PATRICK VERWIJMEREN

Empirical Essays on Debt, Equity, and Convertible Securities

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Patrick Verwijmeren

Empirical Essays on Debt, Equity, and Convertible Securities

Empirische studies over
vreemd vermogen, eigen vermogen, en converteerbare vermogenstitels

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Voor Peter, Carla, en Melissa

Preface

In late 2004, when looking for a master's thesis topic, I was very fortunate to get Miguel Rosellón appointed as my supervisor. At that time the introduction of IFRS provided a turbulent environment in the field of accounting, and during my internship at KPN I observed that managers were highly worried about the implications of these international accounting standards. Under the supervision of Miguel I wrote a thesis on the reactions of managers to the accounting changes. We showed that managers adjusted incentive schemes and hedging activities, even if the accounting changes did not have direct cash flow effects. After successfully defending my thesis, Miguel gave me two suggestions: 1) submit the thesis for the first CFO thesis award, and 2) apply for a PhD-position at the Rotterdam School of Management. The first advice won me 3,000 euros; the second advice cost me more than three years of my life. Nonetheless, I consider the latter advice as one of the best suggestions ever given to me.

The research project I applied for originated from the minds of Abe de Jong and Marno Verbeek, and dealt with firms' financing decisions. This field of corporate finance had recently regained a lot of academic attention after a seminal paper in 1999, and was particularly interesting given the existence of two rival theories. Abe de Jong is an experienced corporate finance researcher, making him a very suitable guide for this project. Marno Verbeek has an econometrical background, and as he became more and more involved in the projects, he distinguished himself as a strong researcher who could answer every econometric question I could think of. I am truly convinced that my conversations with him substantially increased my research abilities, and I would like to thank Marno for his excellent guidance on both the scientific and personal level.

During my PhD, I have had various faculty members as co-authors. Each one of them inspired me, and I am sure that all of them taught me more than I could teach them. Special thanks goes to Miguel Rosellón, who has also been my co-author in a study on the effects of IFRS on preference shares. Miguel is without a doubt one of the most intelligent persons I have ever met. When I had been thinking about a problem for days, Miguel could most of the time provide various solutions in an instant. Marie Dutordoir has been my co-author on my first paper on convertible securities, which is Chapter 5 of this dissertation. I have benefited greatly from Marie's knowledge on convertible securities, and I enjoyed working with her.

In the third year of my PhD, I have spent time at the Owen Graduate School of Management at Vanderbilt University, under the supervision of Ronald Masulis. I would like to thank him for the invitation and his many comments on my ideas. At Vanderbilt, I met Craig Lewis, with whom I wrote a paper on the designs of convertible securities. This paper has resulted in Chapter 4 of this dissertation. Craig's research ideas, working efficiency, and friendliness have greatly inspired me. I am sure that my cooperation with Craig will benefit me for the rest of my academic career.

Next to working with faculty members, I have also been engaged in projects with fellow PhD-students. Jeroen Derwall and I have written a paper on the impact of corporate social responsibility on firms' cost of capital. The paper shows that leaders in the fields of environmental performance, governance, and product quality have lower cost of capital than more sinful firms. I think of Jeroen as a promising young researcher, and expect him to stay a prominent spokesman on the effects of corporate social responsibility. I would also like to thank Tao Jiang who introduced me to the world of franchising: together with Abe de Jong we show that a franchising structure can provide tax benefits for the franchisor. Maarten Jennen and I explored whether the density of a firm's location has an effect on its profitability. Surprisingly, we find that firms in low density areas outperform firms in large cities. Being roommates, we mostly wrote the paper during the evenings, and Maarten is the kind of person that makes it fun to work late.

I would also like to thank my other roommates Willem Schramade, Chris Huurman, and Melissa Porras Prado. They always made it a pleasure to go to work. Furthermore, I would like to thank my fellow members at the PhD council, being Patricia Heijndijk, Remco Prins, and Oliver Weidenmuller. Of course, I am also indebted to ERIM. I would like to thank Tineke, Myra, Olga, and Eric for running a professional research institute that spreads such a warm feeling.

I would not dare writing this preface without thanking some close friends. Most of my best friends are united in my darts team. I would like to thank Bernard, Sandor, Alex, Mark, Koen, and Martin for partnering up with me - or for supporting us - in the many matches we played. In addition, I would like to thank my fellow board members and friends at youth society De Gooth, with whom I spend numerous evenings of beer and laughter. Also, I would like to thank the members of my indoor soccer team, who always kept playing the ball to me even when they knew they would never get it back.

Let me try to express my gratitude to Abe de Jong in just this paragraph, bearing in mind that it can be in no way a sufficient enough thank you. When I first met Abe, I could not have guessed the strong impact he would have on my life. His perseverance in dragging me to seminars, his sharp evaluations of my achievements ("Patrick heeft wetenschappelijk ADHD"), his extensive guidance, and his many research ideas (on every topic I could think of) have made me the researcher I am. Abe makes sure that his PhD-students learn everything they ought to know. His door is always open to discuss matters, and I honestly think Abe is the best supervisor one could wish for. I want to thank him for his care, patience, and extreme friendliness, and hope to continue working with him in the future.

My final word of gratitude goes to my parents and my fiancée. Peter, Carla, and Melissa are truly the most lovable people I know. This book is dedicated to them.

Contents

Chapter 1

Introduction

This thesis consists of four studies in the area of capital structure. The first two studies examine capital structure theories that explain firms' financing decisions. The other two studies focus on recent trends in convertible security offerings. This chapter discusses the current status of the literature regarding capital structure theories and convertible security offerings, and describes how our studies relate to this literature.

1.1 Capital structure theories

The capital structure of a firm refers to the way in which a firm finances its operations. Basically, a firm can choose between straight debt, common equity, and hybrid securities. A general characteristic of debt is that interest has to be paid and that the loan has to be repaid at a given point in time. A common form of equity is a share, which typically is an exchange of money for a share of business ownership. Hybrid securities are financing instruments that combine debt and equity characteristics, like preferred stock and convertible bonds.

One of the main questions in financial economics concerns the optimal financing decisions for firms: which type of financing should the firm obtain when its goal is to maximize firm value? Modigliani and Miller (1958) demonstrate that there would be arbitrage opportunities in perfect capital markets if the value of a firm depends on how it is financed. They also argue that if investors and firms can borrow at the same rate, investors can neutralize any capital structure decisions the firm's management may take. As a result, the financing decision is irrelevant in a perfect world.

However, when the assumptions used by Modigliani and Miller are relaxed, some factors appear to be relevant when determining the optimal debt ratio. The three factors that are mostly cited are tax advantages, bankruptcy costs, and agency costs. The first factor relates to the argument that firms should use as much debt as possible due to the tax deductibility of interest expenses. The second factor is a disadvantage of debt: firms with higher leverage have a larger probability of default, which is costly. Even when firms do not face an immediate threat of bankruptcy, increasing leverage raises the chance of a firm getting into financial distress. Agency costs are another factor influencing the optimal debt ratio. Jensen and Meckling (1976) for example identify the conflicts between the shareholders' interests and the managers' individual interests and suggest that debt is a remedy against this form of agency costs: since debt forces the company to pay out the excessive cash flow, it decreases the free cash flow which is at managers' discretion and thus in danger of being suboptimally invested. The *static tradeoff theory* argues that the tradeoff between these costs and benefits of debt results in an optimal debt ratio for firms.

An alternative financing theory is the *pecking order theory*. This theory suggests that firms' capital structure decisions can help to mitigate inefficiencies in a firm's investment program that are caused by informational asymmetries. Myers and Majluf (1984) show that firms' managers, when acting on behalf of the current shareholders, pass up good investments in case new shareholders will capture the benefits of the investment. Consequently, investors will reason that an investment decision without a security issue signals good news, while issuing securities signals bad news. The latter signal reduces the price investors are willing to pay for the issue. The information costs associated with debt and equity issues has led Myers (1984) to argue that a firm's capital structure reflects past financial requirements. There is a pecking order of corporate financing: firms prefer internal finance over external finance. If internal finance is not sufficient and firms require external finance, firms start with issuing debt, then possibly hybrid securities such as convertible bonds, and issue equity only as a last resort.

Empirical research has found evidence for both capital structure theories. Hovakimian, Opler, and Titman (2001) analyze the debt-equity choice of U.S. firms for the period 1979-1997. They estimate whether the difference between the firm's current leverage and its estimated target has an effect on whether the firm issues or repurchases debt or equity. They find that the higher the target with respect to the current leverage, the higher the probability that the firm issues debt. For repurchase decisions, it is found that the higher the target relative to the current leverage, the higher the likelihood that the firm repurchases equity. Flannery and Rangan (2006) find that the typical firm closes about one-third of the gap between its actual and its target debt ratio each year.

Shyam-Sunder and Myers (1999) introduce an empirical test for the pecking order theory. According to this test, the pecking order implies that firms issue or retire an amount of debt equal to the funds flow deficit, which is the inadequacy of internal cash flows for real investments and dividend commitments. In a regression of a firm's net debt issued on the financing deficit, the slope coefficient provides information on the proportion of a one dollar increase in deficits that is financed by debt. The pecking order implies that this coefficient is close to one. Using a sample of large, mature firms, Shyam-Sunder and Myers conclude that the pecking order model is a first-order descriptor of financing behavior, since they find an estimated pecking order coefficient of 0.75.

Multiple papers have responded to Shyam-Sunder and Myers' model. Chirinko and Singha (2000) argue that the linear specification of Shyam-Sunder and Myers (1999) is subject to a strong influence of large deficits. Frank and Goyal (2003) argue that firms with the greatest potential for asymmetric information will have the greatest incentive to follow the pecking order. They conclude that finding large, mature firms (rather than small, high-growth firms) to perform best in the Shyam-Sunder and Myers' test is contrary to the pecking order theory. Lemmon and Zender (2007) argue that the finding of large firms to perform best for the pecking order is the result of debt capacity restraints, since it are precisely the small, high-growth firms that face the more restrictive debt constraints.

Chapter 2 of this dissertation improves the empirical test of Shyam-Sunder and Myers (1999). Our first modification relates to the fact that Shyam-Sunder and Myers' model does not discriminate between the effects of financing deficits and financing surpluses. Our second modification results from Chirinko and Singha (2000), who argue that Shyam-Sunder and Myers' empirical model is flawed for firms with large deficits. In case these firms follow the pecking order, the large financing needs may exceed the unused debt capacity and firms will finance the remainder of the financing needs with equity. Therefore, our model distinguishes three situations, i.e., firms with surpluses, firms with "normal" deficits, and firms with large deficits. We hypothesize that the pecking order test yields coefficients reasonably close to unity for firms with "normal" deficits, but expect lower coefficients for firms with larger deficits, as these firms are more likely to reach their debt capacity.

We test our capital structure models by using a large panel of U.S. firms taken from Compustat over the period 1971-2005. We find a strong asymmetry in pecking order behavior. For surpluses the estimated pecking order coefficient is 0.90, while for deficits it is only 0.15. Next, we test the pecking order model for different deficit sizes. In firms with normal deficits, the pecking order coefficient is around 0.74. In contrast, large deficit firms exhibit a coefficient of 0.09. This low coefficient can be explained by firms' debt capacities: since the financing of large deficits with debt would result in a substantial increase of the debt ratio, firms opt for issuing equity.

Chapter 3 builds on our finding that the debt capacity is important in firms' financing decisions. The main goal in Chapter 3 is to examine whether the pecking order theory or the static tradeoff theory is more capable of explaining firms' financing decisions. We estimate firm-year specific debt capacities, and use these estimates to construct a framework that allows us to identify situations in which the pecking order theory and the static tradeoff theory have conflicting predictions: the static tradeoff theory argues that a firm increases leverage until it reaches its target debt ratio, while the pecking order yields debt issuance until the debt capacity is reached.

We again focus our analysis on the U.S., and find that the pecking order theory is a better predictor of firms' financing decisions than the static tradeoff theory. That is, most firms that are not restricted by their debt capacity issue debt when their leverage is above their supposed target debt ratio. We further test whether a preference for a capital structure theory is firm-specific. We find persistence in firms' preferences: a firm that acts according to the pecking order theory or static tradeoff theory in a given year is more likely to do so again in a subsequent year.

1.2 Convertible security offerings

For the remainder of this dissertation we shift focus from broad capital structure theories to specific financing instruments. In particular, we focus on hybrid securities, which combine characteristics of debt and equity. The specific structure of these instruments can provide further insight into the relevant costs and benefits of debt and equity. A well-known hybrid instrument is a convertible security. In its basic form, convertible securities are securities that are structured as a bond or preferred stock, but that can be converted into a pre-determined number of common shares. In this way, convertible security holders benefit when the share price of the firm increases.

Tests of the static tradeoff theory and the pecking order theory generally ignore hybrid securities such as convertible securities. Still, convertible securities are a relatively popular instrument. In the U.S. for example, SDC reports that total proceeds of the convertible issues in 2007 exceed 100 billion dollars.

Studies on the motivations for convertible issuance represent two different viewpoints. According to Stein's (1992) delayed equity rationale, companies with high equity-related adverse selection costs use convertibles as a substitute for equity. These firms subsequently force conversion of the convertible into shares by calling them, and thus obtain equity "through the backdoor". Other authors argue that convertibles are used as an alternative for straight debt by firms with high debt-related financing costs (e.g., Green (1984), Brennan and Kraus (1987), and Brennan and Schwartz (1988)).

In line with these two viewpoints, Lewis, Rogalski, and Seward (1999) find evidence that some convertible offerings are substitutes for debt, while other convertible offerings are substitutes for equity. Survey evidence (e.g., Graham and Harvey (2001)) is mostly in line with Stein's backdoor-equity hypothesis.

In Chapter 4 we look at a range of choices that convertible security issuers face. When focusing on convertible issues over the period 2000-2007, we observe that an important decision for convertible security issuers is to choose between convertible debt and convertible preferred stock. When convertible debt is chosen, the next main choice is whether to allow settlement in cash, or to just settle in stock. When convertible preferred stock is issued, the main choice is whether conversion of the convertible preferred stock is mandatory at a given point in time.

We find that taxes are an important factor in explaining why some firms issue convertible preferred stock, and others issue convertible bonds. We also find that refinancing costs and managerial discretion costs are important determinants of the decision between convertible bonds and convertible preferred stock. Cash settlements have become more popular over the years: in 2000, the large majority of convertible bond issues were stock settlements, whereas in 2007 the large majority are cash settlements. We find that earnings management is a strong driver of the increase in popularity of cash settlements. Mandatory convertibles are generally issued by firms to reduce the indebtedness and to improve the credit rating.

In Chapter 5 we focus on a specific innovation in the convertible market. In recent years, firms tend to add stock repurchases to their convertible offerings. We test whether convertible arbitrage drives the combination of a convertible issue and a stock repurchase: convertible arbitrageurs simultaneously buy convertibles and short sell the issuer's common stock, resulting in downward pressure on the stock price. Our hypothesis is that convertible issuers repurchase (borrowed) stock from the arbitrageurs to facilitate such short-selling activity and mitigate the negative price pressure.

We show that convertible arbitrage strategies indeed drive the combinations of convertible issues and stock repurchases. Firms that combine the convertible issue and the stock repurchase exhibit less short-selling activity in the open market and less negative excess returns than uncombined convertible issues. We also show that convertible arbitrage explains both the size and the timing of the stock repurchases.

Chapter 2

The impact of financing surpluses and large financing deficits on tests of the pecking order theory[1]

2.1 Introduction

In explaining firms' financing behavior, the pecking order theory has become a widely debated model of capital structure choice. According to the pecking order theory, firms have no well-defined optimal debt ratio (Myers (1984)). Instead, due to asymmetric information, firms adopt a hierarchical order of financing preferences: internal financing is preferred to external financing. If external financing is needed, firms first seek debt funding. Equity is only issued as a last resort.

The seminal paper by Shyam-Sunder and Myers (1999) introduces an empirical test for the pecking order theory. According to this test, the pecking order implies that firms issue or retire an amount of debt equal to the funds flow deficit, which is the inadequacy of internal cash flows for real investments and dividend commitments. In a simple regression of a firm's net debt issued on the financing deficit, the slope coefficient provides information on the proportion financed by debt of a one dollar

[1] This chapter is based on De Jong, Verbeek and Verwijmeren (2008a). It has benefited from comments by Marie Dutordoir, Kose John, Marieke van der Poel, Abraham Ravid, Miguel Rosellón, and seminar participants at RSM Erasmus University.

increase in deficits and the pecking order implies that this coefficient is close to unity. Using a small sample of firms that survive the entire 1971-1989 period, Shyam-Sunder and Myers conclude that the pecking order model is an excellent first-order descriptor of financing behavior, since they find an estimated pecking order coefficient of 0.75. Frank and Goyal (2003) test the pecking order model using a more comprehensive data set. They find substantially lower coefficients and show that larger firms exhibit more pecking order behavior than smaller firms. This size effect is corroborated by Fama and French (2002). From a pecking order perspective, this relation is counterintuitive as small firms have the highest potential for asymmetric information, which is the actual driver of the pecking order in the Myers and Majluf (1984) model. We refer to the size anomaly as the first pecking order puzzle. Another finding of Frank and Goyal is that the pecking order model has lost its explanatory power over the years. For the period 1971-1989 their estimated coefficient is 0.28, while for 1990-1998 it is as low as 0.15. Frank and Goyal's analysis does not explain this trend. We consider the decreasing pecking order coefficient over time to be the second pecking order puzzle.

The main goal of this chapter is to examine whether two modifications in Shyam-Sunder and Myers' (1999) model can solve the puzzles. Our first modification relates to the fact that the model does not discriminate between the effects of financing deficits and financing surpluses. Instead, the model is typically estimated over both surpluses and deficits, and imposes a common homogeneous pecking order coefficient. However, the implications of deficits and surpluses are different: in case of a deficit, a firm has to issue securities, while it repurchases securities when having a surplus. As Myers and Majluf's (1984) theory for the pecking order for issuance decisions differs from a theory on repurchase decisions in Shyam-Sunder and Myers, we allow for an asymmetry between the effects of surpluses and deficits.

Our second modification results from Chirinko and Singha (2000), who argue that Shyam-Sunder and Myers' empirical model is flawed for firms with large deficits. In case these firms follow the pecking order, the large financing needs may exceed the unused debt capacity and firms will finance the remainder of the financing needs with equity. Therefore, our model distinguishes three situations, i.e., firms with surpluses, firms with "normal" deficits, and firms with large deficits. We hypothesize that the pecking order test yields coefficients reasonably close to unity for firms with "normal" deficits, but expect lower coefficients for firms with larger deficits, as these firms are more likely to reach their debt capacity.

We test our capital structure models by using a large panel of U.S. firms taken from Compustat over the period 1971-2005. We corroborate the results of Frank and Goyal (2003) as the estimated pecking order coefficient is 0.26 over the full period, lower in small firms, and decreasing over time. Next, we extend the analysis by estimating the pecking order model for subgroups with deficits and surpluses. We find a strong asymmetry in pecking order behavior. For surpluses the estimated pecking order coefficient is 0.90, while for deficits it is only 0.15. This finding shows that the average estimate of 0.26 hides a substantial degree of asymmetry across financing surpluses and deficits.

Next, we test the pecking order model for different deficit sizes. In firms with normal deficits, the pecking order coefficient is around 0.74. In contrast, large deficit firms exhibit a coefficient of 0.09. This low coefficient is potentially explained by firms' debt capacities: firms with large deficits are restricted in issuing debt. To test the impact of the debt capacity, we build on previous literature and construct subgroups with different levels of financial constraints. We find that the pecking order model is a good description of the financing behavior of non-constrained firms, and find that the lower pecking order coefficients in certain subsamples are indeed consistent with firms' restrictions in issuing debt.

The distinction between surpluses, normal deficits, and large deficits appears to explain both pecking order puzzles. The size anomaly results from the fact that large financing deficits are much more common for relatively small firms, while financing surpluses are scarcer for small firms. The second puzzle – that the pecking order model loses explanatory power over time – is also explained by large deficits, as these have become more common in recent years.

This chapter is mostly related to Lemmon and Zender (2007) and Agca and Mozumdar (2007). The paper by Agca and Mozumdar, in particular, also uses a piecewise linear specification to account for debt capacity. We corroborate their findings with regard to the effect of the debt capacity: the pecking order model performs worse for firms with smaller debt capacities. We show that the distribution of deficit sizes has an additional decreasing effect on the pecking order coefficient for firms with small debt capacities: it are the constrained firms that have the largest financing needs. We further add to these papers the notion that firms act very differently in response to financing surpluses and deficits, and provide insight into the changes of the financing deficit over time.

The remainder of this chapter is organized as follows. In Section 2.2 we present the pecking order model and its empirical implications. In Section 2.3 the data are described, and Section 2.4 describes the empirical results of this study. Finally, we present our conclusions in Section 2.5.

2.2 Theory

This section describes some of the empirical and theoretical studies on the pecking order theory, and explains how this chapter relates to these studies.

2.2.1 Pecking order theory

Donaldson (1961) is the first to describe firms’ preferences for internal funds over external funds, and firms’ preferences for issuing debt over issuing equity. Myers and Majluf (1984) explain these preferences in a theoretical model that deals with capital structure decisions of firms with external financing needs. Myers and Majluf show that firms’ managers, when acting on behalf of the current shareholders, pass up good investments in case the new shareholders will capture the benefits of the investment. Consequently, investors will reason that an investment decision without an equity issue signals good news, while issuing shares signals bad news. The latter signal reduces the price investors are willing to pay for the equity issue, which results in a pecking order of corporate financing: managers will prefer debt to equity.

A pecking order model for repurchase decisions is presented in Shyam-Sunder and Myers (1999). They assume that firms’ managers differ in their degree of being optimistic. Managers who are less optimistic than investors do not want to repurchase shares, as they perceive the price as being too high. The optimistic managers, however, want to repurchase shares, hence forcing up stock prices if they try to do so. With the new stock price, there will be fewer managers who are more optimistic than the investors, and the stock price impact of an attempted repurchase increases. In the end, the repurchase price reaches such a high level that none of the managers wants to repurchase equity. Accordingly, all managers end up paying down debt.

When one compares the pecking order theory for issue decisions with the pecking order theory for repurchase decisions, it becomes clear that both theories provide differing rationales. For example, the level of optimism of firms’ managers is not required for explaining issuance decisions, while it is an essential part of the pecking order theory for repurchase decisions. An empirical test of the pecking order model should therefore distinguish between issuance and repurchase decisions.

2.2.2 Testing the pecking order theory

Shyam-Sunder and Myers (1999) aim to capture the pecking order theory in an empirical model that relates financing deficits to net debt issues[2]:

$$\Delta D_{it} = \alpha + \beta_{po}{*}DEF_{it} + \varepsilon_{it}, \quad (1)$$

where DEF_{it} is the financing deficit of firm *i* in year *t*, and ΔD_{it} is the net debt issued for firm *i* in year *t*. Both variables are scaled by assets. In case firms have unconstrained access to debt, the pecking order theory predicts that the amount of debt issued equals the deficit, and hence the pecking order coefficient (β_{po}) equals one, and the intercept term α is zero. Note that the size of the financing deficit is endogenous: firms can – to certain limits – decide how much money to attract and invest. In reality, a firm's debt capacity is limited due to financial distress costs. Therefore, Shyam-Sunder and Myers hypothesize that β_{po} is close to one, but not precisely one. For a sample of 157 firms with continuous data over the period 1971-1989, Shyam-Sunder and Myers find an estimated coefficient of 0.75 and conclude that the pecking order model is "an excellent first-order descriptor of corporate financing behavior." Frank and Goyal (2003) substantially extend the sample of firms used to test the pecking order model. Estimating Shyam-Sunder and Myers' regression specification using a comprehensive data set with over 140,000 observations over the period 1971-1998, Frank and Goyal find substantially lower coefficients. Furthermore, they test whether small firms issue less equity than large firms, as investors of smaller firms face more informational asymmetry (e.g., Collins, Kothari, and Rayburn (1987); Brennan and Hughes (1991)), and informational asymmetry increases firms' reluctance to issue equity (Korajczyk, Lucas, and McDonald (1991); Choe, Masulis, and Nanda (1993)). Contrary to this hypothesis, Frank and Goyal find that large firms exhibit more pecking order behavior than small firms. This size anomaly is also found by Fama and French, who consider it a "deep wound" (Fama and French (2002), p. 30) on the pecking order theory.

Frank and Goyal (2003) also find that the pecking order model loses its explanatory power over the years. Because the average publicly traded firm becomes

[2] Prior to this model, the pecking order was usually tested with the event study methodology. Most studies find an insignificant market reaction to debt issues, a significantly negative market reaction to equity issues, and a significantly positive market reaction to equity repurchases. For overviews of this literature, see Eckbo and Masulis (1995) and Ritter (2003). Another way of testing the pecking order theory is by conducting a survey. Graham and Harvey (2001) survey 392 CFOs and interpret the reported importance of financial flexibility and equity undervaluation in managers' financing decisions as support for the pecking order theory.

smaller over time (Fama and French (2005)), the size and time effects can be related. However, Frank and Goyal conclude that the time period effect is not entirely due to the higher amount of small firms in the 1990s: for each of the size quartiles, the pecking order model coefficients are lower after 1989 than before 1989.

2.2.3 Large deficits and firms' debt capacities

In a critical comment on Shyam-Sunder and Myers' (1999) pecking order model, Chirinko and Singha (2000) show that the pecking order coefficient can be significantly smaller than one even when firms follow the financing hierarchy prescribed by the pecking order model. The rationale is that, if deficits are sufficiently large, firms might be constrained in their ability to issue debt and have to finance the remainder of the deficit with equity. According to Chirinko and Singha, these constraints are specifically high when firms have high leverage ratios. We elaborate on the critique of Chirinko and Singha by empirically showing the influence of large deficits.

Lemmon and Zender (2007) and Agca and Mozumdar (2007) estimate Shyam-Sunder and Myers' (1999) regression specification for subsamples that are based on firms' debt capacities. They find that the pecking order model works best for firms that are not constrained in their debt issuing. Although the size of the deficit is not the main focus of either of the papers, both papers control for the effects of larger deficits: Lemmon and Zender include a quadratic term of the deficit and Agca and Mozumdar use a piecewise linear specification. Following our discussion of the different effects of financing surpluses (i.e. negative deficits), a quadratic term of the financing deficit seems inappropriate since a negative deficit becomes positive when squared. We therefore differ from both papers in taking the effect of surpluses into account when testing the relation between the financing deficit, the debt capacity, and firms' financing decisions. We examine how our findings relate to these papers in Section 2.4.4.

2.3 Data

In our empirical analysis, we employ a broad cross-section of U.S. firms from the Compustat database covering the period 1971-2005. The starting point is 1971 because we require flow of funds data to compute the financing deficit, and these data are not available prior to 1971. We compute the financing deficit as the sum of the change in working capital, the investments, and the cash dividends, minus the internal cash flows. By definition, the financing deficit is equal to the sum of net debt issues and net equity issues. Financing deficits (surpluses) and issues (repurchases) are scaled by the book value of total assets. Regulated utilities (SICs 4900-4999), financial firms (SICs 6000-6999), and individual firm-years with missing values for the financing deficit/surplus, the net debt issues, and the net equity issues are excluded. We further exclude firm-years for which the financing deficit, the change in working capital, the investments, the cash dividends, the internal cash flows, the net debt issues, or the net equity issues exceed 400% of the firm's total book assets. While these requirements make our sample comparable to Frank and Goyal (2003), we deviate from the criteria in Shyam-Sunder and Myers (1999), in which firms are required to provide data in each year of their sample period. We will revisit this issue in Section 2.4. Our final sample contains 22,197 firms and covers 233,909 firm-year observations.[3]

Table 1 presents summary statistics of the fund flow and financing variables in our analysis, and how they are computed from Compustat items. Although we are not able to perfectly replicate Frank and Goyal's (2003) sample, Table 1 closely corresponds to their Table 2 (p. 229). Table 1 also shows the composition of the financing deficit and the magnitude of these components in different years. The average internal cash flows and the average working capital decline over the years, while the average cash dividends remain relatively stable over the time period.

[3] Several cash flow statement items are recoded as zero if they were reported missing or combined with other data items in Compustat. The data are often coded as missing when a firm does not report a particular item or when it combines items. See Frank and Goyal's Table 8 (2003, p. 242) for the specific cash flow statement items that are recoded.

Table 1: Corporate cash flows

This table shows the corporate cash flows and the issuance of securities for the sample period 1971–2005. Financial firms and utilities are excluded. The sample additionally excludes firm-years with gaps in the reporting of relevant flow of funds data. The net debt issues are computed as Item 111 – Item 114, and the net equity issues are computed as Item 108 – Item 115. All variables are scaled by total assets. The table is a replication of Table 2 of Frank and Goyal (2003).

	Average funds flow and financing as a percentage of total assets							
	1971	1975	1980	1985	1990	1995	2000	2005
Cash dividends [a]	0.015	0.012	0.014	0.015	0.016	0.014	0.010	0.014
Investments [b]	0.101	0.077	0.110	0.132	0.067	0.094	0.084	0.069
Working capital [c]	0.033	0.015	0.033	-0.028	-0.016	0.023	-0.015	-0.014
Internal cash flow [d]	0.101	0.096	0.095	0.026	0.006	-0.006	-0.084	-0.051
Financing deficit (a + b + c – d)	0.048	0.009	0.062	0.093	0.061	0.137	0.162	0.120
Net debt issues	0.017	0.003	0.012	0.018	0.006	0.026	0.018	0.029
Net equity issues	0.030	0.006	0.050	0.075	0.055	0.111	0.144	0.091
Net external financing	0.048	0.009	0.062	0.093	0.061	0.137	0.162	0.120
N	2,992	5,802	5,709	6,488	6,668	9,009	8,562	5,900

[a] Item 127.
[b] For firms reporting format codes 1 to 3, investments equal Item 128 + Item 113 + Item 129 + Item 219 – Item 107 – Item 109. For firms reporting format code 7, investments equal Item 128 + Item 113 + Item 129 – Item 107 – Item 109 – Item 309 – Item 310.
[c] For firms reporting format code 1, change in net working capital equals Item 236 + Item 274 + Item 301. For firms reporting format codes 2 and 3, change in net working capital equals –Item 236 + Item 274 - Item 301. For firms reporting format code 7, change in net working capital equals –Item 302 – Item 303 – Item 304 – Item 305 – Item 307 + Item 274 – Item 312 – Item 301.
[d] For firms reporting format codes 1 to 3, internal cash flow equals Item 123 + Item 124 + Item 125 + Item 126 + Item 106 + Item 213 + Item 217 + Item 218. For firms reporting format code 7, internal cash flow equals Item 123 + Item 124 + Item 125 + Item 126 + Item 106 + Item 213 + Item 217 + Item 314.

Table 2 provides detailed information on the financing deficits and surpluses over the sample period. Although the yearly percentage of firms with financing deficits varies between 44% (in 1976) and 65% (in 1997), it does not portray a strong time trend. The average size of the deficits varies substantially over time: it fluctuates around 0.10 over the first ten years of our sample period, but is around 0.26 over the last ten years. This trend is caused by the growing magnitude of the deficits at the 75th percentile. In the seventies, about 25% of the deficits is larger than 0.12, while in the late nineties this quartile has increased to 0.40. The average size of the surpluses hardly fluctuates over time. The median is 0.02 or 0.03. Furthermore, the average surplus size is lower than the average deficit size: the overall mean surplus is 0.06 and the overall mean deficit is 0.21. This difference is again caused by the levels of the largest deficits, as large surpluses are virtually absent.[4]

[4] We have tested whether winsorizing the size of the deficit at the 95% level will have a strong effect on our results. We find that both the asymmetry between the effects of deficits and surpluses and the asymmetry between the effects of different deficit sizes (measured in quartiles) remain present when we winsorize the financing deficit.

Table 2: Deficits and surpluses, 1971 to 2005

This table shows the distribution of financing deficits and financing surpluses over time. A firm has a deficit if the sum of the firm's investments, cash dividends, and increase in working capital exceeds the firm's internal cash flows. A firm has a surplus if its internal cash flows in a year exceed the sum of the firm's investments, cash dividends, and increase in working capital. When a firm has a surplus it repurchases securities, while the firm has to issue securities when it faces a deficit. Next to means and medians, we also provide information on the 25th and 75th percentile, to portrait the distribution of the deficits and surpluses more accurately. Deficits and surpluses are scaled by assets. Under "%" we report the percentage of firms having a deficit or a surplus in that particular year. These percentages do not add up to 100% as some firm-years have a financing deficit of exactly zero.

		Deficits					Surpluses				
Year	N	%	Mean	25th perc.	Median	75th perc.	%	Mean	25th perc.	Median	75th perc.
1971	2,992	0.55	0.11	0.02	0.07	0.14	0.40	0.03	0.01	0.02	0.03
1972	3,200	0.57	0.11	0.02	0.06	0.14	0.39	0.03	0.01	0.02	0.03
1973	3,970	0.56	0.09	0.02	0.05	0.11	0.40	0.04	0.01	0.02	0.04
1974	5,638	0.48	0.09	0.02	0.06	0.11	0.45	0.05	0.01	0.02	0.05
1975	5,802	0.44	0.08	0.02	0.05	0.10	0.49	0.06	0.01	0.02	0.06
1976	5,871	0.44	0.09	0.02	0.05	0.11	0.49	0.05	0.01	0.02	0.05
1977	5,912	0.49	0.09	0.02	0.05	0.11	0.44	0.05	0.01	0.02	0.05
1978	5,779	0.51	0.10	0.02	0.05	0.12	0.42	0.05	0.01	0.02	0.05
1979	5,618	0.52	0.11	0.02	0.06	0.12	0.42	0.05	0.01	0.02	0.05
1980	5,709	0.55	0.15	0.02	0.07	0.17	0.40	0.06	0.01	0.02	0.05
1981	5,709	0.56	0.18	0.02	0.07	0.21	0.38	0.05	0.01	0.02	0.05
1982	5,948	0.53	0.16	0.02	0.07	0.17	0.40	0.06	0.01	0.02	0.06
1983	6,136	0.58	0.23	0.03	0.10	0.31	0.37	0.06	0.01	0.02	0.06
1984	6,168	0.56	0.18	0.02	0.08	0.21	0.39	0.06	0.01	0.02	0.06
1985	6,488	0.57	0.21	0.02	0.08	0.26	0.38	0.07	0.01	0.03	0.06
1986	6,657	0.58	0.25	0.03	0.11	0.33	0.37	0.08	0.01	0.03	0.07
1987	6,782	0.56	0.25	0.03	0.11	0.33	0.39	0.07	0.01	0.03	0.07
1988	6,747	0.50	0.18	0.02	0.08	0.21	0.43	0.07	0.01	0.03	0.07
1989	6,612	0.51	0.20	0.02	0.08	0.23	0.42	0.06	0.01	0.03	0.06
1990	6,668	0.48	0.18	0.02	0.07	0.20	0.44	0.06	0.01	0.03	0.06
1991	6,867	0.50	0.20	0.02	0.07	0.22	0.43	0.06	0.01	0.03	0.06
1992	7,102	0.53	0.22	0.02	0.08	0.27	0.41	0.06	0.01	0.03	0.06
1993	7,630	0.57	0.23	0.02	0.10	0.30	0.37	0.06	0.01	0.03	0.06
1994	8,184	0.59	0.22	0.02	0.09	0.27	0.35	0.05	0.01	0.02	0.06
1995	9,009	0.61	0.25	0.03	0.10	0.32	0.33	0.05	0.01	0.02	0.06
1996	9,179	0.63	0.28	0.03	0.13	0.39	0.31	0.05	0.01	0.03	0.06
1997	8,930	0.65	0.25	0.03	0.11	0.33	0.31	0.06	0.01	0.03	0.06
1998	9,164	0.64	0.28	0.03	0.12	0.35	0.31	0.06	0.01	0.03	0.07
1999	9,078	0.62	0.31	0.03	0.12	0.43	0.33	0.07	0.01	0.03	0.07
2000	8,562	0.61	0.30	0.03	0.10	0.41	0.34	0.07	0.01	0.03	0.07
2001	7,945	0.56	0.21	0.02	0.07	0.21	0.37	0.07	0.01	0.03	0.07
2002	7,541	0.51	0.21	0.01	0.06	0.20	0.42	0.07	0.01	0.03	0.07
2003	7,369	0.55	0.23	0.02	0.07	0.26	0.38	0.06	0.01	0.03	0.07
2004	7,043	0.60	0.26	0.02	0.07	0.32	0.34	0.06	0.01	0.03	0.07
2005	5,900	0.60	0.24	0.02	0.07	0.29	0.36	0.06	0.01	0.03	0.07
Avg	6,683	0.56	0.21	0.02	0.08	0.23	0.38	0.06	0.01	0.03	0.06
SD	1,536	0.05	0.07	0.00	0.02	0.09	0.05	0.01	0.00	0.01	0.01

2.4 Empirical tests

In this section we test the pecking order theory for groups with financing surpluses, non-large deficits, and large deficits. We also show the impact of these segregations on the pecking order puzzles.

2.4.1 The pecking order puzzles

We first replicate Frank and Goyal's (2003) key findings that illustrate the pecking order puzzles. Table 3 shows a replication of Frank and Goyal's Table 6 using our sample of Compustat firms, and provides updated results for the second subperiod starting in 1990. In this table, we present pooled OLS estimates of the pecking order coefficients for different time periods and size quartiles.

For the entire sample period 1971-2005, the estimated pecking order coefficient is 0.255, which is comparable to the estimates reported in Frank and Goyal. The interpretation of this coefficient is that an increase of the deficit of one dollar will on average be financed with 25.5 cents of debt. Although this pecking order coefficient is significantly different from zero, it is actually evidence against the pecking order model. Apparently, on average 74.5 cents of a one dollar increase in deficits is met by an equity issue.

The additional results in Table 3 highlight the two pecking order puzzles. Before 1989, the estimated pecking order coefficient for the quartile containing the smallest firms is 0.223, while for the largest firms it is considerably higher, viz. 0.763. After 1989, the pecking order coefficient of the largest firms remains relatively high with an estimate of 0.667, against 0.207 for the smallest firms. As the differences in the average pecking order coefficients before and after 1989 are possibly caused by only a few years, Figure 1 shows the evolution over the years of the estimated pecking order coefficients, using the entire sample of firms.

It can be seen that the pecking order model describes most of firms' financing behavior in the seventies, but is a poor descriptor of firms' financing behavior in the eighties and nineties. Although the pecking order coefficient does not decline linearly, Figure 1 shows a trend of a decreasing impact of the deficit on firms' debt issues over time.

Table 3: Pecking order tests for small and big firms before 1989 and after 1989

The sample period is 1971–2005. Financial firms and utilities are excluded. The sample additionally excludes firm-years with gaps in the reporting of relevant flow of funds data. Firms are yearly sorted into quartiles based on total assets. The estimated regression specification is $\Delta D_{it} = \alpha + \beta_{po} * DEF_{it} + \varepsilon_{it,}$ where ΔD_{it} is the amount of net debt issued and DEF_{it} is the financing deficit. All variables are scaled by total assets. White standard errors appear in parentheses. * indicates significance at the 1% level.

	Overall	1971-1989					1990-2005				
		Overall	Smallest	Medium small	Medium large	Largest	Overall	Smallest	Medium small	Medium large	Largest
α	-0.007*	-0.007*	-0.025*	-0.015*	-0.007*	-0.001*	-0.008*	-0.027*	-0.019*	-0.007*	0.001
	(0.000)	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)	(0.000)
β_{po}	0.255*	0.332*	0.223*	0.517*	0.672*	0.763*	0.226*	0.207*	0.205*	0.410*	0.667*
	(0.005)	(0.009)	(0.011)	(0.015)	(0.015)	(0.020)	(0.005)	(0.008)	(0.010)	(0.009)	(0.009)
N	233,909	107,738	26,656	27,000	27,009	27,029	126,171	30,763	31,783	31,791	31,802
R^2	0.234	0.298	0.191	0.498	0.648	0.756	0.209	0.200	0.169	0.340	0.650

Figure 1: The pecking order coefficients, 1971 to 2005

This figure shows the pecking order coefficients (β_{po}) over the years. We determine the pecking order coefficient by estimating the regression specification $\Delta D_{it} = \alpha + \beta_{po}*DEF_{it} + \varepsilon_{it}$ on a yearly basis, where ΔD_{it} is the net debt issued by firm *i* in year *t* and DEF_{it} is the financing deficit of firm *i* in year *t*.

2.4.2 Deficits and surpluses

To investigate the differences in pecking order behavior for firm-years with financing deficits and firm-years with financing surpluses, we estimate a regression specification that allows for an asymmetry between positive and negative deficits. The following model allows for such an asymmetry

$$\Delta D_{it} = \alpha + \beta_1*d_{it} + \beta_{po}*DEF_{it} + \beta_{sur}*d_{it}*DEF_{it} + \varepsilon_{it,} \quad (2)$$

where d_{it} is a dummy variable that equals one if $DEF_{it} < 0$, and zero otherwise. The term β_1*d_{it} allows for different intercepts for the samples of deficits and surpluses.

Table 4: Pecking order tests for financing deficits and surpluses

The sample period is 1971–2005. We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. This table determines the significance of a dummy for financing surpluses, and tests the model $\Delta D_{it} = \alpha + \beta_1 * d_{it} + \beta_{po} * DEF_{it} + \beta_{sur} * d_{it} * DEF_{it} + \varepsilon_{it,}$ where ΔD_{it} is the amount of net debt issued, DEF_{it} is the financing deficit, and d_{it} is a dummy variable that equals one if $DEF_{it} < 0$, and is zero otherwise. All variables are scaled by total assets. White standard errors appear in parentheses. * indicates significance at the 1% level.

	Overall	1971-1989	1990-2005
α	0.029*	0.035*	0.023*
	(0.001)	(0.001)	(0.001)
β_1	-0.027*	-0.034*	-0.021*
	(0.001)	(0.001)	(0.001)
β_{po}	0.155*	0.169*	0.153*
	(0.005)	(0.008)	(0.006)
β_{sur}	0.746*	0.765*	0.714*
	(0.013)	(0.018)	(0.018)
N	233,909	107,738	126,171
R^2	0.390	0.495	0.324

Table 4 shows our estimation results for Eq. (2). The pecking order coefficient (β_{po}) of 0.155 implies that firms with deficits issue on average 15.5 cents of debt for each additional dollar of the financing deficit. Accordingly, most of the deficits are covered with equity issues. The coefficient estimates are similar in the pre-1989 and post-1989 periods. The coefficient β_{sur} represents the difference in the pecking order coefficients for deficits and surpluses, and is significantly different from zero at the 1% level. For firms with financing surpluses the estimated pecking order coefficient is 0.746 higher than for firms with deficits, and again the effect is similar in the two subperiods. These results imply that the pecking order coefficient is 0.901 (β_{po}+ β_{sur}) for surpluses. That is, on average 90 cents of a dollar increase of the financing surplus are used to repurchase debt. Overall, firms seem to have a strong preference for buying back debt when there is a surplus, but do not seem to follow the pecking order when they have a deficit. Hence, we conclude that a correct empirical pecking order specification requires a differentiation between financing deficits and financing surpluses.

The financing deficit is calculated by subtracting the internal cash flows of a firm in a particular year from the sum of the cash dividends, net investments, and changes in working capital in that year. We decompose the deficits and surpluses in Table 5 to investigate how the components differ for firm-years with deficits and firm-years with surpluses. Table 5 also shows means and medians of several other firm characteristics for firm-years with deficits and those with surpluses.

Table 5: Characteristics for financing deficits and surpluses

The sample period is 1971–2005. We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. This table determines the differences between firm-years with financing deficits and firm-years with financing surpluses. Assets are determined by Compustat Item 6 and are reported in millions of dollars. The debt ratio is computed by dividing Item 9 by Item 6. The market-to-book ratio is (Item 24 * Item 25 – Item 60 + Item 6) / Item 6 and EBIT is Item 18 + Item 15 + Item 16. The issue size is equal to the net amount of equity issued/repurchased plus the net amount of debt issued/repurchased. Rated debt is a dummy variable that equals one if a firm has rated debt outstanding, as reported with Compustat Item 280, and zero otherwise. The variables change in working capital, investments, cash dividends, internal cash flows, EBIT and issue size are scaled by total assets. We estimate *t*-tests with equal variances not assumed to test for equality of means. * indicates significance at the 1% level.

	Deficit		Surplus		Differences of means (*t*-stat.)
	Mean	Median	Mean	Median	
Change in working capital	0.05	0.04	-0.05	-0.01	0.10* (73.25)
Investments	0.14	0.10	0.04	0.04	0.10* (128.21)
Cash dividends	0.01	0.00	0.01	0.00	0.00* (-9.43)
Internal cash flows	-0.03	0.07	0.07	0.09	-0.10* (-79.76)
Assets	2013	68	1653	71	360* (5.30)
Debt ratio	0.21	0.17	0.19	0.14	0.02* (24.35)
Market-to-book ratio	2.30	1.40	1.50	1.14	0.80* (83.37)
EBIT	-0.06	0.07	0.05	0.09	0.11* (-76.21)
Issue / repurchase size	0.21	0.08	0.06	0.03	0.15* (256.38)
Rated debt	0.17	0.00	0.18	0.00	0.01 (-2.14)
N	130,314		89,460		

The results in Table 5 illustrate that – even though the average firm with deficits has lower cash flows – the key determinant for firms to have a deficit is that they invest a large proportion of their capital. Cash dividends do not strongly depend on whether a firm has a positive or a negative deficit. Apparently, firms do not use dividend cuts to finance capital expenditures. Table 5 also shows that median asset sizes do not differ much for firms-years with financing deficits (median of 68 million dollars) and firm-years with financing surpluses (median of 71 million dollars). The average issue size of 0.21, however, is significantly different from the average repurchase size of 0.06. This issue size is likely to have an effect on firms' financing behavior, particularly in case of a deficit, due to firms' debt capacities (Chirinko and Singha (2000)). We investigate the effect of having a large deficit on the pecking order coefficient in Table 6.

Table 6: Pecking order tests for different issue sizes

The sample period is 1971–2005. We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. Firm-years are sorted into firm-years with financing deficits and financing surpluses, and within this segregation quartiles (over all years) are based on the total issue / repurchase size. The estimated regression specification is $\Delta D_{it} = \alpha + \beta_{po} * DEF_{it} + \varepsilon_{it}$, where ΔD_{it} is the amount of net debt issued and DEF_{it} is the financing deficit. All variables are scaled by total assets. White standard errors appear in parentheses. * indicates significance at the 1% level.

	Deficit					Surplus				
	Overall	Smallest issue size	Medium small issue size	Medium large issue size	Largest issue size	Overall	Smallest repurchase size	Medium small repurchase size	Medium large repurchase size	Largest repurchase size
α	0.034*	-0.003*	-0.005*	0.024*	0.085*	0.002*	-0.002*	-0.001*	-0.002	0.013*
	(0.001)	(0.000)	(0.001)	(0.002)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
βpo	0.149*	0.601*	0.741*	0.429*	0.089*	0.901*	0.789*	0.881*	0.815*	0.923*
	(0.005)	(0.030)	(0.017)	(0.012)	(0.009)	(0.012)	(0.076)	(0.064)	(0.026)	(0.015)
N	130,314	32,578	32,579	32,579	32,578	89,460	22,365	22,365	22,365	22,365
R^2	0.100	0.015	0.061	0.043	0.020	0.747	0.008	0.012	0.042	0.735

Table 6 presents the pooled OLS estimates of the pecking order model over the full sample period 1971-2005, across different subsamples by deficit and surplus size (excluding firm-years with DEF = 0). We separate firm-years with deficits and surpluses and within these two sets we distinguish between quartiles. The effects of the repurchase sizes show that the estimated pecking order coefficient is 0.789 for the smallest repurchases, 0.881 and 0.815 for repurchases that are around the median size, and 0.923 for the largest repurchase sizes. Apparently, for each quartile of the surplus distribution the pecking order model is a good and similar descriptor of firms' financing behavior. For deficits, we observe a very different pattern. Although the pecking order model appears to provide a reasonable description for smaller issues (pecking order coefficients of 0.601 and 0.741), it is only a weak explanation for somewhat larger issues (coefficient of 0.429). The most striking result, however, is found for the largest deficits. For these largest deficits the estimated pecking order coefficient is only 0.089. This result implies that when firms face large deficits, they issue on average far more equity than debt.

2.4.3 Large financing deficits

Table 6 makes a somewhat ad hoc distinction between smaller and larger deficits on the basis of the quartiles of the distribution. As a result, a "large deficit" in these tables is empirically defined as being larger than 0.237. To investigate the impact of this cut off point on the resulting estimates for the pecking order coefficient, we extend the pecking order model in Eq. (1) by allowing a different intercept and slope coefficient for larger deficits, where the threshold between "large" and "non-large" is varied over all possible values. That is, we estimate

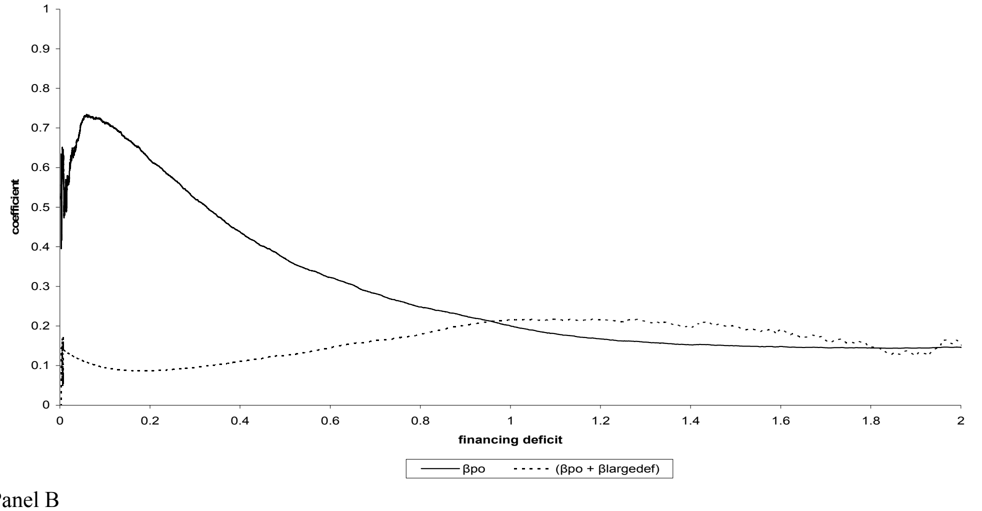
$$\Delta D_{it} = \alpha + \beta_1 * b_{it} + \beta_{po} * DEF_{it} + \beta_{largedef} * b_{it} * DEF_{it} + \varepsilon_{it}, \quad (3)$$

with $b_{it} = I(DEF_{it} > x)$, where I(.) is an indicator function (equal to 1 if the condition in parentheses is satisfied, and zero otherwise), and x is a threshold value for the financing deficit that is chosen a priori. Because x is unknown, we vary x between 0.0001 and 2, and investigate the impact on the resulting pecking order coefficients. This procedure is similar to allowing a structural break in the coefficients of a linear model, where the breakpoint is unknown (see Stock and Watson (2003), Chapter 12). For each value of x, the specification in Eq. (3) provides two pecking order coefficients: one coefficient for observations below a certain deficit level (β_{po}), and one coefficient for observations above a certain deficit level ($\beta_{po} + \beta_{largedef}$). In our

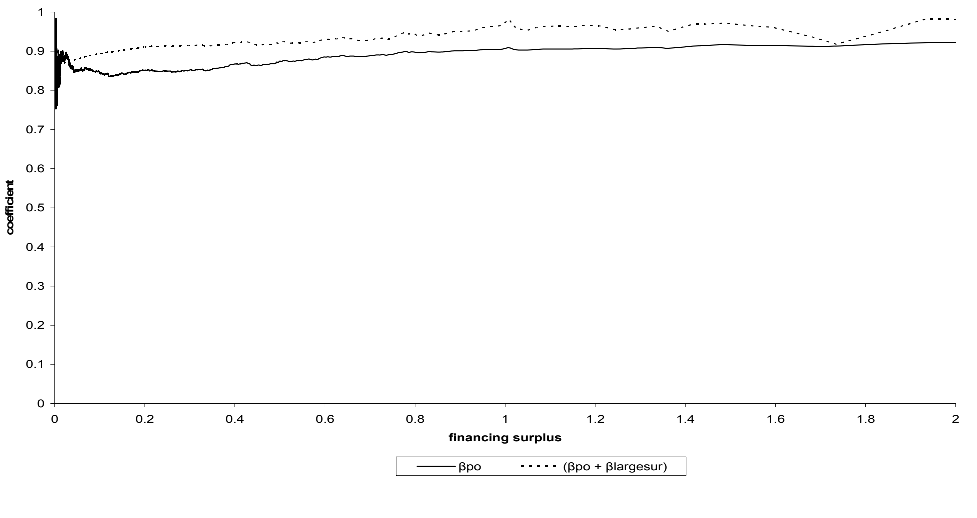
Figure 2: The pecking order coefficient for varying threshold levels of large deficits and surpluses

The solid line in Panel A represents the pecking order coefficient for observations with a financing deficit between zero and the corresponding value at the x-axis. This pecking order coefficient corresponds to β_{po} in the regression specification $\Delta D_{it} = \alpha + \beta_1 * b_{it} + \beta_{po} * DEF_{it} + \beta_{largedef} * b_{it} * DEF_{it} + \varepsilon_{it}$, where ΔD_{it} is the net debt issued by firm *i* in year *t*, DEF_{it} is the financing deficit of firm *i* in year *t*, and b_{it} is one if DEF_{it} is larger than a certain deficit level, and zero otherwise. The dotted line represents $\beta_{po} + \beta_{largedef}$, which is the pecking order coefficient for observations above the financing deficit on the x-axis. The solid line in Panel B represents the pecking order coefficient for observations with a financing surplus between zero and the corresponding value at the x-axis. This pecking order coefficient corresponds to β_{po} in the regression specification $\Delta D_{it} = \alpha + \beta_1 * b_{it} + \beta_{po} * SUR_{it} + \beta_{largesur} * b_{it} * SUR_{it} + \varepsilon_{it}$, where ΔD_{it} is the net debt repurchased, SUR_{it} is the financing surplus ($-DEF_{it}$), and b_{it} is one if SUR_{it} is larger than a certain surplus level, and zero otherwise. The dotted line represents $\beta_{po} + \beta_{largesur}$, which is the pecking order coefficient for observations above the surplus level on the x-axis. Financing deficits, financing surpluses, and net debt issues are scaled by total assets.

Panel A



Panel B



estimation we exclude firm-years with financing surpluses. The results of this exercise are summarized in Panel A of Figure 2.

Any specific financing deficit level in Figure 2 represents a threshold level. The solid line gives the coefficient for deficits below this threshold and the dotted line is the coefficient for deficits above the threshold. In the below-threshold sample, we find that as more observations with large deficits are included in the estimation of β_{po}, this pecking order coefficient decreases.[5] The maximum estimate for β_{po} is 0.734, which corresponds to a financing deficit of 0.059. Hence, if we define a deficit to be large if it exceeds 5.9% of total assets, the estimated pecking order coefficient of the observations with deficits below 0.059 is maximized.[6] Adding firm-years with higher deficits would decrease this pecking order coefficient.

Panel B of Figure 2 shows the results of a similar regression specification for financing surpluses:

$$\Delta D_{it} = \alpha + \beta_1 * b_{it} + \beta_{po} * SUR_{it} + \beta_{largesur} * b_{it} * SUR_{it} + \varepsilon_{it}, \quad (4)$$

where SUR_{it} is the financing surplus of firm *i* in year *t*, and b_{it} is one if SUR_{it} is larger than a certain surplus level, and zero otherwise. The results confirm the findings of Table 6, as we do not find evidence that the magnitude of the financing surplus has a strong effect on the pecking order coefficients.

2.4.4 Firms' debt capacities

Although the size of the deficit is important in establishing whether a firm is able to issue debt, not all firms are similarly constrained in their debt issuing, even with equal financing needs. For example, Lemmon and Zender (2007) argue that firms with rated debt outstanding are less restricted in issuing debt than firms with no rated debt outstanding. Agca and Mozumdar (2007) argue that a firm's total sales, tangibility, profitability, and market-to-book ratio are strong predictors of its debt capacity: total sales, tangibility, and profitability have a positive relation with firms' ability to borrow, whereas market-to-book ratios are negatively related with firms' debt capacities.

[5] For very small deficits, the pecking order coefficient is highly volatile. This volatility is caused by the observations for which the deficit is practically zero, but where a firm still repurchases an amount of debt.

[6] This pattern is stable over time. We compute the correlation coefficients for seven time intervals of five years for deficit values between 0.01 and 1, and find an average correlation coefficient of 0.96.

We will test how our findings on large deficits relate to proxies of firms' debt capacities. For example, do firms with small debt capacities already issue equity for relatively small deficits? We use firms' size, tangibility, profitability, market-to-book ratios, and their rated debt outstanding to determine firms' ability to borrow. We test an extended regression model of the pecking order theory, which allows for differential coefficients for firm-years with surpluses, small deficits (deficits below 0.059), medium deficits (in which firms' debt capacities do limit the firm to some extent) and deficits that have a high probability of posing constraints on firms' use of debt (deficits above 0.237):

$$\Delta D_{it} = \alpha + \beta_1 * d_{it} + \beta_2 * b_{it} + \beta_3 * c_{it} + \beta_4 * DEF_{it} + \beta_5 * d_{it} * DEF_{it} + \beta_6 * b_{it} * DEF_{it} + \beta_7 * c_{it} * DEF_{it} + \varepsilon_{it}, \quad (5)$$

where, d_{it} is a dummy variable that equals one if $DEF_{it} < 0$, and zero otherwise, b_{it} is a dummy variable that equals one if $DEF_{it} \geq 0.059$, and zero otherwise, and c_{it} is a dummy variable that equals one if $DEF_{it} \geq 0.237$, and zero otherwise. This regression specification allows the distinction of four effects: an effect of surpluses ($\beta_4 + \beta_5$), an effect of deficits for which firms are not restricted by their debt capacities (β_4), an effect of deficits in which firms' debt capacities do limit the firm to some extent ($\beta_4 + \beta_6$), and an effect of deficits that have a high probability of posing constraints on firms' use of debt ($\beta_4 + \beta_6 + \beta_7$). Model 1 of Table 7 shows the estimation result for our total sample. As expected, the pecking order coefficient increases for firms with surpluses (β_5), and decreases for firms with high levels of deficits (β_6 and β_7).

To examine how our findings on the effects of surpluses and large deficits relate to predictors of firms' debt capacities, we construct various subsamples. We first divide our sample in firm-years in which a firm has rated debt outstanding, and firm-years in which a firm has no rated debt outstanding, in line with arguments of Lemmon and Zender (2007). Models 2 and 3 of Table 7 show that firms with rated debt outstanding are more likely to cover financing deficits with debt: the pecking order coefficient for small deficits is 0.802 for firms with rated debt outstanding, and 0.649 for firms with no rated debt outstanding. The coefficient of 0.649 indicates that even firms that are restricted in their debt issuing show a tendency to issue debt for small deficits. These findings support the pecking order theory. For both subsamples, the pecking order coefficients decrease for larger deficits. For deficits above 23.7% of total assets, the pecking order coefficient is 0.297 for firms with rated debt outstanding, and 0.093 for firms with no rated debt outstanding. These results confirm the arguments of Lemmon and Zender, i.e. non-rated firms have lower pecking order coefficients for deficits. Our results for the size of the deficit are present in both

Table 7: The pecking order coefficients and firms' debt capacities

The sample period is 1971–2005. We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. The estimated regression specification ΔDit = α + β1*dit + β2*bit + β3*cit + β4*DEFit + β5* dit*DEFit + β6*bit*DEFit + β7*cit*DEFit + εit, where ΔDit is the amount of net debt issued, DEFit is the financing deficit, dit is a dummy variable that equals one if DEFit < 0, and zero otherwise, bit is a dummy variable that equals one if DEFit ≥ 0.059, and zero otherwise, and cit is a dummy variable that equals one if DEFit ≥ 0.237, and zero otherwise. Surpluses are deficits below zero; small deficits are deficits between zero and 5.9% of total assets, medium deficits are deficits between 5.9% and 23.7% of total assets; large deficits are deficits above 23.7% of total assets. The subsample "rated debt outstanding" solely includes observations in which rated debt is outstanding. This subsample only includes observations after 1985, since Compustat does not report credit ratings before 1985. The subsample "no rated debt outstanding" solely includes observations without rated debt outstanding. The subsample "non-constrained firm characteristics" solely includes observations with above-median sales, above-median tangibility, above-median profitability, and below-median market-to-book ratios. The subsample "constrained firm characteristics" solely includes observations with below-median sales, below-median tangibility, below-median profitability, and above-median market-to-book ratios. All variables are scaled by total assets. White standard errors appear in parentheses. * indicates significance at the 1% level.

	Overall	Rated debt outstanding	No rated debt outstanding	Non-constrained firm characteristics	Constrained firm characteristics	Non-constrained firm characteristics and rated debt outstanding	Constrained firm characteristics and no rated debt outstanding
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
α	-0.002*	-0.001*	-0.003*	-0.001	-0.002*	-0.000	-0.002*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
β_1	0.004*	0.002	0.004*	0.000	-0.006	-0.002	-0.006
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.002)	(0.005)
β_2	0.019*	0.014*	0.019*	-0.001	0.002	-0.002	0.002
	(0.001)	(0.002)	(0.001)	(0.002)	(0.004)	(0.004)	(0.004)
β_3	0.068*	0.088*	0.060*	0.039	0.017	0.072	0.018
	(0.005)	(0.021)	(0.005)	(0.024)	(0.010)	(0.033)	(0.010)
β_4	0.690*	0.802*	0.649*	0.814*	0.149*	0.703*	0.154*
	(0.008)	(0.016)	(0.009)	(0.017)	(0.039)	(0.025)	(0.039)
β_5	0.211*	-0.048	0.257*	0.030	0.769*	0.051	0.764*
	(0.014)	(0.041)	(0.015)	(0.028)	(0.076)	(0.062)	(0.076)
β_6	-0.218*	-0.182*	-0.194*	-0.008	0.096	0.049	0.091
	(0.013)	(0.026)	(0.014)	(0.029)	(0.052)	(0.045)	(0.052)
β_7	-0.383*	-0.323*	-0.362*	-0.134	-0.164*	-0.160	-0.165*
	(0.013)	(0.057)	(0.014)	(0.077)	(0.037)	(0.107)	(0.037)
N	233,909	39,420	194,489	18,890	19,940	6,453	19,795
R^2	0.411	0.544	0.406	0.776	0.243	0.775	0.244

Table 7 (continued): The pecking order coefficients and firms' debt capacities

The sample period is 1971–2005. We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. The estimated regression specification $\Delta Dit = \alpha + \beta 1*dit + \beta 2*bit + \beta 3*cit + \beta 4*DEFit + \beta 5* dit*DEFit + \beta 6*bit*DEFit + \beta 7*cit*DEFit + \varepsilon it$, where ΔDit is the amount of net debt issued, DEFit is the financing deficit, dit is a dummy variable that equals one if $DEFit < 0$, and zero otherwise, bit is a dummy variable that equals one if $DEFit \geq 0.059$, and zero otherwise, and cit is a dummy variable that equals one if $DEFit \geq 0.237$, and zero otherwise. Surpluses are deficits below zero; small deficits are deficits between zero and 5.9% of total assets, medium deficits are deficits between 5.9% and 23.7% of total assets; large deficits are deficits above 23.7% of total assets. The subsample "rated debt outstanding" solely includes observations in which rated debt is outstanding. This subsample only includes observations after 1985, since Compustat does not report credit ratings before 1985. The subsample "no rated debt outstanding" solely includes observations without rated debt outstanding. The subsample "non-constrained firm characteristics" solely includes observations with above-median sales, above-median tangibility, above-median profitability, and below-median market-to-book ratios. The subsample "constrained firm characteristics" solely includes observations with below-median sales, below-median tangibility, below-median profitability, and above-median market-to-book ratios. All variables are scaled by total assets. White standard errors appear in parentheses. * indicates significance at the 1% level.

	Overall	Rated debt outstanding	No rated debt outstanding	Non-constrained firm characteristics	Constrained firm characteristics	Non-constrained firm characteristics and rated debt outstanding	Constrained firm characteristics and no rated debt outstanding
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
β_{sur}	0.901	0.754	0.906	0.844	0.918	0.754	0.918
$\beta_{po\ small}$	0.690	0.802	0.649	0.814	0.149	0.703	0.154
$\beta_{po\ medium}$	0.472	0.620	0.455	0.806	0.245	0.752	0.245
$\beta_{po\ large}$	0.089	0.297	0.093	0.672	0.081	0.592	0.080
% surplus	38%	40%	38%	42%	16%	36%	16%
% small def.	31%	35%	29%	35%	25%	39%	25%
% medium def.	17%	20%	17%	21%	14%	24%	14%
% large def.	14%	5%	16%	2%	45%	1%	45%

rating-based subsamples. In other words, the pecking order coefficient decreases when debt is not rated *and* when deficits are larger.

Models 4 and 5 of Table 7 show the results of our estimation when we construct subsamples based on firms' total sales, tangibility, profitability, and market-to-book ratios. The least-constrained-sample has above-median sales (>59.1 million dollars), above-median tangibility (>25.4% of total assets), above-median profitability (>7.5% of total assets) and below-median market-to-book ratios (<1.265). The sample with constrained firm characteristics has below-median size, below-median tangibility, below-median profitability and above-median market-to-book ratios. For the least-constrained-sample the pecking order model predicts firms' financing choices well: the pecking order coefficients are 0.814 for small deficits, 0.806 for median deficits, and 0.672 for large deficits. In line with Agca and Mozumdar (2007), we find that most firms in our constrained sample are not able to cover the deficits with debt: for small deficits, the pecking order coefficient is only 0.149. The pecking order coefficient for large deficits is even significantly lower for these constrained firms. In Models 6 and 7 we combine our subsamples. That is, the least-constrained observations have above-median sales, above-median tangibility, above-median profitability, below-median market-to-book ratios, and rated debt outstanding, while the most-constrained-sample has below-median size, below-median tangibility, below-median profitability, above-median market-to-book ratios, and no rated debt outstanding. Interestingly, the pecking order coefficient for the non-constrained sample is 0.703, which is somewhat smaller than the pecking order coefficients found in Models 2 and 4, and also smaller than the pecking order coefficient for medium deficits (0.752) in the same subsample.[7] Still, the patterns that we find are similar to the patterns in our estimation of Models 4 and 5.

For surpluses, the coefficients are relatively high in all subsamples. Firms that are constrained are more likely to repurchase debt when having a surplus (coefficients of 0.906, 0.918, and 0.918) than firms that are not constrained (coefficients of 0.754, 0.844, and 0.754), which is in line with the constrained firms reducing debt to relax the constraints.

Table 7 also reports the proportional occurrences of surpluses, small deficits, medium deficits, and large deficits for our subsamples. It can be seen that constrained

[7] Apparently, the threshold value for large deficits exceeds the 5.9% of total assets for our sample of non-constrained firms with rated debt outstanding. When estimating the threshold level for this subsample with a similar procedure as in Section 4.3, we find that the threshold level is 33.4% of total assets. The pecking order coefficient that corresponds to deficits below 0.334 is 0.784 for non-constrained firms with rated debt outstanding.

firms are more often confronted with large deficits. Model 7 shows that 45% of the cases in our mostly constrained sample face financing needs above 23.7% of total assets. For non-constrained firms (Model 6), this percentage is only 1%. Hence, we conclude that the relatively low pecking order coefficient for constrained firms is caused by their limited ability to borrow, plus the relatively large financing requirements of these firms.

2.4.5 Equity issuers

Another test on the debt capacity is to specifically look at firms that issue equity, which is comparable to Leary and Roberts (2007). Leary and Roberts compare firms violating the pecking order theory with non-restricted borrowers in the private debt market, to examine whether the debt capacity causes the violation. They find a substantial portion of the violators to be facing debt capacity constraints. However, the majority of firms issuing equity do not seem to be significantly different in terms of firm characteristics from firms tapping the private debt market.

We therefore specifically look at firms with large deficits, to see whether the debt capacity can explain why some firms issue debt, while others opt for equity. Our sample consists of those observations in which the deficit exceeds 0.237. We count observations in which more than 75% of the large deficit is covered by debt as a debt issue, and observations in which less than 25% of the large deficit is covered by debt as an equity issue.

With our subsamples that are based on firms' total sales, tangibility, profitability, market-to-book ratios, and rated debt outstanding, we find that of the non-constrained firms facing a large deficit, 79.8% chooses to issue debt. For the constrained firms, this percentage is 15.1%. Hence, the debt capacity again seems to have a strong impact on firms' financing decisions.

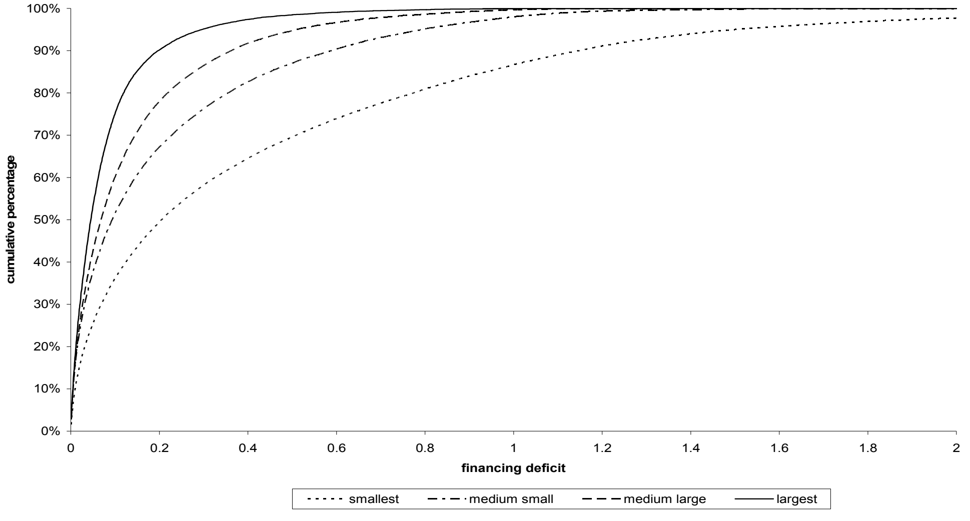
2.4.6 Explaining the time and size effect

In this section we will examine whether the deviant results for large deficits on firms' financing behavior potentially explain the size and time puzzles. We investigate the distributions of deficit sizes for subsamples of firm sizes in Panel A of Figure 3. Panel B shows the distribution of the deficit sizes for subsamples of periods. We calculate the cumulative percentages of observations for financing deficits between zero and two. The lines in Figure 3 show the percentages of observations that are

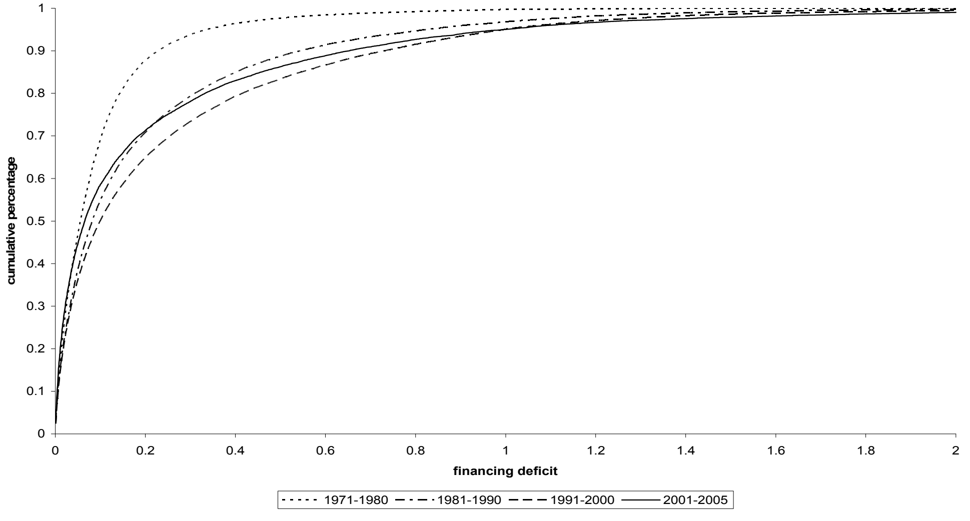
Figure 3: Distribution of deficit sizes for different firm sizes and periods, 1971 to 2005

The lines represent the percentages of observations with deficits between zero and the corresponding value on the x-axis. Panel A shows the lines for different size quartiles. The dotted line represents firm-years in the first size quartile, the dashed and dotted line (third line from above) represents firm-years in the second size quartile, the dashed line represents firm-years in the third size quartile, and the solid line represents firms-years in the fourth size quartile. Panel B shows the lines for different time periods. The dotted line in Panel B represents firm-years for the period 1971-1980, the dashed and dotted line (second line from above) represents firm-years for the period 1981-1990, the dashed line represents firm-years for the period 1991-2000, and the solid line represents firms-years for the period 2001-2005. The financing deficits are scaled by total assets.

Panel A



Panel B



below the deficit levels on the x-axis. The closer the line is to the x-axis, the higher the proportion of relatively high deficits in a subsample.

Panel A of Figure 3 shows that, given that a large firm has a deficit, this deficit will be above 0.2 in about 10% of the cases, whereas small firms face deficits above 0.2 in about 50% of the cases. The results indicate that large firms (the solid line) face the lowest number of large deficits, followed by medium large firms and medium small firms. The smallest firms face most of the large deficits. To examine what causes the relation between firm size and deficit size, we describe in Table 8 the means and standard deviations of the components of the financing deficits for each size quartile.

Table 8: Firm size effects on the mean and volatility of the financing deficits

The sample period is 1971–2005. We delete financial firms, utilities, and firm-years with gaps in the reporting of relevant flow of funds data. This table determines the mean and standard deviation (in parentheses) of firms' deficits, cash dividends, investments, change in working capital, and internal cash flows. Firms are yearly sorted into quartiles based on total assets. The variable deficits includes negative deficits (i.e., financing surpluses). All variables are scaled by total assets.

	Overall	Smallest	Medium small	Medium large	Largest
Averages (st.dev.)					
Deficits	0.094	0.207	0.087	0.054	0.031
	(0.298)	(0.485)	(0.251)	(0.174)	(0.113)
Cash dividends	0.013	0.011	0.011	0.013	0.019
	(0.071)	(0.115)	(0.064)	(0.044)	(0.033)
Investments	0.093	0.073	0.092	0.106	0.100
	(0.195)	(0.280)	(0.189)	(0.155)	(0.119)
Working capital	-0.004	-0.064	0.035	0.032	0.009
	(0.350)	(0.593)	(0.293)	(0.194)	(0.116)
Internal cash flow	0.009	-0.190	0.041	0.088	0.093
	(0.343)	(0.598)	(0.211)	(0.120)	(0.084)
Percentages					
Surpluses	38%	32%	40%	41%	41%
Financing deficits above 0.059	31%	39%	33%	30%	24%
Financing deficits above 0.237	14%	26%	16%	10%	4%

The group of small firms has more volatile internal cash flows: the standard deviation of small firms' internal cash flows is 0.598 against 0.084 for large firms. The volatilities of the other components of the deficit are also higher for small firms. Hence, small firms have more volatile deficits, which means that small firms are more often confronted with considerably large deficits. As these large deficits are almost exclusively covered with equity issues, small firms do not appear to act according to the pecking order model, despite the findings of Collins, Kothari, and Rayburn (1987) and Brennan and Hughes (1991) that small firms have a larger likelihood of high informational asymmetry.

Our analysis on financing surpluses and large financing deficits also allows us to examine why net debt issues decreasingly cover the financing deficits over time. Panel B of Figure 3 shows that firms face the lowest number of large deficits in the seventies (the dotted line), followed by the firms in the eighties. In the nineties, the distribution of firms' deficits is mostly skewed towards large deficits, even more than in the period 2001-2005. Hence, the pecking order coefficient is expected to be higher in the period 2001-2005 than in the period 1991-2000. Furthermore, the coefficients should be at their highest level in the seventies. To illustrate this, Figure 4 shows the pecking order coefficients based on estimating Eq. (1) by OLS for each year separately, together with the percentages of firms with financing surpluses and large financing deficits (above 0.237).

Figure 4: Financing surpluses, large financing deficits, and the pecking order coefficients, 1971 to 2005

The solid line represents the pecking order coefficients (β_{po}), which can be determined by estimating the pecking order specification $\Delta D_{it} = \alpha + \beta_{po}*DEF_{it} + \varepsilon_{it}$ on a yearly basis, where ΔD_{it} is the net debt issued by firm *i* in year *t* and DEF_{it} is the financing deficit of firm *i* in year *t*. Values of the pecking order coefficient can be found on the left-hand axis. The dotted line represents the percentage of firms with a financing surplus in a given year. The dashed line represents the percentage of firms with a financing deficit that is larger than 23.7% of the total assets in a given year. Values of these variables are on the right-hand axis.

Indeed, the estimated pecking order coefficients are higher in the period 2001-2005 than in the period 1991-2000. In general, a rise in the percentage of financing surpluses increases the pecking order coefficient; see for example the years 1975 and 2005. The percentage of firms with large deficits is highly correlated with the change of the pecking order coefficient. For instance, the downfall of the pecking order coefficient in 1983 and the rises in 1982 and 2001 relate to an increase of the percentage of firms with large deficits in 1983, and a decrease in 1982 and 2001. Overall, the time effect can largely be explained by our analysis of financing surpluses and large financing deficits.

The asymmetry between surpluses, normal deficits, and large deficits potentially explains the findings of prior studies. For example, Shyam-Sunder and Myers (1999) find that the pecking order coefficient is 0.75. Apart from the fact that their sample period ends in 1989, Shyam-Sunder and Myers' sample differs from other papers on the pecking order specification in only including firms that have continuous data on flow of funds for the whole sample period. This requirement decreases their sample to 157 firms. In following their data selection procedure, we obtain a sample of 690 firms, for which we find a pecking order coefficient of 0.77. While Frank and Goyal (2003) already highlight the severe sample selection bias in the sample of Shyam-Sunder and Myers, an inspection of the resulting sample reveals that large financing deficits occur much more often when gaps in the data are permitted. This is due to the fact that firms with large financing deficits are less likely to survive the whole sample period. For example, when examining the frequency of financing deficits above 0.237, we find that these deficits only occur in 3% of Shyam-Sunder and Myers' firm-years, compared to 14% in our original sample. Also, the percentage of firms with large deficits is low as their sample is biased towards relatively large firms because these firms have more data available. The lack of large financing deficits substantially increases Shyam-Sunder and Myers' pecking order coefficient. Additionally, the pecking order coefficient is enhanced by the relatively large percentage of firm-years with financing surpluses (47%) in their sample.

2.5 Conclusion

Frank and Goyal (2003) test the pecking order theory of corporate leverage with a model developed by Shyam-Sunder and Myers (1999), and conclude that net equity issues track the financing deficit more closely than net debt issues do. They find two puzzling results: the net debt issues decreasingly explain the deficits over time and especially small firms do not behave according to the pecking order theory. Especially the latter result is counterintuitive, as the pecking order relies on the existence of informational asymmetry, and this asymmetry is higher for investors of small companies. We explain the relations between size, time, and pecking order behavior by separating financing deficits from financing surpluses and by taking issue sizes into account. We show that the debt issues provide an excellent fit for financing surpluses, a reasonable fit for small and medium financing deficits, and an extremely poor fit for large financing deficits. As small firms have more large deficits and fewer surpluses, they are found to issue relatively more equity than large firms do. The pecking order coefficient decreases over time because of an increasing number of firms with large deficits in the Compustat dataset.

Our findings are consistent with the predictions of a pecking order model that considers firms' debt capacities: since large financing needs have the potential of exceeding the unused debt capacity of firms, these firms are restricted in the issuing of debt. In case of a surplus, firms' debt capacities do not pose any restrictions on the repurchase of debt. For firms that are expected to be least constrained in issuing debt, we find the pecking order coefficients to be substantially higher than the coefficients of the overall sample, as reported in Frank and Goyal (2003).

The differences in pecking order coefficients between financing surpluses, normal deficits, and large deficits have implications for other empirical tests in the capital structure literature that apply the Shyam-Sunder and Myers (1999) technique. Examples are Litov (2006), who examines the debt-equity choice for firms in different quintiles of managerial entrenchment, and Bharath, Pasquariello, and Wu (2008), who examine the debt-equity choice for firms into deciles that are based on the market's assessment of their adverse selection risk. As managerial entrenchment and the risk of adverse selection relate to firms' sizes and risk-taking, the distributions of financing surpluses and large deficits are likely to differ among these papers' quintiles and deciles. For instance, firms with more managerial entrenchment are more likely to be large, which results in a lower frequency of large deficits. Hence, including the effects of surpluses and large deficits in their tests will help in interpreting their results, or might provide an alternative explanation for their results altogether.

Chapter 3

Debt capacity and firms' financing decisions[8]

3.1 Introduction

The previous chapter focused on one widely debated capital structure theory: the pecking order theory. This theory argues that, due to asymmetric information, firms adopt a hierarchical order of financing preferences so that internal financing is preferred over external financing. If external financing is needed, firms first seek debt funding. Equity is only issued as a last resort, when debt financing will be extremely costly. In the words of Myers (1984, p. 585): *"you will refuse to buy equity unless the firm has already exhausted its "debt capacity" - that is, unless the firm has issued so much debt already that it would face substantial additional costs in issuing more."*

However, there is another influential capital structure theory: the static tradeoff theory. This theory implies that firms have a target debt ratio and try to move towards this target.[9] In this chapter we will compare these main capital structure theories. Following the analysis in the previous chapter, we incorporate firms' debt capacities in our analysis. We build upon the notion that credit ratings relate to firms' debt capacities (Lemmon and Zender (2007)), and aim to estimate a firm-year specific debt

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[8] This chapter is based on De Jong, Verbeek, and Verwijmeren (2008b). It has benefited from helpful comments by James Ang, Ronald Masulis, participants at the EFMA Conference 2008 in Athens, and seminar participants at RSM Erasmus University.

[9] Myers (1984) focuses on the tradeoff between tax benefits and bankruptcy costs when describing the static tradeoff theory. Several other papers incorporate more factors into the static tradeoff theory, like non-debt tax shields and agency costs (see, e.g., Flannery and Rangan (2006)).

capacity. To do so, we base our estimates on statements by Shyam-Sunder and Myers (1999), who describe the pecking order theory as follows (p. 225): *"If costs of financial distress are ignored, the firm will finance real investment by issuing the safest security it can. Here safe means not affected by revelation of managers' inside information. In practice, this means that firms which can issue investment-grade debt will do so rather than issue equity."* We construct a model explaining a firm's credit rating and use this to derive an estimate of the marginal debt ratio that would make a firm lose its investment grade rating and hence substantially increase its costs of issuing debt.[10] We interpret this debt ratio as an estimate for a firm's debt capacity. We find that the average value of a firm's debt capacity is about 60% of the firm's total assets.

The main contribution of this chapter results from our utilization of the estimated debt capacities. We use firms' debt capacities to test the static tradeoff theory against the pecking order theory: although previous studies have examined these capital structure theories, there is no consensus on the superiority of one of the theories.[11] Shyam-Sunder and Myers (1999) and De Jong and Verwijmeren (2007) argue that to establish the underlying theory for firms' financing decisions it is essential to incorporate the inferences of the pecking order theory when addressing the relevance of the static tradeoff theory, and vice versa. In this chapter we use firms' debt capacities to do exactly this.

We construct a framework that allows us to identify situations in which the pecking order theory and the static tradeoff theory have conflicting predictions. For example, if a firm issues a security and its debt ratio is currently below its target debt ratio, both theories will predict the firm to issue debt: the static tradeoff theory implies that a firm moves towards its target, while in a pecking order world a firm will always cover its external financing needs with debt as long as it is not constrained by its debt capacity. Also, when a firm wants to repurchase securities and has a debt ratio above its target, both theories predict that the firm buys back debt.[12] Figure 5 provides a graphical overview of the predictions of the two theories and indicates whether the pecking order theory and the static tradeoff theory predict a debt or equity issue (repurchase) for different ranges of the debt ratio.

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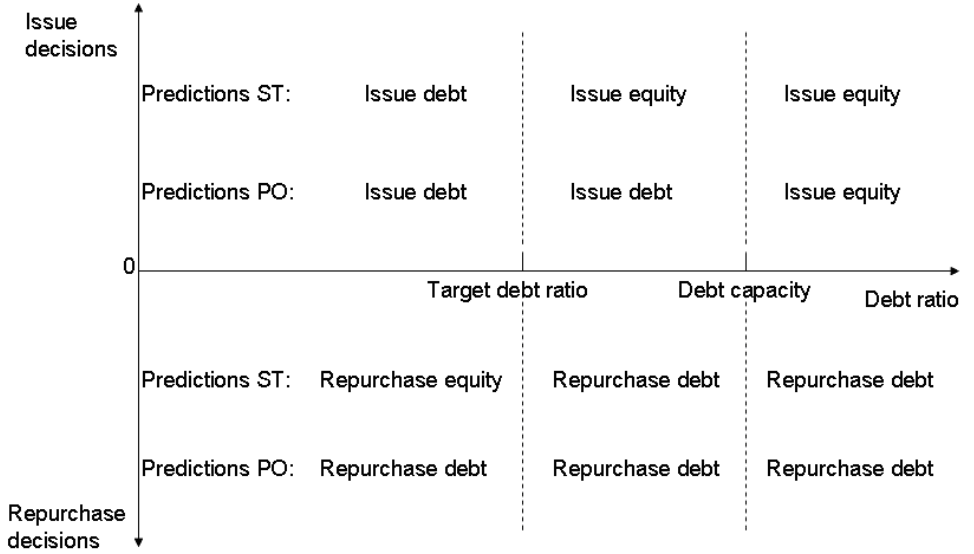
[10] The higher costs for non-investment grade rated firms are mainly the result of the higher probability of default. Standard and Poor's (2006) report that the average 10-year default rate is 2.81% for firms with investment grade ratings, and 27.31% for non-investment grade ratings.

[11] Among others, Shyam-Sunder and Myers (1999), Lemmon and Zender (2007), and Agca and Mozumdar (2007) find evidence in favor of the pecking order theory, while Frank and Goyal (2003), Fama and French (2005), and Leary and Roberts (2007) find evidence against the pecking order theory. Evidence in favor of the static tradeoff theory is also mixed. See Frank and Goyal (2007) for an overview.

[12] For a description of the pecking order theory regarding repurchase decisions, see Chapter 2 or Shyam-Sunder and Myers (1999, p. 225).

Figure 5: The predictions of the pecking order theory and the static tradeoff theory for different debt ratios.

This figure shows whether the pecking order theory and the static tradeoff theory predict a debt or equity issue/repurchase for different positions of the debt ratio. "ST" corresponds to the static tradeoff theory, and "PO" corresponds to the pecking order theory.



The most interesting parts of the debt ratio spectrum are the regions in which the theories have conflicting predictions. This is the case in two regions. For issuing decisions, the theories disagree when the current debt ratio is above the target ratio but below the debt capacity. In this case, the static tradeoff theory predicts a decrease of leverage, whereas the pecking order theory predicts that a firm would still increase leverage. For repurchase decisions the theories disagree when the firm's current debt ratio is below the target debt ratio. The pecking order model predicts that the firm repurchases debt and therefore decreases leverage, whereas the static tradeoff model predicts a move towards the target and therefore an increase of leverage. By identifying the observations in these two regions, we are able to test which of the two theories provides the most accurate predictions.

We test our framework with the regression specification of Hovakimian, Opler, and Titman (2001), in which a firm's decision to either issue (or repurchase) debt or equity is regressed on the difference between a firm's debt ratio and its supposed target, to explain firms' debt-equity choices. However, we extend the specification with the deviations between firms' leverage and their estimated debt capacity. For the situations in which the pecking order theory and the static tradeoff theory have conflicting predictions regarding the issue decision, we find the deviation from the debt capacity to be a better descriptor of firms' debt-equity choices than firms' deviations from their targets. In fact, the estimated target has a statistically insignificant impact on the debt-equity choice after controlling for the debt capacity. This latter finding is strong evidence against the static tradeoff theory. For repurchase decisions, both the deviation from the estimated target and the estimated debt capacity are statistically significant.

Next, we use our framework to identify firms that behave in accordance with the pecking order theory in a given year, and firms that act according to the static tradeoff theory. Corroborating our earlier results, we find that most observations are in line with the pecking order theory. By exploiting these classifications, we examine whether a firm's preference for a capital structure theory is situation-specific, as argued by Myers (2001), or whether the preferences are firm-specific. This latter notion is suggested by survey evidence of, for example, Graham and Harvey (2001). A situation-specific preference would imply, for example, that firms in a specific year with high informational asymmetry correspond to a preference for the pecking order theory. Firm-specific preferences imply that firms have certain preferences, irrespective of their situation and the conditions of the market.

We test whether a preference for a capital structure theory is situation-specific by examining the effects of firm characteristics on firms' preferences for a specific theory, and by examining whether these preferences are time-specific. We find that profitability is the only explanatory variable that robustly explains the choice for a capital structure theory. The more profitable a firm is, the higher the probability that it will act according to the pecking order theory. An examination of the preferences for a capital structure theory over time shows that these preferences are relatively stable over the years. These findings imply that time-varying variables do not have a strong impact on the question whether a firm operates on the basis of one theory or the other. On the other hand, we do find strong persistence in a firm's preferences: a firm that acts according to the pecking order theory or static tradeoff theory in a given year, is more likely to do so again in a subsequent year. Apparently, firms are persistent in financing according to a particular capital structure theory.

This chapter contributes to the literature in various ways. First, we contribute to the ongoing battle between the pecking order theory and the static tradeoff theory. Fama and French (2002) find mixed evidence when examining the conflicting indirect predictions of both theories with regard to the influence of dividends and profitability on leverage. We choose to solely focus on the direct predictions of a capital structure theory on financing decisions. We shed new light on findings by Hovakimian, Opler, and Titman (2001), and show that the pecking order theory is a better predictor of firms' financing decisions than the static tradeoff theory. Second, we quantify a firm's debt capacity, which enables a test of the conflicting direct predictions of the pecking order theory and the static tradeoff theory. Although the concept of the debt capacity has been used throughout the pecking order literature, we do not know of attempts to construct an advanced empirical measure of this concept in terms of a debt ratio. Most related is Turnbull (1979), who models the maximum level of debt that lenders should be willing to provide.

3.2 Data

3.2.1 Sample selection

In our empirical analysis, we employ a broad cross-section of U.S. firms from the Compustat and CRSP databases covering the period 1985-2005. The starting point is 1985 because we require credit rating data (Compustat item 280), and these data are not available prior to 1985. Regulated utilities (SICs 4900-4999) and financial firms (SICs 6000-6999) are excluded. We delete firm-years with missing information for our variables. All variables are winsorized at the 1^{st} and 99^{th} percentile. Our final sample contains 2,259 firms and 13,338 firm-year observations.[13]

3.2.2 The financing deficit

The financing deficit is introduced by Shyam-Sunder and Myers (1999) to test the pecking order model. The financing deficit represents the inadequacy of internal cash flows for real investments and dividend commitments, and is calculated as the sum of the change in working capital, the investments, and the cash dividends, minus the internal cash flows. In Shyam-Sunder and Myers' definition, the financing deficit is equal to the sum of net long-term debt issues and net equity issues. For details about the computation of the deficit, see Chapter 2 or Frank and Goyal (2003).

We define leverage as total debt divided by total assets, since trade credit (which is short-term financing) can provide financing when a firm would otherwise be

[13] This sample is smaller than our sample in Chapter 2 because we require firms to have credit rating data available.

constrained (Petersen and Rajan (1997)). We therefore adjust the deficit so that it represents the need for total (short-term and long-term) financing. We adjust the computation of the deficit by not including changes in current debt (item 301) and changes in accounts payable (item 304; if format code 7). Consequently, our deficit measure represents the need for total financing. The variable is scaled by assets at the beginning of the book-year. We employ the financing deficit in Section 3.5.

3.2.3 Informational asymmetry

An important aspect of the pecking order theory is informational asymmetry. Myers and Majluf (1984) show that managers, when acting on behalf of the current shareholders, pass up good investments in case the new shareholders will capture the benefits of the investment. Consequently, with informational asymmetry, investors will reason that an investment decision without an equity issue signals good news, while issuing shares signals bad news. This signal causes the stock price to drop. An interesting discussion is whether the level of informational asymmetry matters. Basically, the theoretical underlying of the pecking order theory in Myers and Majluf (1984) does not imply that only firms with high informational asymmetry have the financing hierarchy of first internal funds, then external debt, and then external equity. Instead, their model implies that any firm with informational asymmetry would have this financing hierarchy. Still, it could be argued that higher informational asymmetry leads to a larger decrease of the stock price due to an equity issue, as the uncertainty about the true value of the investment opportunity is higher. We therefore treat this issue as an empirical question.

Our proxy of informational asymmetry measures the firm-specific return variation, ψ, as constructed in Durnev, Morck, Yeung, and Zarowin (2003). This measure is based on the assumption that greater firm-specific variation in stock prices reflects more information getting into the stock price, i.e. less informational asymmetry. The firm-specific stock return variation follows from the regression

$$\text{Firm return}_t = \beta_0 + \beta_1 * \text{market return}_t + \beta_2 * \text{industry return}_t + \varepsilon_t,$$

which is estimated for each firm using monthly returns within the previous calendar year. Industry returns are measured at the level of 2-digit SIC-codes. The market return and the industry return are value-weighted averages excluding the firm for which the regression is estimated. The variance of ε is scaled by the total variance of the dependent variable in the regression. This is equal to dividing the residual sum of squares by the total sum of squares, or 1 – R^2. The resulting ψ is a measure for the firm-specific return variability in a given year relative to the total variability. High ψ corresponds to low informational asymmetry. Various papers have used this measure. Dittmar and Thakor (2007), for example, show that firms with a high ψ are more likely to issue equity.

3.2.4 Summary statistics

In our framework we use a firm's credit rating to eventually determine the debt capacity. The credit ratings are from Standard and Poor's and provide information on a firm's creditworthiness. Long-term credit ratings have a scale from AAA to D: a rating of AAA implies that a firm is reliable, stable, and of high quality, while a rating of D qualifies the firm as being expected to default on most or all obligations. The ratings AAA, AA, A, and BBB are called investment grade ratings. As of BB, ratings are called non-investment grade or speculative grade ratings.

Table 9 shows firm characteristics for our total sample, for our sample of firms with investment grade ratings, and for our sample of firms with speculative grade ratings.

The average firm in our sample has assets worth of 6,133 million dollars. Firms with investment grade ratings are on average larger than firms with non-investment grade ratings. The leverage of speculative grade firms is higher: on average these firms have a debt-assets ratio of 0.434, while investment grade firms have an average debt ratio of 0.267. The firms with investment grade ratings have been rated by Standard and Poor's for seven years (median), while firms with non-investment grade ratings have been rated for just four years (median).

3.3 Target leverage and debt capacity

3.3.1 Target leverage

The target debt ratio in the static tradeoff theory is the result of various factors. The tax shield of debt (Modigliani and Miller (1963)) provides an incentive for firms to have higher debt ratios, just as the monitoring and disciplining role of debt holders in case of agency problems (Jensen and Meckling (1976); Jensen (1986)). On the other hand, financial distress costs decrease firms' optimal debt ratio.

Table 9: Summary statistics

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. Assets are determined by Compustat Item 6 and are reported in millions of dollars. Sales is Item 12 and is also in millions of dollars. Tangibility is Item 8. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6, and market leverage is (Item 9 + Item 34) / (Item 34 + Item 9 + Item 24 * Item 25). EBIT is Item 18 + Item 15 + Item 16 and EBITDA is Item 13. The market-to-book ratio is calculated as (Item 24 * Item 25 – Item 60 + Item 6) / Item 6. Age is the number of years since the firm was first rated by Standard and Poor's, and has a maximum value of ten. Dividends correspond to the sum of Item 19 and Item 21, and retained earnings to Item 36. Working capital is Item 4 minus Item 5. Rating is Item 280. The financing deficit is computed as in Frank and Goyal (2003), with the addition of Item 301 and possibly Item 304 (if the format code is 7). Informational asymmetry is measured by *Psi*, as in Durnev, Morck, Yeung, and Zarowin (2003). Industry book leverage is the median book leverage per industry and per year, based on the Fama-French 30-industry classification. The two-year stock return is computed by dividing the stock price in a given year (Item 24) by the stock price two years before. Tangibility, EBIT, EBITDA, dividends, retained earnings, working capital, and the financing deficit are scaled by total assets. We report the means, and the medians are between parentheses.

	All firm-years		Firm-years with an investment grade rating		Firm-years with a speculative grade rating	
	N	Mean (median)	N	Mean (median)	N	Mean (median)
Total assets	13,338	6,133 (1,804)	7,284	9,748 (3,626)	6,054	1,783 (744)
Sales	13,338	5,621 (1,721)	7,284	8,939 (3,705)	6,054	1,630 (641)
Tangibility	13,338	0.391 (0.350)	7,284	0.407 (0.365)	6,054	0.373 (0.330)
Book leverage	13,338	0.343 (0.320)	7,284	0.267 (0.262)	6,054	0.434 (0.428)
Market leverage	13,338	0.351 (0.306)	7,284	0.245 (0.223)	6,054	0.478 (0.470)
EBIT	13,338	0.079 (0.086)	7,284	0.104 (0.102)	6,054	0.049 (0.065)
EBITDA	13,338	0.133 (0.131)	7,284	0.156 (0.151)	6,054	0.105 (0.106)
Market-to-book ratio	13,338	1.612 (1.341)	7,284	1.789 (1.479)	6,054	1.400 (1.195)
Age	13,338	5.719 (5.000)	7,284	6.426 (7.000)	6,054	4.869 (4.000)
Dividends	13,285	0.014 (0.008)	7,253	0.021 (0.016)	6,032	0.006 (0.000)
Retained earnings	13,338	0.163 (0.172)	7,284	0.289 (0.283)	6,054	0.010 (0.045)
Working capital	13,338	0.148 (0.124)	7,284	0.129 (0.108)	6,054	0.170 (0.148)
Credit rating	13,338	3.706 (4.000)	7,284	4.719 (5.000)	6,054	2.486 (3.000)
Financing deficit	12,454	0.030 (0.000)	6,887	0.014 (-0.002)	5,567	0.049 (0.003)
Informational asymmetry	6,846	0.578 (0.611)	4,693	0.581 (0.614)	2,153	0.572 (0.608)
Industry book leverage	13,017	0.458 (0.458)	7,136	0.457 (0.458)	5,881	0.460 (0.458)
Two-year stock return	12,469	0.115 (0.013)	7,098	0.100 (0.043)	5,371	0.135 (-0.044)

Other factors that give incentives to lower debt ratios are the debt overhang problem (Myers (1977)), the cost of personal taxes (Miller (1977)), and non-debt tax shields (DeAngelo and Masulis (1980)). According to the target adjustment theory firms are attempting to move to their target debt ratio, and adjust their financing decisions towards this goal.

In modeling the target, we allow for a current deviation from the target and allow for different targets across firms:

$$dr^*_{i,t+1} = x'_{it}\beta, \tag{6}$$

where $dr^*_{i,t+1}$ is firm *i*'s desired debt ratio at *t+1*; x_{it} is a vector of firm characteristics related to the costs and benefits of operating with various leverage ratios. The coefficient vector β is estimated using a regression explaining the debt ratio in year *t+1* from the firm characteristics in year *t*.

We select firm characteristics for estimating firms' debt ratios based on Rajan and Zingales (1995). These characteristics are size, tangibility, profitability, and the market-to-book ratio. We also include the median industry leverage as an explanatory variable for a firm's target debt ratio. For firms' target ratios, we use book ratios.[14] We exclude the targets of firms that have speculative ratings, as these firms' debt ratios are most likely not the desired ratios of these firms (Kisgen (2006)). Also, these firms are likely to face more difficulties in adjusting their debt ratios than firms with investment grade ratings. Following recommendations of Petersen (2007), we employ panel-robust standard errors throughout the chapter.[15]

[14] This is in accordance with for example Shyam-Sunder and Myers (1999). Still, the target ratio has also been quantified in terms of market leverage. Generally, when authors analyze both market and book leverage, the results are comparable (Flannery and Rangan (2006)). We will redo our analysis with market leverage in Section 3.4.2.

[15] We do not use fixed effects since we expect firms that follow the pecking order theory to deviate from their supposed target for longer periods of time. The inclusion of fixed firm effects imposes that firms are on average on their target during the period used for estimating the model, which would not allow firms to be constantly below or above their supposed target.

Table 10: Target leverage

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the estimated targets for the firms in our sample with an investment grade rating. We estimate the following regression specification: $dr^*_{i,t+1} = x'_{it}\beta$, where $dr^*_{i,t+1}$ is firm *i*'s desired debt ratio at *t+1*; x'_{it} is a vector of firm characteristics related to the costs and benefits of operating with various leverage ratios, and β is a coefficient vector. T-statistics appear in parentheses and are computed using panel-robust standard errors. *, ** indicate significance at the 5%, and 1% confidence level, respectively.

	Target debt ratio
Constant	0.106**
	(2.60)
Log(sales)	0.008**
	(2.74)
Tangibility	0.100**
	(5.84)
EBITDA	-0.068
	(-1.06)
Market-to-book ratio	-0.016**
	(-5.12)
Industry median	0.460**
	(5.72)
Year dummies	Yes
N	7,136
R^2	0.133

The results in Table 10 indicate that size and tangibility increase the target leverage of firms. The relation between size and leverage is usually explained by bankruptcy considerations: larger firms are generally more diversified and therefore less prone to bankruptcy. Also, the direct bankruptcy costs will generally be a smaller portion of the firm's assets. Firms are generally believed to use their tangible assets as collateral, which decreases the costs of debt. Indeed we find firms with higher tangibility to have higher debt targets. We further observe that the market-to-book ratio and profitability have a negative effect on a firm's target, which is also in line with the current literature (see, for example, Rajan and Zingales (1995)).

Up front, we do not know whether a firm has a target debt ratio. Still, we estimate firms' targets on all investment grade firms, which means that we will also incorporate the firms that do not have a target. In a robustness check, we consider an alternative measure for a firm's target debt ratio, by taking the average debt ratio of a given firm over the preceding years (see, for example, Shyam-Sunder and Myers (1999)). In this way, the target debt ratio of a firm that actually has a target is not contaminated by the effects of firms without targets.

3.3.2 Debt capacity

The proxy for the debt capacity should represent the debt ratio for which firms are restricted in issuing debt. This restriction relates to a firm's constraint in issuing debt against "normal" costs. Shyam-Sunder and Myers (1999) interpret the pecking order theory as follows (p. 225): *"If costs of financial distress are ignored, the firm will finance real investment by issuing the safest security it can. Here safe means not affected by revelation of managers' inside information. In practice, this means that firms which can issue investment-grade debt will do so rather than issue equity."* We follow Shyam-Sunder and Myers' (1999) interpretation of the pecking order model and link the debt capacity to investment grade ratings. A firm is constrained in its debt issuing if it cannot issue investment grade debt. The reason why speculative debt is costly is that issuing speculative debt substantially increases the chance of bankruptcy. As a result, it requires higher interest payments (Almeida and Philippon (2007)).[16] Grinblatt and Titman (2002) argue that the cost for speculative debt is also increased as many bond portfolio managers are restricted from owning speculative grade bonds.

The relationship between debt ratings and debt ratios is empirically shown by, for example, Huang and Huang (2003), Molina (2005), and Almeida and Philippon (2007). Table 11 confirms that leverage and credit ratings are strongly related in our sample.[17] The table also shows the 10-year historical cumulative default rates for U.S. firms with a specific rating in the period 1981-2005, based on a report of Standard and Poor's (2006).

On average, firms with the highest rating (AAA) have the lowest debt ratios (mean of 0.177). It can be seen that the lower the credit rating, the higher the leverage. The table also shows how we recode the ratings AAA-D into numerical ratings, based on Ashbaugh-Skaife, Collins, and LaFond (2006). Table 11 further shows that over the period 1981-2005 the historical 10-year cumulative probability of default is 5.73% for firms having a rating BBB in the U.S. (investment grade rating), whereas this default probability rises to 17.87% for firms with rating BB (speculative grade rating).

[16] Sometimes firms issue junk bonds (bonds with a rating lower than BB), and hence opt for high interest rates. Gilson and Warner (1997) find that this is mainly to gain financial flexibility, as junk bonds do usually not have the restrictive covenants that normal debt has.

[17] This relation is likely to work in two ways. Firms' leverage obviously influences probability of defaults and hence credit ratings. However, firms' credit ratings are also believed to influence firms' leverage (see, e.g. Kisgen (2006)), especially because anecdotal evidence suggests that firms contact rating agencies before making large financing decisions. Still, the effect of leverage on credit ratings is likely to be much stronger than the effect of credit ratings on firms' leverage.

Table 11: Credit ratings and leverage

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the book leverage for firms with various long-term credit ratings. We report means, medians, and standard deviations. The table also shows the numerical classifications of credit ratings as in Ashbaugh-Skaife, Collins, and LaFond (2006). The default rate is the cumulative average 10-year default rate of U.S. firms in the period 1981-2005, as reported by Standard and Poor's (2006).

Credit rating	N	Numerical	Investment or speculative	10-year default rate	Book leverage		
					Mean	Median	St. dev.
AAA	234	7	Investment	0.35%	0.177	0.167	0.082
AA	864	6	Investment	0.77%	0.205	0.200	0.109
A	2,807	5	Investment	2.06%	0.254	0.251	0.110
BBB	3,379	4	Investment	5.73%	0.300	0.297	0.128
BB	3,238	3	Speculative	17.87%	0.393	0.385	0.161
B	2,523	2	Speculative	32.65%	0.482	0.490	0.188
CCC & D	293	1	Speculative	55.65%	0.473	0.504	0.238

We use firms' credit ratings to determine the debt capacity for a firm in a given year. First, we determine in what way the credit rating depends on various firm characteristics. The set of characteristics is based on Altman and Rijken (2004) and originates from the Z-score model (Altman (1968)). These variables are working capital, retained earnings, profitability, size, and age. Age is the number of years since a firm was first rated by Standard and Poor's (with a maximum of ten). We model a firm's credit rating y_{it} using an ordered response model, where y_{it}^* is the underlying latent variable:

$$y_{it}^* = \alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it}, \tag{7}$$

where x_{it} is a set of characteristics of firm i in year t, and dr_{it} is the debt ratio of firm i in year t (not included in x_{it}). We define a firm's debt ratio as total debt over the book value of assets. Short-term debt is included as, for example, trade credit can provide financing when a firm would otherwise be constrained (see Petersen and Rajan (1997)). We observe y_{it} on a 7-point scale and we specify our model as an ordered logit model. In this model, γ refers to the boundaries between the different credit ratings.[18] We observe y_{it} = 1 if $y_{it}^* \leq \gamma_1$, y_{it} = 2 if $\gamma_1 < y_{it}^* \leq \gamma_2$, …, and y_{it} = 7 if $y_{it}^* > \gamma_6$. An investment grade rating corresponds to $y_{it} \geq 4$. From Table 9 we know that 7,284 of the 13,338 firms in our sample have an investment grade rating. For a given set of characteristics x_{it}, the probability of getting an investment grade rating is given by

[18] The imposed normalization constraint implies that Eq. (2) has no intercept term.

$$P\{y_{it} \geq 4\} = P\{y_{it}^* \geq \gamma_3\} = P\{\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it} \geq \gamma_3\} = F(-\gamma_3 + \alpha_1 dr_{it} + x_{it}^{'}\alpha_2), \tag{8}$$

where F denotes the logistic distribution function.

We define the debt capacity of a firm as the marginal value of the debt ratio, given its other firm characteristics, that increases the probability of obtaining a speculative grade to 0.50. In other words, we vary the debt ratio and take the value of this debt ratio for which we expect a specific firm in a specific year to have a fifty percent chance of getting a speculative grade, given the firm's other characteristics.

As we vary the debt ratio to find the level for which a firm is expected to lose its investment grade rating, we need the control variables to be constant for changes of the debt ratios. However, a change in short-term debt will, per definition, have an impact on the working capital. Also, a change in leverage will increase a firm's interest payments and therefore its retained earnings. Therefore, in estimating the debt capacity, we take the orthogonal variables for a firm's working capital and the retained earnings.[19] Table 12 shows the estimation results of the ordered logit model.

It can be seen that an increase of a firm's size, profitability, or retained earnings on average has a positive effect on Standard and Poor's credit rating. Leverage has a negative effect. The sign of working capital is somewhat unexpected: firms with higher working capital have on average lower ratings. This is also found by Altman and Rijken (2004). The pseudo R^2 is 0.313, and our model gives the correct prediction of investment grade ratings or speculative grade ratings in 85% of the cases (not reported).

As mentioned, we define the debt capacity (dr_{it}^c) of a firm as the value of the debt ratio, given the other firm characteristics, that increases the probability of obtaining a speculative grade to 0.5. For our model, this means that we look for dr_{it} that – given x_{it} – changes the expected value of y_{it}^* to γ_3. Solving $\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 = \gamma_3$ for the debt ratio it follows that

$$dr_{it}^c = (\gamma_3 - (x_{it}^{'}\alpha_2)) / \alpha_1. \tag{9}$$

[19] We define the orthogonal variables as the residuals of a regression of the debt ratio on a specific variable. Hence, the orthogonal variables are uncorrelated to the debt ratio. In robustness tests we have estimated the model with all five variables as orthogonal. Also, we have estimated specifications in which we use firms' dividends as proxy for retained earnings, and firms' current assets as a proxy for the working capital. Our results prove to be robust for these alterations.

Table 12: Credit ratings

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the estimation of an ordered logit model. We estimate $y_{it}^{*} = \alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + \varepsilon_{it}$, in which y_{it}^{*} is the underlying latent variable of the credit rating, x_{it} is a set of characteristics of firm *i* in year *t*, and dr_{it} is the debt ratio of firm *i* in year *t* (not included in x_{it}). We also report the boundaries that correspond to an ordered logit model. T-statistics appear in parentheses and are computed using panel-robust standard errors. *, ** indicate significance at the 5%, and 1% confidence level, respectively.

	Credit rating
Log(sales)	0.918**
	(24.12)
Book leverage	-6.590**
	(-22.13)
EBIT	2.674**
	(6.26)
Retained earnings	4.559**
	(19.70)
Working capital	-1.853**
	(-6.80)
Age dummies	Yes
Year dummies	Yes
N	13,244
Pseudo R^2	0.313
Boundaries	
γ_1	-2.529
γ_2	1.557
γ_3	3.925
γ_4	6.063
γ_5	8.524
γ_6	10.641

This measure for a firm's debt capacity ignores information on unobserved firm characteristics that can be inferred from the currently observed credit rating. We can exploit this information by noting that the expected value of ε_{it} in (2), given the credit rating y_{it} and other characteristics, is nonzero. Our preferred measure for a firm's debt capacity takes this into account. Accordingly, we define the debt capacity to that value for dr_{it}, given x_{it} and given the current rating y_{it} that increases the probability of a speculative grade to 0.5. It follows that the debt capacity can be derived from

$$\alpha_1 dr_{it} + x_{it}^{'}\alpha_2 + E\{\varepsilon_{it} | y_{it}, x_{it}, dr_{it}\} = \gamma_3. \quad (10)$$

The term $E\{\varepsilon_{it} | y_{it}, x_{it}, dr_{it}\}$ in this expression is nonzero and corresponds to the generalized residual of the ordered response model in Eq. (7), as proposed by Gourieroux, Monfort, Renault, and Trognon (1987). The generalized residual (denoted λ_{it}) is positive for firms that have an unexpectedly high credit rating: these firms have unobservable firm characteristics that make their rating higher than expected. The debt capacity can be estimated as

$$dr_{it}^{c} = (\gamma_3 - (x_{it}^{'}\alpha_2 + \lambda_{it})) / \alpha_1. \quad (11)$$

Assuming $\alpha_1 < 0$, the debt capacity in Eq. (11) will be higher than the debt capacity in Eq. (9) for firms that currently have an unexpected good credit rating, and lower for firms that currently have an unexpected poor credit rating.

Using Eq. (11) and the estimated underlying ordered logit model from Eq. (7) we find the average debt capacity of firms to be 60.3% of total assets. The median is 59.2%, and the standard deviation is 21.2%. Some firms have estimates of debt capacities that are above one or below zero. This means that our model estimates these firms to have a probability smaller than 0.5 of ever getting an investment grade rating (in case of a debt capacity below zero) or a speculative rating (in case of a debt capacity above one), regardless of the change in debt ratio. There are 208 observations (3% of the sample) with values above one and 77 observations (1%) of values below zero. For subsequent analyses, we set these values to one and zero, respectively.

3.4 Testing the influence of a firm's target ratio and debt capacity on its debt-equity choice

In this section we relate the estimated target and debt capacity to the debt-equity choice. Section 3.4.1 extends the debt-equity choice model of Hovakimian, Opler and Titman (2001), Section 3.4.2 provides robustness tests, and Section 3.4.3 discusses non-rated firms.

3.4.1 Extending the Hovakimian, Opler, and Titman (2001) test

Our test is based on Hovakimian, Opler, and Titman (2001), who analyze the debt-equity choice of U.S. firms for the period 1979-1997. They define a firm as being a debt issuer in a year when the net amount of debt issued in that year exceeds 5% of total assets. Likewise, an equity issue indicates that the net amount of equity issued exceeds 5% of total assets. Using a binary logit model, they estimate whether the difference between the firm's current leverage and its estimated target has an effect on whether the firm issues (repurchases) debt or equity. They find that the higher the target with respect to the current leverage, the higher the probability that the firm issues debt. For repurchase decisions, it is found that the higher the target relative to the current leverage, the higher the likelihood that the firm repurchases equity.

Although these findings seem to provide evidence for the static tradeoff theory, we argue that the pecking order theory potentially interfered with the results. For instance, when a firm's current debt ratio is substantially below its target debt ratio, it is likely that the firm also substantially deviates from its debt capacity, and the choice for debt can just as well be explained by the pecking order theory. As was shown in Figure 5, the most interesting region for empirical tests on the capital structure theories for issue decisions is the one in which a firm's leverage is above the target, but below the debt capacity. In this case, the static tradeoff theory predicts a strong influence of the target debt ratio, while the pecking order model predicts a strong influence of the debt capacity and an insignificant impact of the target debt ratio. We therefore extend the test of Hovakimian, Opler, and Titman (2001) by incorporating the estimated debt capacity in the regression specification. We limit our sample to the firms that issue or repurchase amounts of either debt or equity that exceed 5% of total assets.[20] We look at the debt-equity choice in year $t+1$, to ensure that the debt-equity choice does not have an effect on our determination of the debt capacity in Eq. (11). Summary statistics of this subsample are presented in Table 13.

Firms that issue debt have average total assets of 6,566 million dollars, which is larger than the equity issuers (5,880 million), but smaller than the average firm that repurchases debt (6,888 million) or equity (8,409 million). Firms that issue equity or repurchase debt, and herewith decrease leverage, have higher current leverage than firms that issue debt or repurchase equity.

[20] As a result, we follow Hovakimian, Opler, and Titman (2001) in excluding dual issues. In our sample, 423 observations show an issue of both debt and equity within one year that are larger than 5% of total assets. For a discussion of dual issues and their relation to capital structure theories, see Hovakimian, Hovakimian, and Tehranian (2004).

Table 13: Summary statistics for the debt-equity choice

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows mean values of key characteristics. Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets at the beginning of the fiscal year exceeds 5%. Cases where firms issued (repurchased) both debt and equity in a fiscal year are omitted. Assets are determined by Compustat Item 6 and are reported in millions of dollars. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6. Target leverage is estimated on the basis of firm characteristics. The debt capacity is calculated with Eq. (6). ROA is the three year average of Item 13 divided by Item 6. NOLC is the net operating loss carryforward (Item 52), divided by Item 6. The two-year stock return is computed by dividing the stock price in a given year (Item 24) by the stock price two years before. The market-to-book ratio is calculated as (Item 24 * Item 25 – Item 60 + Item 6) / Item 6. The MTB-dummy is one when the market-to-book ratio exceeds one, and is zero otherwise. The dilution dummy examines whether an equity issue could dilute earnings. It is set to zero, except when one minus the assumed tax rate times the yield on Moody's Baa rated debt is less than the firm's after-tax earnings-price ratio. In accordance with Hovakimian, Opler, and Titman (2001), the tax rate is assumed to be 50% before 1987 and 34% afterward. The after-tax earnings price ratio is calculated as Item 18 / (Item 24 * Item 25). The fraction of debt that is due in three years is computed as (Item 44 + Item 91 + Item 92) / (Item 9 + Item 34).

	Debt issue	Equity issue	Debt repurchase	Equity repurchase
Total assets	6,566	5,880	6,888	8,409
Book leverage	0.272	0.341	0.346	0.215
Target – leverage	0.005	-0.065	-0.072	0.029
Capacity – leverage	0.315	0.177	0.198	0.452
Three-year mean ROA	0.163	0.137	0.145	0.203
NOLC	0.011	0.019	0.015	0.010
Two-year stock return	0.120	0.105	0.100	0.185
Market-to-book ratio	1.871	1.720	1.597	2.716
MTB-dummy	0.953	0.929	0.912	0.985
Dilution dummy	0.523	0.231	0.377	0.485
Fraction of debt due in 3 years	0.177	0.167	0.229	0.193
Observations	1,219	182	567	720

Table 13 also includes summary statistics for the control variables used in Hovakimian, Opler, and Titman (2001). The variable "NOLC" represents the net operating loss carryforward. NOLC, ROA, the stock return, and the market-to-book ratio might proxy for the extent to which firms are over- or underlevered. The dilution dummy equals one when an equity issue could dilute earnings, which makes an equity issue less favorable. The percentage of debt that is due in three years is related to the wealth transfer from equity holders to debtholders in case new equity is issued.

The estimation results for the extended Hovakimian, Opler, and Titman regression are given in Table 14.

Table 14: The impact of the debt capacity on debt-equity choices

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table shows the impact of target leverage and the debt capacity on the debt-equity choice for firms with an investment grade rating. We estimate a binary logit model. Firms are defined as issuing (repurchasing) a security when the net amount issued (repurchased) divided by the book value of assets at the beginning of the fiscal year exceeds 5%. Cases where firms issued (repurchased) both debt and equity in a fiscal year are omitted. Target leverage is estimated based on firm characteristics. The control variables are taken at the beginning of the fiscal year. T-statistics appear in parentheses and are based on panel-robust standard errors. *, ** indicate significance at the 5%, and 1% confidence level, respectively.

	Debt vs. Equity issue			Debt reduction vs. Equity repurchase		
	All	When target > book leverage	When target < book leverage	All	When target > book leverage	When target < book leverage
	(1)	(2)	(3)	(4)	(5)	(6)
Target – leverage	3.205**	16.455**	1.089	-7.928**	-13.371**	-3.499*
	(4.13)	(5.11)	(0.82)	(-8.30)	(-5.30)	(-2.25)
Capacity – leverage	2.002**	1.777*	2.190**	-2.217**	-1.504*	-2.987**
	(4.12)	(1.96)	(3.63)	(-4.17)	(-2.05)	(-3.84)
Three year mean ROA	4.282	6.183	1.467	-6.336**	-7.470*	-4.703
	(1.68)	(1.84)	(0.38)	(-3.25)	(-2.52)	(-1.87)
NOLC	0.615	-3.240	1.507	0.775	3.274	-2.525
	(0.25)	(-0.85)	(0.83)	(0.42)	(1.17)	(-1.10)
Two-year stock return	-0.068	0.150	-0.204	0.145	-0.137	-0.004
	(-0.35)	(0.52)	(-0.91)	(0.14)	(-0.51)	(-0.02)
Market-to-book ratio	-0.005	-0.174	0.386	-0.932**	-0.766*	-0.966**
	(-0.03)	(-1.24)	(1.85)	(-4.68)	(-2.45)	(-3.26)
Dummy for MTB > 1	-0.113	-0.141	-0.169	-0.414	-0.666	-0.469
	(-0.30)	(-0.23)	(-0.31)	(-1.05)	(-1.30)	(-0.58)
Dilution dummy	0.948**	1.265**	0.969**	-0.770**	-0.281	-1.210**
	(4.41)	(3.41)	(3.42)	(-4.12)	(-0.95)	(-4.40)
Fraction of debt due in three years (FD3)	0.361	1.020	-0.079	1.238**	1.592**	1.295
	(0.79)	(1.28)	(-0.13)	(2.77)	(2.62)	(1.56)
Dummy for loss*FD3	-3.979**	-4.473	-5.024	-1.614	-2.538	-1.019
	(-2.86)	(-1.94)	(-1.88)	(-1.55)	(-1.48)	(-0.70)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	1,401	745	656	1,287	630	657
Pseudo R^2	0.177	0.223	0.180	0.400	0.312	0.381

For the total spectrum of debt ratios, reported in Model (1), the difference between the target debt ratio and the current leverage significantly increases the likelihood that firms issue debt in our sample of investment grade firms, as the variable “target – leverage” is significant and has a positive sign. To test whether the debt capacity is important for firms’ debt-equity decisions, we look at the variable representing the difference between the debt capacity and the current leverage. It can be seen that this difference also has a significant impact on firms’ debt-equity choice in the total spectrum of debt ratios. For higher debt capacities with respect to the current leverage, the probability that the firm issues debt is larger.

For a comparison between the static tradeoff theory and the pecking order theory in predicting issue decisions, we focus on the situations in which a firm's leverage is above the target. Therefore, we also estimate the model using only those observations for which the estimated target is lower than the firm's current leverage. From the results in Model (3), it can be seen that the difference between the firm's leverage and its targets loses statistical significance. That is, the estimated target does not have an influence on firms' debt-equity choices when a firm is overlevered with respect to its supposed target. The difference with the debt capacity remains significant: the larger the deviation from the debt capacity, the higher the probability that debt is issued. Hence, if a firm has surpassed its potential target, the debt capacity predicts which security the firm will issue. Accordingly, we conclude that our test provides evidence for the pecking order theory. When the book leverage is below the target debt ratio, the impact of the debt capacity is significant at the 5% level, but not at the 1% level. Probably, this is because the debt capacity is generally substantially higher than the target. As the firms in this subsample are currently below their estimated targets, they are therefore unlikely to be constrained by the debt capacity.

For repurchase decisions, reported in Models (4)-(6), we find that both the estimated target and the estimated debt capacity have an influence on firms' financing decisions. An increase of the difference between a firm's estimated target and its current leverage increases the probability that equity is repurchased, just as a higher debt capacity with respect to the current leverage, which is in accordance with findings of Hovakimian, Opler, and Titman (2001). The finding that the variable "target – leverage" is negative for repurchase decisions does not necessarily indicate that low leverage firms prefer repurchasing equity over reducing debt, which would be evidence against the pecking order theory for repurchase decisions in Shyam-Sunder and Myers (1999). Instead, the negative sign indicates that firms that are strongly underlevered are more likely to choose an equity repurchase over a debt reduction than otherwise identical firms that are slightly underlevered. We will examine the overall preference of firms facing a repurchase decision in Section 3.5.4. The finding that the target debt ratio is more influential in repurchase decisions than in issue decisions is also in line with the findings of Hovakimian, Opler, and Titman.

Several control variables are significant at the 5% level. Firms for which an equity issue is likely to dilute earnings have a higher probability of preferring a debt issue over an equity issue. Firm-years in which losses are made reduce the probability that the fraction of debt due in three years leads to debt issues. Contrary to Hovakimian, Opler, and Titman (2001), we do not find significant effects of two-year stock returns and the market-to-book ratios on firms' issuing choices in our overall sample. This is probably due to the fact that our sample only includes firms with investment grade ratings. As could be seen from Table 9, median stock returns and market-to-book ratios are higher for these firms.

More profitable firms are more likely to repurchase stock, and thus increase the debt ratio, which is in line with the indirect static tradeoff predictions on the effect of profitability on leverage (see, e.g., Rajan and Zingales (1995)). High market-to-book ratio firms are more likely to repurchase equity, which is also found by Hovakimian, Opler, and Titman (2001). This finding is intriguing, as high market-to-book ratios can imply overvaluation, which makes the firm repurchase at the inflated price. Firms for which an equity choice could be dilutive are more likely to repurchase equity, while firms with a large fraction of debt due in three years are more likely to reduce the debt level.

To gauge the economic importance of the deviation of firms' leverage from their targets and debt capacities on the debt-equity choice, we have also examined elasticities (not reported). These elasticities provide information on the change in the implied probability of a debt issue (retirement) for a change of a specific explanatory variable, while holding the other variables constant at their respective means. For the whole range of issue decisions, the elasticity with respect to a deviation from the target is 0.250 and with respect to a deviation from the debt capacity it is 0.156. This means that the probability of a debt issue increases by 25.0% in response to a doubling of the gap between a firm's leverage and its target, and by 15.6% in response to a doubling of the gap between a firm's leverage and the debt capacity. For issue decisions above the target, the elasticity is 0.124 with respect to a deviation from the target and 0.249 with respect to a deviation from the debt capacity. The elasticities are higher for repurchase decisions: for the whole range of repurchase decisions we find an elasticity of -1.832 for a deviation from the target, and an elasticity of -0.512 for a deviation from the debt capacity. Overall, we can conclude that the deviations from the target and debt capacity have substantial economic impact on a firm's financing decisions.

3.4.2 Alternative measures of target leverage

We make several choices for our main proxy for leverage than can have an effect on our findings in Table 14. First, in estimating the target in Section 3.3.1, we might have missed important explanatory variables. We therefore include firms' marginal tax rates (before interest expenses) into our target estimation model. Graham (1999) uses these marginal tax rates to show that firms with higher marginal tax rates have significantly higher leverage, indicating that interest deductibility encourages higher debt ratios. We find our results to be robust for the inclusion of marginal tax rates: both the signs and the significance of all variables in our model remain unaltered.

In estimating the target, we excluded firms that have speculative ratings, since these firms are not likely to be on their desired debt ratios. However, because firms with speculative ratings have relatively high leverage, the exclusion creates a downward bias on our estimated targets. We therefore re-estimate the target by including both investment grade and speculative grade firms in the target leverage regression. We indeed obtain higher estimated targets (the average estimated target debt ratio increases from 0.27 to 0.34). When we use these new targets as input for the debt-equity estimation in Table 14, we find the results to be largely robust. The main difference is the number of observations in the different regions: the number of observations in the issue decision that are estimated to be above target decreases from 656 to 329, while the number of observations that are estimated to be below target increases from 745 to 1,072.

We also test whether our results change when we use market leverage instead of book leverage. Interestingly, we find that the pseudo R^2 in our credit rating regression increases when we replace book leverage with market leverage (the pseudo R^2 changes from 0.313 to 0.353). Apparently, market leverage is better able of predicting credit ratings than firms' book leverage. We do not find strong changes for our findings in Table 14.

Several papers, like Shyam-Sunder and Myers (1999), take the average historical leverage as the firm's target. An advantage of this method is that the estimated targets for static tradeoff firms are not contaminated by firms that do not have a target, which potentially occurs in models that base the estimation of the target on firm characteristics. We therefore take the average debt ratio over the last five years as the target debt ratio.[21] We do not find strong differences with our earlier results: in our overall sample, we find that the deviation of firms' leverage from both the estimated target and debt capacity are significant. For the subset of observations where book leverage is above its target leverage, the spread between the target debt ratio and current leverage has no impact on the decision to issue debt versus equity.

3.4.3 Firms without rated debt outstanding

Because our estimation of the debt capacity requires firms to have a credit rating, our framework does not allow for a test on non-rated firms. Given that non-rated firms

[21] We also test the impact of target debt ratios that are specified as the three-year average debt ratio and the ten-year average debt ratio.

are fundamentally different from rated firms (Faulkender and Petersen (2006)), an interesting question is whether the debt capacity also plays a role in the financing decisions of non-rated firms. A potential answer to this question can be provided by estimating the credit rating that a non-rated firm would have upon requesting one. Faulkender and Petersen, however, argue that non-rated firms do not only have different internal characteristics than rated firms, but are also strongly affected by the supply side: a large portion of non-rated firms are restricted in their debt issuance by the market, in line with the credit rationing argument of Stiglitz and Weiss (1981). As a result, it is problematic to estimate the debt capacity for non-rated firms, since we cannot observe the severity of the credit rationing. Fortunately, Lemmon and Zender (2007) have examined the effect of the debt capacity on non-rated firms. They develop a model that predicts whether firms have rated debt outstanding, and show that the firm-years with a prediction of no rated debt do not portrait pecking order behavior, in accordance with the limitations imposed by their debt capacity. Therefore, we would argue that our findings regarding the importance of the debt capacity do not only hold for the rated firms in our sample. In fact, the abovementioned study indicates that our results would be even stronger once we could measure non-rated firms' debt capacities.

3.5 The classification of pecking order and static tradeoff observations

Our finding in Section 3.4 that the pecking order theory provides more accurate predictions for firms' actual financing decisions can potentially be explained by various other factors. One factor relates to firm characteristics: the majority of firms in our sample might have high informational asymmetry. Another factor is related to the sample period: the majority of the observations can be in years with favorable conditions for the pecking order theory. Alternatively, the more accurate predictions of the pecking order theory might also be explained by a group of firms who constantly act in accordance with this theory. To establish why the pecking order theory predicts well, this section uses Figure 5 to segregate observations that are in accordance with the predictions of the pecking order theory from observations that are in accordance with the predictions of the static tradeoff theory. Pecking order observations, for example, correspond to firm-years in which a security has to be issued, while the firm's leverage is above its supposed target but below the debt capacity, and the firm decides to issue debt. A typical static tradeoff observation is a firm in a similar situation that decreases leverage. We will use these classifications to analyze the strength of the pecking order theory in Section 3.6.

3.5.1 Estimating the firm's position with respect to its estimated target

In order to identify pecking order and static tradeoff observations, we need to determine the firm's position towards the target and debt capacity. Basically, we have determined a firm's position towards its estimated target in Section 3.4 when we used Hovakimian, Opler, and Titman's (2001) regression specification. However, in the tests in Section 3.4, the firm's current leverage is the debt ratio at the beginning of the fiscal year. We will extend the analysis by taking into account that firms do not only finance projects at the beginning or end of a book-year. Therefore, instead of the debt ratio that a firm has at the beginning of the year, we are interested in the debt ratio at the time of the financing decision. More specifically, we argue that firms' managers compare the expected debt ratio at the end of the book-year with the firm's possible target debt ratio at the time of the decision. This expected debt ratio is influenced by the expected retained earnings. When a firm expects to have retained earnings, it expects the balance sheet total of the firm to grow. The retained earnings do however not alter the absolute level of debt. Therefore, retained earnings decrease leverage when a firm obtains no external financing. In order to establish their position with respect to their possible targets, firms need to incorporate the effect of expected retained earnings:

$$dr_{i,dec} = d_t / (a_t + re_{t+1}), \qquad (12)$$

where $dr_{i,dec}$ is the leverage at the time of decision, d is the debt level, a is total assets, and re are the expected retained earnings.

Next, we determine whether a firm is below or above its estimated target. Basically, we can observe whether the estimated leverage at the time of the decision is higher or lower than the estimated target. However, we also take the estimation error of the target debt ratio into account. That is, we control for uncertainties about the exact value of the firm's target. We determine the probability that a firm's leverage at the time of the decision is above its estimated target as follows:

$$P\{dr_{i,dec} > dr^*_{i,t+1}\} = F\left(\frac{dr_{i,dec} - \hat{dr}^*_{i,t+1}}{se\{\hat{dr}^*_{i,t+1}\}}\right), \qquad (13)$$

where *se* denotes the appropriate standard error. Remember that $\hat{dr}^*_{i,t+1} = x_{it}^{'}\hat{\beta}$. If we denote the estimated covariance matrix of $\hat{\beta}$ by $\hat{\text{var}}(\hat{\beta})$, then the appropriate standard error can be computed as

$$se(\hat{dr}^*_{i,t+1}) = \sqrt{x_{it}^{'}\,\hat{\text{var}}(\hat{\beta})x_{it}}\,. \tag{14}$$

3.5.2 Estimating the firm's position with respect to its estimated debt capacity

The identification of static tradeoff and pecking order observations further requires the determination of whether a firm is restricted by its debt capacity. A firm's debt capacity is likely to become an issue when a firm substantially increases its leverage. The debt capacity therefore does not only relate to the current debt level, but also to the securities needed for financing decisions. The question is: does a firm get above its debt capacity when it uses debt to finance its investments?

To answer this question, we employ the need for external financing. This financing deficit plays a prominent role in Shyam-Sunder and Myers (1999) and Frank and Goyal (2003). We calculate the hypothetical debt ratio as the debt ratio of a firm would it finance its deficit completely with debt. That is,

$$dr_{i,t+1}^{hyp} = (d_t + def_{t;t+1})/(a_t + di_{t;t+1} + ei_{t;t+1} + re_{t+1}), \tag{15}$$

where $dr_{i,t+1}^{hyp}$ is the hypothetical debt ratio, *d* is the debt level, *def* is the financing deficit, *a* is total assets, *di* is the net debt issued, *ei* is the net equity issued, and *re* are the expected retained earnings. The indication *t;t+1* for the flow variables corresponds to a time frame between year *t* and year *t+1*.

The probability that a firm is limited by its debt capacity depends on the hypothetical debt ratio and the estimated debt capacity. If we take into account the estimation error in determining the debt capacity, we can determine the chance that a firm cannot exclusively issue debt without losing its investment grade rating by:

$$P\{dr_{i,t+1}^{hyp} > dr_{i,t+1}^{c}\} = F\left(\frac{dr_{i,t+1}^{hyp} - \hat{dr}_{i,t+1}^{c}}{se\{\hat{dr}_{i,t+1}^{c}\}}\right), \tag{16}$$

where *se* denotes the standard error. This standard error can be derived from the covariance matrix of the maximum likelihood estimator for the coefficients in Eq. (7) and the functional form in Eq. (11) using the so-called delta method (see Greene (2003), p. 913). It is given by

$$se(\hat{dr}_{i,t+1}^{c}) = \sqrt{f_{it}^{'}\ \hat{\text{var}}(\hat{\theta}) f_{it}}\,, \tag{17}$$

where $\hat{\text{var}}(\hat{\theta})$ is the estimated covariance matrix of the coefficients in Eq. (11) and f_{it} is a vector with derivatives. Its elements are

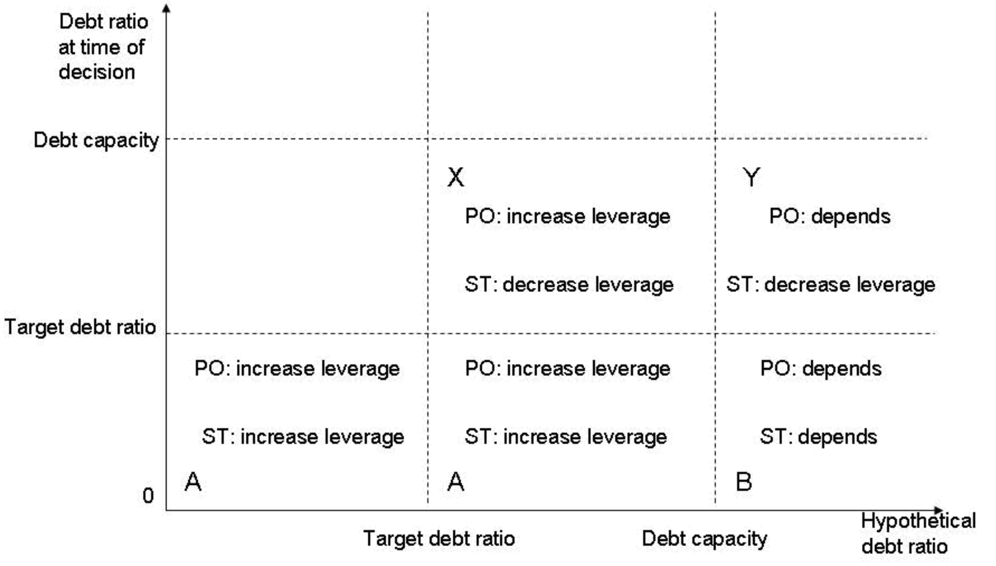
$$(-\hat{\gamma}_3 + (\hat{\alpha}_2 x_{it}^{'} + \hat{\lambda}_{it}) / \hat{\alpha}_1^{2}, -x_{it} / \hat{\alpha}_1, 0, 0, 1/\hat{\alpha}_1, 0, 0, 0).$$

3.5.3 Determining pecking order and static tradeoff observations for issue decisions

Although Figure 5 provides our basic framework for comparing the pecking order theory and the static tradeoff theory, we extend the framework since we compare the target debt ratio with the leverage at the time of the financing decision and the debt capacity with the hypothetical debt ratio. For firms that need funding, our framework provides nine regions that relate to the firm's current and hypothetical debt ratio; see Figure 6. A firm's current debt ratio can be below its potential target, above its potential target, and above its debt capacity (firms with a speculative rating). Also, the firm's hypothetical debt ratio can be below the potential target, above the potential target, and above the debt capacity. The target ratio of a firm lies below its debt capacity: financial distress, as incorporated in the debt capacity, is not the only factor that withholds firms from exclusively having debt. A firm's target is also decreased by for example non-debt tax shields, personal taxes, and agency considerations. On the relation between a firm's target and its debt capacity, Turnbull (1979) shows that a firm's optimal leverage is below the level of debt that lenders are willing to provide. Figure 6 shows the nine possible regions.

Figure 6: The predictions of the theories for issue decisions.

This figure shows whether the pecking order theory and the static tradeoff theory predict an increase or decrease of the debt ratio for different positions of the debt ratio. "PO" corresponds to the pecking order theory, and "ST" corresponds to the static tradeoff theory. The debt ratio at the time of decision can be below and above the target debt ratio. A firm's hypothetical debt ratio is the debt ratio that a firm would have when it finances the investments with debt. The hypothetical debt ratio can be below and above the target debt ratio, and can also be above the debt capacity.



We are interested in the financing decisions of firms that currently have investment grade ratings. These firms are not likely to have a high probability of being currently above the debt capacity. Also, the hypothetical debt ratio assumes that a firm solely uses debt for its investments. Therefore, the hypothetical debt ratio portraits higher leverage than the debt ratio at the time of the decision, which excludes the region in which a firm's current ratio is above target and the hypothetical ratio is below target. This leaves five relevant regions.

Figure 6 includes the predictions of both the pecking order theory and the static tradeoff theory in these five regions. For issue decisions the pecking order theory is well-known: firms will issue debt, as long as they have not reached their debt capacity. The static tradeoff theory predicts that firms will issue debt when they are below their target, and will issue equity when they are above their target. Previous papers have found that firms do not close the whole gap in one year, but move gradually towards their supposed target (e.g., Flannery and Rangan (2006)). For our research, this partial adjustment will not pose a problem, as we do not require that firms end up exactly at their target to provide evidence for the static tradeoff theory. A move towards the target will suffice.

A firm that is below its target will increase its leverage under both theories, when it is not constrained by its debt capacity. The pecking order model implies a preference for debt when external financing is needed, which will increase leverage. The static tradeoff model implies that a firm moves towards the target, which means it also has to increase its leverage. The difference is that the pecking order model implies that the firm solely issues debt, whereas the static tradeoff model would predict that some firms issue a mix between debt and equity, to exactly reach the target debt level.

When a firm's debt capacity constrains a firm to finance its investments with debt only (that is, against reasonable interest rates), the predictions of the pecking order model depend on a firm's willingness to do a mixed issue. Possibly, a firm would still increase leverage by issuing more debt than equity. However, there are costs involved in issuing securities. Therefore, a firm can also opt for a single issue. Given the limitations imposed by the debt capacity for issuing debt, the most likely option would then be to solely issue equity.

Again, when a firm is above its target and is not limited by its debt capacity, the pecking order model predicts that a firm will issue debt and herewith increase leverage. The static tradeoff theory predicts that a firm moves towards the target and decreases leverage. This region is therefore the most interesting one when comparing the theories, as they strongly disagree. We label this region as region X. We can compute each firm's probability of being in a region by using the probabilities of being above the target and above the debt capacity. For example, the probability that a firm-year is in region X is the probability that the firm is above target and not restricted by the debt capacity, and is given by

$$P\{dr_{it} > dr^{*}_{i,t+1}\} * P\{dr^{hyp}_{i,t+1} < dr^{c}_{i,t+1}\}.$$

These probabilities can be derived from the results in Subsection 3.5.2. In each region we want to know whether the firms increase or decrease leverage. We therefore compare the current leverage with the leverage after the financing decision, given by

$$dr_{i,after} = d_{t+1} / (a_t + di_{t;t+1} + ei_{t;t+1} + re_{t+1}). \tag{18}$$

We find that 73% of the observations that have a higher than 50% chance of being in region X (542 firm-years) increase leverage. Again, the pecking order theory predicts firms' financing decisions better than the static tradeoff theory. We label the observations that account for the 73% as pecking order observations. Observations in which leverage is decreased (27%) are labeled as static tradeoff observations.

3.5.4 Determining pecking order and static tradeoff observations for repurchase decisions

We also construct a framework to identify pecking order and static tradeoff observations for repurchase decisions. The pecking order theory implies that firms have a preference of reducing debt over repurchasing equity (Shyam-Sunder and Myers (1999)). Given firms' preferences to pay down debt in the pecking order theory, our framework indicates that the theories have conflicting implications for repurchase decisions a firm's debt ratio is below its target. The static tradeoff theory predicts that a firm in this situation increases leverage by repurchasing stock, whereas the pecking order theory predicts that the firm repurchases debt. For repurchase decisions, the debt capacity is not of interest for the predictions of the pecking order theory, as the repurchase of debt decreases leverage. What is of importance is the level of debt that a firm has outstanding: if a firm has a surplus worth more than the remaining outstanding debt, the firm cannot use the complete surplus to repurchase debt, even if it would want to do so.

We select observations with repurchase decisions that have a higher than 50% chance of being below the estimated target. Deleting observations for which the financing surplus is larger than the debt outstanding, leaves us with 2,241 observations. Our findings are that 60% of the observations use the repurchases to decrease leverage. Hence, we find that the pecking order theory is also a better predictor of firms' financing behavior than the static tradeoff theory in repurchase decisions.

3.6 Is pecking order and static tradeoff behavior situation-specific or firm-specific?

We exploit our classification of "pecking order observations" and "static tradeoff observations", as established in Section 3.5, to examine whether a choice for a theory, as revealed by a firm's decisions, is situation-specific or firm-specific. The possibility that a choice for a theory is situation-specific results from Myers (2001). He argues that there is no universal theory of capital structure, but that the static tradeoff theory and the pecking order theory are good conditional theories. In other words, different theories are important in different circumstances. In contrast, several surveys of Chief Financial Officers have shown that some firms claim to follow a pecking order model, while others follow the tradeoff model (Pinegar and Wilbricht (1989); Kamath (1997); Graham and Harvey (2001)). This implies that a choice for a theory is manager-specific or firm-specific.

3.6.1 Testing whether pecking order behavior and static tradeoff behavior is situation-specific

We test whether a choice for a capital structure theory is situation-specific in two ways. First, we test whether specific firm characteristics in region X can explain which observations are consistent with the pecking order theory and which are not. Second, we test whether the percentage of pecking order firms differs over the years. If macro-economic variables are of influence, we expect to find differences over the years.

3.6.1.1 Explaining financing choices in Region X

Our framework allows us to examine when an observation is consistent with the pecking order theory or with the static tradeoff theory by examining the financing choices of firms in Region X. A "pecking order observation" is an observation in Region X for which the leverage increases (dummy = 1), and a "static tradeoff observation" is an observation for which leverage decreases in Region X (dummy = 0). Table 15 shows the results for a multivariate probit model explaining pecking order behavior, where the dependent variable is a dummy variable indicating whether leverage is increased or not. Because we cannot classify firm-year observations as being in Region X with absolute certainty, we estimate the model over all observations, but weigh them by their probability of being in Region X. That is, our model puts more weight on observations with a high probability of being in Region X than on observations with a low probability of being in Region X.

Table 15: Pecking order behavior in region X

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. We solely consider firm-years in which firms have financing needs and in which the firm has an investment grade rating. The sample period is 1985-2005. This table presents the results of the estimation of a weighted probit model. The observations are weighted by the probability of being in region X. The dependent variable is a dummy that equals one for observations in which leverage is increased, and zero otherwise. T-statistics appear in parentheses and are based on panel-robust standard errors. *, ** indicate significance at the 5%, and 1% confidence level, respectively.

	Increase of leverage			
	(1)	(2)	(3)	(4)
Constant	-0.774	-0.600	-0.579	0.188
	(-1.08)	(-0.86)	(-0.83)	(0.30)
Log(assets)	0.133*	0.180**	0.181**	0.064
	(2.05)	(3.14)	(3.14)	(1.26)
Tangibility	-0.275	-0.387	-0.363	-0.356
	(-0.76)	(-0.93)	(-0.87)	(-1.10)
Book leverage	0.112	-0.050	-0.009	-0.012
	(0.13)	(-0.06)	(-0.01)	(-0.02)
EBIT	4.161*	4.666**	4.056	4.121**
	(2.50)	(2.64)	(1.93)	(3.67)
Loss-dummy			-0.252	
			(-0.69)	
Market-to-book	-0.090	-0.089	-0.078	-0.037
	(-1.88)	(-1.46)	(-1.22)	(-0.90)
Retained earnings	0.242	0.125	0.147	0.260
	(0.46)	(0.22)	(0.26)	(0.56)
Psi	0.117	0.093	0.085	
	(0.43)	(0.39)	(0.36)	
Industry dummies	No	Yes	Yes	Yes
Year dummies	No	Yes	Yes	Yes
N	2,096	2,096	2,089	3,215
Pseudo R^2	0.039	0.073	0.074	0.058

The results in Table 15 indicate that the pecking order theory becomes of less importance when a firm is smaller (see also Frank and Goyal (2003)) and in situations in which profitability is lower. Apparently, firms with low profits in a given year do not want to take on more debt, even if their debt capacity allows for it. Firm-years for which we observe higher informational asymmetry are not associated with an increased likelihood of pecking order behavior: the coefficient for *psi* – which scores high for low informational asymmetry – is positive but statistically insignificant. As discussed earlier, the theory of Myers and Majluf (1984) does not necessary imply that high informational asymmetry leads to more pecking order behavior. In their model, the existence of informational asymmetry is sufficient. It can be argued that all firms or all situations have some level of informational asymmetry. Another issue relating to informational asymmetry is that the measure requires the availability of multiple variables, which substantially decreases our sample size. Model (4), which is estimated over a substantially larger sample, shows that excluding the proxy for informational asymmetry causes the size effect to disappear.

The pseudo R^2 of the estimation is 0.039 without industry and year dummies, and 0.073 with these dummies. Apparently, much of the variation in the dependent variable cannot be explained by the variables in our model. Also, profitability is the only variable that is uniformly significant in all four models. Hence, we do not find strong evidence in favor of circumstance-driven pecking order behavior in region X.

3.6.1.2 Time-varying pecking order and static tradeoff behavior

Macro-economic variables, like the U.S. inflation rate and GDP growth, vary over time. These variables can have an effect on for instance informational asymmetry and therewith financing decisions (Korajczyk and Levy (2003)). If circumstances drive the choice for a capital structure theory, we would expect the distribution of observations that are consistent with the pecking order theory and observations that are consistent with the static tradeoff theory to differ among years.

Table 16: Percentages of pecking order behavior per year

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. The sample period is 1985-2005. This table presents the percentages of observations that we classify as "pecking order behavior" in regions X and A per year. Region X corresponds to the observations that issue securities, that are above their estimated target, and that are not restricted by their debt capacity. Increasing leverage in Region X classifies as pecking order behavior. Region A corresponds to the observations that repurchase securities and that are below their estimated target. Decreasing leverage classifies as pecking order behavior in Region A.

	Issue decisions: percentage of pecking order behavior in Region X		Repurchase decisions: percentage of pecking order behavior in Region A	
	%	N	%	N
Total	73%	542	60%	2,241
1985	75%	12	57%	75
1986	71%	7	66%	98
1987	69%	13	58%	91
1988	71%	21	52%	86
1989	81%	26	49%	86
1990	66%	29	75%	104
1991	70%	27	72%	104
1992	56%	32	75%	106
1993	77%	48	70%	107
1994	76%	37	59%	95
1995	68%	37	64%	118
1996	73%	37	55%	121
1997	81%	31	46%	125
1998	85%	27	44%	120
1999	74%	38	60%	122
2000	57%	21	65%	144
2001	88%	24	64%	139
2002	73%	26	61%	137
2003	78%	27	60%	133
2004	59%	22	58%	130
St.dev.	0.09		0.09	

Table 16 shows that the percentage of pecking order observations is in fact remarkably stable. This stability holds for both issue and repurchase decisions. For issue decisions, there is not a single year in which there are more static tradeoff observations than pecking order observations. Hence, we again find no strong evidence of circumstance-driven preferences.

3.6.2 Testing whether pecking order behavior and static tradeoff behavior is firm-specific

To test whether a choice for a theory is firm-specific, we examine whether a firm that acts according to a theory in one year is more likely to have acted in line with the same theory in the past year. We look at firms with investment grade ratings that issue securities. We assign a firm-year to the region for which it has the highest probability of being in, according to our previous computations. The dependent variable registers whether the firm acts according to the pecking order theory (static tradeoff theory) in a specific region. We look whether the firm acted according to the pecking order theory (static tradeoff theory) the year before. An important difference with our analysis in Section 3.4.1.1 is therefore that we do not solely focus on the observations in Region X: to establish firms' lagged decisions, we include the other regions in which firms issue securities. In this way, we can track firms' financing preferences over time, even if they are not constantly in region X. Note that in some regions a given observation can be one for both the dependent variable in the pecking order-regression and the dependent variable in the static tradeoff-regression (for example when the firm's leverage is below its estimated target and the firm issues debt).

Model 1 in Table 17 shows that firms acting according to the pecking order theory in year *t-1* are more likely to repeat this behavior in year *t*, as the variable "pecking order behavior$_{t-1}$" is statistically significant and has a positive coefficient (0.322). This result holds when we include firms with missing values for our informational asymmetry variable *psi* (Model 2) and when we include a variable indicating that the firm acted according to the static tradeoff model in year *t-1* (Model 3). In Models 4, 5, and 6 we test whether firms are more likely to adjust their debt ratio towards their target debt ratio in year *t* when they did so in year *t-1*. It can be seen that this is the case, as the impact of static tradeoff behavior in year *t-1* is positive and significant at the 1% level. Moreover, the coefficients for lagged decisions are higher in Model (4)-(6) than in Model (1)-(3), indicating that more persistence exists in acting according to the static tradeoff model.

Table 17: Firm-specific behavior

We exclude financial firms, utilities, and firm-years with gaps in the reporting of relevant data. We solely consider firm-years in which firms have financing needs and in which the firm has an investment grade rating. The sample period is 1985-2005. This table presents the results of the estimation of a probit model. The dependent variable is either a dummy that equals one for observations that are consistent with the pecking order theory, and is zero otherwise (models 1, 2, and 3), or a dummy that equals one for observations that are consistent with the static tradeoff theory, and is zero otherwise (models 4, 5, and 6). The variable "Pecking order behavior$_{t-1}$" equals one if the firm acted according to the pecking order theory in the year before, and is zero otherwise. The variable "Static tradeoff behavior$_{t-1}$" equals one if the firm acted according to the static tradeoff theory in the year before, and is zero otherwise. T-statistics appear in parentheses and are based on panel-robust standard errors. *, ** indicate significance at the 5%, and 1% confidence level, respectively.

	Pecking order behavior			Static tradeoff behavior		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Log (assets)	0.041	0.020	0.021	-0.052	-0.011	-0.007
	(0.95)	(0.57)	(0.58)	(-1.23)	(-0.32)	(-0.20)
Book leverage	-0.207	-0.223	-0.188	-3.660**	-3.343**	-3.087**
	(-0.40)	(-0.50)	(-0.41)	(-7.27)	(-7.84)	(-6.91)
Profitability	1.740	2.443**	2.448**	-1.586	-1.078	-1.093
	(1.50)	(2.69)	(2.70)	(-1.49)	(-1.28)	(-1.30)
Retained earnings	0.622	0.398	0.390	0.555	0.715*	0.736*
	(1.54)	(1.22)	(1.20)	(1.38)	(2.21)	(2.29)
Tangibility	-0.017	-0.033	-0.037	1.105**	0.796**	0.764**
	(-0.06)	(-0.15)	(-0.17)	(3.93)	(3.59)	(3.45)
Market-to-book ratio	-0.094*	-0.102**	-0.100**	-0.041	-0.060	-0.057
	(-2.34)	(-2.81)	(-2.81)	(-0.77)	(-1.21)	(-1.15)
Psi	0.120			0.097		
	(0.72)			(0.62)		
Pecking order behavior$_{t-1}$	0.322**	0.401**	0.378**			-0.172
	(2.87)	(4.19)	(3.37)			(-1.47)
Static tradeoff behavior$_{t-1}$			0.033	0.585**	0.591**	0.684**
			(0.32)	(5.46)	(6.52)	(6.22)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
N	971	1,398	1,398	971	1,398	1,398
Pseudo R^2	0.072	0.056	0.056	0.158	0.131	0.132

Note the significance of book leverage in the static tradeoff regression: the lower the leverage, the higher the probability that the static tradeoff predicts correctly. This is in line with our findings in Table 14 that the target is important when a firm's leverage is below the target. We can conclude that firms exhibit consistency in their capital structure decisions: a financing decision in accordance with a particular theory in year *t-1* significantly increases the probability that the same firm will act according to the same theory in year *t*.

3.7 Conclusion

This chapter stresses the importance of the debt capacity in firms' financing decisions. Building on Chapter 2, Lemmon and Zender (2007), and Agca and Mozumdar (2007), we test a pecking order theory that does not imply that firms always issue debt when external financing is needed. Instead, the theory implies that firms have a preference for issuing investment grade debt over issuing equity. We construct a model in which we estimate the debt capacity as the maximum debt ratio that a firm can obtain before facing a higher than 50% probability of losing its investment grade rating. The loss of this investment grade rating would considerably increase the costs of debt.

We show that the static tradeoff theory can appear to be true, even when the underlying financing behavior is driven by the pecking order theory. We hereby corroborate results of Shyam-Sunder and Myers (1999). In an extended test of Hovakimian, Opler, and Titman (2001), we show that the debt capacity is of higher importance than the supposed target when the theories have conflicting predictions. We interpret these findings as evidence for the pecking order theory.

We also construct a framework in which we focus on observations for which the pecking order theory and the static tradeoff theory have contrasting predictions regarding the preferred financing choices. We find that the pecking order theory is of primary importance for both issue and repurchase decisions. By exploiting our classifications of observations that are consistent with pecking order behavior and static tradeoff behavior, we do not find strong evidence that firms' choices for a capital structure theory in a given year are situation-specific. Corroborating the survey evidence of Graham and Harvey (2001), we do find evidence that the choice for a theory is firm-specific: firms are to some extent consistent in their capital structure decisions.

Chapter 4

Convertible security design[22]

4.1 Introduction

Compared to other securities, there has been and continues to be a significant amount of innovation in the design of convertible securities. The rapid rate of innovation in convertible security design is particularly interesting in the context of the theories that explain company motivations for issuing convertible debt. The existing theoretical literature suggests that managers can design convertible debt to mitigate a variety of debt- and equity-related costs of external finance, including asset substitution problems (Green (1984)); financial distress and asymmetric information problems (Stein (1992)); risk uncertainty (Brennan and Schwartz (1988)); and over-investment problems (Mayers (1998)). A common feature of these theories is the prediction that information and agency problems limit the ability of issuers to raise capital efficiently and to fund profitable investment opportunities.[23] Since convertible debt issuers face different external financing costs, firms are expected to choose distinct security designs to mitigate these problems.

In this chapter, we analyze three distinct decisions that issuers make when designing convertible securities: 1) the selection of conversion characteristics, 2) the type of fixed income claim, and 3) the method of payment. The interaction among

[22] This chapter is based on Lewis and Verwijmeren (2008).
[23] It should be noted that these theories are not mutually exclusive. Since we expect firms to use convertibles as a means to control for both concerns simultaneously, the actual security designs should reflect the relative importance of the problems for each issuer.

these choices determines whether particular designs are effective at mitigating external financing costs.

Conversion characteristics include the conversion ratio, maturity date, call period, and time to first call. Taken together, they determine how closely a convertible security resembles debt or equity. Lewis, Rogalski, and Seward (1999) consider whether actual security designs correspond to theoretical explanations that predict whether a convertible security substitutes for debt or equity. They find that debt-like issues replace straight debt in order to mitigate debt-related agency costs and that equity-like designs substitute for common equity when firms face adverse selection problems.

The choice of a fixed income claim is a simple decision. An issuer either selects straight debt or preferred stock. A decision to issue straight debt entails the specification of a coupon rate (possibly zero), maturity date, call features, and call protection. By contrast, preferred stock is essentially a perpetual bond that pays investors fixed periodic dividends and possibly has redemption features.

A significant innovation in the design of fixed income claims occurred in 1985 when Merrill Lynch introduced Liquid Yield Option Notes (LYONs). Compared to plain-vanilla convertible debt, a LYON replaces a coupon paying bond with a zero-coupon bond. The key advantage to this particular design choice is that it takes advantage of the Original Issue Discount (OID) provisions of the U.S. Tax Code, which allow firms to deduct interest expense as it accrues without requiring the issuer to actually make cash payments. A potential limitation associated with OID bonds is that investors must pay personal taxes on the accrued interest.[24] LYONs provide investors with more downside protection. By including a number of put options, the holder may sell the bond back to the issuer at the original issue price plus accrued interest.

Convertible issuers also select a method of payment. This choice refers to the wide variety of settlement options that are currently in use. For convertible debt issuers, the main choice is whether to settle in stock, cash, or a combination of the two. Firms that choose partial cash settlement frequently pre-specify how much of the final payment is to be cash, typically the accreted value of the bond, although another popular settlement choice allows the issuer to pay any combination of stock and cash it desires with the exact proportions to be decided at conversion. For preferred stock, issuers specify whether conversion is optional or mandatory. Compared to convertible debt, there are very few instances where convertible preferred shares are settled in cash.

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[24] Since these securities are primarily purchased by tax free institutions, this ultimately does not impose much of a personal tax penalty.

Compared to other aspects of convertible security design, the method of payment has changed the most. One of the first innovations was the introduction of mandatory conversion. Bear Stearns introduced the so-called Preferred Equity Redemption Cumulative Stock (PERCS) in 1991. A PERCS is structured like preferred stock, but requires the issuer to exchange the preferred stock claim for common stock on a pre-specified date.[25] Given the initial success of PERCS, security offerings with mandatory conversion features were widely imitated by competing investment banks.

Another innovation occurred in November 2000 when Tyco Industries issued the first Contingent Convertible debt (CoCo) offering. This Merrill Lynch product is similar to a LYON with the exception that holders may convert only if a certain knock-in threshold is reached. As argued by Marquardt and Wiedman (2005), the main benefit of this contingent conversion feature is that under Statement of Financial Accounting Standard (SFAS) 128, the shares can be excluded from diluted EPS calculations.[26]

A third innovation in the method of payment is the inclusion of cash settlement features for which at least a portion of the convertible security may be settled in cash upon conversion. Securities that contain cash settlement features include one of the following conversion choices. An issuer must: 1) pay the conversion value (the number of shares a bondholder is entitled to receive times the stock price at the conversion date) in cash (Instrument A), 2) choose to pay either cash or the number of shares a bondholder is entitled to receive (Instrument B), 3) pay cash for the obligation's accreted value (principal value plus accrued interest) and may satisfy the conversion spread (the excess of the conversion value over the accreted value) in either cash or equity (Instrument C or "net share settlements"), or 4) pay any combination of cash and equity (Instrument X). Cash settlement features were incorporated into convertible offerings almost immediately after the FASB clarified the accounting treatment of fully diluted earnings as it relates to convertible securities. Specifically, the Financial Accounting Standards Board (FASB) amended Emerging Issues Task Force (EITF) 90-19 in January 2002 to allow for the exclusion of convertible shares in fully diluted earnings calculations. By the year 2007, cash settlement offerings were the most popular method of payment choice, representing over 86% (94 of 109) of all convertible issues. Reinforcing the notion that accounting treatment is an important design consideration, Marquardt and Wiedman (2007) find

[25] These securities contain call provisions that provide the issuer with the opportunity to force conversion at dates prior to maturity, usually at a premium to the conversion value.

[26] Marquardt and Wiedman (2005) find that firms that are likely to experience large adjustments to fully diluted earnings because of the convertible issue are more likely to issue CoCos. They also show that firms are more likely to issue CoCos when managers' bonuses are based on fully diluted earnings.

that 20% of CoCos are restructured into cash settlements after they have lost their favorable accounting treatment in 2004.[27]

We study convertible security design choices using a nested logit model that treats design choices as a set of simultaneous decisions. We assume that convertible issuers decide how “debt-like” or “equity-like” to structure an offering in the top level of the nested logit model. The choice of a fixed income security (straight debt or preferred stock) represents the middle level, whereas the choice of a method of payment represents the bottom level.

Such an analysis presumes that firms will choose both debt- and equity-like security designs. Historically, this has been the case. For example, Lewis, Rogalski, and Seward (2003) report that, even though equity-like issues are offered at an approximately three-to-one rate relative to debt-like issues, debt-like issues are a common design choice. More recently, the number of debt-like issues has declined significantly. For example, only 5 of the 819 issues are classified as debt-like for our sample, which covers the years 2000 through 2007.

Given the limited number of debt-like issues, it is not feasible to model conversion characteristics as a separate component of a nested logit model. While this limits our ability to test theoretical explanations specific to debt-like designs, their relative absence may simply indicate that these factors are not particularly important over our sample period.[28] By conditioning on equity-like convertible securities, we eliminate what would have been the top level of our nested logit model. This results in a specification where the fixed income choice is the top level and the method of payment choice is the bottom level.

Our empirical analysis characterizes the determinants of the actual designs of convertible securities. With respect to the fixed income choice, we find that firms choose straight debt rather than preferred stock when they are best able to benefit from additional tax benefits, can minimize expected refinancing costs, and are most susceptible to agency costs associated with managerial discretion. The method of payment choice follows the decision to issue either convertible debt or convertible preferred stock. For issuers that choose convertible debt, our results indicate that these firms make method of payment choices that are consistent with the earnings management hypothesis. We document that firms choosing cash settlement would have had the largest potential decreases in reported earnings without favorable accounting treatment. We also show that a number of these firms repurchase shares

[27] EITF 04-08 proposes recognizing CoCos in diluted earnings per share calculations. The FASB has ratified this proposal in the fall of 2004.

[28] The prevalence of equity-like issues appears to be consistent with Stein’s (1992) “backdoor equity hypothesis.” That is, firms use convertible securities as an indirect method for implementing equity financing. To a large degree, the increasing use of cash settlement features mitigates the observation.

and adopt call spread overlays. Share repurchase programs reduce the number of shares outstanding and raise earnings per share. Call spread overlays use derivative securities to raise the effective conversion price. Since reported interest expense is based on the stated rather than effective conversion price, the reported interest expense decreases, and firms are again able to report higher earnings per share. We find that certain banks may develop reputations for facilitating innovative security designs. For example, Bank of America, Deutsche Bank, and JP Morgan are more likely to underwrite the offerings of firms that use cash settlements, call spread overlays, and/or share repurchases.

For firms that issue preferred stock, we consider the choice to include mandatory conversion provisions. This reflects the fact that mandatory conversion rapidly became a part of the security design "equation" following its introduction in 1991. Any firm that issues convertible preferred stock must consider this option. Since mandatory convertible preferred stock automatically converts into equity, its marginal impact on the probability of financial distress in minimal. We find that the large majority of the mandatory convertibles are used to reduce the indebtedness of the firm, and conclude that mandatory conversion is used to decrease the chance of bankruptcy. Consistent with this, we find that all issuers of mandatory convertible preferred stock have credit ratings that are close to the investment-speculative grade cut-off.

The paper by Lewis, Rogalski, and Seward (1998) is most closely related to this chapter. They use a simultaneous equations model to examine specific design elements (the dilution ratio, issue maturity, and call structure) and find that some issuers design convertible debt to control for risk shifting problems, while others design securities with the backdoor-equity explanation in mind. Lee and Figlewicz (1999) study the fixed income choice for 308 issues over the period 1977-1988, and find that convertible debt issuers have lower nondebt tax shields, lower risk, and greater free cash flows than firms that issue convertible preferred stock. Chemmanur, Nandy, and Yan (2004) study the mandatory conversion option. They examine 298 convertible issues over the period 1991-2001 and find that firms issue mandatory conversion features when they have low informational asymmetry but high probabilities of financial distress. We extend the previous studies by jointly evaluating the choices in convertible security design. Moreover, we are the first to closely examine cash settlement features, which have been a popular innovation in convertible security design.

The remainder of this chapter is organized as follows. Section 4.2 discusses theoretical explanations of convertible security design and characterizes testable hypotheses. Section 4.3 describes our sample and provides summary statistics based on the fixed income and method of payment choices. In Section 4.4, we describe the econometric specification of the nested logit model. Section 4.5 reports our empirical results. Section 4.6 provides additional analysis of the earnings management hypothesis and analyzes the method of payment choice in more detail. It estimates a multinomial logit model that treats different cash settlement options as independent choices. Section 4.7 concludes the chapter.

4.2 Security design hypotheses

Security design decisions are important because they influence the cost and terms of raising new investment capital. Financial economists have offered explanations that stress how an appropriately designed convertible can reduce information and agency costs faced by companies when raising external capital. By exploiting a convertible's hybrid nature, a company can achieve different security designs simply by changing its contractual features.

One of the main concerns associated with testing security design hypotheses is the endogenous nature of the choice of different contractual features. The fact that different combinations of contractual features can lead to very similar security designs makes it difficult to analyze specific features in isolation. For example, if a convertible bond is offered with a 30-year maturity but has no call protection it may have a shorter effective maturity than an otherwise identical security that has a 5-year maturity but offers three years of call protection. As a consequence, one must evaluate the effective security design by finding a systematic way to incorporate all of the relevant contractual features. Taken together, security design hypotheses make predictions about how the choice of an appropriately designed set of contractual features can minimize the costs associated with raising external capital.

4.2.1 Conversion characteristics

The central theme that characterizes discussions about optimal security design is that convertible securities can be structured so that they substitute for debt or equity financing (Lewis, Rogalski, and Seward (1998, 1999)). The actual choice of the various contractual features determines whether the conversion characteristics produce a debt- or equity-like design. The hedge ratio ("Delta") embedded in the conversion option is a measure of the equity-likeness of a convertible security (Calamos (2003)). It measures the convertible's sensitivity to small stock price changes. The delta can be calculated as:

$$\Delta = e^{-\delta T} N(d_1) = e^{-\delta T} N\left\{ \frac{\ln(\frac{S}{X}) + (r - \delta + \frac{\sigma^2}{2})T}{\sigma\sqrt{T}} \right\}, \tag{19}$$

where δ is the continuously compounded dividend yield, T is the maturity of the bond, *N(.)* is the cumulative standard normal probability distribution, S is the price of the underlying stock measured one week prior to the announcement date, X is the conversion price, r is the yield on a 10-year U.S. Treasury Bond, and σ is the stock return variance per annum. By construction, the delta is in between zero and one. A high delta means that the convertible bond value is sensitive to the common stock value, which makes the convertible equity-like in nature. Inversely, a low delta value indicates that the convertible is debt-like in nature. If we classify all firms with a Delta below 0.5 as debt-like, only 5 of the 819 issues are considered debt-like.

Although the scarcity of debt-like issues limits our ability to analyze conversion characteristics as a separate design choice, it is still important to include a measure of convertibility in our regression analysis. In the next chapter, we include delta as our measure of convertibility, which is in line with Loncarski, Ter Horst, and Veld (2007), among others. In this chapter, we construct a somewhat different measure: the actual probability of conversion over the life of the convertible security. This measure has the added benefit of incorporating call features. Still, when we use the delta as a control variable in our regressions, we obtain similar results.

We estimate the actual probability of conversion via Monte Carlo simulation. To do this, we assume that stock prices follow a geometric Brownian motion process. The drift rate is expected to grow at the annualized expected return from the Capital Asset Pricing Model.[29] The volatility rate is estimated with ten-years of monthly stock return data. We use a long-horizon for calculating the volatility rate because we want an estimate of volatility over the life of the bond.

We simulate 60,000 (antithetic) stock price paths that have 10,000 compounding periods over the life of the fixed income security. Since the optimal call policy is to force conversion as soon as the conversion option is in-the-money, we calculate whether the firm would have forced conversion prior to maturity subject to constraints that restrict the time to first call. The probability of conversion is then calculated for each convertible issue as the total number of price paths that result in conversion divided by the total price paths.

[29] The expected return is calculated as the yield on a ten-year U.S. Treasury bond plus a risk premium. The risk premium equals the equity beta times a market risk premium of 7.5%. The equity beta is estimated from a market model regression that uses the realized return from the CRSP equally-weighted stock index.

4.2.2 Fixed income component

The choice of a fixed income claim is potentially motivated by corporate taxes and external financing costs related to financial distress, refinancing, and managerial discretion. We summarize our discussion of the testable implications in Table 18.

4.2.2.1 Corporate taxes

Interest payments generate a tax shield because they are deductible for corporate taxes. By contrast, preferred stock is generally considered equity for tax purposes and dividend payments are not tax deductible. Firms that are profitable, have low debt levels, and pay significant corporate taxes are expected to choose convertible debt rather than convertible preferred stock. DeAngelo and Masulis (1980) show that non-debt related tax shields, such as depreciation, can make interest redundant as a tax shield, reducing the incentive to use debt. Therefore, firms that have tax loss carryforwards and high levels of depreciation expense are expected to choose convertible preferred stock.

4.2.2.2 Reduction of financial distress costs

Firms with a relatively high probability of financial distress would not be expected to prefer convertible straight debt over convertible preferred stock, since convertible straight debt has a fixed maturity date that requires repayment of the principal if the conversion option is out-of-the money. Firms that would be vulnerable to financial distress costs are often characterized as high-growth firms, firms that are relatively small, firms that have significant amounts of financial leverage, and firms with low interest coverage ratios.

4.2.2.3 Refinancing and external financing costs

Related to the probability of financial distress are the costs of refinancing. Firms that issue convertible debt must pay the accreted value in cash if the conversion option is out-of-the-money at maturity. Since these firms have not performed well, cash reserves are likely to be low and current debt levels are likely to exceed their target capital structures. In this scenario, firms are unlikely to have sufficient capital on hand and are forced to refinance. Since credit profiles are not expected to be particularly strong, it will be difficult to find additional capital at attractive rates. We predict that

Table 18: Predicted signs based on different hypotheses for the design of convertible securities.

The table presents the expected signs for the different hypotheses that are tested using a nested logit model.

	Choice of fixed income security (Straight debt vs. Preferred stock)					Method of payment choice: Straight debt (Stock vs. Cash)					Method of payment choice: Preferred stock (Mand. vs. optional)		
Description	Taxes	Financial distress	Refinancing costs	Mgr. discretion	Net effect	Financial distress	Mgr. discretion	Staged inv.	Earnings mgt.	Net effect	Financial distress	Staged inv.	Net effect
Constant													
Log(mark. val.)		+			+	-				-	-		-
Book leverage	-	-	-	-	-	+	+	+		+	+	+	+
Market-to-book ratio		-		-	-	+	+	+		+	+	+	+
EBIT	+	+		+	+	-	-	-	+	?	-	-	-
Free cash flow			+	+	+		-	-		-		-	-
Stock price run-up			+	+	+		-			-			?
Investment grade	+	+	+	+	+	-	-	-		-	-	-	-
Interest coverage	+	+	+	+	+	-	-			-	-		-
Slack			+	+	+		-			-			
Tax payments	+				+								
Tax loss carryforwards	-				-								
Depreciation	-				-								
Proceeds/market value					?								
Investment								+		+		+	+
Probability of conversion						+	-	+	-	?	+	+	+
Decrease diluted EPS									-	-			
Call spread overlay									-	-			
Additional stock repurchase									-	-			

firms with low slack, bad credit ratings, low interest coverage ratios, and high debt levels will choose preferred stock rather than debt to avoid refinancing.

4.2.2.4 Managerial discretion and free cash flows

The existence of managerial discretion allows managers to pursue their own objectives, such as excessive firm growth, at the expense of shareholders. Straight debt creates less managerial discretion than preferred stock because it mandates the payment of the principal on the maturity date, whereas there is no principal associated with preferred stock. Therefore, firms with severe managerial discretion costs are expected to choose convertible straight debt. Firms facing managerial discretion problems are expected to have few positive NPV investment opportunities, and are characterized by low market-to-book ratios, good credit ratings, high interest coverage ratios, and low debt levels.

4.2.3 Method of payment

Theories that explain the method of payment predict that the design choice is largely determined by the tradeoff between debt and equity-related financing costs. We examine theories related to financial distress, managerial discretion, staged investment, and earnings management. The expected relation between the method of payment choices and the explanatory variables is summarized in Table 18.

4.2.3.1 Reduction of financial distress costs

As discussed in the choice of fixed income claim section, firms that face relatively high financial distress costs are likely to choose preferred stock over straight debt because it places fewer financial constraints on the issuer. The big difference is that straight debt requires the repayment of the principal at maturity, while preferred stock is infinitely lived and requires no payment at "expiration."

The method of payment choice for convertible debt is also affected by financial distress costs. When firms issue convertible preferred stock because financial distress costs are high, they are likely to opt for mandatory conversion because it enables them to pay with newly issued shares rather than cash (in case of mandatory redemption). For firms choosing convertible straight debt as the fixed income component, the relatively distressed firms may refrain from cash settlement since it requires the firm to have cash reserves available.[30] As noted above, firms that are vulnerable to relatively high financial distress costs have high-growth rates, relatively small size, significant amounts of financial leverage, and low interest coverage ratios.

4.2.3.2 Managerial discretion and free cash flows

Not only does the managerial discretion explanation predict that firms will use convertible straight debt rather than convertible preferred stock, but it predicts that these firms will select cash settlement features as well. Compared to stock settlement, cash settlement features require firms to pay free cash flows following periods of good stock price performance, i.e. when managerial discretion is relatively high. As we note above, firms that face high managerial discretion costs tend to have poor growth opportunities, good credit ratings, high interest coverage ratios, and low debt levels.

4.2.3.3 Staged-investment and free cash flow

Mayers (1998) argues that firms with sequential financing needs can lower financing costs and avoid managerial discretion costs by issuing convertible securities. By setting the maturity of the fixed income claim or times to first call to coincide with the need for new funds, a convertible security creates debt capacity at the time a firm needs another round of financing. The benefit to shareholders is that the firm is obligated to repay the principal amount if it has not achieved its growth objectives. This eliminates managerial discretion at times when the incentive to invest in unprofitable projects is relatively high.

Firms are expected to use mandatory conversion and stock settlement when they face significant managerial discretion costs because additional debt capacity can only be created if investors convert to common stock. Firms that plan to pay at least the principal amount in cash are not as concerned about staged investment.

We predict that firms with large future investment requirements plan to create additional debt capacity at times when they require another round of financing. Since future investment is unobservable, we assume that investment activity around the time of the offering can be used as a proxy for future investment activity. We predict that capital expenditures in the offer year are positively related to the choice of stock settlement and mandatory conversion.

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[30] Although facing lower financial distress costs than convertible preferred stock issuers, convertible straight debt issuers can still have substantial costs of financial distress. This is commonly believed to be an important reason for issuing convertible securities instead of straight debt (see, e.g., Stein (1992)).

4.2.3.4 Earnings management

In 2002, the FASB amended Emerging Issues Task Force (EITF) 90-19 to permit firms that pay the accreted value of the fixed income claim in cash to exclude convertible shares from fully diluted EPS, allowing them to report higher fully diluted EPS. Issues with potential cash settlements that have a stated policy of paying the accreted value in cash also receive this favorable accounting treatment.[31]

We consider three main indicators that relate to cash settlements and that point to the possibility of earnings management. The first is the decrease in diluted earnings per share when the convertible shares are not excluded from the diluted EPS calculations. In effect, we consider whether firms are more likely to choose cash settlement when the potential decrease of diluted EPS is higher.[32]

The second indicator for earnings management is the adoption of share repurchase programs at the time of issue. A number of companies issued a convertible security with cash settlement features and used part of the proceeds to buyback common stock. The convertible debt has a below-market interest rate (often 1%-2%, sometimes even 0%), which has minimal impact on reported earnings. By repurchasing shares with the proceeds from a cash settlement issue, an issuer can significantly reduce the number of outstanding shares with a minimal reduction to reported earnings from the increased debt balance. Firms following this strategy often achieve a substantial immediate boost to their basic and diluted earnings per share.[33]

The third indicator is the use of call spread overlays. This strategy uses equity derivatives to synthetically increase the effective conversion price of a convertible security. To see how this strategy works, consider that a firm issues a convertible that has a low interest rate, and then takes part of the proceeds to purchase call options on its own shares struck at the conversion price. It then writes call options on its own shares at a higher strike price. The effect of this combination of equity derivatives is to synthetically increase the strike price in the conversion option itself. Had the issuer

[31] Note that in a perfect world, changes in accounting standards will not affect decision-making behavior since accounting reports do not have direct cash flow effects and the prospects of firms remain unaltered. However, empirical evidence suggests that in the real world accounting reports do affect the real decisions made by managers, rather than simply reflecting the results of these decisions. Carter and Lynch (2003), Verwijmeren (2005), De Jong, Rosellón, and Verwijmeren (2006), Remmerswaal and Verwijmeren (2007), and Marquardt and Wiedman (2007), among others, provide examples of accounting changes that have influenced firms' decision-making.

[32] This variable is based on the "Impact1" variable in Marquardt and Wiedman (2005).

[33] Hribar, Jenkins, and Johnson (2006) show that share repurchase programs do not necessarily boost earnings per share. These programs are accretive in the context of a concurrent convertible issue because the interest rates associated with convertible debt are very low.

simply offered the convertible bond with a higher conversion price initially, the interest rate would have been higher. By using call spread overlays, the issuing firm gets to report low interest expense for book purposes and higher effective interest rate for tax purposes (i.e., Original Issue Discount provisions) because the convertible debt instrument and purchased call option are "linked" for tax reporting purposes.

We expect that firms are more likely to choose cash settlement features if the potential decrease in reported earnings is relatively large. Firms that concurrently adopt share repurchase programs and use call spread overlays are also more likely to choose cash settlement.

4.3 Sample description

This section describes our sample selection procedure and presents summary statistics. Summary statistics are presented for each decision node in the nested logit model.

4.3.1 Sample selection

We collect convertible issuances from the Securities Data Company (SDC) for the period January 2000 to September 2007. Line (1) of Table 19 indicates that the initial sample consists of 1,326 convertible bond issues.

To be included in the final sample of 819 firms we impose a number of data filters. The first is a requirement that firms must have an offering prospectus available on the SEC's Edgar database. This filter eliminates 197 issues.

Next, we delete a number of issues based on security design characteristics and industry affiliation. Specifically, we eliminate equity units (17 observations), purchase contracts (13 observations), utilities (38 observations) and financial institutions (151 observations). We also delete exchangeable securities (6 observations). Finally, we require issuer firms to have stock return information available on the Center for Research in Security Prices (CRSP) database, and financial statement information in COMPUSTAT, which eliminates an additional 85 observations. This results in a final sample consisting of 819 convertible issues (line (10)).

Table 19 indicates that over our eight year sample period, the number of total issues per year ranges from a low of 113 to a high of 256. Although there is significant year-to-year variation in the number of issues, the market for convertible securities appears to have been robust with no obvious trends in issue activity. One

Table 19: Number of convertible security issues over time.

The table presents the number of convertible issues by security type over time. Total issues (SDC) are all reported U.S. convertible securities in the SDC database, which includes convertible debt, convertible preferred stock, equity units, and purchase contracts. Prospectuses are obtained from the SEC Edgar database. Purchase contracts vary in their characteristics (Upper Decs, Prides, Pacs, Spaces). CoCos are Contingent Convertibles. Exotics issues represent other specific types of convertible bonds (e.g., Carz, Codes, Meds, Oceans, Peacs, Pears, Phones, Pies, or Tides). Issues designated as LYONs, CoCos and Exotics represent distinct security types that may have stock or cash settlement features. Convertible bonds in the year 2007 are only collected until the end of September.

			Years							
	Description	Total	2000	2001	2002	2003	2004	2005	2006	2007
(1)	Total issues (SDC)	1326	154	208	117	256	181	113	143	154
(2)	No prospectus found	197	47	43	21	17	9	8	15	37
(3)	Net issues (SDC), (1)-(2)	1129	107	165	96	239	172	105	128	117
(4)	Equity Units	17	0	1	8	1	1	6	0	0
(5)	Purchase Contracts	13	0	2	7	2	2	0	0	0
(6)	Preferred stock	90	13	5	7	12	16	17	12	8
(7)	Convertible debt	1009	94	157	74	224	153	82	116	109
(8)	Net issues (SDC), (4)+(5)+(6)+(7)	1129	107	165	96	239	172	105	128	117
(9)	Data filters (CRSP, etc.)	310	25	41	38	51	49	38	37	31
(10)	Final sample, (8)-(9)	819	82	124	58	188	123	67	91	86
(11)	Potentially cash settled	473	5	9	15	89	88	69	104	94
(12)	Stock settled	536	89	148	59	135	65	13	12	15
(13)	Convertible debt, (11)+(12)=(7)	1009	94	157	74	224	153	82	116	109
(14)	LYON	31	4	20	5	2	0	0	0	0
(15)	CoCo	194	0	15	13	67	63	12	22	2
(16)	Exotic	31	5	12	3	2	5	3	1	0
(17)	100% cash settlement	2	2	0	0	0	0	0	0	0
(18)	At option of firm in either cash or stock	25	1	5	3	10	6	0	0	0
(19)	Principal in cash, remainder in cash, stock, or combination of cash and stock (at option of firm)	231	0	0	0	6	29	38	86	72
(20)	At option of firm in cash, stock, or a combination of cash and stock &	215	2	4	12	73	53	31	18	22
(21)	Potentially cash settled	473	5	9	15	89	88	69	104	94

aspect of security design worth noting is the tendency for issuers to switch from stock settlement to potential cash settlement structures. At the beginning of our sample, 94.7% of all convertible debt issues in 2000 contained a stock settlement feature. By the end of our sample period, 86.2% are potentially settled in cash.

4.3.2 Summary statistics

We report summary statistics for our sample of convertible issuers based on financial characteristics, security design features, and industry affiliation. Financial characteristics include stock price performance (announcement period excess returns, pre-issue stock price run-up, dividend yield, and volatility), firm size (total assets, sales, and market value of equity), profitability (earnings before interest and taxes (EBIT) and free cash flow), tax status (tax payments, tax loss carryforwards, and depreciation), capital structure (book and market leverage, interest coverage, and decrease in diluted earnings per share), and asset structure (market-to-book, investments, and issue proceeds). We use Factiva to identify announcement dates. The event window used for estimating the excess returns is [-1; 0]; the estimation window we use is [-200; -30]. The market proxy is the CRSP Equally-weighted stock index. Calculation details including COMPUSTAT item numbers are reported in the associated tables.

Security design features and industry association are based on the percentage of issuers that conform to different classifications. Security design features include the percentage of issuers that include potential cash settlement, mandatory conversion, put rights, and call features. We also report the frequency that issuers adopt certain issue strategies that are used to report higher fully diluted earnings (stock repurchase programs and call spread overlays). The percentage of issues that are privately placed and have investment grade ratings are also reported.

4.3.2.1 Choice of fixed income component

Table 20 indicates that firms choosing convertible debt over convertible preferred stock have on average lower tangibility, lower leverage, and higher interest coverage. The observation that straight debt issuers have more conservative capital structures may be an optimal response to having less collateral relative to issuers that choose preferred stock. Convertible debt issuers also have higher growth opportunities but lower investments. In addition, they pay higher taxes, have more slack, and have higher free cash flows than convertible preferred stock issuers.

Table 20: Summary statistics for convertible securities differentiated by choice of fixed income claim.

Excess returns are computed over a [-1,0] event window using the market model. Issue proceeds are the gross proceeds of the issue reported in SDC. Firm characteristics are one year lagged. Assets are determined by Compustat Item 6. Sales is Item 12. The market value of equity is calculated by multiplying Item 24 and Item 25. Tangibility is Item 8. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6, and market leverage is (Item 9 + Item 34) / (Item 34 + Item 9 + Item 24 * Item 25). The market-to-book ratio is calculated as (Item 24 * Item 25 - Item 60 + Item 6) / Item 6. EBIT is Item 18 + Item 15 + Item 16. Tax payments are determined by Item 16. Tax loss carryforwards is a dummy that equals one if Item 52 is larger than zero, and equals zero otherwise. Interest coverage is Item 13 divided by Item 15. Depreciation corresponds to Item 14, and investments are Item 128. Dividend yield is calculated by dividing Item 21 by the market value. Slack is Item 1. Free cash flow is calculated as Item 13 - Item 128. Volatility is calculated as the annualized standard deviation over the period 1987 through 2007 using CRSP monthly data. The stock price run-up is the firm-specific raw return over a period of 75 trading days ending two days before the announcement date. Delta is the convertible's sensitivity for small stock price changes. Decrease EPS is the change in diluted earnings per share that would occur upon issuing the convertible when the "if-converted" accounting method applies. The probability of conversion is calculated over the life of the convertible security using a Monte Carlo simulation. Tangibility, EBIT, tax payments, depreciation, investments, slack, and free cash flows are scaled by total assets. Dollar amounts are in millions of dollars.

	Straight debt (N = 768)		Preferred stock (N = 46)		Diff. in means	
Variable definition	Mean	Median	Mean	Median	t-stat	*p*-value
Excess returns [-1; 0] (%)	-4.240	-3.820	-4.170	-3.300	-0.086	0.931
Issue proceeds	350.2	200.0	321.9	162.5	0.411	0.681
Total assets	5081.9	1069.6	5635.1	2789.9	-0.356	0.722
Total sales	3433.9	735.1	3750.2	1461.9	-0.288	0.773
Market value of equity	4691.2	1289.4	3691.8	1510.6	0.892	0.372
Tangibility	0.239	0.163	0.464	0.395	-5.266	0.000
Book leverage	0.273	0.254	0.385	0.376	-3.296	0.001
Market leverage	0.209	0.154	0.360	0.373	-4.711	0.000
Market-to-book ratio	2.792	1.825	1.798	1.324	4.887	0.000
EBIT	-0.002	0.049	-0.017	0.016	0.541	0.589
Tax payments	0.018	0.009	0.002	0.000	2.140	0.032
Tax loss carryforwards	0.457	0.000	0.522	1.000	-0.845	0.402
Interest coverage	6.301	5.362	4.257	3.667	3.389	0.001
Depreciation	0.046	0.037	0.059	0.042	-1.559	0.119
Investments	0.056	0.036	0.127	0.046	-3.068	0.002
Dividend Yield	0.004	0.000	0.007	0.000	-1.419	0.156
Slack	0.245	0.160	0.108	0.058	6.035	0.000
Free cash flow	0.002	0.050	-0.061	-0.006	1.881	0.060
Volatility	0.325	0.314	0.306	0.316	1.249	0.212
Stock price run-up	0.231	0.163	0.136	0.097	1.758	0.079
Delta	0.826	0.849	0.828	0.900	-0.066	0.947
Decrease diluted earnings per share	0.057	0.041	0.039	0.000	2.256	0.024
Probability of conversion	0.732	0.760	0.531	0.615	3.242	0.001

Table 21: Summary statistics for convertible security design characteristics and industry representation by choice of fixed income claim.

LYONs are liquid yield option notes. A call spread overlay is a strategy that increases the effective strike price implicit in the conversion option. Additional share repurchase indicates that the issuer repurchases shares subsequent to issue. Put rights provide the investor with downside protection in the event the firm does not perform well. A convertible security is callable if the firm has the right to force conversion prior to the maturity date. Securities that are sold to private investors rather than through a public offering are considered private placements. Industries are based on the Fama-French 12 industry classification.

	Straight debt (N = 768)	Preferred stock (N = 46)
Panel A: Percentage of issues that contain a specific design and offer placement characteristics (%)		
Potentially cash settled	43.10	8.70
Contingent convertible	18.23	6.52
LYON	2.86	0.00
Mandatory conversion	0.00	26.09
Call spread overlay	9.77	0.00
Additional stock repurchase	10.29	6.52
Put rights	42.97	0.00
Callable	72.14	69.57
Private placement	84.64	43.48
Issuer has investment grade rating	17.71	13.04
Panel B: Proportion of issues across industry groupings (%)		
Consumer nondurables	2.08	4.35
Consumer durables	1.69	0.00
Manufacturing	7.29	6.52
Energy	4.30	23.91
Chemicals	1.17	6.52
Business equipment	32.42	15.22
Telephone	5.34	13.04
Utility	0.00	0.00
Wholesale	8.85	4.35
Healthcare	23.44	2.17
Other	13.41	23.91

Panel A of Table 21 indicates that 43.10% of straight debt issuers include potential cash settlement features. A similar number of straight debt issuers also include put rights (42.97%). By contrast, the large majority of preferred stock issuers do not include cash settlement features (only four firms do). No convertible preferred stock issuer includes put options.

Another interesting distinction between security designs is that straight debt never includes a mandatory conversion feature, whereas it is quite common for preferred stock issues (26.09%). Finally, we note that, although private placements are quite common regardless of the fixed income choice, straight debt issues employ this method much more frequently (84.64% vs. 43.48%).

Panel B of Table 21 reports the percentage of issues across industry groupings. For the most part, the issue rates are comparable. Still, issuers in the business equipment and healthcare industry tend to prefer convertible straight debt, while issuers in the energy business choose convertible preferred stock.

4.3.2.2 Choice of method of payment for convertible debt issuers

Table 22 indicates that convertible debt issuing firms that choose stock settlement have lower announcement period excess returns and higher levels of pre-issue stock price run-up. On average, firms that issue stock settlements are smaller (total assets and sales) and raise less capital. Stock settlement firms also have better growth prospects (market-to-book), and are characterized by higher volatility. These findings suggest that firms needing additional capital to finance the exercise of growth options are more likely to choose stock settlement.

A comparison of the credit risk profiles for convertible debt issuers across stock and cash settlement is somewhat ambiguous. Issuers that choose stock settlement have less debt, more financial slack, and pay lower dividends. Taken together, this would lead to a relatively favorable credit risk assessment. However, these firms also have lower interest coverage, are less profitable, and have lower free cash flows, which tend to be mitigating factors.

The possibility also exists that firms choose cash settlement features in order to manage reported earnings. Since the accounting treatment for cash settled securities is accretive for fully diluted earnings, one would expect firms to choose this type of security design if they need an earnings boost. Consistent with this argument, Table 5 indicates that cash settlement adopters face larger drops in earnings per share under the if-converted method. Also consistent with the earnings management hypothesis, Panel A of Table 23 reports that firms choosing cash settlement are more likely to implement strategies that increase reported earnings per share (additional stock repurchases and call spread overlays).

Panel A of Table 23 also indicates that stock settlement designs are less likely to include put rights (34.55% vs. 54.08%) and more likely to be callable (81.24% vs. 60.12%). It is interesting to note that, regardless of the payment choice, the majority of convertible debt issues are privately placed.

Table 22: Summary statistics for convertible debt securities differentiated by settlement choice.

Excess returns are computed over a [-1,0] event window using the market model. Issue proceeds are the gross proceeds of the issue reported in SDC. Firm characteristics are one year lagged. Assets are determined by Compustat Item 6. Sales is Item 12. The market value of equity is calculated by multiplying Item 24 and Item 25. Tangibility is Item 8. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6, and market leverage is (Item 9 + Item 34) / (Item 34 + Item 9 + Item 24 * Item 25). The market-to-book ratio is calculated as (Item 24 * Item 25 - Item 60 + Item 6) / Item 6. EBIT is Item 18 + Item 15 + Item 16. Tax payments are determined by Item 16. Tax loss carryforwards is a dummy that equals one if Item 52 is larger than zero, and equals zero otherwise. Interest coverage is Item 13 divided by Item 15. Depreciation corresponds to Item 14, and investments are Item 128. Dividend yield is calculated by dividing Item 21 by the market value. Slack is Item 1. Free cash flow is calculated as Item 13 - Item 128. Volatility is calculated as the annualized standard deviation over the period 1987 through 2007 using CRSP monthly data. The stock price run-up is the firm-specific raw return over a period of 75 trading days ending two days before the announcement date. Delta is the convertible's sensitivity for small stock price changes. Decrease EPS is the change in diluted earnings per share that would occur upon issuing the convertible when the "if-converted" accounting method applies. The probability of conversion is calculated over the life of the convertible security using a Monte Carlo simulation. Tangibility, EBIT, tax payments, depreciation, investments, slack, and free cash flows are scaled by total assets. Dollar amounts are in millions of dollars.

	Stock (N = 437)		Potential cash (N = 331)		Diff. in means	
Variable definition	Mean	Median	Mean	Median	t-stat	*p*-value
Excess returns [-1; 0] (%)	-5.360	-5.060	-2.760	-2.410	-5.417	0.000
Issue proceeds	292.1	190.0	426.8	200.0	-3.195	0.001
Total assets	3199.9	752.8	7566.5	1356.9	-2.164	0.030
Total sales	2238.0	510.9	5012.6	1023.5	-2.412	0.016
Market value of equity	4176.6	1419.1	5370.7	1147.4	-1.296	0.195
Tangibility	0.232	0.160	0.247	0.165	-0.920	0.358
Book leverage	0.264	0.240	0.284	0.273	-1.241	0.215
Market leverage	0.190	0.128	0.235	0.183	-2.920	0.004
Market-to-book ratio	3.284	1.975	2.143	1.630	6.411	0.000
EBIT	-0.039	0.020	0.048	0.069	-6.371	0.000
Tax payments	0.020	0.006	0.017	0.014	0.957	0.339
Tax loss carryforwards	0.428	0.000	0.495	0.000	-1.860	0.063
Interest coverage	5.936	4.720	6.784	6.116	-2.410	0.016
Depreciation	0.048	0.038	0.044	0.036	0.939	0.348
Investments	0.057	0.039	0.054	0.031	0.742	0.458
Dividend Yield	0.003	0.000	0.004	0.000	-2.214	0.027
Slack	0.288	0.206	0.187	0.125	6.031	0.000
Free cash flow	-0.035	0.027	0.050	0.066	-7.084	0.000
Volatility	0.348	0.343	0.295	0.278	6.398	0.000
Stock price run-up	0.294	0.214	0.147	0.122	6.055	0.000
Delta	0.827	0.832	0.825	0.863	0.221	0.825
Decrease diluted earnings per share	0.045	0.000	0.074	0.073	-6.259	0.000
Probability of conversion	0.693	0.717	0.784	0.830	-6.742	0.000

Table 23: Summary statistics for convertible debt security design characteristics and industry representation by settlement choice for straight debt offers.

LYONs are liquid yield option notes. A call spread overlay is a strategy that increases the effective strike price implicit in the conversion option. Additional share repurchase indicates that the issuer repurchases shares subsequent to issue. Put rights provide the investor with downside protection in the event the firm does not perform well. A convertible security is callable if the firm has the right to force conversion prior to the maturity date. Securities that are sold to private investors rather than through a public offering are considered private placements. Industries are based on the Fama-French 12 industry classification.

	Stock (N = 437)	Potential cash (N = 331)
Panel A: Percentage of issues that contain a specific design and offer placement characteristics (%)		
Contingent convertible	13.27	24.77
LYON	4.35	0.91
Mandatory conversion	0.00	0.00
Call spread overlay	2.06	19.94
Additional stock repurchase	2.97	19.94
Put rights	34.55	54.08
Callable	81.24	60.12
Private placement	84.67	84.59
Issuer has investment grade rating	16.70	19.03
Panel B: Proportion of issues across industry groupings (%)		
Consumer nondurables	1.83	2.42
Consumer durables	1.37	2.11
Manufacturing	4.81	10.57
Energy	3.89	4.83
Chemicals	0.69	1.81
Business equipment	35.70	28.10
Telephone	5.95	4.53
Utility	0.00	0.00
Wholesale	7.09	11.18
Healthcare	26.32	19.64
Other	12.36	14.80

Panel B of Table 23 indicates that business equipment manufacturers and healthcare providers tend to be industries that choose a relatively large number of convertible security offerings with stock settlement features. Similar to our results for the choice of a fixed income claim in Table 21, we do not see much industry variation across the method of payment choice.

4.3.2.3 Choice of method of payment for preferred stock issuers

Table 24 indicates that the difference between the announcement effects of convertible preferred stock issues with mandatory and optional (i.e. non-mandatory) conversion options are not statistically significant.

Table 24: Summary statistics for convertible preferred securities differentiated by conversion feature.

Excess returns are computed over a [-1,0] event window using the market model. Issue proceeds are the gross proceeds of the issue reported in SDC. Firm characteristics are one year lagged. Assets are determined by Compustat Item 6. Sales is Item 12. The market value of equity is calculated by multiplying Item 24 and Item 25. Tangibility is Item 8. Book leverage is computed by dividing the sum of Item 9 and Item 34 by Item 6, and market leverage is (Item 9 + Item 34) / (Item 34 + Item 9 + Item 24 * Item 25). The market-to-book ratio is calculated as (Item 24 * Item 25 - Item 60 + Item 6) / Item 6. EBIT is Item 18 + Item 15 + Item 16. Tax payments are determined by Item 16. Tax loss carryforwards is a dummy that equals one if Item 52 is larger than zero, and equals zero otherwise. Interest coverage is Item 13 divided by Item 15. Depreciation corresponds to Item 14, and investments are Item 128. Dividend yield is calculated by dividing Item 21 by the market value. Slack is Item 1. Free cash flow is calculated as Item 13 - Item 128. Volatility is calculated as the annualized standard deviation over the period 1987 through 2007 using CRSP monthly data. The stock price run-up is the firm-specific raw return over a period of 75 trading days ending two days before the announcement date. Delta is the convertible's sensitivity for small stock price changes. Decrease EPS is the change in diluted earnings per share that would occur upon issuing the convertible when the "if-converted" accounting method applies. The probability of conversion is calculated over the life of the convertible security using a Monte Carlo simulation. Tangibility, EBIT, tax payments, depreciation, investments, slack, and free cash flows are scaled by total assets. Dollar amounts are in millions of dollars.

	Mandatory (N = 12)		Optional (N = 34)		Diff. in means	
Variable definition	Mean	Median	Mean	Median	t-stat	*p*-value
Excess returns [-1; 0] (%)	-3.220	-2.950	-4.510	-3.300	0.862	0.389
Issue proceeds	497.1	275.0	260.0	150.0	1.188	0.235
Total assets	10215.9	7797.9	4018.3	1621.9	2.357	0.018
Total sales	6251.3	5227.9	2867.4	633.7	1.794	0.073
Market value of equity	5006.6	3993.8	3227.7	1119.1	1.013	0.311
Tangibility	0.422	0.386	0.479	0.439	-0.636	0.525
Book leverage	0.388	0.380	0.383	0.375	0.069	0.945
Market leverage	0.451	0.446	0.328	0.372	1.848	0.065
Market-to-book ratio	1.330	1.224	1.964	1.393	-2.348	0.019
EBIT	0.051	0.045	-0.041	-0.002	1.366	0.172
Tax payments	0.022	0.005	-0.004	0.000	1.251	0.211
Tax loss carryforwards	0.588	1.000	0.333	0.000	1.536	0.140
Interest coverage	4.800	4.018	4.065	3.053	0.694	0.488
Depreciation	0.042	0.042	0.064	0.045	-1.979	0.048
Investments	0.084	0.036	0.142	0.052	-1.322	0.186
Dividend Yield	0.013	0.003	0.005	0.000	1.154	0.249
Slack	0.066	0.042	0.122	0.061	-1.728	0.084
Free cash flow	0.047	0.038	-0.099	-0.032	2.238	0.025
Volatility	0.241	0.229	0.328	0.336	-3.455	0.001
Stock price run-up	-0.024	0.028	0.192	0.196	-2.049	0.040
Delta	0.598	0.580	0.909	0.928	-14.218	0.000
Decrease diluted earnings per share	0.057	0.041	0.032	0.000	1.192	0.233
Probability of conversion	1.000	1.000	0.366	0.405	10.253	0.000

Firms with lower stock price run-ups are more inclined to include mandatory conversions. This tendency to use mandatory conversion for firms that have not had strong recent performance is in line with their relatively poor growth prospects (market-to-book) and lower volatility. Firms issuing mandatory convertibles also have more assets and higher free cash flows.

Table 25: Summary statistics for convertible preferred security design characteristics and industry representation by conversion feature for preferred stock offers.

LYONs are liquid yield option notes. A call spread overlay is a strategy that increases the effective strike price implicit in the conversion option. Additional share repurchase indicates that the issuer repurchases shares subsequent to issue. Put rights provide the investor with downside protection in the event the firm does not perform well. A convertible security is callable if the firm has the right to force conversion prior to the maturity date. Securities that are sold to private investors rather than through a public offering are considered private placements. Industries are based on the Fama-French 12 industry classification.

	Mandatory (N = 12)	Optional (N = 34)
Panel A: Percentage of issues that contain a specific design and offer placement characteristics (%)		
Potential cash settlement	0.00	11.76
Contingent convertible	8.33	5.88
LYON	0.00	0.00
Call spread overlay	0.00	0.00
Additional stock repurchase	8.33	5.88
Put rights	0.00	0.00
Callable	25.00	85.29
Private placement	0.00	58.82
Issuer has investment grade rating	25.00	8.82
Panel B: Proportion of issues across industry groupings (%)		
Consumer nondurables	8.33	2.94
Consumer durables	0.00	0.00
Manufacturing	16.67	2.94
Energy	8.33	29.41
Chemicals	8.33	5.88
Business equipment	8.33	17.65
Telephone	8.33	14.71
Utility	0.00	0.00
Wholesale	8.33	2.94
Healthcare	0.00	2.94
Other	33.33	20.59

With respect to specific design features, the most notable differences in Panel A of Table 25 are that issues with mandatory conversion are much less likely to include call features (25.00% vs. 85.29%) but are more likely to publicly underwrite their offerings.

Panel B of Table 25 presents the distribution of firms choosing different methods of payment for convertible preferred stock across different industry groups. Manufacturing firms are more likely to include mandatory features, whereas firms in the energy industry are less likely to include mandatory features.

4.4 Econometric specification

A Hausman specification test rejects the independence of irrelevant alternatives assumption, which indicates that a simple multinomial logit model is not appropriate for our analysis. We therefore use a nested logit model (McFadden (1981)) to test our various hypotheses related to convertible security design. The structure imposed by the nested logit model is appropriate for our analysis because it reflects the nature of the actual design choices faced by an issuer. The model assumes that a firm chooses the best outcome among the available alternatives. Cronqvist and Nilsson (2005) use a similar approach to investigate the choice between rights offerings and private equity placements. Their analysis demonstrates the importance of simultaneously modeling joint decisions.

Adopting their notation, we assume that the objective function for choice *j* by firm *i* takes the form:

$$V_{i,j} = \hat{V}_{i,j} + \varepsilon_{i,j}, \tag{20}$$

where $\hat{V}_{i,j}$ is the fitted value for the objective function based on observable firm characteristics and $\varepsilon_{i,j}$ is an idiosyncratic component that reflects unmeasured characteristics.

The convertible design choices are illustrated in Figure 7. We partition the choice space into disjoint subsets. Firms make a choice of fixed income claim indexed by $j = 1, \ldots, F$ and method of payment indexed by $k = 1, \ldots, M_j$. We assume that lowest level objective functions are specified as:

$$V_{i,j,k} = \hat{V}_{i,j,k} + \varepsilon_{i,j,k}, \tag{21}$$

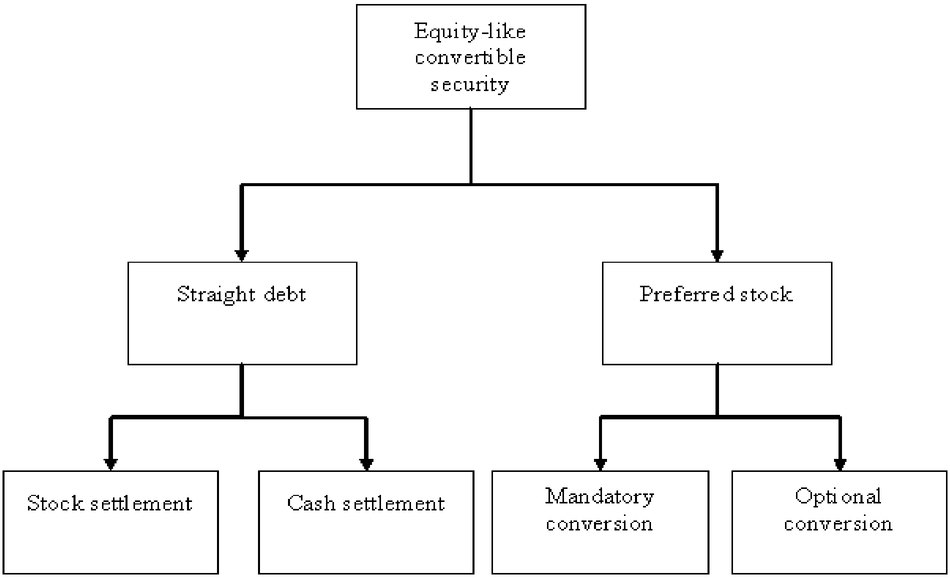
where $\hat{V}_{i,j,k}$ is linear in firm characteristics and additively separable into components that reflect method of payment $M_{i,j}$ and fixed income F_j choices. We assume that $\varepsilon_{i,j,k}$ is generalized extreme-value distributed. The functional form for $\hat{V}_{i,j,k}$ is

$$\hat{V}_{i,j,k} = \alpha' A_{i,j} + \beta' B_{i,j,k}, \tag{22}$$

where α and β are parameter vectors and $A_{i,j}$ and $B_{i,j,k}$ denote vectors of explanatory variables that correspond to choices *j* and *k* for firm *i*.

Figure 7: The security design choice structure.

This figure shows the choices at the different levels of our nested logit model.



Under the nested logit model, the joint probability of firm *i* choosing the security design choice *j,k* is

$$P_{i,j,k} = P_{i,j} * P_{i,j,k|j}, \tag{23}$$

where $P_{i,j}$ is the marginal probability of choosing straight debt or preferred stock and $P_{i,j,k|j}$ is the probability of choosing a particular method of payment if the choice was *j* at the previous level. The conditional probability $P_{i,j,k|j}$ of method of payment choice *j,k* is

$$P_{i,j,k|j} = \frac{\exp(\beta' B_{i,j,k})}{\sum_{M_j} \exp(\beta' B_{i,j,k})}, \tag{24}$$

and the marginal probability of the choice of a fixed income claim is

$$P_{i,j} = \frac{\exp(\alpha' A_{i,j} + \lambda I_{i,j})}{\sum_{F} \exp(\alpha' A_{i,j} + \lambda I_{i,j})}, \tag{25}$$

where the inclusive values for fixed income choice *j* is defined as

$$I_{i,j} = \log\left\{\sum_{Mj} \exp(\beta' B_{i,j,k})\right\}. \quad (26)$$

The inclusive value at a given level represents the expected value from a particular choice made at the next lower level.

We estimate the parameter vectors α, β, and λ using sequential maximum likelihood. Lower-level coefficients are consistently estimated by maximizing the conditional log-likelihood function. Inclusive values are estimated using the procedure in McFadden (1981). Upper level estimates are consistently estimated by sequential maximum likelihood.

4.5 Empirical results

Table 26 reports the estimated coefficients and their associated *p*-values for all levels of the nested logit model. Statistical significance is based upon Huber-White standard errors. For ease of interpretation, the expected signs for the coefficients are carried forward from Table 18. We organize our discussion of the results according to the different design choices and the different hypotheses under consideration.

4.5.1 Choice of fixed income component

We test four hypotheses for the fixed income choice. These are the tax benefits hypothesis, the financial distress hypothesis, the refinancing hypothesis, and the managerial discretion hypothesis.

4.5.1.1 Corporate taxes

We find evidence that firms choose straight debt rather than preferred stock when interest expense can be used to shield income from corporate taxes. Firms that have higher interest coverage ratios (*p*-value = 0.004) are more likely to issue convertible debt. The relatively high credit ratings typically associated with these firms suggest that they have unused debt capacity and are likely to be underlevered. Firms with relatively low depreciation levels (*p*-value = 0.066) are also more likely to choose convertible debt. This is sensible because depreciation is a non-debt tax deduction that

Table 26: Coefficient estimates from the nested logit model

The table reports the estimation of a nested logit model. It reports the expected signs of the coefficients, the coefficient estimates, and p-values based on Huber-White standard errors. The dependent variable for the fixed income choice (the top level) is one for convertible bonds, and zero for convertible preferred stock. The dependent variable for the settlement choice (lower level for convertible bonds) is one for stock settlement and zero for cash settlement. The dependent variable for the mandatory conversion choice (lower level for convertible preferred stock) is one for mandatory conversion features and zero for optional conversion features. The inclusive value represents the expected value from a particular choice made at the lower levels.

	Fixed income choice (Straight debt = 1, Preferred stock = 0)			Settlement choice (Stock = 1, Potential cash = 0)			Mandatory conversion (Mandatory = 1, Optional = 0)		
Variable definition	Sign	Coef.	p-value	Sign	Coef.	p-value	Sign	Coef.	p-value
Constant		-0.189	1.878		1.670	0.018		-4.659	0.337
Log(market value)	+	-0.012	0.948	-	0.074	0.420	-	1.975	0.052
Book leverage	-	-0.004	0.996	+	0.027	0.956	+	1.508	0.705
Market-to-book ratio	-	0.135	0.572	+	0.168	0.003	+	-8.207	0.006
EBIT	+	0.630	0.741	?	0.283	0.788	-	10.219	0.064
Free cash flow	+	5.341	0.000	-	-1.988	0.142	-	14.802	0.093
Stock price run-up	+	0.015	0.987	-	0.558	0.038	?	-8.136	0.050
Investment grade	+	0.099	0.876	-	0.299	0.240	-	-0.904	0.519
Interest coverage	+	0.134	0.004	-	0.027	0.282	-	-0.396	0.349
Slack	+	4.925	0.000	-	0.158	0.751			
Tax payments	+	8.212	0.203						
Tax loss carryforwards	-	-0.132	0.679						
Depreciation	-	-4.422	0.066						
Proceeds / market value	?	3.279	0.114						
Investment				+	-0.848	0.637	+	5.906	0.451
Probability of conversion				?	-2.955	0.000			
Decrease diluted earnings per share				-	-2.398	0.158			
Call spread overlay				-	-2.554	0.000			
Additional stock repurchase				-	-1.434	0.000			
Inclusive value		1.406	0.240						
N		814			768			46	
χ^2 (p-value)		0.000			0.000			0.171	
Pseudo R^2		0.233			0.206			0.439	

makes interest payments potentially redundant as tax shields. The variables tax payments and tax loss carryforwards also have the correct sign, but their effects are not statistically significant (p-values of 0.203 and 0.679, respectively).

4.5.1.2 Reduction of financial distress costs

Since convertible straight debt has a fixed maturity that requires repayment of the principle when the conversion option is out-of-the-money, we predict firms with higher costs of financial distress to choose convertible preferred stock. We find some evidence for the financial distress cost hypothesis in the fixed income decision. Firms with higher interest coverage ratios opt for convertible straight debt, which is in line with the financial distress hypothesis as these firms are better able to pay the principal. However, the effects of the other proxy variables (size, leverage, market-to-book ratio, profitability, and whether the firm has an investment grade rating) are not statistically significant in the fixed income regression.

4.5.1.3 Refinancing costs

We find evidence consistent with the hypothesis that firms choose a fixed income security in an attempt to minimize external financing costs. All of the coefficients in Table 26 have the correct sign. Firms that have stronger free cash flows (p-value < 0.001), higher interest coverage ratios (p-value $= 0.004$), and greater financial slack (p-value < 0.001) are more likely to choose convertible debt because they are more likely to be able to refinance principal balances with debt in the event that the conversion option is not exercised. Generally, firms prefer to refinance with debt because underwriting costs are much lower relative to equity issues, particularly when stock performance has not been as good as the firm anticipated it to be at the time it was originally issued.

4.5.1.4 Managerial discretion

Straight debt does a better job mitigating managerial discretion costs because interest payments are mandatory. Since preferred stock has no maturity date, the mandatory repayment of principal associated with debt forces firms to commit more of their free cash flows to the repayment of financial claims. Firms that have the greatest propensity to encounter managerial discretion problems are therefore the most likely to choose straight debt. Relatively speaking, the results for the choice of fixed income claim are strong. We find that firms with higher free cash flows (p-value < 0.001), higher interest coverage ratios (p-value = 0.004), and greater financial slack (p-value < 0.001) are more likely to choose straight debt.

4.5.2 Choice of method of payment for convertible debt issuers

Two of the hypotheses that potentially explain the fixed income choice also potentially explain the method of payment choice for convertible debt issuers. These are the financial distress hypothesis and the managerial discretion hypothesis. Table 26 also provides results for the staged investment and the earnings management hypotheses.

4.5.2.1 Reduction of financial distress costs

The financial distress cost hypothesis makes predictions regarding the choice of fixed income claim and the method of payment. Firms that choose convertible straight debt as the fixed income component can decide to settle in cash, stock, or a combination of cash and stock. We predict that firms with high costs of financial distress choose stock settlement. In line with this prediction, we find that high-growth firms choose stock settlement in the convertible straight debt sample. However, we do not find the expected significant effects for the other variables of the financial distress hypothesis.

4.5.2.2 Managerial discretion

The managerial discretion hypothesis also makes predictions about the method of payment choice assuming that the firm chooses convertible straight debt. For this case, we predict that firms seeking to mitigate managerial discretion problems are more likely to choose cash settlement. The evidence in Table 26 is mixed. As predicted, we find that firms with relatively poor growth opportunities (p-value = 0.003) are more likely to choose cash settlement. However, despite greater propensity for managerial discretion, firms that have higher stock price run-ups (p-value = 0.038) are more likely to choose stock settlement, which is inconsistent with our predictions.

4.5.2.3 Staged investment

The staged investment hypothesis makes predictions about the method of payment choices for convertible straight debt and convertible preferred stock. The results for convertible straight debt issuers are mixed. Consistent with our predictions, we find that firms with significant growth opportunities (p-value = 0.003) are more likely to choose stock settlement. This finding indicates firms attempt to preserve debt capacity in case additional rounds of financing are needed to complete an investment project. However, firms with higher investments are not more likely to choose stock settlement, which is inconsistent with the staged investment hypothesis.

4.5.2.4 Earnings management

Our results support the predictions of the earnings management hypothesis. According to this hypothesis, firms wanting to report higher fully diluted earnings choose cash settlement. Cash settlement is accretive for fully diluted earnings per share because the shares that would be included in an "as-if" converted calculation had the issuer chosen stock settlement instead are ignored.

Firms often take actions that exacerbate this effect. For example, some firms use part of the offer proceeds to repurchase shares. Although not all share repurchase programs are accretive with respect to fully diluted earnings, the relatively low interest rates that are typically associated with convertible bonds are sufficient for the net effect to be positive.

Other firms select call spread overlays. Under this strategy, a firm issues convertible debt and simultaneously eliminates the equity component by taking an offsetting position in call options. The net effect is to synthetically increase the conversion price. It is accretive with respect to reported earnings because the interest expense that is recognized for financial statement reporting purposes is lower than it would have been had the firm issued the convertible at the synthetic conversion price. Since the firm selects cash settlement (the shares are not reflected in fully diluted earnings), the strategy is accretive for reported earnings.

Consistent with our predictions, firms that use repurchase additional shares (p-value < 0.001) and firms that adopt call spread overlays (p-value < 0.001) are more likely to choose cash settlement features. The decrease in fully diluted earnings per share also has the predicted sign, but is not statistically significant (p-value of 0.158).

4.5.3 Choice of method of payment for convertible preferred stock issuers

We have two hypotheses that potentially explain the choice for mandatory conversion: the staged investment hypothesis and the financial distress hypothesis. A potential third hypothesis would be related to tax benefits, since some mandatory convertible preferred stock issues provide tax advantages (for example, the dividend payments of Feline PRIDES are tax deductable). However, since we could not find tax advantages for the mandatory convertible preferred stock issues in our sample, we focus our analysis on the staged investment and financial distress hypothesis. We could not include the probability of conversion as a control variable in the regression of the mandatory choice since this variable has no variation for convertibles that are mandatorily convertible (for these convertibles the probability of conversion equals one).

4.5.3.1 Staged investment

Firms are expected to use mandatory conversion when they face significant managerial discretion costs because additional debt capacity can only be created if investors convert to common stock. We predict that capital expenditures in the offer year are positively related to the choice of mandatory conversion. However, Table 26 shows that the effect of capital expenditures on the decision to add a mandatory feature is not significant. In fact, none of the variables that are statistically significant have the expected sign for the staged investment hypothesis.

4.5.3.2 Reduction of financial distress costs

Regarding the mandatory choice, firms with higher costs of financial distress are predicted to choose mandatory conversion features. Table 26 does not provide evidence for the financial distress hypothesis. Mandatory issuers are not smaller and do not have higher leverage, higher market-to-book ratios, or lower profitability. However, remember that the costs of financial distress have an effect on the fixed income decision: convertible preferred stock issuers have higher costs of financial distress than convertible debt issuers. Therefore, the costs of financial distress of mandatory issuers are relatively high.

To further examine whether the costs of financial distress have an effect on the mandatory choice, we focus on the actual credit ratings of firms rather than whether the firm has investment grade debt. The reason for this additional analysis on credit ratings is that mandatory convertible preferred stock is a relatively beneficial instrument for a firm's credit rating. Since issuers do not have to repay the principal and the securities automatically convert into common equity within a limited period of time, the instrument is relatively similar to common equity. Therefore, given the choice for a convertible issue, a choice for mandatory convertible preferred stock generates the lowest probability of default. Mandatory convertible preferred stock issue will especially improve a firm's credit rating when the proceeds are used to repay straight debt.

Firms that are most concerned about their credit ratings are likely to be close to the investment-speculative grade cut-off. Credit ratings above BB represent investment grade ratings (i.e. ratings AAA, AA, A, and BBB), whereas lower credit ratings (BB, B, CCC, CC, C, and D) represent speculative grade ratings. The cut-off between investment grade ratings and speculative grade ratings is important since getting a speculative grade rating substantially increases the cost of debt. Grinblatt and Titman (2002), for example, argue that many bond portfolio managers are restricted from owning speculative grade bonds.

In line with the importance of credit ratings, we find that all of the mandatory convertible preferred stock issuers in our sample have ratings that fall in the range BBB-B at the time of the offering. Hence, all mandatory convertible preferred stock issuers are close to the speculative grade cut-off. In fact, 75% of the mandatory convertible preferred stock issuers have BB ratings, indicating a high need to refinance in order to obtain an investment grade rating. An examination of issue announcements indicates that all but one of the mandatory convertible preferred stock issuers plan to use (part of) the issue proceeds to reduce the indebtedness.[34] For regular convertible preferred stock issuers and convertible bonds issuers the percentage of issuers within the BBB-B range is much lower: for regular convertible preferred stock issuers, the percentage with a rating between BBB and B is 56% (29% has a BB rating), while this percentage is 49% (20% has a BB rating) for the convertible bonds in our sample.

[34] When we look at the credit ratings of the issuing firms two years after the issue, we find that 55% of the credit ratings have improved.

4.6 Earnings management and the method of payment choice

Most of the hypotheses we examine are based on the premise that managers choose particular security designs to maximize long-run shareholder value. Consistent with this viewpoint, our evidence finds support for the tax minimization, refinancing costs, and managerial discretion hypotheses. However, not all of our hypotheses are grounded in the shareholder value paradigm. Specifically, firms that use cash settlement features to manage earnings are not necessarily interested in maximizing shareholder value, since future cash flows are not affected by changes in reported diluted earnings per share.

Given that we find evidence consistent with the earnings management hypothesis, this section explores this possibility more carefully. We begin our analysis by providing an expanded description of the relevant accounting issues related to convertible debt and earnings. Since particular investment banks may be responsible for contract innovations that are linked to particular security designs, we then characterize the distribution of underwritten offerings by different investment banks. The idea is to shed light on whether firms desiring particular structures are more likely to choose investment banks that have expertise in this area. The third part of our analysis is to characterize the type of firms that adopt share repurchase programs and call spread overlays. For our sample, there are 79 (75) instances where firms repurchase shares (call spread overlays). In addition, there are 31 cases where firms adopt both strategies simultaneously. We examine the use of these strategies by estimating a logit regression model of the determinants of earnings management. Finally, we estimate a multinomial logit model to characterize the use of cash settlement features.

4.6.1 Accounting for convertible debt and the calculation of fully diluted earnings per share

There are two issues related to the accounting for convertible securities: 1) the allocation of the security between its debt and equity components for financial reporting purposes, and 2) the appropriate way to calculate fully diluted earnings per share. Although the former issue may have some bearing on the determination of bond ratings, we consider it to be second order because, in the absence of agency costs and asymmetric information problems, the pricing of convertible securities is unaffected by the decision to pay a fraction of the entire claim in cash (i.e., the final payoff is the same).

By contrast, the calculation of fully diluted earnings is highly relevant to our earnings management hypothesis. The basic regulations for calculating fully diluted earnings can be found in Statement 128 (1997). Paragraph 26 indicates that:

The dilutive effect of convertible securities shall be reflected in diluted EPS by application of the if-converted method. Under that method:

1. *If an entity has convertible preferred stock outstanding, the preferred dividends applicable to convertible preferred stock shall be added back to the numerator.*
2. *If an entity has convertible debt outstanding, (1) interest charges applicable to the convertible debt shall be added back to the numerator, (2) to the extent nondiscretionary adjustments based on income made during the period would have been computed differently had the interest on convertible debt never been recognized, the numerator shall be appropriately adjusted, and (3) the numerator shall be adjusted for the income tax effect of (1) and (2).*
3. *The convertible preferred stock or convertible debt shall be assumed to have been converted at the beginning of the period (or at time of issuance, if later), and the resulting common shares shall be included in the denominator.*

This treatment recognizes the dilutive nature of convertible securities and requires that potential shares be included in the total shares calculation and that firms add any interest or preferred dividends to income. This treatment can lead to substantial reductions in fully diluted earnings per share estimates relative to undiluted EPS.

In 1991, the application of this approach to convertible securities that contain cash settlement features was considered an emerging issue by the FASB's Task Force when investment banks began discussing potential issuances. The Task Force released EITF Issue 90-19 (Convertible bonds with issuer option to settle for cash upon conversion).[35] The discussion in 90-19 provides guidance regarding securities that can potentially be settled in cash and is contained in Paragraph 29 of Statement 128:

If an entity issues a contract that may be settled in common stock or in cash at the election of either the entity or the holder, the determination of whether that contract shall be reflected in the computation of diluted EPS shall be made based on the facts

[35] It is not clear whether there were in fact any such instruments issued prior to EITF 90-19. If so, we believe that they were used on a very limited basis.

available each period. It shall be presumed that the contract will be settled in common stock and the resulting potential common shares included in diluted EPS (in accordance with the relevant provisions of this Statement) if the effect is more dilutive. A contract that is reported as an asset or liability for accounting purposes may require an adjustment to the numerator for any changes in income or loss that would result if the contract had been reported as an equity instrument for accounting purposes during the period. That adjustment is similar to the adjustments required for convertible debt in paragraph 26(b). The presumption that the contract will be settled in common stock may be overcome if past experience or a stated policy provides a reasonable basis to believe that the contract will be paid partially or wholly in cash.

In January 2002, the Task Force amended EITF 90-19. Among other things, the amendment addresses two issues: 1) whether the initial balance sheet treatment by the issuer should provide for separate or combined accounting for the conversion feature and debt obligation, and 2) how each instrument should be treated in earnings-per-share computations. The amendment makes a distinction between three security types:

1. *Instrument A: Upon conversion, the issuer must satisfy the obligation entirely in cash based on the fixed number of shares multiplied by the stock price on the date of conversion (the conversion value).*
2. *Instrument B: Upon conversion, the issuer may satisfy the entire obligation in either stock or cash equivalent to the conversion value.*
3. *Instrument C: Upon conversion, the issuer must satisfy the accreted value of the obligation (the amount accrued to the benefit of the holder exclusive of the conversion spread) in cash and may satisfy the conversion spread (the excess conversion value over the accreted value) in either cash or stock.*

The amended guidance in Issue 90-19 provides more favorable accounting and EPS treatment for Instrument C ("net share settlements"). The January 23-24, 2002 meeting minutes explain that because the features of Instruments C are sufficiently different from conventional convertible debt, paragraphs 12-32 of Issue 00-19 should be applied in determining whether the conversion feature meets the criteria for classification as permanent equity. If the conversion feature does not meet those criteria, Instruments C should be bifurcated by the issuer and the conversion option should be marked to market.[36]

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[36] FSP APB 14-a nullifies this treatment of Instruments C. As a result, convertible securities that are potentially (either partially or wholly) settled in cash, will be divided into a debt and an equity component. The value of this debt component is calculated by using the interest rate that would apply to a similar debt instrument without a conversion option. The value of the equity component is then the remainder. FSP APB 14-a is into effect from December 2008 (retrospectively).

With respect to the calculation of fully diluted earnings per shares, the guidance in Issue 90-19 concludes that the if-converted method should not be used for Instrument C, due to the cash-settled portion. The conversion spread of Instruments C should be included in diluted earnings per share based on the provisions of paragraph 29 of Statement 128.[37]

For our sample, approximately half of the cash settlements can be settled in any combination of cash and stock at the option of the firm. This security is not considered in (amended) EITF 90-19, and is referred to in practice as Instrument X; a term initially used in a speech by Robert Comerford of the SEC at the AICPA National Conference on Current SEC and PCAOB Developments in December 2003. Although Instrument X offerings have the option, upon conversion, to settle for any combination of equity and cash, many issuers of Instrument X securities have adopted a "stated" policy to pay the principal in cash and the conversion spread in equity (that is, even though they are legally entitled to settle the if-converted value in any combination of cash and shares, they adopt a policy to settle the principal amount of the instrument in cash upon conversion). Specifically, entities apply the guidance in paragraph 29 of FAS 128, which indicates that the presumption of share-settlement can be overcome if an entity has a past practice or "stated policy" of settling an instrument in cash. Because of their policy to settle the principal in cash, they do not apply the if-converted method of computing diluted EPS for Instrument X securities. Rather, they apply a treasury stock-type method whereby only the net shares that would be issuable if conversion occurred at the current stock price are included in diluted EPS. Because such instruments are typically issued with a conversion feature that is significantly out-of-the-money, there is often no diluted EPS impact at all for several years.

Since the 2002 amendment of 90-19, cash settlements have become very popular, which led to new discussions on the subject. The Task Force has questioned whether the accounting guidance in (amended) 90-19 "appropriately reflects the economics of those instruments."[38]

More recently, the accounting for convertible securities has been revisited as part of the FASB's and IASB's agreement to work together toward the convergence of global accounting standards. The FASB and the IASB have had an earnings per share convergence project on their agenda for the past several years. One of the proposed changes to U.S. GAAP (FAS 128) in that project is to eliminate an entity's ability to overcome the presumption of share settlement based on a past practice or stated policy.

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[37] The revised guidance for Instruments C should be applied to instruments issued after January 24, 2002.
[38] EITF 07-2 (Accounting for convertible debt instruments that are not subject to the guidance in paragraph 12 of APB Opinion 14, March 2007 and June 2007) provides a historical perspective of the issues.

That proposed change to U.S. GAAP contained in FASB Staff Position (FSP) 14-a would converge to the guidance that is already required under IFRS.

4.6.2 Distribution of underwriters by security design choice

When a firm decides to issue a convertible security, it must obtain the services of an investment bank to facilitate the transaction. Investment banks develop expertise in designing certain types of transactions and are likely to attract underwriting business because of their reputation.

Table 27 reports the distribution of investment bank participation across different methods of payment. Panel A reports the total number of issues by investment bank. The totals represent counts based on proportional participation. For example, Bank of America and Bear Stearns are credited with 0.5 issues if they are both identified as lead underwriters in the SDC database.

Credit Suisse First Boston (CSFB), Goldman Sachs, Merrill Lynch, and Morgan Stanley account for 48.5% of all issue activity.[39] By contrast, Bear Stearns only recorded 20.81 issues over our sample period. This is somewhat surprising given the firm's reputation as a design innovator in this area.

Panel B reports the proportion of issues for each method of payment choice by investment bank. The proportion of stock settlement issues is highest for Solomon Smith Barney (18.92 of the 21.92 issues, which is 86%). Panel C indicates the degree to which banks specialize in issuing particular security designs. It reports the ratio of this proportion to the average proportion across all investment banks. For example, the proportion of Instrument C issues for Bank of America is about twice the industry average (41% compared to 21%).

4.6.3 Earnings management regressions

Table 28 reports the results for our logit analysis of the determinants of the adoption of share repurchase programs and call spread overlays. The dependent variable is a dummy variable that takes the value one if the firm repurchases shares (Model (1)) or uses a call spread overlay (Model (2)). We also consider the case where either the firm repurchases shares or uses a call spread overlay (Model (3))

[39] CSFB, Goldman Sachs, Merrill Lynch, and Morgan Stanley respectively made 83.23, 87.08, 117.73, and 84.75 issues out of 768 convertible bond issues over our sample period.

Table 27: Distribution of convertible issues by method of payment choice across investment banks

The table reports the number of convertible issues that are underwritten by a specific investment bank. The sample consists of convertible straight debt issues. One firm issued an Instrument A specification; we reclassify this issue as an Instrument C specification. Panel A reports the counts based on proportional participation (if two investment banks are identified as lead underwriters in the SDC database, each would be credited with 0.5 issues). Panel B reports the proportion of stock settlements, Instruments B, Instruments C, and Instruments X per investment bank. Panel C reports the proportion of each settlement type compared to the average industry proportion.

Security type	Bank of America	Bear Stearns	CSFB	Citibank	Deutsche Bank	Goldman Sachs	JP Morgan	Lehman Bros.	Merrill Lynch	Morgan Stanley	Salomon Smith Barney	Other	Total
Panel A: Number of issues for each settlement type													
Stock settlement	12.33	10.00	55.83	22.25	17.33	58.67	27.25	26.08	64.25	55.83	18.92	68.25	437.00
Instrument B	2.14	0.00	1.67	1.48	3.00	0.14	1.98	0.00	3.64	1.48	1.33	1.14	18.00
Instrument C	24.38	2.98	11.73	8.73	11.71	10.81	20.23	7.77	26.21	9.57	0.00	25.89	160.00
Instrument X	20.42	7.83	14.00	14.46	6.29	17.46	9.29	10.71	23.63	17.88	1.67	9.38	153.00
Total	59.27	20.81	83.23	46.92	38.33	87.08	58.75	44.56	117.73	84.75	21.92	104.65	768.00
Panel B: Proportion of issues for each settlement type by investment bank													
Stock settlement	0.21	0.48	0.67	0.47	0.45	0.67	0.46	0.59	0.55	0.66	0.86	0.65	0.57
Instrument B	0.04	0.00	0.02	0.03	0.08	0.00	0.03	0.00	0.03	0.02	0.06	0.01	0.02
Instrument C	0.41	0.14	0.14	0.19	0.31	0.12	0.34	0.17	0.22	0.11	0.00	0.25	0.21
Instrument X	0.34	0.38	0.17	0.31	0.16	0.20	0.16	0.24	0.20	0.21	0.08	0.09	0.20
Panel C: Proportion of issues for each settlement type relative to industry average													
Stock settlement	0.37	0.84	1.18	0.83	0.79	1.18	0.82	1.03	0.96	1.16	1.52	1.15	
Instrument B	1.54	0.00	0.85	1.34	3.34	0.07	1.44	0.00	1.32	0.74	2.60	0.47	
Instrument C	1.97	0.69	0.68	0.89	1.47	0.60	1.65	0.84	1.07	0.54	0.00	1.19	
Instrument X	1.73	1.89	0.84	1.55	0.82	1.01	0.79	1.21	1.01	1.06	0.38	0.45	

Table 28: Earnings management strategies

The table reports logit regression models that examine the determinants of earnings management policies. Our sample consists of convertible straight debt issues.

	Stock repurchase (1)		Call spread overlay (2)		Combined (3)		Combined with investment bank dummies (4)			
Variable definition	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value	Marg. effect	*p*-value
Constant	-4.329	0.000	-5.649	0.000	-3.994	0.000	-3.832	0.000		
Log(market value)	0.554	0.050	1.511	0.000	0.803	0.002	0.735	0.009	0.073	0.007
Book leverage	0.558	0.500	1.026	0.162	1.061	0.080	0.888	0.128	0.088	0.123
Market-to-book ratio	0.002	0.979	-0.106	0.227	-0.041	0.533	-0.022	0.744	-0.002	0.743
EBIT	-1.645	0.171	1.404	0.238	-0.608	0.572	-0.498	0.652	-0.050	0.652
Interest coverage	0.013	0.749	0.085	0.044	0.052	0.114	0.044	0.180	0.004	0.181
Investment	0.186	0.952	-10.716	0.012	-2.876	0.283	-2.075	0.414	-0.207	0.413
Slack	-0.427	0.544	0.590	0.440	0.350	0.561	0.559	0.375	0.056	0.370
Free cash flow	6.157	0.001	-2.709	0.146	1.969	0.277	1.845	0.290	0.184	0.285
Stock price run-up	-1.545	0.000	-2.332	0.000	-1.863	0.000	-1.919	0.000	-0.191	0.000
Decrease diluted earnings per share	0.972	0.654	8.769	0.000	4.863	0.011	4.671	0.025	0.465	0.024
Investment grade	-0.924	0.012	-0.954	0.018	-0.815	0.008	-0.835	0.010	-0.068	0.002
Probability of conversion	0.385	0.596	-2.596	0.000	-0.908	0.134	-1.409	0.032	-0.140	0.026
Bank of America							0.947	0.000	0.123	0.004
Bear Stearns							0.490	0.380	0.058	0.452
CSFB							-0.452	0.262	-0.040	0.201
Citibank							0.554	0.133	0.065	0.196
Deutsche Bank							0.801	0.027	0.103	0.071
Goldman Sachs							-0.212	0.550	-0.020	0.526
JP Morgan							0.622	0.029	0.074	0.058
Lehman Bros.							0.011	0.978	0.001	0.978
Merrill Lynch							0.306	0.302	0.033	0.337
Morgan Stanley							0.309	0.282	0.033	0.320
Salomon, Smith, Barney							-1.578	0.081	-0.092	0.001
N	768		768		768		768			
χ^2 (*p*-value)	0.000		0.000		0.000		0.000			
Pseudo R^2	0.099		0.184		0.104		0.156			

Model (4) is an expanded version of Model (3) that includes underwriter dummy variables.

We find that large firms with relatively poor recent stock performance and no investment grade debt are more likely to adopt an earnings management strategy. Issuing firms are more likely to repurchase shares if free cash flows are high, and more likely to use call spread overlays if they have relatively low investment requirements and high interest coverage ratios. Firms that face larger potential decreases of reported diluted EPS under the if-converted method are more likely to adopt a call spread overlay. The coefficient estimate for the decrease in earnings per share is 8.769 (p-value < 0.001).

Table 28 indicates that the Bank of America, Deutsche Bank, and JP Morgan are more likely to handle the underwriting for firms that adopt earnings management strategies. By contrast, issues underwritten by Salomon Smith Barney are less likely to coincide with attempts to manage earnings.

4.6.4 Specific cash settlement options

The security design model we estimate in Table 26 does not distinguish among alternative cash settlement features. Since different cash settlement choices may be useful at resolving different financing problems, we consider an alternative specification for the choice of settlement features that distinguishes between Instrument B, C, and X designs.[40] Table 29 reports the results of a multinomial logit regression model, and also reports the corresponding marginal effects. These marginal effects are calculated by applying a one standard deviation shock to the mean of each explanatory variable, while holding all other explanatory variables at their sample means. Dummy variables are set to zero for these calculations. Marginal effects for dummy variables are calculated by setting the dummy variables to one.

The tables provide a number of interesting insights. We hypothesized that pre-specified partial cash settlements (Instruments C) or stated policies to settle in cash (Instruments X) are useful security designs for reducing managerial discretion costs associated with free cash flows. This follows because issuers commit future free cash flows to pay the accreted value in cash. Consistent with this prediction, we find that firms choosing an Instrument X-style settlement are more likely to have relatively high levels of free cash flows (marginal effect of 0.416 with a p-value of 0.046) and

[40] Our sample includes only one Instrument A issue. We combine this issue with Instrument C issues, based on the large portion of the value that is assured to be settled in cash for both Instruments A and C.

Table 29: Multinomial logit model based on convertible debt settlement type

The table reports the estimation of a multinomial logit model that examines the determinants of the settlement types (stock settlement, Instrument B, Instrument C, and Instrument X). The sample consists of convertible straight debt issues. One firm issued an Instrument A specification; we reclassify this issue as an Instrument C specification. Panel A reports the coefficient estimates and the associated *p*-values (based on Huber-White standard errors). Panel B reports the marginal effects and *p*-values for the economic significance of the marginal effect. Marginal effects are based on a one standard deviation change in the explanatory variable holding all other explanatory variables at their sample means. Dummy variables are set to zero. Their marginal effects are calculated by evaluating the fitted value assuming the dummy variable under consideration equals one.

Panel A: Coefficients of multinomial logit on settlement type

	Instrument B (N = 18)		Instrument C (N = 160)		Instrument X (N = 153)	
Variable definition	Coef.	*p*-value	Coef.	*p*-value	Coef.	*p*-value
Constant	-7.461	0.001	-6.179	0.000	-0.276	0.727
Log(market value)	0.537	0.016	0.326	0.006	-0.156	0.156
Book leverage	2.510	0.190	-0.054	0.937	0.246	0.628
Market-to-book ratio	-0.671	0.018	-0.118	0.147	-0.205	0.004
EBIT	3.730	0.186	1.005	0.412	-0.859	0.411
Interest coverage	0.020	0.785	0.036	0.256	-0.044	0.114
Investment	-5.568	0.225	-3.161	0.255	1.933	0.334
Slack	-0.152	0.906	-0.194	0.756	0.156	0.778
Free cash flow	-1.833	0.600	0.822	0.668	2.683	0.043
Stock price run-up	0.821	0.236	-1.777	0.000	-0.723	0.025
Decrease diluted earnings per share	5.552	0.109	8.658	0.000	-0.286	0.887
Investment grade	0.088	0.892	-1.399	0.000	0.086	0.775
Probability of conversion	0.489	0.764	3.784	0.000	1.463	0.016
N	768					
χ^2 (*p*-value)	0.000					
Pseudo R^2	0.138					

Panel B: Marginal effects of multinomial logit on settlement type

	Stock settlement (N = 437)		Instrument B (N = 18)		Instrument C (N = 160)		Instrument X (N = 153)	
Variable definition	Marg. effect	*p*-value	Marg. Effect	*p*-value	Marg. effect	*p*-value	Marg. effect	*p*-value
Log(market value)	-0.013	0.507	0.006	0.109	0.043	0.001	-0.036	0.038
Book leverage	-0.045	0.652	0.027	0.149	-0.018	0.828	0.036	0.659
Market-to-book ratio	0.042	0.001	-0.007	0.005	-0.007	0.429	-0.028	0.009
EBIT	-0.005	0.979	0.041	0.218	0.141	0.323	-0.177	0.276
Interest coverage	0.002	0.658	0.000	0.741	0.006	0.142	-0.008	0.060
Investment	0.074	0.857	-0.061	0.305	-0.430	0.200	0.418	0.187
Slack	-0.002	0.987	-0.002	0.903	-0.028	0.702	0.031	0.715
Free cash flow	-0.414	0.139	-0.028	0.496	-0.025	0.910	0.416	0.046
Stock price run-up	0.251	0.000	0.013	0.056	-0.196	0.000	-0.068	0.182
Decrease diluted earnings per share	-0.790	0.053	0.048	0.211	1.050	0.000	-0.309	0.310
Investment grade	0.079	0.857	0.002	0.749	-0.126	0.000	0.044	0.388
Probability of conversion	-0.540	0.000	-0.004	0.838	0.416	0.000	0.127	0.182

poor growth opportunities (marginal effect of -0.028 with a p-value of 0.009). The marginal effects of these variables are not significant for Instrument C issuers.

Firms that want to manage earnings are hypothesized to favor Instrument C settlements. We indeed find that firms choosing Instrument C settlements face the largest decreases in diluted EPS under the if-converted method (marginal effect of 1.050 with p-value of < 0.001). In unreported analysis, we find that Instrument C issuers are most likely to use stock repurchases and call spread overlays (29.56% and 33.96%, respectively). For Instrument X issuers, these percentages are 12.42% and 7.84%, whereas no Instrument B issuer uses stock repurchases or call spread overlays.[41]

4.7 Conclusion

This chapter examines convertible security design for a sample of 819 issuers over the years 2000 through 2007. We find that almost all of the firms in our sample issue equity-like convertibles; only five convertible issues have a Delta below 0.5. Hence, the probability that the securities will be converted is relatively high for almost all issues in our sample. For these equity-like convertible issues, we examine the determinants of the choice of the fixed income claim and the method of payment using a nested logit regression model. For our sample of 814 issues of equity-like convertible securities, we find that firms select a fixed income claim - either a bond or preferred stock - based on incentives to reduce corporate income taxes, minimize refinancing costs, and mitigate managerial discretion costs.

We further find that convertible debt issuers frequently select payment methods that permit them to report higher earnings. Especially net share settlements, which are convertible securities for which at least the principal will be settled in cash, are popular instruments to manage earnings. Some of the firms also adopt concurrent financial strategies that inflate reported earnings. The first strategy is to simultaneously repurchase stock, which reduces the number of outstanding shares and hence dilution. We will examine this strategy further in the next chapter. The second strategy is to use a call spread overlay, which reduces reported interest expenses by synthetically increasing the strike price of the conversion option.

Given the significant amount of innovation in the design of convertible securities, we also examine the role of the underwriters of the convertible securities. We

[41] The regression specification in Table 29 does not include dummies for stock repurchases and call spread overlays to reduce the number of variables compared to the number of observations (only 18 observations for Instrument B).

especially find the Bank of America, Deutsche Bank, and JP Morgan to be the underwriters of firms that use cash settlements, stock repurchases, and/or call spread overlays.

Chapter 5

Convertible arbitrage and stock repurchases[42]

5.1 Introduction

Over the last few years, firms have started to simultaneously repurchase common stock when issuing a convertible bond. An example is Equity Office Properties Trust, the largest office real estate investment trust in the U.S., which issued a $1.5 billion convertible bond and simultaneously repurchased $622 million of common stock (*Wall Street Journal*, July 5th, 2006). Of all the convertible bond issues in 2006, 33.1% were accompanied by a stock repurchase. On average, the stock buybacks account for 43.2% of the proceeds of the convertible bond issue. Our goal in this chapter is to obtain more insight on what motivates firms to combine convertible debt offerings with stock repurchases.

Chapter 4 already discussed the combination of convertible debt offerings with stock repurchases ("combined offerings") in light of earnings management. We found some evidence linking stock repurchases to earnings management. However, it is

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[42] This chapter is based on De Jong, Dutordoir, and Verwijmeren (2008). Part of this article was written while Patrick Verwijmeren was visiting at Owen Graduate School, Vanderbilt University. Ekkehart Boehmer, Nico Dewaelheyns, Rudi Fahlenbrach, Andrew Karolyi, Craig Lewis, Sophie Manigart, Ronald Masulis, Miguel Rosellón, Anil Shivdasani, Randall Thomas, Linda van de Gucht, Mathijs van Dijk, Chris Veld, and seminar participants at Universitat Autonoma de Barcelona, Catholic University of Leuven, Maastricht University, University of Melbourne, RSM Erasmus University, and the 2007 Australasian Finance and Banking conference provided useful comments.

unlikely that earnings management is the sole reason for the existence of combined offerings: especially with cash settlements, earnings per share dilution because of a convertible offering is not severe. Reasons for the existence of combined offerings are also not evident from existing convertible issuance theories. According to Stein's (1992) backdoor equity rationale for convertible debt issuance, firms with large equity-related financing costs use convertible bonds as delayed equity financing. In Stein's framework, firms would not simultaneously repurchase equity, since this mitigates their indirect equity issue. Green (1984) in turn argues that firms with high debt-related financing costs use convertibles as sweetened debt financing. Combining a convertible debt offering with a stock repurchase is also not consistent with this model, because, ceteris paribus, repurchasing equity increases firms' debt ratios and thus enhances the potential for debt-related financing problems.

Our main hypothesis in this chapter is that the recent surge in combined convertible debt offerings and stock repurchases can be explained by the influence of convertible debt arbitrageurs. Arbitrageurs (i.e., mostly hedge funds, but also institutional investors) are strongly involved in convertible issues. In the U.S., for example, convertible debt arbitrage funds buy about 75% of the convertible bonds (Arshanapalli, Fabozzi, Switzer, and Gosselin (2004), Mitchell, Pedersen, and Pulvino (2007)). To exploit underpriced convertible issues, arbitrageurs buy the convertibles and short the common stock of the firms that issue convertibles. The increased open market short selling creates a downward pressure on the stock price of the convertible debt issuer (Bechmann (2004), Mitchell, Pulvino, and Stafford (2004), Loncarski, ter Horst, and Veld (2007)). Therefore, firms might want to mitigate the negative stock price impact by repurchasing their own stock, which prevents the open market short sales.

The International Finance Review (IFR)'s comments on the specific convertible offerings provide several examples of this strategy, e.g.: "United Therapeutics bought back 1.8m shares, about 8% of outstanding, for \$112m, […] enabling buyers to pre-hedge positions through sales of stock back to the company" (October 28th, 2006) and "AmeriCredit repurchased \$254m of its stock on the convertible issue, providing a built-in hedge for convertible arbitrage funds" (September 16th, 2006).

The mechanism works as follows. The issuing firm sells convertibles to a convertible debt arbitrageur via an underwriter. To obtain an arbitrage position (i.e. to be hedged against stock price decreases), the arbitrageur borrows issuer shares and sells them to the underwriter at a pre-agreed-to price. The underwriter sells these shares to the issuing firm, thereby completing the stock repurchase. The benefit for the issuer is that crossing the arbitrageur's trades avoids concentrated open market short sales by convertible debt arbitrageurs and their associated negative stock price effect. The benefit for the arbitrageurs is that they do not have to short stock in a market that is crowded with other short sellers, at an uncertain price. Given this win-win situation, the package of a convertible issue and a stock repurchase is often referred to as a “Happy Meal” in practitioners’ circles.

We combine data from the Securities Data Company (SDC), Compustat, CRSP and the NYSE TAQ REG SHO database and obtain the following main findings. First, the issue date percentage of shares sold short (relative to trading volumes) is significantly smaller for combined offerings (20.7%) than for uncombined offerings (35.5%).[43] This finding can be explained by the fact that, in combined offerings, short-selling positions of arbitrageurs are established in a private negotiation with the underwriter. Unlike the open market short sales that happen in uncombined offerings, such transactions are not marked as short sales in the NYSE TAQ REG SHO database. Second, average issue date abnormal stock returns are significantly less negative for combined offerings (-0.87%) than for single convertible offerings (-4.48%). Third, the number of stocks that the convertible issuers announce to repurchase strongly correlates with the number of shares expected to be shorted by arbitrageurs, assuming that they use a delta-neutral hedging technique to obtain their positions (correlation coefficient of 0.88). Finally, the typical firm engaged in a combined offering repurchases 85.5% of the announced number of shares in the first quarter after the announcement, whereas for uncombined stock repurchases this percentage is much lower (2.5%). The immediate execution of stock repurchases is consistent with arbitrageurs setting up their positions.

As discussed in Chapter 4, earnings management provides an additional potential reason for the concurrent stock repurchases. We also examine whether firms engage in combined offerings to signal their true value to the market, to move closer to their target debt ratio, or to finance a stock repurchase program. We fail to find convincing evidence for these alternative motivations.

Our contributions to the literature are the following. We contribute to the literature on the impact of short-selling activity on corporate actions. Lamont (2004) describes a variety of methods that firms use to impede short selling, including legal threats and lawsuits. We provide further evidence that firms actively anticipate the short-selling transactions of arbitrageurs. This chapter also contributes to the literature on convertible debt. Our study is related to a number of other papers that also examine innovations in convertible debt design, including Chapter 4 of this dissertation. Other examples are Korkeamaki and Moore (2004), who examine different call provisions in convertible bonds, and Hillion and Vermaelen (2004), who study the motives for issuing death spiral convertibles. Further, we contribute to the literature on stock

[43] On normal trading days, these percentages are 19.8% and 19.9%, respectively.

repurchases. Prior studies have shown that stock repurchases tend to be used to signal good prospects (Bhattacharya (1979), Vermaelen (1984)), to reduce the amount of free cash flows at management's disposal (Jensen (1986)), to reduce earnings per share dilution (Weisbenner (2000), Bens, Nagar, Skinner, and Wong (2003)), to bring the firm closer to its optimal debt ratio (Dittmar (2000)), and to deter takeovers (Bagwell (1991), Billett and Xue (2007)). We add another important motivation for repurchasing stock, being the avoidance of negative stock returns associated with open market short-selling activity.

The remainder of this chapter is organized as follows. Section 5.2 provides the theoretical background. Section 5.3 discusses the data, and Section 5.4 shows the empirical results regarding the main hypothesis. Section 5.5 investigates alternative explanations, and Section 5.6 concludes.

5.2 Hypothesis and testable predictions

In this section, we first explain our main hypothesis regarding the motivations for firms to combine a convertible debt offering with a stock repurchase and discuss the relevant literature. Subsequently, we discuss the testable predictions that can be derived from this hypothesis.

5.2.1 The happy meal explanation for combined offerings

In the U.S., convertible debt arbitrageurs buy about three quarters of the issues of convertible bonds (Arshanapalli, Fabozzi, Switzer, and Gosselin (2004), Mitchell, Pedersen, and Pulvino (2007)). Convertible arbitrage opportunities arise when convertibles are underpriced. Several studies have documented evidence of convertible debt underpricing (Ammann, Kind, Wilde (2003), Calamos (2003), Loncarski, ter Horst, and Veld (2007)). Potential reasons for such underpricing include underestimation of the stock return volatility (Calamos (2003)) and complexities associated with the valuation of these hybrid securities (Lhabitant (2002)). Agarwal, Fung, and Naik (2007) and Batta, Chacko, and Dharan (2007) argue that the excess returns from convertible arbitrage strategies are not mainly due to underpricing. Instead, the discounts on convertible bond issues represent a compensation for bearing liquidity risk, since convertible bonds are relatively illiquid.

Since convertibles embed a call option on the underlying stock, convertible debt arbitrageurs generally go short in the common stock of the issuing firm in order to hedge their positions. That is, the short position hedges against the risk of decreasing stock prices. Brent, Morse, and Stice (1990), Ackert and Athanassakos (2005), and Choi, Getmansky, and Tookes (2007) indeed document that firms with convertible debt outstanding report higher monthly short interest than other companies.[44]

A number of theoretical studies predict a negative impact of short-selling activity on stock prices. Miller (1977) argues that only informed traders with strong negative information will be willing to engage in short selling, as short selling is costly. Diamond and Verrecchia (1987) argue that rational market participants should know that high levels of unexpected short sales are bad news, and incorporate this information into their trading decisions. Therefore, high levels of short selling should cause stock prices to drop.

Several papers have empirically tested the relation between short sales and stock prices. Senchack and Starks (1993) look at U.S. firms' reported monthly stock interest in the period 1980 to 1986, and find weak support for the hypothesis that the market reaction to increased short interest is negative around the announcement date. Aitken, Frino, McCorry, and Swan (1998) study the effect of short sales on instantaneous price changes by examining the Australian stock market, in which short sales are disclosed immediately. They find that prices react negatively. Ackert and Athanassakos (2005) argue that stock prices may also react when disclosure is not immediate, as in the U.S. and Canada. In line with their expectations, they find negative contemporaneous price effects for Canadian stocks. Cohen, Diether, and Malloy (2007) find that an increase in shorting demand leads to negative abnormal returns of 2.54% in the following month.

Brent, Morse, and Stice (1990) make a distinction between short selling based on private information and arbitrage-related short selling. Arbitrageurs that short sell shares of a convertible issuer are not directly trading on adverse information about the firm's stock. Instead, these arbitrageurs seek to exploit the fact that convertibles tend to be underpriced. Still, various studies show downward stock price pressures caused by arbitrage-related short selling. Mitchell, Pulvino, and Stafford (2004) study stock price reactions to mergers, and find that nearly half of the negative price reaction for the acquirer reflects downward price pressure because of arbitrage-induced short selling. Bechmann (2004) examines why the announcement of an "in-the-money" convertible bond call is associated with an average contemporaneous abnormal stock price decrease of 1.75%. He shows that the decrease is due to arbitrage-related short

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[44] Short sales are regulated by SEC Rules 240.10a-1 and 240.10a-2. Rule 240.10a-1(a) stipulates that short sales are prohibited when stock prices are declining according to the so-called up-tick rule. However, Rule 240.10a-1(e) states that the up-tick rule does not apply if you are the owner of a convertible bond. This means that even if stock prices are declining, it will be possible for arbitrageurs who own convertible bonds to short sell the corresponding stock.

selling. Loncarski, ter Horst, and Veld (2007) show that short-selling activity by arbitrageurs has a negative impact on the stock price of Canadian convertible debt issuers.

Based on the IFR comments accompanying several of the combined offerings, as well as on informal conversations with convertible bond issuers and their financial advisors, we hypothesize that the combinations of convertibles with stock repurchases are driven by the issuer's wish to mitigate the downward stock price impact of arbitrage-related short selling. The issuer sells the bond to an underwriter in a private 144A offering.[45] The transaction can be completed as rapidly as overnight. The underwriter resells the 144A security for a spread to qualified institutional buyers. These buyers are generally arbitrageurs that hedge their positions by borrowing shares and selling these shares to the underwriter at a pre-agreed-to price. The issuer buys these shares from the underwriter, thus avoiding the downward pressure resulting from open market short sales. The arbitrageur should also be satisfied with this outcome, since he obtains his hedged position without having to engage in open market short sales at an uncertain price. Thus, every party engaged in the transaction gains, which explains its "Happy Meal" nickname in practitioners' circles.

5.2.2 Testable predictions

From our main hypothesis regarding the motivations for combined offerings, we derive four testable predictions. First, for combined transactions, issue date open market short sales should be lower than for uncombined transactions, after controlling for other factors that determine short-selling activity. The reason is that, in combined offerings, the underwriter and the arbitrageur set up the shorting position in a private transaction executed at a pre-agreed-to price. Unlike open market short sales, such privately-negotiated short sales are not registered in the NYSE TAQ REG SHO database. Second, due to the lower open market short-selling activity, issue date abnormal returns should be less negative for combined offerings than for single convertible offerings. Third, since the combined repurchases result from an anticipation of the actions of convertible arbitrage funds, the number of shares that a

[45] Combinations of convertible issues and stock repurchases have been prohibited under Rule 10b-6 of the Securities Act of 1934 (Lowenfels (1973)). The restrictions of trading during distributions are relaxed in Regulation M, which has replaced Rule 10b-6 since December 1996. Regulation M allows the combination of convertible issues and stock repurchases for issues under Rule 144A. Rule 144A was issued in 1990 to improve the liquidity and efficiency of the private placement market by giving more freedom to institutional investors to trade securities. Securities issued under Rule 144A do not require registration with the SEC, but can be traded without restriction in the secondary market among qualified institutional buyers (i.e., institutions that own over $100 million in assets).

convertible debt issuer announces to repurchase should closely match the expected short positions of arbitrageurs. Fourth, whereas normal stock repurchases often take years to be effectively executed (Stephens and Weisbach (1998)), convertible debt issuers should repurchase their stock almost immediately after the repurchase announcement, in order to allow convertible debt arbitrageurs to adopt their arbitrage positions.

5.3 Data

We acquire information on convertible issues and share repurchases in the U.S. for the period 1997 to 2006. We start in 1997, because Regulation M, which made combined offerings legal, was introduced late 1996. We obtain a sample of convertible debt offerings from the Securities Data Company (SDC)'s New Issues Database, and a sample of stock repurchase announcements from SDC's Mergers & Acquisitions Database. We exclude stock repurchases that SDC classifies as Dutch auctions or self-tender offers. We retrieve company accounts data from Compustat and stock price data from CRSP.

We use Factiva to determine the announcement dates of the convertible debt offerings and the stock repurchases. We mark a convertible issue as a "combined offering" if the firm announces that it uses the proceeds to repurchase stock, or when both transactions are announced separately at the same date. We also search the window [-5, 5] relative to the convertible debt announcement date for stock repurchases, but this yields no additional observations.

Panel A of Table 30 shows the number of convertible issues, stock repurchases, and combined offerings over the sample period.[46] As in Chapter 4, we find that the number of convertible debt issues fluctuates somewhat over time. In the period 1997 to 2006, convertible issuance peaks in 2003 (256 issues). The low point, 108 issues, occurs in 1999. After a decrease of convertible issuance in 2004 and 2005, the number of issues again increases in 2006. The number of stock repurchases has been fairly constant since 2000. Before that year, the number of repurchases is substantially higher than it has been since then. The number of combined convertible debt issues and stock repurchases, in turn, has strongly increased over the years. Before 2003,

[46] We constructed this sample before we constructed the sample used in Chapter 4. As a result, we have not included 2007. Also, since SDC sometimes changes its dataset, the number of issues per year can slightly differ.

Table 30: Dispersion over time, value of the transactions, and industrial dispersion.

This table presents summary statistics. The sample period in Panel A is 1997-2006, the sample period in Panels B and C is 2003-2006. Panel A reports the number of convertible issues, stock repurchases, and combined offerings of convertible issues and stock repurchases per year. We label a convertible issue as a combined offering when the firm announces to use part of the proceeds of the convertible debt offering to repurchase stock, or when both transactions are announced on the same date. Panel B compares the proceeds of the convertible issue with the size of the announced stock repurchase. The proceeds of the convertible issue are obtained from SDC; the size of the stock repurchase is obtained from SDC or from the repurchase announcement. We also compare the announced size of the repurchase to firms' market values. We calculate a firm's market value by multiplying Compustat Item 25 with Item 199. In Panel C, we show the distribution of convertible issues over the Fama-French 12-industry classification.

Panel A: Dispersion over time

Year	Number of convertibles issued	Number of repurchases announced	Number of combined offerings	Percentage combined offerings of total convertible issues
1997	237	1,286	0	0.0%
1998	145	1,934	0	0.0%
1999	108	1,515	0	0.0%
2000	153	806	1	0.7%
2001	207	659	3	1.4%
2002	117	469	2	1.7%
2003	256	470	10	3.9%
2004	181	563	9	5.0%
2005	113	638	13	11.5%
2006	142	586	47	33.1%

Panel B: Value of the announced stock repurchases compared to the proceeds of the convertible issue and firms' market values

	Mean	Median	Minimum	Maximum	Standard deviation
Value repurchase / proceeds convertible issue	0.432	0.369	0.050	1.111	0.276
Value repurchase / market value	0.072	0.054	0.004	0.489	0.070

Panel C: Industry classification

Fama-French 12-industry classification	Firms that issue a convertible and repurchase shares		Firms that issue a convertible without repurchasing shares	
	N	%	N	%
Consumer nondurables	1	1.3%	7	1.1%
Consumer durables	2	2.5%	9	1.5%
Manufacturing	4	5.1%	43	7.0%
Energy	0	0.0%	43	7.0%
Chemicals	0	0.0%	8	1.3%
Business equipment	15	19.0%	126	20.6%
Telephone	1	1.3%	29	4.7%
Utility	1	1.3%	20	3.3%
Wholesale	9	11.4%	46	7.5%
Healthcare	16	20.3%	107	17.5%
Financial	16	20.3%	103	16.8%
Other	14	17.7%	72	11.7%
Total	79	100.0%	613	100.0%

these combined offerings are very scarce. In 2003 and 2004 they account for 3.9% and 5.0% of the total number of convertibles, respectively. In 2005, the combined offerings comprise 11.5% of that year's convertible issues. The year 2006 is the most popular year with 33.1% of the total number of convertible issues combined with a stock repurchase.

Overall, these findings indicate that there is an increasing trend to combine convertible issues with stock repurchases, and that this trend is not matched by a strong increase in the overall number of repurchases. Given the very low number of combined offerings prior to 2003, we will from now on limit our research window to the period 2003 to 2006.[47] This leaves us with a sample of 613 uncombined convertible offerings, 2,257 uncombined stock repurchases, and 79 combined offerings.

Panel B of Table 30 compares the size of the convertible offerings with that of the stock repurchases. The proceeds of the convertible debt offerings and the size of the uncombined stock repurchases are obtained from SDC. The size of the stock repurchases that are not covered in SDC are retrieved from Factiva.

We find that the proceeds of the convertible issues are generally substantially larger than the funds used to repurchase shares. The average (median) size of the stock repurchase represents 43.2% (36.9%) of the proceeds of the convertible issue. Still, in five firms the value of the announced repurchase exceeds the proceeds of the convertible issue. The minimum percentage of the proceeds used to repurchase shares, given that a firm opts for a combined offering, is 5.0%. On average, the stock repurchases represent 7.2% of the firm's market value.

Panel C of Table 30 breaks down the sample by the Fama-French 12-industry classification. Most convertibles are issued by firms in the business equipment industry, the financial sector, and the healthcare sector. Firms that engage in combined offerings are spread among 10 of the 12 industries, although the wholesale, financial, and healthcare sector are slightly overrepresented.

[47] The gradual increase in combined offerings suggests that these transactions are a financial innovation: since the introduction of Regulation M, the possibility and benefits of using a simultaneous convertible issue and stock repurchase have become known to more and more firms. We have checked whether particular advisory firms are overrepresented in the sample of firms with combined offerings, because these advisors may drive the increase in combined offerings. We do not find a significant overrepresentation of any advisory firm in combined offerings, compared to the advisory firms involved in uncombined convertible issues.

5.4 Empirical evidence on the Happy Meal explanation

In this section, we test our hypothesis that combinations of convertibles and stock repurchases are driven by the wish to facilitate convertible debt arbitrageurs in obtaining their hedged positions. Each subsection examines one of our four testable predictions.

5.4.1 Short-selling activity for convertible issuers

To test our first prediction, we retrieve all short sale flows for convertible debt issuers in 2005 and 2006 from the NYSE TAQ database's REG SHO file. We start in 2005 as daily data are only available as of January 2005. Thus, in all analyses involving short-selling data, we limit our research window to the period 2005 to 2006. This is not a large limitation since the bulk of combined offerings are made in this time frame.

We compute the total short sales per firm on a specific day by summing all short sales for that firm on that day. We follow Ackert and Athanassakos (2005) by scaling the daily number of short sales by the firm's daily trading volume. We also compute the change in short sales to capture the abnormal part of firms' short sales:

$$Change\,in\,short\,sales = \frac{short\,sales\,issue\,date - normal\,short\,sales}{normal\,trading\,volume}. \tag{27}$$

We calculate normal short sales (trading volume) by taking the average short sales (trading volume) over the period ranging from ten to four trading days before the issue date.

Table 31 reports the results of a univariate analysis comparing average short-selling activity for convertible issuers that simultaneously repurchase stock to short-selling activity of regular convertible debt issuers. For convertible debt issuers that simultaneously repurchase stock, issue date short sales represent on average 20.7% of trading volume. For other convertible debt issuers, the average ratio of issue date short sales to trading volume is 35.5%. This difference is significant at the 1% level. Our findings are similar when we compute the percentage of short sales relative to the number of shares outstanding. By contrast, the issue date ratio of trading volume to shares outstanding is not significantly different between both subsamples. Short-selling activity prior to the convertible issue date is also similar: both groups have a short sales to trading volume ratio of about 20% over the trading days [-10, -4]. This percentage is similar to findings reported by Diether, Lee, and Werner (2007).

Table 31: Univariate analysis of the differences between combined and uncombined convertible issuers

This table presents the results of univariate tests of the differences between combined and uncombined convertible debt issuers. The sample period is 2005-2006, and we only include convertible issuers for which we have short-selling data available. We label a convertible issue as a combined offering when the firm announces to use part of the proceeds of the convertible debt offering to repurchase stock, or when both transactions are announced on the same date. Short sales at the issue date are the sum of all short sales for that firm that day, as reported in the NYSE TAQ database's REG SHO file. We compute the change in short sales by dividing the difference between short sales at the issue date and short sales over trading days [-10, -4] by the trading volume over this same period. Daily trading volume and the number of shares outstanding are from CRSP. Normal short sales is a firm's daily short sales over trading days [-10, -4] divided by the trading volume over that same period. Delta is the convertible's sensitivity to small stock price changes. Stock liquidity is the average trading volume divided by the average number of shares outstanding in the year prior to the offering. Dividend paying is a dummy variable registering whether a firm paid a dividend in the year prior to the offering, which can be established with Compustat Item 21. The stock price run-up is the firm-specific raw return over the 75 trading days before the announcement date, and is computed with CRSP Item RETX. Total assets (expressed in millions of dollars and measured at the fiscal year-end prior to the announcement date) correspond to Compustat Item 6. Book leverage (measured at fiscal year-end prior to the announcement date) is Compustat Item 9 divided by Item 6. The market-to-book ratio (measured at the fiscal year-end prior to the announcement date) is computed as (Item 25 * Item 199 – Item 60 – Item 6) / Item 6. Proceeds represent the total amount of money raised by the convertible issue in millions of dollars. Private placement is a dummy variable equal to one when the bond is privately placed, and equal to zero otherwise. *t*-statistics are for the difference in means between the combined and the uncombined samples. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Total convertible debt sample		Combined offerings		Uncombined offerings		*t*-statistics
	N	Mean	N	Mean	N	Mean	
Short sales / trading volume at issue date	112	0.316	29	0.207	83	0.355	-5.00***
Change in short sales	112	1.329	29	0.227	83	1.714	-5.33***
Short sales / shares outstanding at issue date	112	0.012	29	0.007	83	0.013	-3.01***
Trading volume / shares outstanding at issue date	112	0.036	29	0.039	83	0.035	0.50
Normal short sales / trading volume	112	0.199	29	0.198	83	0.199	-0.06
Delta	78	0.893	25	0.874	53	0.902	-0.57
Stock liquidity	112	0.010	29	0.010	83	0.010	0.01
Dividend paying	110	0.527	28	0.393	82	0.573	-1.66*
Stock price run-up	112	0.001	29	0.001	83	0.001	0.99
Total assets	112	33,706	29	17,565	83	39,345	-1.07
Book leverage	112	0.495	29	0.494	83	0.496	-0.02
Market-to-book ratio	112	1.633	29	1.660	83	1.623	0.19
Proceeds	112	395	29	480	83	366	1.07
Private placement	110	0.927	29	1.000	81	0.901	2.96***

Of course, the lower issue date open market short sales for combined convertible offerings could be driven by the fact that these offerings are different with respect to determinants that drive short-selling activity. We therefore incorporate the following potential short sales determinants in our analysis. Unless otherwise mentioned, these variables are measured at the fiscal year-end preceding the convertible announcement date.

Delta: The delta of a convertible measures the convertible's sensitivity to small stock price changes (Calamos (2003)). The delta is calculated in a similar way as in Chapter 4. Loncarski, ter Horst, and Veld (2007) find that convertible arbitrageurs prefer convertible bonds with relatively high deltas, as these convertibles are more likely to be underpriced.

Liquidity: The average trading volume divided by average shares outstanding in the year prior to the offering. Arbitrageurs want to quickly establish or close positions, and therefore prefer more liquid stocks (Calamos (2003)).

Dividend paying: A dummy variable that equals one when the firm has paid a dividend in the fiscal year preceding the convertible announcement date, and zero otherwise. Calamos (2003) argues that short sellers have a preference for stocks that pay no dividends, since the dividend represents a cash outflow for them.

Stock price run-up: The average daily firm-specific raw return calculated over the 75 trading days before the announcement date, as in Lewis, Rogalski, and Seward (2003). Note that the run-up used in Chapter 4 was based on the total raw return over 75 days; this difference does not influence our results. The stock price run-up serves as a proxy for the perceived overvaluation of the firm by the market. We expect a positive relation with short-selling activity, as overvalued stock is more likely to be sold short.

We also include some standard control variables for which we have no strong prediction on the influence on short sales:

Assets: The book value of total assets.

Book leverage: The ratio of long-term debt to total assets.

Market-to-book ratio: The market price per share of common stock divided by the book value per share.

Proceeds: The total amount of money raised by issuing the convertible.

Private placement: A dummy variable that equals one when the convertible issue is privately placed under Rule 144A, and zero otherwise.

Table 31 shows that, as expected, firms that issue convertible bonds in combination with a stock repurchase are significantly less likely to pay dividends. All combined offerings are privately placed, while 90.1% of the regular convertible issues are privately placed. The other control variables are not significantly different between the two groups.

In Table 32, we test the impact of a concurrent stock repurchase on short-selling activity by using an OLS regression analysis.

Table 32: Impact of adding a stock repurchase to a convertible offering on short-selling activity

This table presents the results of an OLS regression analysis on the impact of adding a stock repurchase to a convertible issue on short-selling activity around the issue date. The sample period is 2005-2006. Short sales at the issue date are the sum of all short sales for that specific firm that day, as reported in the NYSE TAQ database's REG SHO file. We compute the change in short sales by dividing the difference between short sales at the issue date and short sales over trading days [-10, -4] by the trading volume over that same period. Daily trading volume is obtained from CRSP. Combined offering is equal to one for combined offerings, and zero otherwise. We label a convertible issue as a combined offering when the firm announces to use part of the proceeds of the convertible debt offering to repurchase stock, or when both transactions are announced on the same date. Delta is the convertible's sensitivity to small stock price changes. Log(stock liquidity) is the natural logarithm of the ratio of the average trading volume to the average shares outstanding in the year prior to the offering. Dividend paying is a dummy variable registering whether a firm paid a dividend in the year prior to the offering, which can be established with Compustat Item 21. The stock price run-up is the firm-specific raw return over the 75 trading days before the announcement date, and is computed with CRSP Item RETX. Log(assets) corresponds to the natural logarithm of Compustat Item 6 (measured at the fiscal year-end preceding the announcement date). Book leverage is Compustat Item 9 divided by Item 6. The market-to-book ratio is computed as (Item 25 * Item 199 – Item 60 – Item 6) / Item 6. Book leverage and the market-to-book ratio are both measured at the fiscal year-end preceding the announcement date. Log(proceeds) represents the natural logarithm of the total amount of money raised by the convertible issue. Normal short sales is a firm's daily short sales over trading days [-10, -4] divided by the trading volume over that same period. We also include industry dummies based on the Fama-French 12-industry classification. We report *t*-statistics calculated with Huber-White standard errors, to control for heteroscedasticity. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Short sales at issue date / trading volume at issue date (1)	Change in short sales (2)
Combined offering	-0.143***	-1.333***
	(-4.37)	(-2.71)
Delta	0.173**	3.242***
	(2.52)	(3.67)
Log(stock liquidity)	-0.055	-1.275
	(-1.22)	(-1.48)
Dividend paying	-0.009	-0.674
	(-0.27)	(-1.04)
Stock price run-up	12.398**	150.913
	(2.08)	(1.38)
Log(assets)	-0.125***	-1.703***
	(-3.74)	(-2.70)
Book leverage	0.146**	2.392
	(2.03)	(1.23)
Market-to-book ratio	-0.031*	-0.610**
	(-1.83)	(-2.13)
Log(proceeds)	0.036	0.764
	(1.45)	(1.65)
Normal short sales	0.551**	
	(2.17)	
N	76	76
R^2	56.4%	30.7%

Model 1 shows the results with the ratio of issue date short sales to trading volume as the dependent variable. The right-hand side of the regression includes a *Combined offering* dummy variable that equals one for combined offerings and zero for other convertible issues. We also include the potential short sales determinants described earlier, as well as industry dummy variables based on the Fama-French 12-industry classification. We take the normal level of short-selling activity into account by including the variable *Normal short sales*, which registers average short-selling activity over the trading days [-10, -4].

In line with our first prediction, we find a significant negative impact of the *Combined Offering* dummy variable. Hence, even after controlling for other potential determinants, open market issue date short sales are still significantly lower for combined convertibles. Model 2 shows that the results are similar when we use *Change in short sales* as the dependent variable.

For the other variables, we find that the delta of a convertible and the stock price run-up significantly increase short-selling activity. These results are in line with our expectations. *Normal short sales* and *Book leverage* have a significant positive impact on short-selling activity, while *Market-to-book ratio* and *Total assets* have a significant negative impact.

To check the robustness of our finding that open market short selling is significantly lower for combinations of convertible issues and stock repurchases, we perform the following additional analyses, which are not reported for parsimony. First, we scale short sales by shares outstanding, and obtain similar results. Second, instead of the *Liquidity* variable incorporated in the regression, we construct an alternative liquidity measure that takes the size of the convertible issue into account. This liquidity measure is calculated as the number of shares expected to be sold short (on the basis of delta, see Equation (28)) divided by the average daily trading volume prior to the offering. We find that our results are robust for this different measure of liquidity. Third, we allow for the possibility that the decision to repurchase stock is endogenous. That is, there could be (unobserved) characteristics that influence both the firm's decision to repurchase stock and the expected short sales. We use Heckman's (1979) two-step selection model, and still find a significant positive impact of the *Combined offering* dummy variable.[48] Fourth, we re-estimate the analysis for short-selling activity in the period from one day prior to one day after the issue date. We find similar results. Fifth, we look at the influence of single

[48] The first step consists of estimating a probit regression with the dependent variable equal to one for combined offerings and equal to zero for uncombined offerings, and with the same explanatory variables as those included in Table 32 on the right-hand side. In the second step, we estimate the same models as those in Table 32, except that we include the inverse Mills ratio obtained from the first-step analysis as an additional explanatory variable.

(uncombined) stock repurchase announcements on short selling. We find that short-selling activity at repurchase announcement dates does not significantly differ from short-selling activity in prior periods. This result indicates that the reduction in open market short-selling activity is a characteristic of stock repurchases combined with convertible offerings, rather than a general feature of stock repurchases.

5.4.2 Issue date abnormal stock returns

To test our second prediction, we calculate abnormal stock returns around the convertible debt issue date by means of standard event study methodology as described in Brown and Warner (1985). Our primary observation window is [-1, 0] with day 0 representing the issue day, and we estimate the normal return over the window [-200, -30]. The market return is the CRSP equally-weighted market index. Panel A of Table 33 presents the results.

For the sample of uncombined convertible issues, we find an average cumulative abnormal return of -4.481%. Excess returns for convertible debt issuers that combine their offering with a stock repurchase are less negative and not significantly different from zero, i.e., -0.873% on average. In unreported robustness checks, we obtain similar findings for other event windows. These results are in line with our hypothesis that convertible debt issuers use stock repurchases to avoid a highly negative issue date abnormal return caused by open market short-selling activity.

To formally test the influence of an increase in short sales on the issue date returns, we regress abnormal returns measured over the window [-1, 0] on *Change in short sales* and control variables. Panel B of Table 33 presents the results of this regression. We find that *Change in short sales* has a significantly negative impact on the issue date abnormal returns. This result is consistent with our conjecture that the differences in issue date abnormal return between combined and uncombined convertibles are driven by differences in short-selling activity.[49]

The delta and the market-to-book ratio also have a significant coefficient with a negative and a positive sign, respectively. These findings are in line with findings on

[49] For 93.0% of the uncombined convertible offerings, the announcement happens either on the trading date before the issue date or on the issue date itself. The reason is that the large majority (90.1%) of the offerings are privately placed, which means that they can be issued very quickly. For the sample of combined issues, 93.7% of the announcements happen either on the trading date before the issue date or on the issue date itself. Therefore, an alternative explanation for the abnormal return differences between combined and uncombined convertible offerings is that the former offerings signal a higher firm quality than the latter. We examine this explanation in Section 5.5.1.

Table 33: Cumulative abnormal stock returns at the issue date

This table presents the cumulative abnormal returns at the issue date of (un)combined convertible debt offerings. We label a convertible issue as a combined offering when the firm announces to use part of the proceeds of the convertible debt offering to repurchase stock, or when both transactions are announced on the same date. The estimation window for determining the abnormal returns is [-1, 0], with day zero representing the issue date. Panel A reports the average cumulative abnormal returns. The sample period in Panel A is 2003-2006. Panel B shows the results of OLS regression analyses examining the effects of various characteristics on the abnormal returns at the issue date. Given that we need short-selling data, the sample period is 2005-2006. We compute the change in short sales by dividing the difference between short sales at the issue date and short sales over trading days [-10, -4] by the trading volume over that same period. Delta is the convertible's sensitivity to small stock price changes. Log(stock liquidity) is the natural logarithm of the ratio of the average trading volume divided by the average shares outstanding in the year prior to the offering. Dividend yield is Compustat Item 21 divided by the market value, calculated as Item 25 * Item 199 (measured at the fiscal year-end prior to the announcement date). The stock price run-up is the firm-specific raw return over the 75 trading days before the announcement date, and is computed with CRSP Item RETX. Log(assets) corresponds to the natural logarithm of Compustat Item 6 (measured at the fiscal year-end prior to the announcement date). Book leverage is Compustat Item 9 divided by Item 6. The market-to-book ratio is computed as (Item 25 * Item 199 – Item 60 – Item 6) / Item 6. Leverage and market-to-book ratio are both measured at fiscal year-end prior to the announcement date. Log(proceeds) represents the natural logarithm of the total amount of money raised by the convertible issue. We also include industry dummies based on the Fama-French 12-industry classification. We report *t*-statistics (calculated with Huber-White standard errors to control for heteroscedasticity) in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Cumulative abnormal returns at the issue date

	Combined offerings	Uncombined offerings	Difference in means
Mean	-0.873%	-4.481%***	3.608%***
Patell Z statistics	-0.43	-26.47	
t-statistic for difference in means			6.07***
N	73	531	

Panel B: Impact of short sales, firm characteristics, and bond characteristics on cumulative abnormal returns

	Cumulative abnormal returns at the issue date
Change in short sales	-0.008**
	(-2.10)
Delta	-0.049**
	(-2.05)
Log(stock liquidity)	-0.005
	(-0.35)
Dividend yield	-0.099
	(-0.47)
Stock price run-up	1.741
	(0.40)
Log(assets)	0.023
	(0.97)
Book leverage	0.051
	(1.60)
Market-to-book ratio	0.015**
	(2.19)
Log(proceeds)	0.001
	(0.04)
N	76
R^2	30.7%

the determinants of the abnormal returns at convertible debt announcements reported by Lewis, Rogalski, and Seward (2003).

5.4.3 The number of shares announced to be repurchased

Convertible arbitrageurs use the delta to determine the number of shares to be shorted against the long position in the convertible (Calamos (2003)). To calculate the expected number of shares sold short, we assume that convertible arbitrageurs follow a so-called delta-neutral hedging technique, which makes their positions invariant to small stock price movements. The expected number of shares that will be shorted using a delta-neutral hedging technique can be determined by means of the following formula:

$$\#common\ shares\ short = \frac{\#convertibles\ issued * face\ value * delta}{conversion\ price}. \tag{28}$$

The IFR comments on various convertible bond issues effectively relate the simultaneous stock repurchases to the delta of the convertible, e.g.: "Proceeds from the offering [of Medimmune] were used […] to repurchase $150m of stock on the deal; […] the delta hedge is a common application to mitigate the impact of short selling" (June 24th, 2006) and "Generally, when you model a convertible, you allow for some slippage on the stock, but by buying back the delta, you are guaranteeing the hedge" (convertible issue of Waste Connections, March 18th, 2006).

If the repurchase behavior in combined offerings is indeed influenced by arbitrage activities, we expect the correlation between the number of shares that should be repurchased according to the delta-neutral technique and the number of shares the firm announces to repurchase to be high. For 50 of the firms engaging in a combined offering, we have all the necessary information to calculate the expected number of shares sold short. We find that the correlation coefficient between the common stock expected to be shorted and the common stock the firm announces to repurchase is 0.88. The median ratio of shares announced to be repurchased to shares predicted to be repurchased is 55.6%. This relatively low median could be caused by a bias in our calculation of the delta. For instance, delta is biased because it does not take the time to first call into account. When we calculate delta using the time to first call as the input for the time to maturity, we find that the median ratio of shares announced to be repurchased is 79.4%. This percentage is close to the percentage of convertible bonds that tend to be bought by convertible debt arbitrageurs (Arshanapalli, Fabozzi, Switzer, and Gosselin (2004), Mitchell, Pedersen, and Pulvino (2007)). Hence, we interpret the findings in this section as evidence in favor of an influence of convertible debt arbitrage.

5.4.4 The speed with which common stock is repurchased

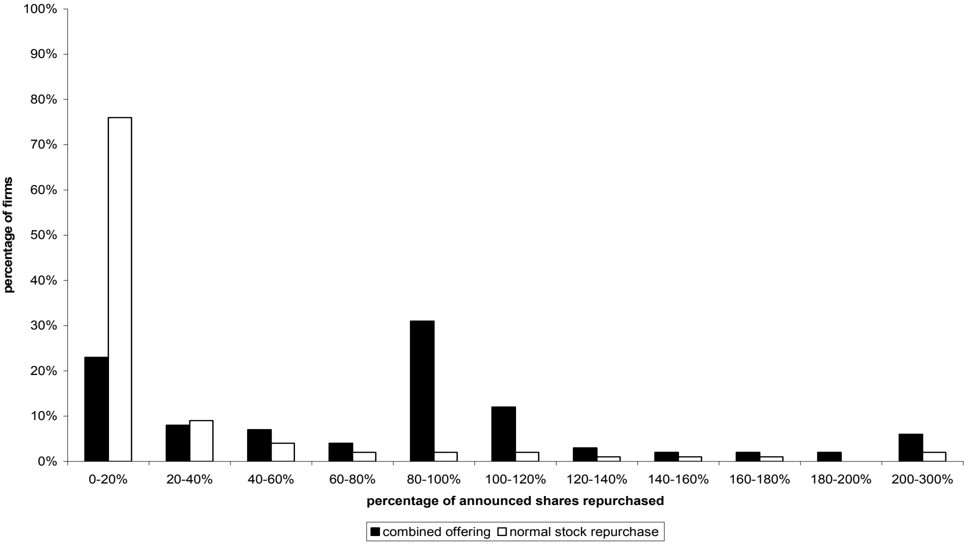
A fourth test relates to the speed with which shares are actually repurchased. An announcement of a stock repurchase does not precommit firms to acquire a specified number of shares. If convertible debt issuers buy back shares to help arbitrageurs obtain their arbitrage positions, then we expect the stock repurchases to be executed very quickly after their announcement.

Stephens and Weisbach (1998) study a sample of 450 repurchase programs from 1981 to 1990. Employing CRSP data, they find that firms on average acquire only 6.3% of the number of stocks announced to be repurchased in the same quarter of the repurchase announcement, 46.2% within a year, and 73.9% within three years after the announcement. Similar to these authors, we examine changes in shares outstanding obtained from CRSP. Among the combined issues, we have 48 observations with sufficient data to determine the changes in shares outstanding for the first quarter. We also re-estimate the percentage of shares that is repurchased for normal (uncombined) stock repurchases. We have 1,701 stock repurchase observations with sufficient data. In line with Stephens and Weisbach, we reset observations in which the number of shares increases to zero, since we are only interested in decreases.

Figure 8 shows the actual shares repurchased in normal stock repurchases and in combined offerings during the first quarter after the announcement date. The white bars represent the percentage of stock repurchased in uncombined stock repurchases. More than 70% of the firms do not repurchase more than 20% of the announced repurchases in the first quarter. For calculating the average percentage of shares repurchased, we reset observations in which the number of shares repurchased exceeds the announced number to 100%. For normal stock repurchases, we find that on average 18.5% of the announced shares are repurchased in the first quarter (the median value equals 2.5%). This percentage is higher than the 6.3% found by Stephens and Weisbach (1998), indicating that firms have increased their actual stock repurchases over time.

Figure 8: Percentages of actual repurchases in the first quarter after the announcement of a stock repurchase.

This figure shows which percentage of an announced stock repurchase is actually repurchased within the first three months after the announcement. The sample period is 2003-2006. The black bars represent stock repurchases that are announced in combination with convertible bond issues. The white bars represent stock repurchases that are announced without a simultaneous convertible bond issue.



The black bars represent the percentage of stock repurchased in combined offerings. A relatively large number of firms (27 or 56.3%) perform more than 80% of the announced stock repurchase in the first quarter after the announcement. The average (median) percentage of shares repurchased in the first quarter is 63.6% (85.5%). Due to potential simultaneous increases in shares outstanding (e.g., due to stock option exercises), the real percentages that are repurchased should be even higher. Apparently, firms in a combined offering repurchase shares much faster than in normal repurchases, which is consistent with arbitrageurs obtaining their positions.

5.5 Alternative explanations

In this section, we examine which other factors might induce firms to opt for a combined offering. We also discuss the possibility that the convertible debt offering serves to finance a stock repurchase.

5.5.1 Signal firm value

Constantinides and Grundy (1989) suggest that the combinations of convertible debt offerings with stock repurchases might also be inspired by signaling motivations. They examine which security a firm should issue when it has private information about its own value, and show that the company can reveal its true value to the market by combining a convertible debt offering with a stock repurchase. The intuition is that, when issuing a convertible, firms have an incentive to overstate their true value. Convertible debt announcements therefore have a negative impact on stock prices, which is confirmed in findings of Davidson, Glascock, and Schwartz (1995), Lewis, Rogalski, and Seward (2003), and Marquardt and Wiedman (2005). The stock repurchase provides a countervailing incentive, since firms will be more likely to buy back stock when they are undervalued. Stock repurchase announcements therefore tend to have a positive impact on stock prices (Asquith and Mullins (1986), Comment and Jarrell (1991), Ikenberry, Lakonishok, and Vermaelen (1995)).

Constantinides and Grundy's (1989) model implies that announcement returns should be less negative for convertible debt offerings combined with a stock repurchase than for uncombined offerings. However, since for the large majority of the convertible debt offerings the announcement happens very close to the issuance, we cannot disentangle announcement effects from issuance effects.

We therefore test the validity of the signaling explanation in an alternative way. We develop three proxy variables for a firm's need for signaling, and predict that these variables should have a positive impact on the likelihood of adding a stock repurchase to a convertible offering, if the signaling explanation holds.

The first proxy is the *Stock run-up* variable defined earlier. When a firm has a high stock run-up prior to an equity(-linked) offering announcement, the market is more likely to think that the offering is inspired by firm overvaluation. For such companies, repurchasing stock might be a way to signal that their stock is in fact not overvalued. The other two proxies relate to the level of informational asymmetry:

Informational asymmetry 1: This variable measures the firm-specific variation, *psi*, as constructed in Durnev, Morck, Yeung, and Zarowin (2003). The measure is based on the assumption that greater firm-specific variation in stock prices reflects more information getting into the stock price, i.e., less informational asymmetry. The firm-specific stock return variation is obtained from the regression:

$$Firm\ return_t = \beta_0 + \beta_1 * market\ return_t + \beta_2 * industry\ return_t + \varepsilon, \qquad (29)$$

which is estimated for each firm using monthly returns measured over the previous calendar year. Industry returns are estimated based on 2-digit SIC-codes. The market and industry returns are value-weighted averages excluding the firm for which the regression is estimated. The variance of ε is scaled by the total variance of the dependent variables in the regression. This operation is equal to dividing the residual sum of squares by the total sum of squares, or $1 - R^2$. The resulting *psi* is a firm-specific return variability in a given year relative to the total return variability. We also employed this variable in Chapter 3.

Informational asymmetry 2: This measure is based on the quality of working capital accruals and earnings. Dechow and Dichev (2002) and Lee and Masulis (2007) argue that accruals quality is a synonym of earnings quality. They construct a measure of accruals quality that maps accruals into cash flow realizations at time *t-1*, time *t*, and time *t+1*. Dechow and Dichev suggest that estimation errors in accruals are likely to reduce the beneficial role of accruals: the quality of accruals decreases when the standard deviation of the estimation errors increases. Since poor accounting quality raises investor uncertainty about a firm, the standard deviation of the estimation errors should be positively related to informational asymmetry.

We use McNichols' (2002) modification of the model, which is:

$$Ca_t = \gamma_0 + \gamma_1 * cfo_t + \gamma_2 * cfo_{t+1} + \gamma_3 * cfo_{t-1} + \gamma_4 * \Delta sales_t + \gamma_5 * ppe_t + v_t, \quad (30)$$

where *Ca* are the total current accruals, *cfo* are the cash flows from operation, and *ppe* is the value of property, plant, and equipment. The term v_t is the error term. Since we are interested in the firm-specific variation, we take the standard deviation of this error term (with a minimum number of observations of four consecutive years, and a maximum of fifteen).

High informational asymmetry increases the need for signaling, and therefore the likelihood that firms will add a stock repurchase to their convertible offering. We test the effects of the three signaling proxy variables on the decision to combine a convertible debt offering with a stock repurchase in a probit model, in which the dependent variable is equal to one for combined offerings, and equal to zero for uncombined offerings. Table 34 shows the results.

Table 34: Impact of Firm and Bond Characteristics on the Decision to Combine a Convertible Issue with a Stock Repurchase

This table presents the results of the estimation of a probit model. The sample period is 2003-2006. The dependent variable is a dummy that equals one for combined offerings and zero for uncombined offerings. We label a convertible issue as a combined offering when the firm announces to use part of the proceeds of the convertible debt offering to repurchase stock, or when both transactions are announced on the same date. Decrease EPS is the change in diluted earnings per share that would occur without a stock repurchase. Bonus is the correlation between the change in annual CEO cash bonus (reported in Execucomp) and the change in diluted EPS by 2-digit SIC code for the year before the offering. Both Decrease EPS and Bonus are calculated as in Marquardt and Wiedman (2005). Delta is the convertible's sensitivity to small stock price changes. The stock price run-up is the firm-specific raw return over the 75 trading days before the announcement date, and is computed with CRSP Item RETX. Log(assets) corresponds to the natural logarithm of Compustat Item 6 (measured at the fiscal year-end preceding the announcement date). Book leverage is Compustat Item 9 divided by Item 6. The market-to-book ratio is computed with Compustat data as (Item 25 * Item 199 – Item 60 – Item 6) / Item 6. Book leverage and market-to-book ratio are measured at the fiscal year-end preceding the announcement date. Volatility represents the stock return variance in the year prior to the issue date, and is estimated as the standard deviation of the monthly returns (reported in CRSP). Informational asymmetry 1 measures the firm-specific variation in stock prices; Informational asymmetry 2 measures the quality of working capital accruals and earnings. We also include industry dummies based on the Fama-French 12-industry classification as well as year dummies. We report *t*-statistics (calculated with Huber-White standard errors to control for heteroscedasticity) in parentheses. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Combined offering		
	(1)	(2)	(3)
Decrease EPS	2.236	2.635	0.859
	(1.31)	(0.92)	(0.41)
Bonus	-0.385	-0.545	-0.217
	(-0.90)	(-0.97)	(-0.49)
Delta	-0.328	-0.259	-0.159
	(-0.75)	(-0.36)	(-0.30)
Stock price run-up	-26.383	-72.929	-39.547
	(-0.87)	(-1.41)	(-1.26)
Log(assets)	-0.028	0.257	0.031
	(-0.19)	(1.11)	(0.18)
Book leverage	-0.034	0.281	0.018
	(-0.12)	(0.62)	(0.06)
Market-to-book ratio	0.099	0.107	0.133*
	(1.59)	(1.36)	(1.74)
Volatility	-3.063*	-4.601*	-2.196
	(-1.96)	(-1.80)	(1.50)
Informational asymmetry 1		-0.035	
		(-0.06)	
Informational asymmetry 2			-1.391
			(-0.86)
N	425	282	347
Pseudo R^2	23.1%	40.2%	24.7%

None of the signaling proxies has a significant influence on the decision to combine a convertible with a stock repurchase. Hence, we do not find evidence that firms combine convertible issues and stock repurchases to signal their true value to the market.[50] The relatively high pseudo R^2 of 23.1% of the estimation can be explained by the significance of year dummy variables (not reported for parsimony).

5.5.2 Optimize capital structure

The decision to add a stock repurchase to a convertible issue could be explained by the fact that firms want to move towards their optimal debt ratios. Repurchasing stock increases the debt ratio, which could bring firms closer to their target debt ratios if they were previously underlevered (Dittmar (2000)). If this explanation holds, then firms that combine their convertible issue with a stock repurchase should be more underlevered than other convertible issuers. Our findings are not consistent with this prediction. More particularly, Table 31 shows that combined and single convertible debt issuers are not significantly different with respect to their debt ratios. Moreover, they are similar with respect to other firm-specific characteristics (see Table 34) and come from the same industries (see Table 30), which casts doubt on the conjecture that they have different target debt ratios.

To more formally examine the possibility that the combined offerings are motivated by the wish to optimize capital structure, we extend the probit analysis reported in Model 1 of Table 34 with two variables. The first variable captures the difference between firms' leverage and the industry median leverage, in which the industries are based on the Fama-French 12-industry classification. The second variable is the marginal tax rate of firms (before interest expenses), which is downloaded from John Graham's website. Graham (1999) argues that firms with higher marginal tax rates have a significantly higher target debt ratio, due to the tax deductibility of interest payments. We thus expect a significant positive impact of both the deviation from the target debt ratio and the marginal tax rate on the decision to add a stock repurchase to a convertible debt offering. We find that none of these additional two variables is significant (detailed results not reported for parsimony). We therefore conclude that the adjustment of firms' leverage towards a target debt

[50] The estimation also includes two earnings management proxies of Marquardt and Wiedman (2005): "Decrease EPS" and "Bonus". Earnings management potentially has an effect on the choice to repurchase stock since a stock repurchase decreases the number of outstanding shares and therefore mitigates (short-term) decreases in diluted earnings per share. The variable Decrease EPS was also tested in Chapter 4; we find that both in Chapter 4 and in Table 35 the variable's coefficient has the right sign but the effect is not significant. Bonus measures the correlation between the change in the annual CEO cash bonus and the change in the diluted EPS by 2-digit SIC code for the fiscal year before the offering (only if the number of observations for each industry-year is larger than five). We obtain CEO cash bonus data from Execucomp and expect that managers are more concerned with diluted earnings per share when their bonus plans relate to this measure, i.e., when Bonus is high. We do not find the expected sign for Bonus, indicating that earnings management is not a strong motivation for additional stock repurchases (contrary to cash settlements and call spread overlays; see Chapter 4).

ratio does not drive the decision to combine a convertible debt offering with a stock repurchase.

5.5.3 Combined offerings from the perspective of stock repurchasers

Throughout the chapter, we have assumed that firms engaging in a combined offering add a stock repurchase to a convertible issue. One argument in favor of this reasoning is that, on average, the convertible issue is about twice the size of the stock repurchase. However, the possibility exists that the initial decision is to repurchase stock, and that the convertible issue is added simply to obtain funds for the repurchase. Therefore, we also examine the differences between pure stock repurchasers and firms that combine stock repurchases with convertible issues.

If the main motivation for the combined offerings is to repurchase stock, we predict that firms engaging in combined offerings have less slack (i.e., cash and marketable securities as a percentage of total assets) than normal stock repurchasers – otherwise, the former firms would not have to issue convertibles in order to obtain the necessary funding. We do not find significant differences in the amount of slack between firms in combined offerings and uncombined stock repurchasers, however (t-test statistic for the difference in means equals -0.32). Also, we have checked whether firms engaging in a combined offering regularly announce stock repurchases and are therefore expected to do so again. We find that, for the combined issuers, the number of announced stock repurchases over the five years preceding the convertible debt announcement does not significantly differ from the numbers for separate stock repurchasers or convertible issuers.

5.6 Conclusion

In this study, we examine why U.S. convertible debt issuers add a stock repurchase to their offering. We argue that the combinations of convertible debt offerings and stock repurchases result from an interplay between convertible debt issuers and arbitrageurs. Convertible arbitrageurs generally short the issuers' common stock in the open market, which is an undesired side effect as these short sales create a downward pressure on the stock price. The stock repurchase serves to facilitate the convertible debt arbitrageurs in obtaining their short position, which mitigates the downward price pressure of the convertible debt issuance.

We obtain strong evidence consistent with this hypothesis. First, open market short-selling activity around convertible debt issuance is lower for combined offerings.

Second, issue date abnormal returns are significantly less negative for combined issuers than for issuers that do not repurchase stock. Third, the number of shares that a firm announces to repurchase correlates strongly with the expected short positions of convertible arbitrageurs. Finally, the speed with which stock is repurchased is substantially higher in the combined transactions than in pure stock repurchases. Combined, this evidence indicates that convertible arbitrage provides an important reason for convertible debt issuers to repurchase stock.

Chapter 6

Summary and concluding comments

This thesis consists of studies that examine firms' financing choices. We study debt financing, equity financing, and convertible securities, which are securities that combine debt and equity characteristics.

In the first study we collect data on firms' financing decisions over the period 1971-2005. Our intention is to use these data to examine whether firms prefer debt financing over equity financing in case external financing is needed, which is predicted by the pecking order theory of Myers (1984). Previous evidence on this issue is mixed. Shyam-Sunder and Myers (1999) for example provide evidence that firms do prefer debt over equity, while Frank and Goyal (2003) find evidence that this is not the case. Fama and French (2005) even go as far as claiming that the pecking order theory is dead.

We differ from previous studies by disentangling the various financing needs that firms face. We first examine situations in which firms have relatively small financing requirements; for these small needs they are not restricted in issuing either debt or equity. We find that firms prefer debt financing in this situation. The second situation deals with larger financing needs, in which firms are restricted in issuing debt. We report that equity financing becomes the selected choice for large financing needs. Firms that have negative financing needs, i.e. have more funds than they need for their investments, prefer to repurchase debt over repurchasing equity.

In the second study of this thesis we extend our analysis of the pecking order theory. We compare the pecking order theory with the static tradeoff theory, which argues that firms make financing decisions in order to move towards a target debt ratio. The question we ask is: when firms are not restricted in issuing securities, do they target a specific mix of debt and equity, or do they follow a pecking order in which debt financing is preferred over equity financing? To answer this question, we focus on situations in which firms are not restricted in their financing choice and in which firms have more debt than you would expect on the basis of their supposed target debt ratios, which are determined by looking at firm characteristics. For the firms in this situation, a debt issue would provide evidence in favor of the pecking order theory, while an equity issue yields evidence for the static tradeoff theory.

We find that for most firms the pecking order theory is a better descriptor of their financing behavior than the static tradeoff theory: when firms are not restricted in their debt issuing, they prefer debt financing over equity financing, even when they already have surpassed their supposed target debt ratios. We further find that firms repeatedly make financing decisions in line with a specific capital structure theory: a firm that acts in line with the pecking order theory in a given year, is more likely to do so again in a subsequent year, while a firm that acts in line with the static tradeoff theory in a given year is more likely to keep making financing decisions in line with this theory.

The other two studies of this dissertation focus on convertible securities. These securities are structured as a bond or preferred stock, but can be converted into a pre-determined number of common shares. In this way, convertible security holders benefit when the share price of the firm rises.

The third study examines the design features of convertibles. Design choices that issuers face are for example the fixed income choice (convertible bonds or convertible preferred stock) and the settlement choice (settlement in cash or stock). These design choices are particularly interesting since they provide information on the external financing costs that are important for security offerings.

One of the external financing costs relates to taxes: firms that choose convertible debt instead of convertible preferred stock generally get a tax benefit since the interest payments related to debt are tax deductible. We find that convertible issuing firms with higher needs of reducing taxes are more likely to select convertible debt as the fixed income component. We also find that some firms favor convertible bonds over convertible preferred stock because the required interest payments lower the free cash flows in the hands of managers, and thus reduce the chance that managers make investment decision that benefit the manager instead of the firm. Another source of financing costs relates to payment of the principal at maturity: a bond requires payment of the principal at maturity, while preferred stock generally has no finite maturity. When firms are unable to pay the principal at maturity, they need to refinance. In line with our expectations, we find that firms with the highest probability of needing costly refinancing favor convertible preferred stock over convertible bonds.

A final finding on the design choices of convertible securities relates to earnings management. Particular designs (like cash settlements) lead to higher reported diluted earnings per share than other designs. We find that earnings management is an important factor in the design of convertible securities.

The fourth study examines the relation between convertible securities and stock repurchases. We observe that in the U.S., one-third of the convertible debt issuers in 2006 simultaneously repurchases stock. We argue that convertible debt issuers buy back their stock in order to facilitate short selling by convertible debt arbitrageurs, which mitigates the negative stock price reaction at the convertible debt offering. In line with this prediction, we find that issue date abnormal returns are significantly less negative for combined offerings than for uncombined convertible issues. We also document that convertible arbitrage explains both the size and the timing of the stock repurchases.

This thesis contributes to various research areas. First, we contribute to studies on empirical tests of the pecking order theory. We show that tests of the pecking order theory should distinguish small financing needs from large financing needs, and should distinguish issue decisions from repurchase decisions. Second, we contribute to the ongoing battle between the pecking order theory and the static tradeoff theory. We show that the pecking order theory is a better predictor of firms' financing decisions than the static tradeoff theory. Third, we quantify a firm's debt capacity. Although the concept of the debt capacity has been used throughout the pecking order literature, we do not know of attempts to construct an advanced empirical measure of this concept in terms of a debt ratio. Fourth, we extend previous studies on convertible designs by jointly evaluating the choices in convertible security design. Fifth, we are the first to closely examine cash settlement features, which have been a popular innovation in convertible security design, and to empirically test the motivations for firms to combine a convertible debt offering with a stock repurchase. Sixth, we contribute to the literature on the impact of short-selling activity on corporate actions. Lamont (2004) describes a variety of methods that firms use to impede short selling, including legal threats and lawsuits. We document that expected short sales also influence firms' capital structure decisions. Seventh, we contribute to the literature on stock repurchases. Prior studies have shown that stock repurchases tend to be used to signal good prospects (Bhattacharya (1979), Vermaelen (1984)), to reduce the amount of free cash flows at management's disposal (Jensen (1986)), to bring the firm closer to its optimal debt ratio (Dittmar (2000)), to reduce earnings per share dilution (Weisbenner (2000), Bens, Nagar, Skinner, and Wong (2003)), and to deter takeovers (Bagwell (1991), Billett and Xue (2007)). We add another important motivation for repurchasing stock, being the avoidance of negative price effects that are related to open market short-selling activity.

An interesting direction for further research is to incorporate hybrid securities in tests of the standard capital structure theories. The pecking order theory, for example, makes clear predictions about convertible securities in the hierarchy of financing choices: when external financing is needed, firms prefer debt, then convertible securities, and issue equity only as a last resort. Incorporating convertible bonds in tests of the pecking order theory provides new evidence on the empirical validity of this theory.

Another direction for further research is the quest for a unified capital structure theory, in which the proven validities of all theories are combined. The market timing theory, for example, in which firms issue equity when shares are overvalued (see Baker and Wurgler (2002)), provides evidence on firms' financing decisions that is not evident from the standard pecking order and static tradeoff theory. Except focusing on a financing hierarchy or a tradeoff between tax benefits and bankruptcy costs, a unified theory should therefore also be able to explain market timing behavior. Other potentially important factors for a unified theory follow from extensive research conducted on capital structure decisions. These factors include the reported earnings per share (see Chapter 4), credit ratings (see Kisgen (2006)), and financial flexibility (Graham and Harvey (2001)). This wide range of factors makes it however complicated to construct one unified theory. Especially since the choice for debt or equity financing can also be related to less obvious factors, like a firm's corporate social responsibility policy (see Derwall and Verwijmeren (2007)) and whether a firm is engaged in franchising (see De Jong, Jiang, and Verwijmeren (2008)). The quest for a unified theory is further complicated by the possibility that different factors are important in different circumstances (Myers (2001)).

Another research area that has the potential of improving current capital structure models is the area of behavioral finance. This research area focuses on the psychological factors that influence decision-making. Hackbarth (2008) argues that the overconfidence of managers is likely to influence financing decisions. Incorporating behavioral issues into capital structure models is likely to improve the predictive power of these models.

Regarding the designs of convertible securities, an interesting venue is to more closely examine the role of financial advisors. It is likely that specific advisors construct new design features and contact firms to include these innovations into their security designs. This line of research has the potential of extending our knowledge on the diffusion of innovations. Also, studying the fees of advisors that are innovators in the convertible market can shed new light on the benefits of being the innovator (see also Tufano (1989)).

A final research direction that builds on this thesis relates to the importance of short sales. It is likely that firms aim to mitigate the negative price effects of short sales in other areas than convertible arbitrage. In mergers, for example, it is known that arbitrageurs take short positions in the acquirer's stock. Studying firms' reactions to these short sale strategies can further deepen our understanding of the implications of short sales.

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Nederlandse samenvatting (Summary in Dutch)

Dit proefschrift behandelt de financieringsbeslissingen van ondernemingen. Ieder jaar trekken ondernemingen voor miljarden euro's aan financiering aan, bijvoorbeeld voor het bekostigen van investeringen. In sommige gevallen opteren ondernemingen voor het aantrekken van vreemd vermogen, in de vorm van een banklening of door het uitgeven van obligaties. In andere gevallen wordt gekozen voor een aandelenemissie, of worden bijvoorbeeld converteerbare preferente aandelen uitgegeven. Dit proefschrift is een bundeling van vier empirische studies die het financieringsgedrag van ondernemingen nader bestuderen.

Het vinden van de optimale financieringsbeslissing voor ondernemingen is een vraagstuk waar Nobelprijzen voor zijn uitgereikt. Een belangrijk beginpunt voor de beantwoording van dit vraagstuk stamt uit 1958, wanneer Modigliani en Miller demonstreren dat in een perfecte markt de waarde van een onderneming onafhankelijk is van de manier van financieren. Met andere woorden, in een perfecte markt is een onderneming bestaande uit 100% eigen vermogen even veel waard als eenzelfde onderneming bestaande uit 100% vreemd vermogen, of uit een combinatie van eigen en vreemd vermogen.

In de werkelijke, niet-perfecte markt zijn er echter factoren te benoemen die de keuze tussen eigen en vreemd vermogen kunnen beïnvloeden. Een belangrijk voordeel van vreemd vermogen is dat de rentebetalingen belastingaftrekbaar zijn. Dividenduitkeringen, als behorende bij eigen vermogen, zijn dit niet. Een nadeel van vreemd vermogen is dat de kansen op een (kostbaar) faillissement toenemen. Het niet kunnen voldoen aan de rente- of aflossingsverplichtingen stellen de vreemd vermogenverschaffers immers in de gelegenheid een faillissement aan te vragen. Agent-principaal problemen kunnen ook de keuze tussen vreemd en eigen vermogen beïnvloeden, want hoewel de aandeelhouders de eigenaar zijn van een onderneming, de topmanagers nemen de dagelijkse beslissingen. Een voorbeeld van een agent-principaal probleem is het overdadig aanschaffen van statusverhogende objecten (bijvoorbeeld bedrijfsvliegtuigen) door managers, welke geen waarde creëren voor de aandeelhouders.

De voor- en nadelen van vreemd en eigen vermogen hebben geleid tot een algemene theorie betreffende kapitaalstructuurbeslissingen: de statische afruiltheorie. Deze theorie stelt dat de optimale financieringsmix voor ondernemingen voortkomt uit de voor- en nadelen van vreemd en eigen vermogen. Ondernemingen trekken vreemd vermogen aan om te profiteren van belastingvoordelen, maar zorgen ook voor eigen vermogen op de balans om bijvoorbeeld de kans op faillissement in te perken. Iedere onderneming heeft daardoor een eigen optimale financieringsmix.

Een andere invloedrijke kapitaalstructuurtheorie is de pecking order theorie. Deze theorie stelt dat belastingen en faillissementskosten ondergeschikt zijn aan problemen gelieerd aan informatieasymmetrie. Myers en Majluf (1984) en Myers (1984) tonen aan dat informatieasymmetrie leidt tot een financieringshiërarchie, waarin financieren met intern geld bovenaan staat en financieren met aandelenemissies onderaan. Met andere woorden, er bestaat een “pecking order” voor financieringen: ondernemingen hebben een voorkeur voor het financieren met intern geld, daarna voor het financieren met vreemd vermogen, en zullen slechts financieren door middel van een aandelenemissie als de maximale schuldcapaciteit bereikt is.

Empirisch onderzoek heeft bewijs gevonden voor beide theorieën. Hovakimian, Opler, en Titman (2001) analyseren de uitgiftekeuzes van Amerikaanse ondernemingen voor de periode 1979-1997. Ze schatten de “optimale” schuldratio van ondernemingen aan de hand van ondernemingskenmerken en testen of de afstand tussen de huidige schuldratio en deze optimale schuldratio invloed uitoefent op het uitgiftebeleid van ondernemingen. De conclusie is dat een hogere optimale schuldratio ten opzichte van de huidige kapitaalstructuur zorgt voor een grotere kans op een schulduitgifte. Deze bevinding is in lijn met de voorspellingen van de statische afruiltheorie. Flannery en Rangan (2006) vinden dat de gemiddelde onderneming in een jaar één derde van de afstand tussen de optimale en huidige schuldratio overbrugt.

Shyam-Sunder en Myers (1999) introduceren een empirische test voor de pecking order theorie. In deze test wordt het uitgiftebeleid van ondernemingen vergeleken met de externe financieringsbehoefte. Indien ondernemingen een voorkeur hebben voor het uitgeven van schuld boven aandelenemissies, dan zal iedere toename van de externe financieringsbehoefte worden opgevuld met vreemd vermogen. Shyam-Sunder en Myers gebruiken een dataset van grote, volwassen Amerikaanse ondernemingen, en schatten in een regressiemodel de invloed van de financieringsbehoefte op de schulduitgifte. Ze vinden een coëfficiënt van 0.75 en concluderen dat het grootste gedeelte van de ondernemingen een voorkeur voor vreemd vermogen tentoonspreidt, en dus in lijn handelt met de pecking order theorie.

Verschillende studies zijn ingegaan op de bevindingen van Shyam-Sunder en Myers. Chirinko and Singha (2000) zetten vraagtekens bij de regressiespecificatie die gebruikt wordt, en beargumenteren dat de resultaten sterk worden beïnvloed door grote financieringsbehoeften. Frank en Goyal (2003) imiteren de studie van Shyam-Sunder en Myers voor kleinere ondernemingen, en vinden voor deze ondernemingen een lagere coëfficiënt. Dit lijkt tegen de pecking order theorie in te gaan, omdat het juist de kleine ondernemingen zijn die kampen met informatieasymmetrie en dus aandelenemissies willen vermijden.

In de eerste twee studies van dit proefschrift gaan we dieper in op de statische afruiltheorie en de pecking order theorie. De eerste studie heeft als doel de testprocedure voor de pecking order theorie te verbeteren. We verzamelen hiervoor gegevens van beursgenoteerde Amerikaanse ondernemingen voor de periode 1971-2005. Er wordt een opsplitsing gemaakt van de verschillende investeringsgroottes van ondernemingen: sommige ondernemingen hebben in een bepaald jaar een grote som aan financieringen nodig, daar waar andere ondernemingen in hetzelfde jaar slechts een kleine financieringsbehoefte hebben. Daarnaast kan het voorkomen dat de financieringsbehoefte negatief is: er wordt in een jaar meer verdiend dan er aan investeringen wordt uitgegeven. Het bij elkaar voegen van de verschillende groottes, zoals in Shyam-Sunder en Myers en in Frank en Goyal, kan een vertekend beeld geven van de voorspellingskracht van de pecking order theorie.

We vinden dat ondernemingen schuldfinanciering boven aandelenemissies prefereren voor relatief kleinere financieringbehoeften. Gemiddeld genomen wordt een toename van de financieringsbehoefte met een dollar gefinancierd met 73 dollarcenten aan vreemd vermogen, zo lang deze behoefte kleiner is dan 5.9% van de balanswaarde. Voor grotere financieringsbehoeften wordt vaker gekozen voor aandelenemissies. Zo wordt voor financieringsbehoeften van meer dan 23.7% van de totale balanswaarde nog maar 9 cent van een extra benodigde dollar opgevuld met vreemd vermogen. We concluderen dat dit verschil wordt veroorzaakt door de maximale schuldratio van ondernemingen: voor grote financieringsbehoeften is het voor veel ondernemingen onmogelijk schuld aan te trekken zonder in financiële moeilijkheden te geraken. Daarnaast zijn het vaak de ondernemingen in financiële moeilijkheden die grotere financieringsbehoeften hebben. We kunnen hierdoor verklaren waarom grotere, stabielere ondernemingen meer in lijn met de pecking order theorie handelen dan kleinere, minder stabiele ondernemingen: het zijn de grotere ondernemingen die minder beperkingen hebben in het uitgeven van vreemd vermogen. We vinden verder dat een overschot aan inkomsten in een bepaald jaar vooral wordt gebruikt om de uitstaande schuld te verminderen, en niet voor het terugkopen van aandelen.

De tweede studie van dit proefschrift vergelijkt de pecking order theorie met de statische afruiltheorie. In verschillende situaties hebben de pecking order theorie en de statische afruiltheorie gelijke voorspellingen. Als een onderneming bijvoorbeeld een erg lage schuldratio heeft, dan voorspellen beide theorieën dat de onderneming een eventuele financieringsbehoefte opvult met schuld. Een interessante situatie is echter als beide theorieën tegengestelde voorspellingen hebben. Een voorbeeld van een dergelijke situatie is als een onderneming boven de “optimale” schuldratio zit, maar nog wel schuld kan uitgeven zonder in financiële problemen te geraken. De pecking order theorie stelt in dit geval dat een financieringsbehoefte nog steeds wordt opgevuld met schuld, daar waar de statische afruiltheorie stelt dat eigen vermogen zal worden uitgegeven om de schuldratio te verlagen. We concentreren ons daarom op (Amerikaanse) ondernemingen in situaties waar de predicties verschillen. De optimale schuldratio in de afruiltheorie wordt geschat door te kijken naar de grootte, winstgevendheid, groeipotentieel, het gedeelte vaste activa, en de bedrijfstak van een onderneming. We stellen een onderneming in staat tot een schulduitgifte totdat deze uitgifte de kredietrating van de onderneming zal verlagen naar speculatief.

We vinden dat de meeste ondernemingen nog steeds vreemd vermogen uitgeven en daarmee handelen in lijn met de pecking order theorie. We concluderen verder dat ondernemingen relatief trouw zijn in het volgen van een kapitaalstructuurtheorie: een onderneming die volgens de pecking order theorie handelt in een bepaald jaar, heeft een grotere kans dit opnieuw te doen in het daaropvolgende jaar. Een onderneming die volgens de statische afruiltheorie handelt in een bepaald jaar, heeft een grotere kans weer volgens de statische afruiltheorie te handelen in het daaropvolgende jaar. Specifieke ondernemingskenmerken zijn geen sterke verklaring voor het handelen in lijn met de pecking order theorie of de statische afruiltheorie.

Onze bevindingen in de eerste twee studies hebben de volgende bijdragen tot de literatuur. Ten eerste verbeteren we de testmethode voor de pecking order theorie, en zijn we in staat te verklaren waarom kleine ondernemingen minder lijken te handelen in lijn met de pecking order theorie. Een tweede contributie is het modelleren van de maximale schuldratio voor bedrijven om de kredietrating niet tot speculatief te laten degraderen. Hierdoor zijn we in staat de predicties van de statische afruiltheorie en de pecking order theorie tegen elkaar te testen. In tegenstelling tot veel andere studies concentreren wij ons daarom niet op een enkele kapitaalstructuurtheorie, maar nemen wij de interacties van twee verschillende theorieën mee. We vinden dat de pecking order theorie beter in staat is financieringsbeslissingen te verklaren dan de statische afruiltheorie.

In de derde en vierde studie van dit proefschrift verleggen we de focus naar specifieke financieringsinstrumenten. We zijn in het bijzonder geïnteresseerd in instrumenten die kenmerken van vreemd vermogen en eigen vermogen combineren, en concentreren ons daarom op converteerbare vermogenstitels. Deze instrumenten zijn gestructureerd als een obligatie of preferent aandeel, maar kunnen worden omgezet in een vooraf vastgesteld aantal aandelen. Op deze manier profiteren de houders van converteerbare instrumenten van een stijging van de aandeelprijs.

Converteerbare vermogenstitels zijn relatief populaire financieringsinstrumenten. Alleen al in de Verenigde Staten is er met converteerbare instrumenten meer dan 100 miljard dollar opgehaald in 2007. Studies naar de motivaties voor het uitgeven van converteerbare vermogenstitels hebben geleid tot twee verschillende stromingen. De eerste stroming beargumenteert dat de belangrijkste motivatie voor het uitgeven van converteerbare vermogenstitels is dat deze instrumenten uitermate geschikt zijn om aandelen te verkrijgen via een "indirecte" manier, dat wil zeggen zonder de negatieve aankondigingseffecten die vaak horen bij directe aandelenemissies. De tweede stroming stelt dat converteerbare instrumenten worden uitgegeven door ondernemingen met hoge schuldgerelateerde kosten; converteerbare instrumenten dienen hier als een alternatief voor reguliere obligaties.

In de derde studie bekijken we de specifieke kenmerken van recente converteerbare vermogenstitels. De keuzes die uitgevers van converteerbare vermogenstitels maken zijn bijvoorbeeld de structuur van de vaste inkomenscomponent (obligatie of preferent aandeel) en of er wordt omgezet in aandelen of geld. We vinden dat belastingen belangrijk zijn voor de structuur van de vaste inkomenscomponent: ondernemingen die sterk profiteren van belastingvoordelen kiezen vaker voor een obligatie, vanwege de aftrekbaarheid van de rentebetalingen. Sommige ondernemingen verkiezen ook obligaties boven preferente aandelen vanwege een ander aspect die aan de rentebetalingen van obligaties zitten: door deze rentebetalingen worden agent-principaal problemen verkleind aangezien de managers minder vrije kasstromen tot hun beschikking hebben. Daarnaast wordt de keuze voor de vaste inkomenscomponent bepaald doordat preferente aandelen over het algemeen geen vaste looptijd hebben. Hierdoor zijn deze instrumenten meer geschikt voor ondernemingen die willen voorkomen dat ze uitstaand vermogen moeten herfinancieren.

We vinden dat winstmanagement vooral belangrijk is voor de keuze tussen conversie in aandelen of kasgeld (ter waarde van de aandelen). Hoewel beide keuzes de onderneming in principe evenveel kosten, zorgt een conversie in aandelen voor een toename van het aantal uitstaande aandelen en daardoor voor een daling van de winst per aandeel (bij een gelijkblijvende winst). Onder Amerikaanse verslaggevingsregels vindt de toename van het aantal aandelen voor bepaalde winst per aandeel kengetallen al plaats voordat een werkelijke conversie plaatsvindt. Ons onderzoek toont aan dat ondernemingen die meerdere maatregelen nemen om de winst per aandeelcijfers te beïnvloeden ook vaker opteren voor conversie in kasgeld.

De vierde studie van dit proefschrift behandelt de relatie tussen de uitgifte van converteerbare vermogenstitels en het terugkopen van aandelen. We observeren dat in 2006 één derde van de converteerbare emissies in de Verenigde Staten gepaard gaat met aandelenterugkopen. We stellen dat deze relatie wordt veroorzaakt doordat arbitragepartijen (zoals hedgefondsen) een positie in converteerbare instrumenten combineren met een short positie in normale aandelen van de onderneming. Deze short posities zorgen normaal gesproken voor een neerwaartse druk op de aandeelprijs. Ondernemingen kunnen deze druk voorkomen door tegen een vooraf afgesproken prijs de (geleende) aandelen van de arbitrageurs via een tussenpartij in te kopen. De arbitrageurs kunnen op deze manier hun short positie verkrijgen zonder tegen een onzekere prijs in de markt te moeten handelen, daar waar ondernemingen voorkomen dat de aandeelprijs onder druk komt te staan.

We vinden dat arbitragestrategieën inderdaad gerelateerd zijn aan de aandelenterugkopen. Ondernemingen die de uitgifte van een converteerbare vermogenstitel combineren met een aandelenterugkoop hebben een negatieve koersreactie van kleiner dan 1%, terwijl andere emissies van converteerbare vermogenstitels gepaard gaan met een koersdaling van meer dan 4%. Dit verschil wordt verklaard doordat er voor ondernemingen met een aandelenterugkoop minder short transacties in de open markt plaatsvinden. We tonen verder aan dat zowel de grootte als de snelheid van de aandelenterugkopen verklaard kunnen worden door de strategieën van arbitragepartijen.

Onze studies naar converteerbare vermogenstitels voegen op verschillende manieren toe aan de literatuur. Door het gezamenlijk analyseren van de verschillende keuzes die uitgevers van converteerbare instrumenten maken, verschaffen we inzicht in de relevante financieringskosten voor ondernemingen. We verklaren tevens de populariteit van structuren als conversie in kasgeld en simultane aandelenterugkopen. Daarnaast tonen we het belang van verwachte short posities aan voor het financieringsbeleid van ondernemingen.

Biography

Patrick Verwijmeren was born in Rotterdam on October 4th, 1982. He attended the Gemini College in Ridderkerk, at which he obtained his Atheneum diploma in 2000. Subsequently, Patrick studied Business Administration at Erasmus University Rotterdam. Part of this program was fulfilled in an exchange with the Copenhagen Business School. He received his Master's degree in Business Administration from the Erasmus University in 2005, with the appellation *cum laude*. The master thesis has been awarded the "CFO Thesis Award 2005." After graduating, Patrick joined the ERIM PhD program to carry out doctoral research at the Department of Financial Management of the Rotterdam School of Management, Erasmus University. During this period, he held a visiting position at Owen Graduate School of Management, Vanderbilt University, and has been chairman of the ERIM PhD council. Patrick has also been involved in writing a report for the Dutch Ministry of Finance, dealing with the influence of hedge funds and private equity in the Netherlands. Patrick's work has been presented at several international conferences, including the EFMA meetings in Madrid and Athens, and the Australasian Banking and Finance conference in Sydney. He has publications in CFO Magazine, European Accounting Review (Accounting in Europe), Finance & Control, Interface, and MAB. His teaching involves courses in the area of Corporate Finance, both at a bachelor and master level. Patrick has supervised 18 master students. Currently, he holds a position as Lecturer in the Finance Department (Faculty of Economics and Commerce) at the University of Melbourne. Patrick's research interests are in the area of corporate finance.

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This dissertation consists of four empirical studies on firms' financing decisions. In the first two studies, we investigate the debt-equity choice for a large number of U.S. firms. We find that firms prefer debt financing over equity financing in case a debt issue allows the firm to keep its investment grade rating. When the financing requirement becomes sufficiently large, firms are more likely to choose equity financing. We find that most firms repurchase debt instead of equity in case they have excess funds. The last two studies of this dissertation deal with convertible security design. Since convertible securities combine debt and equity characteristics, the specific structure of these instruments can provide further insight into the relevant costs and benefits of debt and equity. We find that taxes, the costs of refinancing, and the costs of managerial discretion are important drivers of convertible security design. We further find that the desire to manage earnings has been responsible for recent innovations in the convertible market. Convertible arbitrage drives the innovation of combining a convertible issue with a stock repurchase: the stock repurchase serves to mitigate the negative price impact that results from the short sales of arbitrageurs.

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