).

In the Residual Income Model, equity value estimates are based on future realized earnings performance. The basic model determines the intrinsic value by adding to book value the discounted expected earnings in excess of normal return on book value.

$$E(V_0) = B_0 + \sum_{i=1}^{T} (1+r)^{-i} E[X_i - r * B_{i-1}] + \frac{(1+r)^{-T}}{r} TV \tag{1}$$

Where TV, the terminal value, is calculated as

$$TV = E[(X_{0+T} - r * B_{0+T-1}) + (X_{0+T+1} - r * B_{0+T})] / 2 \tag{2}$$

In this definition $E(V_0)$ is the value of the firm's equity at time zero, $B_0$ is the book value at time zero, r is the cost of equity, and $X_i$ are the firms earnings at time zero plus i. Time zero is the time at the end of the fiscal year immediately preceding the file date, and T equals two years.

The cost of equity, r, uses the Fama and French (1997) method in which each firm is assigned the cost of equity of one of forty-eight industry groups computed using the Fama French three factor model.[18] The short-term T-bill is used as a proxy for the risk-free rate of interest. Lee et al. (1999) report that both the use of short-term T-Bill rates and the long-term Treasury bonds rates are useful proxies, however estimates of V based on the short-term T-Bill rate outperform those based on the long-term T-bond rates because they have a lower standard deviation and a faster rate of mean reversion. Similar to D'Mello and Shroff (2000) TV is calculated as the average of the last two years of the

[18] A fixed risk premium approach as in Lee, Myers and Swaminathan (1999) is also used in the computation of $E(V_0)$ and generates similar results.

finite series and is restricted to be nonnegative. The estimated intrinsic value of the stock is then compared to the market value of the stock at the file/issue date to determine the misvaluation error. Estimated misvaluation is measured as,

$$M_0 = \frac{E(V_0)}{P_0}, \qquad (3)$$

Where $M_0$ represents the estimated misvaluation at time zero, $P_0$ represents the market price of the stock at time zero, and $V_0$ represents the intrinsic value of the stock at time zero. The estimated misvaluation measure of the sample firm is scaled by two different benchmarks. First, the sample valuation ratio is scaled by a similar ratio computed for a matching firm, called SMVP (sample match firm value price ratio). The match is based on the 3-digit SIC code and market capitalization. Second, the sample firm is scaled by a time-series benchmark, as shown in Equation 4, where $M_{0-1}$ and $M_{0-2}$ are the misvaluation measures for the two years prior to the issue.

$$TSVP_0 = \frac{M_0}{[M_{0-2} + M_{0-1}]/2} \qquad (4)$$

If no misvaluation is present, SMVP/TSVP should equal 1. If SMVP/TSVP is less than one, I interpret this as an indication that the sample firm is over-valued. A SMVP/TSVP value greater than one indicates a firm that is under-valued.

### 3. *Variables to Capture the Pecking Order and Static Tradeoff Theories*

The static trade off theory is captured with a measure of deviation from the firm's target ratio, calculated as the firm's current debt ratio minus the average debt ratio over the past ten years.[19] If firms have indeed an optimal debt-equity ratio, managers' decisions with regard to security issuance are expected to be based on the deviations from the optimal target, i.e. when the debt-equity ratio is above the optimal target managers are more likely to issue equity, and vise versa when the debt ratio is below the target. To control for those firms that are below their target debt level but may have low debt capacity, the times interest earned ratio of operating profit divided by interest expense is also included. The expectation is that firms with low TIE ratios issue equity.

Assuming rational investors, the dynamic version of the pecking order theory predicts equity issuance only when asymmetric information is low. Assuming that to be true, high levels of valuation errors as predicted by the timing hypothesis are not expected. Therefore high levels of misvaluation are not expected to be consistent with the pecking order theory, as these imply higher asymmetric information. Also, the dividend payout rate is included as a measure of the level of asymmetric information. This assumes that higher dividend paying firms tend to be more transparent than non-dividend paying firms and would therefore issue equity. Firms with high levels of intangibles are also likely to have higher levels of information problems and are likely to prefer internal financing, or debt financing over equity. As an additional measure of uncertainty, the variance of returns for the year prior to the issue is included. Firms with greater stock return volatility are expected to issue debt over equity. Firms that have greater levels of internal free cash flow are able to finance projects through internal equity. Therefore, it is expected to be less likely that these firms issue equity.

---

[19] See Paul Marsh (1982) for a discussion on the use of the deviation from target ratio in order to control for the trade off theory.

### 4. *Variables to Extend the Frank and Goyal Model*

To further examine the evidence against the pecking order theory provided by Frank and Goyal (2003), their model is extended to include a direct measure of valuation that allows for differentiation between over and under-valued companies. In testing the sensitivity of changes in debt to a firm's financing deficit the pecking order theory implies a nearly one-to-one relationship. However, Frank and Goyal find that the relationship is significantly less than one. They interpret this as evidence against the pecking order theory. The financing deficit variable is interacted with a measure of valuation. More specifically, the interaction takes the form of bifurcating the financing deficit variable, i.e. those for firms that are under-valued and those for firms that are over-valued. Similar to Frank and Goyal, net debt is then regressed on the interacted financing deficit variables and the conventional leverage variables (tangibles, market-to-book, the log of net sales and profitability).[20] If managers do not attempt to time the market, the coefficient on both financing deficit variables should be equal. However, if the degree of misvaluation influences the security decision choice, i.e., firm managers time the market, one would expect to see the relationship between net debt and financing deficit to be much stronger for under-valued firms than for overvalued firms. However, it should be noted that the sample in this study differs markedly from either, the Shyam-Sunder and Myers or the Frank and Goyal samples in that this sample only contains firms that issued securities. It is not expected for this feature to systematically bias the results.

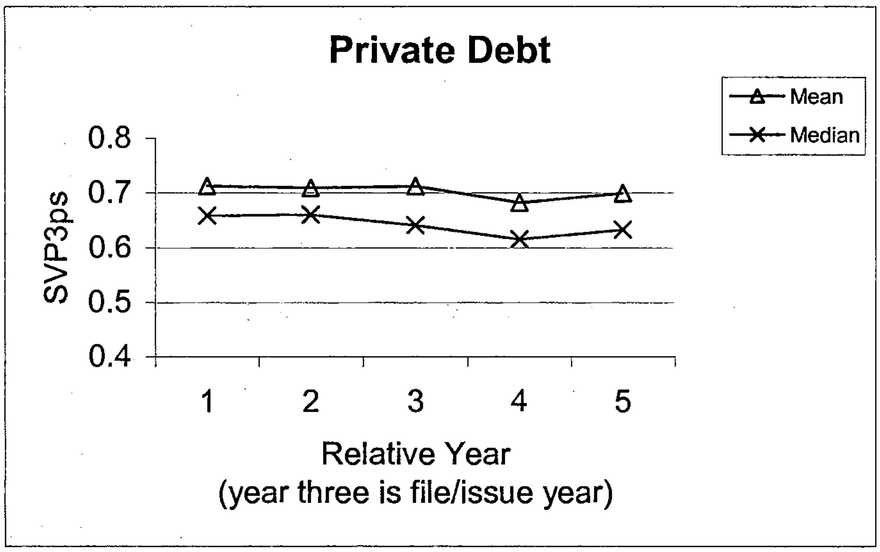
[20]As defined in the Frank and Goyal regression the differences of the independent variables are used in the estimation. However, since market value of equity is included in the measure of mis-valuation the change in net debt is used as the dependent variable instead of the difference between the ratio of total debt to market capitalization.

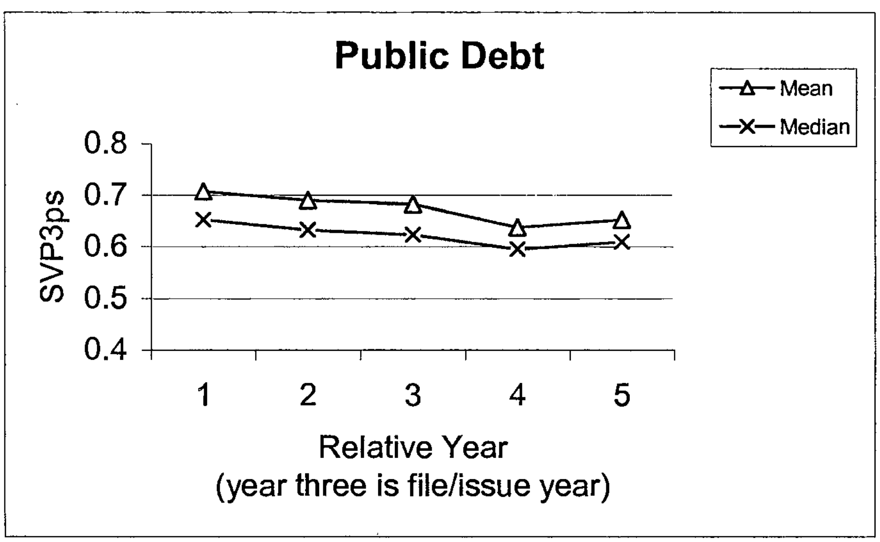
*D. Results*

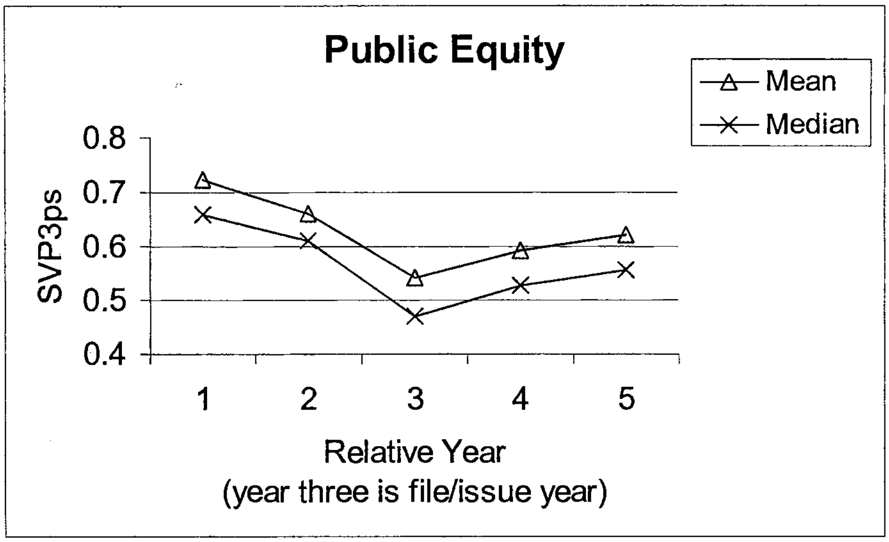
*1. The Security Decision Choice*

Figure I presents the mean valuation ratios on a per share basis of the three sub-samples for the four years around the security issuance. Public equity is clearly overvalued at the issue year and decreases in value the subsequent two years which is consistent with the empirical evidence that stock value decrease after the issuance of new

Figure I






equity. Both, public debt and private debt are fairly valued relative to the prior two years. The small increase in value after the issue year supports the evidence that in general announcements of debt issues are perceived as positive news.

Panel A of Table II presents summary statistics for the full sample. The mean (median) valuation ratio (SVP) for the sample firms is 0.71 (0.64). When SVP is scaled by the matching firm valuation ratio (SMVP), the mean and median is 1.15 and 0.97, respectively. Scaling by the average valuation ratio for the sample firm during the two years prior to the issue (TSVP) yields an average (median) of 1.08 (1.01). Long-term debt as a percent of total assets (Debtrat) ranges from 0 to 83 percent with an average of 23 percent. The current level of long-term debt minus the average long-term debt for the prior ten years (Debtdev) is –0.01 on average and varies from –0.47 to 0.56. The mean (median) free cash flow for the year prior to the issue was -$29 million ($3 million). Intangible assets as a percent of total assets amounted to 7 (1) percent on average (median).

The average firm is 22 years old (Age), while the youngest and oldest are 1 and 74 years of age, respectively. On average the firms have 55 million shares outstanding (SO), a market capitalization of $2.4 billion (MV), and a $30.34 share price (PRC). The average (median) proceeds raised by the issue was $84 ($50) million.

**Table II**
**Summary Statistics for Issuing Firms**

The summary statistics are computed using annual data from 1980 to 2000. SVP is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. MVP is the variable for the matching firms and is defined similarly as above. SMVP is computed as SVP divided by MVP. LnSMVP is the log of SMVP. TSVP is defined as SVP divided by the average of SVP in relative year –1 and –2. LnTSVP is the log of TSVP. DebtRat is long-term debt (D44+D9) divided by total assets (D6). DebtDev is computed as the deviation between the company's current debt ratio (long-term debt (D44+D9) divided by total assets (D6)) prior to the file/issue date and its target debt ratio (estimated by computing the average debt ratio over the previous 10 years prior to the file/issue date). RetVar is the average daily variance of the stock over the year prior to the file/issue date. FCF is free cash flow computed as income before extra ordinary items plus depreciation and amortization minus cash dividends minus additions to fixed assets (d123+d125-d127-d128) ($ millions). Intangibles are obtained from COMPUSTAT and are scaled by total assets (D33/D6). DivRat is the payout dividend ratio (d26/d58). ShrBase is the shareholder base computed as the number of shares outstanding divided by the number of shareholders (d25*1000/d100) (thousands). Proceeds are the total proceeds from the issue defined ($million). Age is the number of years the issuing firm exists. Tie is times interest earned. MV is the market value obtained from CRSP prior to the file/issue date ($million). SO is the number of shares outstanding obtained from CRSP prior to the file/issue date in (millions).

Panel A: Univariate Statistics for Full Sample

| Variable | N | Mean | Std Dev | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP | 1865 | 0.71 | 0.33 | 0.64 | 0.25 | 2.00 |
| MVP | 1865 | 0.74 | 0.36 | 0.66 | 0.25 | 2.00 |
| SMVP | 1865 | 1.15 | 0.72 | 0.97 | 0.16 | 6.08 |
| LnSMVP | 1865 | -0.04 | 0.59 | -0.03 | -1.81 | 1.80 |
| TSVP | 1349 | 1.08 | 0.42 | 1.01 | 0.23 | 1.86 |
| LnTSVP | 1349 | 0.01 | 0.36 | 0.01 | -1.46 | 1.58 |
| DebtRat | 1812 | 0.23 | 0.15 | 0.23 | 0.00 | 0.83 |
| DebtDev | 1778 | -0.01 | 0.10 | -0.01 | -0.47 | 0.56 |
| RetVar | 1778 | 0.0006 | 0.0006 | 0.0004 | 0.00003 | 0.0059 |
| FCF | 1687 | -29.43 | 630.04 | 3.12 | -19374.00 | 5576.00 |
| Intangibles | 1454 | 0.07 | 0.11 | 0.01 | 0 | 0.72 |
| DivRat | 1723 | 0.29 | 1.96 | 0.20 | -38.00 | 29.50 |
| ShrBase | 1686 | 13439.22 | 43113.67 | 3861.44 | 86.70 | 794802.00 |
| Proceeds | 1856 | 83.97 | 107.67 | 49.70 | 0.40 | 1567.90 |
| Age | 1856 | 22.01 | 19.26 | 18.00 | 1.00 | 74.00 |
| Tie | 1808 | 26.04 | 380.76 | 4.07 | -186.97 | 15608.00 |
| SPRC | 1865 | 30.34 | 23.22 | 25.44 | 4.25 | 543.19 |
| MV | 1865 | 2400.10 | 7461.19 | 489.91 | 6.71 | 112481.26 |
| SO | 1865 | 55.00 | 116.90 | 19.85 | 0.422 | 2239.83 |

Panel B: Univariate Statistics for Public Equity (Table II continued)

| Variable | N | Mean | Std Dev | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP | 831 | 0.66 | 0.33 | 0.58 | 0.25 | 2.00 |
| MVP | 831 | 0.72 | 0.35 | 0.64 | 0.25 | 1.97 |
| SMVP | 831 | 1.09 | 0.73 | 0.91 | 0.18 | 5.09 |
| LnSMVP | 831 | -0.10 | 0.61 | -0.9 | -1.70 | 1.65 |
| TSVP | 503 | 0.99 | 0.43 | 0.91 | 0.23 | 3.19 |
| LnTSVP | 503 | -0.09 | 0.41 | -0.09 | -1.46 | 1.16 |
| DebtRat | 813 | 0.22 | 0.16 | 0.21 | 0.00 | 0.83 |
| DebtDev | 801 | -0.02 | 0.11 | -0.01 | -0.47 | 0.44 |
| RetVar | 801 | 0.0008 | 0.0007 | 0.0006 | 0.00004 | 0.006 |
| FCF | 769 | -25.56 | 205.88 | 3.86 | -3664.69 | 433.00 |
| Intangibles | 639 | 0.07 | 0.12 | 0.01 | 0 | 0.72 |
| DivRat | 777 | 0.19 | 1.19 | 0.00 | -22.80 | 20.00 |
| ShrBase | 755 | 20624.96 | 59695.37 | 4903.47 | 86.70 | 794802.33 |
| Proceeds | 826 | 66.32 | 103.98 | 37.45 | 0.40 | 1567.90 |
| Age | 826 | 13.74 | 14.92 | 9.00 | 1.00 | 71.00 |
| Tie | 784 | 43.43 | 564.97 | 4.18 | -186.97 | 15608.00 |
| SPRC | 831 | 25.91 | 13.49 | 23.50 | 5.13 | 88.44 |
| MV | 831 | 770.29 | 2085.06 | 239.28 | 6.71 | 32342.58 |
| SO | 831 | 23.77 | 47.51 | 9.87 | 0.42 | 754.35 |

Panel C: Univariate Statistic for Public Debt

| Variable | N | Mean | Std Dev | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP | 528 | 0.74 | 0.33 | 0.67 | 0.27 | 1.90 |
| MVP | 528 | 0.74 | 0.36 | 0.67 | 0.25 | 1.98 |
| SMVP | 528 | 1.19 | 0.73 | 1.04 | 0.17 | 6.08 |
| LnSMVP | 528 | 0.01 | 0.58 | 0.04 | -1.79 | 1.81 |
| TSVP | 429 | 1.13 | 0.45 | 1.06 | 0.37 | 4.86 |
| LnTSVP | 429 | 0.06 | 0.33 | 0.06 | -1.01 | 1.58 |
| DebtRat | 508 | 0.25 | 0.13 | 0.25 | 0.00 | 0.68 |
| DebtDev | 492 | -0.01 | 0.09 | -0.01 | -0.37 | 0.36 |
| RetVar | 492 | 0.0004 | 0.0003 | 0.0003 | 0.00003 | 0.004 |
| FCF | 462 | -37.40 | 1015.22 | 0.18 | -19374.00 | 5576.00 |
| Intangibles | 410 | 0.07 | 0.11 | 0.02 | 0 | 0.74 |
| DivRat | 478 | 0.36 | 2.40 | 0.36 | -38.00 | 17.88 |
| ShrBase | 470 | 7681.38 | 17717.95 | 3255.10 | 186.17 | 232358.38 |
| Proceeds | 526 | 140.46 | 120.33 | 100.00 | 1.30 | 1000.00 |
| Age | 526 | 32.38 | 20.50 | 29.00 | 1.00 | 74.00 |
| Tie | 524 | 8.96 | 45.49 | 4.14 | -4.24 | 942.94 |
| SPRC | 528 | 37.56 | 30.53 | 33.08 | 5.00 | 543.19 |
| MV | 528 | 4944.85 | 10792.42 | 1833.09 | 16.14 | 112481.26 |
| SO | 528 | 105.75 | 174.39 | 49.85 | 0.97 | 2239.83 |

Panel D: Univariate Statistics for Private Debt (Table II continued)

| Variable | N | Mean | Std Dev | Median | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP | 506 | 0.76 | 0.32 | 0.69 | 0.25 | 1.93 |
| MVP | 506 | 0.76 | 0.36 | 0.70 | 0.25 | 1.99 |
| SMVP | 506 | 1.20 | 0.71 | 1.02 | 0.16 | 4.81 |
| LnSMVP | 506 | 0.02 | 0.57 | 0.02 | -1.81 | 1.57 |
| TSVP | 417 | 1.12 | 0.37 | 1.06 | 0.40 | 3.08 |
| LnTSVP | 417 | 0.07 | 0.30 | 0.06 | -0.92 | 1.12 |
| DebtRat | 491 | 0.23 | 0.14 | 0.22 | 0.00 | 0.83 |
| DebtDev | 485 | 0.01 | 0.09 | -0.001 | -0.42 | 0.56 |
| RetVar | 485 | 0.0005 | 0.0005 | 0.0004 | 0.00004 | 0.005 |
| FCF | 456 | -27.87 | 595.81 | 2.75 | -9571.30 | 3752.7 |
| Intangibles | 405 | 0.06 | 0.10 | 0.01 | 0.00 | 0.63 |
| DivRat | 468 | 0.39 | 2.45 | 0.29 | -29.33 | 29.50 |
| ShrBase | 461 | 7541.06 | 22229.91 | 3350.87 | 280.40 | 423899.41 |
| Proceeds | 504 | 53.94 | 71.77 | 30.00 | 0.70 | 550.00 |
| Age | 504 | 24.75 | 18.23 | 21.00 | 1.00 | 72.00 |
| Tie | 500 | 16.67 | 145.30 | 3.90 | -6.01 | 3187.68 |
| SPRC | 506 | 30.08 | 25.21 | 24.28 | 4.25 | 355.75 |
| MV | 506 | 2424.33 | 8101.99 | 504.34 | 8.19 | 90726.28 |
| SO | 506 | 53.31 | 103.40 | 21.24 | 1.06 | 1261.19 |

Panels B, C, and D of Table II present the same statistics for the public equity, public debt, and private debt sub-samples, respectively. Of particular interest, is the variation in the average and median valuation ratio across the sub-samples. The average (median) TSVP for the public equity sample is 0.99 (0.91). While the same ratio for the public debt and private debt samples have an average (median) of 1.13 (1.06) and 1.12 (1.06), respectively. In a univariate setting, it appears that the public equity issuers are over-valued at the time of issuance relative to their benchmark and the debt issuers are undervalued.[21] The public equity issuers also appear to be younger firms, have smaller market capitalization, smaller dividend payout ratios, smaller shareholder bases, and fewer shares outstanding, than either of the debt sub-samples.

Table III presents further evidence, in a univariate setting, of a difference in valuation as a function of the type of issue. Panel A of Table III shows the percent of observations greater than and less than 1 for each type of issue. For public equity issues, more than 62% of the issues have TSVP ratios less than 1 while only 38% are greater than 1. The difference between these is significant at the 1 percent level. While the TSVP ratio for all debt issues is greater than 1 in 55.5% of the observations, which is significantly different from the 44.5% observations that are less than 1. In Panel B, the percent of issues greater than 1.1 and less than 0.9 are examined to better understand the distribution of the valuation ratio. The results from Panel A could be driven by a large number of ratios just slightly less than or slightly greater than 1. However, when boundaries are placed around 1, equally strong evidence of over-valuation for public equity issues (64% less than 1) and under-valuation for debt issues (57% greater than 1) is found. The Kruskal-Wallis test in panel C examines if the distribution has the same location parameter across the different sub-samples. Except for the private versus public debt sub-samples the hypothesis is rejected at the 1 percent level indicating that median misvaluation is significantly different for the private debt versus public equity and public

[21] Although, the results for the two benchmarks are presented in the tables, the time-series benchmark is discussed throughout this exposition rather than the matching sample benchmark. The results from either are qualitatively similar in all cases. However, it is my contention that the time-series benchmark is a better, less noisy control. First, because it is the average value of the sample firm itself, computed for the two years prior to issue, the result is not a function of the matching algorithm chosen. Second, the matching benchmark is valued contemporaneously with the date of the issuing firms valuation ratio. Should there be an industry-wide or market-wide mis-valuation of equity, the matching firm will be subject to the same mis-valuation as the sample firm, and will be ineffective as a control.

debt versus public equity. The univariate tests reveal an apparent pattern of over-valuation for public equity issuers and under-valuation for debt issuers.

The following logistic regression equation tests how well the misvaluation measure predicts the likelihood that the firm will issue a particular type of security, in a multivariate setting. Table IV presents the coefficient estimates from the following logit regression model:

$$Issue\ Type_j = \Phi(\beta_0 + \beta_1 LnTSVP_j + \beta_2 LnCap_j + \beta_3 LnProc_j + \beta_4 LnAge_j) \quad (5)$$

where $Issue\ Type_{j,T}$ is the probability that issuer j issues one type of security or another – eg. $Issue\ Type_{j,T}$ takes on the value of 1 if the issue is debt and 0 if the issue is equity, $\Phi$ is the logistic cumulative density function, $LnTSVP_j$ is the natural log of the mis-valuation measure. The balance of the variables is intended to control for the differing size of firms, size of the issue, and the age of the issuer. $LnCap_j$ is the natural log of the market capitalization of the issuer for the year ending prior to issue, $LnProc_j$ is the natural log of the proceeds raised in the issue, $LnAge_j$ is the natural log the issuers age, and the $\beta$'s are the parameters of the logit model.

Model 1 in Table IV-A explores the choice between debt and equity. The regression has a likelihood ratio of 275.75 and a R-squared of 0.18. The coefficient for $LnTSVP_j$ is positive (1.2455) and significant at the one-percent level, i.e., firms that are more under-valued, are more likely to issue debt. Two of the control variables are also significant. Older firms and firms raising large amounts of capital are more likely to use debt than equity.

**Table III**

**Percentage of Misvaluation and Sample Comparison**

The percentage misvaluation is based on TSVP or SMVP. TSVP is computed as SVP divided by AVG12rly. SVP is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. AVG12rly is the average of the SVP ratios in relative year –1 and –2. Panel C reports the difference in magnitude of misvaluation of issuing firms relative to each other. SMVP is calculated as SVP divided by MVP. SVP is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. MVP is the variable for the matching firms and is defined as above. The Kruskal-Wallis test, a simple linear rank statistic, is used to test the difference between the three samples, private debt, public debt and public equity.

| Panel A: | Percentage of Issuing Firms with TSVP > 1 and ≤ 1 | | | | |
|---|---|---|---|---|---|
| Percentage of firms with: | Public Equity Offerings | Total Debt Offerings | Total Public Offerings | Private Debt Placements | Public Debt Placements |
| TSVP ≤ 1 | 62.43% | 44.56% | 54.18% | 44.60% | 44.52% |
| TSVP > 1 | 37.57% | 55.44% | 45.82% | 55.40% | 55.48% |
| Z – Statistic | -5.5735*** | 3.1630*** | -2.5550*** | 2.2037** | 2.2692*** |
| N | 503 | 846 | 932 | 417 | 429 |
| | Percentage of Issuing Firms with SMVP > 1 and ≤ 1 | | | | |
| SMVP ≤ 1 | 57.52% | 47.87% | 52.65% | 51.58% | 52.65 |
| SMVP > 1 | 42.48% | 52.13% | 47.35% | 48.42% | 47.35 |
| Z – Statistic | -4.3362*** | 1.3683* | -2.6312*** | 0.7113 | 1.2185 |
| N | 831 | 1034 | 1359 | 506 | 528 |

| Panel B: | Percentage of Issuing Firms with TSVP > 1.1 and < 0.9 | | | | |
|---|---|---|---|---|---|
| Percentage of firms with: | Public Equity Offerings | Total Debt Offerings | Total Public Offerings | Private Debt Placements | Public Debt Placements |
| TSVP < 0.9 | 63.64% | 43.34% | 54.91% | 43.04 | 43.65% |
| TSVP > 1.1 | 36.36% | 56.66% | 45.09% | 56.96 | 56.35% |
| Z - Statistic | -5.4272*** | 3.3253*** | -2.6024*** | 2.4752** | 2.2258*** |
| N | 396 | 623 | 703 | 316 | 307 |

| Percentage of Issuing Firms with SMVP > 1.1 and < 0.9 (Table II continued) | | | | | |
|---|---|---|---|---|---|
| SMVP < 0.9 | 58.66% | 46.95% | 53.92% | 47.11% | 46.80% |
| SMVP > 1.1 | 41.44% | 53.05% | 46.03% | 52.89% | 53.20% |
| Z - Statistic | -4.5139*** | 1.8142** | -2.6563*** | 1.2014 | 1.3625* |
| N | 695 | 886 | 1148 | 433 | 453 |

Panel C: Kruskal-Wallis Test

| TSVP | Public Debt vs. Public Equity | Private Debt vs. Public Equity | Private Debt vs. Public Debt |
|---|---|---|---|
| Chi-Square | 40.87*** | 49.01*** | 0.45 |
| | (<0.01) | (<0.01) | (0.48) |
| SMVP | | | |
| Chi-Square | 14.00*** | 16.15*** | 0.08 |
| | (<0.01) | (<0.01) | (0.78) |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

## Table IV-A

### Binary Logistic Regressions with Time Series Benchmark

Table IV-A provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LnTSVP is computed as the logged SVP divided by AVG12rly. SVP is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. PRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. AVG12rly is the average of the SVP ratios in relative year –1 and –2. LnAge is the log of the number of years the issuing firm exists. SVP is defined as the intrinsic value of the share price divided by PRC using 3-year residual income model (RIM). LnProc is the log of the total proceeds of the issue ($million). LnCap is the log of market capitalization of equity calculated as SPRC times SO, the number of shares outstanding obtain from CRSP.

Panel A: Regression Coefficients (p-values are in parentheses)

| Independent Variable | MODEL 1<br>Debt (=1) vs.<br>Equity (=0) | MODEL 2<br>Public Debt (=1) vs.<br>Public Equity (=0) | MODEL 3<br>Private Debt(=1) vs.<br>Public Equity(=0) | MODEL 4<br>Private Debt (=1) vs.<br>Public Debt (=0) |
|---|---|---|---|---|
| Intercept | -3.1566*** | -6.6838*** | -1.8436*** | 5.6104*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnTSVP | 1.2455*** | 0.9752*** | 1.3618*** | 0.1280 |
| | (<0.01) | (<0.01) | (<0.01) | (0.59) |
| LnCap | 0.0311 | 0.357 | 0.0338 | 0.0027 |
| | (0.14) | (0.17) | (0.17) | (0.92) |
| LnProc | 0.2337*** | 0.7547*** | -0.1994*** | -1.0098*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnAge | 0.8695*** | 1.0458*** | 0.7226*** | -0.5072*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| Likelihood Ratio Chi-Square | 275.75*** | 369.78*** | 141.91*** | 259.59*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| R-square | 0.18 | 0.32 | 0.14 | 0.25 |
| N | 1402 | 971 | 946 | 887 |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table IV-A continued)

| Input | Debt vs. Equity | | | Public Debt vs. Public Equity | | | Private Debt vs. Public Equity | | | Private Debt vs. Public Debt | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnTSVP | 3.475 | 2.499 | 4.830 | 2.652 | 1.734 | 4.055 | 3.903 | 2.681 | 5.683 | 1.137 | 0.715 | 1.807 |
| LnCap | 1.032 | 0.990 | 1.075 | 1.036 | 0.985 | 1.091 | 1.034 | 0.986 | 1.085 | 1.003 | 0.953 | 1.055 |
| LnProc | 1.263 | 1.140 | 1.400 | 2.127 | 1.830 | 2.473 | 0.819 | 0.723 | 0.928 | 0.364 | 0.311 | 0.427 |
| LnAge | 2.386 | 2.054 | 2.771 | 2.846 | 2.331 | 3.474 | 2.060 | 1.729 | 2.454 | 0.602 | 0.488 | 0.743 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

**Table IV-B**

**Binary Logistic Regressions with Matching Sample Benchmark**

Table IV-B provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSMVP3 is computed as the logged SVP3 divided by MVP3. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. MVP3 is the variable for the matching firms and is defined as above. LnCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP. LnProc is the log of the total proceeds of the issue ($million). LnAge is the log of the number of years the issuing firm exists.

Panel A: Regression Coefficients (p-values are in parentheses)

| Independent Variable | MODEL 1<br>Debt (=1) vs.<br>Equity (=0) | MODEL 2<br>Public Debt (=1) vs.<br>Public Equity (=0) | MODEL 3<br>Private Debt(=1) vs.<br>Public Equity(=0) | MODEL 4<br>Private Debt (=1) vs.<br>Public Debt (=0) |
|---|---|---|---|---|
| Intercept | -2.9585*** | -6.4137*** | -1.8484*** | 4.8843*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnSMVP | 0.2242*** | 0.2187** | 0.2557*** | 0.1140 |
| | (<0.01) | (0.05) | (0.01) | (0.37) |
| LnCap | 0.0438** | 0.0483** | 0.0467** | -0.0066 |
| | (0.02) | (0.03) | (0.05) | (0.78) |
| LnProc | 0.2512*** | 0.8276*** | -0.1889*** | -1.0530*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnAge | 0.6996*** | 0.7946*** | 0.6367*** | -0.2046*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| Likelihood Ratio Chi-Square | 363.77*** | 486.63*** | 181.19*** | 289.51*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| R-square | 0.18 | 0.30 | 0.13 | 0.25 |
| N | 1856 | 1352 | 1330 | 1030 |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table IV-B continued)

| Input | Debt vs. Equity | | | Public Debt vs. Public Equity | | | Private Debt vs. Public Equity | | | Private Debt vs. Public Debt | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnSMVP | 1.251 | 1.054 | 1.486 | 1.244 | 0.996 | 1.555 | 1.291 | 1.054 | 1.582 | 1.121 | 0.874 | 1.438 |
| LnCap | 1.045 | 1.009 | 1.082 | 1.049 | 1.004 | 1.097 | 1.045 | 1.001 | 1.090 | 0.993 | 0.947 | 1.042 |
| LnProc | 1.286 | 1.177 | 1.404 | 2.288 | 2.001 | 2.616 | 0.828 | 0.743 | 0.922 | 0.349 | 0.300 | 0.406 |
| LnAge | 2.013 | 1.839 | 2.204 | 2.214 | 1.959 | 2.501 | 1.890 | 1.689 | 2.116 | 0.815 | 0.709 | 0.936 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

The results are similar for Model 2, where *Issue Type*$_j$ equals 1 if the issue is public debt and 0 if the issue is public equity. *Issue Type*$_j$ equals 1 if the issue is private debt and 0 if the issue is public equity in Model 3. Again, the results are similar to Models 1 and 2, except for the *LnProc*$_j$ control variable. In Model 3 firms raising larger amounts of capital are more likely to use equity rather than private debt.

Model 4 models the choice between private debt and public debt. Older firms and firms raising larger amounts of capital are more likely to issue public debt. However, there is no significance found on the misvaluation measure. Table V-A explores the security decision choice using a multinomial regression. The results are consistent with the binary regressions.

In summary, the primary findings of the logistic regressions show that the more over-valued a firm, the more likely it will chose to issue equity, ceteris paribus. This result is robust to separating the debt issues into only public debt and only private debt.

## Table V-A

**Multinomial Logistic Regressions with Time Series Benchmark**

Table V-A provides the estimates from a logistic regression predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSTVP3 is computed as the logged SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. AVG12rly is the average of the SVP3 ratios in relative year 1- and –2. Debtrat is long-term debt (D44+D9) divided by total assets (D6). LnCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP. LnProc is the log of the total proceeds of the issue ($million). LnAge is the log of the number of years the issuing firm exists. Issue type is the type of security issued, where 1 represents private debt, 3 represents public debt, and 4 represents public equity.

Panel A: Regression Coefficients (p-values are in parentheses)

| Issue Type | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|
| Intercept | -1.8593*** | -6.9420*** | 5.0837*** |
| | (<0.01) | (<0.01) | (<0.01) |
| LnTSVP | 1.3162*** | 1.1209*** | 0.1953 |
| | (<0.01) | (<0.01) | (0.36) |
| LnCap | 0.0317 | 0.0301 | 0.0015 |
| | (0.19) | (0.23) | (0.95) |
| LnProc | -0.1540*** | 0.8332*** | -0.9871*** |
| | (0.01) | (<0.01) | (<0.01) |
| LnAge | 0.6741*** | 1.0345*** | -0.3604*** |
| | (<0.01) | (<0.01) | (<0.01) |
| Likelihood Ratio Chi-Square | 498.95*** | | |
| | (<0.01) | | |
| R-square | 0.31 | | |
| N | 1349 | | |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table V-A continued)

| Input | Issue type 1 vs. 4 | | | Issue type 3 vs. 4 | | | Issue type 1 vs. 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LSTVP | 3.729 | 2.564 | 5.424 | 3.068 | 2.008 | 4.686 | 1.216 | 0.798 | 1.852 |
| LnCap | 1.032 | 0.984 | 1.082 | 1.031 | 0.981 | 1.083 | 1.002 | 0.953 | 1.053 |
| LnProc | 0.857 | 0.758 | 0.969 | 2.301 | 1.980 | 2.674 | 0.373 | 0.320 | 0.434 |
| LnAge | 1.962 | 1.651 | 2.332 | 2.814 | 2.307 | 3.431 | 0.697 | 0.568 | 0.856 |

**Table V-B**

**Multinomial Logistic Regressions with Matching Firm Benchmark**

Table V-B provides the estimates from a logistic regression predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSMVP3 is computed as the logged SVP3 divided by MVP3. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. MVP3 is the variable for the matching firms and is defined as above. LnCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP. LnProc is the log of the total proceeds of the issue ($millions). LnAge is the log of the number of years the issuing firm exists. Issue type is the type of security issued, where 1 represents private debt, 3 represents public debt, and 4 represents public equity.

Panel A: Regression Coefficients (p-values are in parentheses)

| Issue Type | | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|---|
| Intercept | | -1.8300*** | -6.5201*** | 4.6901*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| LnSMVP | | 0.2631*** | 0.1806* | 0.0825 |
| | | (<0.01) | (0.10) | (0.49) |
| LnCap | | 0.0440** | 0.0456** | -0.0016 |
| | | (0.04) | (0.04) | (0.95) |
| LnProc | | -0.1688*** | 0.8551*** | -1.0239*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| LnAge | | 0.5997*** | 0.8001*** | -0.2004*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| Likelihood Ratio Chi-Square | 659.25*** | | | |
| | (<0.01) | | | |
| R-square | 0.30 | | | |
| N | 1856 | | | |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table V-B continued)

| Input | Issue type 1 vs. 4 | | | Issue type 3 vs. 4 | | | Issue type 1 vs. 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LSMVP | 1.301 | 1.065 | 1.589 | 1.198 | 0.965 | 1.488 | 1.086 | 0.860 | 1.371 |
| LnCap | 1.045 | 1.002 | 1.090 | 1.047 | 1.003 | 1.092 | 0.998 | 0.954 | 1.045 |
| LnProc | 0.845 | 0.760 | 0.939 | 2.352 | 2.066 | 2.677 | 0.359 | 0.313 | 0.412 |
| LnAge | 1.822 | 1.637 | 2.027 | 2.226 | 1.974 | 2.510 | 0.818 | 0.715 | 0.936 |

### 2. *Inclusion of the Pecking Order and Tradeoff Variables*

Table VI-A incorporates the variables from Table IV-A and adds additional variables to control for the static trade-off and pecking order theories. The following logistic regression equation is estimated:

$$Issue\ Type_j = \Phi(\beta_0 + \beta_1 LnTSVP_j + \beta_2 DebtDum_j + \beta_3 LnRetVar_j + \beta_4 FCF_j + \beta_5 Intang_j$$

$$+ \beta_6 DivRat_j + \beta_7 LnShrBase_j + \beta_8 LnTIE_j + \beta_9 LnCap_j + \beta_{10} LnProc_j + \beta_{11} LnAge_j) \qquad (6)$$

where $Issue\ Type_{j,T}$ is the probability that issuer j issues one type of security or another – e.g., $Issue\ Type_{j,T}$ takes on the value of 1 if the issue is debt and 0 if the issue is equity, $\Phi$ is the logistic cumulative density function, $LnTSVP_j$ is the natural log of the misvaluation measure, $DebtDum_j$ is a binary variable that equals 1 if the company's current debt ratio is below the average 10 year debt ratio and 0 otherwise, $LnRetVar_j$ is the natural log of the variance of daily returns for the year prior to the issue, $FCF_j$ is the free cash flow in \$millions, $Intang_j$ is the intangibles as a percent of total assets, $DivRat_j$ is the dividend payout rate, $LnShrBase_j$ is the natural log of the number of shares outstanding divided by the number of shareholders, and $LnTIE_j$ is the natural log of the times interest earned ratio. The balance of the variables are the same control variables as used in Equation (5).

In Model 1 the dependent variable is equal to 1 if the issue is debt and 0 if it is equity. $LnTSVP_j$ is positive (1.5029) and significant at the 1 percent level, indicating that firms are more likely to issue equity if they are over-valued. Similar to the previous models, $LnProc_j$ and $LnAge_j$ are both positive and significant at the one-percent level. I also find that $LnRetVar_j$ is negative and significant at the one-percent level. There are several possible interpretations for the volatility of returns. Higher risk firms are likely to have higher costs of debt and therefore are more likely to issue equity instead of debt. However, the debt capacity of the firm is controlled for by the times interest earned variable (LnTIE), the debt ratio dummy (DebtDUM) and the free cash flow measure (FCF). An alternative interpretation is that the LnRetVar is measuring asymmetric information and firms with lower asymmetric information issue debt. This however is inconsistent with the pecking order off theory.

The dependent variable in Model 2 equals 1 if the issue is public debt and is 0 if public equity. In this model, again $LnTSVP_j$ is positive and significant (at the one-percent level), as are $LnProc_j$ and $LnAge_j$., and $LnRetVar_j$ is negative and significant. In addition, $DebtDum_j$ and $FCF_j$ are positive and significant. The debtdum variable provides some evidence that in the choice between public debt and equity, the deviation from the historic debt level of the firm is a significant factor. Specifically, the further below its historic debt level, the more likely the firm is to issue public debt. The positive FCF indicates that higher cash flows increase the likelihood of issuing debt, possibly because the firm is better able to service the debt and therefore the cost of debt is lower than the cost of equity. Therefore, in summary, model 2 provides evidence of all three theories. The market timing theory is evidenced by the positive coefficient on the valuation ratio. The static tradeoff theory is evidenced by the positive coefficient on debtdum, and the pecking order theory is evidenced by the retvar and FCF variables, which are consistent with greater debt capacity reducing the cost of debt relative to other forms of financing.

## Table VI-A

**'Horse Race' Binary Logistic Regressions with Time Series Benchmark**

Table VI-A provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LnTSVP is computed as the logged SVP divided by AVG12rly. SVP is defined as the intrinsic value of the share price divided by PRC using the 3-year residual income model (RIM) to calculate the intrinsic value. PRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. AVG12rly is the average of the SVP ratios in relative year –1 and –2. LnCap is the log of market capitalization of equity calculated as PRC times SO, the number of shares outstanding obtain from CRSP. DebtDum is a dummy variable that takes on the value of one if the company's current debtratio is below its estimated target. It is computed as the deviation between the company's current debt ratio (long-term debt (D44+D9) divided by total assets (D6)) prior to the file or issue date and its target debt ratio (estimated by computing the average debt ratio over the previous 10 years prior to the file or issue date). LnRetVar is the log of average daily variance of the stock over the year prior to the file or issue date. FCF is free cash flow computed as income before extra ordinary items plus depreciation and amortization minus cash dividends minus additions to fixed assets (d123+d125-d127-d128). Intangibles are obtained from COMPUSTAT and are scaled by total assets (D33/D6). DivRat is the payout dividend ratio (d26/d58). LnShrBase is the log of the shareholder base computed as the number of shares outstanding divided by the number of shareholders (d25*1000/d100) (thousands). LnTIE is the log of times interest earned. LnProc is the log of the total proceeds of the issue ($million). LnAge is the log of the number of years the issuing firm exists.

Panel A: Regression Coefficients (p-values are in parentheses)

| Independent Variable | MODEL 1<br>Debt (=1) vs. Equity (=0) | MODEL 2<br>Public Debt (=1) vs. Public Equity (=0) | MODEL 3<br>Private Debt (=1) vs. Public Equity (=0) | MODEL 4<br>Private Debt (=1) vs. Public Debt (=0) |
|---|---|---|---|---|
| Intercept | -5.4715*** | -8.2914*** | -4.2212*** | 8.5234*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnTSVP | 1.5029*** | 1.2390*** | 1.6681*** | 0.1159 |
| | (<0.01) | (<0.01) | (<0.01) | (0.70) |
| DebtDum | 0.1923 | 0.4901** | 0.0937 | -0.2528 |
| | (0.21) | (0.02) | (0.60) | (0.19) |
| LnRetVar | -0.2989*** | -0.3413** | -0.2030 | 0.3697*** |
| | (<0.01) | (0.03) | (0.11) | (0.01) |
| FCF | 0.0001 | 0.0011*** | -2.32E-6 | -0.0002 |
| | (0.34) | (<0.01) | (0.99) | (0.28) |
| Intangibles | 0.3126 | -0.594 | 0.3404 | 0.2948 |
| | (0.72) | (0.58) | (0.74) | (0.78) |

| Panel A: Regression Coefficients (p-values are in parentheses) (Table VI-A Continued) | | | | |
|---|---|---|---|---|
| | MODEL 1<br>Debt (=1) vs.<br>Equity (=0) | MODEL 2<br>Public Debt (=1) vs.<br>Public Equity (=0) | MODEL 3<br>Private Debt (=1) vs.<br>Public Equity (=0) | MODEL 4<br>Private Debt (=1) vs.<br>Public Debt (=0) |
| DivRat | 0.0244 | 0.0114 | 0.0571 | 0.0280 |
| | (0.49) | (0.80) | (0.28) | (0.54) |
| LnShrBase | 0.0782 | -0.0528 | 0.1677* | 0.0220 |
| | (0.34) | (0.61) | (0.08) | (0.84) |
| LnTIE | 0.0569 | 0.0265 | 0.0779 | 0.0345 |
| | (0.43) | (0.78) | (0.33) | (0.71) |
| LnCap | 0.0152 | 0.0088 | 0.0180 | -0.0042 |
| | (0.55) | (0.78) | (0.55) | (0.89) |
| LnProc | 0.2043*** | 0.8397*** | -0.3042*** | -1.1051*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| Lnage | 0.6692*** | 0.7221*** | 0.6459*** | -0.3738*** |
| | (<0.01) | (<0.01) | (<0.01) | (0.01) |
| Likelihood Ratio Chi-Square | 159.48*** | 234.34*** | 92.21*** | 204.40*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| R-square | 0.15 | 0.31 | 0.14 | 0.28 |
| N | 952 | 645 | 626 | 633 |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table VI-A Continued)

| Input | Debt vs. Equity | | | Public Debt vs. Public Equity | | | Private Debt vs. Public Equity | | | Private Debt vs. Public Debt | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnTSVP | 4.495 | 2.907 | 6.950 | 3.452 | 1.988 | 5.995 | 5.302 | 3.196 | 8.797 | 1.123 | 0.622 | 2.026 |
| LnCap | 1.015 | 0.966 | 1.067 | 0.009 | 0.949 | 1.072 | 1.018 | 0.960 | 1.079 | 0.996 | 0.936 | 1.059 |
| DebtDum | 1.212 | 0.896 | 1.640 | 1.632 | 1.093 | 2.438 | 1.098 | 0.777 | 1.553 | 0.777 | 0.532 | 1.133 |
| LnRetVar | 0.742 | 0.592 | 0.928 | 0.711 | 0.525 | 0.962 | 0.816 | 0.637 | 1.047 | 1.447 | 1.079 | 1.941 |
| FCF | 1.000 | 1.000 | 1.000 | 1.001 | 1.000 | 1.002 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Intangibles | 1.367 | 0.250 | 7.478 | 0.552 | 0.069 | 4.417 | 1.405 | 0.189 | 10.476 | 1.343 | 0.169 | 10.685 |
| DivRat | 1.025 | 0.956 | 1.098 | 1.011 | 0.925 | 1.106 | 1.059 | 0.954 | 1.175 | 1.028 | 0.941 | 1.123 |
| LnShrBase | 1.081 | 0.922 | 1.268 | 0.949 | 0.775 | 1.161 | 1.183 | 0.979 | 1.429 | 1.022 | 0.832 | 1.256 |
| LnTIE | 1.059 | 0.921 | 1.217 | 1.027 | 0.855 | 1.234 | 1.081 | 0.925 | 1.263 | 1.035 | 0.862 | 1.243 |
| LnProc | 1.227 | 1.071 | 1.405 | 2.316 | 1.877 | 2.857 | 0.738 | 0.621 | 0.876 | 0.331 | 0.270 | 0.407 |
| LnAge | 1.953 | 1.552 | 2.456 | 2.059 | 1.517 | 2.795 | 1.908 | 1.445 | 2.518 | 0.688 | 0.511 | 0.926 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

**Table VI-B**

**"Horse Race' Binary Logistic Regressions with Sample Firm Benchmark**

Table VI-B provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSMVP3 is computed as the logged SVP3 divided by MVP3. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. MVP3 is the variable for the matching firms and is defined as above. LSCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP ($million). Debtdum is a dummy variable that takes on the value of one if the company's current debtratio is below its estimated target. It is computed as the deviation between the company's current debt ratio (long-term debt (D44+D9) divided by total assets (D6)) prior to the file/issue date and its target debt ratio (estimated by computing the average debt ratio over the previous 10 years prior to the file/issue date). Lretvar is the log of average daily variance of the stock over the year prior to the file or issue date. FCF is free cash flow computed as income before extra ordinary items plus depreciation and amortization minus cash dividends minus additions to fixed assets (d123+d125-d127-d128) ($millions). Intangibles are obtained from COMPUSTAT and are scaled by total assets (D33/D6). Divrat is the payout dividend ratio (d26/d58). Lshrbase is the log of the shareholder base computed as the number of shares outstanding divided by the number of shareholders (d25*1000/d100) (thousands). Ltie is the log of times interest earned. Lproc is the log of the total proceeds of the issue ($million). LAge is the log of the number of years the issuing firm exists.

Panel A: Regression Coefficients (p-values are in parentheses)

| Independent Variable | MODEL 1<br>Debt (=1) vs.<br>Equity (=0) | MODEL 2<br>Public Debt (=1) vs.<br>Public Equity (=0) | MODEL 3<br>Private Debt (=1) vs.<br>Public Equity (=0) | MODEL 4<br>Private Debt (=1) vs.<br>Public Debt (=0) |
|---|---|---|---|---|
| Intercept | -7.0560*** | -9.2755*** | -6.0540*** | 7.9212*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LnSMVP | 0.2426*** | 0.1606 | 0.3460*** | 0.2724* |
| | (0.04) | (0.31) | (0.01) | (0.10) |
| DebtDum | 0.0332 | 0.244 | 0.0330 | -0.009 |
| | (0.16) | (0.41) | (0.23) | (0.77) |
| LnRetVar | 0.0681 | 0.2811 | 0.0197 | -0.1952 |
| | (0.63) | (0.14) | (0.90) | (0.29) |
| FCF | -0.4486*** | -0.4413*** | -0.3436*** | 0.3665*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| Intangibles | 0.0001 | 0.0001** | -0.00004 | -0.0002 |

| Panel A: Regression Coefficients (p-values are in parentheses) (Table VI-B Continued) | | | | |
|---|---|---|---|---|
| Independent Variable | MODEL 1<br>Debt (=1) vs.<br>Equity (=0) | MODEL 2<br>Public Debt (=1) vs.<br>Public Equity (=0) | MODEL 3<br>Private Debt (=1) vs.<br>Public Equity (=0) | MODEL 4<br>Private Debt (=1) vs.<br>Public Debt (=0) |
| | (0.58) | (0.03) | (0.79) | (0.26) |
| DivRat | 0.7508 | -0.2128 | 1.0480 | 0.2763 |
| | (0.32) | (0.82) | (0.24) | (0.78) |
| LnShrBase | 0.0177 | 0.009 | 0.0355 | 0.062 |
| | (0.57) | (0.84) | (0.39) | (0.87) |
| LnTIE | 0.0878 | -0.0900 | 0.2185*** | 0.0920 |
| | (0.22) | (0.34) | (0.01) | (0.35) |
| LnCap | 0.0195 | 0.0517 | 0.0086 | 0.0277 |
| | (0.76) | (0.55) | (0.90) | (0.76) |
| LnProc | 0.2534*** | 0.9270*** | -0.2534*** | -1.1604*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| Lnage | 0.6582*** | 0.7090*** | 0.6434*** | -0.2894** |
| | (<0.01) | (<0.01) | (<0.01) | (0.03) |
| Likelihood Ratio Chi-Square | 164.93*** | 273.99*** | 72.08*** | 224.58*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| R-square | 0.14 | 0.31 | 0.09 | 0.28 |
| N | 1086 | 750 | 732 | 690 |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table VI-B Continued)

| Input | Debt vs. Equity | | | Public Debt vs. Public Equity | | | Private Debt vs. Public Equity | | | Private Debt vs. Public Debt | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnSMVP | 1.275 | 1.010 | 1.608 | 1.174 | 0.864 | 1.596 | 1.413 | 1.079 | 1.852 | 1.313 | 0.954 | 1.808 |
| LnCap | 1.034 | 0.987 | 1.083 | 1.025 | 0.967 | 1.085 | 1.034 | 0.979 | 1.091 | 0.991 | 0.934 | 1.051 |
| DebtDum | 1.071 | 0.812 | 1.411 | 1.325 | 0.911 | 1.926 | 1.020 | 0.745 | 1.396 | 0.823 | 0.571 | 1.185 |
| LnRetVar | 0.639 | 0.527 | 0.774 | 0.643 | 0.492 | 0.840 | 0.709 | 0.573 | 0.878 | 1.443 | 1.104 | 1.886 |
| FCF | 1.000 | 1.000 | 1.000 | 1.001 | 1.000 | 1.002 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 |
| Intangibles | 2.119 | 0.477 | 9.409 | 0.808 | 0.124 | 5.256 | 2.852 | 0.496 | 16.387 | 1.318 | 0.193 | 8.988 |
| DivRat | 1.018 | 0.958 | 1.082 | 1.009 | 0.925 | 1.101 | 1.036 | 0.956 | 1.123 | 1.006 | 0.936 | 1.082 |
| LnShrBase | 1.092 | 0.949 | 1.256 | 0.914 | 0.759 | 1.100 | 1.244 | 1.052 | 1.471 | 1.096 | 0.904 | 1.329 |
| LnTIE | 1.020 | 0.901 | 1.155 | 1.053 | 0.890 | 1.246 | 1.009 | 0.878 | 1.158 | 1.028 | 0.863 | 1.224 |
| LnProc | 1.288 | 1.138 | 1.459 | 2.527 | 2.074 | 3.078 | 0.776 | 0.663 | 0.909 | 0.313 | 0.256 | 0.834 |
| LnAge | 1.931 | 1.597 | 2.336 | 2.032 | 1.577 | 2.618 | 1.903 | 1.504 | 2.408 | 0.749 | 0.575 | 0.975 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

Model 3 differentiates between the choice of private debt and public equity. The mis-valuation measure is positive and significant at the one-percent level. Again indicating that over-valued firms will issue equity rather than private debt. Both $LnProc_j$ and $LnAge_j$ are significant at the one-percent level however, the sign on proceeds has changed. Firms issuing private debt are more likely to have smaller issues than firms issuing public equity. $LnShrBase_j$ is positive and significant at the ten-percent level indicating that firms with a smaller shareholder base are more likely to issue private debt.

The dependent variable of Model 4 equals 1 when the firm issues private debt and 0 if the issue is public debt. $LnTSVP_j$ is positive, however, insignificant. In this case equity valuation has no significant relation with the choice of public or private debt. The control variable for both proceeds and age is significant, while proceeds has again a negative sign. $LnRetVar_j$ is also positive and significant, at the one-percent level. This is consistent with low risk, older firms, seeking larger amounts of capital issue public debt. Again the multinomial regression in Table VII-A produces similar results.

**Table VII-A**

**'Horse Race' Multinomial Logistic Regressions with Time Series Benchmark**

Table VII-A provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSTVP3 is computed as the logged SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. LnCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP ($million). Debtdum is a dummy variable that takes on the value of one if the company's current debtratio is below its estimated target. It is computed as the deviation between the company's current debt ratio (long-term debt (D44+D9) divided by total assets (D6)) prior to the file/issue date and its target debt ratio (estimated by computing the average debt ratio over the previous 10 years prior to the file/issue date). LnRetvar is the log of average daily variance of the stock over the year prior to the file/issue date. FCF is free cash flow computed as income before extra ordinary items plus depreciation and amortization minus cash dividends minus additions to fixed assets (d123+d125-d127-d128) ($million). Intangibles are obtained from COMPUSTAT and are scaled by total assets (D33/D6). Divrat is the payout dividend ratio (d26/d58). LnShrbase is the log of the shareholder base computed as the number of shares outstanding divided by the number of shareholders (d25*1000/d100) (thousands). LnTie is the log of times interest earned. LnProc is the log of the total proceeds of the issue ($million). LnAge is the log of the number of years the issuing firm exists. Issue type is the type of security issued, where 1 represents private debt, 3 represents public debt, and 4 represents public equity.

Panel A: Regression Coefficients (p-values are in parentheses)

| Issue Type | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|
| Intercept | -3.8061*** | -9.6755*** | 5.8694*** |
| | (<0.01) | (<0.01) | (<0.01) |
| LnTSVP | 1.6037*** | 1.3466*** | 0.2572 |
| | (<0.01) | (<0.01) | (0.34) |
| LnCap | 0.0139 | 0.0185 | -0.0046 |
| | (0.63) | (0.54) | (0.88) |
| Debtdum | 0.0828 | 0.3803** | -0.2975 |
| | (0.63) | (0.04) | (0.11) |
| LnRetvar | -0.2012 | -0.4045*** | 0.2033 |
| | (0.12) | (<0.01) | (0.15) |
| FCF | 0.00001 | 0.0003* | -0.0003* |

Panel A: Regression Coefficients (p-values are in parentheses) (Table VII-A Continued)

| Issue Type | | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|---|
| | | (0.94) | (0.10) | (0.10) |
| Intangibles | | 0.4182 | -0.0979 | 0.5161 |
| | | (0.68) | (0.92) | (0.60) |
| Divrat | | 0.0495 | 0.0061 | 0.0434 |
| | | (0.29) | (0.89) | (0.32) |
| LnShrbase | | 0.1277 | 0.0058 | 0.1220 |
| | | (0.17) | (0.95) | (0.21) |
| LnTie | | 0.0765 | 0.0594 | 0.0170 |
| | | (0.34) | (0.49) | (0.84) |
| LnProc | | -0.2428*** | 0.8625*** | -1.1053*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| LnAge | | 0.5646*** | 0.7763*** | -0.2117*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| Likelihood Ratio Chi-Square | 362.01*** | | | |
| | (<0.01) | | | |
| R-square | 0.32 | | | |
| N | 952 | | | |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table VII-A Continued)

| Input | Private Debt (1) vs. Public Equity (4) | | | Public Debt (3) vs. Public Equity (4) | | | Private Debt (1) vs. Public Debt (3) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnTSVP | 4.972 | 3.043 | 8.121 | 3.844 | 2.241 | 6.595 | 1.293 | 0.760 | 2.200 |
| LnCap | 1.014 | 0.958 | 1.074 | 1.019 | 0.960 | 1.080 | 0.995 | 0.939 | 1.055 |
| DebtDum | 1.086 | 0.774 | 1.525 | 1.463 | 1.010 | 2.119 | 0.743 | 0.516 | 1.068 |
| LnRetVar | 0.818 | 0.636 | 1.051 | 0.667 | 0.505 | 0.882 | 1.225 | 0.931 | 1.631 |
| FCF | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.001 | 1.000 | 0.999 | 1.000 |
| Intangibles | 1.519 | 0.215 | 10.736 | 0.907 | 0.125 | 6.564 | 1.675 | 0.239 | 11.768 |
| DivRat | 1.051 | 0.960 | 1.151 | 1.006 | 0.922 | 1.098 | 1.044 | 0.959 | 1.137 |
| LnShrBase | 1.136 | 0.948 | 1.361 | 1.006 | 0.828 | 1.221 | 1.130 | 0.931 | 1.371 |
| LnTIE | 1.079 | 0.922 | 1.263 | 1.061 | 0.895 | 1.258 | 1.017 | 0.860 | 1.204 |
| LnProc | 0.784 | 0.667 | 0.923 | 2.369 | 1.949 | 2.880 | 0.331 | 0.272 | 0.403 |
| LnAge | 1.759 | 1.356 | 2.281 | 2.173 | 1.631 | 2.897 | 0.809 | 0.604 | 1.083 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

## Table VII-B

### 'Horse Race' Multinomial Logistic Regressions with Matching Firm Benchmark

Table VII-B provides the estimates from logistic regressions predicting type of security to issue. Coefficients are reported with P-values in parenthesis. LSMVP3 is computed as the logged SVP3 divided by MVP3. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file/issue date. MVP3 is the variable for the matching firms and is defined as above. LnCap is the log of market capitalization of equity calculated as SPRC times SPSO, the number of shares outstanding obtain from CRSP ($million). Debtdum is a dummy variable that takes on the value of one if the company's current debtratio is below its estimated target. It is computed as the deviation between the company's current debt ratio (long-term debt (D44+D9) divided by total assets (D6)) prior to the file/issue date and its target debt ratio (estimated by computing the average debt ratio over the previous 10 years prior to the file/issue date). LnRetvar is the log of average daily variance of the stock over the year prior to the file/issue date. FCF is free cash flow computed as income before extra ordinary items plus depreciation and amortization minus cash dividends minus additions to fixed assets (d123+d125-d127-d128) ($million). Intangibles are obtained from COMPUSTAT and are scaled by total assets (D33/D6). Divrat is the payout dividend ratio (d26/d58). LnShrbase is the log of the shareholder base computed as the number of shares outstanding divided by the number of shareholders (d25*1000/d100) (thousands). LnTie is the log of times interest earned. LnProc is the log of the total proceeds of the issue ($million). LnAge is the log of the number of years the issuing firm exists. Issue type is the type of security issued, where 1 represents private debt, 3 represents public debt, and 4 represents public equity.

Panel A: Regression Coefficients (p-values are in parentheses)

| Issue Type | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|
| Intercept | -5.08862*** | -10.67*** | 4.7860*** |
| | (<0.01) | (<0.01) | (<0.01) |
| LnSMVP | 0.3333*** | 0.1191 | 0.2142 |
| | (0.01) | (0.42) | (0.17) |
| LnCap | 0.0337 | 0.0353 | -0.0016 |
| | (0.22) | (0.21) | (0.96) |
| Debtdum | -0.0023 | 0.2192 | -0.2215 |
| | (0.99) | (0.22) | (0.21) |
| LnRetvar | -0.3744*** | -0.5193*** | 0.1449 |
| | (<0.01) | (<0.01) | (0.25) |
| FCF | -0.00004 | 0.0003 | -0.0003* |

Panel A: Regression Coefficients (p-values are in parentheses) (Table VII-B Continued)

| Issue Type | | Private Debt (1) vs. Public Equity (4) | Public Debt (3) vs. Public Equity (4) | Private Debt (1) vs. Public Debt (3) |
|---|---|---|---|---|
| | | (0.80) | (0.18) | (0.10) |
| Intangibles | | 0.9097 | 0.9097 | 0.6411 |
| | | (0.30) | (0.77) | (0.49) |
| Divrat | | 0.0313 | 0.0055 | 0.0258 |
| | | (0.43) | (0.88) | (0.51) |
| LnShrbase | | 0.1713** | -0.0330 | 0.2042** |
| | | (0.04) | (0.72) | (0.03) |
| LnTie | | 0.0134 | 0.0445 | -0.0311 |
| | | (0.85) | (0.58) | (0.71) |
| LnProc | | -0.2018*** | 0.9513*** | -1.1531*** |
| | | (<0.01) | (<0.01) | (<0.01) |
| LnAge | | 0.5763*** | 0.7423*** | -0.1660 |
| | | (<0.01) | (<0.01) | (0.21) |
| Likelihood Ratio Chi-Square | 387.31*** | | | |
| | (<0.01) | | | |
| R-square | 0.30 | | | |
| N | 1086 | | | |

Panel B: Odds Ratio Estimates and Confidence Intervals (Table VII-B Continued)

| Input | Private Debt (1) vs. Public Equity (4) | | | Public Debt (3) vs. Public Equity (4) | | | Private Debt (1) vs. Public Debt (3) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | | Odds Ratio | Confidence Interval limits 95% | |
| LnSMVP | 1.396 | 1.069 | 1.822 | 1.126 | 0.841 | 1.509 | 1.239 | 0.916 | 1.676 |
| LnCap | 1.034 | 0.981 | 1.091 | 1.036 | 0.980 | 1.095 | 0.998 | 0.944 | 1.056 |
| DebtDum | 0.998 | 0.731 | 1.361 | 1.245 | 0.880 | 1.762 | 0.801 | 0.565 | 1.136 |
| LnRetVar | 0.688 | 0.555 | 0.853 | 0.595 | 0.465 | 0.762 | 1.156 | 0.901 | 1.483 |
| FCF | 1.000 | 1.000 | 1.000 | 1.000 | 1.000 | 1.001 | 1.000 | 0.999 | 1.000 |
| Intangibles | 2.484 | 0.450 | 13.712 | 1.308 | 0.220 | 7.787 | 1.898 | 0.313 | 11.505 |
| DivRat | 1.032 | 0.955 | 1.115 | 1.006 | 0.934 | 1.082 | 1.026 | 0.950 | 1.108 |
| LnShrBase | 1.187 | 1.011 | 1.394 | 0.968 | 0.811 | 1.155 | 1.227 | 1.022 | 1.472 |
| LnTIE | 1.014 | 0.879 | 1.168 | 1.046 | 0.895 | 1.221 | 0.969 | 0.825 | 1.139 |
| LnProc | 0.817 | 0.704 | 0.949 | 2.589 | 2.151 | 3.116 | 0.316 | 0.261 | 0.382 |
| LnAge | 1.779 | 1.429 | 2.216 | 2.101 | 1.648 | 2.678 | 0.847 | 0.655 | 1.096 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

### 3. *The Frank and Goyal Model Revisited*

To examine the evidence against the pecking order theory provided by Frank and Goyal (2003) their model is extended by interacting the financing deficit variable with the valuation measure from the residual income model. However, as mentioned before, market-to-book value is also often used as a measure of firm valuation. Therefore, it is of interest to see what the correlation is between market-to-book ratios and LTSVP3. Table VIII shows the correlation between market-to-book value, the changes in market-to-book value and the valuation measures. The correlation between market-to-book value and the various valuation measures is negative. More specifically, the correlation between the time series valuation ratio LTSVP3 and the market-to-book ratio is -0.13. Consistent with the findings of Lee et al. (1999), this seems to suggest that the market-to-book ratio is not a very robust measure for firm value and that measures based upon earnings and time varying interest rates are better proxies.

## Table VIII
## Correlation Between Market-to-Book and Valuation Ratios

The sample includes all issuers of private debt, public debt and public equity during the period from 1980 to 1998 that meet the parameters discussed in the Data section of the paper. MTB_0 value is the market value of equity divided by the book value of equity at year t, at the file/issue year. MTB value is the market value of equity divided by the book value of equity at year t-1. Δ Market-to-Book is the difference between MTB_0 minus MTB_1. Valuation Ratio is the value, as computed by the Residual Income Model, of equity divided by share price. Time-series Valuation Ratio is the Valuation Ratio, scaled by the average of the valuation ratio for the two years prior to the issue. Matched Sample Valuation Ratio is the Valuation Ratio scaled by the valuation ratio for an industry and size matched firm that did not issue.

| | MTB_1 | MTB_0 | Δ Market-to-Book | Valuation Ratio | Time-series Valuation Ratio | Matched Sample Valuation Ratio |
|---|---|---|---|---|---|---|
| Market-to-Book_1 | 1.00 | --- | --- | --- | --- | --- |
| Market-to-Book_0 | 0.42 | 1.00 | --- | --- | --- | --- |
| | (<0.01) | | | | | |
| Δ Market-to-book | 0.07 | 0.93 | 1.00 | --- | --- | --- |
| | (0.01) | (<0.01) | | | | |
| Valuation Ratio | -0.28 | -0.17 | -0.08 | 1.00 | --- | --- |
| | (<0.01) | (<0.01) | (<0.01) | | | |
| Time-series Valuation Ratio | -0.27 | -0.13 | -0.14 | 0.44 | 1.00 | --- |
| | (0.33) | (<0.01) | (<0.01) | (<0.01) | | |
| Matched Sample Valuation Ratio | -0.15 | -0.07 | -0.02 | 0.59 | 0.23 | 1.00 |
| | (<0.01) | (<0.01) | (0.38) | (<0.01) | (<0.01) | |

Table IX includes the measure of misvaluation in the Frank and Goyal model. The following regression model is estimated:

$$NetDebt_I = \beta_0 + \beta_1(DEF_i * USTVP_i) + \beta_2(DEF_i * OSTVP_i) + \beta_3\Delta T_i + \beta_4\Delta MTB_I + \beta_5\Delta\ln S_i + \beta_6\Delta P_i + \varepsilon_i \quad (7)$$

where $NetDebt_i$ is the net amount of debt issued (COMPUSTAT variables D111-D114), $DEF_i$ is the firm's financing deficit computed as dividend plus net investment plus the change in working capital minus cash flow after interest and taxes[22], $\Delta T_i$ is the change in tangible assets divided by total assets, $\Delta MTB$ is the change in market-to-book value defined as the ratio of market value of assets over book value of assets, $\Delta \ln S_i$ is the change in the natural log of net sales, and $\Delta P_i$ is the change in profitability defined as operating income over total assets. Financing deficit is interacted with the amount of misvaluation of the firm's equity at the file/issue date. $USTVP_i$ takes on the value of one when the firm is undervalued relative to its benchmark, and zero otherwise, while $OSTVP_i$ takes on the value of one when the firm is overvalued relative to its benchmark, and zero otherwise. In addition, a similar regression based on misvaluation quartiles is estimated. The interaction variables based on the quartiles are defined similarly. Again, the regression models are estimated with both benchmarks, the two-year average TSVP prior to the sample firm's issue year and the matching firm benchmark.

In Model 1, the NetDebt variable is regressed on the conventional leverage variables and financing deficit. Unlike the Frank and Goyal sample, this sample consists of only those firms that issue either equity (44% of the sample) or debt. Therefore, it is

[22] For a complete breakdown of the COMPUSTAT variables used in the computation see Frank and Goyal (2003).

**Table IX**
**Pecking Order Regression Analysis**

The sample includes all issuers of private debt, public debt and public equity during the period from 1980 to 1998 that meet the parameters discussed in the Data section of the paper. The dependent variable in all the following regressions is the net amount of debt issued (NETDEBT) (Compustat variables D111-D114). In Model 1 NETDEBT is regressed on the financing deficit (defined as in Frank and Goyal, 2003), the change in tangible assets (scaled by total assets), the change in market-to-book defined as the ratio of market value of assets over book value of assets, the change in the natural log of sales, and the change in profitability defined as operating income scaled by total assets. In Models 2 through 5 the Financing Deficit variable is interacted with the amount of misvaluation of the firm's equity at the file/issue date. For Models 2 and 3, the measure of misvaluation is the value-to-price ratio for the sample firm benchmarked by the average of the same ratio for the sample firm two years prior to the issue. Models 4 and 5 benchmark the sample firms value ratio with a ratio for an industry and size matched firm that did not issue. Under-valued Deficit is the financing deficit if the firm is under-valued relative to the benchmark, and zero otherwise. Over-valued Deficit is the financing deficit if the firm is over-valued relative to the benchmark, and zero otherwise. The quartile variables are defined similarly. P-values are reported in parenthesis.

Panel A: Regression Models

| | | Time-series Benchmark | | Match Sample Benchmark | |
|---|---|---|---|---|---|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 |
| Intercept | -0.00014 | -0.00048 | -0.00023 | -0.00003 | -0.00031 |
| | (0.96) | (0.85) | (0.93) | (0.99) | (0.90) |
| Financing Deficit | 0.39786*** | --- | --- | --- | --- |
| | (<0.01) | | | | |
| Under-Valued Deficit (1) | --- | 0.52181*** | --- | 0.44112*** | --- |
| | | (<0.01) | | ( <0.01) | |
| Over-Valued Deficit (2) | --- | 0.32027*** | --- | 0.36407*** | --- |
| | | (<0.01) | | ( <0.01) | |
| Under-Valued Lower Quartile (A) | --- | --- | 0.49360*** | --- | 0.36500*** |
| | | | (<0.01) | | ( <0.01) |
| Under-Valued Middle Quartile (B) | --- | --- | 0.54024*** | --- | 0.46295*** |
| | | | (<0.01) | | ( <0.01) |
| Over-Valued Middle Quartile (C) | --- | --- | 0.38969*** | --- | 0.38081*** |
| | | | (<0.01) | | ( <0.01) |
| Over-Valued Upper Quartile (D) | --- | --- | 0.24153*** | --- | 0.30193*** |
| | | | (<0.01) | | ( <0.01) |
| Δ Tangibles | 0.06462*** | 0.06070*** | 0.05495*** | 0.06465*** | 0.07087*** |
| | (<0.01) | (<0.01) | (<0.01) | ( <0.01) | ( <0.01) |
| Δ Market-to-book | -0.00709*** | -0.00604*** | -0.00525*** | -0.00685*** | -0.00630*** |
| | (<0.01) | (<0.01) | (<0.01) | ( <0.01) | ( <0.01) |
| Δ ln Sales | 0.00578*** | 0.00592 | 0.00738 | 0.00622 | 0.00933 |
| | (<0.01) | (0.57) | (0.48) | (0.56) | (0.38) |
| Δ Profitability | -0.24230*** | -0.22673*** | -0.21485*** | -0.24053*** | -0.24361*** |
| | (<0.01) | (<0.01) | (<0.01) | ( <0.01) | ( <0.01) |
| Adjusted $R^2$ | 0.3029 | 0.3092 | 0.3202 | 0.3057 | 0.2977 |
| F-Test | 112.96 | 95.38 | 75.48 | 95.53 | 69.26 |
| N | 1289 | 1266 | 1266 | 1289 | 1289 |

Panel B: Test Difference of Coefficients (Table IX continued)

| | | | | |
|---|---|---|---|---|
| F test: Coefficient 1=2 | 34.97*** | --- | 6.15*** | --- |
| | ( <0.01) | | ( <0.01) | |
| F test: Coefficient A=B | --- | 0.82 | --- | 4.21** |
| | | (0.36) | | (0.04) |
| F test: Coefficient B=C | --- | 9.06*** | --- | 2.70* |
| | | ( <0.01) | | (0.10) |
| F test: Coefficient C=D | --- | 14.01*** | --- | 3.83** |
| | | ( <0.01) | | (0.05) |
| F test: Coefficient A=D | | 36.91*** | | 2.43 |
| | | ( <0.01) | | (0.12) |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

not expected to see a coefficient of one as predicted by the pecking order theory, rather it should be 0.66 for the full sample. Similar to the FG result, all the independent variables have the expected sign and are significant at the one-percent level. The coefficient on financing deficit is larger (0.398) compared to F/G results (0.125) indicating that this sample of issuing firms more closely follows the pecking order theory. In addition, the model shows an insignificant intercept and an $R^2$ of 0.306 (F/G 0.219). Although, in this sample financing deficit better explains net debt issues and the importance of the conventional leverage variables cannot be dismissed.

Models 2 and 4 incorporate the valuation-financing deficit interacted variable in the regression.[23] Both, the under-valued variable coefficient (0.52181) and the over-valued variable coefficient (0.32027) are significant at the one-percent level. The two coefficients are also significantly different from each other at the one-percent level. This provides evidence that undervalued firms are more likely to issue debt to reduce their

[23] Models 2 and 3 use the time-series benchmark and Models 4 and 5 use the matching sample benchmark. Again, only the results of the time-series benchmark are discussed in the text of the paper. The matching sample benchmark results are presented in the table, however, for reasons discussed earlier, less emphasis is placed on this benchmark.

financing deficit, while overvalued companies are more likely to resort to equity issuance. All the other independent variables remain significant at the one-percent level except for the change in the natural log of net sales indicating that the conventional leverage variables are still playing a significant role in the security decision choice.

To test the robustness of the specification of Model 2, the financing deficit variable is divided into quartiles, based upon misvaluation of the firm's equity (Model 3 and 5). In Model 3, the coefficients of all the quartile variables are significantly different from each other, except the difference between the two lower quartiles. This provides further evidence that firms that are overvalued are more likely to issue equity. The coefficients of the change in tangibility, the change in market-to-book ratio and the change in profitability are also still significant at the one-percent level, while the change in the log of net sales remains insignificant. Thus, by separating out the over- and under-valued firms I find that the sensitivity of debt issues to the financing deficit is directly related to the degree to which equity is overvalued. The Frank and Goyal result, that net equity issues track the financing deficit more closely than do net debt issues may be interpreted as evidence in favor of the market timing hypothesis of capital structure rather than as evidence against the pecking order theory.

## *E. Conclusions*

This paper examines directly the impact of equity valuation relative to price on the security issuance decision by using a residual income model to measure equity value. This approach has the advantage over the use of market-to-book ratios as a proxy for valuation, that it allows separation of the effects of growth opportunities and misvaluation. This cannot be achieved through the use of market-to-book ratios alone. Using this method of measuring misvaluation, the security decision choice is examined in light of the extant theories of capital structure, including the market timing hypothesis. This study finds evidence indicating that firm managers use timing strategies based upon misvaluation of common equity when issuing straight debt or common equity.

The analysis uses three different approaches. First, I test how well the misvaluation measure predicts the likelihood that managers will issue a particular type of security, using a logistic regression. The empirical results indicates that firms that are overvalued are more likely to issue equity, while those that are undervalued issue debt. These results are consistent with the market timing hypothesis of capital structure.

Second, I am running a horse race in which the three theories of capital structure have an opportunity to reveal their relative impact on the security issuance decision. As a result, the outcome is not restricted to finding results in favor of just one theory. It is perfectly plausible that all the theories may be operating together at some time. Again, the results demonstrate evidence consistent with the market timing hypothesis of capital structure. Firms that are overvalued are more likely to issue equity, while undervalued firms tend to issue debt. In addition, the results also find some support the static tradeoff theory and pecking order theory. Firms that are below the historic debt level will issue debt, after controlling for market valuation. Furthermore, firms that presumably have a lower cost of debt will issue debt rather than equity.

Third, the Frank and Goyal study is examined in light of market timing. The evidence indicates that the sensitivity of debt issues to the financing deficit is directly related to the degree to which equity is overvalued. Greater overvaluation implies equity issuance, and only for undervalued firms the response to the financing deficit is much more in line with the pecking order theory.

The security issuance choice between public and private debt is determined more by the characteristics of the firm than the level of misvaluation. The younger, riskier firms, seeking smaller amounts of capital tend to place debt in private markets, given that firms issue straight debt.

In summary, although this study does not reject the two main theories of capital structure, it is evident that valuation of equity plays a major role, if not a dominant role, in the security decision choice. These results are consistent with the Baker and Wurgler ad hoc theory of market timing which asserts that capital structure is the cumulative outcome of past attempts to time the equity market.

However, future research to further examine the timing hypothesis of capital structure is desirable. One useful approach to gain more insight into the nature of timing would be to investigate the firm's stock performance after the issuance of overvalued equity. If firms issue common equity securities to invest the proceeds in positive NPV project the firm's long-term stock performance should increase. However, if firms issue equity just to take advantage of the overvaluation, the long-term stock performance is expected to decline.

REFERENCES


Asquith, Paul and David W. Mullins, 1986, Equity issues and offering dilution, *Journal of Financial Economics*, 15, 61-89.

Baker, Malcom, and Jeffrey Wurgler, 2000, The equity share in new issues and aggregate stock returns, *Journal of Finance* 55, 2219-2257.

Baker, Malcom, and Jeffrey Wurgler, Market Timing and Capital Structure, *Journal of Finance,* 56, 1-32.

Bayless, Mark, and Susan Chaplinsky, 1996, Is there a window of opportunity for seasoned equity issuance? *Journal of Finance*, 51, 253-78.

Brennan, Michael, and Alan Kraus, 1988, Efficient financing under asymmetric information, *Journal of Finance*, 42, 1225-1243.

Brown, Stephen and Jerold Warner, 1980, Measuring security price performance, *Journal of Financial Economics* 8, 205-258.

Brown, Stephen and Jerold Warner, 1985, Using daily stock returns: The case of event studies, *Journal of Financial Economics* 14, 3-31.

Choe, Hyuk, Ronald Masulis, and Vik Nanda, 1993, Common stock offerings across the business cycle: Theory and evidence, *Jouncal of Financial Economics* 8, 3-29.

Corrado, Charles J. and Terry L. Zivney, 1992, The specification and power of the sign test in event study hypothesis test using daily stock returns, *Journal of Financial and Quantitative Analysis* 27, 465-478.

Dann, L.Y. and W.H. Mikkelson, 1984, Convertible debt issuance, capital structure change and financing-related information: Some new evidence, *Journal of Financial Economics* 13, 157-186.

D'Mello, Ranjan, and Pervin K., Shroff, 2000, Equity undervaluation and decisions related to repurchase tender offers: An empirical investigation, *Journal of Finance*, 55, 2399-2425.

Eckbo, B.E., 1986, Valuation effects of corporate debt offerings, *Journal of Financial Economics* 15, 119-151.

Fama Eugene F., and Kenneth R. French, 1997, Industry cost of equity, *Journal of Financial Economics* 43, 153-193.

Frank, Murray, and Vidhan Goyal, 2003, Testing the pecking order theory of capital structure, *Journal of Financial Economics,* 67, page 175-382.

Goh, Jeremy, Michael J., Gombola, Hei Wai Lee, and Feng-Ying Liu, 1999, Private placement of common Equity and Earnings Expectations, *The Financial Review*, 34, 19-32.

Graham, John R., and Campbell R. Harvey, 2001 The theory and practice of corporate finance: Evidence from the field, *Journal of Financial Economics*, 60, 187-243.

Harris, Milton, and Artur Raviv, 1991, The theory of capital structure, *Journal of Finance*, 46, 297-355.

Hertzel, Michael, and Richard L. Smith, 1993, Market discounts and shareholder gains for placing equity privately, *Journal of Finance*, 48, 459-485.

Hovakimian, Armen, Tim Opler, and Sheridan Titman, 2001, The debt-equity choice, *Journal of Financial and Quantitative Analysis*, 36,

Jindra, Jan, 2000, Seasoned equity offerings, overvaluation, and timing, Working Paper.

Jung, Kooyul, Kim, Yong-Cheol, and Stulz Rene M., 1996, Timing, investment opportunities, managerial discretion, and the security issue decision, *Journal of Financial Economics*, 42, 159-185.

Kaplan, Steven N., and Richard S. Ruback, 1995, The valuation of cash flow forecasts: An empirical analysis, *Journal of Finance*, 50, 1059-1093.

Kim, Moonchul, and Jay R. Ritter, 1999, Valuing IPOs, *Journal of Financial Economics*, 53, 409-437.

Korajczyk, Robert A., Deborah J. Lucas, and Robert L. McDonald, 1991, The effect of information releases on the pricing and timing of equity issues, *Review of Financial Studies*, 4, 685-708.

Krasker, William S., 1986, Stock price movements in response to stock price issues under asymmetric information, *Journal of Finance, 41, 93-105.*

Lee, Charles M.C., James Myers, and Bhaskaran Swaminathan, 1999, What is the intrinsic value of the Dow, *Journal of Finance*, 54, 1693-1741.

Leland, Hayne E., and David H. Pyle, 1977, Informational asymmetries, financial structure, and financial intermediation, *Journal of Finance* 32, 371-387.

MacKinlay, A. Craig, 1997, Event studies in economics and finance, *Journal of Economic Literature* 35, 13-39.

Masulis, Ronald W., 1980, The effects of capital structure change on security prices, *Journal of Financial Economics*, 8, 139-178.

Masulis Ronald W., and A. Korwar, 1986, Seasoned equity offerings: An empirical investigation, *Journal of Financial Economics*, 15, 91-118.

Mikkelson, W.M., and M.M. Partch, 1986, Valuation effects of security offerings and the issuance process, *Journal of Financial Economics*15, 31-60.

Myers, Stewart C., 1984, The capital structure puzzle, *Journal of Finance*, 39, 575-592.

Myers, Stewart C., Majluf, Nicholas S., 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 13, 187-221.

Narayanan, M.P., 1988, Debt versus equity under asymmetric information, *Journal of Financial and Quantitative Analysis* 23, 39-51.

Noe, T., 1988, Capital structure and signaling equilibria, *Review of Financial Studies* 1, 331-356.

Ohlson, James A., 1990, A synthesis of security valuation theory and the role of dividends, cashflows, and earnings, *Contemporary Accounting research*, 6, 648-676.

Ohlson, James A., 1995, Earnings, book values, and dividends in equity valuation, *Contemporary Accounting research*, 11, 661-687.

Penman, Stephen H., and Theodor Sougiannis, 1998, A comparison of dividend, cash flow, and earnings approaches to equity valuation, *Contemporary Accounting research*, 15, 343-383.

Ross, Stephen A., 1977, The determination of financial structure: The incentive signaling approach, *Bell Journal of Economics* 8, 1-32.

Shyam-Sunder, Lakshmi, and Stewart C. Myers, 1999, Testing static tradeoff against pecking order models of capital structure, *Journal of Financial Economics*, 51, 219-244.

Szewczyk, Samual H., and Raj Varma, 1991, Raising capital with private placements of debt, *Journal of Financial Research*, 14, 1-13.

Taggart, Robert A., A model of corporate financing decisions, *Journal of Finance*, 32, 1467-1484.

Wruck, Karen, 1989, Equity ownership concentration and firm value: evidence from private equity financings, *Journal of Financial Economics*, 23, 3-28.

Zechner, Josef, Tax clienteles and optimal capital structure under uncertainty, *Journal of Business* 63, 465-491.

# CHAPTER 2

## *Valuation Errors in Equity and the Motives for Issuing Convertible Debt*

### *A. Introduction*

The purpose of this paper is to examine managerial motives behind the issuance of convertible debt securities. Previous literature analyzing the security choice decision mainly focuses on the choice between straight debt and common equity. However, examining hybrid securities such as convertible debt can add to the understanding of why firm managers choose to issue a specific security type. The hybrid nature of convertible debt comes from the fact that it possesses both the fixed income characteristics of straight debt as well as the potential to increase in value by the conversion feature to common equity. Since the convertible bond exhibits characteristics of both (simple) securities, what then is the motive of management to issue convertible debt instead of straight debt or common equity? Although, there is no unified theory that explains the motives for convertible debt as the security choice, the literature provides several hypotheses.

First, the risk-shifting or asset-substitution hypothesis as proposed by Green (1984) argues that issuance of convertible debt reduces the agency conflict between bondholders and stockholders. When a firm has risky debt outstanding managers can transfer wealth from bondholders to stockholders by over-investing in risky projects. Adverse investment decisions can be mitigated, assuming full conversion, by increasing the proportion of common equity owned by convertible debt holders. Brennan and Schwartz (1988) examine the convertible debt issues in light of risk-shifting using an asymmetric information based argument. They argue that the underlying motivation to issue convertible bonds is induced by the value of the bond's relative insensitivity to company risk.

Second, the backdoor-equity hypothesis articulated by Stein (1992) asserts that issuance of convertible debt is an indirect form of equity financing chosen to alleviate the adverse selection costs associated with asymmetric information. It provides an alternative financing vehicle which is able to lower the high expected cost of financial distress associated with a debt issue and, at the same time, avoid some of the large negative announcement costs observed with an equity issue.

The third hypothesis explaining the convertible debt issue choice conjectures that convertible debt can be used as a means to lower coupon interest rates. Billingsley and Smith (1996) conduct a survey and report that firm managers primarily choose to issue convertible debt to lower the coupon interest rate, thus using the issue as a so called straight debt-sweetener. Empirical evidence reveals contrary results with regard to these hypotheses and the question why managers choose to issue convertible debt has to be resolved yet.[24]

An alternative way to address the convertible debt subject is by analyzing the timing of issuance. Several researchers have analyzed whether market-related strategies such as hot issue markets also apply to convertible debt issues. Alexander, Stover, and Kuhnau (1979) estimate the relationship between convertible debt issues and lagged equity market returns. Although, they are able to predict very short periods of hot and

[24] Billingsley, Lamy, and Thompson (1988) find evidence that balance sheets of convertible debt issuers are more like those of debt than equity issuers. However, their risk/return complexion is more like that of equity issuers. Brennan and Schwartz (1988) show that firms with high uncertainty about their equity risk issue convertible debt as a substitute for straight debt in order to reduce the effects of adverse selection costs. Billingsley and Smith (1996) report that debt-sweetening is the most important reason for firm managers to issue convertible debt. They also report a declining trend on issuance of convertible debt as delayed equity.

cold markets for convertible debt issues, their evidence does not indicate that conversion features are more appealing when equity markets have risen. They provide two explanations for their findings (1) firms are probably not able to exploit the short periods of favorable issuing time, or (2) motives other than minimizing the marginal cost of capital are more important in the convertible debt decision choice. Mann, Moore and Ramanlal (1999) also examine the timing issue and observe that variation around the mean of total aggregate convertible debt issues in the period from 1966 to 1993 is significant, suggesting that timing plays a role in the security choice. They report that firms issue convertible debt when equity markets have risen or when market interest rates have increased. They interpret the results as evidence for the existence of 'hot issue markets'. Their analysis does not find support for the backdoor-equity hypothesis.

In addition to the above mentioned theories there are several empirical studies reporting that the average stock price reaction to convertible debt issue announcements lies somewhere between the average stock price reaction of straight debt and that of common equity offers.[25] These results imply that convertible debt issuers might have characteristics of both, common equity and straight debt issuers. Lewis, Rogalski and Seward (1999), henceforth LRS, examine the characteristics of convertible debt issuers based upon the likelihood that the bond is converted into common equity. Consistent with the risk shifting and backdoor equity hypothesis, their evidence indicates that convertible debt is either issued as a substitute for common equity or as a substitute for straight debt. Firms with valuable, risky investment opportunities are more likely to issue convertible debt as a substitute for straight debt, while firms with valuable investment

[25] See Dann and Mikkelson (1984), Mikkelson and Partch (1986), Eckbo (1986), Essig (1991) and Asquith (1995).

opportunities, but a large degree of asymmetric information, are more likely to use convertible debt issues as a substitute for common equity.

This paper investigates the existing theories explaining managerial motives behind the issuance of convertible debt securities. Using the method developed by LRS (1999) to distinguish between 'debt-like' issuers and 'equity-like' issuers of convertible debt, we test whether valuation errors at the time of the security issue announcement date play a significant role in the security decision choice. The conjecture is that levels of misvaluation within the convertible debt sample might vary significantly among debt-like and equity-like convertible debt issues because of different underlying reasons determining the security choice.

This study analyzes the motivation behind the issuance of convertible debt securities with a sample of U.S. convertible bonds issued between 1971 and 1998. The backdoor equity hypothesis, the risk-shifting hypothesis, and the timing hypothesis are tested using valuation errors at the time of security issuance. The empirical findings are consistent with the backdoor equity hypothesis and the risk-shifting hypothesis. However, no evidence is found to support the timing hypothesis.

The paper proceeds as follows. Section B reviews the literature on convertible debt and develops the hypotheses, section C describes the data and method, section D reports the results, and section E concludes.

## B. *Convertible Debt Theories; Literature Review and Hypotheses Development*

### 1. *The Risk-shifting Hypothesis*

The general consensus concerning the motivation to issue convertible debt among financial practitioners for a long time was that convertible debt is a cheaper form of financing compared to straight debt or common equity. The idea was that it allowed management to issue a security with a coupon rate below that of straight debt and that stock could be sold at a premium over the current stock price. Brennan and Schwartz (1988) point out that this is an erroneous belief and provide an example showing that the argument holds only because convertible bonds are compared to straight debt when company performance is poor and are compared to common equity when the firm performs well. In addition, the cost of the convertible bond is higher than just the coupon interest rate because of the attachment of conversion rights. A better way to look at its costs is as a weighted average of the explicit interest charges and the implicit opportunity costs associated with the equity option. If convertible debt is not just a cheaper source of financing, than the question remains why do firms issue convertible debt?

The risk-shifting hypothesis may provide one explanation to this puzzle. Green (1984) develops the risk-shifting theory using an agency-based argument, while Brennan and Schwartz's (1988) argument is based on asymmetric information. The agency-based version of the risk-shifting theory states that when a firm has risky debt outstanding shareholders can transfer wealth from bondholders by over-investing in risky projects. The increased risk associated with these projects is borne by the bondholders. When the project returns the expected higher cash flows, the profits accrue to the shareholders.

Green develops a model in which he demonstrates that convertible debt can mitigate the agency costs induced by the negative effects when risky debt is issued.

The reasoning of Brennan and Schwartz (1988) is based on the premise that the advantage of convertible debt as the security choice over straight debt or common equity stems from the fact that its value is relative insensitive to changes in company risk. Firms with high operating risk and hard to determine risks associated with future operations usually face high cost of straight debt. The value of a bond will decrease with an increase in risk, i.e. debt will become more expensive as a source of financing for the firm. Attaching a conversion option to the bond, i.e. issuing convertible debt, the cost of external financing can be reduced. Firms with higher operating and financial risk usually face more volatile stock prices. The higher cost of debt is mitigated by the increase in the value of the option induced by greater stock volatility.[26] Brennan and Schwartz postulate that firms issuing convertible debt are perceived to be risky by the market because their operating risk and/or investment policy is hard to assess. Several empirical studies support the risk-shifting hypothesis as an explanation for managerial motives to issue convertible debt. Mikkelson (1981) examines stock return patterns after convertible debt calls and reports that highly levered firms (read high risk) with high growth opportunities (i.e. more uncertain future operations) are more likely to issue convertible debt. Chew (1984) reports similar findings. His evidence indicates that on average those firms which are younger, smaller, more rapidly growing, and are having higher market and earnings variability issue convertible debt. Lewis et al. (1998) analyze the convertible debt design to more fully understand the motives underlying the convertible debt security choice.

---

[26] See Black and Scholes (1972) option pricing model for the relationship between the value of the option and volatility.

Consistent with the risk-shifting hypothesis, they report that convertible bonds are constructed such that the greater the opportunity for stockholders to expropriate bondholder value through risk increasing investment projects, the larger the proportion of common equity owned by convertible bondholders, assuming full conversion. Firms with high debt levels must give a larger proportion of equity ownership to debt holders in order to reduce risk-shifting incentives.

According to the risk-shifting hypothesis the advantage of convertible debt over straight debt or common equity stems from the fact that it can (1) resolve conflicts between bondholders and shareholders with regards to adverse investment decisions, and (2) mitigate the high costs of debt associated with uncertainty about a firm's existing and future operating risk. Note that the stock price at the time of the security decision choice has no influence on the security decision choice. Based on the predictions of the risk-shifting hypothesis, I hypothesize that valuation errors of equity at the security issue announcement date are random and no systematic under- or over-valuation is expected.

### 2. *The Backdoor Equity Hypothesis*

The backdoor equity hypothesis, as proposed by Stein (1992), is an asymmetric based information theory in which a firm's equity value at the time of the security decision choice plays an important role. The premise is that firms with high financial distress costs and high uncertainty about their equity risk resort to convertible debt as a backdoor to increase the amount of equity in their capital structure. Firms use this alternative way of financing to avoid the costs of financial distress associated with high leverage and to reduce the negative announcement effects reported with the sale of common equity. Consistent with the backdoor equity hypothesis are the results of early surveys that try to explain management's motivation for using convertible debt. Pilcher (1955) finds that 82% of the survey's respondents mentioned delayed equity as the main reason to issue convertible debt. Brigham (1966) reports similar results; in his survey 73% of the respondents chose convertible debt as a delayed equity issue, while 27% chose convertible debt to lower the coupon rate. Hoffmeister's (1977) survey also mentioned delayed equity and reduction of coupon rate as the two main reasons to issue convertible bonds. However, there was not a clear distinction between these two motives.

An important implication of the backdoor equity hypothesis is that firms only issue convertible debt if they are optimistic about the future outlook of the firm, i.e. they expect the stock price to go up so debt will be converted into common equity. In practice there are two possible ways conversion takes place. One, investors can convert their bonds voluntarily into common equity when the stock price reaches the conversion price or two, firm managers can force conversion by calling back the bond if a call feature is attached to the issue. Most convertible bonds are issued with a call feature attached to them. Stein (1992) points out that this call feature cannot be explained by the risk-shifting theory, but is clearly justified by management's use of convertible debt as a backdoor to increase the amount of equity in their capital structure.

Assuming the motivation behind a convertible debt issue is to increase equity capital, one would expect those firms with high costs of financial distress, i.e. highly levered firms, with good investment opportunities, and undervalued equity to issue (callable) convertible debt. Empirical evidence for this implication of the backdoor equity hypothesis is provided by several studies. Broman (1963) reports that firms issuing convertible debt have higher debt/equity ratios than firms issuing straight debt. Essig (1991) examines the characteristics of convertible debt issuers and finds that firms issuing convertible debt have, on average, high debt ratios, large growth opportunities, and volatile cash flows, which are proxies for high financial distress costs and high asymmetric information. Billingsley et al. (1988) analyze the security decision choice between straight debt, convertible debt and common equity and model convertible debt in comparison with straight debt and with common equity. Their poorest performing model is convertible debt versus common equity. They interpret these results as being consistent with the backdoor equity hypothesis. Due to the similarity of both securities, they reason that convertible debt is issued as a substitute for common equity. Lewis et al. (1999) examine an 'equity like' sample of convertible debt issuers, i.e. a sample of issuers that substitute convertible debt for common equity. Consistent with the backdoor equity hypothesis, their evidence indicates that convertible debt issuers have more profitable investment opportunities and face higher asymmetric information than equity issuers. However, with regards to the financial distress costs argument, their evidence is mixed. Convertible debt issuers do not portray the expected higher debt levels. In fact, their evidence indicates the opposite, equity issuers are more highly levered than convertible debt issuers.

The implication of the backdoor equity theory that the bond is expected to be converted into equity before or at maturity has empirical support in the literature. Asquith (1991) reports that large fractions of convertible bonds are converted into equity relatively fast after the issue and eventually two-thirds of all convertible debt issues in his sample are converted. Lewis et al. (1998) examine the security design of convertible debt and find that convertible debt issues have less call protection than straight debt issues and that the shorter the call protection, the better the future prospects of the firm. In addition, those issues with high levels of post conversion equity have on average lower conversion premiums and are of shorter maturities, i.e. have a higher probability of conversion.

According to the backdoor equity hypothesis, convertible debt is only issued when managers are more optimistic than investors about future stock price performance. Thus, while firm managers would rather issue equity, they issue convertible debt instead due to their perceived undervaluation of equity. Therefore, I hypothesize that valuation errors of equity are expected to have a significant impact in explaining the security decision choice when convertible bonds are issued as a substitute for common equity.

### 3. *Convertible Debt as a Sweetener of Coupon Interest Rates*

The debt sweetener hypothesis of convertible debt assumes that firm managers issue this hybrid security to lower the coupon interest rate of the bond. Investors are willing to pay a premium for the option allowing them, when specific conditions are met, to convert the bond into common equity. Therefore, all else equal, the coupon rate of the convertible bonds is lower than that of a straight bond.

The early surveys conducted in the 1950s and 1960s examining management motivation to issue convertible debt, find that only about 21% of the respondents report lowering of the bond's coupon rate as the most important reason to issue convertible debt. In those years delayed equity was given as the most important reason to explain the choice of convertible debt. Using a later sample of issuing firms Melicher and Hoffmeister (1977), however, report contrasting results. They observe that the most important reason to issue convertible debt in the 1970s is reduction of coupon interest rates, while an increase of salability and marketability of the issue is the second most important reason. Using a more recent conducted survey among convertible debt issuers between 1987 and 1993, Billingsley and Smith (1996) also examines the different hypotheses explaining convertible debt issues. They report findings consistent with those of Melicher and Hoffmeister (1977) such that convertible debt is primarily used as a substitute for straight debt to lower the coupon interest rate. Out of the 85 respondents to their survey, 48.3% report lower coupon rates as the most influential factor in the decision to issue convertible debt. This evidence is consistent with the idea that motivation to issue a particular security might change over time, depending on the firm's internal and external environment.

### *4. Convertible Debt and Market Timing*

The concept of market timing in relation to security issuance implies that it is more advantageous to bring a security to the market at certain times than at other times. In recent literature, timing of straight debt and common equity issues have received ample attention. However, the timing of convertible debt issues has only been examined sparsely. Alexander, Stover and Kuhnau (1979) examine the existence of "hot issue" markets for convertible debt. They were able to predict cold-hot markets for convertible debt issues by examining price behavior of convertible debt issues using residual analysis to control for general market conditions. However, they did not find evidence that firm managers use timing strategies to exploit these hot markets for convertible debt. They provide two rationales for the absence of timing strategies. One, market timing is simply not possible in practice due to the short periods of favorable issuing time or two, firm managers have more important goals to achieve than trying to issue convertible debt when financial markets are hot for convertible debt issues. Mann, Moore, and Ramanlal (1999) observe that variation around the mean of aggregate convertible debt issues in the period from 1966 to 1993 is significant, indicating that timing plays a role in the security decision choice. They regress the aggregate proportion of publicly issued debt with conversion features on the lagged values of convertible bond issues, the market return, changes in market volatility, and changes in the interest levels. Contrary to the findings of Alexander et al. (1979) their evidence indicates the existence of extended periods of hot markets for convertible debt issues. They find a positive, significant relationship between the return on common equity and the issuance of convertible debt. Firm managers are more likely to issue convertible debt when equity markets have risen and seem to engage in market timing. Indeed, there seems to be some belief among investment bankers that during equity bull markets convertible debt is easier to sell than straight debt. In rising equity markets, investors are afraid to miss out on the expected future profits associated with investments in common equity and they are more likely to invest in equity than debt. Attaching conversion features to debt issues makes it is easier to entice investors to buy debt because they are still able to reap the potential profits from rising equity prices.

If managers issue convertible debt because it is easier to sell than straight debt during specific time periods, it must be obvious that the issue is a substitute for straight debt and not a means to issue equity via a backdoor. In equity bull markets, equity is more likely to be overvalued relative to its intrinsic value than in bear markets. If management would like to increase the amount of equity in their capital structure, it would be more logical to just issue common equity using the 'front door' instead of a more uncertain backdoor. Assuming that management uses timing strategies during the security issuance choice, I hypothesize that equity is significantly overvalued at the time of a convertible debt issue.

Table X summarizes the predictions for the risk-shifting, backdoor equity, and market timing hypotheses in relation to the use of valuation errors in common equity at the time of security issuance.

**TABLE X**
**Predictions of the Alternative Convertible Debt Hypotheses in Relation to Valuation Errors at the Time of Security Issuance**

(1) The risk-shifting hypothesis (Green, 1984, Brennan and Schwartz, 1988)

$H_1$: Valuation errors in common equity do not have a significant role in the security decision choice of convertible debt at the file/issue date and valuation errors in equity are random without any systematic over- or under-valuation present.

$H_A$: Systematic under- or over-valuation is present at the file/issue date.

(2) The backdoor equity hypothesis (Stein, 1992)

$H_2$: Valuation errors in common equity do have a significant role in the security decision choice of convertible debt at the file/issue date and there is systematic undervaluation present.

$H_A$: Equity is not undervalued relative to its intrinsic value at the file/issue date and there is no systematic undervaluation present.

(3) The timing hypothesis (Alexander et al., 1979, Mann et al., 1999)

$H_3$: Valuation errors in common equity do have a significant role in the security decision choice of convertible debt at the file/issue date and there is systematic overvaluation present.

$H_A$: Equity is not overvalued relative to its intrinsic value at the file/issue date and there is no systematic overvaluation present.

## C. *Data and Method*

### 1. *Sample Selection*

The initial sample consists of all non-financial, U.S. firms that issue convertible debt during the period 1971-1998. Financial companies are excluded from the sample due to the highly regulated environment in which they operate (SIC codes 6000 to 6799). File/issue dates and issue specific variables are obtained from Securities Data Corporation's (SDC) Global New Issues database.[27] Issuances of firms with multiple offers during the sample period are separated by at least three years. In the event that there are less than three years between offers only the first issue is allowed into the sample.[28] This yields an initial sample of 701 companies. In addition, all firms are required to have relevant data available on the Center for Research in Security Prices database (CRSP) and Standard and Poor's Research Insight annual database (COMPUSTAT). To compute the valuations of the residual income valuation model for the issue year and the two years prior to the issue each firm must have six years of continuous data available on COMPUSTAT. This approach leaves a final sample of 408 firms. The market price at the file/issue date is computed as the average of the closing stock price (CRSP) for the two days prior to the file/issue date. Treasury bond rates are obtained from the Federal Reserve Bank.

[27] The file date is used as the issue announcement date. Random sampling from the sample revealed that the announcement date falls on or within one day of the file date. For those firms where the file date cannot be obtained the issue date is used.
[28] Six firms had multiple issues within three years.

## 2. *The Dependent Variable*

As discussed before, convertible debt can be a substitute for straight debt or for common equity. Firms that issue convertible debt that is likely to be converted into equity at maturity are more probable to use the issue as a substitute for common equity. On the other hand, firms that issue convertible debt with a low probability of conversion are more likely to use the security as a substitute for straight debt. To distinguish between the different convertible debt issues in the sample, the risk neutral probability of converting a convertible debt issue into equity at maturity is calculated. A continuous variable on the interval (0,1) is created using an approach similar to the one developed by Lewis, Rogalski and Seward (1999). The full sample is divided on basis of the probability of conversion. Firms with a probability of conversion less than 0.5, and firms with a probability greater than or equal to 0.5, i.e. firms issuing convertible debt as a substitute for straight debt or a substitute for common equity.

Assuming that the underlying stock follows a Geometric Brownian Motion diffusion process, the probability of conversion is calculated as $N(d_2)$.

Where,

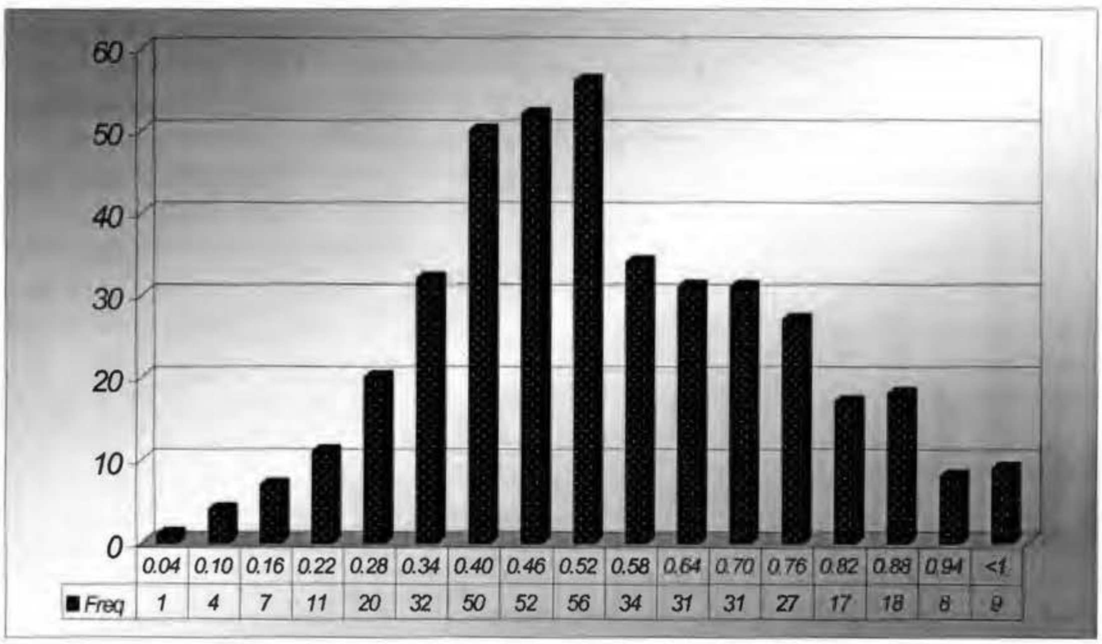
$$d_2 = \frac{\ln(S/X) + (r - div - \sigma^2/2)T}{\sigma\sqrt{T}}, \tag{8}$$

and $N(\cdot)$ is the cumulative probability under a standard normal distribution.

In this equation S is the current price of the underlying stock at the file/issue date, X is the conversion price, r is the continuously compounded yield estimated from a 10-year U.S. Treasury bond on the file/issue date, div is the issuing firm's continuously compounded dividend yield for the fiscal year end preceding the offer date, $\sigma$ is the standard deviation of the continuously compounded common equity return estimated over the period 240 to 40 trading days prior to the file/issue date, and T is the number of years until maturity for the convertible bond. If r-div is negative the risk-neutralized drift will be equal to zero.

Figure II shows the empirical distribution of the full sample. The distribution has a mean of 0.51 and a median of 0.49. The minimum probability of conversion is 0.04 and the maximum is 0.99.

**Figure II**
**Empirical Distribution of the Risk Neutral Probability of Conversion**
Figure II shows the empirical distribution of the risk neutral probability of conversion at the issue time for the all firms issuing U.S. public convertible debt during the time period 1971 through 1998.




Bifurcating the sample on the basis of the probability of conversion allows for testing the discussed hypotheses using valuation errors at the time of issuance.

### 3. *The Independent Variables*

The key independent variable for testing the hypotheses in Table X is a measure of valuation of the firm's common equity at the file/issue date. Most studies employ market-to-book ratios as a proxy for valuation. However, it is well documented that market-to-book ratios as a valuation measure incorporate noise. Not only does it serve as a proxy for valuation, it also can be interpreted as a proxy for growth opportunities or asymmetric information.[29] In order to separate growth opportunities, asymmetric information and pure valuation, this study utilizes a residual income valuation model to calculate the intrinsic value of the firm's equity. The residual income model is similar to the dividend discount model but has the advantage that it uses accounting numbers which makes it more practical for implementation.[30] This paper directly measures misvaluation using the method employed by D'Mello and Shroff (2000) and Jindra (2001) who use the ratio of intrinsic value of the stock price to the current market price. Use of this valuation ratio has several advantages. First, there is no need to rely on the market model and the well documented potential problems relating to the use of daily stock returns in event studies can be avoided.[31] Second, previous literature has not only documented abnormal performance in the short-run, but also in the long-run. The residual income model allows for capturing both, short-run and long-run effects. Last, assuming perfect foresight by managers allows the use of ex-post

---

[29] Lee, Myers and Swaminathan (1999) find that market to book ratios have very little economic predictability of stock returns compared to valuation measures incorporating time varying interest rates and earnings.
[30] Ohlson (1990, 1991, and 1995) demonstrates the relationship between the dividend discount model and the residual income model.
[31] See Brown and Warner (1980, 1985), Corrado and Zivney (1992), and MacKinlay (1997) for a detailed discussion on the use of daily stock returns in event studies.

data, avoiding reliance on estimates used in event study methodology. Using ex-post data does not rule out the possibility that management may manipulate accounting data and therefore influence the results. However, to ameliorate this problem, the valuation ratio is scaled by the average valuation ratio for the subject firm from the two years prior to the issue.

The equity value estimates in the residual income model are based on future realized earnings performance. The basic model determines the intrinsic value by adding to book value the discounted expected earnings in excess of normal return on book value.

$$E(V_0) = B_0 + \sum_{i=1}^{T}(1+r)^{-i} E[X_i - r * B_{i-1}] + \frac{(1+r)^{-T}}{r} TV \qquad (9)$$

Where TV, the terminal value, is calculated as

$$TV = E[(X_{0+T} - r * B_{0+T-1}) + (X_{0+T+1} - r * B_{0+T})] / 2 \qquad (10)$$

$E(V_0)$ in this equation is the value of the firm's equity at time zero, $B_0$ is the book value at time zero, r is the cost of equity, and $X_i$ are the firms earnings at time zero plus i. Time zero is the time at the end of the fiscal year immediately preceding the file/issue date, and T equals two years.

The cost of equity, r, is estimated using the Fama and French (1997) method in which each firm is assigned the cost of equity of one of forty-eight industry groups computed using the Fama French three factor model. The short-term T-bill is used as a proxy for the risk-free rate of interest. Lee et al. (1999) report that both, the short-term T-Bill rates and the long-term Treasury bonds rates are useful proxies for the level of interest rate. However, estimates of V based on the short-term T-Bill rate outperform those based on the long-term T-bond rates because they have a lower standard deviation and a faster rate of mean reversion. TV is calculated as the average of the last two years of the finite series and is restricted to be nonnegative. The estimated intrinsic value of the stock is then compared to the market value of the stock at the file/issue date to determine the valuation error. Estimated misvaluation is measured as,

$$M_0 = \frac{E(V_0)}{P_0}, \tag{11}$$

Where $M_0$ represents the estimated misvaluation at time zero, $P_0$ represents the market price of the stock at time zero, and $V_0$ represents the intrinsic value of the stock at time zero. The estimated misvaluation measure of the sample firm is then scaled by the two-year average misvaluation of the same firm prior to the file/issue date as shown in equation 12. $M_{0\text{-}1}$ and $M_{0\text{-}2}$ are the misvaluation measures for the two years prior to the issue.

$$TSVP_0 = \frac{M_0}{[M_{0-2} + M_{0-1}]/2} \tag{12}$$

If no misvaluation is present, TSVP should equal 1. If TSVP is less than one the sample firm is over-valued relative to its previous two years. A TSVP value greater than one indicates a firm that is under-valued relative to its previous two years.

In order to determine the impact of valuation errors in common equity as predicted by the hypotheses in table X, the full sample will be divided into two sub-samples. Those firms issuing convertible debt as a substitute for straight debt, from this point on called the risk-shifters, and those issuing convertible debt as a substitute for common equity, from this point on called the backdoor equity issuers. In both sub-samples there is a need to control for those variables from which we know might have significant explanatory power in the convertible debt security decision choice.

Risk-shifters issue convertible debt as a substitute for straight debt because their operating risk and future policies are hard to assess. Investment in smaller companies with high growth opportunities is not just perceived as more risky than investment than their larger, more mature counter parts, but also future investment risk for these firms is harder to predict. To control for company risk I include firm size and a proxy for growth opportunities. Firm size is measured as the natural logarithm of total revenue scaled by total assets at the fiscal year end prior to the file/issue date (COMPUSTAT variable D12/D6). Market-to-book serves as a proxy for growth opportunities and is calculated as the ratio of market value of assets to book value of assets (COMPUSTAT variables ((D6-D60)+(D24*D25))/D6. As additional risk proxies I also include the debt ratio, and credit quality. Highly financial levered firms may be tempted to over-invest in risky projects with the purpose to transfer wealth from bondholders to shareholders. In addition, the risk of default increases with an increase in leverage. Financial leverage is calculated as the ratio of total debt over total assets (COMPUSTAT variables (D44+D9)/D6). Credit quality also proxies for the firm's ability and incentive to shift risk since the greater the probability of financial distress, the greater the level of agency costs. Credit quality is a dummy variable based on the company's rating as given by Standard and Poors. It is equal to 1 if the firm has an 'A' rating, 2 if it has an 'AA' rating, up till 9 if it has a 'C' rating. A value of 10 is assigned if the company is not rated. Due to the fact that the difference between an 'AAA' rated bond and an 'AA' rated bond might not be viewed the same as the difference between a 'BBB" rated bond and a 'BB' rated bond by some researchers, a second credit rating dummy variable is created as well. The dummy equals 1 when the convertible bond has a credit rating of 'BBB' or higher, i.e. investment grade status, and zero otherwise, i.e. non-investment grade status. To control for the fact that management might choose to issue convertible debt in order to lower the coupon rate of the bond, the market level of interest as measured by a 10-year Treasury Bond is added as an additional control variable. Also, the firms tax status, i.e. the potential tax benefit of debt, might influence the security decision choice. I construct two alternative measures as a proxy for the potential tax benefit. The first one is computed as the ratio of tax payments to total assets (COMPUSTAT variable D16/D6). The second one is a trichotomous taxable income dummy developed by Graham (1996) This dummy equals the statutory rate for the top tax bracket if taxable income (COMPUSTAT D71) and net operating loss carry forward (COMPUSTAT D52) are positive. It equals half the statutory rate for the top tax bracket if only one of the two is positive and the other one is negative. It equals zero if both are negative.[32]

Backdoor equity issuers choose convertible debt as the security issuance choice because they cope with high asymmetric information and increased financial distress costs. Firm size, dividend payout ratio, intangibles, and market-to-book are utilized as control variables to capture the asymmetric information content. Smaller firms receive less scrutinizing by financial analysts and are not as well covered by the media as large firms. Therefore, these firms are expected to have a higher level of asymmetric

[32] The top rate before1979 is 48%, 46% from 1979 to 1986, 39.5% in 1987, 34% from 1988 to 1992, and 35% starting in 1993. The regression results using the alternative measure for potential tax benefits are very similar. This paper only reports the results using tax payments divided by total assets.

information. High dividend paying firms are assumed to be more transparent than low or non-dividend paying companies. The dividend payout ratio is calculated as the ratio of the amount of dividend paid out to net income at the fiscal year end prior to the file/issue date (COMPSTAT variables D26/D58). In addition, firms with high levels of intangibles are more likely to have information problems. Intangibles are calculated as the ratio of intangible assets to total assets (COMPUSTAT variables D33/D6). Since it is difficult for investors to quantify future investment opportunities, the degree of asymmetric information is expected to increase with the firm's growth opportunities. The market-to-book ratio is included as a proxy for growth opportunities. I also include free cash flow scaled by total assets as a proxy for current profitability (COMPUSTAT variables (D123+D125-D127-D128)/D6). Availability of free cash flow is an indicator of the company's ability to service its current financial obligations. In addition, the market level of interest rate and the firm's tax benefit measure are also included.

### *4. Testing the Hypotheses*

Employing the probability of conversion as a measure to distinguish between firms substituting convertible debt for straight debt and firms substituting convertible debt for common equity allows for testing the discussed hypotheses using valuation errors at the time of issuance.

First, I use a Wilcoxon Rank Sums test, also named a Mann-Whitney test, to examine if the empirical distribution function of the various response variables have the same location parameter for both of the sub-samples of debt-like and equity-like issuers. Assuming that different firms issue convertible debt for different reasons, i.e. issue convertible debt as a substitute for straight debt or a substitute for common equity, I would expect to find differences in the location parameters in terms of valuation, risk level, and the level of asymmetric information. Previous studies report that firms issuing common equity are generally more overvalued relative to their intrinsic value than firms issuing straight debt. Based on these findings in a univariate setting I would expect the backdoor equity issuers to be more overvalued relative to their intrinsic value than the risk-shifters. The expected differences in location parameters for the risk level and level of asymmetric information are more uncertain. Both, the risk-shifting and backdoor equity hypothesis include components based on the level of risk and asymmetric information.

Second, I estimate the following cross-sectional regression equation that relates the risk neutral probability of conversion to the issuing firm's valuation measure and the full balance of control variables. To guard against heteroskedasticity all regressions are estimated using General Method of Moments (GMM) to obtain the unbiased White t-statistics.[33]

$$Conv_j = \beta_0 + \beta_1 LTSVP3_j + \beta_2 LnSize_j + \beta_3 MB_j + \beta_4 Divrat_j + \beta_5 Intang_j + \beta_6 FC_j$$

$$+ \beta_7 Debrat + \beta_8 Rating_j + \beta_9 Taxpmt_j + \beta_{10} Irate_j + \varepsilon_j \qquad (13)$$

where $Conv_j$, is the risk neutral probability that convertible debt issue j is converted into

[33] The GMM procedure provides an asymptotically unbiased estimation of the t-statistic without specifying the heteroskedastic structure of the regression equation. The t-statistics obtained using GMM are identical to those obtained using Ordinary least Squares in the absence of heteroskedasticity. The regression coefficients are the same for both procedures.

equity at maturity, $LTSVP3_j$ is the natural log of the misvaluation measure, $LnSize_j$ is the natural log of firm size, $MB_j$ is the market-to-book ratio, $Divrat_j$ is the dividend payout ratio, , $Intang_j$ are intangibles scaled by total assets, $FC_j$ is the level of free cash flow scaled by total assets, $Debtrat_j$ is the debt ratio, $Taxpmt_j$ is the tax payment scaled by total assets, $Irate_j$ is the market level of interest rate, and $Rating_j$ represents a dummy variable for credit quality at the file/issue date. This equation is first estimated for the full sample. If the three hypotheses in table X are mutually exclusive the risk-shifting hypothesis predicts LTSVP3 to have an insignificant impact, the backdoor equity hypothesis predicts a significant positive impact, and the market timing hypothesis predicts a significant negative impact. In addition, the equation is also estimated for the two sub-samples. If the tested hypotheses are not mutually exclusive, i.e. some firms issue convertible debt to mitigate costs associated with risk while others may want to issue equity via a backdoor, I would expect to see significant differences in the coefficients and signs of the control variables of the sub-samples compared to the full sample.

Third, after bifurcating the full sample into firms substituting convertible debt for straight debt and firms substituting for common equity, I estimate for each sub-sample a cross-sectional regression equation which includes the key variable LTSVP3 and those control variables pertaining to the specific hypothesis tested.

For firms substituting convertible debt for straight debt the estimated regression is:

$$Conv_j = \beta_0 + \beta_1 LTSVP3_j + \beta_2 LnSize_j + \beta_3 MB_j + \beta_4 Debrat + \beta_5 Rating_j + \beta_6 Taxpmt_j + \beta_6 Irate_j + \varepsilon_j \quad (14)$$

The risk-shifting hypothesis predicts that the value of the firm's common equity does not have a significant impact on the decision to issue convertible debt. Therefore, LTSVP3 is expected to be insignificant in explaining the security decision choice. The market timing hypothesis predicts that firms are more likely to issue convertible debt in equity bull markets. During equity bull markets it is easier to sell convertible debt to investors than straight debt because investors attain the opportunity to reap potential profits in the common equity market. Finding that equity is overvalued would provide evidence in favor of the timing hypothesis. Thus, consistent with the market timing hypothesis of convertible debt LSTVP3 is expected to be negative.

For those firms substituting convertible debt for common equity the estimated regression is:

$$Conv_j = \beta_0 + \beta_1 LTSVP3_j + \beta_2 LnSize_j + \beta_3 MB_j + \beta_4 Divrat_j + \beta_5 Intang_j + \beta_6 FC_j + \beta_6 Taxpmt_j + \beta_6 Irate_j + \varepsilon_j \quad (15)$$

The backdoor equity hypothesis postulates that firm managers would like to issue common equity however, due to perceived undervaluation of this equity they issue convertible debt with the intent to convert the issue into common equity in the future. Therefore, valuation errors in common equity are expected to have a significant impact on the security issue choice. Consistent with the backdoor equity hypothesis the predicted sign of LTSVP3 positive, i.e., the lower the valuation measure LTSVP3 the more likely the convertible debt issue is a substitute for common equity.

## D. *Results*

### 1. *Descriptive Statistics*

Table XI shows the total number of issues by year for the full sample and the two sub-samples. The full sample contains 408 issues of which 221 issues have a probability of conversion less than 0.5 and 187 issues have a probability greater than or equal to 0.5. The number of total issues ranges from a low of zero (1971, 1973, 1974, and 1998) to a high of 46 (1986). Due to the requirement that each firm must have six years of CRSP and COMPUSTAT data prior to the file/issue date there are only a few observations in the early years of the sample. The requirement of three years of data after the file/issue date explains the remainder of zero firms out of the initial 22 obtained from SDC in 1998. The debt-like and equity-like sample both ranges from a low of zero to a high of 26, although the years are different, respectively 1987 and 1986. Interestingly, during the time period 1980 to 1986 the majority of issuers seem to substitute convertible debt for common equity (136 out of 198) while during the period 1987 to 1997 most of the issues are a substitute for straight debt (147 out 187) with the exception of 1989.

**Table XI**
**Summary Statistics by Year**

Table XI presents the total sample of all U.S. non-financial firms with required data available on CRSP and COMPUSTAT issuing public convertible debt between January 1971 and December 1998. Issues done by the same company within three years of the file/issue date are deleted from the sample.

| | Number of issues | | |
|---|---|---|---|
| Year | Full Sample | Equity Like Sample | Debt Like sample |
| 1971 | 0 | 0 | 0 |
| 1972 | 1 | 1 | 0 |
| 1973 | 0 | 0 | 0 |
| 1974 | 0 | 0 | 0 |
| 1975 | 1 | 0 | 1 |
| 1976 | 3 | 1 | 2 |
| 1977 | 3 | 1 | 2 |
| 1978 | 2 | 1 | 1 |
| 1979 | 13 | 7 | 6 |
| 1980 | 25 | 16 | 9 |
| 1981 | 26 | 18 | 8 |
| 1982 | 18 | 15 | 3 |
| 1983 | 32 | 21 | 11 |
| 1984 | 16 | 15 | 1 |
| 1985 | 35 | 25 | 10 |
| 1986 | 46 | 26 | 20 |
| 1987 | 35 | 9 | 26 |
| 1988 | 13 | 4 | 9 |
| 1989 | 23 | 14 | 9 |
| 1990 | 14 | 4 | 10 |
| 1991 | 19 | 3 | 16 |
| 1992 | 24 | 0 | 24 |
| 1993 | 21 | 3 | 18 |
| 1994 | 8 | 1 | 7 |
| 1995 | 12 | 1 | 11 |
| 1996 | 10 | 0 | 10 |
| 1997 | 8 | 1 | 7 |
| 1998 | 0 | 0 | 0 |
| 1999 | 0 | 0 | 0 |
| Total | 408 | 187 | 221 |

Table XII provides the descriptive statistics of the issuing firm sample. Panel A report the sample characteristics for the full sample. The mean (median) stock price of the firm at the file/issue date is $25.36 ($23.75) and the mean (median) conversion price of the issue is $30.43 ($27.78). The average maturity of the convertible bond is 18 (20) years. The mean (median) valuation ratio for the issuing firm is 0.62 (0.51). The mean (median) of the valuation ratio scaled by the average valuation ratio for the sample firm during the two years prior to the issue (TSVP3) is 0.87 (0.74). Indicating that firms issuing convertible debt, compared to the average of the previous two years, are less overvalued at the file/issue date. On average a firm has $969 (260) million in net sales, a market-to-book ratio of 1.78 (1.49), intangibles of 4.6% (0.6%), negative free cash flow of -3% (-0.5%), and a dividend payout ratio of 18% (3%). The average debt ratio is 25% (25%) and the firm's tax benefit as measured by tax payments scaled by total assets on average is 4% (3%). The average market level of interest rate during the sample period is 9.03% (8.26%).

Panel B and Panel C of table XII report the same statistics for equity-like firms and debt-like firms, i.e. firms with a probability of conversion greater then or equal to 0.5 and firms with a probability of conversion less then 0.5. Compared to the debt-like issuers equity-like issuers have on average a higher stock price at the file/issue date ($27.83 vs. $23.28). Likewise, the bond has on average a higher conversion price ($32.45 vs. $28.72) and the maturity of the bond for these equity-like issuers is 21.6 years versus 15.1 years for the debt-like issuers. The mean and the median of the valuation ratio SVP3 for both sub-samples is about the same, 0.61 (0.52) for the equity-like issuers

**Table XII**

**Descriptive Statistics**

Table XII provides the summary statistics of a sample of all U.S. non-financial firms issuing public convertible debt between January 1971 and December 1998 with required data available on CRSP and COMPUSTAT. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file or issue date if the file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the issue date. Convprc is the conversion price of the bond. Maturity is the number of years the till the conversion option expires. Prob is the risk natural probability of conversion. . Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market–to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). Rating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to the highest credit rating and the value of 9 is assigned to the lowest credit rating. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

**Panel A: Total Issuers (prob (0,1))**

| | N | Mean | Median | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP3 | 408 | 0.62 | 0.51 | 0.47 | 0.06 | 4.92 |
| TSVP3 | 408 | 0.87 | 0.74 | 0.61 | 0.07 | 7.18 |
| Prob | 408 | 0.51 | 0.49 | 0.20 | 0.04 | 0.99 |
| Sprice | 408 | 25.36 | 23.75 | 14.43 | 1.34 | 102.13 |
| Convprc | 408 | 30.43 | 27.78 | 17.27 | 1.75 | 129.13 |
| Maturity | 408 | 18.08 | 20.00 | 7.34 | 1.00 | 30.00 |
| Size | 408 | 968.74 | 260.12 | 2691.65 | 1.93 | 35209.00 |
| MB | 407 | 1.78 | 1.49 | 0.90 | 0.71 | 6.59 |
| Divrat | 355 | 0.18 | 0.03 | 0.46 | 0.00 | 6.66 |
| DebtRat | 395 | 0.25 | 0.25 | 0.16 | 0.00 | 0.79 |
| Intang/d6 | 352 | 0.046 | 0.006 | 0.09 | 0.00 | 0.617 |
| FC/d6 | 402 | -0.030 | -0.005 | 0.96 | -0.458 | 0.195 |
| Irate | 408 | 9.03 | 8.26 | 2.40 | 5.19 | 15.36 |
| Taxpmt/d6 | 408 | 0.04 | 0.03 | 0.03 | -0.11 | 0.16 |
| Rating | 408 | 6.21 | 6.00 | 2.19 | 2.00 | 10.00 |

**Panel B: Equity Like Issuers (prob=>0.5)**

| | N | Mean | Median | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP3 | 187 | 0.61 | 0.52 | 0.38 | 0.08 | 2.20 |
| TSVP3 | 187 | 0.79 | 0.72 | 0.39 | 0.13 | 2.80 |
| Prob | 187 | 0.69 | 0.67 | 0.13 | 0.50 | 0.99 |
| Sprice | 187 | 27.83 | 25.88 | 13.97 | 4.00 | 94.28 |
| Convprc | 187 | 32.45 | 30.47 | 15.68 | 4.00 | 84.00 |
| Maturity | 187 | 21.60 | 25.00 | 5.29 | 5.00 | 30.00 |
| Size | 187 | 820.61 | 304.00 | 1607.89 | 7.52 | 11719.60 |
| MB | 187 | 1.74 | 1.49 | 0.85 | 0.84 | 6.59 |
| Divrat | 174 | 0.16 | 0.09 | 0.25 | 0.00 | 2.50 |
| DebtRat | 181 | 0.26 | 0.25 | 0.16 | 0.00 | 0.79 |
| Intang/d6 | 162 | 0.045 | 0.010 | 0.089 | 0.000 | 0.617 |
| FC/d6 | 183 | -0.025 | -0.009 | 0.088 | -0.458 | 0.144 |
| Irate | 187 | 10.16 | 10.26 | 2.32 | 5.83 | 15.36 |

**Panel B: Equity Like Issuers (prob=>0.5)** (Table XII continued))

| | N | Mean | Median | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| Taxpmt/d6 | 187 | 0.04 | 0.04 | 0.03 | -0.04 | 0.14 |
| Rating | 187 | 5.93 | 6.00 | 2.24 | 2.00 | 10.00 |

**Panel C: Debt Like Issuers (prob<0.5)**

| | N | Mean | Median | Std Dev | Minimum | Maximum |
|---|---|---|---|---|---|---|
| SVP3 | 221 | 0.62 | 0.50 | 0.54 | 0.09 | 4.92 |
| TSVP3 | 221 | 0.95 | 0.78 | 0.75 | 0.07 | 7.18 |
| Prob | 221 | 0.36 | 0.38 | 0.10 | 0.04 | 0.49 |
| Sprice | 221 | 23.28 | 20.88 | 14.51 | 1.34 | 102.13 |
| Convprc | 221 | 28.72 | 25.00 | 18.37 | 1.75 | 129.13 |
| Maturity | 221 | 15.11 | 15.00 | 7.52 | 1.00 | 25.40 |
| Size | 221 | 1094.45 | 191.03 | 3314.29 | 1.93 | 35209.00 |
| MB | 221 | 1.82 | 1.52 | 0.94 | 0.71 | 5.66 |
| Divrat | 181 | 0.19 | 0.00 | 0.60 | 0.00 | 6.66 |
| DebtRat | 214 | 0.24 | 0.24 | 0.17 | 0.00 | 0.67 |
| Intang/d6 | 190 | 0.047 | 0.001 | 0.092 | 0.00 | 0.570 |
| FC/d6 | 219 | -0.032 | -0.003 | 0.103 | -0.419 | 0.195 |
| Irate | 221 | 8.06 | 7.37 | 2.01 | 5.19 | 14.04 |
| Taxpmt/d6 | 221 | 0.03 | 0.03 | 0.04 | -0.11 | 0.16 |
| Rating | 221 | 6.45 | 6.00 | 2.12 | 2.00 | 10.00 |

and 0.62 (0.50)) for the debt-like issuers. However, the mean (median) of the valuation ratio scaled by the average valuation ratio for the sample firm during the two years prior to the issue (TSVP3) differs significantly for both sub-samples, respectively 0.79 (0.72) for equity-like issuers and 0.95 (0.78) for debt-like issuers. Although both samples areless overvalued when scaled by the average valuation ratio for the sample firm during the two years prior to the issue, the mean of the equity-like sample is more overvalued than the mean of debt-like sample. Note however, the medians of TSVP3 are much closer together and the univariate results for the means of TSVP3 seem notably influenced by an undervalued outlier in the debt-like sample. The maximum value for TSVP3 for the equity-like sample is 2.80, but for the debt-like sample 7.18. On average the equity-like firms are smaller in terms of their means ($820 vs. $1094 million), but not in terms of their medians ($304 vs. $191 dollar). They have lower market-to-book ratios,

pay lower dividend as a function of net income, and have higher risk ratings. In addition, the market level of interest rate at the file/issue date is on average about 2% higher.

Table XIII presents the results of a Wilcoxon Rank Sums test, which examines if the empirical distribution function of the various response variables has the same location parameter for both the debt-like and the equity-like issuers. Most of the explanatory

**Table XIII**
**Test of Medians**

Table III presents the results of a Wilcoxon Rank Sums test, which examines if the empirical distribution function of the various response variables has the same location parameter for both the debt-like and the equity-like issuers. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file or issue date if the file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the issue date. Convprc is the conversion price of the bond. Maturity is the number of years the till the conversion option expires. Prob is the risk natural probability of conversion. Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market–to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). Rating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to the highest credit rating and the value of 9 is assigned to the lowest credit rating. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

| Variable | Debt like issuers vs. Equity like issuers | | | |
|---|---|---|---|---|
| | N | | Z-value | p-value |
| | Prob. < 0.5 | Prob => 0.5 | | |
| SVP3 | 221 | 187 | 0.8156 | 0.42 |
| TSVP3 | 221 | 187 | -1.8874* | 0.06 |
| Sprice | 221 | 187 | 3.6282*** | <0.01 |
| Convprc | 221 | 187 | 2.9672*** | <0.01 |
| Maturity | 221 | 187 | 8.1468*** | <0.01 |
| MB | 220 | 187 | -0.4101 | 0.68 |
| Size | 221 | 187 | 2.5601*** | 0.01 |
| Debtrat | 214 | 181 | 1.000 | 0.32 |
| Divrat | 181 | 174 | 3.2071*** | <0.01 |
| Intang | 190 | 162 | 0.7170 | 0.47 |
| FC | 219 | 183 | 0.2875 | 0.77 |
| Taxpmt | 221 | 187 | 3.5148*** | <0.01 |
| Irate | 221 | 187 | 9.3271*** | <0.01 |
| Rating | 221 | 187 | -3.3703*** | <0.01 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

variables exhibit a significant difference between the two groups with regard to their medians. Equity-like issuers are more overvalued relative to the previous two-year average valuation ratio then debt-like issuers (p-value 0.06). This conforms to findings that firms issuing equity are generally more overvalued relative to their intrinsic value than firms issuing straight debt.[34] Debt-like issuers of convertible debt are smaller in size compared to equity-like issuers (p-value 0.01). The level of risk for small firms is generally harder to assess than the risk level of large firms which is consistent with the hypothesis that risk-shifters substitute convertible debt for straight debt to mitigate costs associated with these higher levels of risk. The dividend payout ratio is significant at the one-percent level and is higher for the equity-like issuers than for the debt-like issuers. One explanation is that the dividend payout ratio measures the stability of expected future cash flows. Consistent with the risk-shifting hypothesis, firms that substitute convertible debt for straight debt are expected to have high uncertainty with regard to future cash flows, i.e. low dividend payments. In the literature we also see that dividend payout ratio is used as a proxy for expected profitability. Again, consistent with the backdoor equity hypothesis, firm managers issuing convertible debt as a substitute for common equity anticipate having higher future earnings. Moreover, the firm's credit rating, tax shields and the market levels of interest rate are also significantly different between both groups at the one-percent level.

[34] Early studies by Masulis and Korwar (1986), Asquith and Mullins (1986) Mikkelson and Partch (1986) report significantly negative announcement date effects on equity prices. They interpret this finding as that equity is perceived overvalued by investors at the announcement date. These effects are not reported in the literature when straight debt is issued. Baker and Wurgler (2002) also find evidence that firms are more overvalued when issuing common equity than when issuing straight debt.

### 2. *Multivariate Analysis: Initial Results*

Table XIV-A reports the parameters estimates and heteroskedastic consistent p-values for regression equation (13) using General Method of Moments where the dependent variable is the risk neutral probability of conversion.[35] The three regressions reported in table XIV-A differ by the sample that is used in the estimation procedure. The estimation is performed for the full, the debt-like and the equity-like samples. First, note that included in this regression are all the control variables based on the theory of the alternative hypotheses tested. If the hypotheses are mutually exclusive or if the risk neutral probability of conversion is not a good metric for separating out the debt-like issuers from the equity-like issuers, one would expect to see similar signs and significance of the parameter estimates of the sub-samples compared to the full sample. However, the explanatory power and signs of the parameter estimates for the full sample and the two sub-samples appear to be different. Consistent with the finding of LRS (1999) this suggests that the alternative convertible debt hypotheses are not mutually exclusive and that the risk neutral probability of conversion might provide a good metric to separate debt-like and equity-like issuers. For equity-like issuers the key explanatory variable LTSVP3 is positive and significant. Consistent with the backdoor equity hypothesis of Stein (1992), this indicates the more undervalued the firm the higher the probability of conversion and the more likely the convertible debt issue is a substitute for common equity.

[35] Table XIV-B reports the results of the parameter estimates and heteroskedastic consistent p-values using the investment grade dummy variable as a proxy for credit rating. The results are very similar.

## Table XIV-A

### Cross-sectional Regressions Results

Table XIV-A provides the estimates from ordinary least square regressions with heteroskedastic consistent p-values. The dependent variable is the risk neutral probability of conversion (prob). Regression Coefficients are reported with p-values in parentheses. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file date or issue date when file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the file/issue date. LTSVP3 is the natural logarithm of TSVP3. Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market–to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). Rating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to the highest credit rating available and the value of 9 is assigned to the lowest credit rating available. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

| Independent variable | All Issuers | Debt Like Issuers (prob. < 0.5) | Equity Like Issuers (prob. > 0.5) |
|---|---|---|---|
| Intercept | 0.2908*** | 0.4551*** | 0.5499*** |
| | (<0.01) | (<0.01) | (<0.01) |
| LTSVP3 | 0.1300 | 0.0067 | 0.0436** |
| | (0.51) | (0.67) | (0.03) |
| Size | 0.0069 | -0.0334*** | 0.0287 |
| | (0.67) | (0.01) | (0.12) |
| MB | -0.0374*** | -0.0157* | -0.0220* |
| | (<0.01) | (0.10) | (0.10) |
| Divrat | -0.0618* | -0.0390** | -0.0360 |
| | (0.03) | (0.04) | (0.61) |
| Intang | 0.0739 | -0.0365 | 0.0088 |
| | (0.51) | (0.64) | (0.95) |
| FC | -0.1767 | 0.7554 | -0.3062*** |
| | (0.18) | (0.41) | (<0.01) |
| Debtrat | 0.0158 | -0.0324 | 0.0133 |
| | (0.80) | (0.57) | (0.85) |
| Rating | -0.0108** | -0.0091** | -0.0020 |
| | (0.05) | (0.02) | (0.68) |
| Taxpmt | 1.2285** | -0.5336 | 1.2411*** |
| | (0.02) | (0.22) | (<0.01) |
| Irate | 0.0355*** | 0.0055 | 0.0142*** |
| | (<0.01) | (0.21) | (<0.01) |
| R-squared | 0.29 | 0.12 | 0.24 |
| N | 288 | 144 | 133 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

## Table XIV-B

### Cross-sectional Regressions Results

Table XIV-B provides the estimates from ordinary least square regressions with heteroskedastic consistent p-values. The dependent variable is the risk neutral probability of conversion (prob). Regression Coefficients are reported with p-values in parentheses. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file date or issue date when file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the file/issue date. LTSVP3 is the natural logarithm of TSVP3. Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market-to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). InvRating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to bond ratings 'BBB' or higher and zero otherwise. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

| Independent variable | All Issuers | Debt Like Issuers (prob. < 0.5) | Equity Like Issuers (prob. > 0.5) |
|---|---|---|---|
| Intercept | 0.18518*** | 0.3753*** | 0.5107*** |
| | (<0.01) | (<0.01) | (<0.01) |
| LTSVP3 | 0.0058 | 0.0016 | 0.0392** |
| | (0.77) | (0.92) | (0.05) |
| Size | 0.0079 | -0.0310** | 0.0293* |
| | (0.62) | (0.01) | (0.09) |
| MB | -0.0301** | -0.0112 | -0.0190 |
| | (0.02) | (0.24) | (0.15) |
| Divrat | -0.0743*** | -0.0384** | -0.0564 |
| | (<0.01) | (0.02) | (0.42) |
| Intang | 0.07550 | -0.0569 | 0.01367 |
| | (0.46) | (0.42) | (0.91) |
| FC | -0.1780 | 0.0794 | -0.2991*** |
| | (0.16) | (0.37) | (<0.01) |
| Debtrat | 0.03659 | -0.0298 | 0.0418 |
| | (0.55) | (0.59) | (0.56) |
| InvRating | 0.1053*** | 0.0591*** | 0.4860** |
| | (<0.01) | (<0.01) | (0.03) |
| Taxpmt | 1.1304** | -0.4879 | 1.1701*** |
| | (0.02) | (0.25) | (<0.01) |
| Irate | 0.03545*** | 0.0054 | 0.0147*** |
| | (<0.01) | (0.21) | (<0.01) |
| R-squared | 0.32 | 0.13 | 0.26 |
| N | 288 | 144 | 133 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

Consistent with the predictions of the risk-shifting hypothesis of Green (1984) and Brennan and Schwartz (1988), valuation errors in common equity at the time of the security issuance do not matter for the debt-like issuer. LTSVP3 is insignificant. The valuation effects in the full sample are insignificant and seem to be dominated by the debt-like issuers.

The results do not find support for the market timing hypothesis of convertible debt, predicting that equity is overvalued relative to its intrinsic value at the file/issue date and systematic overvaluation is expected. This evidence seems to contradict the findings of Mann et al. (1999) and the LRS (1999). Mann et al. find a positive, significant relationship between the return on common equity and the issuance of convertible debt, while LRS report that convertible debt issuers experience significant positive excess returns for the eleven months prior to the security offering.

### 3. *The Independent Variables: Additional Considerations*

As mentioned before, market-to-book value is often used as a measure of firm valuation. Since this study uses market-to-book as a risk proxy and employs the residual income model to compute the valuation measure LTSVP3 it is of interest to see what the correlation is between market-to-book ratios and LTSVP3. Table XV shows the correlation between the dependent and all the independent variables. The correlation between the market-to-book ratio and LTSVP3 is 0.05 and not significant. This appears to be consistent with the Lee et al. (1999) finding that a valuation measure based on earnings and time varying interest rates is a better proxy for firm value than the market-to-book ratio.[36]

Another interesting, but potentially troublesome observation is the correlation between the risk neutral probability of conversion and the market level of interest rate (0.47, p-value <0.01). The market level of interest rate plays a very important role in the calculation of the dependent variable therefore the parameter estimates of regression equations (14) and (15) may be distorted when the market level of interest rate is included as a control variable into the estimated regression model. To see the effect of inclusion of the level of interest rate as a control variable into equation (14) and (15), both equations are also estimated without the market level of interest rate at the file/issue date.[37]

### 4. *Multivariate Analysis: Debt-Like and Equity-Like Issuers*

Table XVI reports the parameter estimates and heteroskedastic consistent p-values for regression equations (14) and (15). Models 1a and 1b estimate the sample of firms that substitute convertible debt for straight debt as assumed by the risk-shifting and the market timing hypotheses. The difference between the two models is determined by the credit rating dummy variable used in the estimation. The results appear to be robust to the choice of credit rating variable.

---

[36] As a test of robustness LTSVP3 is regressed on the market-to-book ratio. The residuals are used to re-estimate the regressions in tables XIV and XVI. Using the orthogonalized measure of LTSVP3 did not significantly change any of the results. However, the explanatory power of LTSVP3 increased slightly, while the explanatory power of the market-to-book ratio decreased.

[37] Another approach for avoiding these potential problems has been taken by utilizing the conversion premium of the bond as an alternative measure for the dependent variable. However, I did abandon this approach for two reasons. First, the correlation between the probability of conversion and the conversion premium is positive but very weak. Second, although the signs of the coefficients are similar in the re-estimated models, the explanatory power of the independent variables is reduced and the R-squared of the models dropped significantly.

## Table XV
## Correlation Matrix

Table XV provides the correlations between the dependent and all the independent variables for a sample of firms issuing U.S. non-financial convertible debt during the period from 1971 to 1998. P-values are in parentheses. Prob is the risk natural probability of conversion. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file or issue date if the file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the issue date. LTSVP3 is the log of TSVP3. Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market–to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). Rating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to the highest credit rating and the value of 9 to the lowest credit rating. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

| Variable | Prob | TSVP3 | LTSVP3 | Size | MB | Intang | FC | Divrat | Debtrat | Taxpmt | Irate | Rating |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Prob | 1.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| TSVP3 | -0.14 (<0.01) | 1.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| LTSVP3 | -0.05 (0.33) | 0.84 (<0.01) | 1.00 | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Size | 0.13 (0.01) | -0.11 (0.02) | -0.07 (0.16) | 1.00 | --- | --- | --- | --- | --- | --- | --- | --- |
| MB | -0.03 (0.51) | 0.17 (<0.01) | 0.05 (0.36) | -0.03 (0.62) | 1.00 | --- | --- | --- | --- | --- | --- | --- |
| Intang | -0.05 (0.34) | 0.08 (0.14) | 0.07 (0.17) | -0.09 (0.09) | 0.02 (0.65) | 1.00 | --- | --- | --- | --- | --- | --- |
| FC | 0.02 (0.75) | -0.05 (0.28) | -0.02 (0.68) | 0.28 (<0.01) | 0.06 (0.27) | 0.16 (<0.01) | 1.00 | --- | --- | --- | --- | --- |
| Divrat | -0.05 (0.34) | -0.07 (0.22) | -0.03 (0.52) | -0.03 (0.60) | -0.18 (<0.01) | -0.03 (0.60) | -0.06 (0.29) | 1.00 | --- | --- | --- | --- |
| Debtrat | 0.02 (0.76) | -0.13 (0.01) | -0.14 (<0.01) | -0.19 (<0.01) | -0.37 (<0.01) | -0.01 (0.89) | -0.19 (<0.01) | 0.03 (0.52) | 1.00 | --- | --- | --- |
| Taxpmt | 0.26 (<0.01) | -0.11 (0.03) | -0.10 (0.04) | 0.26 (<0.01) | 0.44 (<0.01) | -0.06 (0.26) | 0.34 (<0.01) | -0.17 (<0.01) | -0.33 (<0.01) | 1.00 | --- | --- |
| Irate | 0.47 (<0.01) | -0.15 (<0.01) | -0.15 (<0.01) | 0.13 (0.01) | -0.06 (0.24) | -0.18 (<0.01) | -0.07 (0.15) | -0.01 (0.82) | 0.10 (0.04) | 0.20 (<0.01) | 1.00 | --- |
| Rating | -0.15 (<0.01) | 0.01 (0.80) | -0.04 (0.43) | -0.09 (0.07) | -0.02 (0.70) | 0.04 (0.49) | -0.20 (<0.01) | -0.09 (0.11) | 0.15 (<0.01) | -0.12 (0.01) | 0.004 (0.94) | 1.00 |

The implication of the risk-shifting hypothesis of Green (1984) and Brennan and Schwartz (1988) is that valuation errors in common equity at the file/issue date have no significant impact on the decision to issue convertible debt. Therefore, if the risk-shifting hypothesis holds, valuation errors in common equity should be insignificant. Thus, no systematic over- or under-valuation is expected to be present ($H_1$). Consistent with the risk-shifting hypothesis LTSVP3 is insignificant.[38] In addition, the control variables size, market-to-book, and credit rating are negative and significant. The tax shield benefit is positive and significant at the ten-percent level. The credit rating variable provides additional evidence for risk-shifting. The lower the firm's credit rating, i.e. the riskier the firm, the less likely the convertible bond will be converted into common equity. Therefore, the issue may be more like a debt-like instrument. The sign for size is more difficult to explain. In general, investments in smaller firms are perceived to be riskier then those in larger firms. Therefore, consistent with the risk-shifting hypothesis, one would expect the sign on the size variable to be positive instead of negative. The potential tax benefit is positive and significant at the five-percent level indicating the higher the tax shield benefit the less debt-like the convertible debt issue. This result is congruent with findings of LRS (1999) who report that debt-like issuers have lower tax benefits than those issuing straight debt.

The results in models 1a and 1b do not provide evidence in favor of the market timing hypothesis which asserts that equity is overvalued relative to its intrinsic value at the file/issue date and systematic overvaluation is expected to be present ($H_3$). Evidence

[38] I realize that an insignificant finding is a failure to reject and cannot be interpreted as an acceptance of the null hypothesis.

of market timing as reported by Alexander et al. (1979) and Mann et al. (1999) would predict a negative significant parameter estimate for the valuation variable LTSVP3.

Model 2a estimates a sample of firms that substitute convertible debt for common equity as assumed by the backdoor equity hypothesis proposed by Stein (1992). The implication of the backdoor equity hypothesis is that managers want to issue common equity, but due to asymmetric information and associated high financial distress costs perceive this equity to be undervalued at the file/issue date, hence issue convertible debt ($H_2$). The relationship between the probability of conversion and the valuation ratio provides empirical evidence for the backdoor equity hypothesis. LTSVP3 is positive and significant at the five-percent level indicating the more undervalued the firm's common equity at the file/issue date relative to the average valuation of the previous two years, the more likely the issue is a substitute for common equity. Four of the control variables are also significant. Consistent with the backdoor equity hypothesis, free cash flow has a negative sign and is significant at the one-percent level. Availability of free cash flow is an indicator of the company's ability to service its current financial obligations. For firms with high financial distress costs, i.e., low free cash flow, the bond is more likely to be converted into common equity. Therefore, the issue may be more an equity-like instrument. The market-to-book ratio and potential tax benefits are also significant. The lower the market-to-book ratio the more likely the convertible debt issue is converted into common equity. Inconsistent with the backdoor equity hypothesis, this would indicate that firms with low asymmetric are more likely to substitute convertible debt for common equity. However, its significance is very weak (p-value 0.10), and when orthogonalizing the valuation measure LTSVP3 to the market-to-book ratio (see footnote 34) its significance disappears completely. The larger the tax benefits of debt, the more equity-like the issuer. Again, this result is similar to findings of LRS (1999) who report that that equity-like issuers of convertible debt do have higher tax shields than firms issuing common equity. One way to interpret this finding is that firms may issue convertible debt in order to make use of their tax shields. The market level of interest rates is significant at the one-percent level and has a positive sign. The higher the market level of interest rate at the file/issue date, the more equity-like the issuer. This might indicate that firms that are more likely to convert the bond into common equity might design the convertible bond so that conversion into common equity is possible as soon as the cost of interest payments on the bond exceed the cost of adverse selection.

To test if the inclusion of the market level of interest as an independent variable in the regressions distort the results as discussed above, the equations are also estimated with the market level of interest rate omitted. Models 1c and 1d report the parameter estimates and p-values for the debt-like sample. The results are not really surprising since interest rate did not have any significant explanatory power in the first model. The exclusion of the level of interest rate from the model does not change the results and

## Table XVI

## Cross-sectional Regression Results

Table XVI provides the estimates from ordinary least square regressions with heteroskedastic consistent p-values. The dependent variable is the risk neutral probability of conversion (prob). Regression Coefficients are reported with p-values in parentheses. TSVP3 is computed as SVP3 divided by AVG12rly. SVP3 is defined as the intrinsic value of the share price divided by SPRC using the 3-year residual income model (RIM) to calculate the intrinsic value. SPRC is the prevailing market price computed as an arithmetic two-day average prior to the file date or issue date when file date is not available. AVG12rly is the average of the SVP3 ratios in relative year –1 and –2. Sprice is the closing stock price prior to the file/issue date. LTSVP is the natural logarithm of TSVP3. Size is net revenue at the fiscal year end prior to the file/issue date scaled by total assets (D6). MB is market-to-book value calculated as total assets minus book value of equity plus market value of equity scaled by total assets ((D6–D60)+(d24*D25))/D6. Divrat is the dividend payout ratio (D26/D58). Intang is intangibles scaled by total assets (D33/D6). FC is free cash flow scaled by total assets (D123+D125–D127–D128)/D6. Debtrat is long-term debt (D44+D9) divided by total assets (D6). Rating is a dummy variable for the firm's credit rating according to Standard and Poors. InvRating is a dummy variable for the firm's credit rating according to Standard and Poors. The value of 1is assigned to bond ratings 'BBB' or higher and zero otherwise. The value of 1is assigned to the highest credit rating available and the value of 9 is assigned to the lowest credit rating available. Taxpmt is the ratio of tax payments to total assets at the fiscal year end prior to the file/issue date. Irate is the market level of interest rate at the file issue date proxied by the 10-year Treasury Bond.

| | Debt Like Issuers (prob. < 0.5) | | | | Equity Like Issuers (prob > 0.5) | |
|---|---|---|---|---|---|---|
| Independent variable | Model 1a | Model 1b | Model 1c | Model 1d | Model 2a | Model 2b |
| Intercept | 0.4276*** | 0.3503*** | 0.4362*** | 0.3641*** | 0.5364*** | 0.6802*** |
| | (<0.01) | (<0.01) | (<0.01) | (<0.01) | (<0.01) | (<0.01) |
| LTSVP3 | 0.0011 | -0.0012 | 0.0005 | -0.0019 | 0.0430** | 0.0406** |
| | (0.93) | (0.93) | (0.97) | (0.89) | (0.03) | (0.02) |
| Size | -0.0254*** | -0.0232** | -0.0254*** | -0.0231** | 0.0244 | 0.0286* |
| | (0.01) | (0.03) | (0.01) | (0.03) | (0.16) | (0.10) |
| MB | -0.0153 | -0.0116 | -0.0158 | -0.0122 | -0.0209* | -0.0244** |
| | (0.13) | (0.26) | (0.11) | (0.22) | (0.10) | (0.03) |
| Divrat | | | | | -0.0179 | -0.0253 |
| | | | | | (0.79) | (0.71) |
| Intang | | | | | 0.0113 | -0.0621 |
| | | | | | (0.93) | (0.64) |
| FC | | | | | -0.2990*** | -0.3660*** |
| | | | | | (<0.01) | (<0.01) |
| Debtrat | -0.0148 | -0.0194 | -0.0134 | -0.0177 | | |
| | (0.78) | (0.71) | (0.80) | (0.73) | | |
| InvRating | | 0.0625*** | | 0.0616*** | | |
| | | (<0.01) | | (<0.01) | | |
| Rating | -0.0094*** | | -0.0094*** | | | |
| | (<0.01) | | (<0.01) | | | |
| Taxpmt | 0.5264* | 0.5317* | 0.5461* | 0.5538* | 1.2435*** | 1.4520*** |
| | (0.10) | (0.08) | (0.08) | (0.06) | (<0.01) | (<0.01) |
| Irate | 0.0015 | 0.0017 | | | 0.0143*** | |
| | (0.67) | (0.62) | | | (<0.01) | |
| R-squared | 0.08 | 0.09 | 0.08 | 0.09 | 0.25 | 0.17 |
| N | 205 | 205 | 206 | 206 | 146 | 146 |

*** indicates significance at the 1% level
** indicates significance at the 5% level
* indicates significance at the 10% level

the $R^2$ remain the same at 0.08 for model 1c and 0.09 for model 1d. In model 2a the market level of interest rate is significant at the one-percent level. However, excluding the variable in model 2b does not change the significance of the key variable LTSVP3. In addition, market-to-book, free cash flow and tax payments are also still significant and show the same sign. The p-value for size changes from 0.16 to 0.10 and $R^2$ drops by 8 percent (from 0.25 to 0.17). It is apparent that the results of model 1a, 1b, and 2a are not driven by the relatively strong relationship between the dependent variable and the market level of interest rate.

### *E. Conclusion*

The purpose of this paper is to investigate the theoretical reasons for the issuance of convertible debt securities. Previous studies analyzing the convertible debt security choice mostly utilize methods in which they compare convertible debt to straight debt and common equity. This study instead employs an innovative method using valuation errors at the time of the security file/issue date to test the risk-shifting hypothesis, the backdoor equity hypothesis, and the timing hypothesis of convertible debt, using a sample of 408 firms issuing convertible debt during the period 1971 to 1998. The residual income model is utilized to determine the firm's intrinsic value at the file/issue date. This value is then compared to the market value of common equity to determine the level of misvaluation. The conjecture is that levels of equity valuation within the convertible debt sample might vary significantly among debt-like and equity-like convertible debt issuers because of different underlying reasons determining the security choice. A method developed by LRS (1999) is utilized to distinguish between 'debt-like' issuers and 'equity-like' issuers of convertible debt, i.e. firms substituting convertible debt for straight debt or for common equity. This study finds support for the risk-shifting and backdoor equity hypotheses of convertible debt, but provides no evidence for the market timing hypothesis.

Consistent with the risk-shifting hypothesis of Green (1984) and Brennan and Schwartz (1988), the value of equity at the file/issue date has no significant impact explaining the security decision choice for issuing firms that substitute convertible debt for straight debt. In addition, the higher the risk level of the firm as measured by the market-to-book ratio and credit rating the more likely the issue is a substitute for straight debt. This indicates that the primary concern of the debt-like issuers of convertible debt is to mitigate the higher cost of debt associated with firm specific risk and agency problems. The results however, do not find support for the market timing hypothesis of convertible debt, predicting that equity is overvalued relative to its intrinsic value at the file/issue date and systematic overvaluation is expected.

Consistent with the backdoor equity hypothesis of Stein (1999), firm value at the file/issue date does have significant influence explaining the security decision choice. The more undervalued the firm's common equity relative to the average valuation for the previous two years prior to the file/issue date, the more likely the issue is a substitute for common equity. Managers who perceive the equity of the firm to be undervalued at the file/issue date issue convertible debt rather than common equity.

Further examination of the alternative hypotheses could be provided by tracking the convertible debt issues after the issue date and examine the characteristics of a sample of firms that actually convert to common equity and a sample of firms that do not convert. First, one would possibly get more insight in the motivations driving the convertible debt security decision choice. Second, it could provide a test of how well the risk neutral probability of conversion performs as a metric for dividing convertible debt issuers into firms that substitute convertible debt for common equity and those that substitute convertible debt for straight debt.

# REFERENCES


Alexander, Gordon J., Roger D. Stover, and David B. Kuhnau, 1979, Market timing strategies in convertible debt financing, *Journal of Finance,* 34, 143-155.

Asquith, Paul, 1991, Convertible debt: Corporate call policy and voluntary conversion, *Journal of Finance*, 46, 1273-1289.

Billingsley, Randall S., Robert E. Lamy, and G. Rodney Thompson, 1988, The choice among debt, equity, and convertible bonds, *Journal of Financial Research,* 11, 43-55.

Billingsley, Randall S., and David M. Smith, 1996, Why do firms issue convertible debt, *Financial Management*, 25, 93-99.

Brennan, Micheal J., and Alan Kraus, 1987, Efficient financing under asymmetric information, *Journal of Finance*, 42, 1225-1243.

Brennan, Micheal J., and Eduardo S. Schwartz, 1988, The case for convertibles, *Journal of Applied Corporate Finance,* 1, 55-64.

Brigham, Eugene F., 1966, An analysis of convertible debt debentures: theory and some empirical evidence, *Journal of Finance*, 21, 35-54.

Broman, Keith, 1963, The use of convertible subordinated debentures by industrial firms 1949-59, *Quarterly Review of Economics and Business,* 3, 65-75.

Brown, Stephen and Jerold Warner, 1980, Measuring security price performance, *Journal of Financial Economics* 8, 205-258.

Brown, Stephen and Jerold Warner, 1985, Using daily stock returns: The case of event studies, *Journal of Financial Economics* 14, 3-31.

Corrado, Charles J. and Terry L. Zivney, 1992, The specification and power of the sign test in event study hypothesis test using daily stock returns, *Journal of Financial and Quantitative Analysis* 27, 465-478.

Essig, Stuart, 1991, Convertible securities and capital structure determinants, Ph.D. dissertation (Graduate School of Business, University of Chicago, Chicago, IL).

Fama Eugene F., and Kenneth R. French, 1997, Industry cost of equity, *Journal of Financial Economics* 43, 153-193.

Graham, John R., 1996, Proxies for the corporate marginal tax rate, *Journal of Financial Economics* 42, 187-221

Green, Richard C., 1986, Investment incentives, debt, and warrants, *Journal of Financial Economics,* 13, 115-136.

Hoffmeister, J. Ronald, 1977, Use of convertible debt in the early 1970s: a reevaluation of corporate motives, *Quarterly Review of Economics and Business,* (Spring) 23-32.

Mann, Steven V., William T. Moore, and Pradipkumar Ramanlal, 1999, Timing of convertible debt issues, *Journal of Business Reseacrh*, 45, 101-105.

Mikkelson, Wayne H., Convertible calls and security returns, 1981, *Journal of Financial Economics*, 9, 237-264.

Lee, Charles M.C., James Myers, and Bhaskaran Swaminathan, 1999, What is the intrinsic value of the Dow, *Journal of Finance*, 54, 1693-1741.

Lewis, Craig M., Richard J. Rogalski, and James K. Seward, 1998, Problems, information asymmetries, and convertible debt security design, *Journal of Financial Intermediation,* 7, 32-59.

Lewis, Craig M., Richard J. Rogalski, and James K. Seward, 1999, Is convertible debt a substitute for straight debt or for common equity? *Financial Management,* 28, 5-27.

MacKinlay, A. Craig, 1997, Event studies in economics and finance, *Journal of Economic Literature* 35, 13-39.

Melicher, Ronald W., and J. Ronald Hoffmeister, 1977, The issue is convertible bonds, *Financial Executive,* November, 46-50.

Ohlson, James A., 1990, A synthesis of security valuation theory and the role of dividends, cashflows, and earnings, *Contemporary Accounting research*, 6, 648-676.

Ohlson, James A., 1995, Earnings, book values, and dividends in equity valuation, *Contemporary Accounting research*, 11, 661-687.

Pilcher, C. J., 1955, Raising capital with convertible securities, Michigan Business Studies No. 21/2, University of Michigan, Ann Arbor, MI.

Stein, Jeremy C., 1992, Convertible bonds as backdoor equity financing, *Journal of Financial Economics,* 32, 3-21.

VITA

Johanna Koeter-Kant

Candidate for the Degree of

Doctor of Philosophy

Thesis: VALUATION ERRORS AT THE TIME OF SECURITY ISSUANCE AND THE MARKET TIMING THEORY OF CAPITAL STRUCTURE

VALUATION ERRORS IN EQUITY AND THE MOTIVES FOR ISSUING CONVERTIBLE DEBT

Major Field: Business Administration

Biographical:

Personal Data: Born in Zwijndrecht, The Netherlands, on February 20, 1962, the daughter of Johannes Kant and Driesje Maria van Zwam.

Education: Received Bachelor of Science degree equivalent in Business from the Open Universitieit, Heerlen, the Netherlands in 1993; received Master of Business Administration degree from Oral Roberts University, Tulsa, Oklahoma in 1996. Completed the requirements for the Doctor of Philosophy degree with a major in Business Administration and a specialization in Finance at Oklahoma State University in August, 2003.

Experience: Graduate teaching Associate at Oklahoma State University from 1999 to 2001; Personal Assistant to Senior Technical Representative of Fokker Aircraft B.V. in Seoul, Korea from 1991 to 1993; Manager of Purchase Department, Nijhuis Alkono, the Netherlands from 1987 to 1990; Self employed from 1983 to 1987; Manager Personnel Planning, van der Valk B.V., the Netherlands from 1982-1983.

Professional Memberships: American Finance Association, Financial Management Association, Southern Finance Association.