Essays on the Use of Convertible Bonds and the Security Issuance Decision

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Proefschrift

ter verkrijging van de graad van doctor aan de Universiteit van Tilburg, op gezag van de rector magnificus, prof. dr. F.A. van der Duyn Schouten, in het openbaar te verdedigen ten overstaan van een door het college voor promoties aangewezen commissie in de aula van de Universiteit op maandag 17 december 2007 om 14.15 uur door

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geboren op 22 september 1975 te Ljubljana, Slovenië.

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Acknowledgements

This manuscript is the result of four years of doctoral studies at the Tilburg University, where I started the doctoral program in 2003. The journey was both, difficult and enjoyable. And this is how it should be, since without difficult moments and hard challenges in life one does not appreciate all the small moments of success and joy.

I am highly indebted to my supervisors Jenke ter Horst and Chris Veld who made this project possible with their continuous support, guidance, motivation and all the efforts they have put into it.

I wish to express my gratitude to Hans Degryse, Ming Dong, Piet Duffhues, Abe de Jong, Luc Renneboog and Frans de Roon for their participation in the dissertation committee and their efforts of reading and commenting of the manuscript. I am grateful for all the excellent comments I received from them.

My deep gratitude goes to all the members of the Finance Department. They make the department what it is today, a pleasant, stimulating and supporting environment to do challenging research and have a feeling of belonging. I am particularly grateful to Bas Werker for his support.

I especially appreciate all the support and joyful moments I shared with my friends Péter, Ralph, Norbert, Esther, Crina, Marta, Marina, Viorel, Jéremié and many other colleagues without whom the life in Tilburg would not have been as memorable. Moreover, I thank all my friends from Slovenia for all the encouragement they provided.

I wish to thank all my family, especially my grandmother and my parents-in-law for their unconditional support. With deep sadness in my heart I regret that my mother and my grandfather are not among us anymore to share this special moment with me.

My deepest gratitude goes to my wife Teja and all the sacrifices she had to make. She encouraged, inspired, tolerated all my whims and supported me throughout the four years of my studies and had to endure the separated life we had - her being back home in Slovenia and me being in the Netherlands. Without her all this would not have been possible.
I dedicate this thesis to her.

I sincerely thank you all.

Tilburg, September 2007

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Chapter 1

Introduction

In this thesis we investigate two issues, the use of convertible debt by Canadian companies and the security issuance choice in the Canadian market.

In the first part of the thesis we devote our attention to the use of convertible debt by Canadian companies. A convertible bond is a security that can be exchanged for a predetermined fixed number of shares of the issuing company within a predetermined period of time. In essence, a convertible is a package consisting of a straight bond and warrants written on the issuing company stock. The question as to why companies issue convertible debt has received much attention in the past. Practitioners most often view convertibles as delayed equity and claim to issue them because of the lower coupon rate and to "sweeten" the debt issue, which would be otherwise more difficult to place. On the other hand, academics have proposed theories that relate the use of convertible debt to informational asymmetries, agency issues and tax motives. These theories in general suggest that companies that face high debt- and/or equity-related agency costs could benefit from issuing convertible debt as opposed to other "straight" means of financing.

First, in Chapter 2 we review the theoretical and empirical literature on the motives for the issuance of convertible debt. The literature shows a large discrepancy between theory and practice. Surveys show that managers base their motives for the use of convertible debt on factors that are irrational according to the theoretical literature. This theoretical literature in turn offers a number of rational motives. These motives are based on the resolution of the problems of informational asymmetry and agency costs, on tax motivations and managerial entrenchment arguments. Most of the rational motives have been investigated in cross-sectional studies, which offer general support to at least some of them. However, survey studies find very little to no support for the rational motives. This might be due to either the sensitivity of the surveys to the question contents, to the use of weak proxies in cross-sectional studies, or a combination of these.

In Chapter 3 we study the announcement effects and their determinants of convertible debt issues in the Canadian market in order to identify issuer motives. The average wealth

effect for the three-day event window around the announcement of convertible bonds between 1991 and 2004 is a significantly negative -2.7%. When the issues are classified into equity- and debt-like, we find that the wealth effects are significantly more negative for the equity-like convertible bond issuers. Equity-like convertibles are significantly negatively affected by agency costs of equity. However, agency costs of debt do not have a significant effect on equity-like convertibles and agency costs of equity do not have a significant effect on debt-like convertibles. These findings suggest that convertibles are used to mitigate different aspects of informational asymmetries. These findings are in line with motives proposed by Stein (1992) and Mayers (1998). Moreover, we find a shift in the convertible debt design towards more debt-like convertibles that coincides with the popularity of conversion of businesses into income trusts. However, when controlling for the convertible debt design and other determinants of the wealth effects, we do not find any significant differences that can be attributed to this business structure.

In the second part of the thesis we analyze the security issuance decision in the Canadian market. The security issuance decision is one of the most important long term financial decisions of the firm. Firstly, it has a strong impact on the stock returns, as different types of securities convey different information to the market - the equity issues for example induce strong negative announcement date excess returns. Secondly, it affects relationships and incentives of different interest groups (managers, shareholders, debtholders) within the firm, but also those between the insiders and the outsiders. Thirdly, it determines corporate investment policies - equity for example provides more flexibility in risk taking. The importance of the security issuance decision is also demonstrated in managerial surveys, where managers claim to consider financial flexibility, dilution of earnings and recent stock returns of the greatest importance when it comes to the decision on the firm's financing choice. The security issuance decision is essentially a capital structure decision. Different explanations have been put forward in the past as to how and when do managers decide to increase or decrease the leverage of the firm, such are the pecking-order model, the market timing model and the agreement between insiders and outsiders.

In Chapter 4 we study determinants of public financing choice in a relation to security issuance theories. We find that overvaluation increases the probability of issuing equity. The post-announcement excess returns are lower for the high market-to-book equity issuers. Our findings give support to the market timing theory of capital structure. We surprisingly find that straight debt issuers are more financially constrained than equity issuers in general. However, the largest equity issuers are more financially constrained than the smallest ones. This result indicates that smaller equity issuers time the market, while the largest seem to exhibit the "pecking-order behavior". We do not find support for the theory that higher levels of agreement between insiders and outsiders of the firm lead the firm to prefer equity over debt.

In Chapter 5 we use changes in short interest following the announcements of security issues (withdrawals) to investigate market timing and pecking-order theories of capital structure. First, we find significant increases in short interest for equity and convertible bond issuers, no significant changes for straight bond issuers and some significant decreases for share repurchasers. More importantly, we examine the effect of (over)valuation and financial constraint proxies on changes in short interest in order to test the market timing and the pecking order explanations of capital structure. We do so for hot and cold equity markets separately, as previous literature suggests that issuers and investors act differently. We find evidence to support both, the market timing and the pecking order explanations. In addition, we find evidence of a positive and a negative relationship between changes in short interest and stock returns, in particular in hot equity markets. Investors perceive equity issue announcements and issuers' characteristics differently in hot and cold equity issuance markets. This implies either some degree of difficulty discerning among different equity issuers in hot equity markets (due to easier mimicking and bunching of the issuers) or lack of rational behavior in the case of market frenzies (herding).

Finally, in Chapter 6 we turn back to the use of convertible debt and analyze convertible arbitrage, one of the most successful hedge fund strategies. We start by identifying convertible arbitrage activities. We find convertible bonds to be underpriced at the issuance dates. At the same time, short sales of underlying equity significantly increase. Both effects are stronger for equity-like than for debt-like convertibles. Although convertible arbitrage positively affects markets by providing liquidity, we also find that short sales pressures negatively affect both shareholders and existing bondholders. An investigation of the determinants of convertible arbitrage returns shows that, over a one-year period following the issue, equity-like convertibles earn a return that is more than 20 percentage points higher than the return of debt-like convertibles. In recent years the returns from convertible arbitrage have strongly decreased, because the universe of issuers shifted from the issuance of equity-like to debt-like convertibles. Chapter 7 concludes the thesis.

All the chapters of the thesis are based on the papers co-authored with Jenke ter Horst. Chapters 2, 3, 4 and 6 are co-authored with Chris Veld as well and Chapter 4 is additionally co-authored with Ming Dong.

Chapter 2

Why do Companies Issue Convertible Bonds? A Review of Theory and Empirical Evidence

2.1 Introduction

Exchange-listed companies have a wide range of possibilities when they look for new sources of financing. Companies can use equity in the form of internally generated funds or issue new shares of common stock. Alternatively, they can use debt in the form of bank loans or issue bonds. The use of hybrid securities represents yet another possibility. The most well-known hybrid securities are so-called convertible bonds which, at the option of the holder, can be exchanged into shares of common stock of the issuing company. An example of a convertible bond issue is the bond issue by General Motors Corporation in 2003. These bonds pay an annual coupon of 6.25 percent. Furthermore, on their maturity date, the holder of the bond has the option to choose between receiving the nominal value in cash or converting the bond into 21 shares of the General Motors Corporation stock[1]. Convertible bonds possess characteristics of both equity and debt: they resemble debt, because they pay a fixed coupon interest. On the other hand they resemble equity, because part of the price that is paid for them is for the option to exchange the bonds into shares. The money paid for the option does not have to be paid back by the company, irrespective of future developments of the stock price.

An interesting question is what motivates companies to issue a hybrid security like a convertible bond instead of issuing straight debt or equity. Ross, Westerfield, and Jaffe (2005, page 686) state that *"probably there is no other area of corporate finance where real-world practitioners get as confused as they do on the reasons for issuing convertible debt."* The

[1]The data on these convertible bonds is taken from the SDC database on new issues.

authors observe that practitioners generally argue that convertible bonds offer the possibility to issue equity at a higher price than the currently prevailing stock price and/or that they offer a possibility to attract debt at a low interest rate. The argument that equity can be attracted at a higher price than the stock price at the issuance date of the convertibles is based on the fact that the conversion price is generally higher than the current stock price. The conversion price is the price for which the holders of the convertible bonds can buy stocks. In the General Motors example the conversion price is \$47.62[2]. The conversion price is higher than the stock price at the issuance date of the convertibles, which was \$35.94. The second argument that convertibles offer a possibility to attract debt at a low interest rate is based on the fact that the coupon rate on the convertibles is lower than the coupon rate a company would have to pay on ordinary debt. In the General Motors example, the company pays a coupon of 6.25 percent on the convertible bonds, while the closest comparable straight bond of the same company had a yield to maturity of around 7.5 percent. However, both these claims are refuted by academics who argue that the conversion price should not be compared to the current stock price, and hence reject the first argument. They also reject the second argument, explaining that the lower coupon interest on convertible bonds is caused by the fact that the holder of a convertible gets the option to buy stock in the future. Since an option is a right and not an obligation, this option has a value, which is paid for by the holder of the convertible by accepting a lower interest rate.

Academic theories in corporate finance concerning the question why companies issue convertible debt are generally based on agency and asymmetric information models. However, surveys among managers responsible for the decision to issue convertibles generally show very little support for these theories. This shows that there is a large divergence between the practitioner's and the academic literature on the question why companies issue convertible bonds. The objective of this chapter is to review the different viewpoints and to see where theory and practice agree, and where the large disagreement lies.

Before going into the question why companies issue convertible bonds, it is useful to give a short overview of the market for these financial instruments. The size of the market for convertible debt varies between the countries considerably, with the U.S. market being the single largest market for convertible bonds in the world, accounting for 30 percent of all the convertible bond issues in the period 1990-2003, as shown in Table 2.1. The U.S. market is followed by Japan, South Korea and Canada, while the largest Western European markets account only for somewhat more than 9 percent of the total global issues.

With respect to the popularity of the convertible bonds over time, Table 2.2 shows that globally there are no large variations in the number of issues over time. However, there is

[2]This is the nominal value of the bonds divided by the conversion ratio. The conversion ratio is the number of shares that is acquired when the bonds are converted. In this example it is 21. This leads to a conversion price of $\frac{\$1{,}000}{21} = \$47.62$

an increased popularity of convertible debt between 1993 and 1999 in terms of the number of convertible bond issues, which can again be observed in 2003.

Another interesting difference among different markets is the issue size. As shown in Table 2.3, the largest issue sizes, measured in mean and median values, are in the Western European markets, while the smallest are in South Korea and Australia. The largest variations, measured with the coefficient of variation, are in the German and South Korean market, while the smallest can be observed in Taiwan[3].

As mentioned before, the objective of this chapter is to overview the theory and empirics on the question why companies issue convertible bonds. This question is very relevant in practice, because convertible bonds are not only frequently used by large exchange-listed companies, but also by young companies that use venture capital. By answering the question why companies issue convertible bonds we can also shed more light on the question why companies issue other hybrid financial instruments. These hybrids include convertible preferred stock and warrant-bond loans among others. Convertible preferred stock is preferred stock with an option for the holder to convert it into common stock. A warrant-bond loan is a loan with warrants attached. The most important difference between warrant-bonds and convertible bonds is that the warrants in a warrant-bond loan can be detached from the bonds after the issuance. We will not go into the choice that companies can make between different hybrid financial instruments.

A related topic that will shortly be mentioned is that of the call policy of convertible bonds. Convertible bonds are usually callable, which means that the company has a right to call the bonds, and to repay the investor before maturity or conversion. Ingersoll (1977) demonstrates that the optimal moment to call a convertible is when the conversion value equals the call price. The conversion value is the value of the common stock to be received in the conversion exchange. However, in an empirical study he finds that in practice the calls show a delay. On average the conversion value of the bonds is 43.9 percent above the call price. This finding of Ingersoll has led to a large amount of academic papers on the question why convertible bonds are called late. Given that this is only a side issue in the decision to issue convertible bonds, we will not discuss this topic further.

The chapter is structured as follows. In Section 2.2 we review the theoretical arguments for the issuance of convertible debt. Section 2.3 is dedicated to a review of empirical evidence, based on different types of empirical studies: event studies, cross-sectional analyses and surveys. Section 2.4 concludes the chapter.

[3]Note that the number of issues in Table 2.3 can be different than the reported number of issues in Table 2.2. This is due to missing information on issue sizes for some of the issuers in the SDC database.

2.2 Theoretical Motivations for the Use of Convertible Debt

2.2.1 Capital Structure Irrelevance and Security Choice

In their seminal work on capital structure (ir)relevance Modigliani and Miller (1958) show that the way a firm finances its investments does not matter for the market value of the firm. It is irrelevant whether companies choose to issue equity, straight debt, convertible bond or any other package of securities to finance their investments. Why do investors then in terms of underlying equity valuation of the company react differently to the issue announcements of different types of securities[4]?

Modigliani and Miller build their model based on the assumptions of perfect capital markets8 and those of perfectly informed agents who trade securities, who share similar information (symmetric knowledge) and are of equal (atomic) size. Their model, although shown not to hold in reality, provides the cornerstone of the capital structure research framework. Perhaps the most crucial assumption is the one about symmetric information and perfect knowledge of the agents. This assumption has inspired numerous later strains of literature. In reality agents posses different information, contracts cannot be written such to cover for all possible contingencies that might arise and many actions of agents are not observable and / or verifiable. We can describe such a setting with the notion of an asymmetric information framework. In such a setting efficient transmission of funds (contracts) between parties is impaired and can, in the worst case, lead to a complete market collapse (see Akerlof 1970). The main reasons are adverse selection and agency problems.

The adverse selection problem results in ex-ante unobservable and / or unverifiable type of agents that the other party (principal) in the contract has to choose or determine. The agency problem is a result of ex-post possible opportunistic behavior of an agent, once the contract has been made, but the actions of the agent are unverifiable and contracts do not cover all possible contingencies. In a financing arrangement (contract) between a firm (agent) and an investor (principal) all these issues play crucial roles and the severity of the adverse selection and the agency problem affects the efficiency of a firm's financing. The worse the adverse selection and agency problems are, the less efficient the financing channel will be, since a first best solution cannot be achieved. A first best solution is the outcome under no adverse selection and agency problems. Put differently, the financing will become more expensive for the firms, because principals cannot differentiate between the agents properly, since bad types can mimic good types. This drives out some positive net present value investment opportunities (Myers and Majluf 1984) and creates a social dead weight loss,

[4]For the empirical evidence on wealth effects associated with announcements of different securities see Section 3.

since a first best solution is not implemented. Good type agents thus try to send signals to the principals about their true types in order to differentiate themselves and overcome this issue. In such setting the capital structure, or the way a firm finances itself, is considered to be a signaling device (Heinkel 1982), but above all the security types that compose the capital structure are considered to be a signaling mechanism (Myers and Majluf 1984).

Producing a signal has to be costly in order to be perceived as credible. In other words, only the agents that can afford to produce the signal (good types) will do so, while bad types will not mimic them, as the cost of the signal would exceed the benefit (higher valuation for example) of representing themselves as good types. Otherwise, the signal can be sent by anyone and types cannot be correctly inferred. For example, a bad type firm will not issue debt, since that increases the probability of the financial distress much more than for a good type firm. In that respect, a capital structure or a degree of leverage can serve as a credible signal of the firm type. Similar is the case of different types of security issues, where there is an equity issue on one end of the spectrum and a straight debt issue on the other. The paradox of both security types is their incompatibility. Namely, equity ownership induces risk taking, due to limited liability. The most an investor can lose are the funds invested, while the upper potential for gains is unlimited[5]. Debt ownership on the other hand induces risk aversion, since the most debtholders can gain is the principal and a fixed return. Debtholders are not compensated for additional risk being undertaken by the firm and are therefore faced with a concave payoff function. In the case of the firm's default on debt, when the realized cash flow of the firm is less than the principal, debtholders receive any cash flow from the firm. In the case where the realized cash flow of the firm is greater than the principal, debtholders receive only the principal and do not participate on any gains above that value. As mentioned in the introduction, convertible bonds are hybrid instruments, which combine features of straight debt and equity. They are straight debt packaged with a call option on the firm's equity, making it possible for convertible bondholders to participate in potential value gain sharing of the firm.

2.2.2 Theoretical Motivations for issuing Convertible Debt

There are number of different theoretical explanations as to why companies finance themselves with convertibles. These can be classified into several broader categories:

- Theories based on an asymmetric information framework (Brennan and Kraus 1987, Brennan and Schwartz 1988, Kim 1990 and Stein 1992).

- Theories based on an agency problem framework (Green 1984, Mayers 1998 and Isagawa 2000).

[5]This creates a convex payoff function.

- Tax advantage based theories (Jalan and Barone-Adesi 1995).

- Theories based on managerial entrenchment (Isagawa 2002).

- Rationing in the equity market (Lewis, Rogalski and Seward 2001).

The theoretical explanations show an important distinction between adverse selection models and agency theories on one hand, and the entrenchment theories on the other. The distinction is in the underlying assumptions about the control over financial and investment policies. Adverse selection models and agency theories solve for specific asymmetric information and agency issues between insiders (managers and/or existing shareholders) and outsiders (either new shareholders or bondholders) and assume maximization of the existing shareholder's wealth (in the literature also referred to as the efficient approach). The entrenchment approach on the other hand assumes that financial and investment policies are determined by the entrenched manager (insider), who serves his or her own interests (empire building and different perks among other) and does not necessarily pursue value maximization of the firm.

Theories based on the Asymmetric Information Framework

According to Brennan and Kraus (1987) convertible debt can costlessly mitigate investment inefficiencies, which arise due to information asymmetry issues in the framework of Myers and Majluf (1984) and Heinkel (1982). The information asymmetry can either concern the uncertainty regarding returns on investments made by firms (mean of the distribution of returns) or the uncertainty regarding the variance of returns (mean-preserving spread). Brennan and Kraus develop such a single parameter model of information asymmetry. The goal of the firm is to maximize the difference between the value of the funds, obtained from the investors, and a true value of the financing, given the full information about the firm. In the equilibrium each financing strategy[6] is chosen by the worst possible type of firm for that particular financing strategy (this is the so-called "lemons property"). Securities that can lead to such equilibrium include convertible bonds, junior bonds, and bonds with warrants. These securities can effectively resolve the issue of adverse selection, as each type of firm reveals itself with the choice of the financing strategy. The strategy depends on the nature of the information asymmetry problem.

Brennan and Schwartz (1988) argue that the only reason investors are willing to pay more for a convertible bond than for a straight bond is because of its hybrid nature. The cost of convertibles is evaluated on a weighted basis of the straight debt component cost

[6]Note that Brennan and Kraus make a distinction between securities and financing. They consider securities *"to be basic claims traded in the capital markets"*, while financing in their terminology refers *"to the complete set of financial decisions by a firm at a point in time"*.

of convertibles and the equity option cost of a convertible. Convertible bonds are relatively insensitive to the risk of the issuing company exactly because of their hybrid nature. Namely, higher risk reduces the value of the straight debt component, but at the same time it increases the value of the equity option component, thus having very limited overall effect on the value of convertibles. Brennan and Schwartz (1988: 59) point out that the relevant risk is *"...not only the risk of the company's existing operations, but also the risk of any future operations in which the firm may become involved over the life of the bond."* This relates to the agency cost of straight debt. It arises from the different payoff structures of bondholders and shareholders, and limited liability of shareholders (Jensen and Meckling 1976). With straight debt outstanding, shareholders[7] have strong incentives to increase the risk of the company, which increases the upper potential for gains of shareholders, but reduces the value of straight debt. Convertibles reduce these incentives, as their value is less sensitive to the changes in the riskiness of the underlying equity[8]. Brennan and Schwartz (1988: 59) conclude that *"...convertibles are most likely to be used by companies which the market perceives as risky, whose risk is hard to assess and whose payment policy is hard to predict."*

Constantinides and Grundy (1989) present a model in which an issue of a convertible bond, combined with a partial share repurchase, serves as a credible signal of a firm type. This resolves the information asymmetry problem and related underinvestment issue, when the firm is restricted to equity financing. Since the management owns a fraction of the stock in an all-equity firm, they are interested in maximizing the value of the firm's stock. Management may not sell their stock or buy the securities issued by the firm. Constantinides and Grundy show that in the fully revealing equilibrium the payoff of the issued security has to be similar to the payoff of straight debt (concave payoff function) for the low values of the firm's investments. On the other hand, for the high values of the firm's investments, payoff of the issued security should be similar to the payoff of equity (convex payoff function). Constantinides and Grundy argue that such payoff structure of the security assures the proper signaling incentives for the management (costly signaling). As previously discussed, a convertible bond is a security that conforms to these requirements.

Similarly, in the model of Kim (1990) the convertible bond issue and in particular the conversion ratio serve as a signal of firm's type. The conversion ratio serves as a credible signal of a company's future earnings. In the equilibrium, lower expected future earnings of the worse types induce higher conversion ratios. These imply more shares per bond and thus higher dilution of future earnings, as those have to be shared with a relatively larger share of new shareholders. The model yields a testable hypothesis that abnormal common stock returns at the announcements of the convertible debt issues are negatively related to

[7]Here, we can also think of the management that acts in the interests of shareholders, if we set aside the agency costs of equity.

[8]Note that this second argument of Brennan and Schwartz should essentially be classified in the moral hazard framework.

the conversion ratio, since higher conversion ratios imply worse type firms.

According to Stein (1992) firms issue convertible bonds in order to get equity through the "back door" in situations where informational asymmetries make conventional equity issues unattractive due to high issue costs and dilution (Myers and Majluf 1984). Stein's rationale resembles that of Constantinides and Grundy (1989), but has a different empirical implication. In the model of Constantinides and Grundy the share repurchase mechanism is a way of signaling type of the firm to the market. This is not the case in Stein's model, where two factors are particularly important: call features of convertibles bonds and increased possibility of financial distress due to excess debt. In a fully separating equilibrium good firms issue debt, medium quality firms issue convertible debt and bad quality firms issue equity. Financing choice therefore serves as the signal to the market. Announcement effects, which are generally found to be negative for all kinds of security type issues, are according to Stein's model expected to be worst for equity offerings, somewhat better for convertible debt issues and the least negative for straight debt issues. These expectations are in line with the adverse selection models of a capital structure.

Theories based on the Agency Problem Framework

Maximizing the value of the equity claim and maximizing the value of the firm can, with risky debt outstanding, lead to agency problems (debtholder expropriation). Shareholders have an incentive to substitute projects of lower risk with riskier projects. This is due to their limited liability. Green (1984) develops a model in which option claims issued with debt may mitigate those incentive problems. By addressing the financing and incentive problems simultaneously, the correct incentives can be induced with a convertible bond or debt-warrant combination. This alters the incentives of the equity holders to take risk, as part of the potential gains has to be shared with new shareholders, since option claims on company's equity are issued together with debt. However, Green's analysis abstracts from a number of other incentive (agency) problems, where the most important is the one between management and shareholders. Therefore, the model does not eliminate all the agency costs. The crucial characteristic of convertible and warrant bonds is sharing of the upper potential of the equity gains, while there must be the lower bound of the gains, for which the fixed claim on the debt is paid (the option is not exercised). Only then will such instruments have the desired effect on incentives.

The model of Mayers (1998) is very close to that of Stein (1992), but is different in spirit, since Stein's model is based on asymmetric information about assets in place, whereas Mayers's sequential financing hypothesis is based on the uncertainty about the value of future investment options. In Stein's model the convertibility feature solves the financing problem at the time of the issue, whereas in Mayers' model convertibility solves a future financing problem. Compared to straight bonds convertible bonds economize on issue costs,

because they leave funds in the firm (convertibility feature) and reduce the leverage when the investment option is valuable. On the other hand convertibles control the overinvestment problem (see Jensen 1986) when the investment option is not valuable. The call provision is an important feature of convertible bonds, when there is uncertainty about the maturity date of the investment option. Mayers notes that existing evidence on convertible bonds supports the sequential financing hypothesis, but that much of it is also consistent with other theories, since (Mayers 1998: 88) *"...investment options provide opportunities for risk-shifting or are a likely source of asymmetric information"*. The sequential financing hypothesis has no direct implication for stock price reactions at the time of convertible debt announcements. However, as none of the other motivations for the use of convertible debt predicts any additional investment at the time of conversion, evidence of investment related activity at the time of conversion would support the sequential-financing hypothesis.

In the model of Isagawa (2000) the managerial investment decisions are affected through default risk rather than financing constraints as in Mayers' model. In cases, where managers have empire-building tendencies[9] and fear of default[10], properly structured convertible debt alleviates managerial opportunism. In essence, the model does not depend on the informational asymmetry problem and thus does not have any testable hypothesis regarding stock price reaction following convertible debt offer announcements.

Tax Advantage based Theories

Jalan and Barone-Adesi (1995) consider convertible bonds as delayed equity financing and motivate their use with a different tax treatment of coupon interest and dividend payments in a setting with market frictions and incompleteness. In such a setting issuing convertible bonds increases the residual equity value of the firm, since the firm benefits from the tax shield as opposed to an up-front equity financing. Cooperation between firms and investors and the fact that firms have repeated need to tap into the financial markets assure that both firms and investors have an incentive to use convertibles and share their benefits. Compared to straight debt, convertible bonds offer much less trade-off between interest tax shields and cost of financial distress. In the case of straight bonds higher interest tax shields are only achievable trough higher indebtedness, which increases the probability of financial distress. On the other hand, convertible bonds offer the benefit of the interest tax shields, but do not increase the probability of financial distress as much. Empirical evidence shows that firms tend to delay calls of convertibles, even though this goes against rational explanation (Brennan and Schwartz 1988). This fact seems to support the tax motivation. By delaying the call, firms leave more benefits to convertible bondholders, thus cooperating in the continuous game, where they repeatedly have to go back to the market for financing.

[9]This relates to the so-called overinvestment problem related to free cash flow. See Jensen (1986).

[10]This relates to the so-called underinvestment problem related to debt. See Myers (1977).

Should they fail to cooperate and share tax benefits with the investors, they would not be able to issue new convertibles and exploit the tax benefits.

Theories Based on Managerial Entrenchment

Isagawa (2002) analyzes the use of convertible bonds in a setting, where an entrenched manager determines the financial policy of the firm. This model is a deviation from the other literature, which mostly assumes that corporate financial policy is chosen such that it maximizes shareholder's wealth. Isagawa builds on the work of Zwiebel (1996) in which the management chooses financial policy based on its own interests. The interests are best served if management remains in control of the firm and undertakes any expansion project (empire building). In the absence of the market for corporate control managers have no incentives to issue debt, since that increases the probability of bankruptcy (and loss of their position). With the existence of the market for corporate control, the manager will issue debt in order to fence the takeover. By doing that and distributing cash dividends, managers can commit not to undertake value-decreasing projects. This, according to Zwiebel, explains why managers would choose to issue debt. When there are no other financing instruments, managers issue straight debt, which increases a probability of bankruptcy, and undertake the value-increasing project. By issuing callable convertible debt instead, managers can reduce the probability of bankruptcy. This implicitly assumes that bonds will eventually be converted into equity. A callable convertible bond is thus an effective financial instrument for an entrenched manager, but it is not desirable from the standpoint of the value of a firm. In this model the firm value decreases, since the probability of an inefficient manager being replaced decreases. Isagawa (2002: 266) concludes that *"...this implies that corporate financial policy itself creates a conflict between the objectives of the management and the owners..."*.

Rationing in the Equity Markets

Lewis, Rogalski, and Seward (2001) propose an alternative explanation for the issuance of convertible debt. Their model is in the spirit of the explanation of the rationing in debt markets (see Stiglitz and Weiss 1981). Lewis et al argue that there may be cases in which issuers want to issue common stock, but the firm's participation in the equity market is hampered. In case of rationing in debt markets, there is no alternative to raising debt, since straight debt is the most senior security. In case of equity, which is the most junior security, rationing may not necessarily exclude the firm from raising funds with a more senior security such is for example convertible debt.

2.3 Empirical Research

2.3.1 Wealth Effects Associated with Convertible Debt Offering Announcements

It is empirically well documented and consistent with the model of Myers and Majluf (1984) that different security types induce different wealth effects at the time of their announcements. Seasoned equity offerings induce the strongest negative wealth effects[11] of between -2.5 and -4.5 percent for the U.S. market, while straight debt issues induce only slightly (many times insignificant) negative wealth effects[12]. In Table 2.4 it is shown that convertible debt offerings induce announcement date valuation responses that are between those for equity and straight debt. Using the results of the previous empirical U.S. studies, we have computed the weighted[13] average wealth effect associated with the convertible debt issue announcements in the U.S. market of -1.63 percent, while the results of individual U.S. studies vary between -0.6 and -3 percent.

However, the results for the wealth effects associated with the announcements of convertible debt offerings differ across countries and periods. Contrary to studies conducted in the U.S. market, Kang and Stulz (1996) find significant positive abnormal returns in the Japanese market and attribute those to deregulation in Japan during their sample period and different behavior of Japanese managers, who seem to be less concerned about short-term results than their American counterparts. Similarly to Kang and Stulz, the abnormal returns associated with convertible debt offerings documented by Christensen, Faria, Kwok and Bremer (1996) in the Japanese market are positive, but insignificant. This is also the only difference they observe between the U.S. and the Japanese market in terms of abnormal stock price reactions to announcements of different securities, but they offer no clear explanation. De Roon and Veld (1998) also find positive abnormal returns for convertible offering announcements in the Dutch market. They do not find support for the notion that differences in corporate governance structures cause the difference in abnormal returns. In a study of the Taiwanese convertible bond market Chang, Chen and Liu (2004) find differences in the wealth effects between the first time issuers and seasoned convertible debt offerings, where the wealth effects are significantly positive for the first and negative (but insignificant) for the latter. They suspect that deregulation (similarly as in Japan) could account for the difference, where relaxed criteria for issuance of convertible bonds leads to the issue announcements being interpreted as a signal of the firm becoming more independent from bank financing (Kang and Stulz 1996).

[11] See for example Masulis and Korwar (1986), Mikkelson and Partch (1986) and Asquith and Mullins (1986).

[12] See for example Dann and Mikkelson (1984) and Eckbo (1986).

[13] The weights are sample sizes of the U.S. studies.

Apart from country and period specific differences in studies, most of the variation in the size of the wealth effects is attributable to issuer and issue specific factors due to the hybrid nature of convertible debt. More specifically, convertible debt can be structured such that it is either more equity- or more debt-like, by adjusting the characteristics of the issue. These include conversion price, maturity and call protection period among others. Typically, convertibles with shorter maturities or call protection periods and lower conversion prices are more likely to be in the money sooner and be converted into equity, which makes them more equity-like. Longer maturities or call protection periods and high conversion prices are characteristics, which make a convertible issue more debt-like. This effectively provides an important measure. First, by estimating whether the issue is more equity- or more debt-like, it is possible to capture an important explanation for the different size of the wealth effect associated with the announcement of a convertible debt issue. Second, it gives a useful test for the theoretical motives behind issues of convertibles. Almost all researchers agree to the following reasoning. Cases, where most of the convertibles are indeed more debt-like, suggest that convertibles are structured such as to resolve issues mostly associated with substitutions for straight debt (risk-shifting hypothesis of Green 1984, risk estimation of Brennan and Schwartz 1988 and Brennan and Kraus 1987). On the other hand, if the convertibles are more equity-like, this could be interpreted as support for delayed equity and signaling motives (relating to theories of Stein 1992 and Kim 1990). Although the reasoning that convertible bonds are a substitute for either debt or equity seems straightforward, it could be the case that they are neither or perhaps something else, which so far has not been theoretically proposed. This is also the most important point that future empirical research should address. The structure of the convertible debt issue on the other hand does not have any direct implication for the sequential financing model of Mayers (1998) and Isagawa's idea behind the control of managerial opportunism (2000) and managerial entrenchment (2002).

For the measurement of the size of the equity component in a particular convertible debt issue, different authors propose several measures, which are summarized in Burlacu (2000). The measure mainly used in the most recent literature is the so-called delta[14] (see Burlacu 2000 and Dutordoir and Van de Gucht 2004). The delta measure relates to the price sensitivity of a convertible bond to the underlying equity, and takes values between 0 and 1. A value closer to 1 indicates that the sensitivity of convertible bond price with respect to changes in the price of underlying equity is high, which makes the convertible bond

[14]Under standard Black-Scholes assumptions for the probability of conversion (option being in-the-money), the delta measure is computed as: $\Delta = e^{-\delta T} \cdot N\left[\frac{ln\frac{S}{K}+(r-\delta+\frac{\sigma^2}{2})\cdot T}{\sigma\cdot\sqrt{T}}\right]$, where S is the current price of the underlying stock, K is the conversion price, δ is the continuously compounded dividend yield, r is the continuously compounded yield on a selected "risk-free" bond, σ is the annualized stock return volatility, T is the maturity of the bond and N(.) is the cumulative standard normal probability distribution. The delta measure always takes a value between 0 and 1.

more equity-like. Therefore, we expect that more debt-like offerings of convertible bonds are associated with less negative abnormal returns and more equity-like offerings with more negative abnormal returns. Indeed, all the studies using the delta measure to determine the characteristic of the convertible bond issue find that issues with higher delta value induce more negative wealth effects. This is consistent with the more equity-like nature of such issues.

2.3.2 Convertible Debt Structure and Empirical Tests of Theoretical Motives

Stein (1992) finds support for his model in managerial motives, since in the earlier survey research most managers state that convertible debt is issued in the function of "delayed equity". The surveys do not support the implications of the signaling model of Constantinides and Grundy (1989), since no firm in the surveys uses the proceeds to repurchase stock. They rather use the proceeds for capital expenditures, general corporate spending and debt refinancing. Empirical evidence (Essig 1991) suggests that high debt-to-equity ratio firms, firms with high informational asymmetries and high growth potential are significantly more likely to use issue convertible debt. Call provisions seem to be crucial, since most of the firms force conversion in a short time after the issue date or call protection expiration. Mikkelson and Partch (1986) document that convertible bond issues with high bond ratings (A and above) have very negative wealth effects associated with the announcements of convertible debt issues, whereas issues with lower ratings essentially exhibit no wealth effects. At first, this finding seems difficult to reconcile with theory. However, Stein argues that the greater the potential for financial distress (lower bond rating), the more credible is convertible debt as a signal of optimism, since without the conversion into equity companies would be left with a debt overhang.

Davidson, Glascock and Schwartz (1995) investigate Kim's signaling hypothesis and Stein's delayed equity motivation on a sample of 146 convertible bond issues in the U.S. market between 1980 and 1985. Davidson et al propose the use of the expected time until the convertible becomes at-the-money as a proxy that captures both Kim's and Stein's equity related motives for issuing convertible debt. On one hand it depends upon the conversion ratio, which is perceived as the signal sent to the market in Kim's model. On the other hand it depends on the market's expectations about the firm's growth rate, which relates this measure to Stein's delayed equity argument. Davidson et al argue that a relatively low conversion ratio compared to the market's expectations about the growth will result in a relatively short expected time for the option becoming at-the-money, effectively making the convertible issue more equity-like and vice versa. Firstly, their results show that the average expected time for the convertible options to become at-the-money is less than 1.5 years.

Secondly, the shorter the expected time until the convertible bond becomes at-the-money (more equity like as conversion is more likely), the more negative the wealth effect associated with the announcement is. The authors interpret the first result as support for Stein's delayed equity motive and the second result as being consistent with Kim's conversion prices signaling mechanism.

Based on Stein's argument for the use of convertible debt Jen, Choi and Lee (1997) test two hypotheses using a sample of 158 convertible issues in the U.S. market between 1976 and 1985. The first "growth funding" hypothesis states that companies with large and growing capital needs and limited debt capacity are more likely to issue convertibles and thus create a future equity base with lower flotation and information costs (less dilution due to information asymmetries). The second "expected cost of financial distress" hypothesis states that issuers with high expected costs of financial distress and limited additional debt capacity will have a greater incentive to reduce the interest coupon (due to the conversion option) and lower the probability of financial distress by issuing convertibles. Both hypotheses together yield the idea that high-growth companies with limited debt capacity and high expected costs of financial distress are more likely to issue convertibles. The market is expected to react more favorably to convertible issues announced by such companies than to the issue announcements made by low-growth companies. Jen et al find two-day abnormal returns to be significantly negative (i.e. -2.15 percent) for the whole sample. They also note a stock price run-up prior to announcement date. Using a standard cross-sectional regression analysis, where they regress the cumulative average abnormal returns on a set of independent variables, they find support for the two hypotheses and thus Stein's "backdoor equity" argument. Firms issue convertible debt because of the high-growth potential and limited debt capacity (costly or unavailable debt financing), while at the same time managers believe that equity prices do not properly reflect the firm's value and new equity issues would not be favorable to the existing shareholders (costly equity financing).

Similarly to Davidson et al (1995), Magennis, Watts and Wright (1998) explore Kim's signaling hypothesis on a sample of 45 convertible issues in the Australian market between 1986 and 1995. To measure, whether the convertible issue is more equity- or debt-like, they use the expected time for the convertible options to become at-the-money as the proxy measure. The longer the expected time to at-the-money of the conversion option is, the more debt-like the convertible issue is. The size of the abnormal returns should be positively related to the expected time of the convertible option to become at-the-money. Magennis et al indeed find this relationship to be positive and significant . This yields support for Kim's signaling hypothesis. However, they claim that convertibles are not simply substitutes for equity or debt, but rather *"...a "ready-made" capital structure"* (Magennis et al 1998: 313), as a single convertible issue can be a *"...simple and cheaper alternative (to separate debt and equity issues)"* (Magennis et al 1998: 314).

Lewis, Rogalski and Seward (1999) investigate Stein's backdoor equity hypothesis and Green's risk-shifting hypothesis on a sample of 203 convertible issues on the U.S. market between 1977 and 1984. If the hypothesis of risk-shifting holds, convertible debt issuers must have higher agency costs than straight debt issuers. Should the Stein's hypothesis be correct, convertible debt issuers must have higher adverse selection and financial distress costs than common equity issuers. Lewis et al classify convertible debt offers as either debt- or equity-like by estimating the probability of conversion of convertible bond into equity at the maturity[15]. They confirm the findings of previous studies of announcement dates wealth effects, where the most negative effects are for equity issues, a bit less negative for convertibles issues and somewhat neutral for straight-debt issues. Firms that issue convertibles are smaller in terms of capitalization (size is often seen as proxy for information asymmetry), riskier in terms of total risk, with better pre-issue stock performance and more financial slack (consistent with the model of Myers and Majluf 1984) and with highly profitable growth opportunities. Firms that issue debt-like convertibles are smaller than those that issue straight debt, have higher market-to-book ratios, lower cash flows, lower dividend payouts, higher stock volatility and higher leverage before the issue. These findings about debt related costs are consistent with the hypothesis that firms use debt-like convertibles to control for the asset substitution (risk-shifting) problem. The equity related financing costs indicate that debt-like convertibles are issued when future economic conditions are expected to be good (good growth opportunities). Investment opportunities are significantly more profitable for equity-like convertible debt issuers than for common equity issuers. Equity-like convertible issuers have more financial slack than common equity issuers, which according to Myers and Majulf (1984) implies greater adverse selection costs. Lewis et al see this as evidence that issuing equity-like convertibles instead of common equity mitigates information asymmetry problems. Common stock issuers are riskier, both in terms of systematic and total firm risk, than firms that issue equity-like convertibles. Overall, the effects of equity related costs are consistent with the backdoor-equity hypothesis, since the adverse selection costs are higher for equity-like convertible issuers than for common equity issuers.

In the follow up paper Lewis, Rogalski and Seward (2001) investigate long-run performance of companies issuing convertible debt. Lewis et al argue that issuers might be using the convertible debt market because they were "rationed out" of the equity market. As mentioned in Section 2.2.5 this provides another motive for issuing convertible debt. On a sample of 566 convertible debt issues in the U.S. market from 1979 to 1990 they find deteriorating operating performance of the issuers of convertible bonds following the convertible debt issue compared to the matched sample of non-issuing firms. However, the difference in operating performance is not significant as in the case for equity issuing firms compared

[15]This is estimated using the standard Black-Scholes assumptions, where the underlying stock follows a geometric Brownian motion.

to the matched sample of non-issuing firms. Lewis et al interpret these findings as evidence somewhat contradicting the arguments of Green (1984) and Mayers (1998). Lewis et al argue that in Green's and Mayers' models it is implicitly assumed that one of the consequences of a convertible debt issue would be that firms invest only in positive net present value projects. Given a relatively deteriorating performance of convertible bond issuers, they conclude that convertible debt does not completely resolve risk-shifting and / or managerial discretion (overinvestment problem). On the other hand, they see the findings as support for Stein's delayed equity motive, as firms may choose a convertible debt issue over an equity issue when they expect improved operating performance in the future. Lewis et al consider the findings on relative operating performance of convertible versus equity issuers as support for their alternative explanation for the use of convertible debt due to the rationing in the equity market. This rationing means that some firms are allowed to access the equity market, but only if their post-issue performance proves to be sufficient.

Mayers (1998) empirically tests the proposed "sequential financing" rationale for convertible debt issues. If the sequential financing hypothesis holds, firms will exhibit intensive investment-related activity at the time of calls of convertible bonds. Mayers documents that issuers of convertible debt have higher than industry median leverage, higher market-to-book ratios, higher R&D costs relative to sales and a lower than industry median ratio of tangible to total assets. For these companies convertible debt represents 30 percent of total debt on average. Somewhat contrary to the sequential-financing hypothesis is the large size of the firms in the sample, since the sequential-financing hypothesis is based on the issue cost economization, which is more important for smaller firms. Compared to a matching sample of non-issuing firms, Mayers finds statistically significant larger capital expenditure changes for companies that issued and called convertible debt in the call year and in the year following the call. Calls of convertibles that precede significant changes in financing activity seem to be an important breakpoint. This breakpoint signals an increased rate of new financing, with straight debt being the most popular instrument. Mayers argues that this evidence does not support Stein's model, since calls are not being executed to avoid possible financial distress, as new debt is issued shortly after the calls. This, combined with increased investment activities, gives support to the sequential-financing hypothesis.

In their analysis of 129 convertible debt issues on the UK market in the period 1982 to 1996 Abhyankar and Dunning (1999) find limited support for Stein's model and for the risk estimation arguments of Brennan and Kraus (1987) and Brennan and Schwartz (1988). Similarly as in some other studies (for example McConnell and Muscarella 1995) they observe a positive effect on abnormal returns in firms, which use the proceeds to finance capital expenditure, while a negative effect is observed in firms, which dedicate the proceeds to refinancing, mergers and acquisitions and general expenditure.

Chang, Chen and Liu (2004) test Mayers' sequential financing hypothesis based on a

sample of 109 issues of Taiwanese firms. They develop and test two implications directly related to Mayers' model. The first implication is related to the overinvestment problem. If convertibles are an effective way to mitigate this issue, they are more valuable in cases, where current investments and future investment options are highly positively correlated. According to Chang et al this is a feature generally found in firms with focused activities and more volatile cash flows (since they are not diversified). Therefore, such companies will benefit more from the use of convertibles. Essig (1991) documents volatility of corporate cash flows to be positively related to the use of convertible debt. The second testable prediction refers to the net new financing (gross proceeds less refinancing) that companies will raise during the life of convertible bond. If indeed Mayers' hypothesis holds, companies want to avoid costly external financing when capital needs are high and should therefore mostly rely on internal funds during the life of the convertible bond. Chang et al find support for both implications related to the sequential-financing motivation for the issue of convertible securities. The difference in size of the wealth effects associated with the announcement of the convertible debt issue between companies with more focused and companies with less focused activities is significant. The wealth effects for the subsample of companies with focused activities are significantly positive, while negative and not significant for those with less focused activities.

In another paper Lewis, Rogalski and Seward (2003) use a sample of 588 convertible debt issues in the U.S. market in the period 1972 to 1992. They attempt to reconcile the diverging evidence on the motives for convertible debt issues and determinants of stock price reactions to convertible debt announcements. They analyze the impact of issuer characteristics on the size of the wealth effect associated with the announcement of convertible debt offers. They again split the issues according to the previously mentioned delta measure into more equity- and more debt-like issues. Lewis et al find support for the risk-shifting motive proposed by Green (1984), as investment related issuer characteristics do not affect the investor reactions for the debt-like offers. They do not document strong support for the risk estimation argument proposed by Brennan and Schwartz (1988), as leverage negatively affects abnormal returns for issuers that are neither equity- nor debt-like. They find strong support for Stein's (1992) backdoor equity hypothesis, as good industry-adjusted growth opportunities of the issuers positively affect abnormal returns, especially if they invest the proceeds in new projects. Following a strain of the literature on market timing (see for example Bayless and Chaplinsky 1996) they analyze the impact of the market, issue and issuer characteristics on abnormal returns for subsamples of cold, normal and hot market periods of security offerings. They show that the size of the wealth effect associated with the announcement of convertible debt issue also depends on the aggregate volume of the issues in the seasoned equity markets. Moreover, firm-specific factors seem to be more important in periods of cold equity markets, when investors more closely analyze these factors than in

periods of more attractive equity issues.

Similar to the analysis of Lewis et al 2003 is the study of Dutordoir and Van de Gucht (2004), conducted on 222 convertible debt issues on eight Western European markets in the period 1990 to 2002. They explicitly test Brennan and Kraus' (1987) and Stein's (1992) motivations for the use of convertible debt. Dutordoir and Van de Gucht document strong support for the Brennan and Kraus' model and only limited support for Stein's backdoor-equity motivation. In the analysis they point to certain differences between the U.S. and Western European markets, as the convertible issues on Western European markets seem to be more debt-like and firms are much larger than those on the U.S. market.

In Table 2.5 empirical research related to theoretical motivations for the issue of convertible debt is summarized. The summarized studies use issue, accounting and stock prices information to capture issuer and issue specific characteristics. In the studies a cross-sectional analysis is mostly used as the research method; while Lewis et al 1999 for example also used a multinomial logit model in their study to investigate security choice decision. As the table shows, the most frequently tested motivation was Stein's "backdoor equity" explanation for the use of convertible debt. The support for it (and Kim's hypothesis as well) has consistently been documented. Green's (1984) and Mayers' (1998) agency cost resolution based arguments have also been explored and generally supported, but with some studies finding contradictory or mixed evidence. Tax motivation and managerial entrenchment explanations have not been tested directly to our knowledge, while little and mixed evidence has been found to support Brennan and Kraus (1987) and Brennan and Schwartz (1988) motivations for the use of convertible debt. One of the reasons for this disparity in popularity of individual motives might be in the ease of deriving and applying meaningful empirical tests. To find support for Stein's motivation, most of the researchers rely on establishing whether the largest share of convertible bonds in the sample is equity-like. All the other theoretical motivations are more difficult to address, as the nature of convertible debt is very complex.

2.3.3 Survey Evidence

There have not been many surveys on convertible debt issues. The first survey was done by Pilcher (1955), followed by Brigham (1966) and Hoffmeister (1977), while the latest surveys include Billingsley and Smith (1996), Graham and Harvey (2001) and Bancel and Mittoo (2004). The survey by Bancel and Mittoo (2004) has been conducted on an international scale (European countries), while other surveys have been done for the U.S. market. The sample sizes vary substantially across the surveys.

Pilcher's (1955) sample includes 22[16] responding presidents of corporations, Brigham (1966) bases his conclusions on a sample of 22 responding firms, Hoffmeister's (1977) survey

[16]There were actually 75 repondents, but only 22 are for companies that issued convertible debt. Others were from companies that issued convertible preferred stock.

is composed of 55 respondents, Billingsley and Smith (1996) have a sample of 88 responding firms, Graham and Harvey (2001) base their survey on 392 responses from CFOs and Bancel and Mittoo (2004) have a sample of 29 firms from eight countries.

In most of the surveys questions were grouped into the following broader categories:

- Rationales (reasons) for issuing convertible securities
- Financing alternatives
- Use of funds
- Conversion policy
- Other factors

It is important to note that the difference between the questions about the use of convertible debt related to the motives, put forward by practitioners, and the theoretical motives, put forward by academics. In general, two distinctive motivations are put forward by practitioners. Namely, practitioners seem to consider convertible debt as the cheaper source of financing than straight debt, as it bears a lower coupon rate. Closely related to this view is also the role of the conversion option as the so-called "deal sweetener", which helps achieve a lower coupon rate and sell otherwise hard to sell debt issue. Secondly, practitioners traditionally consider convertible debt to be a way of selling the equity at a premium, as the conversion price is higher than the current stock price. As previously mentioned, both views are refuted by academics, who offer other motives for the use of convertible debt.

As theoretical motivations for the use of convertible debt only started to emerge in the late eighties, early surveys do not rely on any theoretical motivation for the issuance of convertible debt, but rather rely on the mentioned general perceptions among investors and managerial communities. Pilcher (1955) asked managers about the primary motivation for issuing convertible securities, where raising a common equity and "sweetening" (with conversion option) the senior security (debt) were offered as possible answers. 82 percent of respondents said that the prime motivation for the issue of convertibles was to raise equity. Brigham (1966) based the questions on the primary interest in either equity or debt, where a company was not able to issue one of those and opted for convertibles instead. 73 percent of the respondents claimed that their primary interest was in equity. He also asked questions about equity undervaluation, concerns about equity dilution, high cost of straight debt and targeting a particular investor's group. 68 percent of respondents claimed that convertibles were the way to sell the equity at a premium, while only 27 percent stated that convertibles were issued in order to "sweeten" otherwise difficult to sell straight debt issue. Hoffmeister (1977) related the questions to interest rate reduction (cost of debt in Brigham 1966), perceived undervaluation of equity, enhancement of an otherwise difficult to

sell issue (marketability in Pilcher 1955 and debt sweetening), and popularity of convertible debt at the time, equity dilution and a favorable accounting treatment. 70 percent of those surveyed found the issuance of delayed equity as an important feature of convertible debt, while 58 percent claimed that reducing the interest cost was an important consideration. Somewhat more than a quarter of the respondents said that marketability of the issue also played an important role. Interestingly, Hoffmeister also found some differences between large and medium-sized firms, where the managers of large firms more often stated cheaper debt as the motivation for the use of convertibles, while the managers of medium-sized firms perceived delayed equity as a more important reason.

By the time of the Billingsley and Smith 1996 survey several theoretical motivations for the issuance of convertible bonds emerged. They used the questionnaire to test whether the theories about delayed equity (Stein 1992) and risk shifting[17] (Green 1984) in fact drive a firm's decision to issue convertible securities. Aside from the questions related to practical motivations for the use of convertible debt, which were asked in previous surveys[18], they also asked questions about delayed equity and bondholder protection. On top of those, they also pose a question about the advice of an investment banker and the popularity of convertible debt at the time. The lower coupon rate compared to straight debt was cited as the primary motivation for the issuance of convertibles by most of the mangers, while managers in general offered mixed responses regarding the sale of equity at a premium. The survey is also the first that explicitly asks about the ranking of other financing alternatives that were considered. Managers most often claimed that straight debt was the primary alternative to convertibles, while equity issuance came second. Billingsley and Smith document a strong support for Stein's delayed equity argument, while almost no support for Green's risk shifting argument[19]. Surveyed managers also gave high importance to the window of opportunity for the issuance of the securities.

Among the questions regarding capital structure, payout policy and capital budgeting Graham and Harvey (2001) asked the surveyed CFOs specific questions about convertible bonds. The questions were aimed at testing the risk estimation models of Brennan and Schwartz (1977) and Brennan and Schwartz (1988), the risk shifting model of Green (1984) and the sequential financing model of Mayers (1998)[20], as well as the delayed equity model of Stein (1992). Similarly to previous surveys they also ask questions about equity dilution, lower coupons on convertibles and popularity of convertible securities at the time. 58

[17] Billingsley and Smith (1996) actually do not mention Green (1984) explicitly, but the question they ask is a direct test of Green's risk shifting proposition.

[18] lower coupon rates versus straight debt, over and undervaluation of stock at the time

[19] Note that results of the survey also depend on the way questions are asked. In most cases where questions denote negative meaning, we do not believe that answers are equally truthful as with the other questions. This might also provide an alternative explanation to finding no support for certain issues.

[20] The test of Mayers' model was not related to a direct question in the survey.

percent of the respondents viewed convertible debt as an inexpensive way to issue delayed equity, while more than 40 percent of the surveyed CEOs found a lower coupon rate to be an important motive for the issue of convertible debt. Graham and Harvey find support for the risk estimation argument, since more than 40 percent of those surveyed stated that issuing convertibles was a way to attract investors unsure about the riskiness of the company. Similarly as in the study of Billingsley and Smith (1996) Graham and Harvey did not document any support for Green's risk shifting argument.

The survey by Bancel and Mittoo (2004) encompasses the widest spectrum of theoretical motivations. Aside from delayed equity, risk shifting motives and the risk estimation models, they also formulate questions with respect to the signaling model of Constantinides and Grundy (1989), which is closely related to that of Stein (1992). Bancel and Mittoo also ask questions about the relationship between a convertible debt issue and rating requirements, call provisions, dilution concerns, importance of covenants, tax advantage of convertibles[21], reducing the risk of hostile takeover[22], popularity of convertible debt at the time and tapping a group of international investors. They find strong support for Stein's delayed equity argument, since around 86 percent of respondents state "delayed equity" as the most important or very important reason for the issue of convertibles. Around 55 percent of respondents claim that the signaling role of convertibles is an important feature, which gives further support both to Stein's and Kim's (1990) models. Somewhat less support is documented for the sequential financing hypothesis (Mayers 1998), as only about 28 percent of the managers find the call feature of convertibles important and the same percentage claim that they would force the conversion as and when future investment opportunities occur. Limited support is shown for the risk estimation (Brennan and Kraus 1987 and Brennan and Schwartz 1988) motivations for the use of convertible debt, as only about 21 percent of the respondents claim that the most important reason for the issue of convertibles is to attract investors, unsure about the risk of the firm. The same weak support is documented for the tax based explanation[23] (Jalan and Barone-Adesi 1995), while no support is found for Isagawa's (2002) managerial entrenchment motivation and Green's (1984) risk shifting argument.

In the surveys managers were also asked to state and rank the financing alternatives to convertible debt at the time of the issue. These financing alternatives range from simple equity and straight debt to preferred stock (convertible and non-convertible), private placements and synthetic convertible debt (debt with warrants). Bancel and Mittoo (2004) find that for the most of the companies convertible debt is the alternative to straight debt. The result is somewhat in conflict with the responses relating to the question of delayed equity,

[21]Note that this is implicitly related to Jalan and Barone-Adesi (1995) argument, although Bancel and Mittoo do not mention them.

[22]Note that this is implicitly related to the managerial entrenchment motivation by Isagawa (2002), although Bancel and Mittoo do not explicitly relate the survey question to Isagawa's argument.

[23]They find that this motivation is more important for the low-growth companies.

where over 80 percent of the managers find that motive to be the most or very important. On the other hand, this result is in line with the findings of Dutordoir and Van de Gucht (2004) for the Western European markets, where most of the convertible bonds are structured to be more debt-like.

Bayless and Chaplinsky (1996) present a model of window of opportunity for seasoned equity offerings. They show that negative price reactions in hot equity markets are lower than in cold equity markets and attribute this difference in part to reduced levels of informational asymmetries. The same reasoning could then also be applied to convertible bond issues. Bancel and Mittoo (2004) surveyed managers on how the market conditions affected their decision to issue convertibles, by asking them about the importance of the different factors (overvaluation and undervaluation of equity, levels of interest rates, volatility of the stock market, among others). Most of the respondents claim that high stock market volatility, which translates into a higher value of the conversion option, and low interest rates were the key factors that affected the timing of the convertible debt issue.

In Table 2.6 a summary of survey evidence relating to the theoretical motivations for the use of convertible debt is presented. With respect to practical motivations for the issue of convertible debt, surveys in general find strong to moderate support for both "cheap" debt argument and the motivation based on selling the equity at the premium. The importance of these two arguments, which are most often put forward by practitioners, varies over time. For example, Hoffmeister (1977) notes that the shift he observes from delayed equity financing toward a desire to reduce debt interest cost is consistent with the highest interest rates experienced in 30 years at the time. Nevertheless, both practical motivations have remained very important arguments for managers. With respect to theoretical motivations for the use of convertible debt, all the surveys find strong evidence for the delayed equity motivation. In the latest two surveys some support for the risk estimation argument and the sequential-financing hypothesis is documented, while no support is found for the managerial entrenchment and risk shifting argument for the use of convertible debt in particular[24]. The survey questions do not differ much between (in particular the recent) surveys and aim at the most direct tests of different theoretical motivations for the use of convertible debt. Although this direct approach is useful for the interpretation of the results, some questions, which are too direct (for example the question on risk shifting or bondholder expropriation), might invoke answers that do not reflect the true state of affairs. The weakness of more indirect questions of course is that the results might be subject to different interpretations.

[24]Veld (1994) has done a survey for warrant-bond loans in the Netherlands. His findings are similar to those of the studies for convertibles. He finds support for the practical motives, but not for theoretical motives, such as for Brennan and Schwartz (1988) and Green (1994). His study does not include questions on the Stein (1992) model.

2.4 Conclusion

In this chapter we have summarized and reviewed the most relevant up to date literature on the motives for the issuance of convertible debt. The evidence is far from being conclusive and unanimous as to why companies choose to issue convertible debt and how these motives affect investor reactions to convertible debt issue announcements. However, there exist some findings, which are common to all the empirical research.

First of all, the wealth effects associated with the announcements of the convertible debt announcements are generally negative and in between those for straight debt and equity. Secondly, convertible debt can be structured to be either more debt- or equity-like. Convertible issues that are more equity-like induce stock market responses at the issue announcements closer to those, documented for equity issues. This is consistent with the adverse selection model of Myers and Majluf (1984). Thirdly, Stein's (1992) delayed equity motive, Kim's (1990) signaling theory, Mayers' (1998) sequential- financing argument and Green's (1984) risk shifting hypothesis are the most investigated theoretical argumentations for the use of convertible debt versus straight debt and / or equity. The support for the delayed equity and signaling models found in cross-sectional analyses is corroborated in the surveys. Some support is documented for the risk shifting hypothesis in the cross-sectional empirical analysis, but is completely refuted in the surveys. Limited evidence is provided for Brennan and Kraus (1987) and Brennan and Schwartz (1988) risk estimation explanations, both in cross-sectional analyses and surveys. Tax based motivation for the use of convertible debt (Jalan and Barone-Adesi 1995) and Isagawa's (2002) managerial entrenchment argument have not been investigated in cross-sectional analyses and surveys yield no support either. Finally, to a large extent surveys reveal that managers still find a lower coupon rate of convertible debt as an important argument for its issuance, although the importance of this motive varies over time. Given that convertibles include a conversion feature (that comes at a price), a view that convertibles are a cheaper source of financing than straight debt is deceptive. The same is true for the practitioners' view that convertibles provide means of selling the equity at a premium.

Based on a review on the theoretical and empirical literature on why companies issue convertible bonds we can conclude that there are large discrepancies between theory and practice. The practical point of view shows up in surveys among managers that were responsible for issuing convertible bonds. These surveys show that they base themselves on irrational motives. The theoretical literature presents a number of rational motives. These rational motives are confirmed in some of the cross-sectional studies, but they are not confirmed in the survey studies. There are two possible explanations for the different outcomes of the survey and cross-sectional studies. The first explanation is that the surveys are sensitive to the question contents. Therefore they may not yield reliable results. It is often argued that "managers act smarter than they speak". Therefore they may follow rational motives,

without being aware of this. The second explanation is that the proxies in the cross-sectional studies may be weak. For example, it is very hard to measure a concept of informational asymmetry using only stock market and/or accounting data. In our view, future research in this field should aim for an approach that captures the best of both worlds. Such an approach would ideally combine the different techniques in one study. More specifically, besides using surveys to ask direct questions, it is also possible to use them to find proxies for variables that are used in cross-sectional studies. This approach was used before by De Jong and Van Dijk (2003) in a study on the capital structure of Dutch companies, and by De Jong, Van Dijk, and Veld (2003) in a study on the dividend and share buy-back policies of Canadian firms. We believe that such an approach may bridge the gap between theory and practice.

2.A Tables

Table 2.1: Number of convertible bond issues in different regions and countries
Number of convertible bond issues in different regions and countries in the period 1990-2003; source of the data: SDC New Issues database

Region / Country	Number of issues	Percent of all issues
Europe (All)	**1025**	**14.2%**
UK	143	2.0%
France	216	3.0%
Germany	158	2.2%
The Netherlands	152	2.1%
US	**2166**	**30.0%**
Canada	**280**	**3.9%**
Asia (All)	**2967**	**41.2%**
Hong Kong	110	1.5%
Japan	1632	22.6%
Taiwan	185	2.6%
South Korea	827	11.5%
Australia	**235**	**3.3%**
Rest of the World	**535**	**7.4%**
World (Total)	**7208**	**100.0%**

Table 2.2: Yearly breakdown of the number of convertible bond issues

Yearly breakdown of the number of convertible bond issues in the period 1990-2003; source of the data: SDC New Issues database

Year	Number of issues	Percent of all issues
1990	335	4.65%
1991	384	5.33%
1992	308	4.27%
1993	640	8.88%
1994	797	11.06%
1995	490	6.80%
1996	710	9.85%
1997	583	8.09%
1998	598	8.30%
1999	436	6.05%
2000	364	5.05%
2001	552	7.66%
2002	381	5.29%
2003	630	8.74%
Total	**7208**	**100.00%**

Table 2.3: Descriptive statistics

Descriptive statistics of the issue sizes in different countries and the Global market in the period 1990-2003. The values are in millions of US dollars, except for N (number of issues) and CV (coefficient of variation); source of the data: SDC New Issues database.

Country	Mean	Median	Min.	Max.	Std. dev.	N	CV
UK	324.66	159.50	23.40	2026.80	433.10	141	1.33
France	404.61	245.70	2.40	3097.20	481.16	215	1.19
Germany	149.84	56.40	3.90	5096.30	436.68	154	2.91
The Netherlands	368.25	200.90	0.30	2908.30	506.99	151	1.38
US	237.55	135.00	0.10	4500.00	331.71	2162	1.40
Canada	122.85	87.80	0.10	1500.00	167.92	236	1.37
Hong Kong	181.91	115.00	0.40	2500.00	342.48	109	1.88
Japan	116.36	65.80	0.10	2851.80	188.49	1632	1.62
Taiwan	124.65	100.00	13.20	700.00	100.25	185	0.80
South Korea	34.45	12.50	0.20	1317.80	91.38	804	2.65
Australia	93.65	8.50	0.10	1500.00	183.41	221	1.96
World(Total)	175.46	85.40	0.00	5096.30	307.55	7074	1.75

Table 2.4: Studies of wealth effects associated with convertible debt issue announcements
CAAR denotes Cumulative Average Abnormal Return

Study	Period	Sample size	CAAR (-1,0) (%)		CAAR (0,1) (%)	
U.S. domestic market						
Dann and Mikkelson (1984)	1970-1979	132	-2.31	***	-	
Mikkelson and Partch (1986)	1972-1982	33	-1.97	***	-	
Eckbo (1986)	1964-1981	75	-1.25	***	-	
Hansen and Crutchley (1990)	1975-1982	67	-1.45	***	-	
Long and Sefcik (1990)	1965-1984	134	-0.61	***	-	
Billingsley, Lamy and Smith (1990)	1971-1986	104	-2.04	***	-	
Kim and Stulz (1992)	1970-1984	259	-1.66	***	-	
Davidson III, Glascock and Schwarz (1995)	1980-1985	146	-1.40	***	-	
Jen, Choi and Lee (1997)	1976-1985	158	-2.15	***	-	
Lewis, Rogalski and Seward (1999)	1977-1984	203	-1.51	**	-	
Lewis, Rogalski and Seward (2003)	1978-1992	588	-1.09	**NA**	-	
Arshanpalli, Fabozzi, Switzer and Gosselin (2004)	1993-2001	229	-3.07	***	-1.92	***
Weighted average (sample sizes are weights)			*-1.63*			
Japanese domestic market						
Kang and Stulz (1996)	1985-1991	561	0.83	***	1.05	***
Christensen, Faria, Kwok and Bremer (1996)	1984-1991	35	0.60		-	
Taiwanese market						
Chang, Chen and Liu (2004)	1990-1999	109	0.42		-	
Australian market						
Magennis, Watts and Wright (1998)	1986-1995	45	-1.08	**	-	
Dutch market						
De Roon and Veld (1998)	1976-1996	47	0.63	**	0.54	NA
UK market						
Abhyankar and Dunning (1999)	1982-1996	129	-1.20	***	-	
French market						
Burlacu (2000)	1981-1998	141	-0.20	***	-	
Western European markets						
Dutordoir and Van de Gucht (2004)	1990-2002	222	-1.18	***	-1.42	***
German and Swiss markets						
Ammann, Fehr and Seiz (2004)	1996-2003	55	-0.18		-1.36	**

*** - denotes significance at 1% level
** - denotes significance at 5% level
NA - not reported

Table 2.5: Theoretical motivations for issuing convertible debt and related empirical research

Notes: BK (1987) refers to Brennan and Kraus (1987); BS (1988) refers to Brennan and Schwartz (1988); K (1990) refers to Kim (1990); S (1992) refers to Stein (1992); G (1984) refers to Green (1984); M (1998) refers to Mayers (1998); I (2002) refers to Isagawa (2002); JBA (1995) refers to Jalan and Barone-Adesi (1995); LRS (2001) refers to Lewis, Rogalski, and Seward (2001). **+: strong support; 0: limited support; −: contradicting evidence**

EMPIRICAL RESEARCH	**THEORETICAL MOTIVES**								
	Asymmetric information based				**Agency cost based**		**M. entrench.**	**Tax**	**Eq. rationing**
	BK (1987)	BS (1988)	K (1990)	S (1992)	G (1984)	M (1998)	I (2002)	JBA (1995)	LRS (2001)
Davidson, Glascock and Schwartz (1995)			+	+					
Jen, Choi and Lee (1997)				+					
Magennis, Watts and Wright (1998)			+						
Mayers (1998)						+			
Lewis, Rogalski and Seward (1999)				+	+				
Abhyankar and Dunning (1999)	o	o		o					
Lewis, Rogalski and Seward (2001)				+	-	-			+
Lewis, Rogalski and Seward (2003)		o		+	+				
Chang, Chen and Liu (2004)						+			
Dutordoir and Van de Gucht (2005)	+			o					

Table 2.6: Theoretical motivations for issuing convertible debt and related survey research

BK (1987) refers to Brennan and Kraus (1987); JBA (1995) refers to Jalan and Barone-Adesi (1995); BM (2004) refers to Bancel and Mittoo refers to Lewis, Rogalski, and Seward (2001); BS (1988) refers to Brennan and Schwartz (1988); GH (2001) refers to Graham and Harvey (2001); Pilcher (1955); K (1990) refers to Kim (1990); I (2002) refers to Isagawa (2002); B (1966) refers to Brigham (1966); S (1992) refers to Stein (1992); to Hoffmeister (1977); G (1984) refers to Green (1984); BS (1996) refers to Billingsley and Smith (1996); M (1998) refers to Mayers (1998). **+: strong support; 0: limited support; −: contradicting evidence**

SURVEY			**P (1955)**	**B (1966)**	**H (1977)**	**BS (1996)**	**GH (2001)**	**BM (2004)**
Sample size			22	22	55	88	392	29
Practical motives	**lower coupon rate / deal "sweetener"**		**o**	**o**	+	+	**o**	+
	sell equity at the premium		+	+	+	**o**	+	**o**
Theoretical motives	**Asymmetric information based**	BK (1987)					+	**o**
		BS (1988)					+	**o**
		K (1990)						+
		S (1992)				+	+	+
	Agency cost based	G (1984)				**-**	**-**	**-**
		M (1998)					+	+
	Managerial entrenchment	I (2002)						**-**
	Tax motivation	JBA (1995)						**o**
	Equity rationing	LRS (2001)						

Chapter 3

Why do Companies Issue Convertible Bond Loans? An Empirical Analysis for the Canadian Market

3.1 Introduction

A question that receives considerable attention in the theoretical as well as the empirical corporate finance literature is why companies issue convertible debt. While practitioners put forward notions such as delayed equity, lower coupon rate and "sweetening" of deals that are otherwise hard to sell[1], academics have proposed theories that relate the use of convertible debt to informational asymmetries (Brennan and Kraus, 1987, Brennan and Schwartz, 1988, Kim, 1990, and Stein, 1992), agency issues (Green, 1984, Mayers, 1998, and Isagawa, 2000) and tax motives (Jalan and Barone-Adesi, 1995). These theories in general suggest that companies that face high debt- and/or equity-related agency costs could benefit from issuing convertible debt as opposed to other "straight" means of financing. Prime candidates for issuing convertible debt are companies for which straight debt or equity does not provide the most efficient way of financing. These include companies to which one of the following problems applies: difficulty in estimating risk, possession of ample growth opportunities, high costs of financial distress, financial constraints, and/or high agency costs.

A convertible bond, from now on to be referred to as a convertible, is a bond that can be exchanged for a predetermined fixed number of "new" shares of the issuing company

[1]See, for example, surveys of managers by:

- Billingsley and Smith (1996) (for the U.S. market)
- Graham and Harvey (2001) (for the U.S. market)
- Bancel and Mittoo (2004) (for the European markets).

within a predetermined period of time. In essence, a convertible is a package consisting of a straight bond and warrants written on the issuing company stock.[2] Empirically it is well documented that different security types induce different wealth effects at the time of their announcements. For example, seasoned equity offerings induce the strongest negative wealth effects (see, e.g., Masulis and Korwar, 1986, Mikkelson and Partch, 1986, and Asquith and Mullins, 1986) of between -2.5 and -4.5 percent, while straight debt issues induce only slightly (often insignificant) negative wealth effects (see, e.g., Dann and Mikkelson, 1984, and Eckbo, 1986). Given the hybrid character of convertibles, we can expect that the size of the wealth effects associated with the announcements of convertible security offerings will be between those for straight debt and equity.

Previous studies on stock market reactions to the announcements of convertible debt issues in the U.S. market document significant negative effects of convertible debt announcements in the range between -1 to -3 percent.[3] Other studies on Anglo-Saxon markets find similar results. That is, Magennis, Watts and Wright (1998) and Abhyankar and Dunning (1999) find significantly negative effects for the Australian and the UK markets respectively. Outside the Anglo-Saxon markets, the empirical evidence has been somewhat less conclusive. Burlacu (2000), Dutordoir and Van de Gucht (2006), Ammann, Fehr and Seiz (2006) find similar effects for France, Western European markets, and Germany and Switzerland respectively. However, results for other markets go in the opposite direction. More specifically, Kang and Stulz (1996), and Christensen, Faria, Kwok, and Bremer (1996) find positive effects for the Japanese market; Chang, Chen, and Liu (2004) find positive (insignificant) effects for the Taiwanese market; and De Roon and Veld (1998) find a significantly positive effect for the Dutch market. The hybrid nature of convertibles and the institutional and regulatory differences among countries and markets seem to be the driving force of the divergence. This makes the analysis one of the more interesting fields in empirical corporate finance today, since convertible debt can be structured to be either more debt- or equity-like as to mitigate some of the risks and deficiencies associated with each of "plain" securities.

Following Lewis et al. (1999), Burlacu (2000), and Dutordoir and Van de Gucht (2006), we estimate the structure of the convertible debt design (i.e. how debt- or equity-like it is) by employing the delta measure. The delta measure relates the price sensitivity of a convertible to the underlying equity, and takes values between 0 and 1. A value closer to 1 suggests that the convertible is more equity-like, since the probability of conversion is higher. In addition we use the equity-to-debt component ratio as an alternative measure of the convertible

[2]Given that the exercise price is "paid" by redeeming the bonds, convertible bonds are in fact warrants with a variable exercise price.

[3]These studies include Dann and Mikkelson (1984), Mikkelson and Partch (1986), Lewis, Rogalski and Seward (1999, 2003), and Arshanapalli, Fabozzi, Switzer, and Gosselin (2004). See Table 12.4 of Loncarski, ter Horst and Veld (2006) for a complete overview of studies on wealth effects associated with convertible debt issue announcements.

debt design, since the delta measure only captures the value of the equity component of a convertible. We estimate the equity and debt components by using the valuation approach proposed by Tsiveriotis and Fernandes (1998). Note that issuers of convertibles that are more equity-like are hypothesized to be more adversely affected by equity-related costs, while debt-like issuers are hypothesized to be more negatively affected by debt-related costs. According to adverse selection models on capital structure (e.g. Myers and Majluf, 1984), we expect that more debt-like offerings are associated with less negative abnormal returns and more equity-like offerings with more negative abnormal returns. Moreover, we do not expect more debt-like convertible offerings to be significantly affected by equity-related agency costs and more equity-like convertible offerings by debt-related agency costs.

The purpose of this chapter is twofold. The first objective is to provide further evidence on the market reactions to convertible debt offerings by studying the Canadian market. Although the Canadian market shares many of its design features with its U.S. counterpart, closer scrutiny reveals some differences. First of all, the Canadian market is much smaller than the U.S. market. Secondly, investment (income) trusts have become a very popular mean of business organization after 2000 due to very favorable tax treatment.[4] This study therefore adds to the literature on the use of convertible debt. The convertible bonds issues by income trusts are different from those issued by regular companies in the sense that the income trusts' convertibles are more debt-like, while the regular companies issue more equity-like convertibles. Therefore, the existence of income trusts allows us to study convertible debt design in more detail.

The second objective is to examine the nature and determinants of the size of the wealth effect with respect to issuer characteristics and to relate these findings to theories about motives for the use of convertible debt. We examine the influence of several issuer characteristics on announcement reactions in the Canadian market for the period between 1991 and 2004. To the best of our knowledge this is the first study that examines the wealth effects associated with convertible debt issues in the Canadian market.

Our empirical findings are mostly in line with the seminal work of Myers and Majluf (1984) on external financing and the role of informational asymmetry. As in the U.S., the event study analysis shows that wealth effects associated with the announcements of Canadian convertibles offerings yield significantly negative abnormal returns of about -2.7%. The analysis shows that this is to be attributed to the more equity-like nature of most of the convertibles issued in the Canadian market in the period under consideration, in particular before 2000. After 2000 most of the issues are made by income trusts and are very much

[4]Note that the Canadian government already has or is about to sidestep this regulation due to heavy tax losses. Although income trusts have been around for more than 20 years, they were initially designed for mature industries with steady cash flows. However, lately the conversions of all sorts of business into income trusts have grown out of proportions (see for example *The Economist, June 22, 2005*: Canada's income trusts - Cold shower.)

debt-like in nature. The result is robust using different convertible bond design measures.

With respect to the firm-specific determinants of announcement price reactions, we find that the abnormal returns are to be driven by factors related to equity-like features of convertible debt. Debt-related costs, as proxied by interest coverage and leverage, do not have significant effect on the market valuation. On the other hand, equity-related costs, proxied by the stock price run-up (overvaluation issue) in particular, have a negative market valuation effect. Firms with higher dividend yields are mostly found to have higher cumulative average abnormal returns related to the announcement of the convertible offerings, as the dividend payout serves as a disciplining device that lowers equity-related agency costs. Our results appear to be robust across different specifications, i.e. when we control for the stated use of the proceeds (acquisitions, capital expenditures or refinancing) and the design of convertibles (debt- versus equity-like). These findings are in line with the theories that relate the use of convertible debt to mitigate different aspects of informational asymmetries, in particular those related to the agency costs of equity (Stein, 1992 and Mayers, 1998). We do not find support for tax arguments for the use of convertible debt.

The remainder of this chapter is structured as follows. The next section reviews the theoretical models yielding the testable hypotheses for our study. Section 3.3 describes the sample, provides some summary statistics, and discusses the methodology. In Section 3.4 we present the empirical results on the announcement returns and their determinants. Section 3.5 gives the conclusion.

3.2 Shareholder Reactions to Convertible Debt Announcements

3.2.1 Wealth Effects Associated with the Announcements of Convertible Debt Offerings

A general explanation of why investors react negatively to security offerings follows from the informational asymmetry between managers and the market with respect to value of assets in place and/or future growth opportunities. In this respect, security offerings are viewed as special examples of the lemons problem presented by Akerlof (1970). The models of Myers and Majluf (1984) and Miller and Rock (1985) can be viewed as specific applications of the lemons problem. According to these models, when a company issues risky securities, investors will demand a discount on the security price in order to be compensated for a potential overvaluation of the firm. Therefore, the announcements of convertible issues are predicted to have a negative impact on the issuer's stock price.

From the results of previous studies it appears that the abnormal returns may be driven by the type of the financial system. Market-oriented systems, including those in the U.S.,

Canada and the U.K. have well-developed financial markets and open corporations with widely dispersed share ownership. On the other hand, network-oriented systems, including those in Japan, Germany, Switzerland and the Netherlands have strong banks with large share ownership and a greater role in monitoring. In the market-based systems it is expected that managers are more likely to act in the interest of existing shareholders, and informational asymmetries may be larger. It follows from Myers and Majluf's (1984) adverse selection model that in these systems the market reaction to convertible debt issues may be less favourable. In the network-oriented systems, where managers are more likely to be entrenched given their institutional settings, the Myers and Majluf model may not hold.

A second explanation for negative stock returns at the announcement of convertible debt issues attributes these returns at least in part to systematic underpricing of public offerings. If public offerings are underpriced, then wealth is transferred from the firm's current stockholders to the purchasers of the underpriced securities. Evidence of underpricing for convertibles at the issue date is reported by Loncarski, ter Horst and Veld (2007a) for the Canadian market and Kang and Lee (1996) and Chan and Chen (2005) for the U.S. market. Moreover, Loncarski et al. show that more equity-like convertibles are more underpriced at the issuance date than more debt-like convertibles. This implies that a more negative market response can be expected for announcements of the issuance of equity-like convertibles compared to debt-like convertibles.

Given the adverse selection model of Myers and Majluf (1984) and the underpricing of convertibles we test the following hypothesis regarding the wealth effects associated with the announcements of convertible debt offerings.

H1: The market valuation effect will be more negative for equity-like convertibles than for debt-like convertibles.

3.2.2 Determinants of the Size of Wealth Effects

The effect of issuer characteristics on the size of the wealth effect associated with the announcements of convertible debt offerings can, in general, be separated according to the dominating nature of the convertible issue (debt- versus equity-likeness) and related to the motives for issuing such security. Convertible debt is a particularly useful financing instrument in cases where informational asymmetries and market imperfections make the use of straight debt or equity more costly or even impossible.

Agency Costs of Debt

As Brennan and Schwartz (1988) and Brennan and Kraus (1987) show, convertible debt mitigates problems associated with the risk estimation of value and returns of assets in

place. According to these explanations, convertible debt represents an alternative to straight debt, which would be very costly and/or difficult to issue. Green (1984) also considers convertible debt as a resolution to the agency conflict between bondholders and shareholders, where shareholders may be inclined to expropriate debt-holders by substituting less risky investment policies for riskier ones due to their limited liability in a standard debt contract. Since convertible debt can be turned into equity at the discretion of bondholders, it alleviates the risk shifting problem and can therefore be viewed as a substitute for straight debt.

When treated as a substitute for straight debt, the information signalling model of Ross (1977) suggests that the issuance of debt securities conveys favorable information to the market. A manager of a successful firm may choose to increase leverage to send positive signals to the market about the future performance of the firm;[5] unsuccessful firms cannot mimic these signals because they have insufficient earnings to meet the debt payments. On the other hand, Myers (1977) demonstrates the opposite – firms with a higher share of growth opportunities with respect to the current value of the firm issue less debt. In the spirit of Myers, increases in leverage can be interpreted as a worse signal about future growth opportunities of the company.

From the debt perspective, the effect of convertible debt issuance on leverage is not obvious since it has both debt-like and equity-like components, if we analyze the entire sample of convertible issues. However, for more debt-like convertibles, the level of debt-related costs at the firm level should have a negative impact on the price response. This leads to Hypothesis 2:

H2: Agency costs of debt will have a negative effect on the market valuation for the more debt-like convertibles and a non-negative effect for the more equity-like convertibles

Firms are expected to face high debt-related costs when their financial leverage is high and earnings are not sufficiently adequate to service the interest payments, since these factors increase the risk of financial distress and the threat of bankruptcy. With respect to debt-related costs we test the following two sub-hypotheses, where we take leverage and the Times-Interest-Earned (interest coverage) ratio as proxy measures for the level of debt and the risk of financial distress.

H2a: Higher financial leverage negatively affects the market valuation, in particular for more debt-like convertibles.

[5]Here, it is assumed that manager's compensation policy includes a penalty in cases of bankruptcy, which makes the signal costly for the sender (manager). In reality this is usually the case, as managers lose their position when companies experience financial distress.

H2b: Interest coverage positively affects the market valuation.

Agency Costs of Equity

From the equity component perspective, Kim (1990) and Stein (1992) argue that convertibles are delayed equity and are used to signal the quality of the firm in the framework of informational asymmetry. This is consistent with the adverse selection model of Myers and Majluf (1984), where conventional equity issues are unattractive due to high issue costs and dilution. Kim demonstrates that the conversion ratio serves as a credible signal of a company's future earnings. Stein argues that good quality firms issue debt, while medium quality firms differentiate themselves from bad quality firms by issuing convertibles. If the nature of a convertible issue is more equity-like, the equity-related adverse selection costs should negatively affect the price reaction to convertible debt offerings. We therefore postulate the following hypothesis:

H3: Agency costs of equity will have a negative effect on the market valuation for the more equity-like convertibles and a non-negative effect for the more debt-like convertibles.

If the nature of a convertible issue is more equity-like, the equity-related adverse selection costs should negatively affect the price reaction to convertible debt offerings. Lucas and McDonald (1990) show why equity issues on average are preceded by positive abnormal returns. However, in line with the pecking order theory of Myers and Majluf (1984), costs associated with issuing equity should be higher for companies with larger stock price run-ups, since they are more likely to be overvalued.

H3a: A period of positive abnormal returns preceding the announcement date negatively affects the market valuation.

Another aspect of the issuer's characteristics is related to the equity-like nature of convertibles: the free cash flow. Jensen (1986) points to the adverse effect of free cash flow on the value for shareholders, in particular for low growth firms. He proposes debt to be a better control or bonding device for managers than payout policy, as company's future payouts can be changed, while debt has to be repaid. Nevertheless, it has been documented that reductions in dividends are associated with negative wealth effects for shareholders, and managers try to avoid negative changes in payout policy. This is especially the case if their compensation schemes are related to shareholder value creation. Therefore payout policy has a disciplining function for managers to act in shareholders' best interests. We therefore test the following two sub-hypotheses with respect to the agency cost of free cash flow (agency

cost of equity).

H3b: Higher free cash flow negatively affects the market valuation.

H3c: Dividends payments positively affect the market valuation.

Tax Motivation

Jalan and Barone-Adesi (1995) consider convertibles as delayed equity financing, and motivate their use with the different tax treatment of coupon interest and dividend payments in a setting with market frictions and incompleteness. In such a setting, issuing convertibles increases the residual equity value of the firm, since the firm benefits from the tax shield as opposed to up-front equity financing. The cooperative game, and the fact that firms have repeated need for the financial markets, assures that both firms and investors have an incentive to use convertibles and share their benefits. Compared to straight debt, convertibles offer much less trade-off between interest tax shields and cost of financial distress. In case of straight bonds, higher interest tax shields are only achievable through higher indebtedness, which increases the probability of financial distress. On the other hand, convertibles offer the benefit of interest tax shields. However, they give a smaller probability of financial distress.[6] We expect a positive effect of the tax burden (marginal tax rate) on the size of abnormal returns, especially in case of more equity-like convertibles, implying some evidence on the tax motive argument. We therefore test the following hypothesis.

H4: Income taxes positively affect the market valuation, in particular for more equity-like convertibles.

Other Observations

From the reasoning so far it follows that price reactions to convertible debt announcements should be negatively influenced by both debt- and equity-related agency costs, since convertible debt encompasses both debt-like and equity-like components. We consider three additional factors that influence both debt- and equity-related costs.

First, both debt-related costs (e.g. risk uncertainty and financial distress costs) and equity-related adverse selection costs should be lower for larger companies. Larger firms tend to be more familiar to the market, lowering its respective issuing costs because less information search and processing costs are required. On the other hand, the size of the company increases the complexity and analysis, so that the larger company might actually

[6] A direct test of this tax motivated argument for the issue of convertible debt is also related to calls of convertibles, which we will not address in this chapter.

be more opaque. Size, therefore, does not necessarily translate into a smaller adverse selection problem. We therefore use the size of the firm as a control variable, but do not have any a priori expectation about the direction of the effect. The size of the company captures complex interactions between different issuer characteristics.

Secondly, De Jong and Veld (2001) argue that the problem of perceived overvaluation will be worse for firms with sufficient slack in the form of liquid assets. The reason for this is that slack provides an alternative source for financing of new projects and thus enhances the potential agency problem (overinvestment) between managers and shareholders. This negative impact should be more pronounced for equity-like convertibles. It is not likely to be detected in the overall sample of convertibles, since its role should be less strong for more debt-like convertibles. However, there is also the opposite potential impact of slack. It can be viewed as a build-up of internally generated and needed funds for increased capital expenditures, when the external sources of financing are very costly (i.e. along the lines of the pecking-order theory of capital structure). This is in particular the case for companies with higher risk and larger growth opportunities (more equity-like issuers). We therefore include slack in our cross-sectional analysis without hypothesizing its overall effect on the valuation, since it does not only have a negative effect of increased agency cost of equity, but also a positive effect of internal (less expensive) build-up of funds. In addition, slack can also be viewed as collateral, in which case it should have a positive effect on valuation in case of debt-like convertibles, where it mitigates agency costs of debt.

Thirdly, a firm with good growth opportunities should face reduced debt- and equity-related agency costs. De Jong and Veld (2001) argue that expectations in the market regarding the profitability of the firm's projects reduce the potential for both the asset substitution problems and adverse selection problems described earlier.

Finally, we investigate the effect of the stated use of the proceeds. In the offering prospectuses, firms state the purposes for which the proceeds will be used, such as financing acquisitions, refinancing debt, capital and general expenditures.

3.3 Data and Methodology

3.3.1 Sample Selection

The sample consists of convertibles issued between January 1991 and December 2004 by Canadian companies that were listed on the Toronto Stock Exchange. During that period there were 207 convertible bond issues in total. We excluded issues made by financial companies (SIC division H - Finance, Insurance and Real Estate), and were left with 149 issues by non-financial companies. Data on announcement dates and other features of the convertible bond issues were obtained from the SDC database and checked against press releases

in Lexis-Nexis, Canadian newswires, company web sites and the SEDAR[7] database. For 26 issues in our final sample, we have found discrepancies in the announcement dates. In those cases we used the earliest announcement date that we could find. The criteria for an issue to be included in our sample were:

- The announcement date had to be verifiable through a source other than SDC.
- The issuing firm's stock price data had to be available in DataStream.
- The issuing firm's accounting data had to be available in DataStream.
- The announcement should not confound with other corporate announcements.
- The conversion option relates to the equity of the issuing company (no exchangeable bonds).[8]
- The issues of the same issuer had to be at least 120 trading days apart in order for the estimation and event periods for different issuers not to overlap.

Given the criteria, the initial 149 issues by non-financial companies first shrink to 129 due to stock price data availability, and further down to 107 issues due to accounting data availability. Of those 107 issues, we could not verify the announcement date for 10 of them; 4 were exchangeable bonds (their conversion price relates to other than the underlying equity); 3 were too close together with the previous issues of the same issuer, causing an overlap of event periods; and 4 were joined together with the convertible bond issues (by the same issuer) announced on the same or the previous day. This means that our final sample consists of 86 bond issues offered by 77 different companies. The breakdown of issues over the years is shown in Table 3.1.

<Insert Table 3.1 here>

From the table it appears that around 48 percent of the issues in our sample were offered after the end of 2000. This is approximately comparable with the issue year breakdown of all the 136 non-financial companies' issues in the period, with somewhat better coverage in the sample towards the end of the sample period due to scarce data availability for the beginning of the 1990s. Offerings seem to exhibit some bunching, with hot periods being 1993-1994 and the end of the 1990s onwards.

[7]SEDAR stands for "System for Electronic Document Analysis and Retrieval" and is a service of CSA (Canadian Securities Administration) providing public securities filings. (http://www.sedar.com/)

[8]An exchangeable bond may be converted into existing shares of the same or an alternative company. It is much like a convertible, except that in a convertible the bond may be converted into new shares.

3.3.2 Event Study Methodology

We use standard event study methodology to estimate the wealth effects associated with the announcement of convertible debt offerings. To estimate the parameters of the market model we use the Standard & Poor's TSX (Toronto Stock Exchange) value-weighted total return index to compute the market return. This is widely considered as the benchmark for Canadian equities as it accounts for more than 200 stocks listed on the TSX or about 70% of the total market capitalization. The estimation period ranges from day -120 to day -20 relative to the announcement date of the offering. There is no significant clustering of the announcement dates of the offerings, so residuals in the market model regressions for individual issuers are not likely to be correlated.

3.3.3 Proxies

The variables that are used in the analysis are related to the hypotheses described in Section 3.2.

Leverage. Leverage (LEV) is measured as the ratio between total debt and total assets. **Times-Interest-Earned**. The Times-Interest-Earned ratio (TIE) is a measure that is often employed in practice, in particular in restrictive covenants that govern typical debt contracts. It is defined as EBIT (Earnings Before Income and Taxes) over interest expense. **Slack**. SLACK is measured as the ratio of cash and equivalents over total assets. **Free cash flow**. Free cash flow (FCFA) is measured as the ratio of free cash flow (net income plus depreciation minus capital expenditures) over total assets. **Dividend yield**. The dividend yield (DY) is measured as the average dividend yield between (-15, -5) days relative to the announcement date. **Tax burden**. The tax burden (TAXA) is measured as a ratio of income taxes over total assets. **Growth opportunities**. Growth opportunities are measured using Tobin's Q (Q).[9] The nominator of this ratio is computed as the sum of market value of equity (measured as the average between (-15,-5) days relative to the announcement date), long term and short term debt. The denominator is calculated as the book value of total assets. **Size of the firm**. We have added a control variable for firm size, i.e. the natural logarithm of firm size (LNTA). **Size of the issue proceeds**. We define the size of the issue proceeds relatively

[9]There is a possibility that Tobin's Q-measure might be biased towards older and more mature firms. However, the industrial composition of our sample (not reported in the chapter) suggests that the vast majority of firms are from industries that are either not mature or from industries where the nature of the business (natural resources) make the use of the Q-measure more viable. We have done a robustness check using an estimated growth rate of sales (based on the three year growth rate of sales prior to the announcement of the issue) instead of the Q-measure and it did not affect the results. Similarly, we explored use of other measure that can capture debt and equity related agency costs (intangible and tangible assets for example). The use of these additional variables did not change our main results, but it did further reduce our sample size, since the values for these variables were missing for several issuers. Therefore, we did not include these variables in our final analysis. The results are available from the authors upon a request.

to the book value of equity (RISSEQ). This variable captures both the dilution effect and proxies for the agency cost of equity - higher relative issue proceeds indicate higher agency costs of equity. **Use of proceeds**. Based on the stated use of proceeds, we define three dummy variables that we use in the analysis: M&ADUM takes a value of 1 if issuer stated to use the proceeds for acquisitions and 0 otherwise, REFDUM takes a value of 1 if issuer stated to use the proceeds for refinancing and 0 otherwise and CGXDUM is a dummy variable with a value 1 if the issuer states to use the proceeds for capital and general expenditures and 0 otherwise.

Measurement of the Convertible Debt Design

The most difficult variable to proxy is the measurement of the equity component of convertible debt. As previously shown and used in the literature (see, e.g., Lewis et al., 1999 or Burlacu, 2000), different approaches can be used to determine the size of the equity component embedded in a convertible bond design. Following Lewis et al. (1999), Burlacu, (2000) and Dutordoir and Van de Gucht (2006), we estimate the structure of the convertible debt design (i.e. how debt- or equity-like it is) by employing the **delta measure**. The delta is derived from the option pricing model of Black and Scholes (1973), adjusted for continuous dividend payments in the way suggested by Merton (1973):

$$\Delta = e^{-\delta T} \cdot N\left[\frac{ln\frac{S}{K} + (r - \delta + \frac{\sigma^2}{2}) \cdot T}{\sigma \cdot \sqrt{T}}\right], \tag{3.1}$$

where S is the current price of the underlying stock, K is the conversion price, δ is the continuously compounded dividend yield, r is the continuously compounded yield on a selected "risk-free" bond, σ is the annualized stock return volatility, T is the maturity of the bond and N(.) is the cumulative standard normal probability distribution. The delta measure always takes a value between 0 and 1. Values closer to 1 indicate a high sensitivity of the convertible bond value to the underlying equity (stock) value, implying a high probability of conversion. As a proxy for the risk-free rate we use the yield of a Canadian government benchmark bond of the closest matching maturity rounded upwards. For the stock price volatility measure we use the annualized volatility of stock returns as estimated over the period (-120,-20) relative to the announcement date of the offering. In order to differentiate between equity- and debt-like convertibles we use a delta cut-off value of 0.5. We will denote the sub-sample with a delta smaller than 0.5 as more debt-like, while the sub-sample with a delta greater than (or equal) 0.5 will be referred to as the more equity-like sample. For comparison, Burlacu (2000) denotes convertibles with delta values below 0.33 as debt-like and those with delta values above 0.66 as equity-like. Lewis et al. (2003) use cut-off values for delta of 0.4 and 0.6 for classifying bonds as either debt or equity-like. Dutordoir and Van de Gucht (2006) use the median delta value as a split for this classification.

The delta measure only captures the equity component of a convertible. It does not take into account the credit quality and other important characteristics of convertibles such as callability, putability, and early conversion. We therefore also use two alternative measures for the size of the equity component relative to the size of the debt component in convertible debt.[10] The **ratio of equity to straight debt component value of the convertible bond (ED measure)** is estimated using the convertible debt valuation approach proposed by Tsiveriotis and Fernandes (1998). This ratio accounts for different credit qualities among issuers and other important features of convertibles.[11] We estimate the model price of the convertible bond at the issue, where the price is the sum of equity (value of the conversion right) and straight debt component. We use values of ED greater than 1 as the reference for the more equity-like convertibles, and values of ED lower than 1 as the reference for the more debt-like convertibles.

Finally, we also compute a simple **ratio of conversion value to the par value of the convertible bond (M measure) - "moneyness"**. This is defined as the conversion value at the announcement of the bond issue ($CR \cdot S_0$, where CR represents conversion ratio and S_0 represents the stock price at the announcement of the bond issue) over the par value of the convertible bond.

3.4 Results and Analysis

3.4.1 Wealth Effects Associated With the Announcement Dates of Convertible Debt Offerings

In Table 3.2 we present the Cumulative Average Abnormal Returns (CAAR) as well as tests for Hypothesis 1 regarding the wealth effects associated with the announcements of the convertible debt offerings.

In Panel A of the table the results for the total sample are presented. CAARs are significantly negative over different event windows for the total sample. In particular, the effect for the event window (-1,1) is a significantly negative -2.7%. These results are in line with the results from previous studies, in particular those for the U.S. market. Panels B and C of Table 3.2 report the CAAR for the sub-samples with a value of the delta measure above 0.5 and below 0.5 respectively. The first interesting result is the comparison of wealth effects for the sub-samples in the event window (-10, -2), where the CAAR of 2.24% is significantly positive for more equity-like convertibles (delta above 0.5), and significantly negative (-

[10] Other measures that are available are the ratio between the conversion price and the stock price (Kuhlman and Radcliffe, 1992) and the expected time for the conversion option to become "in the money" (Davidson, Glascock and Schwartz, 1995). These measures can both be used to estimate the size of the equity component.

[11] See Tsiveriotis and Fernandes (1998) for details on the valuation approach.

0.77%) for the more debt-like convertibles (delta below 0.5). The difference between the two values is also significant, which implies that prior to the announcement of the issue, more equity-like issuers experience a significant stock price run-up. This suggests that issuers try to time their announcements after periods of favorable stock price movements. It also suggests that the market is more likely to perceive the more equity-like issuers as overvalued at the announcement dates of the convertible debt offerings in our sample, given the prior streak of positive abnormal returns. Therefore they react more negatively to the announcement. The most negative CAAR for the more equity-like issuers are in the event window (0,20) with a significantly negative -6.32%, while more debt-like issuers do not experience significant wealth effects during that period.

Based on the results in Table 3.2 we conclude that wealth effects associated with the announcements of convertible bond offerings are significantly more negative for the more equity-like convertible issues than for the more debt-like issues.[12] This confirms Hypothesis 1.

Figure 3.1 shows the evolution of the CAARs over the event window (-20, 20) for the total sample as well as for the two sub-samples with a delta measure above or below 0.5. A striking result is that the wealth effect continues to grow negatively after the announcement date. For the total sample, we find a CAAR of -1.35% at the announcement of the issue, while over the event window (-1,2) the CAAR drops to -2.87% and continues to fall to -4.62% over the event window (0,20). From the analysis of the two sub-samples it appears that the more debt-like convertible issues (delta below 0.5) experience negative abnormal returns somewhat prior to the announcement, i.e. -0.77% over the event window (-10,-2), and this rebounds after the announcement of the offering to around 0. Conversely, the more equity-like convertible issues (delta above 0.5) exhibit a significantly positive abnormal return reaction prior to the issue announcement (2.24% in the event window -10,-2), but this becomes significantly negative after the announcement by decreasing to around -4% over the event window (-1,2) and even further to -6.32% over the event window (0,20). Loncarski, ter Horst and Veld (2007a) analyze convertible arbitrage in the Canadian market and show that short positions in stock of equity-like convertible bond issuers increase significantly more immediately following the announcement of the issue than short positions in stock of debt-like convertible bond issuers. They demonstrate that the increase in the short positions is negatively correlated with the abnormal returns between the announcement and the issue date of the bond.

[12]The findings in Table 3.2 are confirmed using non-parametric test results as well. The Wilcoxon signed rank test, which tests the difference in sums of ranks of the mean adjusted CAAR above and below medium, gives significant differences. These differences are statistically significant for different event windows (up to 20 trading days) following the announcement date. A similar result, using the difference in means between Panels B and C in Table 3.2 is obtained using the non-parametric Kruskall-Wallis test for the equality of subpopulations. These results are available on request from the authors.

3.4.2 Convertible Bond Design

We classify convertible debt into more equity and more debt-like using three different measures. Although somewhat problematic and questionable, the delta measure has been extensively used in previous studies. In order to be able to compare the design of convertible debt in the Canadian market with other markets (other studies) we use the delta measure as well. In contrast to the studies for other markets (Dutordoir and Van de Gucht, 2006, for example, find convertible bonds in the Western European markets to be more debt-like than in the U.S. market; Lewis et al. 1999 on the other hand report an almost normal distribution of the delta for the U.S. market) we find a bimodal distribution of the delta of the convertible bond issues. We find that prior to 2000 convertible debt issues in the Canadian market were mostly equity-like (value of the delta>0.5). After 2000 most of the convertible bond issues become debt-like with very low values of the delta. This change coincides with the increasing popularity of conversion of businesses into income trusts. These are specially designed financing vehicles, where the trust is positioned as an immediate full owner of a typically mature business. The cash flows from the ultimate operating company, which the trust owns, are usually fully distributed to the trust and then passed on to unit holders (owners of the income trust) as dividends. Since the trust accrues no tax payments, investors then (depending on the tax status of their investment) either pay no or lower taxes as they would otherwise. The main benefit of the income trust is therefore tax driven. Income trusts have become very popular in the Canadian market after 2000. Jog and Wang (2004) report that the number of income trust IPOs has grown from 9 in 1998 to 64 and 36 in 2002 and 2003 respectively, with the highest increase in the number of business trusts.

Contrary to the findings based on the delta we find normal distributions of the ED and M measures with strong asymmetry towards high values (more equity-like convertible debt design).

3.4.3 Issue and Issuer Characteristics

In order to explore the characteristics of the issues and the issuing companies we examine some descriptive statistics for the total sample and the two sub-samples according to the delta measure. Selected descriptive statistics are presented in Table 3.3.

In Panel A of the table we first investigate the differences between debt- and equity-like convertibles split based on the delta measure. From the differences in Panel A of the table it appears that the more debt-like convertible issues have significantly lower conversion premiums (ratio between conversion price and stock price at the announcement date of the issue) and shorter maturities than more equity-like convertibles, i.e. a conversion premium of 1.090 versus 1.233, and a maturity of 6.4 years versus 9.9 years. A significantly lower conversion premium for the more debt-like convertibles is surprising. Typically, a conversion premium

for the more debt-like convertibles should be higher than for the equity-like convertible, since the probability of conversion should be lower. This is correctly reflected in a significantly lower maturity and also in the lower volatility (0.205 for more debt-like convertibles versus 0.484 for more equity-like). This can be explained in terms of time varying elements (conversion price, maturity, volatility, dividend yield) that affect the value of the delta measure. Most of the debt-like issues in our sample occur towards the end of our sample period, while the opposite is true for the more equity-like issues.

We have shown in Section 3.2 that issuers of the more equity-like convertibles experience significantly positive abnormal returns prior to the announcement of the issue, while those of more debt-like convertibles experience significantly negative CAARs. The same conclusion can be inferred from Table 3.3, as the stock price run-up over the period (-10,-2) days prior to the announcement is significantly larger by 3 percentage points for the more equity-like issuers.

Both types of issuers seem to have similar leverage on average (0.254 for the more equity-like versus 0.218 for the more debt-like). The difference between interest coverage capacities is not significant.

There is no statistically significant difference between the Q-ratios of the equity-like and the debt-like issues. The equity-like issues do seem to be accompanied by more risk, as indicated by a higher volatility of respectively 48% versus 21% (annually). Note that issuers of equity-like convertibles are characterized as those that might have wanted to issue equity, but due to adverse selection and agency problems this would have been too costly or impossible.

The level of slack is significantly higher for the equity-like convertibles (8.5% of the total assets versus 2.4% of the total assets for debt-like issuers). The dividend yield is also significantly different between the issuers of the more equity-like and those of more debt-like convertibles. While the issuers of debt-like convertibles have an average dividend yield of around 12%, the issuers of equity-like convertibles have a significantly lower dividend yield of 0.6%. More equity-like issuers also have, on average, negative free cash flow relative to the total assets (-6.9% of the total assets), while the free cash flow for the more debt-like issuers is, on average, positive (1.6% of the total assets). This implies that, given the costly external finance, more equity-like issuers seem to be more financially constrained than more debt-like convertible bond issuers.

In Panel B of Table 3.3 we explore differences between more debt- and more equity-like convertibles where we split the convertibles based on the alternative measure of convertible bond design - the equity-to-debt component ratio (ED). The results are similar as in Panel A, except that statistical significance for some of the differences changes. The findings here suggest that equity-like issuers ($ED > 1$) have significantly lower dividend yield, have more slack, pay more taxes, have larger relative issue size, issue bonds of longer maturities and are

riskier. In Panel A only the delta measure significantly differs (by construction of the two sub-samples) between the two sub-samples. However, in Panel B we observe that all three measures of the convertible bond design - the delta (Δ_i), the ED measure and the simple moneyness (M measure), significantly differ between debt- and equity-like convertibles. The delta is, as expected, significantly higher for the equity-like convertibles (0.755) than for debt-like convertibles (0.371). Similar is the case of ED measure (6.095 versus 0.597). The simple ratio of conversion value to par value of the bond (M) similarly shows that equity-like convertibles are in the money at the issue (1.097), while the debt-like convertibles are not (0.880). This suggests that the ED measure might be somewhat superior at capturing the design of a convertible bond, but on the other hand the delta does provide similar results.

Overall, the more equity-like convertible issuers have more slack and lower free cash flow. Lower free cash flow does imply that equity-like convertible bond issuers are more financially constrained than the issuers of debt-like convertibles. However, issuers of the equity-like convertibles have significantly higher slack than the issuers of debt-like convertibles, which mitigates the problem of the financial constraint. The issuers of equity-like convertibles also have lower dividend yield and are riskier than the more debt-like convertible issuers. This is in line with many previous findings (see for example Lewis et al., 1999; Jen et al., 1997) on the characteristics of convertible debt issuers.

3.4.4 Cross-sectional Analysis of Determinants of the Size of the Wealth Effect

Analysis of the Total Sample, Convertible Debt Design and the Effect of Income Trust Business Design

In order to examine the impact on the size of the wealth effect due to the implicit design of convertibles (e.g. delta and the alternative measure of the convertible debt structure) and the issuer characteristics associated with debt- and equity-related agency costs, we perform a number of cross sectional regressions. The dependent variable is the cumulative average abnormal return (CAAR) in the event window (-1,1) in all models we consider. In Table 3.4 we present the results based on the total sample. In the first specification we test our hypotheses regarding the effects of debt-related agency costs (Hypothesis 2), equity-related agency costs (Hypothesis 3), the effect of the tax burden (Hypothesis 4) and the effect of some other determinants for the total sample of convertible debt issues.

Based on the results of the first regression specification in Table 3.4[13], we do not find support for Hypotheses 2a and 2b. Leverage (LEV) has no significant effect on the market valuation in any of the specifications. The same holds for the proxy for Times-Interest-

[13]Note that the number of observations is less than 86 (initial sample) due to either missing accounting items or the values of the convertible bond design measures for some issues.

Earned (TIE). Hypothesis 3a is confirmed, because we see that the market valuation is worse after a period of significant stock price run-up (a significantly negative coefficient of -0.3339). This implies that an increase in cumulative abnormal stock returns in the event window (-10,-2) of 3 percent decreases the announcement related CAAR by 1 percentage point. This confirms the hypothesis that investors are more concerned with overvaluation when the announcement of the issue is preceded by a streak of positive abnormal stock returns. Next, we find that the level of slack significantly positively affects CAAR. The coefficient of 0.1812 implies that an increase in slack of 10 percentage points increases the CAAR related to the announcement of the issue by 1.8 percent. As mentioned earlier, this result suggests that slack can be viewed as a build-up of internally generated funds. These are particularly important when the external sources of financing are very costly. Judging by our results, this effect dominates the effect of the high agency costs of slack capital. We expected the market valuation effect to be less favorable when the issuing firm has more free cash flow (Hypothesis 3b). However, even though we find the expected negative sign for the coefficient, it is not significant. Therefore we cannot confirm Hypothesis 3b. The coefficient for the payout proxy variable is a significantly positive 0.3059. This implies that an increase in dividend yield by 1 percentage point has, on average, a positive effect on the CAAR at the announcement of convertible debt offering of around 0.3 percent, all else being equal. This yields support for Hypothesis 3c and is in line with the disciplining role of the payout policy. On the other hand, it could also account for the fact that dividend-paying companies are usually mature and less risky companies. The more direct effect of the disciplining role of dividend payments needs to be explored on the subset of more equity-like convertible debt issuers, where the agency costs of equity are assumed to be more important. The coefficients for growth opportunities (Q) and relative issue size (RISSEQ) do not significantly affect the market valuation.

In the second specification in Table 3.4, we additionally include a taxation proxy in the cross sectional regression to test for the effect of income taxes on the wealth effect. While other coefficients remain practically unchanged, we find no significant effect of taxes on the wealth effect associated with the announcement of the convertible debt offering. We therefore find no support for Hypothesis 4.

Note that an analysis for the total sample is not the most appropriate, since the design of the convertible has to be taken into account as we argued in Section 3.2.2. We therefore also estimate the third specification in Table 3.4, where we include a control variable for implicit issue characteristics by adding the delta measure as an explanatory variable. The delta measure reflects how debt- or equity-like the convertible issue is, and therefore it captures the issue characteristics comprehensively. Since a value of delta closer to 1 indicates a more equity-like convertible issue, we expect to find a negative relationship between the size of the wealth effect and the value of delta. The results of the third specification in Table 3.4

are very similar to those in specifications 1 and 2. The effect of delta on CAAR is not significant. In specification 4 in Table 3.4 we include ED variable to account for the design of a convertible bond (instead of the delta measure). We observe that ED has an expected negative effect (coefficient of -0.0008) - more equity-like convertible issuers experience more negative CAAR. However, the effect is only marginally significant, both in statistical and economical terms. The results of specifications 3 and 4 suggest that issuer characteristics and convertible bond design seem to be closely related, as there is no significant additional information in the measures of convertible debt design that affects market valuation beyond the issuers characteristics.

Given the specific role and organizational design of income trusts, we investigate the impact of such business design on the size of the wealth effect controlling for the convertible debt design, measured both with delta and the ED measure. The results are presented in columns 5 and 6 of Table 3.4. As can be observed, we were not able to find any significant effects and other results remain virtually unchanged.

The overall results suggest that perceived overvaluation (stock price runup), slack and dividend yield significantly affect the size of the wealth effect. The overvaluation is the most robust result, as it persists even when controlling for a convertible bond design.

Agency Costs of Debt and Equity versus Convertible Debt Design

In order to test hypotheses related to impact of debt-related and equity-related costs on the size of wealth effects, we estimate the regressions separately for two sub-samples split according to implicit issue characteristics (the delta and/or the ED measure). In Panel A of Table 3.5 we present the estimation results of these two specifications for the two sub-samples split by the cut-off value of 0.5 for the delta measure.[14]

Note that convertible issues with a value of delta below 0.5 are denoted as more debt-like, while those with a value of delta above 0.5 are identified as more equity-like. We expect that debt-related costs will have a market valuation impact for more debt-like convertibles, and equity-related costs will have a valuation effect for more equity-like convertibles. As the results of the first specification ($\Delta_i < 0.5$) in Panel A of Table 3.5 show, we do not find evidence that leverage has a significant effect on the excess returns. This means that, just like in Table 3.4, we do not find any evidence to support Hypothesis 2a. The interest coverage has a significantly positive effect on CAAR (column 1) of more debt-like convertible bond issuers. This can be interpreted as an evidence to support Hypothesis 2b. The economic significance of the effect of interest coverage seems to be rather small, but given the very high variation in the TIE ratio (between around -2 to around 40 for debt-like convertible issues), the coefficient of 0.0013 suggests that an increase in TIE of 8 leads to the increase in

[14]Note that the number of observations is less than 86 (initial sample) due to missing accounting items or the values of the convertible bond design measures for some issues.

CAAR of around 1 percent, all else being equal. We find a positive, but not significant effect of free cash flow. Thus we are not able to confirm Hypothesis 3c. Growth opportunities have a significantly negative effect on CAAR (coefficient of -0.0364), where an increase in the Q-ratio of 0.3 leads to approximately 1 percent decrease in CAAR. Company size also has a significantly negative effect on CAAR. Although the negative effect of growth opportunities seems somewhat surprising, it is also possible to think of the Q-ratio as a proxy for the risk of the company. This might lead to difficulties in risk estimation such that larger issuers with higher growth opportunities (in the universe of more debt-like convertible issues) are perceived to be riskier. A somewhat striking result is the significant negative effect of the size of the issuing company on CAAR (coefficient of -0.0360). As stated earlier, firm size might not only mitigate adverse selection and agency problems, but could actually make them more acute since the opaqueness can also increase with the size. To sum up, we find support for one of the hypotheses relating to the effect of debt-related agency costs on the wealth effects associated with the announcement of convertible debt offerings for the sub-sample of debt-like convertibles, while equity-related agency costs do not adversely affect the valuation in this case. We do not find any significant effect of tax burden on the valuation (Hypothesis 4).

The second specification ($\Delta_i > 0.5$) in Panel A of Table 3.5 relates to the sub-sample of more equity-like convertible bond issues. Here, we find that proxies relating to the agency cost of equity significantly affect the wealth effects at the announcement of convertible debt issues. More specifically, the prior stock price run-up negatively affects the valuation, as there is more concern about the potential overvaluation of the equity. As in Table 3.4, this result can be interpreted as a confirmation of Hypothesis 3a. The coefficient for SPRUN of -0.3407 suggests that a 5 percent positive cumulative average abnormal return in a ten day period prior to the announcement of the issue leads to a negative -1.7 percent CAAR following the announcement. Again, as in Table 3.4, we find a marginally significant positive effect of slack (coefficient of 0.2011) on the valuation. As discussed previously, this confirms that the overall effect of slack is positive, or, put differently, the flexibility benefits of such "buffer" funds in the case of costly external financing outweigh the agency cost of slack. With respect to the taxation proxy, we do not find a significant effect on the valuation in the case of more equity-like convertible issues, again leading to the conclusion that Hypothesis 4 can not be confirmed.

In Panel B of Table 3.5, we redo the sub-sample analysis for more debt-like versus more equity-like convertibles using the alternative measure of equity-to-debt component of convertible bond (ED). The results for the more equity-like convertibles ($ED > 1$) are partly similar in terms of statistical and economic significance as in the case of sub-sample analysis based on delta measure in Panel A. One difference is the effect of slack, which is now not significant. In addition, the effect of dividend yield on the wealth effect here is significantly

positive (a coefficient of 0.6200), giving support to Hypothesis 3c. This suggests that in the case of equity-like convertibles, an increase in dividend yield of 0.01 leads to an increase in CAAR of around 0.62 percentage points, all else being equal. Contrary to the results in Panel A, the results for the sub-sample of the more debt-like convertibles, as defined with the value of ED below the value of 1, yield no support to Hypothesis 2. Summarizing, the sub-sample analysis based on an alternative measure of convertible security design (equity-to-debt component value) gives partly similar results regarding the effect of the agency costs of equity, but does not provide any conclusive evidence regarding the effect of the agency costs of debt.

De Jong and Veld (2001) argue that the profitability of the projects reduces the potential for asset substitution problems and adverse selection. In order to examine the effect of the stated use of the proceeds of the convertible issue on the wealth effect, we estimate a specification where we include dummy variables for Merger & Acquisitions (M&A), Refinancing, and Capital Expenditure (CAPX) or General Expenditure (GENX).[15] In Panel C of Table 3.5 we present the estimation results[16] for the total sample of convertible debt issues over the period 1991 - 2004. First, we do not find a significant effect of the stated use of proceeds on the valuation, as coefficients for all dummy variables relating to the stated use of proceeds are not significant. Secondly, the effect of other issuer characteristics on the wealth effects remains in line with the results from Table 3.4. We conclude that use of proceeds does not seem to affect the abnormal returns.

3.4.5 Relationship Between the Results and the Motives for the Use of Convertible Debt

In Table 3.6 we present the summary of hypotheses and the results. Although convertibles are hybrid securities that share characteristics of both equity and straight debt, they can nevertheless be classified according to their specific debt- or equity-like nature.

Results for the total sample suggest that the agency costs of debt do not have any significant effect on the CAAR around the announcement of the convertible bond issue (H2 is not confirmed). On the other hand, agency costs of equity seem to have a negative effect (H3a always confirmed and H3c mostly confirmed), especially the degree of potential overvaluation (stock price run-up prior to the announcement).

Moreover, similar is the case when we take into account the hybrid nature of convertibles and split the sample into more debt- and more equity-like convertibles. Results based on such classification suggest that the agency costs of debt have no effect on wealth effects of debt-like convertible issuers (H2a not confirmed and H2b mostly not confirmed), while no significant

[15] Note that the number of observations is less than 86 (initial sample) due to missing accounting items or delta measures for some issues.

[16] If issuers stated more potential uses of proceeds, we recorded the first use stated as predominant.

effect of debt-related costs is found in case of equity-like convertibles. The opposite holds for the agency costs of equity (H3a confirmed and H3c mostly confirmed). If we only focus on the immediate wealth effect of the announcement of the convertible debt issue as opposed to issuing either straight debt or equity, the following can be argued. Issuers of equity-like convertibles are better off issuing convertible debt than equity. The reason for this is that the wealth effects associated with the announcement of the convertible debt are negatively affected with the agency costs of equity. This implies that in such a setting convertible debt, which is not 100% equity (lower agency costs of equity) can be seen as a good substitute for equity. It creates a less negative response from the market as the debt-like feature acts either as a commitment or as a controlling device reducing the impact of the agency costs of equity. This lends support to the motives for the use of convertible debt as proposed by Stein (1992) and Mayers (1998).

For issuers of debt-like convertibles, Green (1984) suggests that convertibles help resolve the risk substitution threat faced by debtholders. This threat is increasing in the alignment of incentives between managers and shareholders, since agency costs of equity are minimized at the expense of agency costs of debt. We do not find direct and strong evidence to argue in favor of this theory. However, we find that in the case of debt-like convertibles some proxies for agency costs of equity affect the wealth effects in an opposite way as hypothesized for equity-like convertibles. The regression results for the debt-like convertibles in column 1 in panel A of Table 3.5 show that the free cash flow and the dividend yield have opposite (albeit not significant) effects on the valuation as in the case of equity-like convertibles (column 4 of the same table). This suggests that the lower agency costs of equity might have actually negative valuation effect in the case of debt-like convertibles. From such a perspective an issue of straight debt would have been more desirable, as there would be no dilution and no residual claims. This gives some (albeit indirect) support to Greens "risk shifting" argument, as investors negatively perceive the issue of a security that reduces agency costs of debt (mitigates incentive conflict between shareholders and holders of straight debt).

We find no evidence for the tax hypothesis relating to the benefits of the use of convertible debt as opposed to the use of equity (Jalan and Barone-Adesi, 1995).

3.5 Conclusion

In this chapter we analyze the size and determinants of wealth effects associated with the announcements of convertible debt offerings on the Canadian market in the period between 1991 and 2004.

Similarly to previous research for other markets, in particular the U.S., we find a significant negative wealth effect associated with the announcement date of convertible debt offerings. This effect is significantly more negative for equity-like convertibles than for debt-

like. Contrary to the results for the U.S. market we find the distribution of the delta (a measure which reflects convertible bond design) to be bimodal. Canadian companies started issuing predominantly debt-like convertibles after 2000. This switch coincides with the increased popularity of conversions of the businesses into income trusts.

We find support for the hypotheses related to the negative impact of equity-related agency costs on the size of the wealth effect. In particular, we find that the determinants of the size of the wealth effects reflect the hybrid nature of convertible debt, where convertible debt issues can be structured to be either more debt- or equity-like. More specifically, we show that proxies for agency costs of equity negatively affect abnormal returns associated with the issue of more equity-like convertibles, while they do not significantly affect wealth effects associated with the more debt-like convertible issues. The opposite holds for the agency costs of debt, albeit the evidence is much weaker then in the case of equity-related agency costs. The results are robust according to different specifications and use of different measures to classify convertible bond issues into more debt- or more equity-like. After controlling for convertible debt design we find no evidence that income trusts as particular organizational structure affect these results.

Relating the determinants of the wealth effects to the motives for the use of convertible debt we find evidence that convertibles in the Canadian market used to be mostly a substitute for equity (as proposed by Stein, 1992), but were also used as a sequential financing device, where the straight debt nature of the convertible is used as a commitment device for managers (Mayers, 1998). Lately however, when convertible issues in Canada shifted towards more debt-like design, the role of convertibles has become less clear.

3.A Tables and Figures

Table 3.1: Breakdown of convertible debt issues according to year of the issue
Distribution of non-financial Canadian companies that announced a convertible bond loan in the period from January 1991 to December 2004 by announcement year. The announcements are identified from the SDC database. Announcements are eliminated for the following reasons (1) no stock and / or accounting data available; (2) non-verifiable announcement dates; (3) non-standard convertible bonds; (4) issuance dates overlap or are very close to issuance dates of other securities.

Year	Number of issues	Percent
2004	10	11.6
2003	13	15.1
2002	12	14.0
2001	6	7.0
2000	3	3.5
1999	7	8.1
1998	4	4.7
1997	4	4.7
1996	5	5.8
1995	2	2.3
1994	8	9.3
1993	5	5.8
1992	3	3.5
1991	4	4.7
Total	86	100.0

Table 3.2: Cumulative Average Abnormal Returns (CAAR) for different event windows

Cumulative average abnormal returns for the sample of 86 convertible bond announcements by Canadian companies from January 1991 to December 2004. The convertible bond announcements are identified from the SDC database. Abnormal returns are based on the market model, estimated over a 100-day period for each company (from day -120 to day -20). Under the null hypothesis CAAR equals 0.

* - denotes significance at below 10% level, ** - denotes significance at below 5% level and *** - denotes significance at below 1% level

$CAAR_{\tau_1,\tau_2}$	Panel A - Total Sample n=86			Panel B - $\Delta_i > 0.5$ n=62			Panel C - $\Delta_i < 0.5$ n=24			Panel B - Panel C	
	CAAR	J1 stat.		CAAR	J1 stat.		CAAR	J1 stat.			
-10, -2	1.426%	3.92	***	2.240%	4.62	***	-0.769%	-2.42	***	3.009%	**
-5, -2	0.680%	2.00	**	0.990%	2.20	**	-0.155%	-0.47		1.145%	
-2, 0	-0.598%	-1.25		-1.150%	-1.80	**	0.890%	2.16	**	-2.040%	**
-1, 0	-0.539%	-1.45	*	-0.860%	-1.75	**	0.328%	0.93		-1.187%	
-1, 1	-2.703%	-6.53	***	-3.669%	-6.63	***	-0.098%	-0.29		-3.571%	***
-1, 2	-2.874%	-7.48	***	-3.995%	-7.80	***	0.145%	0.43		-4.140%	***
-1, 5	-2.871%	-8.60	***	-4.000%	-8.99	***	0.171%	0.58		-4.171%	***
0	-1.351%	-3.74	***	-1.982%	-4.37	***	0.350%	0.67		-2.332%	***
0, 1	-3.516%	-11.58	***	-4.791%	-11.84	***	-0.076%	-0.29		-4.715%	***
0, 2	-3.687%	-12.21	***	-5.117%	-12.82	***	0.167%	0.56		-5.284%	***
0, 5	-3.684%	-12.91	***	-5.122%	-13.52	***	0.193%	0.74		-5.315%	***
0, 20	-4.623%	-17.17	***	-6.324%	-17.75	***	-0.038%	-0.14		-6.287%	***

Table 3.3: Descriptive statistics for issue and issuer characteristics

Descriptive statistics for sub-samples of debt- and equity-like convertible bond announcements by Canadian companies from January 1991 to December 2004. The convertible bond announcements are identified from the SDC database. The sub-samples are divided according to the delta (Δ_i) of the conversion rights and equity-to-debt component ratio (ED). Δ_i is the measure of the sensitivity of the value of convertible bond with respect to the value of the underlying equity. This measure is calculated using the option pricing model of Black and Scholes corrected for continuous dividend payments (see Equation 3.1). ED is the equity-to-debt component ratio based on the Tsiveriotis and Fernandes convertible bond valuation model. M is the "moneyness" measure defined as a ratio between conversion value at the announcement of the convertible bond issue and the par value of the bond. LEV is computed as the ratio between total debt and total assets. TIE is the Times-Interest-Earned ratio. This is defined as EBIT (Earnings Before Income and Taxes) over interest expense. SLACK is the ratio of cash and equivalents over total assets. SPRUN is the cumulative average abnormal stock return measured over the window (-10,-2) relative to the announcement date. FCFA is the ratio of free cash flow (net income + depreciation - capital expenditures) over the total assets. DY is the dividend yield. Q is the Tobin's Q-ratio measured as (market value of equity measured as average between (-15,-5) days relative to the announcement date + book value of long and short term debt) over the book value of total assets. LNTA is the natural logarithm of total assets. TAXA is the ratio of income taxes over total assets. MATURITY is the maturity of the convertible bond defined as the difference in time between the maturity date of the bond and the issue date. RISSEQ is the ratio of the issue proceeds over the book value of equity. CPREM is a conversion premium, defined as the ratio between conversion price and the stock price. VOLAT is the annualized stock returns volatility, measured during the period (-120, -20) relative to the announcement date of the issue.

* - denotes significance at below 10% level, ** - denotes significance at below 5% level and *** - denotes significance at below 1% level

Panel A: Δ_i sub-samples split

Statistics	$\overline{x}$	x_{min}	x_{max}	c_x^{50}	$\frac{\sigma_x}{\overline{x}}$	n	$\overline{x}$	x_{min}	x_{max}	c_x^{50}	$\frac{\sigma_x}{\overline{x}}$	n	$\overline{x_{\Delta_i>0.5}} - \overline{x_{\Delta_i<0.5}}$	
Variable	$\Delta_i < 0.5$						$\Delta_i > 0.5$							
LEV	0.218	0.000	0.490	0.199	0.610	21	0.254	0.000	0.697	0.178	0.921	59	0.035	
TIE	4.452	-2.223	41.621	2.004	2.244	20	3.654	-35.920	101.798	1.173	5.500	58	-0.798	
SPRUN	-0.006	-0.104	0.116	-0.005	-8.184	24	0.022	-0.548	0.311	0.022	5.388	62	0.028	*
SLACK	0.024	0.000	0.165	0.000	1.790	21	0.085	0.000	0.390	0.066	0.989	60	0.061	***
FCFA	0.016	-0.143	0.121	0.023	3.993	21	-0.069	-0.540	0.149	-0.017	-2.071	57	-0.085	***
DY	0.122	0.038	0.205	0.120	0.371	24	0.006	0.000	0.045	0.000	1.723	62	-0.116	***
Q	1.304	0.506	3.049	1.168	0.405	21	1.385	0.250	6.454	0.992	0.933	59	0.081	
LNTA	13.240	11.435	15.475	13.333	0.067	21	13.779	10.583	17.957	13.803	0.118	60	0.538	**
TAXA	0.006	0.000	0.064	0.000	2.554	21	0.011	0.000	0.073	0.002	1.499	58	0.005	*
MATURITY	6.355	0.161	20.989	5.416	0.613	24	9.896	2.003	30.041	7.134	0.653	62	3.541	***
RISSEQ	0.394	0.089	1.250	0.232	0.892	21	0.484	0.049	3.326	0.258	1.281	60	0.090	
CPREM	1.090	0.316	2.509	1.078	0.313	24	1.233	0.484	3.134	1.188	0.281	62	0.143	**
VOLAT	0.205	0.119	0.350	0.192	0.290	24	0.484	0.188	1.466	0.418	0.512	62	0.279	***
Δ	0.159	0.008	0.495	0.143	0.818	24	0.782	0.509	0.991	0.811	0.165	62	0.622	***
ED	2.912	0.000	45.970	0.602	3.401	21	4.455	0.574	83.846	1.468	2.969	54	1.544	
M	1.041	0.867	3.176	0.937	0.449	23	1.011	0.548	1.949	0.960	0.277	57	-0.030	

Panel B: ED sub-samples split

Statistics	$\overline{x}$	x_{min}	x_{max}	c_x^{50}	$\frac{\sigma_x}{\overline{x}}$	n	$\overline{x}$	x_{min}	x_{max}	c_x^{50}	$\frac{\sigma_x}{\overline{x}}$	n	$\overline{x_{ED_i>1}} - \overline{x_{ED<1}}$	
Variable					$ED_i < 1$						$ED_i > 1$			
LEV	0.264	0.000	1.247	0.193	0.911	29	0.213	0.000	0.697	0.171	0.861	44	-0.051	
TIE	3.091	-3.519	41.621	0.168	2.876	28	6.073	-35.920	101.798	2.510	3.689	42	2.982	
SPRUN	0.023	-0.104	0.304	-0.002	3.961	32	0.014	-0.548	0.311	0.022	8.747	47	-0.009	
SLACK	0.044	0.000	0.390	0.018	1.763	30	0.083	0.000	0.384	0.066	0.980	44	0.039	**
FCFA	-0.032	-0.456	0.121	0.002	-3.973	29	-0.058	-0.540	0.104	-0.002	-2.422	41	-0.026	
DY	0.081	0.000	0.205	0.086	0.832	30	0.014	0.000	0.152	0.000	2.365	45	-0.067	***
Q	1.242	0.329	3.049	1.142	0.501	29	1.486	0.250	6.454	1.127	0.928	44	0.244	
LNTA	13.480	11.435	15.292	13.550	0.072	30	13.748	10.583	17.957	13.526	0.128	44	0.268	
TAXA	0.005	0.000	0.064	0.000	2.527	29	0.013	0.000	0.056	0.007	1.273	43	0.008	**
MATURITY	5.464	0.115	10.025	5.256	0.465	32	10.076	2.751	30.041	7.214	0.620	47	4.612	***
RISSEQ	0.297	0.060	1.250	0.203	0.909	28	0.507	0.049	3.326	0.309	1.240	45	0.210	**
CPREM	1.180	0.981	1.901	1.103	0.181	32	1.168	0.316	3.134	1.169	0.323	47	-0.012	
VOLAT	0.348	0.119	1.064	0.266	0.649	32	0.459	0.169	1.466	0.406	0.561	47	0.110	**
Δ	0.371	0.008	0.882	0.268	0.805	30	0.755	0.033	0.991	0.811	0.261	45	0.385	***
ED	0.597	0.000	0.982	0.657	0.487	32	6.095	1.007	83.846	1.901	2.506	47	5.498	***
M	0.880	0.548	1.043	0.916	0.131	32	1.097	0.558	3.176	0.976	0.377	47	0.218	***

Table 3.4: OLS regressions of the cumulative average abnormal returns in the event window (-1,-1) on the issue and issuer characteristics

Dependent variable is the cumulative average abnormal return in the event window (-1,-1) around the convertible debt offering announcement. Cumulative average abnormal returns are for the sample of 86 convertible bond announcements by Canadian companies from January 1991 to December 2004. The convertible bond announcements are identified from the SDC database. Abnormal returns are based on the market model, estimated over a 100-day period for each company (from day -120 to day -20). LEV is computed as the ratio between total debt and total assets. TIE is the Times-Interest-Earned ratio. This is defined as EBIT (Earnings Before Income and Taxes) over interest expense. SLACK is the ratio of cash and equivalents over total assets. SPRUN is the cumulative average abnormal stock return measured over the window (-10,-2) relative to the announcement date. FCFA is the ratio of free cash flow (net income + depreciation - capital expenditures) over the total assets. DY is the dividend yield. Q is the Tobin's Q-ratio measured as (market value of equity measured as average between (-15,-5) days relative to the announcement date + book value of long and short term debt) over the book value of total assets. TAXA is the ratio of income taxes over total assets. LNTA is the natural logarithm of total assets. RISSEQ is the ratio of the issue proceeds over the book value of equity. Δ is a measure of the sensitivity of the value of convertible bond with respect to the value of the underlying equity. This measure is calculated using the option pricing model of Black and Scholes corrected for continuous dividend payments (see Equation 3.1). ED is the equity-to-debt component ratio based on the Tsiveriotis and Fernandes convertible bond valuation model. ITRUST is a dummy variable that takes a value of 1 if the company is organized as income or interest trust and a value of 0 otherwise. All the standard errors are White heteroskedasticity corrected. Under the null of the F-test all the b_j are equal to 0.

* - denotes significance at below 10% level, ** - denotes significance at below 5% level and *** - denotes significance at below 1% level

	1			2			3			4			5			6		
Variable	b_j	t		b_j	t		b_j	t		b_j	t		b_j	t		b_j	t	
LEV	-0.0039	-0.16		-0.0073	-0.29		-0.0051	-0.20		-0.0009	-0.03		-0.0038	-0.14		0.0012	0.51	
TIE	-0.0001	-0.63		0.0000	-0.11		0.0000	-0.09		0.0001	0.29		0.0000	0.08		0.0001	0.04	
SLACK	0.1812	2.06	**	0.1847	2.08	**	0.1732	2.00	**	0.1405	1.30		0.1824	1.99	**	0.1484	1.34	
SPRUN	-0.3339	-2.34	**	-0.3291	-2.30	**	-0.3327	-2.38	**	-0.3525	-2.33	**	-0.3297	-2.36	***	-0.3480	-2.27	**
FCFA	-0.0556	-1.23		-0.0494	-1.06		-0.0465	-0.96		-0.0478	-0.80		-0.0450	-0.90		-0.0480	-0.77	
DY	0.3059	2.74	***	0.2951	2.65	***	0.3849	1.61		0.2678	1.83	*	0.3068	1.34		0.1410	0.92	
Q	-0.0077	-1.32		-0.0079	-1.36		-0.0085	-1.42		-0.0076	-0.94		-0.0095	-1.53		-0.0087	-1.07	
TAXA				-0.2849	-0.55		-0.2576	-0.49		-0.5375	-0.76		-0.2526	-0.47		-0.5471	-0.77	
LNTA	-0.0010	-0.22		-0.0005	-0.11		-0.0016	-0.31		0.0042	0.60		-0.0009	-0.18		0.0058	0.77	
RISSEQ	0.0155	1.35		0.0157	1.34		0.0140	1.16		0.0250	1.38		0.0159	1.25		0.0286	1.53	
Δ							0.0242	0.49					0.0296	0.58				
ED										-0.0008	-1.98	*				-0.0008	-2.10	**
ITRUST													0.0189	0.85		0.0233	1.02	
intercept	-0.0306	-0.45		-0.0333	-0.48		-0.0332	-0.46		-0.0937	-0.89		-0.0479	-0.62		-0.1169	-1.02	
n	79			79			76			65			76			65		
Adj. R^2	0.333			0.327			0.314			0.333			0.311			0.327		
F-test	***			***			***			***			***			***		

Table 3.5: OLS regressions of abnormal returns at the announcement date of convertible debt offering on issue and issuer characteristics for split samples

Dependent variable is the cumulative average abnormal return in the event window (-1,-1) around the convertible debt offering announcement. Cumulative average abnormal returns are for the sample of 86 convertible bond announcements by Canadian companies from January 1991 to December 2004. The convertible bond announcements are identified from the SDC database. Abnormal returns are based on the market model, estimated over a 100-day period for each company (from day -120 to day -20). LEV is computed as the ratio between total debt and total assets. TIE is the Times-Interest-Earned ratio. This is defined as EBIT (Earnings Before Income and Taxes) over interest expense. SLACK is the ratio of cash and equivalents over total assets. SPRUN is the cumulative average abnormal stock return measured over the window (-10,-2) relative to the announcement date. FCFA is the ratio of free cash flow (net income + depreciation - capital expenditures) over the total assets. DY is the dividend yield. Q is the Tobin's Q-ratio measured as (market value of equity measured as average between (-15,-5) days relative to the announcement date + book value of long and short term debt) over the book value of total assets. TAXA is the ratio of income taxes over total assets. LNTA is the natural logarithm of total assets. RISSEQ is the ratio of the issue proceeds over the book value of equity. Δ is a measure of the sensitivity of the value of convertible bond with respect to the value of the underlying equity. This measure is calculated using the option pricing model of Black and Scholes corrected for continuous dividend payments (see Equation 3.1). ED is the equity-to-debt component ratio based on the Tsiveriotis and Fernandes convertible bond valuation model. M is the "moneyness" measure defined as a ratio between conversion value at the announcement of the convertible bond issue and the par value of the bond. DMA is a dummy variable with a value 1 if the issuer stated to use the proceeds for acquisitions and 0 otherwise. DREF is a dummy variable with a value 1 if the issuer stated to use the proceeds for refinancing and 0 otherwise. DCGX is a dummy variable with value 1 if the issuer stated states to use the proceeds for capital and general expenditures and 0 otherwise. All the standard errors are White heteroscedasticity corrected. Under the null of the F-test all the b_j are equal to 0.

* - denotes significance at below 10% level, ** - denotes significance at below 5% level and *** - denotes significance at below 1% level

Panel A: Delta split

[redacted]	$\Delta_i < 0.5$			$\Delta_i > 0.5$		
Variable	b_j	t		b_j	t	
LEV	-0.0559	-0.92		-0.0045	-0.15	
TIE	0.0013	2.46	**	-0.0001	-0.39	
SLACK	0.0970	0.69		0.2011	1.91	*
SPRUN	-0.0271	-0.19		-0.3407	-2.22	**
FCFA	0.1455	1.26		-0.0836	-1.35	
DY	-0.0516	-0.44		0.6603	0.56	
Q	-0.0364	-2.39	**	-0.0075	-1.12	
TAXA	0.0445	0.12		-0.0782	-0.10	
LNTA	-0.0360	-3.96	***	-0.0002	-0.04	
RISSEQ	0.0139	0.46		0.0160	1.16	
intercept	0.5283	4.00	***	-0.0454	-0.53	
n	20			56		
Adj. R^2	0.537			0.276		
F-test	**			**		

Panel B: Equity-to-debt component split

[redacted]	$ED < 1$		$ED > 1$		
Variable	b_j	t	b_j	t	
LEV	0.0014	0.03	0.0461	0.78	
TIE	0.0010	1.23	-0.0001	-0.01	
SLACK	0.1030	0.84	0.2575	1.49	
SPRUN	-0.0959	-0.54	-0.4156	-2.27	**
FCFA	0.0416	0.44	-0.1448	-1.54	
DY	0.2908	1.60	0.6200	1.97	**
Q	-0.0177	-0.81	-0.0016	-0.16	
TAXA	-0.2806	-0.49	-0.1014	-0.08	
LNTA	0.0074	0.46	0.0006	0.07	
RISSEQ	0.0616	0.90	0.0066	0.33	
intercept	-0.1406	-0.63	-0.0798	-0.56	
n	26		39		
Adj. R^2	0.188		0.306		
F-test			**		

Panel C: Use of proceeds

[redacted]	Use of proceeds		
Variable	b_j	t	
LEV	-0.0050	-0.19	
TIE	-0.0001	-0.55	
SLACK	0.1906	2.13	**
SPRUN	-0.3211	-2.21	**
FCFA	-0.0474	-0.98	
DY	0.2455	2.27	**
Q	-0.0084	-1.32	
TAXA	-0.2882	-0.54	
LNTA	-0.0005	-0.10	
RISSEQ	0.0169	1.39	
DMA	0.0224	1.02	
DREF	0.0094	0.43	
DCGX	-0.0003	-0.01	
intercept	-0.0396	-0.55	
n	79		
Adj. R^2	0.310		
F-test	***		

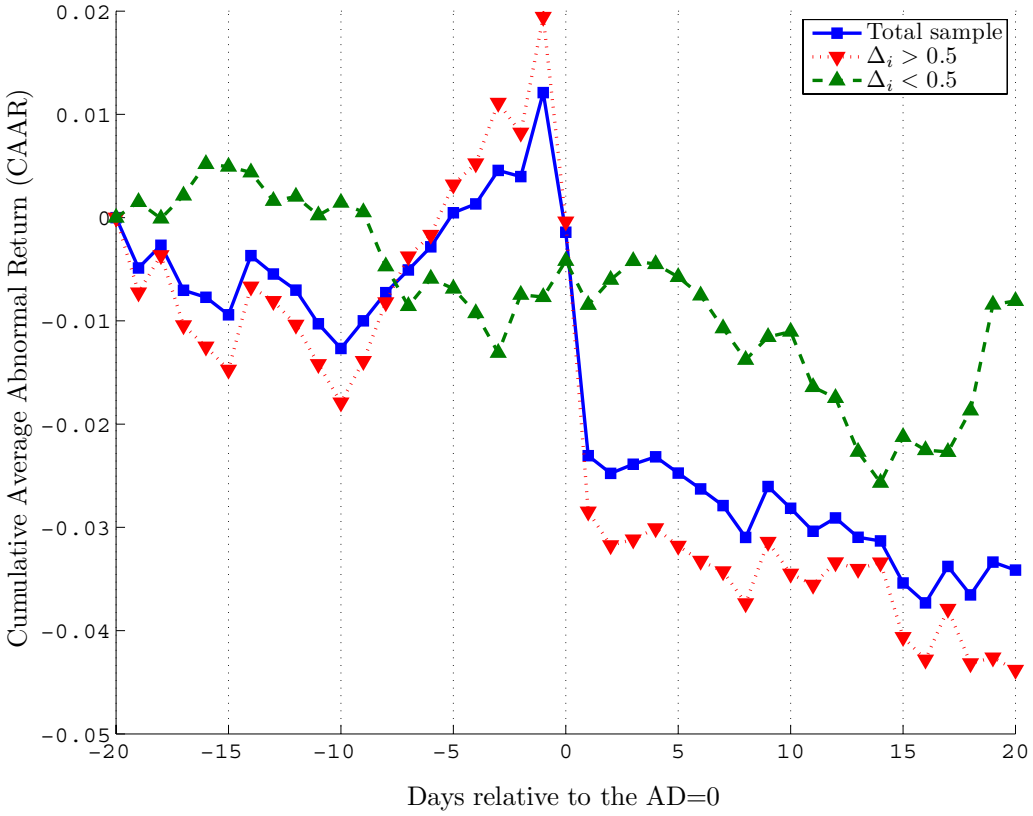
Table 3.6: Overview of hypotheses and the results of the tests of the hypotheses

This table gives an overview of the hypotheses that we test in this chapter as well as of the results of these tests. The delta-specific and ED-specific sub-sample results are from columns (1) and (2) of Panels A and B in Table 3.5 for hypotheses 2a and 2b, from columns (3) and (4) for hypotheses 3a to 3c, and from columns (1) and (2) of Panels A and B in Table 3.5, as well as from columns (2) to (6) of Table 3.4 for hypothesis (4).

Hypothesis	**Proxy**	**Table with result**	**Result**	**Result (delta-specific sub-sample)**	**Result (ED-specific sub-sample)**
H1: The market valuation effect will be more negative for equity-like convertibles than for debt-like convertibles	Difference in CAARs between equity-like (delta>0.5) and debt-like (delta<0.5) convertibles	Table 3.2	Confirmed		
Agency costs of debt					
H2: Agency costs of debt will have a negative effect on the market valuation for the more debt-like convertibles and a non-negative effect for the more equity-like convertibles					
H2a: Higher financial leverage negatively affects the market valuation, in particular for more debt-like convertibles	Leverage (LEV): ratio between total debt and total assets	Tables 3.4 and 3.5	Not confirmed	Not confirmed	Not confirmed
H2b: Interest coverage positively affects the market valuation	Times-interest-earned ratio (TIE): Earnings Before Income and Taxes over interest expense on debt	Tables 3.4 and 3.5	Not confirmed	Confirmed	Not confirmed
Agency costs of equity					
H3: Agency costs of equity will have a negative effect on the market valuation for the more equity-like convertibles and a non-negative effect for the more equity-like convertibles.					
H3a: A period of positive abnormal returns preceding the announcement date negatively affects the market valuation	CAAR over the window (-10,-2) relative to the announcement date	Tables 3.4 and 3.5	Confirmed	Confirmed	Confirmed
H3b: Higher free cash flow negatively affects the market valuation	Free cash flow (FCFA): ratio of free cash flow (net income plus depreciation less capital expenditures) over total assets	Tables 3.4 and 3.5	Not confirmed	Not confirmed	Not confirmed
H3c: Dividend payments positively affect the market valuation	DY: the dividend yield	Tables 3.4 and 3.5	Confirmed	Not confirmed	Confirmed
Tax hypothesis					
H4: Income taxes positively affect the market valuation, in particular for more equity-like convertibles	TAXA: ratio of income taxes over total assets	Tables 3.4 and 3.5	Not confirmed	Not confirmed	Not confirmed

Figure 3.1: Cumulative average abnormal returns (CAAR)

Cumulative average abnormal returns (CAAR) for the total and two sub-samples split according to the value of the delta over the event window (-20, 20)



Chapter 4

Determinants of Public Financing Choice

4.1 Introduction

The security issuance decision is essentially a capital structure decision - an increase or a decrease of the leverage of a firm. Leverage increasing actions refer to the issue of straight debt, convertible debt or a share repurchase[1]. On the other hand, leverage decreasing actions refer to the issuance of equity, but also to some extent to the issuance of convertible debt. Different explanations have been put forward in the literature as to how and when managers decide to increase or decrease the leverage of a firm, and empirical tests on these theories have yielded mixed results. The pecking-order model (Myers and Majluf, 1984) argues that due to informational asymmetries different financing options bear different financing costs and firms will prefer flexibility in financing. They will only issue the "costliest" security (equity) when ultimately needed - i.e. when firms are financially constrained. Previous research, conducted for the US and the UK markets (see for example Bayless and Chaplinsky, 1991; Hovakimian, Opler and Titman, 2001), mostly finds that equity is preferred over debt by smaller and riskier companies, those with better growth opportunities and lower leverage and less profitable ones, consistent with pecking-order. Related to capital structure theories Shyam-Sunder and Myers (1999) demonstrate support for the pecking-order theory. However, the pecking-order is refuted in other research (e.g., Frank and Goyal, 2003; Leary and Roberts, 2005; Helwege and Liang, 1996). According to the market timing model managers are able to time the market and issue equity when the firm's stock is overvalued and retire equity when undervalued. Jung, Kim and Stulz (1996) find evidence inconsistent with market timing, while a growing body of papers show that firms time the market with equity

[1]Convertible debt is a mixture of straight debt and equity. The debtness depends on the characteristics of the issue and on the evolution of the share price after convertible debt issue.

issues (e.g., Baker and Wurgler, 2002; Gomes and Philips, 2005). More recently, Dittmar and Thakor (2007) argue that firms issue equity when the agreement between insiders and outsiders is high, regardless of the firm's valuation.

In this chapter we revisit some of the security issuance theories using a sample of Canadian firms that repurchase shares, issue equity, debt, and convertibles between 1998 and 2004. We test the three aforementioned theories of firms' public financing choice / capital structure - market timing, pecking-order and the agreement between insiders and outsiders. Market timing is particularly interesting, since most previous research finds stock price run-ups prior to the announcement of equity issues, but subsequently fails to provide conclusive evidence that managers time the market. We therefore look at pre- and post-announcement period excess returns in relationship with market-to-book values to shed more light on the issue. Tests of the pecking-order theory provide mixed answers as well. We use a comprehensive measure of financial constraint - the Kaplan and Zingales (1997) index - to examine if at least some firms are forced into issuing equity, a result that is consistent with the pecking-order model of the preference for financial flexibility. Finally, a recently proposed explanation (Dittmar and Thakor, 2007) of the agreement between insiders and outsiders as the motive for issuing equity is examined. In addition to the investigation of the issuance theories, we compare determinants of the choice between convertible debt, straight debt and equity in order to revisit motives for issuing convertible debt compared to straight debt or equity.

We find strong and consistent evidence that equity overvaluation leads companies to choose equity over debt issuance. Firms with high prior stock returns and high market-to-book ratios tend to issue equity rather than debt, and equity issuers tend to earn lower post-issue returns than debt issuers. Strikingly, among equity issuers, overvalued firms as measured by the market-to-book ratio, earn significantly lower returns in the three months after the issuance, despite the less negative returns during the initial announcement period. Overall, these results give support to the market timing argument for issuing equity, consistent with previous findings on market timing (e.g., Baker and Wurgler, 2002; Gomes and Philips, 2005), but in contrast to Jung et al. (1996) who reject market timing on the basis of the finding that high market-to-book equity issuers earn higher announcement returns. Our long-run returns evidence indicates that investors tend to mis-react on the initial equity issuance announcement, but this misreaction is corrected in the months following the issuance.

To test the pecking-order hypothesis of security issuance, we relate the issuance decision to the Kaplan-Zingales (1997) index of financial constraints. Strikingly, we find that according to the KZ index straight debt issuers are on average more financially constrained than equity issuers. However, after controlling for the size of the issuer we find evidence that firms with high KZ index are more likely to issue equity. Moreover, we find that the smallest equity issuers are less financially constrained than the largest ones, but are more overvalued.

This implies a dual nature of equity issuers, where smaller equity issuers time the market, while the largest ones seem more prone to "pecking-order" behavior.

We find no evidence that companies issue equity when the agreement between outside investors and insiders is high (Dittmar and Thakor, 2007). On the contrary, we find that the probability of issuing equity increases in the level of "disagreement", as proxied by the discrepancy between actual and forecast earnings or dispersion of analyst forecasts. Since these proxies are also measures of information asymmetry, our results are inconsistent with findings based on US studies that firms with high levels of information asymmetry tend to issue debt to avoid high informational costs. At the very least, our evidence suggests that the conclusion that firms with high levels of information asymmetry or disagreement between insiders and outsiders prefer equity issuance is not robust to different capital markets.

Finally, we find convertible debt to represent the alternative to straight debt and be used to "sweeten" a debt issue. However, some findings on the agency costs of convertible debt issuers are also consistent with the sequential financing motive for the use of convertible debt (Mayers, 1998).

The remainder of the chapter is organized as follows. In Section 4.2 we discuss related research, present capital structure theories and relate them to hypotheses that we test. In Section 4.3 we describe proxies that we use to test the hypotheses and describe construction of the data. In Section 4.4 we present sample characteristics, explore the differences between different security issue types and investigate market timing, pecking-order and agreement theories of capital structure individually. In Section 4.5 we proceed with the analysis of the relationship between the security issuance choice and capital structure theories in a mulitinomial choice setting. Section 4.6 discusses a dual nature of equity issuers. Section 4.7 concludes.

4.2 Capital Structure Theories and the Security Issuance Choice

4.2.1 Previous Research

Previous research has found that equity offers coincide with high market valuations of equity (see for example Asquith and Mullins, 1986; Jung et al., 1996; Hovakimian et al., 2001). Two thirds of CFOs surveyed by Graham and Harvey (2001) claim that undervaluation (overvaluation) of equity was one of the most important considerations in their decision to issue equity. Baker and Wurgler (2002) show that past market valuations have strong and persistent effect on capital structure or, in other words, managers try to time the market. Firms raise equity when the cost of equity is "unusually low" or market-to-book values (if considered as proxy for misvaluation) are extremely high. Bayless and Chaplinsky (1991)

show that firms issue equity in periods of reduced information asymmetry in the markets, when the announcement period excess returns are less negative (hot equity markets). They also find that higher risk and larger firms prefer issuing equity over straight debt. Gomes and Philips (2005) find strong evidence for the market timing hypothesis. The probability of issuing equity increases with stock price returns prior to the announcement compared to the benchmark portfolio. Moreover, they show that market timing is a particular characteristic of public equity markets.

According to the pecking-order model (Myers and Majluf, 1984) different financing options bear different financing costs due to informational asymmetries and firms will prefer flexibility in financing. A broad definition assumes that firms will only issue the "costliest" security (equity) when ultimately needed - i.e. when firms are financially constrained. Previous research, conducted for the US and the UK markets (see for example Bayless and Chaplinsky, 1991; Hovakimian et al., 2001), mostly finds that equity is preferred over debt by smaller and riskier companies, those with better growth opportunities and lower leverage and less profitable ones, consistent with pecking-order. Related to capital structure theories Shyam-Sunder and Myers (1999) demonstrate support for the pecking-order theory. However, the pecking-order is refuted in other research. Frank and Goyal (2003) do find some evidence that large firms exhibit "pecking-order" behavior, but overall evidence goes against it. Fama and French (2005) show that equity issues are very frequent and typically not a result of a "duress". Gomes and Philips (2005) investigate the private versus public security decision and subsequent security type choice. They find that the probability of issuing securities in the private market increases in the degree of informational asymmetry. For securities issued in the public market they find support for the pecking-order theory of capital structure, as the probability of issuing equity decreases for firms with high degrees of informational asymmetry. The opposite holds for firms that issue debt.

Jung et al. (1996) use the security issue choice to test three theories of capital structure on a sample of US firms in the period 1977 to 1984: Myers' and Majluf's (1984) pecking-order model, the agency model and market timing model. The agency model refers to the agency cost of equity, which is mitigated with the use of debt. Debt serves as a disciplining device that lowers free cash flows and managerial discretion. Although the "timing model" is inherent in both the pecking-order and the agency model, Jung et al. investigate whether timing is of the first order importance in the security decision process. They find bond (debt) issuers to be significantly larger companies that pay more dividends, have less leverage, lower market-to-book ratios and have not experienced positive stock price run-ups during the 11 months prior to the announcement. Companies with better growth opportunities (measured by the market-to-book ratio) and better cumulative excess stock performance in the past are significantly more likely to issue equity. Jung et al. conclude that their findings support the agency model, since they find some evidence against the pecking-order model - some

firms issue equity against their type. Moreover, they argue that no evidence is found for the market timing explanation of capital structure, since the announcement date excess returns are more negative for lower market-to-book ratios or less overvalued firms.

Boot and Thakor (2003) argue that firms value flexibility. They define flexibility as the ability to take action that one (manager) thinks is the best even when others (group of investors) disagree. Flexibility depends on how the firm is financed, where flexibility increases from the debt to equity spectrum. Boot and Thakor argue that firms trade the flexibility provided by issuing equity against debt tax shield. The main implication of their idea is that firms issue equity when stock prices are high and issue debt when stock prices are low.

Dittmar and Thakor (2007) provide an additional explanation on why (when) firms issue equity. They argue that companies issue equity when agreement between managers and outside investors is high. This is typically the case in periods of high equity valuation (high stock prices). The main implication of Dittmar's and Thakor's argument is that companies will issue equity when agreement with outsiders is high, regardless of the valuation of a company. This is in some contrast to market timing and pecking-order hypotheses that predict equity issues in times of high stock prices and / or high degree of financial constraint, regardless of the level of agreement between managers and outsiders.

Apart from researchers that studied the pure play between equity and debt, there are some that looked also into other (hybrid) security types such are convertible bonds and convertible preferred shares. Lewis, Rogalski and Seward (1999) investigate motives for the issuance of convertible debt by comparing it to pure equity and pure debt. Lewis et al. argue that companies issue convertibles when the costs of either equity or pure debt issues are too high. They document that firms that issue convertible debt are significantly smaller than debt issuing firms, have lower dividend yields, but higher slack, market-to-book ratios and higher excess returns prior to the issue announcement. Compared to equity issuing firms, convertible bond issuers have significantly more slack and have significantly higher announcement date returns. They do not find volatility of stock returns and slack to have statistically significant effect on the security decision choice, while on the other hand they find leverage to have a significantly positive effect on the probability of issuing equity. Hovakimian et al. (2001) document that companies are more likely to issue convertibles than common equity if they have a lower market-to-book ratio (Q ratio) and have experienced lower pre-announcement stock returns.

4.2.2 Hypotheses and Definitions of Proxy Variables

In this chapter we examine three distinct explanations of the firm's capital structure - market timing, pecking-order and agreement between insiders and outsiders of a firm.

Market Timing

In a survey of managerial practice in the US Graham and Harvey (2001) find that managers consider equity market prices as one of the most important factors in their decision to raise equity or equity-like securities. Moreover, Baker and Wurgler (2002) empirically demonstrate that low leverage firms issue equity when their valuation is high and high leverage firms raise funds when their valuations are low. This implies:

H1: Overvaluation increases the probability of issuing equity-like security.

However, Jung et al. (1996) show that high market-to-book (MB) firms earn higher announcement period abnormal returns than low MB firms. In their view this represents evidence against market timing. To show the contrary, we investigate an additional hypothesis related to market timing by equity issuers:

H1a: Post-announcement excess returns will be decreasing in market-to-book ratio for equity issuers.

Pecking-Order Hypothesis

According to the pecking-order hypothesis (Myers and Majluf, 1984 and Myers, 1984) companies are faced with different levels of informational asymmetries, which create an adverse selection problem. As a results there is a financing hierarchy that firms will follow, where internal financing (retained earnings) will be used first, followed by external debt-like financing. Equity will only be issued when the debt capacity is used up. This suggests that equity financing is used when firms are financially constrained and cannot take up any additional leverage. In other words, this implies:

H2: Higher degree of financial constraints increases the probability of issuing equity-like security.

(Dis)agreement between insiders and outsiders

Dittmar and Thakor (2007) propose an alternative explanation of the security issuance choice to resolve the ambiguity of market timing hypotheses of capital structure. Compared to market timing or pecking-order explanations of capital structure, according to their proposition companies will issue equity when agreement with outsiders is high, regardless of the (over)valuation of a company and / or degree of financial constraint.

H3: High "agreement" between insiders and outsiders increases the probability of issuing

equity-like security.

4.3 Data and Definitions of Variables

4.3.1 Sample Construction

We analyze three types of public security issues on the Canadian market in the period between 1998 and 2004: straight debt (bond) issues, equity issues and convertible debt issues, as well as share repurchases (equity withdrawal). The data on the new issues is gathered from the SDC New Issues database. During this period, there were 1,075 corporate nonconvertible debt issues, 95 convertible debt issues, 3,439 equity issues and 1,415 intended share repurchases in the corporate sector.[2] We first eliminate all financial companies from our sample (SIC 6000-6999). This leaves us with 440 corporate nonconvertible debt issues, 58 convertible debt issues, 2,271 corporate equity and 1,084 intended share repurchases. Next, we match the sample with the WorldScope accounting data, as well as stock price and market value of equity data from Datastream.[3] Since data in Datastream is not available for all non-financial companies in our sample, we are left with 142 corporate nonconvertible debt issues (made by 40 different companies), 51 convertible debt issues (made by 41 different companies), 682 corporate equity issues (made by 341 different companies) and 575 intended share repurchases (made by 238 different companies). The total sample contains 1,450 different security issues and share repurchases made by 546 different companies.

Next, we gather data on analysts forecasts from the I/B/E/S database available through Wharton Research Data Services (WRDS). Analysts' forecasts are available for 108 corporate nonconvertible debt issues, 43 convertible debt issues, 463 equity issues and 469 intended share repurchases. However, quite a few companies are only covered by a single analyst. Therefore, we are only able to compute dispersion of forecasts for the companies that are covered by more than one analyst. This results in dispersions of earnings forecasts for 106 nonconvertible debt issues, 38 convertible debt issues, 353 equity issues and 360 intended share repurchases.

4.3.2 Definitions of Variables

As described in Section 4.2.2, where we define the hypotheses, we group our proxies such to test different hypotheses related to capital structure theories. We therefore define groups of

[2]Note that this does not include the issues placed by government or government agencies.

[3]Note that availability of data refers to a particular company being listed in Datastream and not to the actual accounting numbers per se. Number of companies in tables of descriptive statistics and regression tables might therefore be different, depending on the availability of data for the variables used in the analysis.

variables that we use to test hypotheses regarding (1) market timing, (2) pecking-order and (3) agreement between insiders and outsiders.

Market Timing

According to H1 overvaluation increases the probability of issuing equity. This implies that managers will exploit periods of equity overvaluation and will issue equity. Similarly, when managers perceive firm's equity to be undervalued they will repurchase firm's stock. To test this hypothesis we look into stock returns prior to the announcement of the issue, together with other measures of equity valuation (market-to-book ratio, Q-ratio), as defined below:

- **Stock price run up** prior to the announcement of the issue: $SRB = AR^i_{-60,-10}$, where $AR^i_{-60,-10}$ is estimated using the standard market model[4] with the total return on TSX 300 market index being a proxy for the market return.

- **Stock returns after the announcement** of the security issue: $SRA = AR^i_{10,60}$, where $AR^i_{10,60}$ is estimated using the standard market model with the total return on TSX 300 market index being a proxy for the market return.

- **Stock returns at the announcement** of the security issue: $AR = AR^i_{-1,1}$, where $AR^i_{-1,1}$ is estimated using the standard market model with the total return on TSX 300 market index being a proxy for the market return.

- **Growth opportunities - Q ratio** or market-to-book value is defined as: $Q = \frac{\text{book values of long term and short term debt + market value of equity}}{\text{total assets}}$

- **Market-to-book value of equity** is defined as $MB = \frac{\text{market value of equity}}{\text{book value of equity}}$, where market value of equity is taken 5 trading days prior to the announcement.

We expect equity issuers to have significantly higher stock price run ups and higher market-to-book (MB) values than debt issuers or share repurchasers. Moreover, stock returns after the announcement of the issue are expected to be decreasing in market-to-book ratios, if managers time the market.

Pecking-order

H2 predicts that the probability of equity issuance is increasing in the degree of financial constraint, as companies issue equity as a last resort to finance profitable projects (after they have exhausted internal reserves and debt capacity). To test this we look into a number of firm characteristics that proxy for the amount of internally generated funds, debt capacity and financial constraints.

[4]Return on any security i is defined as $R_{it} = \alpha + \beta_i \cdot R_{mt} + \epsilon_{it}$. R_{it} and R_{mt} are the period t returns on security i and the market portfolio respectively. ϵ_{it} is the error term.

- **Leverage** is defined as: $LEV = \frac{\text{long term debt}}{\text{total assets}}$
- **Free cash flow** is defined relative to total assets as: $FCFA = \frac{\text{net income+depreciation-capital expenditures}}{\text{total assets}}$
- **Payout** is defined as cash dividends relative to the assets: $DIVA = \frac{\text{cash dividends}}{\text{total assets}}$.
- **Slack** is defined as: $SLCK = \frac{\text{cash and equivalents}}{\text{total assets}}$
- **Size of the company** is defined as logarithmic value of total assets, where we deflated the value of total assets with the consumer price index ($CPI_{1997} = 100$): LNTA=log(deflated total assets)

Firms with low internally generated funds (low free cash flow), a low debt capacity (high leverage) and high financial constraints (high payout, low slack) are supposed to be more likely to issue equity.

In addition, we employ a comprehensive measure of **financial constraint**, where we follow Baker, Stein and Wurgler (2003). They use a four-variable version of the Kaplan-Zingales (KZ) index, which is constructed based on the coefficients of the restricted ordered logit model. This is in some contrast to the approach used by Lamont, Polk and Saá-Requejo (2001), where they use a five-variable version of the index. They include the Q-ratio as an additional component of the index. We choose not to include the Q-ratio as component of the index, as a high Q-ratio might indicate an overvaluation and thus "contaminate" the index as the measure of financial constraint. We therefore construct the KZ index as:

$$KZ_{it} = -1.002 \cdot \frac{CF_{it}}{A_{it-1}} + 3.139 \cdot LEV_{it} - 39.368 \cdot \frac{DIV_{it}}{A_{it-1}} - 1.315 \cdot \frac{CASH_{it}}{A_{it-1}} \tag{4.1}$$

CF represents sum of the depreciation, the amortization and the income before extraordinary items, A stands for total assets, LEV represents leverage as debt over the sum of debt and equity and CASH represents cash and short-term investments. The KZ index is higher for firms which are more financially constrained, since such firms have exhausted their debt capacity (high leverage), have low cash flows from operations and / or need to pay higher dividends. *H2 implies that the probability of issuing equity should be increasing in the value of KZ. More financially constrained firms are forced to issue equity.*

Agreement between Insiders and Outsiders

We explore this implication by first computing the parameter of agreement between managers and outsiders. We follow Dittmar and Thakor and define the agreement parameter α as the relative difference between actual (EPS_a) and last forecasted EPS. Dittmar and Thakor argue that higher α represents higher agreement, as outsiders are less likely to question the managerial decisions if the managers are able to deliver better earnings than expected. In

addition, we measure the disagreement between insiders and outsiders by looking at the dispersion of analysts' earnings forecasts. Higher dispersion implies higher disagreement.

- **Agreement parameter** α is defined as a relative difference between actual (EPS_a) just prior to the announcement of the security issue and the last forecasted EPS (EPS_f): $\alpha = \frac{EPS_a - EPS_f}{EPS_f}$.
- **Dispersion of analysts' forecast** is defined as an absolute value of the coefficient of variation of forecasted earnings for t+1 year, where t is the year of the security issue: $DISP = \mid \frac{\text{standard deviation of earnings forecasts}}{\text{mean earnings forecast}} \mid$
- **Volatility** is defined as the relative volatility of stock returns: $RVOL = \frac{\sigma_i}{\sigma_M}$, where σ_i is the volatility of stock price returns of company i and σ_M is volatility of the returns of the TSX 300 market index measure over a one year period (250 trading days) prior to the announcement of the security issue.

According to H3 higher alpha implies higher probability of equity issue regardless of equity valuation on the market. Similarly, low dispersion implies low disagreement (high agreement) and higher probability of equity valuation.

Other variables

Unrelated to a single hypothesis we define additional variables that provide some insight into characteristics of the issuers (repurchasers).

- **Issue size** is defined as the value of the issued security or repurchased stock, where we deflated the value of the issue size with the consumer price index ($CPI_{1997} = 100$): ISS=deflated issue size
- **Relative issue size** is defined as the nominal amount of funding raised with the issue relative to total assets: $RISS = \frac{\text{issue size}}{\text{total assets}}$
- **Number of analysts** that follow the company and provide estimates.

4.4 Results of the Analysis

4.4.1 Sample Characteristics and Bivariate Analysis

In Table 4.1 we present descriptive statistics and pairwise differences in means between different security types for selected characteristics that we use as proxies for market timing and the pecking-order theories of capital structure, as well as proxies for disagreement between insiders and outsiders.

In Panel A we first report characteristics and differences between different issuers related to *market timing*. Based on the results in the table we first observe that equity issuers experience significant positive excess stock returns prior to the issue (mean value of 19.65%). These are 18.44 percentage points higher than those for straight debt issuers (mean value of 1.22%). Similar is the case when we compare equity issuers to convertible debt issuers (20.55 percentage points higher mean excess returns) and to companies that repurchase stocks (21.46 percentage points higher mean excess return).

Companies that announce stock repurchases experience significantly negative excess returns prior to the announcement of the share repurchase programme (mean value of -1.80%). Quite the opposite is the case in the period following the announcement of the issue, when share repurchasing companies face a mean 8.28% excess return. In a three month period following the announcement of the issue[5] excess returns are more negative for equity issuers (mean value of -3.2%) than for straight debt issuers (mean value of 0.05%), but the difference is marginally significant. On the other hand convertible bond issuers experience significant positive excess returns (mean value of 1.61%). We present all these results in Figure 4.1.

When we look at the differences in market-to-book (MB) values, we observe companies that repurchase shares to have the lowest MB values (1.4251), while equity issuers have the highest MB values (mean MB value of 3.3262). The difference in MB values between equity issuers and issuers of debt-like securities (straight debt, convertible debt and share repurchases) is statistically significant.

Moreover, announcement period abnormal returns show that equity issuers on average experience 2.10 percentage points lower abnormal returns than straight debt issuers. Companies that announce share repurchase programs experience on average 3.37 percentage points higher abnormal returns than equity issuers. The results are consistent with previous literature on the wealth effects associated with the announcement of different security issues[6], with the exception that convertible bond issuers experience 1.20 percentage points more negative excess returns around the announcement of the issue than equity issuers. It appears from Figure 1 that companies choose to issue equity after a period of stock price run-up, which is then followed by a decline of the equal magnitude. The opposite seems to be the case for share repurchases, where companies engage in them after a prolonged period of stock underperformance (compared to the market).

[5]Note that we treat announcement date returns separately, as we want to capture post-announcement excess returns.

[6]Seasoned equity offerings induce the strongest negative wealth effects (see for example Masulis and Korwar, 1986, Mikkelson and Partch, 1986 and Asquith and Mullins, 1986) of between -2.5 and -4.5 percent for the U.S. market, while straight debt issues induce only slightly negative wealth effects (see for example Dann and Mikkelson, 1984 and Eckbo, 1986). Convertible debt offerings induce announcement date valuation responses that are between those for equity and straight debt (see for example also Lewis, Rogalski and Seward, 2003 and Arshanpalli, Fabozzi, Switzer and Gosselin, 2004).

All this evidence is consistent with previous literature on market timing (see for example Baker and Wurgler, 2002) where equity issuers time the market and issue equity after a period of positive returns and / or before a period of declining stock returns relative to the market. *This confirms H1.* Fama and French (2005) argue that firms repurchase shares (retire equity) when leverage is low and / or investment opportunities lower the value of debt capacity (low Q). In our sample (see Table 4.1) we observe that companies that repurchase shares have the lowest Q ratio (mean value of 1.4251) and a low leverage comparable to equity issuers (mean value of 0.1798). This is in line with the findings of Fama and French.

Next, we look at the variables related to the *pecking-order explanation of capital structure* (Panel B of Table 4.1). First, we observe that leverage significantly differs across different types of issuers. A significantly higher leverage for straight debt issuers (mean value of 0.2891) compared to equity issuers (mean value of 0.1716) is surprising and counterintuitive. One does expect that firms with higher leverage do not have sufficient debt capacity to issue debt. However, it is also true that other characteristics of the companies determine borrowing capacity as well (profitability, collateralibility of assets, etc.). On the other hand, equity issuers do have on average significantly lower (negative) cash flows (mean value of -2.80% of assets) compared to straight debt issuers (9.79%) and stock repurchasers (9.90%). Equity issuers on average also pay less cash dividends (1.01% of total assets) than straight debt issuers (2.13%) and convertible debt issuers in particular (3.73%). Somewhat surprising is the finding that equity issuers on average tend to keep significantly more cash and equivalents on their balance sheets (mean value of 15.95% of total assets) than straight debt issuers (5.08%). These results are somewhat difficult to reconcile with pecking-order theory of capital structure (and our Hypothesis 2) if looked upon individually. Financially constrained firms (potential equity issuers) are expected to have higher leverage, low cash flows, low dividend payments and low balances of slack on their balance sheets. In order to assess the financial constraint better we look into a comprehensive measure of financial constraint, the four-variable Kaplan-Zingales index (see equation 4.1). Furthermore and contrary to the expectations, the results for the index itself (variable KZ) do not show equity issuers to be more financially constrained than straight debt issuers. Even contrary, straight debt issuers seem to be marginally more financially constrained than equity issuers (difference in means of 0.1412). Equity issuers are significantly more financially constrained only compared to convertible bond issuers (difference of 0.6787). In addition, we compute an industry demeaned KZ index (KZind)[7] to account for uneven distribution of security types across different industries. The results are comparable to the ones obtained using the "raw" index measure. *This evidence gives no support to the pecking-order explanation of the capital structure (Hypothesis 2)*, that is that firms issue equity when they are financially (equity) constrained. The only piece of evidence consistent with pecking-order theory is the fact that

[7]We define industry at 1-digit SIC code

equity issuers are significantly smaller firms compared to straight debt issuers (difference in log total assets of 3.50) or firms that repurchase shares (difference of 1.13).

We use several proxies to measure *agreement between insiders and outsiders of the firm*. The results for these proxies are shown in Panel C of Table 4.1. First, we assume that higher dispersion (absolute value of coefficient of variation of forecasted earnings) implies higher asymmetry (disagreement) of information between investors (outsiders) and insiders. It is therefore not surprising to see that equity issuers seem to suffer more from this phenomenon (mean DISP of 0.4087) than debt issuers (mean DISP of 0.1178). Secondly, we look at the values of the α measure. According to Dittmar and Thakor (2007) high values of α show higher agreement between insiders and outsiders. Our results show no significant differences in α between issuers of different securities. We therefore find no support for the Dittmar and Thakor explanation (Hypothesis 3) that companies issue equity when agreement between insiders and outsiders is high (high alpha), regardless of firm valuation (market timing). In addition, we compute the measure of the volatility of the firm's stock returns relative to the market volatility (RVOL) and find that equity issuers have significantly higher volatility of stock returns (4.2744) than straight debt issuers (1.7419), convertible debt issuer (2.2554) and share repurchasers (3.0471). The results overall indicate that there is more disagreement (higher dispersion of analysts' forecasts) in the case of equity issuers compared to straight debt issuers. *This is in contrast to H3.*

In Panel D of Table 4.1 we additionally present some other characteristics of the issues and issuers. Results show that more analysts cover debt issuers (median value of 10) than equity issuers (median of 4). This is also not surprising if we look at the size of the companies that issue straight debt and those that issue equity. The average issue size of the straight debt is around 154 million CAD, while the one of equity is around a third of that (57 million CAD). The average size of the share repurchase is around 45 million CAD. Finally, the relative issue size of equity represents on average around 27% of the assets of the issuing company at the time of the issue, but only around 4% in the case of straight debt issuers. Given the costs of issuing securities and significant difference in the sizes of different issuers, this is not surprising. Small equity issuers seem to issue larger shares of the new equity compared to their size.

4.4.2 Market Timing

In Panel A of Table 4.1 we observe that equity issuers have significantly larger excess returns prior to the announcement of the issue than straight debt issuers and share repurchasers (leverage increasing security issuance actions). In addition, they also have significantly lower announcement date excess returns compared to straight debt issuers and share repurchasers. Although this and the significantly higher market-to-book (MB) values for equity issuers provide evidence of market timing, we further investigate Hypothesis 2a. Jung et al. (1996)

show that announcement date excess returns are significantly lower for equity issuers with lower MB values, which goes against market timing hypothesis. Although we document the same finding, we further investigate post-announcement excess returns for equity issuers. In Table 4.2 we present results of announcement date excess returns and post-announcement excess returns for equity issuers sorted into MB quartiles.

In Panel A of the table we present the results of a standard market model event study approach to calculating abnormal (excess) returns. First, we observe that excess returns in the period around the announcement of the issue are more negative for low MB firms (mean $CAR_{(-1,1)}$ of -2.92%) than for high MB firms (mean $CAR_{(-1,1)}$ of -0.36%). This is consistent with the finding of Jung et al. (1996). However, when we look into post-announcement excess returns we observe the opposite. Cumulative post-announcement abnormal returns are significantly higher for low MB firms (mean $CAR_{(2,60)}$ of 2.52% and mean 1-year excess return $CAR_{(2,250)}$ of 50.21%) than for high MB firms (mean $CAR_{(2,60)}$ of -20.54% and mean $CAR_{(2,250)}$ of -42.01%). We interpret this as confirmation of Hypothesis 2a. Moreover, high MB firms earn significantly higher pre-announcement cumulative abnormal returns (mean $CAR_{(-60,10)}$ of 20.92%) than low MB firms (mean $CAR_{(-60,-10)}$ of 4.78%).

In order to provide stronger support for this finding, we also perform a matching firm excess returns analysis. We use size-MB matched firms approach to compute buy-and-hold abnormal returns (BHAR).[8] For each calendar month we first sort all the firms listed on the Toronto Stock Exchange into deciles based on the market-to-book (MB) values. Then we match the issuing firm's MB value to a corresponding decile and among the firms within the decile we find the one which is the closest in size (the size is the market value of equity). The difference in buy-and-hold returns for a given time period between the issuing and the matching firm is a buy-and-hold abnormal return (BHAR). We present the results for BHAR in Panel B of Table 4.2. For the most part the results are similar to those in Panel A. Firms with higher MB have significantly higher pre-announcement BHARs (a difference in $BHAR_{(-60,-10)}$ of around 32 percentage points between the highest and the lowest MB quartile). Contrary to the findings in Panel A, announcement date excess returns are here higher for the firms with lower MB (the difference between the highest and the lowest MB quartile is only marginally significant though). Post-announcement excess returns are here again significantly larger for the lower MB firms - $BHAR_{(2,60)}$ is by 11 percentage points larger (1-year excess return $BHAR_{(2,250)}$ by 18 percentage points) for the lowest MB quartile firms compared to the highest MB quartile firms.

Finally, we perform a cross sectional multivariate regression analysis in order to provide further test of market timing hypothesis. We estimate reduced form models based on the following full specification for **equity issuers only**:

$$CAR_{(2,60),i} = \beta_0 + \beta_1 \cdot LNMV_i + \beta_2 \cdot \Omega_i + \beta_3 \cdot KZ_i + \beta_4 \cdot \Theta_i + \beta_5 \cdot RISS_i + \epsilon_i, \qquad (4.2)$$

[8] See for example Barber, Lyon and Tsai, 1999.

where $CAR_{(2,60),i}$ denotes post-announcement excess returns, $LNMV_i$ represents log of market value of the company, Ω_i corresponds to the market timing proxies (market-to-book ratio, pre-announcement excess returns and Q-ratio), KZ_i represents the raw KZ index of financial constraint, Θ_i denotes "agreement" proxies (α and DISP), $RISS_i$ represents the issue size relative to the total assets of the firm and ϵ_i denotes an error term.

We present the regression results in Table 4.3. In all the models in Panel A of the table market timing proxies (MB, $CAR_{(-60,-10)}$ and Q) significantly negatively affect post-announcement excess returns. Overall, results in this section show that overvalued equity issuing firms (high MB, high pre-announcement excess returns, high Q) seem to time the market, where managers take advantage of the overvaluation and issue overvalued equity. The results refute the findings of Jung et al. (1996), where they do not find support for market timing, but rather propose the agency model of capital structure.

In Panel B of Table 4.3 we redo the analysis using size-MB matched firm post-announcement excess returns ($BHAR_{(2,60)}$) as the dependent variable instead of $CAR_{(2,60)}$. The results are similar when MB-ratio is used as the overvaluation proxy, while pre-announcement excess returns and Q-ratio do not seem to significantly affect post-announcement excess returns of equity issuers.[9]

4.4.3 (Dis)agreement between the Insiders and the Outsiders

In Panel C of Table 4.1 we observed no significant differences in the value of α (agreement) between different security issues (stock repurchases). On the other hand, there were significant differences in dispersion of analysts' earnings forecasts (disagreement). However, in order to better investigate the explanation for security issuance decision proposed by Dittmar and Thakor (2007), we need to relate the decision to issue equity to the valuation of the issuer and the agreement between insiders and outsiders of the issuing firm. Dittmar and Thakor propose that the decision to issue equity will be driven solely by the agreement between insiders and outsiders of the firm (high value of α), regardless of the valuation. Otherwise, market timing considerations have important effects on the security issuance decision. Therefore, we sort all the issuers into quartiles based on company valuation (book-to-market ratio) and agreement parameter α. Then, we construct a matrix of valuation (columns) and agreement quartiles (rows) and compute percentage of equity issuers for each matrix field. We present the results in Table 4.4.

In both panels of Table 4.4 the first number in each cell represents the fraction of equity issues and the second number represents the number of all issuers pertaining to that particular cell.

[9]We have also estimated models in both panels with the inclusion of industry and year dummies and the results have not changed.

In Panel A we present the relationship between agreement between insider and outsiders and valuation. We observe that the decision to issue equity is mostly driven by high stock prices (valuation), as the highest proportions of equity issuers are in high valuation quartiles (market-to-book), irrespective of agreement parameter α (the differences between the highest and the lowest α quartiles for a given market-to-book quartile are not significantly different from zero - the bottom most row). We observe that the proportion of equity issuers across agreement quartiles is almost the same, between 0.461 and 0.462 (the "Total" column). This is in contrast with the prediction of Dittmar and Thakor, where equity issuance is driven by the agreement parameter α. On the other hand, the proportion of equity issuers significantly increases in market-to-book ratios (MB) from 0.291 for the lowest MB quartile to 0.690 for the highest MB quartile (the "Total" row of Panel A).

In addition, we perform the same analysis using the disagreement parameter (coefficient of variation of analysts' earnings forecasts - DISP) and present the results in Panel B of Table 4.4. Contrary to no relationship between proportion of equity issues and agreement parameter α that we demonstrate in Panel A, we observe that the proportion of equity issuers here is significantly increasing in disagreement. While 34.0% of all the issues are equity issues in the lowest DISP quartile, 61.9% of issues are equity issues in the highest DISP quartile (the "Total" column). This indicates that while the probability of equity issues is not increasing in the agreement, it is certainly increasing in disagreement and market-to-book value. Based on this we reject the "agreement" explanation of equity issuance (Hypothesis 3) and claim that firms time the market and issue equity when valuation is high, regardless of the level of agreement between insiders and outsiders.[10]

4.4.4 Convertible Debt versus Straight Debt or Equity

We find differences between both convertible debt and straight debt issuers and convertible debt and equity issuers. Convertible debt issuers are riskier, are significantly less financially constrained and seem to suffer from higher informational asymmetry or disagreement between insiders and outsiders of the firm than straight debt issuers. On the other hand, equity issuers have higher market-to-book values and are more financially constrained than convertible debt issuers. Since convertible debt issuers are in many respects more similar to straight debt issuers, it is puzzling that they experience announcement date excess returns very close and even more negative than equity issuers. These negative excess returns however do rebound in the post-announcement period, while the post-announcement excess returns of equity issuers are negative. Most of our findings here are in some contrast to the findings of Lewis et al. (1999). Our evidence suggests that the few firms that issue convertible debt do so mostly as an alternative to straight debt. They are the least financially

[10]We did the similar analysis where we replaced the α quartiles with the quartiles based on the relative volatility of returns. The results are similar to those in Panel B.

constrained of all the issuers, do not have the highest leverage and are reasonably profitable, so there is little doubt that they do not have sufficient debt capacity left to issue straight debt. This implies that convertible debt to this extent serves as a substitute for straight debt, where issuers use the sale of the conversion option to lower their debt financing costs (deal sweetener). This is consistent with motives that are put forward by managers in the surveys on the use of convertible debt[11]. On the other hand, convertible debt issuers have lower market-to-book values than equity issuers, but do have significantly higher cash flow compared to equity issuers. This result suggests that issuing equity directly could prove to be very costly, as firms with very high cash flows and poor growth opportunities (proxied by MB and Q-ratios) are considered to have the highest agency costs of equity. From this perspective, convertible debt could also be looked upon as a substitute for equity, where the straight debt component serves as a bonding device, should the future project ex-post prove not to be valuable. This reasoning is in line with the proposition made by Mayers (1998), where convertible debt serves as a sequential financing device. If certain investment options of firms prove to be ex-post valuable, debt is converted into equity and new debt capacity to finance valuable projects is obtained.

4.5 Choice Model Analysis Results

In this section we turn to a multivariate choice model analysis. We estimate a multinomial probit model, where companies can simultaneously decide on two distinct securities: equity and straight debt. In addition to that companies can also repurchase stock, which is similar to increasing the leverage. We use a multinomial probit as the issue under investigation fails to assure the so-called independence from irrelevant alternatives property of the multinomial logit model. This property is generally referred to as the IIA property. Clearly, if any of the security types is taken away as possibility, the choice between the remaining three is not unaffected, as companies that considered issuing the withdrawn security type will not proportionally redistribute themselves among the remaining alternatives. If for example the choice set is narrowed down by removing the equity issue, we can expect more of the potential equity issuers to decide to issue convertible debt than straight debt or repurchase stocks. Therefore, we use a multinomial probit, which does not require the IIA property.[12]

In Table 4.5 we present the results of the multinomial probit regression, where the dependent variable is a categorical variable denoting selected security type. As the base outcome we set equity issue and confront the probability of issuing equity (leverage decreasing security decision) to the two leverage increasing security decisions - issue of straight debt and

[11] See for example Graham and Harvey, 2001; Bancel and Mittoo, 2004.

[12] We have formally tested whether multinomial logit model assures the IIA and different tests showed that IIA property was often violated.

share repurchase. All the models are estimated with industry (at 1-digit SIC code) and year dummies.

Models 1, 2 and 3 of the table refer to a setup where we jointly test all the hypotheses using KZ index as the proxy for financial constraint. Models differ in proxies that we use to test hypothesis related to the market timing theory of capital structure (security issuance). In Model 1 we proxy for the market timing by using the MB-ratio, in Model 2 we use the pre-announcement excess return ($CAR_{(-60,-10)}$), while in Model 3 we use Q-ratio.

Let us first turn to the market timing hypothesis. In the table we observe that higher excess stock returns prior to the announcement of the issue (higher valuation) increase probability of issuing equity - coefficients for $CAR_{(-60,-10)}$ of -0.474 in Model 2 for straight debt issuers compared to equity issuers and -0.675 for share repurchasers compared to equity issuers. Somewhat surprising is the fact that market-to-book (MB) ratio of equity does not affect choice between straight debt and equity. On the other hand, comparison of equity issuers and share repurchasing firms shows that higher MB-ratio does increase the probability of issuing equity compared to repurchasing shares (coefficient in Model 1 of -0.180). Moreover, the same holds when we use Q-ratio as the proxy for overvaluation (coefficient in Model 3 of -0.437). These last two results lead us to believe that Q-ratio is predominantly a **valuation measure** rather than a measure for growth opportunities.

Next, we turn to the pecking-order hypothesis. We first test it by using the raw KZ index variable (Models 1-3) as a comprehensive proxy for financial constraint. Contrary to the findings based on the bivariate analysis in Table 4.1, we find support for pecking-order theory of capital structure (Hypothesis 2). A financial constraint proxied by KZ index negatively affects probability of issuing straight debt (coefficients for KZ between -0.339 and -0.301 in Models 1-3) or repurchasing shares (coefficients between -0.188 and -0.115) versus issuing equity. Note that in all the models we use firm size as the control variable. The results for firm size show that larger firms are more likely to issue straight debt or repurchase shares than issue equity. It therefore seems that when controlling for the firm size in a multivariate setting degree of financial constraint has a significant effect on security issuance decision, despite the fact that straight debt issuers are on average more financially constrained than equity issuers.

Finally, in Models 1-3 we use proxies for agreement (α) between insiders and outsiders to explore the agreement hypothesis of Dittmar and Thakor (2007). There is no significant effect of the agreement proxy on probability of issuing equity (decrease in leverage) versus straight debt or share repurchase (increase in leverage).

In Models 4-6 we repeat the same analysis but use the individual components of KZ index as proxies for financial constraints of the company. The results for the market timing proxies (MB, $CAR_{(-60,-10)}$ and Q) remain virtually the same for both, straight debt issuers and firms that repurchase shares. Again, there is no significant effect of the "agreement"

proxy (α) on the security issuance choice. However, different components of KZ index do have different effects on probabilities of issuing straight debt versus equity or repurchasing shares versus issuing equity. Firms with low internally generated funds (low cash flows), low debt capacity (high leverage) and high financial constraints (high payout, low slack) are predicted to be more likely to issue equity. Indeed, firms with higher leverage (coefficients for LEV between -3.084 and -2.844 in Models 4-6) are more likely to issue equity, while those with more slack are more likely to issue straight debt (coefficients for SLACK of 1.962 and 1.890 in Models 4 and 5). Similarly as in the case of straight debt issuers, firms with higher leverage are more likely to issue equity than to retire one (coefficients for LEV between -1.676 and -1.155 in Models 4-6). On the other hand, we find the probability of issuing equity decreases in cash flows (coefficients for CFA between 7.159 and 7.820 in Models 4-6), but increases in the payout. Firms that pay more dividends are more likely to issue equity than repurchase shares (coefficients for DIVA between -9.453 and -8.437 in Models 4-6). Strong evidence on the negative effect of cash flows and leverage (opposed to issuing straight debt) and the positive effect of dividend payments on probability of issuing equity (opposed to repurchasing shares) again gives support to the pecking-order theory of capital structure.

To summarize, multinomial choice model analysis provides evidence to support market timing hypothesis and pecking-order theory of capital structure, while no support is found for the insider-outsider "agreement" explanation of security issuance.

4.6 Market Timing versus Pecking-order - Dual Nature of Equity Issues

Given the conflicting evidence of bivariate and multivariate analysis regarding pecking-order hypothesis, in particular the values of KZ index, we continue to further explore differences within the subsample of equity issuers. In Section 4.5 we observed that KZ index does have a significant effect on the choice between straight debt and equity when controlling for the size of the firm. We therefore partition the subsample of equity issuers into size quartiles (based on the log of total assets) and compare different characteristics among them. We present the results in Table 4.6.

Differences between size quartiles in Table 4.6 show that the largest equity issuers are significantly more financially constrained than the smallest equity issuers (difference in KZ of 0.3086). Moreover, they have significantly higher leverage (difference in LEV of 0.2116), less slack (difference in SLACK of -0.2591) and pay more dividends (difference in DIVA of 0.0175). However, they also have significantly more cash flow (difference in CFA of 0.2864), but higher leverage, lower slack and higher dividend payments have prevailing effect to account for the higher mean value of KZ index.

On the other hand, the smallest equity issuers have significantly higher market-to-book

value of equity (difference in MB of -6.6872), higher values of Q-ratio (difference in Q of -4.7650), higher pre-announcement excess stock returns (difference of -0.1663) and more negative post-announcement excess returns (difference of 0.1288).

These differences imply that smaller equity issuers seem to be issuing equity as the result of market timing (issuing overvalued equity), while the largest equity issuers seem to be issuing equity as the result of "pecking-order behavior" (issuing equity when being financially constrained).

4.7 Conclusion

In this chapter we look into the determinants of security issuance decision in the Canadian market in a period between 1998 and 2004, where we focus on the external financing in the public market (equity, straight debt, convertible debt and the share repurchases). We use a comprehensive set of accounting and market variables to revisit capital structure theories - market timing, pecking-order and agreement between insiders and outsiders.

Overall, we find strong and consistent evidence that overvaluation leads companies to choose equity over debt. This gives support to the market timing argument for issuing equity. The striking finding about market timing is that despite the less negative announcement period returns of equity issuers with high market-to-book ratios, the long-run performance of those issuers is much weaker than that of issuers with low market-to-book ratios. This is consistent with previous findings on market timing (e.g., Baker and Wurgler, 2002; Gomes and Philips, 2005), but in contrast to Jung et al. (1996) who refute market timing on the basis of the finding that the announcement excess returns are decreasing in the firms' market-to-book ratios. Our results also provide support for pecking-order explanation of capital structure. However, there is a dual nature of equity issuers. Small equity issuers tend to time the market, while the largest equity issuers seem to issue equity as a result of "pecking-order behavior". We find no evidence that companies issue equity when the agreement between outside investors and insiders is high (Dittmar and Thakor, 2007). At the very least, this finding suggests that the conclusion that firms with high levels of information asymmetry or disagreement between insiders and outsiders prefer equity issue is not robust to different capital markets. Finally, small differences between straight debt and convertible debt issuers that suggest that few firms that issue convertible debt do so to "sweeten" the deal and achieve lower debt financing costs. We also find some evidence that is consistent with Mayers' (1998) proposition on the sequential financing role of convertible debt, where the agency costs of issuing equity could prove to be extremely high and companies issue convertible debt to mitigate these costs.

4.A Tables

Table 4.1: Descriptive statistics

Mean($\overline{x}$), median(c_{50}^{x}) and number of observations (n) for excess stock price returns prior to the announcement of the issue ($SRB = AR^{i}_{-60,-10}$), excess stock price returns after the issue ($SRA = AR^{i}_{2,60}$), Tobin's Q ratio ($Q = \frac{\text{book values of long term and short term debt + market value of equity}}{\text{total assets}}$), market-to-book value of equity ($MB = \frac{\text{market value of equity}}{\text{book value of equity}}$), free cash flow ($FCFA = \frac{\text{net income+depreciation-capital ex.}}{\text{total assets}}$), payout ($DIVA = \frac{\text{cash dividends}}{\text{total assets}}$), slack ($SLACK = \frac{\text{cash and equivalents}}{\text{total assets}}$), leverage ($LEV = \frac{\text{long term debt}}{\text{total assets}}$), relative volatility ($RVOL = \frac{\sigma_i}{\sigma_M}$, where σ_i is annualized standard deviation of stock price returns of company i based on 250 trading days before the announcement of the issue and σ_M is annualized standard deviations of the returns of the TSX 300 market index based on 250 trading days before the announcement of the issue), dispersion of analysts' forecasts ($DISP = |\frac{\text{standard deviation of earnings forcasts}}{\text{mean earnings forecast}}|$), number of analysts' forecasts (NAN), size (LNTA=log of deflated total assets; deflator 1998=100), relative issue size ($RISS = \frac{\text{issue size}}{\text{total assets}}$) and KZ index that measures a degree of financial constraint (see equation (1)). All variables except α, DISP, NAN, LNTA, RISS, ISS and KZ are winsorized at 2.5% of top and bottom values. SD denotes straight debt, E denotes equity, CB denotes convertible debt and REP denotes stock repurchases. Q, MB, SLACK, FCFA, DIVA and LEV are also industry demeaned. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Difference in means is equal to zero under the null.

Panel A: Proxies for Market Timing

Security	Statistics	SRB		AR		SRA		Q		MB	
SD	$\overline{x}$	0.0122		0.0026		0.0005		1.5794		2.5267	
	c_x^{50}	-0.0009		0.0005		-0.0204		1.4454		2.1130	
	n	140		140		140		132		137	
EQ	$\overline{x}$	0.1965		-0.0183		-0.0320		3.3262		4.8735	
	c_x^{50}	0.0447		-0.0228		-0.0871		1.8924		2.8189	
	n	547		550		550		544		549	
CD	$\overline{x}$	-0.0089		-0.0303		0.0161		1.6885		2.2591	
	c_x^{50}	-0.0252		-0.0204		0.0154		1.3156		1.6236	
	n	50		51		51		50		50	
REP	$\overline{x}$	-0.0181		0.0154		0.0828		1.4251		1.8991	
	c_x^{50}	-0.0209		0.0054		0.0347		1.1596		1.3822	
	n	549		549		549		473		479	
SD-EQ		-0.1844	***	0.0210	***	0.0326	*	-1.7468	***	-2.3468	***
CD-EQ		-0.2055	***	-0.0120	***	0.0481	*	-1.6377	***	-2.6144	***
REP-EQ		-0.2146	***	0.0337	***	0.1148	***	-1.9011	***	-2.9744	***
CD-SD		-0.0211		-0.0329	***	0.0156		0.1090		-0.2676	
SD-REP		0.0303	**	-0.0128	***	-0.0823	***	0.1543	**	0.6275	***

Panel B: Proxies for Pecking-order

Security	Statistics	LNTA		LEV		CFA		DIVA		SLACK		KZ		KZind	
SD	$\overline{x}$	15.2206		0.2891		0.0979		0.0213		0.0508		0.5413		-0.0071	
	c_x^{50}	15.2803		0.2480		0.0897		0.0153		0.0215		0.8751		0.2864	
	n	141		141		138		141		141		133		133	
EQ	$\overline{x}$	11.7199		0.1716		-0.0280		0.0101		0.1595		0.3992		0.0395	
	c_x^{50}	11.7882		0.1286		0.0525		0.0000		0.0620		0.5334		0.1474	
	n	576		573		570		571		571		555		555	
CD	$\overline{x}$	13.7264		0.1982		0.0558		0.0373		0.0598		-0.2795		-0.6318	
	c_x^{50}	13.4810		0.1765		0.0640		0.0107		0.0255		0.1521		-0.2586	
	n	50		50		49		50		50		46		46	
REP	$\overline{x}$	12.8480		0.1798		0.0960		0.0090		0.0957		0.4363		0.0168	
	c_x^{50}	12.6672		0.1810		0.1027		0.0028		0.0371		0.5870		0.1206	
	n	501		499		496		496		494		481		481	
SD-EQ		3.5007	***	0.1175	***	0.1259	***	0.0112	***	-0.1087	***	0.1421	*	-0.0466	
CD-EQ		2.0065	***	0.0265		0.0838	***	0.0271	***	-0.0997	***	-0.6787	***	-0.6713	***
REP-EQ		1.1281	***	0.0082		0.1240	***	-0.0011		-0.0638	***	0.0371		-0.0227	
CD-SD		-1.4942	***	-0.0910	***	-0.0421	***	0.0159	**	0.0090		-0.8209	***	-0.6248	***
SD-REP		2.3726	***	0.1093	***	0.0018		0.0123	***	-0.0449	***	0.1050		-0.0239	

Panel C: Proxies for Disagreement between Insiders and Outsiders

Security	Statistics	α	DISP		RVOL	
SD	$\overline{x}$	-0.0010	0.1178		1.7419	
	c_x^{50}	0.0000	0.0448		1.5012	
	n	108	106		141	
EQ	$\overline{x}$	-0.0287	0.4087		4.2744	
	c_x^{50}	0.0000	0.1639		3.7853	
	n	446	353		565	
CD	$\overline{x}$	-0.0274	0.3586		2.2554	
	c_x^{50}	0.0000	0.2470		2.0131	
	n	24	18		51	
REP	$\overline{x}$	-0.0312	0.3283		3.0741	
	c_x^{50}	0.0000	0.0962		2.5180	
	n	408	360		562	
SD-EQ		0.0277	-0.2909	***	-2.5325	***
CD-EQ		0.0013	-0.0501		-2.0190	***
REP-EQ		-0.0025	-0.0804		-1.2003	***
CD-SD		-0.0264	0.2408	**	0.5135	**
SD-REP		0.0302	-0.2105	***	-1.3322	***

Panel D: Other Characteristics

Security	Statistics	ISS		RISS		NAN	
SD	$\overline{x}$	153.9200		0.0450		10.7778	
	c_x^{50}	132.0423		0.0281		10.0000	
	n	142		141		108	
EQ	$\overline{x}$	56.8894		0.2663		5.1879	
	c_x^{50}	25.2630		0.1972		4.0000	
	n	685		576		463	
CD	$\overline{x}$	219.4254		0.1690		4.4000	
	c_x^{50}	88.0282		0.1066		2.0000	
	n	51		50		25	
REP	$\overline{x}$	45.3455		0.0430		6.0917	
	c_x^{50}	5.0736		0.0248		4.0000	
	n	571		498		469	
SD-EQ		97.0306	***	-0.2214	***	5.5899	***
CD-EQ		162.5360	***	-0.0973	***	-0.7879	
REP-EQ		-11.5440	**	-0.2233	***	0.9038	***
CD-SD		65.5054		0.1240	***	-6.3778	***
SD-REP		108.5746	***	0.0020		4.6861	***

Table 4.2: Market timing and Excess Returns

Pre-announcement excess returns $CAR_{(-60,-10)}$, announcement date excess returns $CAR_{(-1,1)}$ and post-announcement excess returns $CAR_{(2,60)}$ and $CAR_{(2,250)}$ for equity issuers sorted according to market-to-book quartiles. CARs in Panel A are computed using the standard market model, where market return is represented as a total return on TSX 300 index. Buy-and-hold abnormal returns (BHAR) in Panel B represent size-MB matched firm abnormal returns. $\overline{x}$ represents mean excess return, c_x^{50} corresponds to median excess return and n to number of observations. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Difference in means is equal to zero under the null. Under the null excess returns are equal to zero. Tests of significance of the excess returns are performed for the total sample of equity issuers only.

Panel A: Cumulative Average Abnormal Returns (Market Model)

MB quartile	Statistics	$CAR_{(-60,-10)}$	$CAR_{(-1,1)}$	$CAR_{(2,60)}$	$CAR_{(2,250)}$
1	$\overline{x}$	0.0478	-0.0292	0.0252	0.5021
	c_x^{50}	0.0422	-0.0261	0.0271	-0.0607
	n	129	129	129	129
2	$\overline{x}$	0.0341	-0.0239	-0.0375	-0.1005
	c_x^{50}	0.0216	-0.0221	-0.0384	-0.1064
	n	131	131	131	131
3	$\overline{x}$	0.0658	-0.0161	-0.0742	-0.2659
	c_x^{50}	0.0454	-0.0127	-0.0869	-0.3816
	n	130	130	130	130
4	$\overline{x}$	0.2092	-0.0036	-0.2054	-0.4201
	c_x^{50}	0.1109	-0.0244	-0.1834	-0.6805
	n	123	123	123	123
Total	$\overline{x}$	0.0875 ***	-0.0173 ***	-0.0713 ***	-0.0661
	c_x^{50}	0.0433	-0.0227	-0.0517	-0.2924
	n	513	513	513	513
Difference in means (Q4-Q1)		0.1614 ***	0.0255 **	-0.2306 ***	-0.9402 ***
t-statistics		-3.40	-1.73	4.71	4.24

Panel B: Buy-and-hold Abnormal Returns (size-MB matched firms)

MB quartile	Statistics	$BHAR_{(-60,-10)}$	$BHAR_{(-1,1)}$	$BHAR_{(2,60)}$	$BHAR_{(2,250)}$
1	$\overline{x}$	0.0112	0.0161	0.0247	-0.1222
	c_x^{50}	-0.0086	0.0088	0.0147	-0.0644
	n	129	129	129	129
2	$\overline{x}$	0.0233	0.0092	-0.0203	-0.0724
	c_x^{50}	0.0234	0.0040	-0.0148	-0.0405
	n	131	131	131	131
3	$\overline{x}$	0.1400	0.0095	-0.0363	-0.0189
	c_x^{50}	0.0835	-0.0046	-0.0170	0.0155
	n	130	130	130	130
4	$\overline{x}$	0.3353	-0.0047	-0.0862	-0.3025
	c_x^{50}	0.2809	-0.0084	-0.0939	-0.1655
	n	123	123	123	123
Total	$\overline{x}$	0.1286 ***	0.0075 **	-0.0296 *	-0.1309 ***
	c_x^{50}	0.0741	-0.0012	-0.0171	-0.0632
	n	513	513	513	513
Difference in means (Q4-Q1)		0.3241 ***	-0.0207 *	-0.1110 ***	0.1803 *
t-statistics		-5.43	1.40	1.93	-1.42

Table 4.3: Post-announcement excess returns and company characteristics

Estimation results for the OLS regression model $CAR_{(2,60),i}(BHAR_{(2,60),i}) = \beta_0 + \beta_1 \cdot LNMV_i + \beta_2 \cdot \Omega_i + \beta_3 \cdot KZ_i + \beta_4 \cdot \Theta_i + \beta_5 \cdot RISS_i + \epsilon_i$. The dependent variable is the post-announcement cumulative average abnormal return $CAR_{(2,60)}$. Explanatory variables are excess stock price returns prior to the announcement of the issue ($CAR_{(-60,-10)}$), equity market-to-book ratio ($MB = \frac{\text{market value of equity}}{\text{book value of equity}}$), Tobin's Q ratio ($Q = \frac{\text{book values of long term and short term debt + market value of equity}}{\text{total assets}}$), size of the company (LNMV=log value of the market value of the company measured 5 days prior to the announcement of the issue), cash flow over assets ($CFA = \frac{\text{net income+depreciation}}{\text{total assets}}$), payout ($DIVA = \frac{\text{cash dividends}}{\text{total assets}}$), slack ($SLCK = \frac{\text{cash and equivalents}}{\text{total assets}}$), leverage ($LEV = \frac{\text{long term debt}}{\text{total assets}}$), dispersion of analysts' forecasts ($DISP = \left| \frac{\text{standard deviation of earnings forcasts}}{\text{mean earnings forecast}} \right|$), agreement parameter α ($\frac{EPS_a - EPS_f}{EPS_f}$), KZ index that relates to financial constraint (see equation 4.1) and relative issue size ($RISS = \frac{\text{issue size}}{\text{total assets}}$). All variables except α, DISP, and KZ are winsorized at 2.5% of top and bottom values. Standard errors in the regressions are White heteroskedasticity corrected. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null b_j is equal to zero.

Panel A: Dependent Variable is the Postannouncement Cumulative Average Abnormal Return ($CAR_{2,60}$)

Model	1			2			3			4			5			6		
Variable	b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$	
LNMV	-0.018	0.012		-0.022	0.012	*	-0.019	0.012		-0.012	0.013		-0.017	0.013		-0.006	0.012	
MB	-0.019	0.007	***							-0.021	0.007	***						
$CAR_{(-60,-10)}$				-0.053	0.015	***							-0.053	0.014	***			
Q							-0.035	0.013	***							-0.044	0.013	***
KZ	-0.003	0.014		-0.002	0.012		-0.01	0.013										
LEV										-0.092	0.113		-0.127	0.101		-0.182	0.099	*
CFA										-0.050	0.138		-0.044	0.127		-0.081	0.130	
DIVA										0.263	0.443		0.225	0.422		0.151	0.450	
SLACK										0.146	0.128		0.080	0.113		0.180	0.127	
α	0.005	0.015		-0.002	0.012		0.006	0.014		0.006	0.014		-0.001	0.012		0.008	0.014	
RISS	-0.094	0.078		-0.123	0.053	***	-0.046	0.09		-0.133	0.082		-0.160	0.059	***	-0.064	0.089	
intercept	0.161	0.082	**	0.147	0.081	*	0.174	0.082	**	0.137	0.082	*	0.138	0.079	*	0.138	0.082	*
n	392			392			392			397			397			397		
adj. R^2	0.112			0.187			0.113			0.119			0.193			0.129		

Panel B: Dependent Variable is the Postannouncement Buy-and-Hold Abnormal Returns ($BHAR_{2,60}$)

Model	1			2			3			4			5			6		
Variable	b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$	
LNMV	0.023	0.014		0.008	0.014		0.017	0.014		0.029	0.015	*	0.011	0.015		0.024	0.016	
MB	-0.015	0.006	**							-0.018	0.006	***						
$CAR_{(-60,-10)}$				-0.018	0.013								-0.018	0.013				
Q							-0.011	0.014								-0.017	0.014	
KZ	-0.007	0.013		-0.013	0.013		-0.015	0.013										
LEV										0.033	0.134		-0.024	0.138		-0.032	0.136	
CFA										-0.221	0.137		-0.166	0.139		-0.204	0.138	
DIVA										0.728	0.483		0.814	0.487	*	0.821	0.492	*
SLACK										0.104	0.134		0.065	0.139		0.100	0.135	
α	-0.030	0.029		-0.033	0.029		-0.028	0.029		-0.031	0.029		-0.033	0.029		-0.029	0.029	
RISS	-0.010	0.075		-0.087	0.066		-0.084	0.097		-0.027	0.076		-0.111	0.070		-0.093	0.096	
intercept	-0.077	0.095		-0.013	0.094		-0.049	0.095		-0.127	0.094		-0.046	0.094		-0.096	0.096	
n	392			392			392			397			397			397		
adj. R^2	0.034			0.020			0.020			0.040			0.020			0.024		

Table 4.4: Security Issuance and (Dis)agremeent

Quartiles matrix of market-to-book values (columns) and agreement parameter α (rows) (*Panel A*) and quartiles matrix of market-to-book values (columns) and disagreement parameter (coefficient of variation of analysts' earnings forecast - DISP) in rows (*Panel B*). α is defined as a relative difference between actual (EPS_a) just prior to the announcement of the security issue and the last forecasted EPS (EPS_f): $\alpha = \frac{EPS_a - EPS_f}{EPS_f}$. DISP is defined as an absolute value of the coefficient of variation of forecasted earnings for t+1 year, where t is the year of the security issue: $DISP = \mid \frac{\text{standard deviation of earnings forecasts}}{\text{mean earnings forecast}} \mid$. First value in cells represents proportion of equity issuers for a given cell, the second value represents number of all issuers.

Panel A: Agreement between Insiders and Outsiders and Valuation

		market-to-book quartile							
		1	2	3	4	Total	Diff. Q4-Q1		t-stat
	1	0.284	0.423	0.513	0.795	0.461	0.511	***	6.08
		74	52	39	39	204			
	2	0.299	0.418	0.538	0.625	0.487	0.326	***	4.98
α		87	98	106	128	419			
quartile	3	0.250	0.500	0.429	0.636	0.479	0.386	**	2.31
		12	16	21	22	71			
	4	0.300	0.383	0.426	0.814	0.462	0.514	***	5.79
		50	60	68	43	221			
	Total	0.291	0.416	0.491	0.690	0.474	0.399	***	9.24
		223	226	234	232	915			
Diff. Q4-Q1		0.016	-0.040	-0.086	0.019	0.001			
t-stat		0.19	-0.42	-0.85	0.21	-0.02			

Panel B: Disagreement between Insiders and Outsiders and Valuation

		market-to-book quartile							
		1	2	3	4	Total	Diff. Q4-Q1		t-stat
	1	0.077	0.368	0.362	0.410	0.340	0.333	***	4.02
		26	38	69	61	194			
	2	0.200	0.286	0.300	0.587	0.342	0.387	***	3.97
DISP		40	63	50	46	199			
quartile	3	0.283	0.418	0.460	0.763	0.459	0.480	***	5.12
		53	55	50	38	196			
	4	0.446	0.512	0.722	0.889	0.619	0.443	***	5.67
		65	43	36	45	189			
	Total	0.293	0.387	0.434	0.637	0.438	0.344	***	7.07
		184	199	205	190	778			
Diff. Q4-Q1		0.369 ***	0.144 *	0.360 ***	0.479 ***	0.279 ***			
t-stat		4.51	1.29	3.77	6.05	5.67			

Table 4.5: Multinomial probit regressions for the determinants of security issuance choice

Dependant variable takes value of 0 for straight debt issues, 1 for equity issues and 3 for share repurchases. In all the models the base security choice is equity issue. Standard errors are heteroscedasticity consistent. Explanatory variables are size of the company (log value of total assets), excess stock price returns prior to the announcement of the issue ($CAR_{(-60,-10)}$), equity market-to-book ratio ($MB = \frac{\text{market value of equity}}{\text{book value of equity}}$), Tobin's Q ratio ($Q = \frac{\text{book values of long term and short term debt + market value of equity}}{\text{total assets}}$), leverage ($LEV = \frac{\text{long term debt}}{\text{total assets}}$), cash flow over assets ($CFA = \frac{\text{net income+depreciation}}{\text{total assets}}$), payout ($DIVA = \frac{\text{cash dividends}}{\text{total assets}}$), slack ($SLACK = \frac{\text{cash and equivalents}}{\text{total assets}}$), agreement parameter α ($\frac{EPS_a - EPS_f}{EPS_f}$) and KZ index that relates to financial constraint (see equation 4.1). All variables except α and KZ are winsorized at 2.5% of top and bottom values. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null b_j is equal to zero.

Model	1			2			3			4			5			6		
Variables	b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$		b_j	$se(b_j)$	
Straight Debt																		
LNTA	0.988	0.103	***	0.971	0.103	***	0.983	0.100	***	1.002	0.091	***	0.995	0.089	***	1.014	0.092	***
MB	-0.008	0.030								-0.024	0.029							
$CAR_{(-60,-10)}$				-0.474	0.274	*							-0.615	0.260	**			
Q							0.019	0.064								-0.055	0.081	
KZ	-0.336	0.096	***	-0.301	0.096	***	-0.339	0.099	***									
α	-0.009	0.140		0.022	0.139		-0.015	0.143		0.022	0.135		0.042	0.092		0.005	0.135	
LEV										-2.844	0.972	***	-3.084	0.929	***	-2.977	0.918	***
CFA										1.677	2.177		1.743	2.180		0.911	2.010	
DIVA										2.872	3.578		0.499	3.859		3.138	3.731	
SLACK										1.962	0.900	**	1.890	0.785	**	1.639	1.050	
intercept	-13.849	1.588	***	-14.530	1.783	***	-16.207	1.654	***	-14.134	1.491	***	-15.863	1.390	***	-15.542	1.441	***
Share Repurchases																		
LNTA	0.249	0.047	***	0.254	0.045	***	0.194	0.048	***	0.211	0.051	***	0.199	0.050	***	0.186	0.052	***
MB	-0.180	0.041	***							-0.178	0.057	***						
$CAR_{(-60,-10)}$				-0.675	0.108	***							-0.766	0.144	***			
Q							-0.437	0.083	***							-0.527	0.114	***
KZ	-0.124	0.063	**	-0.115	0.062	*	-0.188	0.063	***									
α	0.072	0.085		0.075	0.098		0.050	0.090		0.055	0.090		0.000	0.061		0.039	0.097	
LEV										-1.155	0.611	*	-1.676	0.598	***	-1.634	0.643	**
CFA										7.281	0.964	***	7.159	0.917	***	7.820	1.086	***
DIVA										-8.437	2.841	***	-8.662	3.015	***	-9.453	2.835	***
SLACK										0.717	0.624		-0.359	0.568		1.552	0.670	**
intercept	-1.113	0.784		-2.219	0.746	***	-1.518	0.763	**	-1.037	0.802		-2.720	0.728	***	-1.242	0.813	
Industry dummies	YES			YES			YES			YES			YES			YES		
Year dummies	YES			YES			YES			YES			YES			YES		
Obs	873			873			873			873			873			873		

Table 4.6: Characteristics of Equity Issuers by Size Quartiles

Variables are size of the company (log value of total assets), excess stock price returns prior to the announcement of the issue ($CAR_{(-60,-10)}$), equity market-to-book ratio ($MB = \frac{\text{market value of equity}}{\text{book value of equity}}$), Tobin's Q ratio ($Q = \frac{\text{book values of long term and short term debt + market value of equity}}{\text{total assets}}$), excess stock price returns after the announcement of the issue ($CAR_{(2,60)}$), leverage ($LEV = \frac{\text{long term debt}}{\text{total assets}}$), cash flow over assets ($CFA = \frac{\text{net income+depreciation}}{\text{total assets}}$), payout ($DIVA = \frac{\text{cash dividends}}{\text{total assets}}$), slack ($SLACK = \frac{\text{cash and equivalents}}{\text{total assets}}$) and KZ index that relates to financial constraint (see equation 4.1). All variables except KZ are winsorized at 2.5% of top and bottom values. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null difference between quartiles is equal to zero.

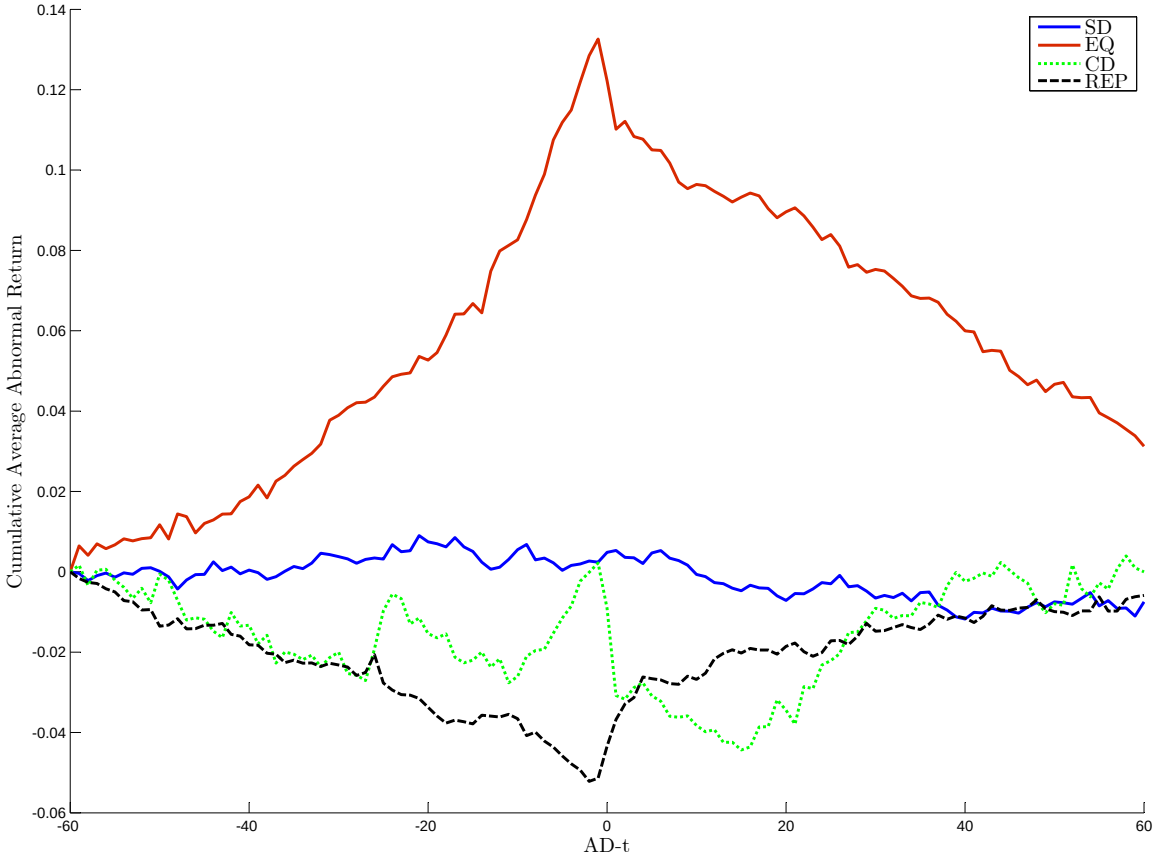
Size Quart.	Statistics	LNTA	MB	$CAR_{(-60,-10)}$	Q	$CAR_{(2,60)}$
1	$\overline{x}$	9.4716	9.1599	0.2017	6.3272	-0.1388
	c_x^{50}	9.6517	6.7070	0.1167	5.2108	-0.1365
	n	115	115	115	115	115
2	$\overline{x}$	11.0821	4.5383	0.0560	3.2534	-0.1104
	c_x^{50}	11.0392	3.2191	0.0280	2.2069	-0.1151
	n	134	134	134	133	134
3	$\overline{x}$	12.3557	3.2566	0.0714	2.1436	-0.0336
	c_x^{50}	12.3262	2.1881	0.0549	1.6557	-0.0541
	n	135	135	135	132	135
4	$\overline{x}$	14.0023	2.4727	0.0353	1.5623	-0.0100
	c_x^{50}	13.7928	1.8137	0.0285	1.2775	-0.0133
	n	129	129	129	128	129
Total	$\overline{x}$	11.7906	4.7176	0.0875	3.2348	-0.0713
	c_x^{50}	11.8158	2.7598	0.0433	1.8801	-0.0517
	n	513	513	513	508	513
Diff. in means (Q4-Q1)		4.5307 ***	-6.6872 ***	-0.1663 ***	-4.7650 ***	0.1288 ***
t-statistics		43.43	-9.22	-3.46	-11.33	2.79

Table 4.6 continued

Size Quart.	Statistics	KZ	LEV	CFA	DIVA	SLACK
1	$\overline{x}$	0.2672	0.0737	-0.2056	0.0007	0.3091
	c_x^{50}	-0.0048	0.0047	-0.1496	0.0000	0.2573
	n	107	115	114	114	114
2	$\overline{x}$	0.3400	0.1308	-0.0256	0.0053	0.1887
	c_x^{50}	0.2769	0.0290	0.0310	0.0000	0.0788
	n	131	134	134	134	133
3	$\overline{x}$	0.4136	0.2014	0.0302	0.0161	0.0880
	c_x^{50}	0.8297	0.1896	0.0630	0.0000	0.0354
	n	132	132	132	132	132
4	$\overline{x}$	0.5758	0.2853	0.0807	0.0183	0.0500
	c_x^{50}	0.9635	0.2978	0.0775	0.0061	0.0108
	n	128	129	129	129	129
Total	$\overline{x}$	0.4045	0.1753	-0.0245	0.0104	0.1543
	c_x^{50}	0.5434	0.1386	0.0525	0.0000	0.0569
	n	498	510	509	509	508
Diff. in means (Q4-Q1)		0.3086 **	0.2116 ***	0.2864 ***	0.0175 ***	-0.2591 ***
t-statistics		2.23	11.49	11.09	6.00	-10.99

Figure 4.1: Cumulative Average Abnormal Returns

Cumulative average abnormal returns around the announcements of security issues (share repurchases). t0 represents the announcement date of the security issue (share repurchase). SD refers to straight debt (bonds), EQ refers to equity issues, CD to convertible bond issues and REP to announced share repurchases.



Chapter 5

Security Issue Announcements, Short Interest, Market Timing and Pecking-order

5.1 Introduction

Short interest (short sales) has been studied extensively, in particular the relationship between short interest and stock returns or put differently, the informational content of short sales. However, the views on the informational content of short sales are different. Diamond and Verrechia (1987) argue that short interest negatively affects stock returns, as given the cost of shorting the stock, only informed traders will engage in the activity, thus conveying the new (bad) information to the market. A positive relationship between short sales and stock returns stems from the fact that open short positions will eventually have to be closed, thus resulting in a higher probability that the price of a highly shorted stock will eventually have to rise due to increased demand. The third perspective on a relationship between short sales and stock prices offers no informational link between the two, since short interest is a result of different hedging and arbitrage strategies (Brent, Morse and Stice, 1990). Most of the empirical research has failed to provide conclusive evidence about the relationship (see for example Brent et al., 1990, Senchack and Starks, 1993), also due to the poor quality and low frequency of data on short interest[1].

While there are numerous papers on the wealth effects (excess returns) associated with announcements of different security issues[2], the evolution and differences in short interest

[1]Aitken, Frino, McCorry and Swan, 1998 for example use intraday data on short sales in the Australian market and find significant negative relationship between short sales and stock returns.

[2]Seasoned equity offerings induce the strongest negative wealth effects (see for example Masulis and Korwar, 1986, Mikkelson and Partch, 1986 and Asquith and Mullins, 1986) of between -2.5 and -4.5 percent for the U.S. market, while straight debt issues induce only slightly negative wealth effects (see for example

across different security types around security issue and share repurchase announcements have not been studied. Therefore, we firstly investigate changes in short interest around the announcements of different security issues (straight debt, equity and convertible debt) and share repurchase programs, as well as differences in the changes between different security types. Moreover, previous studies on the relationship between short interest and stock returns were performed on a cross-section of stocks at any given point in time, while we look at the cross-section of stocks where short interest clearly bears information content (announcement of a security issue or share repurchase).

On the other hand, corporate finance literature has provided some inconclusive evidence on market timing theory regarding the capital structure of firms. Although firms are generally observed to issue equity after periods of longer positive stock price movements (Baker and Wurgler, 2002), recent evidence has suggested that the effects are not persistent (Alti, 2006 and Hovakimian, 2006 for example). Secondly, we use data on short interest and exploit the information bearing corporate event to test the market timing and the pecking-order hypotheses of capital structure. According to the market timing hypothesis managers time the market and issue equity when it is overvalued, while increase leverage when equity is undervalued (Baker and Wurgler, 2002). If this is the case, we should observe significantly larger increases in short interest for equity issuing firms, which in large part revert back to pre-announcement levels shortly after, as stock prices adjust. Moreover, the increase in the short positions will be positively related to the (over)valuation of equity. Previous literature (see for example Bayless and Chaplinsky, 1996 and Korajczyk and Levy, 2003) has shown that in hot and cold equity markets issuers give different considerations to the security to be issued and investors react differently to security issue announcements. Therefore, we also expect the changes in the short interest to differ in hot and cold equity issuing markets because of the market sentiment and issuer characteristics (in particular overvaluation). Korajczyk and Levy (2003) show that financially unconstrained firms consider the timing of the issues, while the constrained firms do not. Given this, we expect that the short interest will be decreasing in the degree of financial constraint, as financially constrained firms do not issue equity when overvalued and in hot equity market periods only. This represents a test of the pecking-order hypothesis on the capital structure (Myers and Majluf, 1984), according to which firms issue equity when financially constrained and cannot finance projects with other means of financing.

Lastly, we investigate the relationship between the short interest and excess stock returns. We do so on a contemporaneous basis, where we compare the announcement date excess returns with the corresponding short interest change, but also on a delayed basis, where we

Dann and Mikkelson, 1984 and Eckbo, 1986). Convertible debt offerings induce announcement date valuation responses that are between those for equity and straight debt (for an overview see Loncarski, ter Horst and Veld, 2006).

explore the relationship of the announcement date excess returns and the lagged changes in the short interest. This way we analyze both, the explanations for the negative and the positive relationship between short interest and stock returns.

In summary, we use the announcements of security issues and share repurchase programs to a) investigate their effect on the short interest, b) use the short interest data to test the market timing and the pecking-order hypotheses of capital structure and c) revisit the relationship between short interest and stock returns.

We find that short interest significantly increases after the announcement of equity and convertible debt issues. In the case of the former the changes in large part revert back to the pre-announcement levels, corresponding to a reversion in stock prices (disappearance of overvaluation). In the case of convertibles the changes persist over a longer period of time due to convertible arbitrage activities (as shown by Loncarski, ter Horst and Veld, 2007). This is also clearly seen in the cumulative average abnormal returns, where the initial announcement date returns are more negative for the convertible debt issue announcement than for equity issues, but they revert back to pre-announcement levels much quicker. In our view, this is due to different informational content of short interest in both cases. More importantly, we show that the difference in the determinants of the changes in short interest in hot and cold equity issuing periods, where companies clearly time the market and take advantage of overvaluation, in particular during hot equity issuing markets. Investors are able to observe this ex-post, but they do not differentiate between companies that time the market and those that issue equity because they are financially constrained. However, the opposite is the case in cold equity issuing markets. This suggests that screening abilities of investors are impaired during hot equity market periods, which managers seem to take advantage of. This provides evidence of both, the market timing and the pecking-order hypothesis of capital structure. We also find a positive effect of the company size on changes in short interest across the board (even when controlling for the issue type), which suggests that size of the issuer does represent a limit to arbitrage in short interest market (as also shown by d'Avolio, 2002 and Ackert and Athanassakos, 2005 for example). Finally, we show that the relationship between the changes in short interest and stock returns is both, negative if investigated contemporaneously and positive if investigated on a lagged basis.

The remainder of the chapter is structured as follows. In Section 5.2 we relate changes in short interest to the announcements of increases (decreases) in leverage, market timing hypothesis and pecking-order explanation of capital structure. In Section 5.3 we present our data on short interest and issuer characteristics. Section 5.4 is devoted to the analysis of changes in short interest following the announcements in increase (decrease) in leverage. In Section 5.5 we perform an analysis of the cross-sectional determinants of changes in short interest following the leverage increase (decrease) announcements that we use to test the market timing hypothesis of capital structure. Moreover, we perform the same analysis in

different market sentiment periods (hot versus cold equity issuing markets) and to separate the effects of the market timing and pecking-order hypothesis of capital structure. Section 5.6 concludes.

5.2 Short Interest, Stock Returns and Market Timing

Previous research on wealth effects associated with announcements of different security issues has consistently shown that equity issue announcements are associated with significantly negative excess returns (between 2 and 3 percent), while the debt issue announcements are accompanied with zero or slightly positive excess returns. In a frictionless market short interest with *informational content* would represent a "flip" side of stock returns. The stock returns and short interest would therefore exhibit a negative relationship[3]. However, markets are not frictionless and there are limits to arbitrage, in the short interest market in particular.[4] Nevertheless, a corporate event with strong informational content, such as a security issue announcement, should still have a significant effect on the changes in short interest even in a market with limits to arbitrage. Note that we assume here that the shorting is done by the informed investors - i.e. a corporate event (in this case an announcement of a security issue) provides new information to the market on which the informed shorters react, as there is an increased (or decreased) benefit from the shorting, all else equal. We use data on short interest to a) examine the market timing and the pecking-order hypothesis of capital structure and b) explore relationship between excess returns and short interest.

The market timing hypothesis of capital structure (see for example Baker and Wurgler, 2002) predicts that managers time the market and issue equity when equity valuation is high or put differently, when managers perceive the firm's equity to be overvalued (lower future returns). The converse holds for withdrawals (repurchases) of equity. According to the negative relationship between stock returns and short interest, we should observe a significant increase in the short interest for leverage decreasing security issue announcements (overvaluation) and no or a significant decrease in short interest following a leverage increasing security issue announcement (undervaluation). Put differently, short interest will be increasing in the (over)valuation around the issue announcement date. Moreover, if companies issue equity (leverage decreasing securities) when managers perceive their firms to be overvalued and the equity issue conveys this information to the market, one would expect to see a reversion in the short interest when stock prices adjust to the increase in the short interest due to the

[3]Ackert and Athanassakos (2005) document this for the Canadian market.

[4]For extensive analysis of the short interest market in the US see d'Avolio, 2002 for example. More specifically, Ackert and Athanassakkos (2005) show that the supply of short interest is constrained for the smaller firms in the Canadian market.

overvaluation - i.e. equity issuing firms will experience a strong reversion in short interest following the postannouncement short interest increase.

However, it can also be the case that a large part of the short interest increase is not related to overvaluation or undervaluation of equity. In that case we should observe no or only a minor reversion in short interest following the post-announcement increase in short interest. This would be typical of convertible arbitrage activities in the case of convertible bonds (see for example Loncarski et al., 2007) and would also imply that the effect of the increase in short interest in this case would have limited impact on stock returns compared to the issues of overvalued equity.

The pecking-order explanation of capital structure (Mayers and Majluf, 1984) hypothesizes different levels of informational asymmetries between outsider and insiders of the companies lead to an adverse selection problem. This results in the financing hierarchy that firms follow. For their financing firms will use internal financing (retained earnings) first, followed by external debt-like financing. External equity is issued only when debt capacity is used up. This suggests that equity financing is used when firms are financially constrained and cannot take up any additional leverage. Korajczyk and Levy (2003) for example show that financially unconstrained firms issue equity when macroeconomic conditions are favorable, while such conditions do not affect a security issuance decision of financially constrained firms. Similarly, Choe, Masulis and Nanda (1993) find evidence that the equity issuance is pro-cyclical, as the adverse selection costs are lower in the expansionary parts of the business cycles. Bayless and Chaplinsky (1996) demonstrate that market reactions to seasoned equity issuance are more favorable in hot equity markets, which shows existence of the windows of opportunity for equity issuance. This evidence shows that a) firms choice of financing is affected by the macroeconomic and financial market conditions and b) investors perceive information conveyed by the security choice differently in hot and cold equity markets.

To be able to separate the market timing hypothesis from the pecking-order hypothesis of capital structure we investigate hot and cold equity market periods separately. First of all, issuers in hot equity markets are more likely to be overvalued. However, there will always be equity issuers that are financially constrained and would issue equity for a different reason than market timing. In hot equity market periods, bunching of equity issuers can make it more difficult for investors to tell such issuers apart because of adverse selection issues. Interestingly enough, it may also be the case that screening abilities of investors are diminished in such periods because of overwhelming market sentiment (frenzy). Note that such predictions indicate some sort of behavioral explanation of investors' behavior in the markets. Rational investors would always consider the differences in issuers and would tell apart market timers and financially constrained equity issuers. We see a short interest that is decreasing in the degree of financial constraint, in particular in cold equity markets, as evidence to support and separate the pecking-order hypothesis from the market timing

hypothesis.

5.3 Data

We analyze three types of public security issues on the Canadian market in the period between 1998 and 2004: straight debt (bond) issues, equity issues and convertible debt issues, as well as share repurchases (equity withdrawal). The data on the new issues is gathered from the SDC New Issues database. During this period, there were 1,075 corporate nonconvertible debt issues, 95 convertible debt issues, 3,439 equity issues and 1,415 intended share repurchases in the corporate sector.[5] We first eliminate all financial companies from our sample (SIC 6000-6999). This leaves us with 440 corporate nonconvertible debt issues, 58 convertible debt issues, 2,271 corporate equity and 1,084 intended share repurchases. Next, we match the sample with the WorldScope accounting data, as well as the stock price and the market value data from Datastream.[6] Since the data in Datastream is not available for all non-financial companies in our sample, we are left with 142 corporate nonconvertible debt issues (made by 40 different companies), 51 convertible debt issues (made by 41 different companies), 682 corporate equity issues (made by 341 different companies) and 575 intended share repurchases (made by 238 different companies). The total sample contains 1,450 different security issues and share repurchases made by 546 different companies.

Data on short interest (short sales) was obtained from the Toronto Stock Exchange Group (TSX Group). TSX provides information on consolidated short positions for stocks traded on TSX and TSX Venture exchanges twice a month (every 15th and the last day of the month), as reported by brokers. Frequency of the short interest data is twice as high compared to the short interest data on the US market, where reports are in general available once a month. Only non-zero short interest is reported, so the number of observations with non-missing values varies over reporting periods. In general the short interest data is available for at least 80 corporate straight debt issues, 40 convertible debt issues, 413 equity issues and 280 share repurchases.

[5]Note that this does not include the issues placed by government or government agencies.

[6]Note that availability of the data refers to a particular company being listed in Datastream and not to the actual accounting numbers per se. Number of companies in tables of descriptive statistics and regression tables might therefore be different, depending on the availability of the data for the variables used in the analysis.

5.4 Stock Returns and Changes in Short Interest

5.4.1 Wealth Effects Associated with Leverage Increase (Decrease) Announcements

In Table 5.1 we first show wealth effects associated with the announcements of security issues and share repurchase programs. The announcement effects are estimated using a market model. For the market portfolio return we use the Standard & Poor's TSX (Toronto Stock Exchange) value-weighted total return index, which is widely considered as the benchmark for Canadian equities. It accounts for more than 200 stocks listed on the TSX or about 70% of the total market capitalization. Denoting the announcement period, reported by SDC, as day 0, the estimation period for the parameters of the market model ranges from day -250 to day -60.

In line with previous studies on the wealth effects associated with the announcements of security issues we find a significantly negative market reaction to equity issues ($CAAR_{-1,1} = -1.832\%$) and convertible debt issues ($CAAR_{-1,1} = -3.030\%$), while no significant market response in the case of straight bond issue announcements (statistically insignificant ($CAAR_{-1,1} = 0.264\%$). On the other hand we find a significantly positive market response to the announced share repurchase programs ($CAAR_{-1,1} = 1.541\%$).

In addition to the announcement date related wealth effects, we show evolution of cumulative average abnormal returns in a wider period around the announcement date of the security issue (withdrawal) in Figure 5.1. From Figure 5.1 we can observe that equity issues are characterized with a significant cumulative average abnormal return run-up prior to the issue announcement, followed with a prolonged decline. On the other hand, share repurchasing companies are plagued with prolonged negative cumulative average abnormal returns prior to the repurchase announcement. There is hardly any abnormal returns action in the case of straight bond issuers, while convertible debt issuers experience a strong negative market response immediately after the issue announcements, but the returns do rebound shortly after. However, in order to say more about the relationship between stock returns and changes in short interest we need to look into the latter first.

5.4.2 Levels and Changes in Short Interest

In Panel A of Table 5.2 we present levels of short interest for different security types (share repurchasers) and different reporting periods. Short interest level in period t (si_t) is defined relatively to the total number of share outstanding, such that:

$$si_t = \frac{SI_t}{n}, \tag{5.1}$$

where SI_t represents number of open short interest (number of shares sold short) in a

reporting period t and n represents total number of shares outstanding. Note that TSX reports consolidated broker positions twice a month (every fortnight).

From Panel A of Table 5.2 we first observe that the relative level of short interest after the announcement of the issue (from si_0 onwards) is the highest in the case of convertible bond issues (increasing to beyond 2 percent), while in the case of the other two security types and share repurchases it remains below 1 percent. Of course, we cannot compare levels across different securities, as a) initial levels of short interest (si_{-1}) are different and b) sizes of the issuers differ, which means that limits of arbitrage in the short interest market differ across company sizes and security types.

Therefore, we need to look either at pairwise differences in short interest between period t and the period prior to the announcement (t=-1) or into differences in means across consecutive periods for a given security type.

In Panel A of Table 5.2 we first look into significance in pairwise differences (as denoted by stars in the column corresponding to the number of observations in a given short interest reporting period). Note that number of observations change over the reporting period, so the pairwise differences refer only to the observations in period t that were also reported having short interest in period t-1. Based on the significance levels of these pairwise differences we can conclude that only equity and convertible debt issuers experience a significant increase in the levels of short interest following the announcement of the issue.

In Panel B of Table 5.2 we investigate the differences in relative short interest between consecutive periods and test whether these differences are significantly different from zero. We compute the differences as:

$$d_t = si_t - si_{t-1} \tag{5.2}$$

From Panel B we observe that in a reporting period (d_0) in which the announcement of the issue takes place short interest immediately increases in the case of equity issuers (0.040%) and convertible debt issuers (0.641%). In the next period (d_1) there is the largest additional significant increase for equity issuers (0.421%) and significant decrease for share repurchasers (-0.040%). More interestingly, there is a significant decrease in period 3 for equity issuers (-0.137%), which suggests some reversion in short interest.

Similar can be inferred from the graphical representation in Figure 5.2, where we scale the preannouncement level of relative short interest for each security type (share repurchase) to 100. We observe that the largest increase (150 percent within a month of the issue announcement) is experienced by convertible debt issuers. Moreover, the increase is persistent over a longer period of time, which suggests that the increase is for the larger part not to be attributed to the perceived overvaluation of equity. In case of equity issuers we also observe a large increase in short interest (around 75 percent within a month of the issue announcement), but the effect is short lived, as we see some reversion of short interest in a month

after the announcement of the issue. If we compare Figures 5.1 and 5.2, we can observe some correspondence between short interest and stock returns following the announcement of the issue.

Initial levels of short interest (si_{-1}) differ across different security types and the same absolute difference in the relative short interest represents quite different informational content for different issuers. Therefore, we also compute relative differences in short interest as:

$$\delta_t^{SI} = \frac{si_t}{si_{t-1}} \tag{5.3}$$

In Table 5.3 we show mean and median values, together with standard deviations separately for hot and cold equity market periods. We define a hot market period as a period in which a three month moving average of the number of equity issues exceeds the median value of our sample. The converse holds for cold market period (i.e. number of equity issues is below median value). We show the value separately for hot and cold equity market periods, as we will later perform a separate analysis for hot and cold equity issuance market periods.

The first thing that can be noted in Table 5.3 are very large differences between mean and median values. This indicates that in relative terms changes in short interest are substantial, in particular for equity and convertible debt issuers, but also that dispersion of such relative changes is quite wide. In terms of median values we observe the largest increases in short interest for equity issuers in hot equity markets (1.685 in period 1) and convertible bond issuers in cold equity markets (1.636 in period 0). We observe stronger reversion in short interest for equity issuers in hot equity markets (0.867 in period 3) than in cold equity markets (0.909 in period 3). These findings are similar to the findings based on Table 5.2 and Figure 5.2.

All the results are in line with the expectations based on the market timing hypothesis of capital structure. Firms issue overvalued equity. The announcement of such issue is followed by a strong increase in short interest and subsequent partial reversion once the (overvalued) stock prices decline.

5.5 Cross-sectional Determinants of the Changes in Short Interest

We devote this section to the analysis of cross-sectional determinants of the changes in short interest, which we more specifically use to test the market timing and the pecking-order hypotheses of the capital structure. To do so, we estimate the following two models, where we regress the relative changes in short interest on the variables that proxy for the (over)valuation (pre and post announcement excess returns, announcement date excess re-

turns and market-to-book value) and financial constraint (KZ index), controlling for size (shares of the larger firms are easier to short) and the two issue types (equity and convertible debt):

$$\begin{aligned}\delta_{t,i}^{SI} =&\theta_{t,0} + \theta_{t,1} \cdot CAAR_{(-60,-10),i} + \theta_{t,2} \cdot CAAR_{(-1,1),i} + \theta_{t,3} \cdot MB_i \\ &+ \theta_{t,4} \cdot KZ_i + \theta_{t,5} \cdot LNTA_i + \epsilon_i,\end{aligned} \tag{5.4}$$

$$\begin{aligned}\delta_{t,i}^{SI} =&\theta_{t,0} + \theta_{t,1} \cdot CAAR_{(-60,-10),i} + \theta_{t,2} \cdot CAAR_{(-1,1),i} + \theta_{t,3} \cdot MB_i \\ &+ \theta_{t,4} \cdot KZ_i + \theta_{t,5} \cdot LNTA_i + \theta_{t,} \cdot CD_i + \theta_{t,7} \cdot EQ_i + \epsilon_i,\end{aligned} \tag{5.5}$$

where $\delta_{t,i}^{SI}$ refers to relative short interest of issuer i in reporting period t, $CAAR_{(-60,10),i}$ denotes cumulative average abnormal return of issuer i in the pre-announcement period (between -60 and -10 days prior to the announcement of the issue), $CAAR_{(-1,1),i}$ denotes cumulative average abnormal return of issuer i in a period between a day prior and a day following the announcement of the issue (share repurchase), MB_i denotes market-to-book ratio, KZ_i refers to the KZ index that proxies for a degree of financial constraint of the issuer, $LNTA_i$ is the size of the issuer measured in log of total assets (in 1998 Canadian dollar terms), CD_i denotes dummy variable that takes a value of 1 if the issue is a convertible bond and 0 otherwise and EQ_i denotes a dummy variable that takes a value of 1 if the issue is equity and 0 otherwise.

For a comprehensive measure of **financial constraint**, we follow Baker, Stein and Wurgler (2003). They use a four-variable version of the Kaplan-Zingales (KZ) index, which is constructed based on the coefficients of the restricted ordered logit model.[7] We therefore construct the KZ index as:

$$KZ_{it} = -1.002 \cdot \frac{CF_{it}}{A_{it-1}} + 3.139 \cdot LEV_{it} - 39.368 \cdot \frac{DIV_{it}}{A_{it-1}} - 1.315 \cdot \frac{CASH_{it}}{A_{it-1}} \tag{5.6}$$

CF represents the sum of the depreciation, the amortization and the income before extraordinary items, A stands for total assets, LEV represents leverage as debt over the sum of debt and equity and CASH represents cash and short-term investments. KZ index is higher for firms which are more financially constrained, since such firms have exhausted their debt capacity (high leverage), have a low cash flow from operations, need to pay higher dividends, but do have good growth opportunities.

In Table 5.4 we present descriptive statistics for the variables that we use as proxies for the (over)valuation and the financial constraint. From the table we firstly observe that

[7] This is in some contrast to the approach used by Lamont, Polk and Saá-Requejo (2001). They include the Q-ratio as an additional component of the index. In our view high Q-ratio might indicate an overvaluation and thus "contaminate" the index as the measure of financial constraint.

equity issuers have higher market-to-book ratios compared to other types of issuers, in particular share repurchasing firms in both, hot and cold equity market periods. Secondly, we observe that the differences in firms characteristics between hot and cold equity markets are significant only in the case of equity issuers. The market-to-book ratio is higher in the hot equity market periods (5.617) than in the cold equity market periods (4.210). Equity issuers also experience higher preannouncement excess stock returns in the hot equity market periods (28.7 percent) than in the cold equity market periods (11.4 percent). Moreover, equity issuers also experience negative postannouncement excess stock returns in the hot equity market periods (-9.0 percent on average). This implies that the probability of the firm's overvaluation is higher in the hot equity market. In line with the predictions of previous literature (see for example Bayless and Chaplinsky, 1996), equity issuers in the hot equity markets are significantly more financially constrained (average value of KZ index of 0.199) than in the cold equity markets (KZ index 0.022).

5.5.1 Short Interest and the Capital Structure Theories

We proceed by investigating the relationship between the relative changes in short interest and the (over)valuation and financial constraint proxies. Because of the non-normality of our dependent variable and quite a few extreme values we estimate the parameters of the model using a robust regression approach. This approach uses iteratively reweighted least squares, where case weights (Huber weights and biweights) are taken from scaled residuals, where larger residuals are assigned lower weights. In Huber weighting, observations with small residuals are assigned a weight of one. In the case of biweighting, all cases with a non-zero residual get down-weighted, but the weight is decreasing in the absolute value of the residual. In Panel A of Table 5.5 we show the regression results for the whole sample for the model without the dummy variables (Equation 5.5).

We perform five cross-sectional regressions in different short interest reporting periods. In the period of the announcement of the issue we observe a significant negative relationship between the relative changes in short interest (δ_0) and the announcement effect (coefficient for $CAAR_{-1,1}$ of -0.8004). This suggests that announcements of the issues that induce a larger negative market response have a larger increase in short interest around the announcement. For example, a one percentage point more negative announcement effect is related to an additional increase in short interest in the period of the announcement of 80 percentage points. In all the regressions (short interest reporting periods) size variables have a significant and positive effect on the relative changes in short interest. This is due to the fact that shares of larger issuers are easier to short. The effect is economically important, as the difference in log total assets between the smallest and the largest issuer (around 10) translates into around 60 percentage points higher increase in short interest δ_0 ($0.0561 \cdot 10 = 0.5610$) during the announcement period. More action can be observed in the first period following the

announcement, where we observe that overvaluation has a significant positive effect on the increase in short interest (coefficients for $CAAR_{-60,-10}$ of 0.3365 and MB of 0.0195), while the announcement date excess returns exhibit even a stronger negative effect (-0.9391). The second period after the announcement of the issue seems to be a "quiet" one. The more interesting is the third period (δ_3), where we observe strong reversion of short interest. Here, the announcement effect of excess returns is now positively correlated with the increase in short interest (coefficient of 0.6518). If in period 0 we found a negative relationship, which is in line with the explanations of negative effect of short interest on stock returns, we find a positive relationship (reversion) here. This provides evidence to support the explanations of the positive effect of stock returns on short interest. More importantly, this supports the notion that important part of the short positions during the announcement period (δ_0) are due to perceived overvaluation. These induce negative announcement excess returns ($CAAR_{-1,1}$), but are later closed as overvaluation dissipates.

We extend the model by adding dummies for the convertible debt and the equity issues to account for these two security types. The results of the extended model are presented in Panel B of Table 5.5. The most important conclusions do not change significantly. Additionally, we observe that part of the increase in short interest in period 1 is now directly explained with the equity issue dummy (0.5874), as well as part of the reversion in period 3 (-0.1838). This provides evidence to support the market timing explanation of capital structure. In addition, financially constrained issuers (once we control for the equity issuers) are now seen to experience a significantly lower (coefficient of -0.1031) increase in short interest, which gives some support to the explanation regarding the pecking-order explanation of the capital structure.

Finally, we started off by assuming that the relationship between short interest and stock returns is negative, as shown in the most of the recent literature, but also documented specifically for the Canadian market by Ackert and Athanassakos (2005). However, there are different effects of informational content of short interest on stock returns. One can think of the short interest as being related to "bad news" (i.e. have negative correlation with announcement period stock returns), but also having a positive correlation with announcement period stock returns during a period of short interest reversion (along the lines of the traditional "Wall Street wisdom"). If this is the case, then the initial post-announcement increase in short interest following the announcement of the overvalued equity issue will be negatively correlated with the announcement period stock returns, while the latter decrease (reversion) in short interest will be positively correlated with the announcement period stock returns. Note that the two explanations for the relationship between short interest and stock returns are not necessarily mutually exclusive, since the negative relationship inherently refers to the contemporaneous relationship between the two, while the positive relationship refers to the prediction of future stock returns by today's changes (or level) in short interest. Because we

look at the evolution of short interest after the corporate event with strong informational content, we can capture and explore both potential relationships. This is confirmed by the results in both panels. We find a negative contemporaneous relationship between short interest (δ_0) and excess returns in the announcement period, while later on we show a positive relationship between the announcement period excess returns ($CAAR_{-1,1}$) and short interest (δ_3).

5.5.2 Hot versus Cold Equity Markets and the Theories of Capital Structure

In order to investigate the market timing and the pecking-order explanations in more detail, we need to evaluate effects in hot and cold equity issuing market separately. Therefore, we redo the analysis for subsamples of issues in hot and cold equity issuance markets. We present the results in Table 5.6.

Panels A and B show estimates for a model without convertible bond and equity issue dummies. Panel A refers to estimates for the subsample of issues in hot equity markets and panel B to the subsample of issues in cold equity markets.

There are differences between both panels. First of all, there seems to be a strong and significant negative relationship between announcement returns and increase in short interest in cold equity markets in period 0 (coefficient of -1.0802), while no significant effect is found in hot equity markets. On the other hand, there is a strong and significant negative effect in period 1 (-1.4898) and a significant positive effect (reversion) between excess stock returns and increase in short interest in the hot equity market in period 3 (0.6310), with marginally significant reversion in the case of cold equity markets. Moreover, there is a significant negative effect for financially constrained issuers on changes in short interest in period 1 in the case of cold equity markets (coefficient of -0.0984), while there is no significant effect in the case of hot equity markets. This gives support to both explanations of the capital structure, the market timing and the pecking-order. Investors do not seem to differentiate between issuers that time the market and those that are financially constrained and issue equity when equity markets are hot. This implies that financially constrained issuers are perceived to be timing the market if they issue equity during hot equity market periods and will thus exhibit more negative stock returns and larger increases in short interest.

We redo the same analysis with the estimation of the extended model, where we add dummy variables for convertible debt and equity issues. The results are presented in Panels C and D of Table 5.6.

The results show that the differences between hot and cold equity markets are now even stronger. Most of the valuation effect is now shown to be concentrated around equity issues. In the case of hot equity markets we first observe a significant increase in short interest for

equity issuers in period 1 (coefficient of 0.7418) and a subsequent reversion in period 3 (-0.2527). On the other hand, the increase in period 1 for the equity issuers in the cold equity markets is much less in size (0.4820), but the same is the case with the reversion in period 3 (coefficient of -0.1267). However, there is again a significantly negative relationship between the degree of financial constraint and the increase in short interest (coefficient of -0.1572). Moreover, in cold equity market periods there is a significant positive relationship in the announcement period (δ_0) and the first postannouncement period (δ_1) between convertible bond issues and the increase in the short interest (0.2650 and 0.3491 respectively). This could imply that in cold equity market periods convertible debt serves as a substitute for the equity. In such case, a convertible debt would be designed to be more equity-like. Loncarski et al. (2007) show that more equity-like convertible bonds are more underpriced and as such better suited for convertible arbitrage. This might explain the large and significant coefficients for the convertible debt dummies in the cold equity markets, as convertible arbitrage implies taking a long position in a (underpriced) convertible bond and a short position in the underlying stock.

5.6 Conclusion

In this chapter we analyze changes in short interest following the announcements of security issues (withdrawals). We use the relative changes in short interest, together with the (over)valuation and financial constraint proxies to test the market timing and the pecking-order theories of capital structure.

We find significant increases in short interest for equity and convertible bond issuers, no significant changes for straight bond issuers and some significant decreases for share repurchasers. We also find consistent evidence to support the market timing explanation of the capital structure.

Since the issuers and the investors perceive hot and cold equity markets differently, we investigate the determinants of short interest in hot and cold equity market periods separately. In hot equity issuance markets we observe an increase and reversion in the short interest for equity issuers, while the reversion in cold equity markets is much lower. In addition, investors do not seem to consider the degree of financial constraint of the issuer in hot equity markets, as they do in cold equity markets. This has several implications.

Firstly, we show that investors perceive equity issue announcements and issuers' characteristics differently in hot and cold equity issuance markets. In hot equity markets most of the attention is focused on overvaluation aspects, while no or limited attention is put on a degree of financial constraint. This is not the case in cold equity markets, where more financially constrained equity issuers experience less of the increase in short positions (even after we control for the size or limits to arbitrage in the short interest market). This implies

either some degree of difficulty discerning among different equity issuers in hot equity markets (due to easier mimicking and bunching of the issuers) or lack of rational behavior in the case or market frenzies (herding). Overall, we see these results as evidence in support of the market timing and the pecking-order hypothesis of capital structure.

Secondly, we find both positive and negative relationship between changes in short interest and stock returns, in particular in hot equity markets. This provides evidence for both, Diamond and Verrechia's (1987) "negative information content" and the popular "Wall Street" reversion explanation. Moreover, given the differences between convertible bonds and equity issues, it is clear that persistence in short interest (as is the case for convertible bonds) also provides evidence for the view that short interest to a certain degree does not have information content to be transmitted into stock prices. We are able to find this by looking at different cross-sections of changes of short interest, as the negative relationship between short interest and stock returns is contemporaneous, while the positive relationship is based on the lagged effect.

5.A Tables and Figures

Table 5.1: Wealth effects

Wealth effects associated with announcements of different security types and share repurchases. $CAAR_{t_1,t_2}$ denotes cumulative average abnormal return between days t_1 and t_2, where t=0 denotes the announcement date of the security issue or share repurchase. AAR_t denotes average abnormal return on day t. $\overline{x}$ denotes mean value, c^x_{50} denotes median value, σ_x denotes standard deviation and n denotes number of observations.

Security	Period	$CAAR_{-1,1}$		AAR_0		$CAAR_{0,2}$		$CAAR_{0,5}$	
Straight debt	$\overline{x}$	0.264%		0.246%		0.120%		0.231%	
	c^x_{50}	0.055%		-0.008%		-0.157%		-0.245%	
	σ_x	3.592%		2.331%		3.772%		5.334%	
	n	140		140		140		140	
Equity	$\overline{x}$	-1.832%	***	-1.037%	***	-2.048%	***	-2.759%	***
	c^x_{50}	-2.284%		-1.089%		-2.613%		-3.547%	
	σ_x	9.462%		5.753%		8.812%		10.825%	
	n	550		550		550		550	
Convertible debt	$\overline{x}$	-3.030%	***	-1.170%	***	-3.493%	***	-3.383%	***
	c^x_{50}	-2.043%		-0.358%		-2.037%		-1.338%	
	σ_x	5.438%		3.223%		6.288%		7.470%	
	n	51		51		51		51	
Share repurchase	$\overline{x}$	1.541%	***	0.794%	***	1.844%	***	2.474%	***
	c^x_{50}	0.545%		0.289%		0.770%		1.192%	
	σ_x	7.115%		5.062%		8.175%		9.664%	
	n	549		549		549		549	

Table 5.2: Levels and changes in short interest

Levels and changes in short interest for different security types and share repurchases for 12 reporting periods following the announcement date of the security issue or share repurchase programe. Short interest in a period t is defined relative to the total number of shares outstanding ($si_t = \frac{SI_t}{n}$). d_t is defined as a difference between short interest in the reporting period t (si_t) and the short interest in preceding reporting period (si_{t-1}). $\overline{x}$ denotes mean value, c^x_{50} denotes median value, σ_x denotes standard deviation and n denotes number of observations.

Panel A: Level of short interest for different security types and share repurchases

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null pairwise difference between short interest in period t and period t_{-1} is equal to zero.

Security	Straight debt				Equity					Convertible debt					Share repurchases			
Period	$\overline{x}$	c^x_{50}	σ_x	n	$\overline{x}$	c^x_{50}	σ_x	n		$\overline{x}$	c^x_{50}	σ_x	n		$\overline{x}$	c^x_{50}	σ_x	n
t_{-1}	0.796%	0.354%	1.327%	83	0.581%	0.122%	1.404%	425		0.937%	0.467%	1.334%	41		0.800%	0.053%	1.865%	332
t_0	0.813%	0.352%	1.332%	82	0.623%	0.139%	1.447%	431	**	1.578%	0.923%	2.058%	41	***	0.809%	0.067%	1.919%	336
t_1	0.933%	0.380%	1.574%	83	1.015%	0.362%	1.888%	442	***	1.907%	0.800%	2.490%	40	***	0.765%	0.054%	1.860%	340
t_2	0.892%	0.375%	1.484%	83	0.981%	0.352%	1.672%	447	***	2.315%	0.942%	3.718%	41	***	0.769%	0.078%	1.904%	338
t_3	0.840%	0.415%	1.369%	83	0.841%	0.242%	1.612%	454	***	2.043%	0.782%	2.920%	40	***	0.831%	0.073%	2.095%	335
t_4	0.830%	0.411%	1.315%	84	0.809%	0.247%	1.597%	462	***	2.149%	0.870%	2.930%	41	***	0.792%	0.061%	1.999%	335
t_5	0.749%	0.357%	1.072%	85	0.778%	0.179%	1.554%	475	***	2.087%	0.601%	3.221%	41	***	0.784%	0.075%	1.994%	334
t_6	0.727%	0.364%	1.148%	85	0.745%	0.177%	1.515%	478	***	2.022%	0.661%	3.201%	42	***	0.826%	0.079%	2.003%	341
t_7	0.742%	0.372%	1.167%	86	0.790%	0.199%	1.664%	475	***	1.990%	0.826%	3.015%	42	***	0.843%	0.089%	2.017%	337
t_8	0.796%	0.408%	1.381%	85	0.760%	0.194%	1.505%	471	***	2.095%	0.797%	2.998%	42	***	0.858%	0.072%	2.078%	338
t_9	0.877%	0.401%	1.864%	84	0.746%	0.182%	1.609%	479	***	2.207%	1.030%	2.968%	42	***	0.830%	0.081%	1.955%	338
t_{10}	0.938%	0.365%	2.461%	84	0.732%	0.197%	1.532%	472	***	2.286%	1.042%	2.931%	42	***	0.819%	0.097%	1.895%	338
t_{11}	0.839%	0.378%	1.917%	85	0.715%	0.193%	1.397%	464	***	2.265%	1.140%	2.879%	41	***	0.795%	0.077%	1.837%	337
t_{12}	0.795%	0.301%	1.829%	85	0.735%	0.202%	1.466%	462	***	2.308%	1.061%	2.901%	41	***	0.848%	0.081%	1.994%	328

Panel B: Changes in short interest for different security types and share repurchases

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null d_t is equal to zero.

Security	Straight debt					Equity					Convertible debt					Share repurchases				
Period	$\overline{x}$	c^x_{50}	σ_x	n		$\overline{x}$	c^x_{50}	σ_x	n		$\overline{x}$	c^x_{50}	σ_x	n		$\overline{x}$	c^x_{50}	σ_x	n	
d_0	0.007%	0.000%	0.248%	82		0.040%	0.001%	0.395%	413	**	0.641%	0.192%	1.366%	41	***	0.018%	0.000%	0.427%	315	
d_1	0.129%	0.009%	1.048%	81		0.421%	0.143%	1.159%	421	***	0.292%	0.006%	1.538%	40		-0.040%	-0.001%	0.334%	319	***
d_2	-0.041%	0.000%	0.274%	83	*	-0.027%	0.000%	1.245%	433		0.463%	0.009%	1.737%	40	**	-0.004%	0.000%	0.278%	316	
d_3	-0.052%	0.009%	0.417%	83		-0.137%	-0.022%	0.757%	435	***	-0.328%	0.010%	2.566%	40		0.058%	0.000%	0.725%	311	*
d_4	0.000%	0.012%	0.341%	83		-0.019%	0.000%	0.940%	443		0.158%	0.029%	0.535%	40	**	-0.045%	-0.001%	0.766%	314	
d_5	-0.072%	0.003%	0.480%	84	*	-0.034%	0.000%	0.744%	451		-0.062%	-0.020%	0.705%	41		-0.012%	0.000%	0.254%	310	
d_6	-0.022%	0.001%	0.371%	85		-0.046%	0.000%	0.645%	459	*	-0.018%	-0.002%	0.287%	41		0.059%	0.000%	0.495%	315	**
d_7	0.013%	0.010%	0.308%	85		0.041%	0.000%	0.874%	461		-0.032%	0.015%	0.530%	42		-0.011%	0.000%	0.548%	322	
d_8	0.045%	0.000%	0.521%	85		-0.042%	0.000%	0.760%	456		0.106%	0.022%	0.312%	42	**	0.016%	0.000%	0.445%	317	
d_9	0.072%	0.004%	0.794%	84		-0.007%	-0.001%	0.531%	460		0.112%	0.007%	0.459%	42	*	-0.030%	0.000%	0.720%	316	
d_{10}	0.062%	-0.002%	0.778%	83		-0.032%	0.000%	0.542%	457		0.078%	0.016%	0.469%	42		-0.015%	-0.001%	0.225%	321	
d_{11}	-0.089%	0.000%	0.903%	84		-0.033%	-0.001%	0.554%	452		-0.074%	-0.014%	0.429%	41		-0.029%	0.000%	0.334%	316	*
d_{12}	-0.044%	0.002%	0.560%	85		0.015%	0.000%	0.526%	448		0.043%	0.000%	0.790%	41		0.032%	0.000%	0.479%	316	

Table 5.3: Relative changes in short interest

Relative changes in short interest for different security types and share repurchases in hot / cold equity markets for 6 reporting periods following the announcement date of the security issue or share repurchase programe. Hot equity market is defined as a month of the announcement of the issue where the three month moving average of the number of the equity issues is above median value. Converse criteria holds for the definition of cold equity market. δ_t^{SI} is a ratio between short interest in the reporting period t (si_t) and the short interest in preceding reporting period (si_{t-1}). $\overline{x}$ denotes mean value, c_{50}^x denotes median value, σ_x denotes standard deviation and n denotes number of observations. SD refers to straight debt, EQ to equity issue, CD to convertible debt issue and REP to share repurchase.

Security	[redacted]	δ_0^{SI}	δ_1^{SI}	δ_2^{SI}	δ_3^{SI}	δ_4^{SI}	δ_5^{SI}	δ_6^{SI}
Hot equity market								
SD	$\overline{x}$	1.007	2.279	1.184	1.265	1.224	0.975	1.124
	c_{50}^x	0.999	1.057	0.999	1.017	1.034	0.990	1.007
	σ_x	0.413	4.979	0.946	1.469	0.984	0.417	0.792
	n	40	40	40	40	40	40	40
EQ	$\overline{x}$	3.475	6.297	5.923	3.562	3.430	2.192	2.025
	c_{50}^x	1.005	1.685	1.000	0.867	0.978	1.000	0.992
	σ_x	18.374	20.662	33.790	20.503	20.321	11.132	5.194
	n	184	189	199	200	202	200	207
CD	$\overline{x}$	6.882	10.830	1.178	1.180	1.953	1.107	1.321
	c_{50}^x	1.099	0.867	1.083	1.044	1.003	0.983	1.011
	σ_x	22.411	44.532	0.487	0.866	3.981	0.722	1.282
	n	21	20	19	20	20	21	21
REP	$\overline{x}$	3.341	3.720	1.418	3.373	4.333	1.939	1.523
	c_{50}^x	1.000	0.977	0.995	1.000	0.966	0.999	1.000
	σ_x	17.471	18.802	2.837	21.133	21.989	5.841	2.654
	n	144	142	146	146	148	141	140
Cold equity market								
SD	$\overline{x}$	1.266	1.024	1.070	1.047	6.264	1.539	1.716
	c_{50}^x	0.997	0.994	1.005	1.043	1.036	1.043	1.014
	σ_x	1.062	0.484	0.789	0.388	30.383	3.512	3.535
	n	42	40	43	42	42	44	44
EQ	$\overline{x}$	1.642	10.404	22.728	2.032	2.002	1.537	2.348
	c_{50}^x	1.000	1.389	0.988	0.909	1.000	1.000	1.000
	σ_x	3.273	37.319	302.752	7.519	6.032	3.262	9.716
	n	204	212	226	227	232	237	241
CD	$\overline{x}$	36.939	1.672	1.159	1.352	1.251	1.098	1.231
	c_{50}^x	1.636	1.244	0.983	0.991	1.164	0.985	0.987
	σ_x	148.165	1.396	1.025	1.506	0.644	0.726	1.532
	n	20	20	20	20	20	20	20
REP	$\overline{x}$	4.138	1.056	3.790	2.829	1.243	3.190	5.165
	c_{50}^x	1.000	0.964	1.000	1.000	0.994	0.998	1.000
	σ_x	18.878	1.405	27.448	13.668	2.306	15.667	30.593
	n	164	164	158	161	161	157	161

Table 5.4: Descriptive statistics

Descriptive statistics for the preannouncement excess returns ($CAAR_{-60,-10}$), winsorized market-to-book value (MB), KZ index (KZ), and the log size of the company, expressed in 1998 Canadian dollars (LNTA) across different security type issues and share repurchase programs. The sample is split in the hot / cold equity markets. Hot equity market is defined as a month of the announcement of the issue where the three month moving average of the number of the equity issues is above the median value. Converse criteria holds for the definition of cold equity market. $\overline{x}$ denotes mean value, c^x_{50} denotes median value, σ_x denotes standard deviation and n denotes number of observations. SD refers to straight debt, EQ to equity issue, CD to convertible debt issue and REP to share repurchase. ***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null difference in means (for the same security type) between the hot and the cold equity market period is equal to 0.

Security	Statistics	$CAAR_{-60,-10}$	$CAAR_{2,60}$	MB	KZ	lnta
			Hot Equity Market			
SD	$\overline{x}$	0.020	0.029	2.579	0.128	15.254
	c^x_{50}	-0.010	0.008	2.274	0.466	15.491
	σ_x	0.122	0.140	1.234	0.906	0.868
	n	72	72	70	70	72
EQ	$\overline{x}$	0.287	-0.090	5.617	0.199	11.542
	c^x_{50}	0.047	-0.115	3.035	0.336	11.621
	σ_x	1.959	0.445	6.100	1.181	1.889
	n	261	262	259	265	273
CD	$\overline{x}$	-0.005	0.033	2.168	-1.025	13.841
	c^x_{50}	-0.028	0.026	1.739	-0.266	13.495
	σ_x	0.147	0.175	2.328	1.879	1.557
	n	27	27	27	27	27
REP	$\overline{x}$	-0.020	0.076	1.969	0.183	12.860
	c^x_{50}	-0.015	0.032	1.384	0.355	12.642
	σ_x	0.189	0.283	2.345	1.005	1.919
	n	267	267	246	246	250
			Cold Equity Market			
SD	$\overline{x}$	0.004	-0.029 **	2.472	0.197	15.186
	c^x_{50}	0.004	-0.046	2.091	0.486	15.196
	σ_x	0.115	0.148	1.744	1.114	1.117
	n	68	68	67	68	69
EQ	$\overline{x}$	0.114 *	0.021 ***	4.210 ***	0.022 *	11.880 ***
	c^x_{50}	0.044	-0.064	2.721	0.345	11.843
	σ_x	0.464	0.419	4.619	1.458	1.818
	n	286	288	290	295	303
CD	$\overline{x}$	-0.013	-0.003	1.837 *	-0.299 *	13.591
	c^x_{50}	-0.023	-0.014	1.580	0.173	13.393
	σ_x	0.152	0.219	1.406	1.513	1.376
	n	23	24	23	23	23
REP	$\overline{x}$	-0.016	0.090	1.826	0.098	12.836
	c^x_{50}	-0.036	0.037	1.351	0.293	12.766
	σ_x	0.209	0.351	1.785	1.010	1.827
	n	282	282	233	240	251

Table 5.5: Robust regressions

Iteratively reweighted least squares of relative changes in short interest (δ_t) on pre-announcement stock returns ($CAAR_{-60,-10}$), announcement date returns ($CAAR_{-1,1}$), KZ index (KZ - see equation 5.6), market-to-book value (MB), size of the issuing company (LNTA - log value of total assets) and issue type dummies (CD and EQ) for 4 reporting periods following the announcement date of the security issue or the share repurchase program. δ_t is defined as a ratio between short interest in the reporting period t (SI_t) and the short interest in preceding reporting period (SI_{t-1}). Variable CD takes value 1 if the issue is convertible debt and 0 otherwise. Variable EQ takes value 1 if the issue is equity and 0 otherwise. F refers to the significance of the model's F-test and n refers to the number of observations.

Panel A: Results for the model without dummy variables for convertible debt and equity issues

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	-0.0176	0.0752		0.3365	0.0999	***	-0.1106	0.0816		0.0561	0.0738		0.1144	0.0720	
$CAAR_{-1,1}$	-0.8004	0.2695	***	-0.9391	0.3673	**	-0.2114	0.2597		0.6518	0.2269	***	-0.1554	0.2204	
MB	0.0116	0.0055	**	0.0195	0.0071	***	0.0080	0.0057		0.0104	0.0052	**	0.0091	0.0051	*
KZ	-0.0060	0.0156		-0.0596	0.0216	***	0.0063	0.0176		0.0158	0.0151		-0.0147	0.0147	
LNTA	0.0561	0.0107	***	0.0437	0.0147	***	0.0463	0.0118	***	0.0556	0.0104	***	0.0521	0.0100	***
intercept	0.1392	0.1492		0.3787	0.2029	*	0.2532	0.1625		0.0829	0.1428		0.1725	0.1379	
n	746			750			770			774			776		
adj. R^2	0.040			0.041			0.019			0.043			0.030		
F	***			***			***			***			***		

Panel B: Results for the model with dummy variables for convertible debt and equity issues

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	-0.0315	0.0765		0.2629	0.1054	**	-0.1243	0.0834		0.1148	0.0736		0.0939	0.0734	
$CAAR_{-1,1}$	-0.7075	0.2780	**	-0.4618	0.3945		-0.1402	0.2668		0.4953	0.2271	**	-0.0571	0.2256	
MB	0.0109	0.0056	*	0.0070	0.0074		0.0078	0.0058		0.0119	0.0051	**	0.0088	0.0051	*
KZ	-0.0057	0.0159		-0.1031	0.0229	***	0.0094	0.0180		0.0204	0.0149		-0.0065	0.0149	
LNTA	0.0624	0.0116	***	0.0934	0.0166	***	0.0490	0.0130	***	0.0358	0.0110	***	0.0544	0.0109	***
CD	0.0295	0.0884		0.0790	0.1264		0.1082	0.1004		0.0495	0.0846		0.2080	0.0842	**
EQ	0.0654	0.0447		0.5874	0.0635	***	0.0375	0.0495		-0.1838	0.0420	***	0.0491	0.0420	
intercept	0.0294	0.1676		-0.4123	0.2373	*	0.1976	0.1864		0.4131	0.1577	***	0.1099	0.1569	
n	746			750			770			774			776		
adj. R^2	0.040			0.147			0.018			0.068			0.034		
F	***			***			***			***			***		

Table 5.6: Robust regressions - hot and cold markets split

Iteratively reweighted least squares) of relative changes in short interest (δ_t) on pre-announcement stock returns ($CAAR_{-60,-10}$), announcement date returns ($CAAR_{-1,1}$), KZ index (KZ - see equation 5.6), winsorized market-to-book value (MB), size of the issuing company (LNTA - log value of total assets) and issue type dummies (CD and EQ) for 4 reporting periods following the announcement date of the security issue or the share repurchase program. δ_t is defined as a ratio between short interest in the reporting period t (SI_t) and the short interest in preceding reporting period (SI_{t-1}). Variable CD takes value 1 if the issue is convertible debt and 0 otherwise. Variable EQ takes value 1 if the issue is equity and 0 otherwise. F refers to the significance of the model's F-test and n refers to the number of observations.

Panel A: Results for the model without dummy variables for convertible debt and equity issues for the hot equity issuing period

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	0.0099	0.0971		0.5105	0.1325	***	-0.1084	0.1141		0.0219	0.1024		-0.0261	0.0949	
$CAAR_{-1,1}$	-0.6480	0.3987		-1.4898	0.4832	***	-0.4473	0.4072		0.6310	0.2888	**	0.1320	0.2664	
MB	0.0081	0.0074		0.0192	0.0100	*	0.0091	0.0085		0.0155	0.0073	**	0.0122	0.0067	*
KZ	-0.0324	0.0239		-0.0099	0.0353		-0.0456	0.0296		0.0155	0.0248		0.0400	0.0227	*
LNTA	0.0495	0.0154	***	0.0508	0.0219	**	0.0573	0.0185	***	0.0531	0.0157	***	0.0447	0.0145	***
intercept	0.2112	0.2147		0.2851	0.3039		0.1378	0.2551		0.0923	0.2163		0.2349	0.1995	
n	363			359			371			379			379		
adj. R^2	0.024			0.076			0.026			0.033			0.025		
F	**			***			**			***			***		

Panel B: Results for the model without dummy variables for convertible debt and equity issues for the cold equity issuing period

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	-0.0395	0.1315		-0.0222	0.1567		-0.0678	0.1314		0.1049	0.1144		0.3547	0.1151	***
$CAAR_{-1,1}$	-1.0802	0.4171	**	0.0099	0.5528		0.1242	0.4641		0.7780	0.4102	*	-0.6960	0.4083	*
MB	0.0202	0.0089	**	0.0172	0.0099	*	0.0047	0.0083		0.0081	0.0079		0.0079	0.0082	
KZ	0.0129	0.0207		-0.0984	0.0256	***	0.0408	0.0218	*	0.0159	0.0187		-0.0491	0.0190	**
LNTA	0.0664	0.0151	***	0.0379	0.0187	**	0.0391	0.0156	**	0.0598	0.0139	***	0.0597	0.0139	***
intercept	0.0081	0.2088		0.4444	0.2570	*	0.3488	0.2138		0.0400	0.1915		0.0880	0.1912	
n	383			391			398			398			399		
adj. R^2	0.057			0.034			0.016			0.049			0.066		
F	***			***			**			***			***		

Panel C: Results for the model with dummy variables for convertible debt and equity issues for the hot equity issuing period

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	-0.0009	0.0963		0.4029	0.1287	***	-0.1527	0.1174		0.0915	0.1001		-0.0420	0.0972	
$CAAR_{-1,1}$	-0.6573	0.3665	*	-0.8317	0.4751	*	-0.3300	0.4210		0.5028	0.2813	*	0.1924	0.2720	
MB	0.0089	0.0074		0.0104	0.0096		0.0085	0.0086		0.0158	0.0070	**	0.0118	0.0067	*
KZ	-0.0410	0.0247	*	-0.0596	0.0352	*	-0.0412	0.0314		0.0372	0.0246		0.0563	0.0235	**
LNTA	0.0604	0.0174	***	0.1331	0.0235	***	0.0656	0.0211	***	0.0234	0.0167		0.0441	0.0160	***
CD	-0.1914	0.1292		-0.1027	0.1796		0.1346	0.1654		0.1189	0.1315		0.2624	0.1266	**
EQ	0.0626	0.0679		0.7418	0.0918	***	0.0934	0.0810		-0.2527	0.0650	***	0.0355	0.0628	
intercept	0.0494	0.2521		-1.0026	0.3397	***	-0.0078	0.3044		0.5738	0.2398	**	0.2158	0.2301	
n	363			359			372			379			379		
adj. R^2	0.029			0.219			0.024			0.075			0.032		
F	**			***			**			***			***		

Panel D: Results for the model with dummy variables for convertible debt and equity issues for the cold equity issuing period

***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null value of a regression parameter is 0.

Short Interest Period	δ_0			δ_1			δ_2			δ_3			δ_4		
Variable	$\theta_{0,j}$	$se(\theta_{0,j})$		$\theta_{1,j}$	$se(\theta_{1,j})$		$\theta_{2,j}$	$se(\theta_{2,j})$		$\theta_{3,j}$	$se(\theta_{3,j})$		$\theta_{4,j}$	$se(\theta_{4,j})$	
$CAAR_{-60,-10}$	-0.0743	0.1366		-0.0832	0.1785		-0.0753	0.1355		0.1589	0.1159		0.3527	0.1172	***
$CAAR_{-1,1}$	-0.8718	0.4372	**	0.6050	0.6434		0.1706	0.4868		0.5670	0.4224		-0.5575	0.4218	
MB	0.0186	0.0091	**	0.0060	0.0113		0.0051	0.0085		0.0110	0.0079		0.0075	0.0082	
KZ	0.0157	0.0212		-0.1572	0.0288	***	0.0415	0.0221	*	0.0152	0.0186		-0.0448	0.0190	**
LNTA	0.0699	0.0160	***	0.0646	0.0221	***	0.0397	0.0168	**	0.0478	0.0146	***	0.0601	0.0149	***
CD	0.2650	0.1234	**	0.3491	0.1681	**	0.0493	0.1288		-0.0220	0.1102		0.2189	0.1125	*
EQ	0.0682	0.0609		0.4820	0.0838	***	0.0131	0.0649		-0.1267	0.0552	**	0.0327	0.0568	
intercept	-0.0710	0.2284		-0.0096	0.3128		0.3332	0.2386		0.2465	0.2089		0.0562	0.2135	
n	383			391			398			398			399		
adj. R^2	0.063			0.137			0.010			0.057			0.069		
F	***			***						***			***		

Figure 5.1: Cumulative Average Abnormal Returns

Cumulative average abnormal returns around the announcements of security issues (share repurchases). t0 represents the announcement date of the security issue (share repurchase). SD refers to straight debt (bonds), EQ refers to equity issues, CD to convertible bond issues and REP to announced share repurchases.

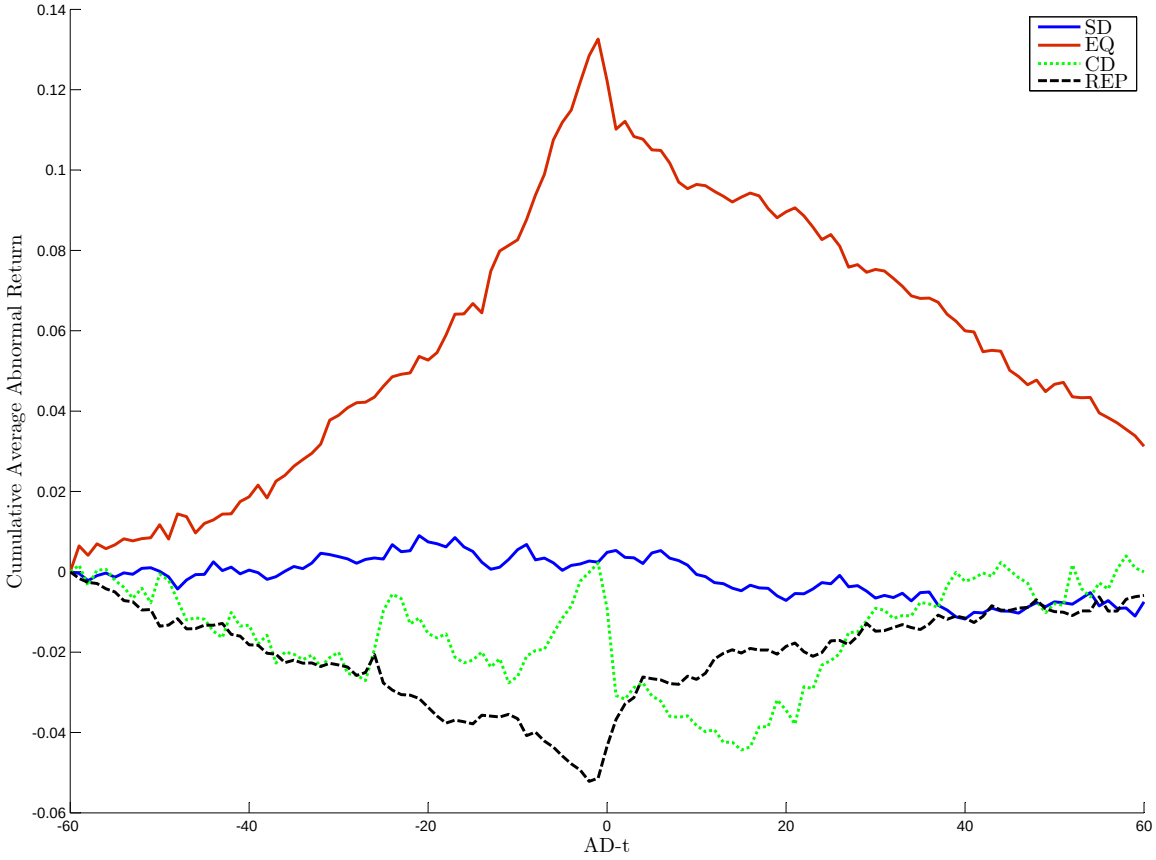
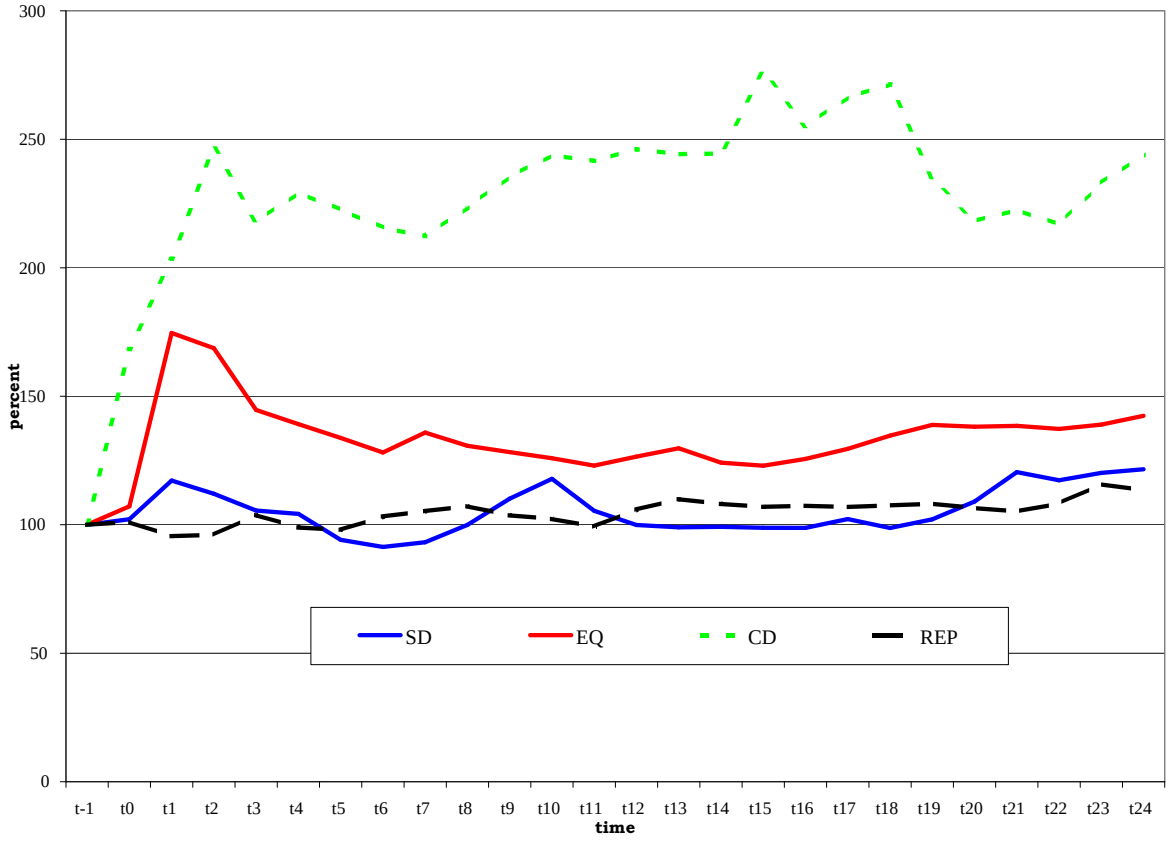


Figure 5.2: Changes in Short Interest

Changes in short interest over reporting periods (short interest is reported bi-weekly) after the announcement of security issue (share repurchase) for different types of securities relative to the short interest level at time t-1. t0 represents short interest reporting period in which security issue (share repurchase) was announced. The starting level of short interest at time t=-1 is set to 100 for all security types (share repurchases). SD refers to straight debt (bonds), EQ refers to equity issues, CD to convertible bond issues and REP to announced share repurchases.



Chapter 6

The Rise and Demise of the Convertible Arbitrage Strategy

6.1 Introduction

Convertible arbitrage[1] has been one of the most successful hedge fund strategies at the end of the 1990s and the beginning of the 2000s, earning annual returns of up to 20% or more. Even though the returns of convertible arbitrage have strongly decreased in recent years, its trades currently represent more than half of the secondary market trading in convertible securities with hedge funds as the most important player in this market.[2] Moreover, in the market of primary convertible bond issues 70% to 75% of the issues are bought by hedge funds (see for example Arshanapalli, Fabozzi, Switzer, and Gosselin, 2004 and Lian, 2006). This implies that hedge funds engaging in convertible arbitrage[3] are important investors, both in primary and secondary markets. This chapter studies the different effects that convertible arbitrage has on the capital market and its participants.

Research on hedge fund inflows and performance (see for example Agarwal, Daniel, and Naik, 2004 and Choi, Getmansky, and Tookes, 2006) has shown that inflows into hedge funds chase performance or follow performance with some delay. The inflow of funds into convertible arbitrage hedge funds started increasing exponentially after the market downturn in 2000, when the returns on convertible arbitrage hedge fund indices peaked at more than 20%, but decreased sharply afterwards, turning negative in 2005. This raises two important

[1]This strategy is aimed at exploiting the underpricing of convertible bonds. It consists of taking a long position in the convertible bond and a short position in the underlying asset into which the bond can be converted. The underlying asset is typically a stock of the company that issues the convertible bond.

[2]See for example Lhabitant (2002).

[3]The term convertible bond arbitrage is misleading. The complicated nature of the different options that are combined in a convertible bond combined with the fact that it involves corporate bonds, which are by definition risky, makes it impossible to create a real risk-free strategy. However, given that this term is widely used in the hedge fund industry it will also be used throughout this chapter.

economic questions. First, what are the determinants of convertible arbitrage returns? Secondly, who wins and who loses in this strategy? It is clear that convertible arbitrage hedge funds are gaining. On the other hand, negative wealth effects associated with the increase in short positions have a direct negative effect for shareholders of the issuing companies. In addition to this direct effect, shareholders indirectly suffer from the lower market value of collateral (firm's assets), since this will negatively affect the credit spread of the existing and potential new debt claims (as shown by Longstaff and Schwartz, 1995). Through this same channel, debt claimants are directly negatively affected as well. The two questions also seem to be closely inter-related, as the realization of extreme gains and losses may lead to a change of the type and behavior of the issuers.

In order to shed additional light on the economic issues regarding determinants of convertible arbitrage returns and sources of gains and losses, we do the following. First, we need to identify convertible arbitrage activities. Since hedge funds are not required to report their holdings, a direct identification of the strategy is not possible. We therefore investigate several pieces of evidence that jointly provide proper identification. With convertible arbitrage hedge funds being important investors in convertible bonds, we expect the following developments around the issuance of convertible bonds. First, convertible bonds are expected to be underpriced at the issue in order to provide a potential "arbitrage" gain. Second, we expect a significant increase in the short positions (short interest) of the underlying stocks after the announcement of a convertible issue. This increase is expected to be larger for the convertible bonds with higher exposure to the underlying stock, as measured by the delta (more equity-like convertible bonds), since more stock has to be sold short to achieve a neutral hedge position. We investigate the issue on the sample of convertible bonds on the Canadian market issued in the period between 1998 and 2004. Toronto Stock Exchange provides the information on consolidated short positions twice a month, as reported by brokers. For comparison, until recently the data on short positions for the US market was only available on the monthly basis. Therefore, the bi-weekly Canadian data on consolidated short positions offers better setting for the investigation of convertible arbitrage activities.

The **identification of convertible arbitrage activities** leads us to several findings. First, we examine the mispricing of convertible bond issues. Kang and Lee (1996) and Ammann, Kind and Wilde (2003) provide evidence on convertible bond underpricing. The underpricing provides potential arbitrage opportunities, and may attract the attention of hedge funds, amongst others, nowadays. Based on the valuation model of Tsiveriotis and Fernandes (1998) we find the equity-like issues about 25% underpriced, and the debt-like convertibles about 5% underpriced at the issue. The underpricing does decline somewhat immediately following the issue, but nevertheless persists over a longer period of time. We show that the trading volume (liquidity of the issue), the low investment grade, the size of the issue and the size of the equity component are potential explanations for the observed

phenomena. Second, by using information on aggregated bi-weekly short positions on the Toronto Stock Exchange (TSX) we investigate changes in short positions (interest) around the issuance dates of convertible bonds. We observe significant increases in the short positions of the underlying stocks after the announcement of a convertible bond issue. In the 30 trading days following the announcement of the issue, the increases in relative short positions for equity-like issuers are about 25 percentage points higher than for debt-like issuers. These increased aggregated short positions remain stable after the issue of the convertible for a longer period of time. This indicates that hedge funds, or other participants, construct their position immediately after the announcement of a convertible issue, and keep the position for a longer period. The long term changes in the levels of short positions demonstrate a pattern in investment activities that is a characteristic of convertible arbitrage strategies.

Finally, we investigate the **determinants of the convertible arbitrage** success as well as it demise in the recent past. Even though convertible bond strategies have received ample attention in the popular press, there is not much academic research on this phenomenon. This is remarkable, given the extent of this market. To the best of our knowledge, four other papers study convertible arbitrage strategies in detail. In a simulation experiment, Arshanapalli et al. (2004) show that a convertible arbitrage strategy can be highly profitable, especially in down equity markets. Similarly, Henderson (2005) finds positive excess risk-adjusted returns of convertible arbitrage strategies, in particular up to six months following the issue. Agarwal, Fung, Loon and Naik (2007) show that abnormal returns of convertible arbitrage hedge funds can be explained by the underpricing (discount) in the primary market for convertible bonds and argue that abnormal returns of convertible arbitrage hedge funds are in fact a liquidity premium, as hedge funds act as liquidity providers in the convertible bond market. Finally, Choi et al. (2006) examine the impact of convertible arbitrage on equity market liquidity and stock prices. They find evidence for arbitrage induced short selling. This is significantly and positively related to liquidity improvements. We additionally show that declining equity markets were an important determinant of the success of the strategy in the past, implying that convertible arbitrage hedge funds were able to generate high returns mainly due to short positions in declining stocks. This also suggests that the short positions that hedge funds take in the underlying stocks are not hedge-neutral. These returns were generated at the expense of the issuers, in the form of more underpriced issues in the past, and of the investors that lent the shorted stocks. Although the activities of hedge funds improve the liquidity of convertible bonds and the underlying stocks, the negative effect on the underlying stock prices affected the universe of potential issuers. We demonstrate that this universe of issuers changed over time, such that convertible bond issues became less underpriced at the issuance date and thus less attractive for convertible arbitrageurs. In our opinion this is an important explanation why convertible arbitrage returns declined in the recent years.

The remainder of the chapter is structured as follows. In Section 6.2 we describe the notion of convertible arbitrage and the role of hedge funds. In addition, we present our testable hypotheses regarding the identification of convertible arbitrage activities and their effect for shareholders and debtholders of the issuing companies. In Section 6.3 we describe our sample data. This is followed by the main analysis regarding the relationship between the mispricing, trading volume and short sales in Section 6.4. In Section 6.5 we analyze convertible arbitrage returns and provide some insights into the discussion regarding the reasons for their decline. Section 6.6 concludes.

6.2 Convertible Arbitrage and Hedge Funds

6.2.1 Convertible Arbitrage

The classic convertible arbitrage strategy involves taking a long position in a convertible bond and a short position in the underlying stock. Similar results can be achieved by warrant hedging (long position in warrant, short position in underlying stock), reverse hedging (short position in warrant, long position in underlying stock), capital structure arbitrage (a technique aimed at exploiting pricing inefficiencies in the capital structure of the firm), as well as with some other techniques (for more details see Calamos, 2005). In this chapter we focus on the classic convertible arbitrage, since we explore the relationship between convertible arbitrage returns, the pricing of convertible bonds and short sales.

The beginnings of convertible arbitrage, albeit not as refined and computationally sound as today, go back as far as the second half of the nineteenth century, when the first convertible securities were being issued (Calamos, 2005). The "arbitrage" setup was based on the same principle as today - taking a long position in bonds and a short position in the underlying stock. The specific number of shares of common stock to be sold short is a function of the conversion ratio (number of stocks into which the convertible bond converts), the sensitivity of the value of the conversion option to changes in the price of underlying equity (the so-called delta measure), and the sensitivity of the delta measure to the changes in the price of underlying equity (the so-called gamma measure).

The delta measure is defined as the change in the value of the conversion right due to the change in the value of the underlying equity. It can be derived from the option pricing model of Black and Scholes (1973), adjusted for continuous dividend payments in the way suggested by Merton (1973):

$$\Delta = \frac{\partial C}{\partial S} \tag{6.1}$$

$$\Delta = e^{-\delta T} \cdot N\left[\frac{ln\frac{S}{K} + (r - \delta + \frac{\sigma^2}{2}) \cdot T}{\sigma \cdot \sqrt{T}}\right], \tag{6.2}$$

where C is the value of the conversion option, S is the current price of the underlying stock, K is the conversion price, δ is the continuously compounded dividend yield, r is the continuously compounded yield on a selected "risk-free" bond, σ is the annualized stock return volatility, T is the maturity of the bond and N(.) is the cumulative standard normal probability distribution. The delta measure always takes a value between 0 and 1. Values closer to 1 indicate a high sensitivity of the convertible bond value to the underlying equity (stock) value, implying a high probability of conversion.

The convertible arbitrage strategy provides the following cash flows. First, cash inflows from coupon payments of the convertible. Second, cash inflows from the short interest credit on the short stock account.[4] Three, dividend payments on shorted stock lead to cash outflows. This is also the reason why non-dividend paying stock is more desirable for the strategy. Finally, if at the time of the arbitrage setup the convertible bonds are underpriced, there is a potential for arbitrage profits.

The hedge ratio and the convertible arbitrage setup are time varying, since they depend on the stock price. When the stock price approaches the conversion price, the delta of a convertible bond increases; since the bond becomes more equity-like (i.e. the price of the bond becomes more sensitive to the changes in the value of the underlying equity). This means that more stocks need to be shorted in order to maintain the neutral hedge ratio, which is defined as a product of the conversion ratio and delta. The opposite holds if the stock price goes down.

It should be noticed that the delta is not a perfect measure for the sensitivity of the conversion option to changes in the stock price. This is caused by the fact that the conversion option is in fact an option with a stochastic exercise price (since the underlying bond is used to pay for the exercise price). Besides that, convertible bonds are almost always callable, and sometimes also putable. In addition, the exercise of a conversion option leads to the creation of new shares. All these features are not captured in the delta measure. However, given the fact that there is no better variable available than the delta measure, we continue to use this measure as an indicator of the sensitivity of the conversion option to changes in the price of the underlying stock.[5]

Calamos (2005) argues that convertible arbitrageurs in general look for convertible bonds

[4]The borrower of the stock (the party that short sells the stock) needs to keep a certain margin requirement with the broker where the shares were borrowed. This serves as a guarantee for the future return of the stock. This margin is typically about 50% of the value of the shorted stock. These funds are then credited with the short interest credit.

[5]For the same reason other studies use the delta measure as well; see e.g. Lewis, Rogalski and Seward (1999).

that are more equity-like. The underlying shares have a higher volatility, which translates into a higher value of the equity option, a lower conversion premium and a higher gamma. Besides that, they have a preference for underlying stocks that pay low or no dividends, that are undervalued, liquid and that can be easily be sold short. Additionally, zero coupon convertible bonds or so-called LYONs (Liquid Yield Option Notes[6]) are said to be less desirable for convertible arbitrage, as they do not pay coupons and therefore lack cash inflows in the form of coupon components. For the purpose of this chapter we look into a simple (stylized) setup of a convertible arbitrage, where a neutral hedge ratio is determined with the delta measure. We ignore any higher "Greeks" or moments in sensitivity of the convertible bond value with respect to changes in the value of the underlying equity. This provides us with a simple and intuitive framework for analyzing the relationship between underpricing, short sales and convertible arbitrage returns.

6.2.2 Convertible Arbitrage Hedge Funds

Convertible arbitrage has been one of the most successful hedge fund strategies of the end of the nineties and the beginning of 2000's. Using a survivorship free hedge fund dataset of Tass-Tremont, we find that the number of convertible arbitrage hedge funds grew from about 26 in 1994 to about 145 in May 2003. As of that moment the number of convertible arbitrage hedge funds dropped to about 126 in November 2004. In the same period the assets under management grew from about 0.7 billion in January 1994 (i.e. about 2.2% of the total assets under management in the hedge fund industry) to about 11.5 billion in May 2003 (i.e. about 2.8% of the total assets under management) and to 13.9 billion in November 2004 (i.e. about 1.9% of the total assets under management). The average annual return over the period 1994 - 2004 was 9.40% with an annual standard deviation of 4.66%. For comparison, during the same period the average annual return of the S&P 500 was 11.68% with a corresponding standard deviation of 15.24%. This indicates that the risk-reward trade-off for the convertible arbitrage strategy was much better than that of a pure equity strategy.

According to Lhabitant (2002), convertible arbitrage trades represent more than half of the secondary market trading in convertible securities. This indicates that hedge funds are a very important liquidity provider in the convertible market. Hedge funds differ from mutual funds and other investment vehicles by their lack of regulation, with limited transparency and disclosure, and by their internal structure (see Fung and Hsieh, 1997). Most hedge funds try to achieve an absolute return target, irrespective of global market movements, while hedge fund managers typically have incentive-based contracts. Accordingly, hedge funds have a broad flexibility in the type of securities they hold and the type of positions they take.

[6]LYONs are zero coupon callable and putable convertible bonds.

On the other hand, investors in hedge funds are often confronted with lockup periods and redemption notice periods. Such restrictions on withdrawals imply smaller cash fluctuations, and give fund managers more freedom in setting up long-term or illiquid positions.

The non-standard features make hedge funds an interesting investment vehicle for investors with potential diversification benefits. From an investor point of view, it appears that a convertible arbitrage strategy offers a significant diversification benefit due to a low correlation between a convertible arbitrage strategy and a pure equity index like the S&P500. During the period 1994 - 2004 this correlation was about 0.126. Using a sample of convertible bonds issued by Japanese firms, Agarwal et al. (2007) show that most of the return variation in convertible arbitrage hedge fund indices can be explained by three risk factors, i.e., the implied interest rate, the implied credit spread, and the implied option price. It has to be noticed that these three components also make the pricing of convertibles complex. This may add to the explanation of the observed underpricing of convertibles.

6.2.3 Hypotheses

Convertible arbitrage hedge funds do not provide explicit data regarding their investment activities. In order to identify convertible arbitrage we have to rely on evidence that can be gathered from market data. Given the set-up and characteristics of convertible arbitrage, we test several hypotheses in order to identify convertible arbitrage.

First of all, the main idea behind convertible arbitrage is the exploitation of the mispricing (underpricing) of convertible bonds. The convertible bond issue has to be mispriced (underpriced) in order to draw attention of convertible arbitrageurs. We therefore explore the first hypothesis:

H1: Underpricing Hypothesis: Convertible bonds are underpriced at the issuance date.

Secondly, the arbitrageur who is attracted by the underpriced convertible bond has to short sell shares into which the bond can be converted in order to establish the convertible arbitrage. This implies the second hypothesis:

H2: Short interest hypothesis: Short sales of the underlying stock of the convertible bond issuers will increase around the issuance of convertibles.

The number of shares sold short will be larger for higher values of delta (more equity-like

issues). This leads to a sub-hypothesis of Hypothesis 2:

H2a: The effect of the increase in short sales will increase in the value of delta.

In addition we hypothesize that the increase in short sales will persist over a longer period of time. This persistence shows that we are not simply picking up valuation shorting. This typically occurs in the case of equity issues (or securities that are equity-like), as any valuation shorting will typically have a more short-lived effect. Therefore Hypothesis 2b is stated as:

H2b: The effect of the increase in short sales will persist over a longer period of time.

6.3 Data

We investigate the convertible debt issues in the Canadian market between 1998 and 2004. Data regarding the issues and their characteristics is obtained from the SDC New Issues database and from prospectuses of the issuers (available on the SEDAR web site.[7]) Data on the stock prices, market indices, government bond yields, interest rates, dividends, and number of shares outstanding is obtained from Datastream. Data on convertible bond prices, their trading volumes, and number of trades is obtained from Stockwatch. Data on short interest (short sales) is obtained from the Toronto Stock Exchange Group (TSX Group). TSX provides the information on consolidated short positions for stocks traded on TSX and TSX Venture exchanges twice a month (every 15th and the last day of the month), as reported by brokers. Until recently, data on short positions for the US market for example was only available on monthly basis. Therefore, the bi-weekly Canadian data on consolidated short positions provides us with a better setting for examining patterns in the number of stocks sold short of the underlying equity of a convertible issue immediately after announcing and issuing the convertible. Moreover, short sales on the Canadian market are said to be easier (less limitation[8]) and less costly to execute than for example in the US market. This is especially the case for stocks of companies with options or convertible bonds outstanding. This makes the Canadian market a suitable setting for the investigation of short sales and convertible arbitrage returns.

[7]SEDAR stands for "System for Electronic Document Analysis and Retrieval" and is a service of CSA (Canadian Securities Administration) providing public securities filings. (http://www.sedar.com/)

[8]According to Universal Market Integrity Rules set by Market Regulation Services of Canada (http://www.rs.ca), which replaced rules of individual exchanges in Canada, short sales are allowed on zero tick and in certain cases also on down tick.

6.3.1 Sample Selection and Description

As mentioned before, we have obtained the data on convertible bond issues in the Canadian market between 1998 and 2004 from the SDC New Issues dataset as the basis for our sample formation. In total, there were 88 new public convertible bond issues denominated in Canadian Dollars and registered in the SDC dataset during that period. We exclude all the exchangeable bonds[9] and zero coupon bonds. In case of exchangeable bonds the options are not written on the issuer's equity, but rather on another asset (either other companies' stocks or a specific commodity). In this case there is an additional settlement risk involved, which the valuation model does not take into account. In the case of true convertibles, the issuer can always deliver its own equity (issue new shares), so that part of the convertible value is considered to be riskless.[10] Zero coupon bonds are excluded, because coupon payments are an important part of the cash flows for convertible arbitrageurs. Since zero coupon bonds do not provide these cash flows, they tend to be avoided by convertible arbitrageurs. We impose the requirement that announcement and issuance dates (completion of the offer) are verifiable either in company's announcements and prospectuses on the SEDAR website or in Lexis Nexis. These requirements reduce our sample to 72 convertibles. Finally, all our bonds in the sample should have stock price and bond price data available on Datastream or Stockwatch, as well as all the details of the issue provided in the prospectus. This leaves us with a final sample of 61 convertible bond issues.

In Table 6.1 we present the descriptive statistics broken down by the year of the convertible bond issue. We observe that changes in volatility and delta closely correspond over time. In particular, the average values of delta have decreased over time, from 0.613 in 1998 to 0.111 in 2004. This implies that, according to the delta measure, the average issue was much more equity-like at the beginning of our sample period than at the end. At the same time the average volatility of the issuer's stock price also decreased from 0.485 in 1998 to 0.187 in 2004. The dividend yield increased from 3.2% in 1998 to 11.8% in 2004. The average maturity of the issue declined from 8.5 years in 1998 to around 6.5 years in 2003 and 2004.

The construction of the delta measure itself implies that lower volatility leads to lower delta values. The overall volatility in the market has declined after 2000, but we believe that the universe of issuers has also changed during the same period, thus additionally affecting the lower value of the delta. Given the important effect of volatility on the value of the delta, we investigate the changes in the volatility of the issuers by taking into account the changes in the market volatility at the same time. We look at the ratio between the volatility of the issuer at the time of the issue announcement and the market volatility at the same time $\left(\frac{\sigma_i}{\sigma_M}\right)$. The higher the ratio, the riskier the issuer compared to the risk of the investment in

[9] Exchangeable bonds are bonds that are convertible into some other asset than the (equity) stock of the issuing company.

[10] The valuation approach is explained in more detail in Section 6.4.1 and Appendix A.

the market index. In Table 6.1 we observe that the ratio was the highest in 1998 (3.262), dropping over the years to 1.567 and 1.796 in 2003 and 2004 respectively. This suggests that on average the issuers became less risky.

Next, we look at the conversion premium, which is defined as the difference between the conversion price and the stock price at the issue relative to the stock price $\left(\frac{K-S}{S}\right)$. The conversion premium is inversely related to the conversion ratio. Higher conversion ratios (lower conversion premiums) indicate more equity-like convertibles (Kim, 1990) and vice-versa, since a convertible bond with a lower conversion premium is more likely to become in-the-money (all else equal) and be converted into equity. Besides the maturity of the bond, the conversion ratio (or conversion price), on which the conversion premium depends, is the only parameter in Equation 2 which companies can arbitrary choose. As shown in Table 6.1, the average conversion premium in our sample of convertible bonds has declined from 0.297 in 1998 to 0.165 and 0.198 in 2003 and 2004 respectively. All else equal, this would imply that convertible bonds have become more equity-like, which is in contrast to the conclusion based on the delta measure. However, we argue that the change in conversion ratios indicates that issuers tried to offset the effect of lower volatility by lowering the conversion premium and making the issues more attractive for the investors. Otherwise, the issues would have been even more debt-like and would probably be more difficult to sell.

Finally, we investigate the industry composition of the issuers and observe significant changes in time.[11] Financial companies (SIC division H) accounted for between 40 to 55% of issuers in 1998 and 1999, with almost no issuers from SIC division A (agriculture, mining and construction) during the same period. In 2001 and 2002 we observe a decrease in the number of issues by financial companies (to one-third of the issues in a given year) and an increase in the number of issuers from SIC division D (manufacturing), which accounted for about one third of the issuers. In contrast, we observe 45 to 50% of the issues in 2003 and 2004 being made by companies in agriculture, mining and construction (SIC division A).

In addition, we look at some of the other characteristics of the issue. Although the maturity of the bonds has decreased over time, time-to-first call has not changed significantly, as it is on average between 3 and 4 years over the whole sample period. Call-price premiums have increased, going from no premium at the end of the nineties to an average call-price premium of around 1 percent in 2004. More interesting is the comparison of average coupons across the sample period. Although it seems that the average coupon has little variation over time (going from 7.1% in 1998 to 10.7% in 1999 and back to 7.3% by 2004), when the changes in the risk-free rate are taken into account, the relative coupon values (r_c) show much more variation. Bonds in later years of the sample, which are also associated with lower delta (more debt-like convertibles), seem to have higher credit spreads (r_c) than more equity-like convertibles (higher delta). Although this might seem surprising at first (given

[11] We do not report complete results here. These results are available from the authors upon a request.

the lower relative volatilities), it can be reconciled from the perspective of the valuation of convertibles. The equity part of the convertible bond is not risky in terms of its delivery, while the straight debt part bears the default risk. The larger the debt component, the higher the probability of the default risk, hence riskier the bond.

We interpret the changes of the delta, volatility, conversion premiums and industrial composition as evidence for the fact that the universe of issuers and their characteristics has changed over time. This had an important impact on the delta measure (the design of the convertible bond issue), in addition to the effect of the overall lower volatility in the market.

6.4 Identification of Convertible Arbitrage

6.4.1 Pricing of Convertible Bonds

In general, a convertible bond can be considered as a bundle of a straight bond and a warrant written on the underlying equity. There are two theoretical approaches to valuing convertible debt. The so-called *structural models* use the value of the firm as the underlying state variable[12], while in the so-called *reduced form* models the value of the firm's equity or rather the default probability is modeled as underlying state variable.[13] The reduced form models have been adopted in most of the recent literature on the pricing of convertible debt.

Grimwood and Hodges (2002) argue that the most widely adopted model among practitioners for valuing convertible debt is the one first considered by Goldman Sachs in 1994 and later formalized by Tsiveriotis and Fernandes (1998). Moreover, Zabolotnyuk, Jones and Veld (2007) show that the Tsiveriotis Fernandes (TF) model outperforms other recent convertible bond valuation models that are popular among practitioners. TF use a binomial tree approach to model the stock price process and decompose the total value of a convertible bond (CB) in an equity part and a straight debt part (so-called Cash Only part of a Convertible Bond - COCB). The holder of the hypothetical COCB receives all the cash flows, but no equity flows. The value of the COCB is determined by the convertible bond price, the underlying stock price and the time to maturity, since these so-called early exercise parameters define the boundary conditions. In other words, since early call, put or conversion is possible, the stock prices that trigger these events represent the so-called free boundaries that affect the COCB and CB values. Since the COCB is risky, the partial differential equation (Black-Scholes) must include the issuer's risk or the credit spread to account for the relevant risk. The difference between the value of the convertible bond and COCB is the payment in equity. Since the firm can always deliver its own equity, this part can be discounted using the risk-free rate.[14] In this chapter we use the methodology of Tsiveriotis and Fernandes to

[12] See for example Ingersoll (1977), Brennan and Schwartz (1977 and 1980), Nyborg (1996)

[13] See for example Jarrow and Turnbull (1995), Tsiveriotis and Fernandes (1998).

[14] For more details see Appendix A and Tsiveriotis and Fernandes (1998).

estimate the model prices of convertible debt issues in our sample, since this approach can take into account any call, put and conversion features of convertible debt.

In order to calculate the theoretical (model) price of a convertible bond we use the following inputs. For the risk-free rate we use the yield on government bonds (Canadian) of comparable maturity as the convertible bond. A static spread is used to correct for the credit risk of the issue. Where the data on credit risk (credit rating of the issue) are not available, we assumed that the company is of the BBB risk.[15] In Datastream only Scotia Capital provides Canadian corporate bond benchmarks for different maturities and different credit ratings. They cover BBB, A and AA rankings of short, medium and long term. Based on the maturities we have extrapolated the following maturities: 1 year (equivalent to short term), 3 years (between short and medium term), 5 years (medium term), 7 years (between medium and long term), 10 years and more (long term). Based on the rankings, we have also extrapolated the rankings lower than BBB (BB and B) by adding a spread to BBB. This spread is relative to the spread between BBB and A, but is increasing in a lower credit quality and maturity. The price of the underlying stock at the valuation date is taken from Datastream, where we take the average stock price between days -12 and -2 relative to the announcement date of the issue. The number of steps in the tree is equal to the number of months to maturity at the issue of the bond. The coupon rate, the number of coupons per year, conversion ratio and call schedule are all obtained from the respective prospectuses of the bonds. With respect to the dividend information, we obtained dividend yield data from Datastream.

We define mispricing as:

$$e_{i,t} = \frac{(M_{i,t} - B_{i,t})}{B_{i,t}}, \tag{6.3}$$

where for every issue i $e_{i,t}$ denotes the mispricing at time t, $M_{i,t}$ represents the model price at time t, computed using the approach to convertible bond valuation as previously described, and $B_{i,t}$ denotes the closing market price of a convertible bond at time t.

Based on the model and observed prices we investigate the mispricing of the convertible bond issues during the first year of trading. Volatility estimates are based on a rolling window of the past 250 trading days and the delta is estimated for every individual trading day. Both the risk-free rate and the credit spread are also considered for each trading day separately. Stock prices are matched to every individual trading day. We use constant dividend yields, computed as the average dividend yield of the past 250 trading days.

In Table 6.2 (Panels A and B) we present the degree of mispricing (e_t) at different points

[15] We have also computed model prices by taking the lowest possible credit quality for the issues with no credit risk information available. The mispricing was on average somewhat lower, but it did not significantly affect the results. These calculations are available upon the request from the authors.

in time after the issue of the bond for the sub-samples of the equity-like and the debt-like convertibles.

First, we observe that on average the equity-like convertibles are underpriced by 25.2% (Panel A) at the issuance date, while the debt-like convertibles are on average only underpriced by 5.4% (Panel B). This difference of 19.8 percentage points is statistically significant (Panel C). The underpricing[16] at the issuance date in the overall sample is on average 10%. These results confirm our *underpricing hypothesis* and are in line with the findings of Chan and Chen (2005), who find an 8% overall underpricing of convertibles at the issuance date in the US market. Similarly to the higher degree of underpricing for the equity-like convertibles in our sample, Chan and Chen find riskier companies (those with low or no credit rating) to be more underpriced. In addition, Kang and Lee (1996) find a positive effect of the size of the equity component on the underpricing and King (1986) finds issuers with higher volatility of stock returns (riskier companies) to be associated with a higher underpricing.[17]

Second, the underpricing on average declines in the first 15 trading days following the issue (Panel D), with a decline of 5.5 percentage points in the case of the equity-like convertibles and 2.6 percentage points in the case of the debt-like convertibles.[18] It increases somewhat afterwards for the debt-like convertibles and remains at about 5% (Panel B), while the case of equity-like convertibles shows a slight downward trend, but remains at around 19% by the end of the eleventh trading month following the issue (Panel A). The difference in the underpricing between the equity-like and debt-like issues is still significant at 12.2 percentage points six months (120 trading days) after the issue (Panel C). This is in some contrast to the previous findings on the evolution of underpricing following the issue, since Chan and

[16]Note, that we do not report the total sample averages in detail, but these results are available upon request.

[17]We have also looked at the phenomenon of income trusts. These are specially designed financing vehicles, where the trust is positioned as an immediate full owner of a typically mature business. The cash flows from the ultimate operating company, which the trust owns, are usually fully distributed to the trust and then passed on to unit holders (owners of the income trust) as dividends. Since the trust accrues no tax payments, investors then (depending on the tax status of their investment) either pay no or lower taxes as they would otherwise. The main benefit of the income trust is therefore tax driven. Income trusts have become very popular in the Canadian market in the last few years. Jog and Wang (2004) report that the number of income trust IPOs has grown from 9 in 1998 to 64 and 36 in 2002 and 2003 respectively, with the highest increase in the number of business trusts. Since our sample is drawn from the period between 1998 and 2004, we have looked into the impact of the income trusts on our results. In total 35 out of 61 of the issues in our sample have been made by income trusts. They are not uniformly distributed over time, but are rather concentrated in 2002, 2003 and 2004. This coincides with the increasing popularity of income trusts in the recent years. We have checked whether our results are driven by income trusts and found no conclusive evidence to suggest that. The strongest conclusion that can be reached is that the increase in the number of income trusts coincides with the change in the universe and characteristics of the issuers that we described in Section 3.1.

[18]Note that these are pairwise differences.

Chen (2005) show that initial underpricing dissipates within the first 500 trading days after the issue. Kang and Lee (1996) find the same to occur within the first 250 trading days following the issue.

6.4.2 Liquidity and the Mispricing

We further investigate potential explanations for the mispricing of convertibles. We investigate explanations proposed by Lhabitant (2002) and find that the majority of the issuers, in particular those of the more equity-like convertibles, are below investment grade or without a credit rating. This reduces the liquidity of their bonds in the market. We analyze trading volumes of convertibles following the issue. In Table 6.3 we present the results for the debt-like and the equity-like subsamples.

We find relative trading volumes (v_t)[19] of the more debt-like convertibles to be significantly higher in the first 4 trading days than those of the more equity-like convertibles. For example, at the issue date (v_0) 77.4% of the total issue of the debt-like convertibles is traded, while only 21.3% of the total issue of the equity-like convertibles. On the fourth day of trading this number is reduced to only 3.4% of the equity-like convertible issues and 10.1% of the debt-like issues.

In addition, in Table 6.4 we provide correlation coefficients between trading volumes and mispricing of convertibles. The results show that on the issuance date and the subsequent first three trading days trading volume and mispricing are significantly negatively correlated (correlation coefficients of -0.264, -0.329, -0.227 and -0.298 respectively).[20] This further suggests that part of the mispricing is to be attributed to the lower liquidity of the convertibles in early trading, in particular in the case of the more equity-like issues. This is in line with the argument of Ammann et al. (2003) that relates the underpricing to the lower liquidity of convertibles. In addition, we have seen that mispricing decreases during the first 15 to 20 trading days (see Panel D of Table 6.2), but nevertheless remains significantly positive afterwards. This is to a certain extent not surprising, since trading volumes and number of trades become significantly lower after the initial 5 to 10 trading days, while major investors (hedge funds) in convertible securities tend to maintain their positions for a longer period of time.

We find mispricing developments during the initial trading period particularly important for our analysis, as it shows that convertible bonds are underpriced at the issuance date. The underpricing does decrease immediately following the issue, but remains present over a longer period of time afterwards. This suggests that major activities related to convertible

[19] We construct the relative trading volume (v_t) as the ratio between the trading volume and the size of the convertible bond issue - face value of the issue.

[20] The correlation coefficient on the second trading day (-0.227) is not statistically significant (p-value of 0.109).

arbitrage take place closely around the issuance date.

So far, we have shown that the more equity-like convertibles are more underpriced than the debt-like convertible bond issues. If indeed the convertible arbitrage activities take place immediately after the announcement of the issue, we should be able to observe an increase in the short positions.

6.4.3 Short Positions

One of the basic principles of convertible arbitrage is to short sell the underlying assets of the convertible bond, while purchasing the convertible bonds at the same time. An increase in the short selling activities of the underlying stock at and after the announcement of convertible bond issues, compared to levels before the announcement, can be interpreted as additional (and more direct) evidence that convertible arbitrage strategies are taking place.[21]

For the purpose of investigating the relationship between the short sales, the characteristics of the issue and the underpricing we define a relative measure of short sales as the ratio between the short interest in a given period[22] and the potential number of shares that are to be issued if the convertible bond issue is converted into shares[23]:

$$Z_{i,t} = \frac{ss_{i,t}}{n_i^b \cdot cr_i} \tag{6.4}$$

$Z_{i,t}$ represents the relative short sales (interest) measure for company i at time t (t=0 is the announcement date), $ss_{i,t}$ represents the number of shorted shares (so-called short interest) of issuer i at time t, n_i^b denotes the number of issued bonds of issuer i and cr_i denotes the conversion ratio of the issue i. This measure of short interest standardizes outstanding short positions in every period with the number of new shares to be issued upon conversion of the convertible bond issue into the issuer's equity. After the announcement we expect Z_t (cross-sectional average at time t) to be significantly higher for the more equity-like convertibles than for the debt-like convertibles. The reason for this is that, given the convertible arbitrage strategy, more shares need to be sold short given the higher delta.

In Table 6.5 we present the descriptive statistics for both the level and the changes in the relative short sales between the consecutive periods in a cross-section of issuers at given points in time t following the announcement of the issue.

[21] An alternative for hedging by shorting stocks is to create a hedge that involves writing call options. However, most Canadian convertibles are issued on stocks on which no exchange-traded call options are available. For this reason we limit ourselves to considering short positions in stocks.

[22] Note that the data on short interest (short positions) is available biweekly - in the middle and the beginning of every month.

[23] We have also investigated the second relative measure of short sales defined as the ratio between the short interest in a given time period and the corresponding total number of shares outstanding. The results, which are available from the authors upon request, are very similar and are only downscaled.

With respect to the summary statistics for the measure of the level of short interest, we observe that in the case of the more equity-like issues (Panel A) the average relative short interest (Z_t) increases from around 4.5% in the last period before the announcement of the issue to 25.0% of the new potentially issued shares in 4 weeks (t=2) following the announcement date. In the case of the more debt-like convertibles (Panel B) the mean relative short interest (Z_t) increases slightly from 9.3% prior to the announcement to 11.0% in the period of the announcement. It declines to 9.7% in 4 weeks following the announcement. The difference of 10.4 percentage points between the two sub-samples at t=1 (approximately two weeks after the announcement of the issue) is statistically significant at the 5% level (Panel C). The difference continues to increase following the announcement of the issue (t=7) to 28.8 percentage points and then declines to 17.6 percentage points after 8 months (t=16) following the issue announcement (as shown in Panel C). Even after 12 months (t=24) following the issue announcement, the mean relative short interest for the equity-like convertible issuers is 15.4 percentage points higher than the average short interest of the debt-like issuers. This confirms *hypothesis 2a*.

Panels D and E present results for the changes in relative short interest (dZ_t) between consecutive periods. These are also based on the relative short interest measure (Z_t) and defined as differences between consecutive reporting periods ($dZ_t = Z_t - Z_{t-1}$). From these results we conclude that the highest increase in the short interest for the equity-like convertibles is at the announcement of the issue and the immediate subsequent period (average increase of 6.3 and 9.7 percentage points respectively). This is followed by a more moderate increase of 4.5 percentage points in a period between two weeks and one month (t=2) after the announcement. Afterwards, the relative short interest keeps increasing, but at a lower pace of between 2 to 3 percentage points per two weeks. Contrary to that, companies that issue debt-like convertibles experience an average 1.7 percentage points increase in short positions just after the announcement of the issue, and a 2.1 percentage points decline (complete off-set) after the issue of the bond (t=3).

Moreover, the persistence in the level of open short positions indicates that investors, who take the short position, do so over a longer period of time, which is consistent with investors engaging in convertible arbitrage rather than investors shorting the stock, since they perceive it to be overvalued. If indeed this latter group of investors was shorting the stock, we would observe a decline in short positions shortly between the announcement and the issuance dates. However, this is not the case, as can be inferred from the changes in mean values for relative short positions in Panels D and E in Table 6.5. This confirms *hypothesis 2b*.

All the evidence on the evolution of short interest confirms the *short interest hypothesis*. Together with the confirmation of the *underpricing hypothesis* this provides identification of convertible arbitrage.

6.5 Convertible Arbitrage Returns

6.5.1 Convertible Arbitrage Setup and Returns

Until now we have presented different pieces of evidence that all indicate the existence of convertible arbitrage activities in the Canadian market and its effect for market participants. The more important contribution of this chapter is the investigation of the determinants of convertible arbitrage returns. Other papers that examine this topic in similar spirit are by Arshanapalli et al. (2004) and Henderson (2005).

Arshanapalli et al. (2004) investigate convertible arbitrage returns for the US market in the period between 1993 and 2001. However, they use a more simplified portfolio setup. Instead of taking the delta into account, they assume equal values for the long position in convertibles and the short positions in stocks. Their results show positive convertible arbitrage returns, especially in declining equity markets. Henderson (2005) analyzes convertible arbitrage returns using data for the US market in the period between 1998 and 2004. He structures his investigation of convertible arbitrage returns by taking into account the time-varying delta value of convertibles when establishing the hedge ratio. He also includes the borrowing costs for the investment in convertibles. However, he does not take into account the conversion ratio of the convertibles and the short interest rebate.[24]

We employ a simple convertible arbitrage strategy, where we go long in one convertible bond at the issuance date and short the appropriate number of underlying stocks (corresponding to the conversion ratio). In this way we achieve a delta-neutral hedge at the issuance date. We rebalance the short position as the delta changes over time and we consider the so-called short interest rebate. We take borrowing costs into account, as proceeds from shorted stock do not suffice for the purchase of a convertible bond. For every convertible issue i, we form the following convertible arbitrage portfolio at time t:

$$
\begin{aligned}
P_{i,t} = \quad & \underbrace{(B_{i,t} + I_{i,t})}_{\text{Convertible bond part}} \quad - \\
& \underbrace{(\Delta_{i,t} \cdot cr_i \cdot (S_{i,t} + D_{i,t}) - (\Delta_{i,t} - \Delta_{i,t-1}) \cdot cr_i \cdot S_{i,t})}_{\text{Stock part}} + \\
& \underbrace{(\Delta_{i,t} \cdot cr_i \cdot S_{i,t-1} \cdot g_i \cdot w_{i,t})}_{\text{Short position rebate}} - \\
& \underbrace{((B_{i,0} - \Delta_{i,0} \cdot cr_i \cdot (1 - g_i) \cdot S_{i,0}) \cdot l_{i,t})}_{\text{Borrowing part}},
\end{aligned}
\tag{6.5}
$$

[24] The short interest rebate is interest paid on the share of proceeds of sale of shorted stock that needs to be kept with the broker as a coverage (margin) for future delivery of shorted stock.

where for every issue i $P_{i,t}$ denotes the value of the convertible arbitrage portfolio at time t, $B_{i,t}$ denotes the convertible bond price at time t, $I_{i,t}$ denotes the accrued interest at time t, $\Delta_{i,t}$ denotes the delta value of the convertible bond issue at time 0 (issuance date), cr_i denotes the conversion ratio, g_i denotes the short interest coverage ratio, $w_{i,t}$ denotes the short interest rebate rate per period t, $S_{i,t}$ denotes the stock price at time t, $D_{i,t}$ denotes the dividend at time t and $l_{i,t}$ denotes the borrowing cost from t=0 up to time t.

The convertible bond part consists of the bond price at time t and the accrued interest or coupon payment at time t. The stock part refers to the short position in the issuer's stock, where we assume to take a short position (hedge ratio) in $\Delta_{i,t} \cdot cr_i$ shares. This means that we hedge the quantity of shares equal to the conversion ratio (shares that we would receive in the case of conversion of the convertible) taking into account the sensitivity of the conversion option to the changes in the stock price (delta). The short interest rebate refers to the interest paid on the margin requirement with the broker for the future delivery of shorted stock. Here, we assume the margin requirement (g_i) to be 50% and the short interest rebate rate ($w_{i,t}$) to be 75% of the short-term interest rate. Finally, the borrowing part refers to the borrowing cost that the arbitrageur incurs by borrowing the shortfall of funds needed to establish a long position in convertibles at the issuance date. More specifically, the arbitrageur shorts $\Delta_{i,0} \cdot cr_i$ shares, but she needs to maintain a margin requirement (g_i). She therefore needs to borrow the difference $B_{i,0} - \Delta_{i,0} \cdot cr_i \cdot (1 - g_i) \cdot S_{i,0}$ at interest rate $l_{i,t}$. Here, we assume that the borrowing rate equals the short-term interest rate.

Returns on convertible arbitrage portfolios are computed as:

$$R_{i,t} = \ln P_{i,t} - \ln P_{i,t-1} \tag{6.6}$$

Finally, we average the daily convertible arbitrage portfolio returns in a cross-section at each time t and sum them up in order to obtain cumulative returns for the different time periods. In Table 6.6 we present the cumulative average returns (buy-and-hold strategy at the issue) of convertible arbitrage, convertible bonds and stocks (raw returns) for the sub-samples of the more equity-like ($\Delta_i > 0.5$) and the more debt-like ($\Delta_i < 0.5$) convertibles. From the table we observe that the returns on convertible arbitrage are positive over different time periods immediately following the issue of the bond. This result holds both for the equity- and the debt-like convertibles. In case of the equity-like convertibles, convertible arbitrage (Convertible Arbitrage column of Panel A) earns a return (R_t) of around 33.8% in one year, while for the debt-like convertibles this is 10.7% (Convertible Arbitrage column of Panel B). This result is driven by the very negative return on the underlying stock of around 34.4% (Stock column of Panel A) for the equity-like convertibles (at t=240). This, coupled with the higher delta, generates the positive return difference for convertible arbitrage for the equity-like convertibles.

The returns on the long position in convertible bonds, although positive for the first

six months (120 trading days) after the issue, turn negative to -8.5% (Convertible Bond column of Panel A) by the end of the first year after the issue compared to the issuance date price. Contrary to the equity-like convertibles, the returns on the convertible bonds are positive for the more debt-like convertibles after the first year of trading. For the debt-like convertibles, which have low deltas, the average convertible arbitrage return of around 10.7% is 5.1 percentage points lower than the 15.8% return (Convertible Bond column of Panel B) on the convertible bond by the end of the first year of trading. The difference is due to the positive return on the underlying stock, which, given the short positions, offsets the gain on the long position in the bond.

More interesting is the question of the determinants of convertible arbitrage returns and the evolution of the returns in the first year of trading. By construction of the convertible arbitrage strategy it is clear that convertible arbitrage returns will be driven by returns on the long position in convertibles and returns on the short position in stock - i.e. the strategy will generate positive returns when bond prices rise or stock prices fall, all else being equal. Given that other parameters in the setup either do not change (conversion ratio, margin requirement) or change very little (short interest rebate rate, borrowing rate), we focus on convertible bond returns and raw stock returns.

First, we observe that within 15 trading days following the issue, the returns on the more equity-like convertibles significantly outperform returns on the more debt-like convertible by 2.2 percentage points (Convertible Bonds column of Panel C). At the same time, convertible arbitrage returns on the more equity-like convertibles are also significantly higher than those on the more debt-like convertibles. The difference in stock returns between the more debt-like and the equity-like convertible bond issuers is not significant during the same period. This indicates that during this initial period following the issue, convertible arbitrage returns are mostly driven by convertible bond returns. These in turn are mostly driven by increases in stock prices (positive returns for both equity-like and debt-like convertibles). Note that convertible bond prices positively co-move with the stock prices. Both, downward and upward movements in stock prices, have a dual effect on convertible arbitrage returns, directly via the stock part of the convertible arbitrage return and indirectly via the convertible bond part of the return. The indirect effect depends on the delta; as a higher delta corresponds to the higher sensitivity of the price of a convertible bond to the changes in the price of the underlying equity.

In Figure 6.1 we present the evolution of the returns on the convertible strategy, convertible bonds and stocks for the sub-samples of the more equity and the more debt-like convertibles during a period of one year following the issue of the bond. We have argued that dissipation of underpricing, driven by increases in convertible bond prices in the initial trading, affects the positive returns on convertible arbitrage in the period immediately following the issuance of the bonds. From Figure 6.1 we observe that in the later period, in

particular beyond the first 120 days of trading, the negative stock returns dominate the convertible arbitrage returns for the more equity-like convertibles. In case of the more debt-like convertibles, the positive stock returns depress the convertible arbitrage returns in comparison to the convertible bond returns. It seems that convertible arbitrage strategies earn very high returns in case of adverse selection of the issuers and/or the down equity markets. This is in line with the findings of Arshanapalli et al. (2004).

6.5.2 Performance of Convertible Arbitrage Hedge Funds

The performance of hedge funds that are involved in convertible arbitrage strategies has been decreasing over time. In Table 6.7 we present the returns on Convertible Arbitrage Index HEDG CA that is tracked by CSFB/Tremont, convertible arbitrage returns based on our sample and MSCI World and S&P 500 indices.

Based on the returns presented in Table 6.7 we observe that, apart from two setbacks in 1994 and 1998, returns on the HEDG Convertible Arbitrage index have for the most part been above 15%. However, the convertible arbitrage performance has deteriorated in later years. The popular press provides different explanations for this, ranging from stable equity markets, rising interest rates, withdrawals from funds, to increased competition in the hedge fund industry and lower volatilities in the main capital markets. In case of the mutual fund industry, Berk and Green (2004) show that an increase in fund inflows is followed by a decrease in performance, caused by decreasing returns to scale. Since hedge funds are typically employing limits to the size of the assets they manage, we expect other factors to explain the decrease in returns (increased competition in the industry and market stability among others). Given the set-up of the convertible arbitrage strategy, these factors indeed contribute to a decreased performance. However, we believe (as we showed in Section 6.3.1) that the structure of the convertible bond (convertible being either debt- or equity-like) is an important additional explanatory factor to be considered, as it affects the degree underpricing.

Agarwal et al. (2007) argue that hedge funds act as liquidity providers (by buying convertibles in the primary market) to otherwise iliquid convertible bond markets. In Table 6.3 we observed that more debt-like convertible bonds have significantly higher relative trading volume than equity-like convertibles. This significantly better liquidity of debt-like convertibles can be related to the broader spectrum of investors participating in the trading of such issues. Ammann, Kind and Seiz (2007) for example analyze the performance of US mutual funds that invest in convertible bonds. Since these funds are more limited in their investment policies, in particular in taking the short positions in stock, they might only be able to invest in the convertible bond issues with low delta and hence lower delta hedge requirements. On one hand, this emphasizes the importance and the role of convertible arbitrage hedge funds in the case of the more equity-like convertible bond issues, where the number of investors is

more limited. On the other hand, it provides some information about the lower degree of competition among investors on the market for equity-like convertibles.

An important part of the return in the convertible arbitrage strategy represents the profit from the underpricing of convertible bond issues. The degree of mispricing of convertible bond issues has shown to be to a large extent determined by characteristics of any particular issue. In other words, the more equity-like convertible bonds are likely to be more underpriced than debt-like convertible bonds, as we have shown in previous sections. As the structure of the convertible bond changed over time from the more equity-like to more debt-like, we observe less underpricing and less true arbitrage opportunities for convertible arbitrage strategies. Agarwal et al. (2007) similarly demonstrate that abnormal returns of the convertible arbitrage hedge funds can be explained by the *"original issue discount in the primary convertible bond market"*.

In addition to this established fact, we have shown that the returns on the more equity-like convertibles were also largely driven by the negative stock returns. This is in some contrast to the findings of Agarwal et al. (2007), who find very low returns from the "delta-hedging" activities, but it is in line with the returns in Table 6.7, where the highest returns were recorded in downward pressured or stagnating stock markets and in years in which most of the issues were more equity-like (end of the nineties, beginning of the new millenium). It also shows that our sample is representative of the overall convertible arbitrage hedge fund universe or, put differently, that Canada is in that respect not different from the other markets in which convertibles are mostly traded and hedge funds are engaged in convertible arbitrage activities.

In Table 6.8 we provide the mean for the delta and the mispricing values averaged across the years of convertible debt issues for the sub-samples of the more equity and the more debt-like convertible bond issues.

We observe from the table that the mispricing of the convertible bond issues declines over time. This corresponds to the change in the structure of convertible bond issues from the predominantly equity-like issues in late 1990s to the more debt-like issues in 2003 and 2004 (as measured by the delta). This is in line with the discussion regarding the change in the universe of issuers in Section 6.3.1. Second, we demonstrated (see Table 6.6) that the convertible arbitrage returns are lower for the debt-like convertibles compared to the equity-like convertible bond issues. Finally, this change towards more debt-like issues corresponds in time to the decline in convertible arbitrage returns in Table 6.7.

We interpret the joint evidence on the higher underpricing, lower liquidity and higher convertible arbitrage returns for the equity-like issues, coupled with the shift towards more debt-like issues in recent years, as an additional explanation for the corresponding deteriorating performance of convertible arbitrage hedge funds.

6.5.3 Winners and Losers of Convertible Arbitrage

Clearly, as demonstrated so far, convertible arbitrage activities have a positive effect for hedge funds and other investors that engage in them, as they earn positive returns for the investors. However, these returns come at the expense "insiders" of the issuing firms.

As shown before, the short interest significantly increases after the announcements of convertible bond issues. Diamond and Verrechia (1987) for example argue that short interest negatively affects stock returns. Given the cost of shorting the stock, only informed traders will engage in the activity, thus conveying the new (bad) information to the market. A negative relationship between short interest and abnormal returns is for example found by Aitken, Frino, McCorry and Swan (1998) in the Australian market and Ackert and Athanassakos (2005) in the Canadian market. On the other hand, Loncarski, ter Horst and Veld (2007b) find a negative downward pressure on cumulative abnormal returns that goes beyond the announcement date effects of the convertible bond issue and continues up to the issuance of the bond.

Arbitrage induced short selling therefore seems to have a negative effect on abnormal returns - a direct negative effect for shareholders of the issuing companies. The results imply that convertible arbitrage activities create additional adverse wealth effects for shareholders of the issuing companies. If there was no convertible arbitrage, there would be no increase in short interest (sales) and no additional negative wealth effect, in particular for the issuers of more equity-like convertibles. The result has therefore consequences for both shareholders and debtholders of the issuing company. It clearly negatively affects shareholders by additionally destroying shareholder value. Moreover, it also affects debtholders. Longstaff and Schwartz (1995) develop a model in which they show that value of firm's assets (proxied by stock market index) negatively affects credit spread. This implies that existing debtholders are affected by the negative wealth effect as the lower value of firm's collateral generally leads to an increase in the credit spread and thus a lower value of current (outstanding) debt claims. In such a context convertible arbitrage seems to have a negative effect for the shareholders and debtholders of the issuing companies, in particular when the issue is structured to be more equity-like (high value of delta).

6.6 Conclusion

This chapter studies determinants of convertible bond arbitrage and its effect on capital markets and its participants. Convertible arbitrage mostly takes place by hedge funds, which do not report their holdings. For this reason we have to rely on indirect evidence to first identify convertible arbitrage activities. Several pieces of evidence are presented for convertible arbitrage. First, we find that the convertible bonds are underpriced. Second, we find that short positions in the underlying stocks strongly increase around the issuance date.

Both effects are stronger for equity-like than for debt-like convertible bonds. In addition, we argue that "arbitrage" increases in short positions negatively affect abnormal returns around the issue date of convertibles. This has important negative implications for both, shareholders and existing debtholders of the issuing companies.

Finally, when examining the returns of convertible bond arbitrage strategies, we find that the equity-like convertible bonds have earned much higher returns than the debt-like convertible bonds. This difference is approximately 23 percentage points during the first year following the issue. Returns on the convertible arbitrage strategy strongly decrease towards the end of the sample period. This is mostly caused by the fact that convertible bond issues and issuers became more debt-like compared to the early years in our sample. This is, of course, not surprising. The high returns of the hedge funds came at the expense of the companies issuing convertible bonds. In order to cap their losses, they apparently either switched to issuing less underpriced debt-like convertible bonds and or they moved out of the convertible bond market altogether.

6.A Tables and Figures

Table 6.1: Descriptive Statistics

Descriptive statistics (number of observations, mean and standard deviation) for maturity (in years), delta, issuer and market volatilities, conversion premium, dividend yield, coupon rate, relative coupon rate, time-to-first-call and call-price premium. The statistics are provided based on the year of the issue. T represents the maturity of the bond at the issue. Both, issuer and market volatility (σ_i and σ_M) are the annualized standard deviations of daily stock returns and returns on S&P TSX composite index based on 250 trading days prior to the announcement of the convertible bond issue. The delta measure (Δ_i) is computed as defined in Equation 2. The conversion premium (cp_i) is defined as $\frac{K-S}{S}$, where K represents the conversion price and S represents the stock price at the announcement date of the issue. The dividend yield (δ_i) is the average dividend yield over the 250 trading days prior to the announcement of the issue. c_i represents the coupon rate of the bond. rc_i denotes the relative coupon rate, defined as the difference between the coupon rate of the bond and the "risk-free" rate, which is proxied by the yield of the government bond of the comparable maturity. The time-to-first-call (T_{call}) is the time between the issue of the bond and the first possible call date expressed in years. The call-price premium (p_{call}) is defined as the ratio between the call price and the par value of the bond, less one ($\frac{P_{call}}{P_{par}} - 1$).

year		T	Δ_i	σ_i	σ_M	$\frac{\sigma_i}{\sigma_M}$	cp_i	δ_i	c_i	rc_i	T_{call}	p_{call}
1998	N	9	7	9	9	9	8	7	9	9	8	8
	Mean	8.49	0.613	0.485	0.144	3.262	0.297	0.032	0.071	0.013	4.04	0
	std. dev.	2.24	0.287	0.417	0.017	2.626	0.159	0.052	0.016	0.015	1.66	0
1999	N	5	4	5	5	5	4	4	5	5	4	4
	Mean	4.61	0.405	0.441	0.196	2.264	0.174	0.099	0.107	0.050	3.13	0
	std. dev.	1.67	0.271	0.179	0.004	0.956	0.163	0.076	0.012	0.017	0.08	0
2001	N	7	7	7	7	7	7	7	7	7	7	7
	Mean	5.68	0.613	0.548	0.211	2.685	0.077	0.035	0.076	0.020	3.29	0
	std. dev.	0.93	0.330	0.367	0.025	1.826	0.100	0.052	0.010	0.009	0.40	0
2002	N	12	12	12	12	12	12	12	12	12	12	12
	Mean	5.14	0.368	0.389	0.167	2.310	0.233	0.085	0.089	0.037	3.58	0.004
	std. dev.	0.17	0.286	0.225	0.017	1.284	0.300	0.072	0.006	0.009	1.08	0.014
2003	N	11	11	11	11	11	11	11	11	11	10	10
	Mean	6.26	0.239	0.228	0.143	1.567	0.165	0.090	0.078	0.030	3.18	0.010
	std. dev.	1.78	0.267	0.142	0.021	0.854	0.174	0.055	0.014	0.016	0.63	0.021
2004	N	17	17	17	17	17	17	17	17	17	16	16
	Mean	6.73	0.111	0.187	0.104	1.796	0.198	0.118	0.073	0.026	3.44	0.022
	std. dev.	1.94	0.093	0.038	0.008	0.383	0.394	0.041	0.009	0.014	0.48	0.026

Table 6.2: Convertible Bond Mispricing

Descriptive statistics (mean, minimum and maximum value, median and standard deviation) for the mispricing measure $e_{i,t} = \frac{(M_{i,t} - B_{i,t})}{B_{i,t}}$, which represents a comparison of the model price ($M_{i,t}$) to the trading price ($B_{i,t}$) at time t. ID+t denotes t days after the issuance date of the convertible bond.
***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null means are equal to zero.

Panel A: Mispricing After the Bond Issue for the Sub-sample of the More Equity-like Convertibles

period	N	mean		min	max	median	sd
ID	12	0.252	***	0.021	0.500	0.262	0.154
ID+5	12	0.226	***	-0.008	0.471	0.251	0.161
ID+10	12	0.203	***	-0.020	0.463	0.234	0.147
ID+15	12	0.197	***	-0.038	0.473	0.213	0.150
ID+20	13	0.208	***	-0.017	0.472	0.210	0.165
ID+30	13	0.194	***	-0.026	0.514	0.211	0.154
ID+60	14	0.201	***	-0.019	0.499	0.182	0.156
ID+120	15	0.179	***	-0.069	0.402	0.185	0.137
ID+220	15	0.189	***	-0.117	0.848	0.108	0.237

Panel B: Mispricing After the Bond Issue for the Sub-sample of the More Debt-like Convertibles

period	N	mean		min	max	median	sd
ID	40	0.054	***	-0.067	0.223	0.046	0.066
ID+5	42	0.043	***	-0.078	0.174	0.038	0.061
ID+10	42	0.036	***	-0.115	0.184	0.030	0.059
ID+15	42	0.026	***	-0.121	0.180	0.023	0.060
ID+20	42	0.031	***	-0.105	0.179	0.037	0.060
ID+30	44	0.036	***	-0.090	0.204	0.031	0.063
ID+60	44	0.044	***	-0.067	0.193	0.040	0.058
ID+120	44	0.057	***	-0.091	0.380	0.044	0.093
ID+220	44	0.053	***	-0.127	0.516	0.032	0.119

Panel C: Differences in Means Between the Two Sub-samples Based on the Delta Measure

period	diff. in means	95% conf. int.		t	
ID	-0.198	-0.298	-0.099	-4.328	***
ID+5	-0.183	-0.286	-0.080	-3.867	***
ID+10	-0.167	-0.262	-0.073	-3.848	***
ID+15	-0.171	-0.267	-0.074	-3.856	***
ID+20	-0.177	-0.278	-0.076	-3.794	***
ID+30	-0.158	-0.252	-0.064	-3.613	***
ID+60	-0.157	-0.248	-0.066	-3.688	***
ID+120	-0.122	-0.201	-0.042	-3.206	***
ID+220	-0.136	-0.271	-0.001	-2.124	**

Panel D: Differences in Means Between Different Time Periods After the Issue for the Sub-samples of the More Equity and Debt-like Convertibles

periods	$\Delta_i > 0.5$ pairwise diff.		$\Delta_i < 0.5$ pairwise diff.	
ID to ID+5	-0.026	***	-0.009	**
ID to ID+10	-0.049	***	-0.016	***
ID to ID+15	-0.055	***	-0.026	***
ID to ID+20	-0.063	***	-0.024	***
ID+20 to ID+60	0.008		0.009	*
ID+60 to ID+120	-0.038	**	0.013	
ID+120 to ID+220	0.010		-0.004	

Table 6.3: Trading Volume

Descriptive statistics (mean, median and standard deviation) for the trading volume of convertible bonds for the two subsamples of the more debt-like ($\Delta_i < 0.5$) and the more equity-like ($\Delta_i > 0.5$) convertibles. v_t denotes relative trading volume at time t (t=0 is the issue date of the bond), which is defined as the ratio between the actual trading volume and the size of the convertible bond issue (nominal value of the issue). Difference in means t-test is computed as the two-sided t-test with unequal variances of the two groups assumed, where under the null difference in means is equal to 0.

	$\Delta_i < 0.5$				$\Delta_i > 0.5$						
v_t	N	mean	median	sd	N	mean	median	sd	diff. in means	t	
v_0	44	0.774	0.619	0.741	15	0.213	0.129	0.300	0.561	4.13	***
v_1	44	0.232	0.179	0.230	15	0.060	0.036	0.069	0.171	4.40	***
v_2	44	0.156	0.101	0.179	15	0.046	0.010	0.061	0.110	3.52	***
v_3	44	0.116	0.097	0.104	15	0.034	0.017	0.052	0.082	3.96	***
v_4	44	0.101	0.072	0.116	15	0.034	0.015	0.036	0.067	3.39	***
v_5	44	0.073	0.077	0.058	15	0.050	0.011	0.085	0.023	0.96	
v_{10}	44	0.046	0.043	0.036	15	0.032	0.020	0.037	0.014	1.31	
v_{20}	44	0.023	0.019	0.020	15	0.017	0.011	0.019	0.007	1.12	
v_{60}	44	0.023	0.010	0.060	15	0.012	0.002	0.023	0.011	1.03	
v_{120}	44	0.021	0.007	0.055	15	0.005	0.002	0.007	0.015	1.80	**
v_{220}	44	0.015	0.005	0.021	15	0.006	0.000	0.012	0.009	2.03	**

Table 6.4: Correlations Between Mispricing and Trading Volume

e_t denotes the average mispricing at time t (average in a cross-section) based on a comparison of the model price at time t ($M_{i,t}$) to the trading price ($B_{i,t}$) at time t=0 (issuance date) for each issue i ($e_{i,t} = \frac{(M_{i,t}-B_{i,t})}{B_{i,t}}$). v_t denotes relative trading volume at time t, which is defined as the ratio between the actual trading volume and the size of the convertible bond issue (nominal value of the issue). The first number in each field is a coefficient of correlation and the second number is a p-value (under the null hypothesis that there is no correlation).

v_t	e_0	e_1	e_2	e_3	e_4	e_5	e_{10}	e_{20}
v_0	**-0.264**	**-0.257**	**-0.242**	**-0.234**	-0.227	-0.189	-0.195	**-0.247**
	0.061	**0.066**	**0.085**	**0.092**	0.102	0.177	0.161	**0.072**
v_1	**-0.377**	**-0.329**	**-0.323**	**-0.323**	**-0.300**	**-0.293**	**-0.275**	**-0.312**
	0.006	**0.017**	**0.020**	**0.018**	**0.029**	**0.033**	**0.046**	**0.022**
v_2	**-0.283**	**-0.234**	-0.227	**-0.235**	-0.224	-0.219	-0.202	**-0.239**
	0.044	**0.095**	0.106	**0.090**	0.108	0.115	0.147	**0.081**
v_3	**-0.352**	**-0.319**	**-0.320**	**-0.298**	**-0.285**	**-0.265**	**-0.313**	**-0.367**
	0.011	**0.021**	**0.021**	**0.030**	**0.038**	**0.056**	**0.023**	**0.006**
v_4	-0.161	-0.139	-0.123	-0.110	-0.094	-0.099	-0.070	-0.164
	0.260	0.326	0.385	0.434	0.505	0.479	0.620	0.236
v_5	-0.172	-0.133	-0.121	-0.116	-0.117	-0.097	-0.124	**-0.238**
	0.227	0.347	0.393	0.407	0.406	0.488	0.378	**0.083**
v_{10}	-0.057	-0.009	0.006	0.009	-0.005	0.027	0.029	-0.166
	0.689	0.949	0.964	0.951	0.974	0.851	0.835	0.231
v_{20}	0.079	0.075	0.112	0.120	0.134	0.118	0.064	0.053
	0.583	0.598	0.428	0.393	0.338	0.399	0.649	0.704

Table 6.5: Levels and Changes in Short Interest

Descriptive statistics (mean, minimum, maximum, median and standard deviation) for the relative measure of short interest for the sub-samples of equity and debt-like convertibles. The relative short interest is defined as $Z_{i,t} = \frac{ss_i}{n_i^b \cdot cr_i}$, where $Z_{i,t}$ represents the relative short sales (interest) measure for company i at time t (t=0 is the short interest reporting period at the announcement date of the issue), $ss_{i,t}$ represents number of shorted shares of issuer i at time t, n_i^b denotes the number of issued bonds of issuer i and cr_i denotes the conversion ratio of the issue i. Δ_i denotes the delta value of the issue.
***, ** and * denote significance at the level below 1, 5 and 10% respectively. Under the null means are equal to zero.

Panel A: Relative Short Interest for the Sub-ample of the More Equity-like Issues ($Z_{\Delta_i>0.5,t}$)

period	N	mean	min	max	median	sd
t=-2	17	0.037	0.000	0.270	0.013	0.066
t=-1	17	0.045	0.000	0.269	0.013	0.074
t=0	17	0.107	0.000	0.368	0.061	0.117
t=1	17	0.205	0.000	0.664	0.135	0.211
t=2	17	0.250	0.001	0.780	0.158	0.252
t=3	17	0.272	0.000	0.800	0.218	0.258
t=4	17	0.306	0.000	0.952	0.194	0.309
t=5	17	0.333	0.000	1.128	0.249	0.335
t=6	17	0.345	0.000	1.119	0.236	0.342
t=7	17	0.375	0.000	1.320	0.240	0.394
t=8	17	0.354	0.000	0.971	0.246	0.343
t=16	17	0.316	0.007	0.788	0.254	0.269
t=24	17	0.285	0.010	0.813	0.210	0.250

Panel B: Relative Short Interest for the Sub-sample of the More Debt-like Issues ($Z_{\Delta_i<0.5,t}$)

period	N	mean	min	max	median	sd
t=-2	40	0.086	0.000	0.770	0.011	0.172
t=-1	40	0.093	0.000	0.598	0.016	0.160
t=0	40	0.110	0.000	0.587	0.023	0.165
t=1	40	0.100	0.000	0.633	0.021	0.163
t=2	40	0.097	0.000	0.602	0.026	0.160
t=3	40	0.076	0.000	0.578	0.031	0.132
t=4	40	0.091	0.000	0.640	0.039	0.154
t=5	40	0.092	0.000	0.545	0.042	0.137
t=6	40	0.094	0.000	0.551	0.043	0.142
t=7	40	0.087	0.000	0.557	0.051	0.124
t=8	40	0.087	0.000	0.546	0.055	0.123
t=16	40	0.140	0.001	0.999	0.077	0.192
t=24	40	0.131	0.000	0.478	0.057	0.147

Panel C: Difference in Means Between the Sub-samples; under the alternative hypothesis $Z_{\Delta_i>0.5,t} > Z_{\Delta_i<0.5,t}$

Period	diff. in means	95% conf. int.		t	
t=-2	0.049	-0.014	0.113	1.563	
t=-1	0.049	-0.014	0.111	1.565	
t=0	0.002	-0.075	0.080	0.060	
t=1	-0.104	-0.222	0.014	-1.818	**
t=2	-0.153	-0.290	-0.016	-2.307	**
t=3	-0.196	-0.334	-0.058	-2.966	***
t=4	-0.215	-0.379	-0.050	-2.725	***
t=5	-0.241	-0.417	-0.065	-2.874	***
t=6	-0.251	-0.431	-0.072	-2.929	***
t=7	-0.288	-0.493	-0.082	-2.950	***
t=8	-0.267	-0.446	-0.087	-3.123	***
t=16	-0.176	-0.324	-0.028	-2.446	**
t=24	-0.154	-0.289	-0.020	-2.380	**

Panel D: Between Periods Changes in the Relative Short Interest for the Sub-sample of the More Equity-like Issues ($dZ_{\Delta_i>0.5,t} = Z_{\Delta_i>0.5,t} - Z_{\Delta_i>0.5,t-1}$)

period	N	mean	min	max	median	sd
t=-1	17	0.008	-0.015	0.109	0.000	0.029
t=0	17	0.063	-0.002	0.228	0.054	0.069
t=1	17	0.097	0.000	0.328	0.070	0.103
t=2	17	0.045	-0.008	0.153	0.020	0.053
t=3	17	0.022	-0.027	0.105	0.007	0.036
t=4	17	0.034	-0.105	0.457	0.001	0.122
t=5	17	0.027	-0.016	0.175	0.005	0.049
t=6	17	0.012	-0.064	0.066	0.008	0.031
t=7	17	0.030	-0.166	0.647	0.000	0.166
t=8	17	-0.021	-0.393	0.038	0.000	0.097

Panel E: Between Periods Changes in the Relative Short Interest for the Sub-sample of the More Debt-like Issues ($dZ_{\Delta_i<0.5,t} = Z_{\Delta_i<0.5,t} - Z_{\Delta_i<0.5,t-1}$)

period	N	mean	min	max	median	sd
t=-1	40	0.007	-0.358	0.306	0.001	0.079
t=0	40	0.017	-0.186	0.251	0.001	0.071
t=1	40	-0.009	-0.379	0.320	0.000	0.091
t=2	40	-0.003	-0.560	0.330	0.000	0.117
t=3	40	-0.021	-0.486	0.040	0.000	0.087
t=4	40	0.015	-0.041	0.348	0.000	0.059
t=5	40	0.001	-0.537	0.342	0.000	0.105
t=6	40	0.002	-0.074	0.114	0.000	0.032
t=7	40	-0.007	-0.418	0.127	0.000	0.077
t=8	40	0.000	-0.123	0.053	0.000	0.030

Table 6.6: Convertible Arbitrage Returns

Cumulative average daily returns of convertible arbitrage (R_t), convertible bonds and stocks for the sub-samples of the more equity ($\Delta_i > 0.5$) and the more debt-like ($\Delta_i < 0.5$) convertibles at the different periods following the issue. The reference date for the accumulation of the returns is the issuance date of the bond (t=0).

***, ** and * denote significance at the level below 1, 5 and 10 percent respectively. Under the null means are equal to zero.

Panel A: Returns for the Sub-sample of the More Equity-like Issues ($\Delta_i > 0.5$)

		Convertible Arbitrage			Convertible Bond			Stock		
period	N	**mean**	**median**	**sd**	**mean**	**median**	**sd**	**mean**	**median**	**sd**
t=1	12	0.039 **	0.010	0.073	0.008 **	0.005	0.013	-0.006	0.000	0.013
t=5	12	0.033 **	0.024	0.053	0.017 ***	0.013	0.020	0.007	0.008	0.033
t=10	12	0.052 **	0.038	0.083	0.036 ***	0.029	0.032	0.021	0.009	0.062
t=15	12	0.075 ***	0.072	0.070	0.048 ***	0.048	0.045	0.046 *	0.042	0.094
t=20	12	0.062 *	0.071	0.148	0.063 ***	0.058	0.061	0.058 **	0.081	0.110
t=40	12	0.177 ***	0.164	0.129	0.070 ***	0.067	0.086	0.015	0.062	0.183
t=60	12	0.125 **	0.092	0.162	0.043	0.048	0.139	-0.008	0.042	0.282
t=120	12	0.214 **	0.134	0.299	0.022	0.048	0.142	-0.132 *	-0.157	0.261
t=240	12	0.338 ***	0.214	0.358	-0.085	0.049	0.333	-0.344 **	-0.253	0.656

Panel B: Returns for the Sub-sample of the More Debt-like Issues ($\Delta_i < 0.5$)

		Convertible Arbitrage			Convertible Bond			Stock		
period	N	**mean**	**median**	**sd**	**mean**	**median**	**sd**	**mean**	**median**	**sd**
t=1	40	0.006 ***	0.004	0.012	0.005 ***	0.002	0.010	-0.002	0.000	0.013
t=5	40	0.013 ***	0.013	0.019	0.011 ***	0.013	0.012	0.004	0.006	0.040
t=10	40	0.016 ***	0.016	0.018	0.019 ***	0.021	0.016	0.016 ***	0.009	0.035
t=15	40	0.023 ***	0.023	0.019	0.027 ***	0.027	0.019	0.018 ***	0.019	0.046
t=20	40	0.023 ***	0.024	0.021	0.029 ***	0.031	0.023	0.020 **	0.019	0.055
t=40	40	0.035 ***	0.031	0.038	0.045 ***	0.044	0.044	0.041 ***	0.044	0.093
t=60	40	0.037 ***	0.042	0.065	0.050 ***	0.057	0.065	0.053 ***	0.054	0.096
t=120	40	0.060 ***	0.057	0.082	0.090 ***	0.081	0.083	0.071 ***	0.085	0.149
t=240	40	0.107 ***	0.083	0.125	0.158 ***	0.130	0.148	0.092 **	0.105	0.251

Panel C: Difference in Means Under the Alternative Hypothesis: $R_{\Delta_i>0.5} > R_{\Delta_i<0.5}$

	Convertible Arbitrage		Convertible Bond		Stock	
period	**diff. in means**	**t**	**diff. in means**	**t**	**diff. in means**	**t**
t=1	-0.033	-1.542 *	-0.003	-0.791	0.004	0.837
t=5	-0.021	-1.335	-0.006	-1.073	-0.003	-0.246
t=10	-0.036	-1.486 *	-0.016	-1.665 *	-0.006	-0.293
t=15	-0.052	-2.581 **	-0.022	-1.601 *	-0.028	-1.018
t=20	-0.038	-1.209	-0.034	-1.901 **	-0.038	-1.155
t=40	-0.142	-3.773 ***	-0.025	-0.983	0.026	0.472
t=60	-0.087	-1.826 **	0.007	0.180	0.061	0.737
t=120	-0.153	-1.756 *	0.068	1.575 *	0.204	2.582 **
t=240	-0.231	-2.194 **	0.243	2.453 **	0.436	2.255 **

Table 6.7: Convertible Arbitrage and Equity Returns

Returns on convertible arbitrage performance index (HEDG CA), convertible arbitrage in the sample (CA sample), MSCI World Stock Index and S&P 500 index. Data is provided by CSFB/Tremont HedgeIndex (http://www.hedgeindex.com). Note that year in the convertible arbitrage returns of the sample refers to the year of the convertible bond issue.

Year	**HEDG CA**	**CA sample**	**MSCI World Index**	**S&P 500**
2005	-3.48%		7.61%	4.88%
2004	1.98%	15.97%	15.25%	10.88%
2003	12.90%	11.02%	33.76%	28.68%
2002	4.05%	16.64%	-19.54%	-22.10%
2001	14.58%	27.81%	-16.52%	-11.89%
2000	25.64%		-12.92%	-9.10%
1999	16.04%	55.23%	25.34%	21.04%
1998	-4.41%	-3.83%	24.80%	28.58%
1997	14.48%		16.23%	33.36%
1996	17.87%		14.00%	22.96%
1995	16.57%		21.32%	37.58%
1994	-8.07%		5.58%	1.32%

Table 6.8: Delta and the Mispricing

Mean values of delta (Δ_0) and the mispricing (e_0 at the issuance date of the convertible bond across the years of the issue.

Year	Δ_0	e_0
1998	0.453	0.072
1999	0.363	0.181
2001	0.524	0.276
2002	0.243	0.129
2003	0.148	0.061
2004	0.068	0.047

Figure 6.1: Returns on Convertible Arbitrage, Convertible Bonds and Stocks

Cumulative average convertible bond returns, raw stock price returns and convertible arbitrage returns for convertible arbitrage portfolio as defined in equation (6) for the sub-samples of equity-like and debt-like convertibles.

Equity-like Convertibles ($\Delta_i > 0.5$)

Debt-like Convertibles ($\Delta_i < 0.5$)

6.B Appendix: Tsiveriotis and Fernandes (1998) pricing model (TF)

6.B.1 The Model

Although convertible bonds (CBs) consist of two parts, a straight bond and a call option on the underlying equity, multiplicity of terms (callability by the issuers, putability by the holder, early conversion, etc.) makes it difficult to disentangle the stock option part and the straight bond part. As TF point out, CBs *"can only be accurately valued only by simultaneous pricing of the equity and fixed-income part."* TF continue by recognizing that CB components have different default risks. The total value of a CB (let us denote this as M) can therefore be decomposed in an equity part and a straight debt part (so-called Cash Only part of a Convertible Bond - COCB). The holder of the hypothetical COCB (let us denote this as Ω) receives all the cash flows, but no equity flows. Since the COCB is risky, the valuation model must account for the the relevant risk - the issuer's risk or the credit spread. The difference between the value of the convertible bond and COCB (M - Ω) is the payment in equity. Since the firm can always deliver its own equity, this part can be discounted using the risk-free rate.

TF therefore formulate the CB valuation problem as a system of two coupled Black-Scholes equations (PDE - partial differential equations) for the value of the bond (M) and the value of the COCB (Ω):

$$M : \frac{\partial M}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 M}{\partial S^2} + r_s S \frac{\partial M}{\partial S} - r(M - \Omega) - (r + r_c)\Omega + f(t) = 0, \tag{6.7}$$

$$\Omega : \frac{\partial \Omega}{\partial t} + \frac{1}{2}\sigma^2 S^2 \frac{\partial^2 \Omega}{\partial S^2} + r_s S \frac{\partial \Omega}{\partial S} - (r + r_c)\Omega + f(t) = 0, \tag{6.8}$$

where S is the price of the underlying stock, r is the risk free rate, r_s is the growth rate of the stock, r_c is the credit spread that reflects the default risk and f(t) refers to prespecified external cash flows in cash or equity (e.g. dividends, coupons). TF assume that f(t) refers to cash flows only.

To estimate the value of the CB the system of the two PDEs needs to be solved for. The value of the COCB is determined by the convertible bond price, the underlying stock price and the time to maturity, since these so-called early exercise parameters define the boundary conditions. In other words, since early call, put or conversion is possible, the stock prices that trigger these events represent the so-called free boundaries that affect the COCB and CB values. TF therefore define the following final and boundary conditions.

Consider a CB maturing at time T, which is at any time convertible into shares of the underlying stock S, pays a principal F at the maturity (T) if not converted and pays a fixed coupon c at times t. CB can also be callable by the issuer at a price F_c at any time after T_c

and or putable by the holder for an amount of F_p at any time after T_p. Final conditions at expirations:

$$M(S,T) = max(aS, F), \tag{6.9}$$

$$\Omega(S,T) = max(F, 0), \tag{6.10}$$

where a is the conversion ratio. Upside constraints due to conversion are:

$$M \geq aS \text{ for } t \in [0,T], \tag{6.11}$$

$$\Omega = 0 \text{ if } M \leq aS \text{ for } t \in [0,T], \tag{6.12}$$

Upside constraints due to callability are:

$$M \leq (F_c, aS) \text{ for } t \in [T_c, T], \tag{6.13}$$

$$\Omega = 0 \text{ if } M \geq F_c \text{ for } t \in [T_c, T], \tag{6.14}$$

Here, it is assumed that the holder has the right to convert if the issuer calls the bond. Downside constraints that arise because of the putability option that can be given to the holder:

$$M \geq F_p \text{ for } t \in [T_p, T], \tag{6.15}$$

$$\Omega = F_p \text{ if } M \leq F_p \text{ for } t \in [T_p, T]. \tag{6.16}$$

Given the final and the boundary conditions, the convertible bond price is obtained using the binomial tree approach. First, the binomial tree is expanded for the given number of steps between the time 0 and T (maturity of the bond). At each of the nodes the stock prices are established. We then start calculating the convertible bond prices from the maturity date backwards, given the stock prices and the final and the boundary conditions. When the stock price is such that the conversion value is higher than the face value of the bond, the convertible bond price is equal to the conversion price at the given stock price (aS). In this case the value of the convertible bond is discounted for one period (back) at the risk-free rate (r), as explained earlier. When the stock price is such that the conversion value is lower than the face value of the bond, the CB "behaves" like a straight bond, so the value of the CB is discounted for one period (back) at the risky rate, which is equal to the risk-free rate (r) plus the credit spread (r_c). At each of the points in time greater or equal to T_c and T_p callability and putability features are also accounted for in order to obtain CB model prices. The process is iteratively repeated until the start date is reached and the value of the CB at that date established.

6.B.2 Inputs

In order to calculate the theoretical (model) price of a convertible bond we use the following inputs. For the risk-free rate we use the yield on government bonds (Canadian) of comparable maturity as the convertible bond. A static spread is used to correct for the credit risk of the issue. Where the data on credit risk (credit rating of the issue) are not available, we assumed that the company is of the BBB risk. In Datastream only Scotia Capital provides Canadian corporate bond benchmarks for different maturities and different credit ratings. They cover BBB, A and AA rankings of short, medium and long term. Based on the maturities we have extrapolated the following maturities: 1 year (equivalent to short term), 3 years (between short and medium term), 5 years (medium term), 7 years (between medium and long term), 10 years and more (long term). Based on the rankings, we have also extrapolated the rankings lower than BBB (BB and B) by adding a spread to BBB. This spread is relative to the spread between BBB and A, but is increasing in a lower credit quality and maturity. The price of the underlying stock at the valuation date is taken from Datastream, where we take the average stock price between days -12 and -2 relative to the announcement date of the issue. The number of steps in the tree is equal to the number of months to maturity at the issue of the bond. The coupon rate, the number of coupons per year, conversion ratio and call schedule are all obtained from the respective prospectuses of the bonds. With respect to the dividend information, we obtained dividend yield data from Datastream.

Chapter 7

Conclusion

In this thesis we investigated two issues, the use of convertible debt by Canadian companies and the security issuance choice in the Canadian market.

In Chapter 2 we summarized and reviewed the most relevant up to date literature on the motives for the issuance of convertible debt. Although the evidence is far from being conclusive and unanimous as to why companies choose to issue convertible debt and how these motives affect investor reactions to convertible debt issue announcements, there are some findings common to all the empirical research. First of all, the wealth effects associated with the announcements of the convertible debt announcements are generally negative and in between those for straight debt and equity. Secondly, convertible debt can be structured to be either more debt- or equity-like. Convertible issues that are more equity-like induce stock market responses at the issue announcements closer to those, documented for equity issues. This is consistent with the adverse selection model of Myers and Majluf (1984). Thirdly, empirical research has documented consistent support only for Stein's (1992) delayed equity motive and Kim's (1990) signaling theory. To a large extent surveys reveal that managers still find a lower coupon rate of convertible debt as an important argument for its issuance, although the importance of this motive varies over time. Given that convertibles include a conversion feature (that comes at a price), a view that convertibles are a cheaper source of financing than straight debt is deceptive. The same is true for the practitioners' view that convertibles provide means of selling the equity at a premium. Surveys therefore show that managers base their decisions (or at least so they claim) on irrational motives. There are two possible explanations for the different outcomes of the survey and cross-sectional studies. The first explanation is that the surveys are sensitive to the question contents. Therefore they may not yield reliable results. It is often argued that "managers act smarter than they speak". Therefore they may follow rational motives, without being aware of this. The second explanation is that the proxies in the cross-sectional studies may be weak. For example, it is very hard to measure a concept of informational asymmetry using only stock market and/or accounting data.

In Chapter 3 we analyzed the size and determinants of wealth effects associated with the announcements of convertible debt offerings on the Canadian market in the period between 1991 and 2004. Similarly to previous research for other markets, in particular the U.S., we find a significant negative wealth effect associated with the announcement date of convertible debt offerings. This effect is significantly more negative for equity-like convertibles than for debt-like. Contrary to the results for the U.S. market we find the distribution of the delta (a measure which reflects convertible bond design) to be bimodal. Canadian companies started issuing predominantly debt-like convertibles after 2000. This switch coincides with the increased popularity of conversions of the businesses into income trusts. We find support for the hypotheses related to the negative impact of equity-related agency costs on the size of the wealth effect. In particular, we find that the determinants of the size of the wealth effects reflect the hybrid nature of convertible debt, where convertible debt issues can be structured to be either more debt- or equity-like. More specifically, we show that proxies for agency costs of equity negatively affect abnormal returns associated with the issue of more equity-like convertibles, while they do not significantly affect wealth effects associated with the more debt-like convertible issues. The opposite holds for the agency costs of debt, albeit the evidence is much weaker then in the case of equity-related agency costs. The results are robust across different specifications and use of different measures to classify convertible bond issues into more debt- or more equity-like. After controlling for convertible debt design we find no evidence that income trusts as particular organizational structure affect these results. Relating the determinants of the wealth effects to the motives for the use of convertible debt we find evidence that convertibles in the Canadian market used to be mostly a substitute for equity (as proposed by Stein, 1992), but were also used as a sequential financing device, where the straight debt nature of the convertible is used as a commitment device for managers (Mayers, 1998). Lately however, when convertible issues in Canada shifted towards more debt-like design, the role of convertibles has become less clear.

In Chapter 4 we turned to the security issuance decision, where we looked into the determinants of security issuance decision in the Canadian market in a period between 1998 and 2004. Our focus was on the external financing in the public market (equity, straight debt, convertible debt and the share repurchases). We used a comprehensive set of accounting and market variables to revisit capital structure theories - market timing, pecking-order and agreement between insiders and outsiders. Overall, we found strong and consistent evidence that overvaluation leads companies to choose equity over debt. This gives support to the market timing argument for issuing equity. The striking finding about market timing is that despite the less negative announcement period returns of equity issuers with high market-to-book ratios, the long-run performance of those issuers is much weaker than that of issuers with low market-to-book ratios. This is consistent with previous findings on market timing

(e.g., Baker and Wurgler, 2002; Gomes and Philips, 2005), but in contrast to Jung et al. (1996) who refute market timing on the basis of the finding that the announcement excess returns are decreasing in the firms' market-to-book ratios. Our results also provide support for pecking-order explanation of capital structure. However, there is a dual nature of equity issuers. Small equity issuers tend to time the market, while the largest equity issuers seem to issue equity as a result of "pecking-order behavior". We find no evidence that companies issue equity when the agreement between outside investors and insiders is high (Dittmar and Thakor, 2007). At the very least, this finding suggests that the conclusion that firms with high levels of information asymmetry or disagreement between insiders and outsiders prefer equity issue is not robust to different capital markets. Finally, small differences between straight debt and convertible debt issuers suggest that few firms that issue convertible debt do so to "sweeten" the deal. We also find some evidence that is consistent with Mayers' (1998) proposition on the sequential financing role of convertible debt, where the agency costs of issuing equity could prove to be extremely high and companies issue convertible debt to mitigate these costs.

In Chapter 5 we analyzed changes in short interest following the announcements of security issues (withdrawals). We use the relative changes in short interest, together with the (over)valuation and financial constraint proxies to test the market timing and the pecking-order theories of capital structure. We find significant increases in short interest for equity and convertible bond issuers, no significant changes for straight bond issuers and some significant decreases for share repurchasers. We also find consistent evidence to support the market timing explanation of the capital structure. Since the issuers and the investors perceive hot and cold equity markets differently, we investigate the determinants of short interest in hot and cold equity market periods separately. In hot equity issuance markets we observe an increase and reversion in the short interest for equity issuers, while the reversion in cold equity markets is much lower. In addition, investors do not seem to consider the degree of financial constraint of the issuer in hot equity markets, as they do in cold equity markets. This has several implications. Firstly, we show that investors perceive equity issue announcements and issuers' characteristics differently in hot and cold equity issuance markets. In hot equity markets most of the attention is focused on overvaluation aspects, while no or limited attention is put on a degree of financial constraint. This is not the case in cold equity markets, where more financially constrained equity issuers experience less of the increase in short positions (even after we control for the size or limits to arbitrage in the short interest market). This implies either some degree of difficulty discerning among different equity issuers in hot equity markets (due to easier mimicking and bunching of the issuers) or lack of rational behavior in the case or market frenzies (herding). Overall, we see these results as evidence in support of the market timing and the pecking-order hypothesis of capital structure. Secondly, we find both positive and negative relationship between changes

in short interest and stock returns, in particular in hot equity markets. This provides evidence for both, Diamond and Verrechia's (1987) "negative information content" and the popular "Wall Street" reversion explanation. Moreover, given the differences between convertible bonds and equity issues, it is clear that persistence in short interest (as is the case for convertible bonds) also provides evidence for the view that short interest to a certain degree does not have information content to be transmitted into stock prices. We are able to find this by looking at different cross-sections of changes of short interest, as the negative relationship between short interest and stock returns is contemporaneous, while the positive relationship is based on the lagged effect.

Finally, in Chapter 6 we turned back to convertible bonds and studied determinants of convertible bond arbitrage and its effect on capital markets and its participants. This strategy is aimed at exploiting the underpricing of convertible bonds. It consists of taking a long position in the convertible bond and a short position in the underlying asset into which the bond can be converted. The underlying asset is typically a stock of the company that issues the convertible bond. Convertible arbitrage mostly takes place by hedge funds, which do not report their holdings. For this reason we have to rely on indirect evidence to first identify convertible arbitrage activities. Several pieces of evidence are presented for convertible arbitrage. First, we find that the convertible bonds are underpriced. Second, we find that short positions in the underlying stocks strongly increase around the issuance date. Both effects are stronger for equity-like than for debt-like convertible bonds. In addition, we argue that "arbitrage" increases in short positions negatively affect abnormal returns around the issue date of convertibles. This has important negative implications for both, shareholders and existing debtholders of the issuing companies. Finally, when examining the returns of convertible bond arbitrage strategies, we find that the equity-like convertible bonds have earned much higher returns than the debt-like convertible bonds. This difference is approximately 23 percentage points during the first year following the issue. Returns on the convertible arbitrage strategy strongly decrease towards the end of the sample period. This is mostly caused by the fact that convertible bond issues and issuers became more debt-like compared to the early years in our sample. This is, of course, not surprising. The high returns of the hedge funds came at the expense of the companies issuing convertible bonds. In order to cap their losses, they apparently either switched to issuing less underpriced debt-like convertible bonds and or they moved out of the convertible bond market altogether.

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Nederlandse Samenvatting (Dutch Summary)

In dit proefschrift staat centraal het gebruik van converteerbare obligaties door Canadese ondernemingen. In het eerste deel van het proefschrift wordt de aandacht gericht op het gebruik van converteerbare obligaties door Canadese ondernemingen. Een converteerbare obligatie is een vermogenstitel die kan worden omgeruild voor een vooraf vastgesteld aantal aandelen van de onderneming binnen een vooraf vastgestelde periode. In essentie is een converteerbare obligatie een combinatie van een standaard obligatie en warrants geschreven op de aandelen van de onderneming. De vraag waarom ondernemingen converteerbare obligaties uitgeven heeft in het verleden veel aandacht gekregen. In de praktijk worden converteerbare obligaties gezien als een uitgestelde uitgifte van aandelen. Bovendien beargumenteert men dat de lagere coupon rente ten opzichte van een niet converteerbare obligatie, een reden is om ze uit te geven. Aan de andere kant hebben academici theorien voorgesteld die het gebruik van converteerbare obligaties relateren aan asymmetrische informatie, conflicterende belangen en belasting motieven. Dergelijke theorien suggereren in het algemeen dat ondernemingen die te maken hebben met hoge kosten van conflicterende belangen, die zijn gerelateerd aan het gebruik van eigen of vreemd vermogen, kunnen profiteren van converteerbare obligaties, in plaats van aandelen of obligaties.

De theoretische en empirische literatuur aangaande de motieven voor de uitgifte van converteerbare obligaties wordt samengevat in Hoofdstuk 2. Er blijkt in de literatuur een forse discrepantie te bestaan tussen theorie en praktijk. Interviews met managers tonen aan dat managers de keuze voor het uitgeven van converteerbare obligaties baseren op irrationele factoren volgens de theoretische literatuur. De theoretische literatuur daarentegen verschaft enkele rationele motieven. Dergelijke motieven zijn gebaseerd op het oplossen van problemen met asymmetrische informatie, conflicterende belangen, en belasting motieven. De meeste rationele theorien zijn onderzocht met behulp van cross-sectionele studies, die in het algemeen bepaalde theorien ondersteunen. Echter, interviews met managers resulteren in beperkte ondersteuning van rationele motieven. Dit kan het gevolg zijn van de wijze waarop de vragen zijn geformuleerd, het gebruik van zwakke instrumenten in cross-sectionele studies of

een combinatie van beide.

In Hoofdstuk 3 wordt het effect bestudeerd van het aankondigen van een emissie van converteerbare obligaties in de Canadese markt. Het gemiddelde vermogenseffect voor een 3-daagse periode rond de aankondiging van converteerbare obligaties, uitgegeven tussen 1991 en 2004, bedraagt een significante -2.7%. Wanneer de emissies worden geklassificeerd als meer gelijkend op eigen of vreemd vermogen, dan vinden we dat dat de vermogenseffecten significant negatiever zijn voor uitgiftes die meer op eigen vermogen lijken. Dergelijke converteerbare obligaties worden significant negatief beinvloed door de kosten van conflicterende belangen in geval van eigen vermogen. Echter, de kosten die corresponderen met vreemd vermogen hebben geen significant effect op converteerbare obligaties die lijken op eigen vermogen en vice versa voor converteerbare obligaties die lijken op vreemd vermogen. Deze resultaten suggereren dat converteerbare obligaties worden gebruikt om verschillende aspecten van asymmetrische informatie te mitigeren en zijn in lijn met de motieven zoals voorgesteld in Stein (1992) en Mayers (1998). Daarnaast zien we een verschuiving in het type converteerbare obligaties naar converteerbare obligaties die meer op vreemd vermogen lijken. Deze ontwikkeling valt samen met de populariteit van de verandering van Canadese ondernemingen naar income trusts. Echter, wanneer we controleren voor het type converteerbare obligaties en andere determinanten van vermogenseffecten, dan vinden we geen significante verschillen die kunnen worden toegeschreven aan deze bedrijfsstructuur. In het tweede deel van het proefschrift wordt de uitgiftebeslissing in de Canadese markt geanalyseerd. Deze beslissing is een van de belangrijkste financiele beslissingen van de onderneming op de lange termijn. Ten eerste heeft het een sterke invloed op aandelenrendementen omdat verschillende type vermogentitels verschillende informatie onthullen aan de markt - aandelenemissies induceren bijvoorbeeld een sterk negatief rendement op het moment van aankondiging. Ten tweede, het beinvloedt de relatie en incentives van verschillende belanghebbenden (managers, aandeelhouders, verschaffers van vreemd vermogen) binnen de onderneming, maar ook tussen partijen binnen en buiten de onderneming. Ten derde, het bepaalt het investeringsbeleid van ondernemingen - eigen vermogen geeft bijvoorbeeld meer flexibiliteit in het nemen van risico's. Het belang van emissiebeslissingen wordt ook duidelijk uit interviews met managers, waarin managers aangeven financiele flexibiliteit, het verwateren van earnings en recente aandelenrendementen als belangrijkste argumenten te zien. De emissiebeslissing is in essentie een vermogensstructuur beslissing. In het verleden zijn verschillende verklaringen gesuggereerd over het hoe en wanneer managers leverage verhogen of verlagen, zoals het pecking-order model, het market timing model en de mate van overeenstemming tussen mensen binnen en buiten de onderneming.

In Hoofdstuk 4 onderzoeken we de emissiebeslissingen in de Canadese markt in de periode tussen 1998 en 2004. In het bijzonder wordt onderzocht welke factoren deze emissiebeslissing be?nvloeden. We richten ons op externe financiering in de publieke markt (aandelen,

vreemd vermogen, converteerbare obligaties en inkoop van eigen aandelen). We beschouwen een aantal theorien voor de financieringsstructuur - market timing, pecking order en de mate van overeenstemming tussen mensen binnen en buiten de onderneming. We vinden sterk en consistent bewijs voor het feit dat overwaardering van de aandeelprijs bepaalt dat ondernemingen aandelen uitgeven, in plaats van vreemd vermogen. Dit ondersteunt het market timing argument voor het uitgeven van aandelen. Het is consistent met eerdere bevindingen aangaande market timing (e.g., Baker and Wurgler, 2002; Gomes and Philips, 2005), maar contrasteert met Jung et al. (1996) die market timing weerleggen op basis van het resultaat dat de buitengewone rendementen rond aankondigingen negatief gecorreleerd zijn met de market-to-book ratios van de ondernemingen. Nadat we corrigeren voor de omvang van de onderneming, vinden we steun voor de pecking-order theory. We vinden geen bewijs dat ondernemingen aandelen uitgeven wanneer de mate van overeenstemming tussen investeerders binnen en buiten de onderneming hoog is (Dittmar en Thakor, 2007). Dit suggereert op zijn minst dat de conclusie, dat ondernemingen met veel asymmetrische informatie of onenigheid tussen partijen binnen en buiten de onderneming aandelen prefereren, niet robuust is in verschillende kapitaalmarkten.

In Hoofdstuk 5 gebruiken we veranderingen in de short posities na de aankondiging van een emissie (inkoop) om de market timing en de pecking-order theorie, te onderzoeken. We vinden een significante toename in de short posities voor ondernemingen die aandelen en converteerbare obligaties uitgeven. Verder vinden we geen significante veranderingen voor ondernemingen met vreemd vermogen en een significante verlaging voor ondernemingen die aandelen terugkopen. Belangrijker, we bekijken het effect van (over)waardering en proxies voor financiele restricties op veranderingen in de short posities om de market timing en de pecking order theorie te testen. We doen dit onafhankelijk voor zogenaamde hot en cold equity markets, omdat de literatuur suggereert dat ondernemingen en investeerders zich dan anders gedragen. We vinden bewijs voor beide theorien. Ten tweede, we vinden zowel positieve als negatieve relaties tussen veranderingen in de short posities en aandelenrendementen, in het bijzonder voor hot equity markets. Dit geeft bewijs voor zowel Diamond en Verrechia's (1987) "negative information content" als de populaire "Wall Street" reversion verklaring.

Tenslotte, in Hoofdstuk 6 bekijken we wederom converteerbare obligaties en analyseren convertible arbitrage, een van de meest succesvolle hedge fund strategien. We identificeren allereerst convertible arbitrage activiteiten. We vinden dat converteerbare obligaties ondergewaardeerd zijn op het moment van uitgifte. Tegelijkertijd nemen de short posities van het onderliggende aandeel significant toe. Beide effecten zijn sterker voor converteerbare obligaties die meer op aandelen dan op obligaties lijken. Ondanks het feit dat de convertible arbitrage strategie een positief effect heeft op de liquiditeit van de onderliggende instrumenten, vinden we tevens dat de short posities een negatief effect hebben op aandeelhouders en bestaande obligatiehouders. Het blijkt dat, over een 1-jaars periode na emissie, conver-

teerbare obligaties die op aandelen lijken 20% procent punten meer rendement genereren dan converteerbare obligaties die op obligaties lijken. In de recente jaren zijn de rendementen op de convertible arbitrage strategie sterk afgenomen, ondermeer omdat ondernemingen meer converteerbare obligaties hebben uitgegeven die op obligaties in plaats van aandelen lijken.