DEATH SPIRAL CONVERTIBLES

by

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ABSTRACT

Floating-priced convertibles, known as "death spirals," are privately held convertible securities with a conversion price set at a discount from the average of past stock prices in a look-back period. The issuance of floating-priced convertibles is followed by significant negative abnormal returns. Two alternative hypotheses are explored. The "faulty contract hypothesis" argues that the contract design encourages short-selling by the convertible holders and other professional short sellers. The selling pressure and the conversion below fair value triggers a permanent decrease in the share price that generates a "death spiral." The "last-resort financing hypothesis" argues that the stock price declines because the stock is overvalued at the time of the issue. Consistent with the faulty contract design hypothesis, the conversion discount is the most important predictor of long-term performance. Consistent with the last-resort financing hypothesis, issuers experience a significant decline in post-issue operating profitability relative to benchmark firms.

Keywords: convertibles, financial innovation, anomalies, capital structure, manipulation, short-selling

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1. Introduction

The goal of the paper is to examine floating-priced convertibles, a financial innovation used by U.S. firms in the second half of the 1990's. A floating-priced convertible is a convertible bond or a convertible preferred stock that allows the holder to convert at a discount from a reference price. The latter is the lowest stock price or the average of a series of past stock prices in a look-back period. Floating-priced convertibles have two important characteristics. First, a typical contract specifies a lock-up period during which conversion is prohibited. Second, once the lock-up period expires, most contracts specify the maximum number of newly issued shares that can be sold in the secondary market as a function of the stock trading volume. These two features guarantee that conversion takes place gradually, and several months after the issue announcement. Issuing a floating-priced convertible is like issuing equity with an issue price determined in the future when the investors are allowed to convert.

From the investor's perspective, the instrument avoids the adverse selection problem described in Myers and Majluf (1984) associated with equity issues or convertibles with a fixed conversion price. To see this, consider a convertible with a nominal value of $ 1000, a 20% discount from the reference price and a look-back period of one day, i.e., a reference price on any given day equal to the closing stock price on this particular day. The investor is indifferent as to whether the stock trades at $ 12.50 or $ 1.25. Upon conversion, the investor receives 100 or 1000 shares, respectively, and receives proceeds equal to $ 1250 in both cases. Long before the existence of floating-priced convertibles, Brennan (1985) argued that making the conversion price float avoids adverse selection problems and the costs of financial distress. As long as the stock price is positive and the company honors the conversion notice, the investor is protected against a fall in the company's stock price[2].

[2] Sometimes, firms in financial distress refuse to file a registration statement, or in more extreme cases, file for Chapter 11. Such resistance is usually followed by contract renegotiation.

From the firm's perspective, the floating-priced convertible has lower costs of financial distress relative to debt and convertible debt with a fixed conversion price. First, interest payments are paid "in kind" by issuing additional convertibles and, in 70 % of the cases where the convertible has a specific maturity date, the remaining outstanding principal is converted into common stock at maturity. Second, at the end of the lock-up period and subject to the volume constraints described supra, investors start converting which lowers the nominal value of the debt. This minimizes the likelihood that the asset value falls below the value of the convertible. Finally, because the conversion option is always in the money, the convertible is protected against attempts to transfer wealth to shareholders through risk-shifting and the issuance of securities of higher seniority (Myers(1977)). For example, if the firm unexpectedly increases the asset volatility by investing in a high-risk low value project, investors would react by converting at a discount and selling the stock. Relative to equity financing, the floating-priced convertible is appropriate for under-valued firms. Rather than issuing equity at a price below fair value, or waiting for the market to become efficient, the firm receives the proceeds now with the issue price determined later, hopefully at a higher level. A floating-priced convertible seems to be an ideal financing technique for companies that cannot issue debt because of high potential costs of financial distress and are reluctant to issue equity because of an undervalued stock price. To the extent that the issue is a signal of under-valuation, the announcement of a floating-priced convertible should be followed by positive abnormal stock returns. This is referred to as the *under-valuation hypothesis*.

Although a potentially useful innovation, especially for risky growth firms, floating-priced convertibles are under intense attack in the financial press. As a result of this critique, the convertibles are commonly referred to as "death spirals"[3]. The critique is the result of casual empiricism where several companies that issued floating-priced convertibles have

[3] The securities are also called "floorless convertibles", "lesser-of-convertibles", "future priced convertibles", "discounted convertibles", "toxic convertibles" or "junk equity." See Friese and Raissi (1999).

experienced spectacular price declines. The argument is that convertible investors have an incentive to sell short the stock prior to conversion. The resulting short-selling pressure may push the stock below “fair value”, especially considering that the typical issuer is a small, thinly traded firm. As conversions take place at prices below fair value, the resulting dilution lowers the underlying value per share. In addition, the potential to lower the fundamental value of the stock when conversions take place below “fair value” attracts professional short-sellers and hedge funds. This hypothesis predicts that issuing firms experience negative abnormal returns after the announcement date. This is referred to as the *faulty contract design hypothesis*.

Investment bankers and others who defend the use of the floating-priced convertibles claim that the issuers have no other alternative. They argue that managers are unable to raise equity or convertibles with a fixed conversion price because the stock is over-valued. The subsequent price decline reflects the fact that the market gradually discovers the poor operating performance of the issuer. The issuing firm, rather than the instrument, is a source of concern and floating-priced convertibles help companies survive in difficult times. Because the stock is over-valued at the time of the issue, this hypothesis predicts that issuing firms experience negative abnormal returns after the announcement date. Compared to the faulty contract design hypothesis, it also predicts that measures of operating performance decline “abnormally” after the issuance. This is referred to as the *last resort-financing hypothesis*.

The hypotheses are empirically tested using an exhaustive dataset that contains all the floating-priced convertible issues announced after December 1994 and before August 1998, a total of 467 observations. Floating-priced convertible issuers tend to be small, young and risky firms. The empirical evidence suggests that stockholders lose 34 % of their wealth in the year after the issue on average. In 85 % of the cases, the one-year post-announcement returns are negative. This result is especially striking considering that the sample period, January 1995 until December 1999, coincides with one of the strongest bull markets in the U.S. stock market history.

While these results are clearly inconsistent with the under-valuation hypothesis, the empirical evidence supports the two alternative hypotheses. First, the value of the underlying assets, i.e., common stock plus convertibles, falls significantly during the year after the issue. This suggests that the stock price decline is not just a simple wealth transfer from common stockholders to convertible investors. Second, during the years following the issue announcement, operating performance, as measured by return on assets and operating cash flow over assets, declines significantly relative to matching non-issuing firms. Third, poorly performing firms are more likely to issue a floating-priced convertible. These results are consistent with the last resort-financing hypothesis. The empirical evidence also suggests that, after controlling for accounting-based measures of operating performance, one important characteristic of the contract, i.e., the conversion discount, remains a significant determinant of the long-term stock price performance. This finding, combined with the observation that discounts have decreased over time, is consistent with the faulty contract design hypothesis.

The issuance of floating-priced convertibles is followed by a significant decline in shareholder value. Given that the typical issuer is a small company, with significant managerial ownership, a relevant question is why managers approve them. The answer is obvious under the last resort-financing hypothesis. Managers have no other alternative and the floating-priced convertible allows them to buy time and to avoid bankruptcy. Under the faulty design hypothesis, managerial behavior is less straightforward to explain. It could be that the managers did not understand the negative consequences of the issue. Alternatively, the managers may have known about the potential negative consequences but were able to restore their personal wealth by re-pricing their stock options, thereby questioning the effectiveness of the board of directors.

The paper makes several contributions. First, it illustrates the difficulties of designing financial innovations aimed at resolving asymmetric information problems in small risky firms. In theory, a floating-priced convertible is ideal for such firms. In practice, their stocks are illiquid and subject to manipulation by short sellers and hedge funds. This may produce a downward spiral in the stock price. Second, the strong empirical support for the last-resort financing hypothesis suggests that the negative publicity surrounding floating-priced convertibles is misplaced. Many of the firms would have failed earlier without "death spiral" financing. Finally, on the methodological front, the paper proposes a new matching algorithm based on propensity scores to match issuing firms to a suitable control group. Propensity score-sorted groups are suggested as a novel and fruitful technique to investigate abnormal stock returns in long-term event studies.

This paper is organized as follows. Section 2 develops the working hypotheses and empirical predictions. Section 3 describes the dataset. Section 4 documents the issuers' stock price performance and section 5 focuses on their operating performance. Section 6 investigates the relationship between the contract design and the post-issue performance. Section 7 concludes.

2. Hypotheses and Empirical Predictions

The paper considers three hypotheses, the under-valuation hypothesis, the faulty contract design hypothesis and the last-resort financing hypothesis. They are discussed below. For illustrative purposes, the following assumptions are made: (1) zero transactions costs and issue costs, (2) a zero risk-free rate, (3) risk-neutral investors, (4) floating-priced convertibles issued at fair value, (5) issue proceeds invested in zero net-present value risk-free projects, (6) an all equity financed firm before the issue, (7) no dividends or interest paid on any security, (8) no lock-up period, (9) no look-back period, (10) no uncertainty about requests for conversion, (11) immediate delivery of the shares on the conversion date, (12) convertible investors are not allowed to sell short.

The notation is as follows. Let:

- N_0 be the current number of common shares outstanding, prior to the issue announcement.
- F be the face value of the floating-priced convertible bond issue.
- d be the conversion discount, with $d < 1$ and let $d = (1 - d)$.
- P_0 be the current stock price, prior to the issue announcement.
- P_r be the reference price, i.e., the stock price used to calculate the conversion price. At any point in time, it is assumed to be equal to the prevailing stock price.
- P_c be the conversion price equal to: $P_c = dP_r$.
- C_0 be the fair value of the convertible issue equal to: $C_0 = F/d$.

Under the above assumptions, the market value of the firm V_0 after the issue announcement is equal to [4]:

$$V_0 = N_0 P_0 + C_0$$

2.1 The Under-valuation Hypothesis

Assume that before the issue the current market value of equity, i.e., the firm, equal to $S_0 = P_0 N_0$, reflects the market's belief that, with equal probability, the equity value at time 1, S_1, will be equal to S^h or S^l, where $S^h > S_0 > S^l$. The management believes that the shares are undervalued and the equity is worth S^h. Assume the firm is unable to raise debt and the

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[4] For the sake of clarity, the analysis is also illustrated by a numerical example. Let $N_0 = 100$, F =$ 1000, d = 0.2, implying δ = 0.8, and P_0 =$ 12.50. The reference price P_r is assumed to be equal to the prevailing market stock price, i.e., P_r = $ 12.50. This implies a fair value for the convertible equal to C_0 = $ 1250. The convertible holder has the right to convert the bond into 1000/((0.8)(12.50) = 100 shares. Under the assumption that the converted shares are delivered immediately, the investor can sell the shares at $ 12.50 and realize proceeds of $ 1250[4]. The market value of the firm is equal to $2500.

management considers two financing alternatives, a floating-priced convertible or equity with the proceeds invested in a zero net present value project in both cases.

Under the first alternative, the company decides to raise an amount $C_0 = F/d$ by issuing a floating-priced convertible. The assumption regarding the absence of a lock-up period is relaxed. Assume that *investors are not allowed to convert prior to* $t = 1$, *when the true value of the firm is revealed to all market participants.* Two cases are possible:

1. If the management is right, in the good state of the world, the stock price, after the conversion of the bond issue, P^h, is equal to:

$$P^h = \left(S^h + C_0\right) / \left(N_0 + C_0 / P^h\right) \Rightarrow P^h = S^h / N_0 \ . \qquad (1)$$

2. If the management is wrong, in the bad state of the world, the stock price, after the conversion of the bond issue, P^l, is equal to:

$$P^l = \left(S^l + C_0\right) / \left(N_0 + C_0 / P^l\right) \Rightarrow P^l = S^l / N_0 \ . \qquad (2)$$

The convertible holders, who are assumed to be uninformed investors, are indifferent as to whether the fair value equity is S^h or S^l. As discussed above, the value of their claims is independent of the stock price. If the share price is high (low), the firm issues less (more) shares. Stockholders are protected against dilution because of i) the assumption that the issue proceeds are invested in a zero NPV project and ii) the adjustment in the number of shares. The stock price at time 1 would be exactly the same if the firm had not issued the floating-priced convertible.

Under the second alternative, the firm raises the same amount C_0 by issuing C_0 / P_0 new shares at time 0. The stock price at time 1 is equal to

1. $P^{h'}$ in the good state of the world with:

$$P^{h'} = \left(S^h + C_0\right) / \left(N_0 + C_0 / P_0\right) . \qquad (3)$$

This is lower than P^h, as $P^h > P_0$.

2. $P^{l'}$ in the bad state of the world with:

$$P^{l'} = \left(S^{l} + C_0\right)/\left(N_0 + C_0/P_0\right). \quad (4)$$

This is higher than P^l, as $P^l < P_0$ [5].

This suggests that good firms with under-valued shares issue floating-priced convertibles while bad firms with over-valued shares issue equity. Firms issuing equity are assumed to issue shares at P_0. However, in a fully revealing signaling equilibrium, the stock price of equity issuers falls to P^l immediately after the announcement. Bad firms are then indifferent between issuing equity and convertibles, while good firms always issue convertibles. To obtain a separating equilibrium, where good firms issue floating-priced convertibles and bad firms issue equity, the equity issue is assumed to be only "partially" revealing, i.e., the stock price does not fall to immediately to P^l. This partial adjustment is consistent with the long-term negative stock price drift after equity issues documented by Loughran and Ritter (1995).

Note that our analysis focuses on information asymmetry and ignores the costs of financial distress. Without financial distress, a straight debt issue refinanced with an equity issue after the true value of the firm is revealed is equivalent to a floating-priced convertible. In a more realistic setting with costs of financial distress, floating-priced convertibles would dominate debt.

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[5] In the numerical example, the current market value of equity is equal to S_0= \$ 12.50*100=\$ 1250. Assume that the value of the current shares of equity at time 1 is either \$ 2000 or \$ 500 with equal probability. Under the first alternative, convertible debt financing, with F = \$ 1000 and d = 0.2, the firm raises $C_0 =$ \$ 1250. This implies that P^h = (\$ 2000+ 1250)/(100 + 62.50) = \$ 20 and P^l = \$ (500 +1250)/(100 + 250) = \$ 5.0 per share. Under the second alternative, equity financing, the firm raises \$ 1250 by issuing 100 shares at \$ 12.50. This implies that $P^{h'}$ = (2000 +1250)/(100 +100) = \$ 16.25 and $P^{l'}$ = (500+1250)/(100+100) = \$ 8.75.

The under-valuation hypothesis generates two testable implications. First, the issuance of floating-priced convertibles is a positive signal and issuing firms experience positive abnormal returns on the announcement date and possibly afterwards if the market under-reacts. Second, abnormal returns are higher for issues with lock-up periods than without lock-up periods. Indeed, the crucial assumption in our analysis is that good firms want investors to delay the conversion decision until the market becomes more efficient.

2.2 The Faulty Contract Design Hypothesis

The assumption that convertible investors are not allowed to sell short the issuers' common stock is relaxed. One possible explanation for shorting is that it allows convertible investors to hedge the proceeds from the shares received through conversion. The risk stems from a possible drop in the share price in the period of time that elapses between the decision to convert and the receipt of the shares. An alternative explanation is that shorting allows investors to increase their expected returns. As is shown below, this is the case when shorting generates selling pressure.

2.2.1 No selling Pressure

Without selling pressure and with the assumption that the proceeds of the convertible are invested in a zero net present value project, the stock price is expected to remain unchanged at P_0. This implies that $P_r = P_0$ and the conversion price is equal to:

$$P_c = dP_0 \, . \tag{5}$$

Let M denote the number of new shares issued as a result of the conversion, with $M = F/P_c = F/dP_0$. To hedge their position, the convertible holders short M shares and cover their short position with the M shares received through conversion[6].

2.2.2 Selling pressure by bondholders

[6] In the numerical example, with P_0 = \$ 12.50, F = \$ 1000, d =0.2 and d =0.8, it follows that P_c = \$ 10.0 and M = 100.

Selling pressure is introduced next. Note that selling pressure can be quite significant as many issuers are small firms. Its impact on the current stock price is unknown ex-ante. Assume that the convertible holders sell short a number of shares equal to the number of shares sold short under the no selling pressure scenario, i.e., M . In addition, suppose that the selling pressure pushes the stock price down to a value of P_m and the convertible holders short the shares at an intermediary price equal to P_s, with $P_0 \geq P_s \geq P_m$. Under the assumption that the reference price is equal to the current stock price, the reference price is P_m and the conversion price is equal to $P_c = dP_m$. This implies that the convertible holders receive $L = F/dP_m$ shares where $L \geq M$. The value of their claims, assuming they use M shares to cover their short position and sell $(L - M)$ shares in the open market, is equal to

$$MP_s + (L - M)P_m = M(P_s - P_m) + LP_m. \qquad (6)$$

The convertible holders are better off selling short than by converting immediately at $P_c = dP_0$ when:

$$M(P_s - P_m) + LP_m \geq MP_0. \qquad (7)$$

Using the fact that $(L/M) = (P_0 / P_m)$, compared to the no price pressure scenario, the incremental profits obtained by short selling are equal to:

$$M(P_s - P_m). \qquad (8)$$

Hence, the gain to the bondholders is equal to the gain from selling short M shares at P_s and repurchasing them at P_m. This amount is **not** equal to the total loss suffered by the shareholders. To see this more clearly, note that the total number of shares increases to $(N_0 + L)$. The market value of assets is equal to the original asset value $N_0 P_0$ plus the proceeds of the issue, $F/d = MP_0$, giving a total value of:

$$(N_0 + M)P_0. \qquad (9)$$

This implies that the long-term stock price, P^*, once the impact of short-selling has vanished is equal to[7]:

$$\boxed{P^* = [(N_0 + M)/(N_0 + L)]P_0.} \tag{10}$$

The original N_0 stockholders who hold on to their shares lose an amount, ΔW_S, equal to the difference between the market value of equity before and after the issue:

$$\Delta W_s = N_0 P_0 - [(N_0 + M)/(N_0 + L)]N_0 P_0. \tag{11}$$

This can be expressed as:

$$\Delta W_s = N_0 P_0 [(L - M)/(N_0 + L)]. \tag{12}$$

Rearranging, and taking into account the fact that $M = P_m L / P_0$ yields:

$$\Delta W_s = l\,(P_0 - P_m)N_0, \tag{13}$$

where the parameter λ is a dilution factor equal to $L/(N_0 + L)$. This implies a loss per share equal to:

$$\boxed{\Delta W_s / N_0 = l\,(P_0 - P_m).} \tag{14}$$

This shows that, *ceteris paribus*, the loss to the original shareholders is an increasing function of (i) the dilution, as measured by λ, itself a function of the conversion discount d, and (ii) the selling pressure as measured by the difference between P_0 and P_m. Without selling pressure, the size of the discount is irrelevant. The value destruction occurs because the firm is forced (as a result of conversion requests) to issue equity at prices below "fair" value.

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[7] Note that, as a result of the short-selling pressure, just prior to conversion, the stock price is $P_m \le P^*$. In the example, P_0 = \$ 12.5 and M =100. Suppose P_m = \$ 10.0 and P_s = \$11.0. This implies that L = 125 and the value of the convertible holder's claim is equal to \$ 1100 + (25 * 10.0) = \$ 1350. This is to be compared to the proceeds of \$ 1250 obtained by the convertible holders upon conversion. The incremental profit is equal to \$ 100 (11.0 – 10.0) = \$ 100 or \$ 1.0 per share. The long-term stock price P^* is equal to \$ 11.11.

Equation (14) predicts that the discount should be negatively correlated with stock returns. However, equation (8) implies that the incentive to sell short does not depend on the discount. One reason for this apparent inconsistency is the fact that the loss to the original shareholders does not match the gain to the convertible holders. The loss to the common stockholders is uniquely determined by λ, P_0 and P_m, while the gain to the bondholders depends on the proceeds from shorting M shares at P_s. [8]

Another reason for the absence of the discount in equation (8) is that the number of shares shorted, M , is the same as in the no selling pressure hypothesis. Bondholders could make larger profits by anticipating both the selling pressure on the reference price and the resulting dilution and, accordingly, short more than M shares. Under a perfect foresight scenario, the bondholder would short $M + L$, rather than M shares. Under the assumptions this would result in an additional profit, relative to selling in the open market, of $L(P_s - P_m)$. The faulty contract design hypothesis predicts that, c*eteris paribus*, when the discount increases, bondholders short more shares. This conclusion crucially depends on the existence of selling pressure. Without it, bondholders' profits are independent of the discount.

2.2.3 Selling pressure by outsiders

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8 Note that in the example, with N_0 =100, P_0 = \$ 12.50, P_m = \$ 10.0, P_s = \$ 11.0, L =125 and M =100, the dilution factor is equal to $(125/225) = .56$. The loss per share equals \$ (.56) (12.5 – 10.0) = \$ 1.39. The original shareholders own 100 shares and lose \$ 139. Note that this \$ 139 loss is also equal to the loss from selling 125 shares at \$ 10.0, while the true long-term stock price is \$ 11.11. This is larger than the \$ 100 gain made by the bondholders, which is equal to the gain from selling short 100 shares at \$ 11.0 and buying them back at \$ 10.0. The remaining loss of \$ 39 is a wealth transfer to two classes of new shareholders: those that purchased the 100 shares from the bondholders at \$ 11.0 (and made a profit of 11 cents per share) and those that purchased 25 shares from the bondholders at \$ 10.0 (and made a profit of \$ 1.11 per share), the market price at the time of the conversion.

The previous analysis assumes that the short selling pressure originates exclusively from the convertible bondholders. In the presence of a floating-priced convertible, the original shareholders may also suffer if other investors, such as professional short-sellers and hedge funds, short the stock *and* conversions take place at prices below fair value. Suppose that a "short-selling network" drives the stock price down to P_m. For the sake of simplicity, suppose that the convertible bondholders do not sell short but convert at a price equal to $P_c = dP_m$ and sell the shares at the price P_m. If the "short-selling network" sells short the stock *and* conversions take place at prices $P_m < P_0$, the long-term share price falls to P^*. As equation (14) indicates, the loss to the original shareholders is solely determined by the difference between the current stock price P_0 and P_m. This implies that the original shareholders suffer a loss, but the loss is not a gain to the convertible holders. The gain accrues to the new shareholders who buy the shares below fair value because of the short-selling pressure. The short-selling pressure and the conversion below fair value lower the long-term share value. This is clearly a desirable outcome for the "short-selling network" and could explain why firms that issue floating-priced convertibles attract short-sellers. A critical assumption underlying the "short-selling network" story is that the bondholders "cooperate" and convert when stock prices are falling. Unlike the previous case where the selling pressure originates from the bondholders, the short-selling network does not control the conversion process.

The bondholders have no incentives to convert early under the assumptions of i) zero coupons on the debt, ii) a zero risk-free interest rate, iii) no default risk, i.e., a stock price above the minimum price level and the firm complying with conversion requests and iv) a reference price equal to the current stock price. When these assumptions are relaxed, there are at least two reasons for **not** converting early. First, the coupon yield on the debt is typically higher than the risk-free rate. Second, the reference price is usually a weighted-average, or the minimum, of stock prices in a look-back period of 5 days on average. This may encourage investors to wait for price jumps to the extent that the reference price is below the current, i.e., post-jump, stock price.

This should be weighted against two reasons for converting early. Early conversion is optimal for bondholders who believe that, by waiting until time t to convert, there is a significant probability that the value of the firm falls below $F_t/(1-d)$. Early conversion is also optimal when the bondholders fear a refusal by the issuing firm to let them convert and/or register the shares obtained through conversion. Firms justify such actions when they believe the bondholders engaged in a deliberate stock price manipulation scheme. *Ceteris paribus*, a large conversion discount increases the incentive to convert early. High discount issues are more valuable than low discount issues only as long as "converting and selling" is possible. This is another reason why the faulty contract design hypothesis predicts a negative relation between stock returns and the conversion discount. Short-sellers are attracted to firms offering high-discount issues because the investors are more likely to "cooperate" by early converting and selling.

Summarizing, **in the presence of short-selling pressure**, the existence of a floating-priced convertible lowers the long-term value of equity. Equation (14) suggests that this effect is more important the higher the dilution, i.e., the higher the relative issue size and the conversion discount. Bondholders anticipate the selling pressure and, *ceteris paribus*, short more shares the larger the discount. Finally, short-sellers and hedge funds are more attracted by large discount issuers as the bondholders are more likely to convert early and cooperate with the short-sellers by diluting the fundamental value of the equity.

The contract design hypothesis generates three testable implications. First, an abnormal negative stock price performance should be observed after the issuance of floating-priced convertibles. Second, the negative abnormal performance should be correlated with the contract design, such as the size of the conversion discount. Third, the underlying value of the firm on the issue announcement date should remain constant over time.

2.3 The Last-Resort Financing Hypothesis

In contrast to the under-valuation hypothesis, the last-resort financing hypothesis assumes that the shares are over-valued at the time of the issue. The over-valuation prevents the management of the firm from convincing investment bankers and potential investors to invest in a secondary offering or a private equity placement despite extensive “road shows.”

This hypothesis can be formalized as follows. Assume there are two groups of investors. The first group is formed of the current shareholders who believe the shares are fairly valued. Suppose that they cannot or are not interested in buying more shares of the company because of wealth constraints or portfolio considerations. The second group is formed of outside investors. They are potential investors but believe the shares are over-valued and cannot be convinced to buy the company’s shares at the current share price. Although the management may disagree with this negative opinion, there exists no other option to avoid immediate bankruptcy. The floating-priced convertible is an instrument that allows the management to buy time, until the perceptions about the firm’s prospects change.

The last-resort financing hypothesis generates three sets of testable implications. First, similar to the contract design hypothesis, it predicts negative abnormal returns after the issue announcement. Second, as the issue of a floating-priced convertible is a signal that the shares are over-valued, it predicts a decrease in the market value of assets. Third, the hypothesis predicts negative “abnormal” changes in the operating performance after the issue announcement. The company has no other alternative than to issue a floating-priced convertible because informed investors realize the company is over-valued and refuse to provide equity finance. As the market gradually becomes aware of the negative operating performance, stock prices gradually adjust to their lower equilibrium level. The issuance of a floating-priced convertible is a negative signal. In contrast to the contract design hypothesis, the convertible has no *causal* effect on the long-term stock price.

3 The Dataset

Floating-priced convertibles are private placements. As such, they are not widely covered by typical data sources such as SDC or the Dow Jones Retrieval Service. The information about floating-priced convertible issues was recovered as follows. When a company completes a private placement, it files an 8-K form with the SEC most of the time. In contrast, the firm must always file an S-3 registration statement to allow the convertible holders to sell the converted shares. The database was created by systematically searching for floating-priced convertibles, preferred issues and debentures, in *all* the 8-K filings and S-3 filings available on the SEC Edgar database from 1994 until June 30, 1998.The year 1994 corresponds to the start of the Edgar database. The ending date of June 30, 1998 was selected to be able to examine the equity long-term performance. Stock returns are obtained from the CRSP database ending on December 31, 1999. The "announcement" date is either the date of the 8-K filing or the date of the first S-3 filing after the issue. In a few instances where a company issued a press release immediately after closing the deal, the press release date is selected as the announcement date.

The dataset includes 467 issues made by 261 different firms for which CRSP returns are available on the announcement date. Twenty firms made at least 4 consecutive convertible issues during the sample period. By December 31, 1999, 144 out of the 261 firms remain listed. Except for 14 firms that were taken over and 2 firms that went bankrupt, all the firms disappeared because of failure to meet one or more listing requirements, such as a minimum share price, minimum equity, minimum float, etc. This suggests that a remarkably large number of firms, 101 out of 261 or 38%, were in serious trouble by the end of 1999. Approximately 50% of the firms are in the technology sector or the medical sector and the average size of the firms (measured as the market value of equity on the day prior to the issue) in the sample is $ 67.5 million with a median $ 39.2 million. On average, the issue size is $ 6.2 million. This represents about 13 % of the market value of the issuer's equity.

More than 50 percent of the firms went public after 1992. This is consistent with the theoretical arguments developed in the previous section. Floating-priced convertibles are issued by young, small and risky firms, where adverse selection problems are potentially large. This pattern persists after our sample period: PlacementTracker.com reports that during the two years after the end of our sample period 295 issues were announced, mainly by Internet companies.

4. The Under-valuation Hypothesis vs. the other Hypotheses: the Long-Term Stock Market Performance of Floating-Priced Convertible Issuers

The under-valuation hypothesis, the faulty contract design hypothesis and the last-resort financing hypothesis predict floating-priced convertible issuers to display abnormal stock market performance in the issue announcement month and, if the market is not fully efficient, after the issue month as well. The performance should be positive according to the first hypothesis and negative according to the last two hypotheses. An event-study is a logical starting point. Traditional short-horizon event-studies using daily data are difficult to implement due to the uncertainty surrounding the issue announcement dates. Moreover short-term event studies only make sense if the market reacts efficiently to a corporate event. The results in this paper are clearly inconsistent with this assumption. Long-horizon returns based on monthly data are investigated as an alternative.

Abnormal performance is estimated here using cumulative abnormal returns and the intercept of the Fama-French time-series regression. As mentioned in the previous section, issuing firms experience a high de-listing frequency. Specifically, in 69 cases the issuer is de-listed within one year after the announcement. To minimize the adverse effect of survivorship, the abnormal returns are estimated over a 12-month post-issue announcement period. Abnormal returns are estimated using three different samples. The first sample includes all the issues, the second excludes the follow-up issues and the third includes only the follow-up issues.

Cumulative average "raw" returns (CARR) and cumulative average "abnormal" returns relative to the equally-weighted market index (CAREW) and the value-weighted market index (CARVW) are estimated over the 12-month period before and after the issue announcement date. The results are shown in Figure 1 and in Panel A of Table 1. In the period prior to the issue announcement date (month –12 through –1), the raw returns are positive in 10 out of the 12 months. A dramatic change is observed in the post-issue announcement period. In 11 of the 12 months after the event month, (month 0 through +12), average returns are negative. The cumulative average *raw* return (CARR) is equal to – 30.1 % (t = -3.51). The significant decline becomes even more apparent after adjusting for general market movements. In the 12 months prior to the issue, the issuing firms under-perform the equally-weighted market index (CAREW) by 5.1 % (t=-1.12) and the value-weighted market index (CARVW) by 10.75 % (t=-2.44). In the 12-month period after the issue, the cumulative average abnormal return is equal to – 40.4 % (t = - 4.71) relative to the equally-weighted market index and to – 54.1 % (t = -6.38) relative to the value-weighted market index.

The analysis is repeated after excluding the subsequent issues made by the same firm. The sample size decreases from 467 to 261 observations. The results are displayed in Panel B of Table 1. They are qualitatively similar to those obtained with the full sample but are less negative. In the 12-month post-announcement period, the CARR, CAREW and CARVW estimates are equal to -14.7 % (t = -1.31), -26.0 % (t= -2.37) and – 39.0 % (t = - 3.56), respectively. This implies that the follow-up issues are associated with a more drastic price decline than the first issues. This could be explained by the fact that, at the time of the follow-up issue, more investors are aware of the consequences of floating-priced convertibles than at the announcement of the first issue. Panel C confirms this. In the 12-month post-announcement period, the CARR, CAREW and CARVW are equal to -51.39% (t = -5.20), -60.01% (t = -6.04) and -74.49% (t = -7.57), respectively[9].

To control for possible size and growth effects and test the robustness of the results, the Fama-French (1993) three-factor model and Ibbotson's Returns Across Time and securities (RATS) procedure is used to estimate abnormal returns. The results (CARFF) are reported in the last column of Table 1, as well as in Figure 1. Similar results are obtained. The empirical evidence is consistent across samples and measures of abnormal performance.

The most important conclusion is that results are inconsistent with the under-valuation hypothesis that predicts positive abnormal performance. They are consistent with the faulty contract design hypothesis and the last-resort financing hypothesis. Additional tests are designed to separate both hypotheses.

4.1 Consistency with the contract design and last-resort financing hypotheses: preliminary findings

A straightforward test to separate out the contract design and last-resort financing hypothesis is to compare the market value of the firm at the time of the issue announcement including the issue proceeds, at time $t = 0$, to the market value of the firm owned by the original shareholders, the new shareholders, i.e., the "converts" and the convertible bondholders a year later, at time $t = 1$. The market value of the firm at time $t = 0$ is equal to

[9] Buy-and-hold returns during the 12-month post-announcement period are also estimated. On average, the 12-month post-announcement holding return is –34.0 % (t= -4.60) without adjusting for market effects. The estimate drops to –43.78% and –58.07% after adjusting for the market using the EW and VW index, respectively. They are statistically significant in both cases. In 85 % of all cases, the 12-month post-announcement returns are negative. When the first issues are excluded, the percentage increases to 92 %. This suggests that the poor stock price performance is not the result of a few outliers. Note that buy-and-hold return estimates have poor statistical properties. See Barber and Lyon (1997), Brav (1999), Kothari and Warner (1997), Lyon, Barber and Tsai (1999) and Mitchell and Stafford (2000).

$V_0 = N_0 P_0 + C_0$. The market value of the firm at time $t = 1$ is equal to $V_1 = (N_0 + L)P_1 + C_1$, where L is the number of shares issued as a result of the conversions during the year and C_1 is the privately-placed (so not easily observed) market value of the remaining non-converted convertible debt. If a stock is de-listed within a 12-month period of the announcement day, time $t = 1$ is redefined as the de-listing month.

The faulty contract design hypothesis predicts that the expected market value of the firm $E(V_1)$ is either equal to the original market value V_0 with zero interest rates and risk-neutral investors or higher with non-zero interest rates and risk-averse investors, i.e., $E(V_1) \geq V_0$. According to this hypothesis, the decline in the stock price reflects a wealth transfer from the original shareholders to the convertible holders and to the new shareholders who buy the shares below the "true" value as a result of selling pressure by bondholders or other short sellers. In contrast to the faulty contract design hypothesis, the last-resort financing hypothesis predicts that the company is over-valued at the time of the issue, i.e., $E(V_1) < V_0$.

Empirical tests of a change in the market value of the firm between time $t = 0$ and time $t = 1$ are fraught with difficulties. First, many firms in the sample make multiple issues within a 12-month period following the first issue. This implies that V_1 is affected by the subsequent issues. To solve this first issue, the tests are performed on a sample composed of the 157 issuers that made a single issue and for which the data is available. Second, as a private placement, the market value of the floating-priced convertible, C_0, is not observable and cannot be directly estimated. In the empirical tests, C_0 is assumed to be fairly priced on the issue date and equal to the value of the gross proceeds. Similarly, C_1 is assumed to be equal to the book value reported in the first quarterly earnings report published a year after the issue announcement date. A third problem with the test is the difficulty to estimate L, the number of shares issued as a result of conversion. In the tests, the increase in the number of shares between time $t = 0$ and time $t = 1$ is assumed to be the result of conversions only, i.e., $N_1 = N_0 + L$, where N_1 is the number of shares outstanding at time $t = 1$. This assumption is clearly unrealistic as post-issue stock-financed acquisitions, executive stock option exercise and other conversions suggest that $N_1 > N_0 + L$. This implies that the market value of the firm is over-valued at time $t = 1$, imparting a bias against the last-resort financing hypothesis. Finally, the test implicitly assumes that, on average, realized values of V_1 are equal to expected values. The facts that the sample period is short and coincides with one of the strongest bull markets in history imply that V_1 is likely to be much higher than $E(V_1)$. This is another reason why the tests are biased against the last-resort financing hypothesis.

Table 2 displays the cross-sectional distribution of the percentage change in the asset value, $\Delta V = (V_1 - V_0)/V_0$, between time $t = 0$ and time $t = 1$. The results are consistent with the last-resort financing hypothesis. The market value of the firm falls by 12% on average. A t-test equal to –1.24 suggests that the difference is not statistically significant. This apparent lack of statistical significance can be seriously challenged in light of the non-normality of the data. While the mean is –12 %, the median is -43 % and the upper quartile is equal to -1%. Close to 75 % of the changes in the market value over a one-year period are negative. Non-parametric tests of the hypothesis that the median is equal to zero reject the null at very high level of statistical significance. The p-values of the Wilcoxon signed rank test and the sign test, better suited in light of the asymmetry of the distribution, are indistinguishable from zero in both cases. The empirical evidence strongly supports the last-resort financing hypothesis. In addition, the evidence is inconsistent with the "faulty contract design" hypothesis as the *only* explanation for the stock price decline of the typical issuer. The remainder of the paper examines additional empirical evidence in support of these two alternative, but not mutually exclusive, hypotheses.

5. *The Operating Performance of Floating-Priced Convertible Issuers*

The last-resort financing hypothesis predicts convertible issuers to experience negative "abnormal" post-issue operating performance. According to this hypothesis, the issue *per se* is not responsible for the stock price decrease. Rather, it stems from a fall in the operating performance of the issuer that was not anticipated by the stock market at the time of the issue. As more information about fundamentals becomes available, the market gradually adjusts its assessment of the company's earnings potential. Two issues must be addressed to test this prediction empirically. The first regards the choice of operating performance measures and the second the choice of control firms. They are discussed next.

5.1 Measuring Operating Performance and Selecting Comparable Firms

The methodology of Loughran and Ritter (1997) is used to measure operating performance. For the sample of issuing firms, operating performance is measured by the median 1) operating income before depreciation (OIBD) to assets ratio, 2) profit margin, 3) return on assets, 4) operating income relative to sales, 5) capital expenditures plus research and development relative to assets and 6) market value of equity relative to book value of equity. Control firms are selected in two ways, with the Loughran-Ritter (1997) matching algorithm and a propensity score matching algorithm, respectively.

5.1.1 The Loughran and Ritter Matching Algorithm

Loughran and Ritter (1997) candidate matching firms are those in the same industry, as defined by the two-digit SIC code, with asset size at the end of year –1 between 25% and 200% of the asset size of the firms to be matched. If there are no issuers in the appropriate industry meeting the asset requirement, the industry matched. If there are no issuers in the appropriate industry meeting the asset requirement, the industry requirement is dropped and the constraint on asset size is tightened to a 90%-110% range. The initial asset requirement is satisfied by 95% of the issuing firms. The Loughran and Ritter (1997) algorithm is applied to all the issuers with a non-missing OIBD/assets ratio in the fiscal year before the issue announcement i.e., year -1. The sample size drops to 415 observations as many of the firms are not available on Compustat in that year. Panel A of Table 3 displays the median operating performance of issuers and non-issuers in year –1.

The results suggest that issuers are poor performers. All the median values of operating performance are highly negative. In contrast, median ratios obtained for non-issuers are much less negative. The comparison of the two groups suggests that issuing firms are relatively big spenders as measured by the capital expenditures and R&D ratio. Finally, as is reflected in the significantly higher market-to-book ratio, the market perceives issuers as relatively high growth firms in their industry. Hoping that investments will payoff in the future, the market seems to tolerate the issuers' poor accounting operating performance.

Panel A also reports Z-statistics for the Wilcoxon matched-pairs signed rank tests of the hypothesis that the distributions of the issuer and non-issuer ratios are identical. The Z-statistics obtained for the six accounting ratios suggest that the algorithm fails to match issuers and non-issuers. The null hypothesis is rejected at a high level of statistical significance. Although the procedure aims at matching on the basis of performance as measured by the OIBD/assets ratio, the performance of issuing firms is so bad that the median OIBD/assets ratio for the comparable firms, -10.6%, is 19.6% above the ratio obtained for issuing firms, -29.0%, with a statistically significant difference. In addition, the algorithm fails to match issuers and non-issuers along the five remaining measures of operating performance.

Two arguments may be advanced to explain the failure of the algorithm to match issuers and non-issuers. The first pertains to the operating characteristics of issuing firms. It could be that they are the worst performers in their respective industry and asset class, explaining why they cannot be matched to any other firm. The second pertains to the algorithm. The Loughran and Ritter (1997) procedure could fail for two reasons. First, partial matches based on only three characteristics, industry, asset size and profitability as measured by the OIBD/assets ratio may not yield the most relevant group for comparison. A match performed on additional variables may be necessary. Second, the requirements imposed on asset size may not be judicious. The problem is that little guidance exists to choose the "optimal" constraints to be imposed on the matching variables. This calls for the use of a different matching algorithm to test the robustness of the results reported in Panel A.

5.1.2 A Propensity Score Matching Algorithm

Propensity score matching algorithms are becoming increasingly popular to construct suitable control groups in non-experimental studies. They are quite successful at generating accurate estimates of the treatment effect in non-experimental settings when the treated group differs substantially from the pool of potential controls (Dehejia and Wahba (1998)). They offer three major benefits. First, no constraints need to be imposed on the matching variables. Second, they accommodate a high number of matching variables. Third, they produce accurate estimates of the treatment impact even when very few units exist that are comparable to the treatment units. This alleviates the bias due to systematic differences between the treated and comparison units[10].

Different versions of the propensity score matching algorithm have been suggested in the literature. A simple version, known as the "nearest-match" method, works as follows. Given a set of observable characteristics, i.e., the accounting ratios, the conditional probability of receiving treatment, i.e., issuing a floating-priced convertible, is estimated with a parsimonious logistic function using a sample that contains the treated and control units. The treated units are ranked according to the estimated conditional probability, referred to as the propensity score. Each treated unit is then matched to the single control unit with the closest propensity score. The role of the score is to reduce the dimensionality of the matching

[10] For an interesting and pioneering application of the propensity score algorithm in finance, see Villalonga (2001). The paper re-examines whether the discount of diversified firms can be attributed to diversification. Two important results emerge. First, estimates of the effect of diversification on firm value obtained from single equation models suffer from a sample selection bias. Second, the diversification discount disappears when a comparable benchmark based on propensity scores is used.

problem. Matching on the propensity score allows one to maximize the comparability between the treated and control groups.

The nearest-match version of the propensity score algorithm is used to generate the sample of matching firms. This is done as follows. Let:

- j: be the fiscal year prior to the issue announcement date defined as year –1. Given that the first (last) issue took place in 1995 (1998), j takes the four values, 1994, 1995, 1996 and 1997.
- i be an issuing or non-issuing firm, with $i=1,\dots N_j$, where N_j is the cross-sectional sample size in year j, with $N_j=I_j+NI_j$ where I_j and NI_j is the number of issuers and non-issuers in year j, respectively. Summing over the j's, the total number of issuers and non-issuers is equal to I and NI, respectively.
- $X_{i,j,l}$ be the characteristic l observed for firm i in year j, with $l=1,\dots 7$. The characteristics are 1) assets, 2) OIBD/assets, 3) profit margin, 4) ROA, 5) OIBD/sales, 6) CE+RD/sales, 7) market/book ratio [11].
- $D_{i,j}$ be a dummy variable equal to 1 for issuers and 0 for non-issuers.

The following steps generate the sample of matching firms in the fiscal year j, say 1994, before the announcement:

- **Step 1**: Estimate the propensity to issue, $P_{i,j}$, using the logit function,

$$P_{i,j}=PROB(D_{i,j}=1|\ X_{i,j,l}),\ \text{for}\ i=1,\dots Nj.$$

- **Step 2**: Rank the Ij estimated propensity scores obtained for the issuers in ascending order.

[11] None of the accounting variables must be missing on Compustat in year j for an issuer to be included in the analysis. In contrast, only those issuers with a non-missing OIBD/asset ratio are included in the previous analysis. The Loughran and Ritter (1997) algorithm imposes fewer data requirements than the propensity score algorithm. This explains the slightly higher sample size in the former than in the latter case, 415 versus 402 observations, respectively.

- **Step 3**: Match each issuing firm to the single non-issuing firm with the closest propensity score to form a sample of NI_j nearest-match control firms[12]. Note that by construction the sample size NI_j is equal to I_j.

Given that the issue announcement dates occur in four different years, the logit function must be re-estimated in each fiscal year *j*, 1994, 1995, 1996, 1997.

- **Step 4**: Repeat steps 1 through 3 for each fiscal year *j*.
- **Step 5**: Pool the estimated propensity scores across the fiscal years *j* and obtain a total sample of *I* issuing firms and *NI* non-issuing firms with *I* equal to *NI* by construction.

The results obtained with the propensity score algorithm are presented in Panel B of Table 3. One major conclusion emerges. Compared to the Loughran and Ritter (1997) algorithm the procedure is significantly more successful at matching issuers and non-issuers. The median propensity scores for the issuers and the non-issuers are identical. They are equal to 0.29. The median accounting ratios obtained for issuers and non-issuers are very close. More importantly, the null hypothesis that the distributions of issuer and non-issuer ratios are identical is not rejected. This holds true for every accounting ratio. The results show that it is possible to find non-issuing firms that have performed as badly as issuing firms.

The propensity score measures the likelihood that the company will issue a floating-priced convertible. Table 4 shows that, both for issuers and non-issuers, the correlation between the propensity scores and all measures of pre-operating performance (except the market to book ratio) is significantly negative. The correlation is most significant for OIBD/assets and ROA. This supports the last-resort financing hypothesis according to which issuing firms *have* to raise external funds to avoid bankruptcy.

[12] To be able to maintain the equality between the number of issuers and non-issuers in every single year after year *j*, the second, third,…, nearest match is also saved to substitute for a (first) nearest-match non-issuing firm that drops out from Compustat or is de-listed after time –1.

5.2 The Operating Performance in the Pre- and Post-Announcement Period

The median of the accounting ratios is estimated from four years before until two years after the announcement. The results obtained for issuers and non-issuers are reported in Panels A and B of Table 5.

The results reported in Panel A of Table 5 confirm the previous findings obtained in the fiscal year -1 that convertible issuers are poor performers. All the median values of the performance measures are highly negative. Moreover, they tend to get worse as the issuance year gets closer. The worst measures of performance are obtained in the fiscal years -1 or 0 depending on the performance measure. For example, the ROA and OIBD/assets ratios reach their lowest values, -48.5% and -28.1% in the fiscal year 0, respectively. While the median profit margin and sales margin recover after two years, the two performance measures that should be highly correlated with stock returns, i.e., the OIBD/assets and the ROA ratios do not recover significantly. Also, a sizeable decrease in capital expenditures and market-to-book ratio is observed. As discussed above, in the pre-issue period, the market hopes that investments will payoff. The optimism vanishes in the two years following the issue. These results should be interpreted with caution as companies that go bankrupt are removed from the Compustat database. This implies that the results obtained for the 239 surviving companies in the fiscal year +2 are biased upward and the recovery overstated.

Panel B shows the results for the matching non-issuing firms. Non-issuers experience a negative median operating performance in the fiscal years before the issue. Non-issuers do better than issuers but the change in the performance is negative and higher for the former than for the latter. Stated differently, the operating performance of issuers is bad in the years preceding the issue. In contrast to this relative steady state, the performance of non-issuers keeps deteriorating over the same time period. In fiscal year -1, when the matching is done, issuers and non-issuers display a similar level of operating performance. In the two years after the issue, non-issuers recover much faster than issuers. Both the ROA and the OIBD/assets ratios display a much stronger mean-reverting pattern.

Panel C of Table 5 reports the Z-statistics obtained for the Wilcoxon matched-pairs signed rank tests of the hypothesis that the distributions of issuer and non-issuer ratios are identical. The Z-statistics suggest that the post-operating performance of issuers and non-issuers differ mostly with respect to the measures of profitability. The operating performance of issuers and non-issuers reverts to the mean but the speed of reversion is faster for the latter than the former, explaining the relative difference and its statistical significance.

Panel D of Table 5 reports the Wilcoxon matched-pairs signed rank tests of the equality of distributions between the change in issuers and non-issuers ratios. The changes are calculated for three sub-periods. They are measured over the fiscal years -1 to 0, -1 to +1 and -1 to +2, respectively. For example, the Z-statistic obtained for the change in the ROA of issuers relative to non-issuers is equal to -4.34 between the fiscal years -1 and +2. Panel D shows that regardless of the sub-period and relative to non-issuers, the OIBD/assets and ROA ratios of issuers decline significantly. The changes are not statistically significant for the other accounting ratios, such as the market-to-book ratio.

The results reported in Table 5 are consistent with the last-resort financing hypothesis. Floating-priced convertibles signal that the performance gap between issuers and their peers will widen in the future, i.e., that issuers are overvalued relative to their peers. This suggests that the outside equity investors who refused to invest in the issuer's stock at the time of the issue, made the right decision ex-post.

6. Performance and Contract Design

The cause of the issuers' abnormal stock price performance is still unresolved. Is the firm or the contract at fault? A two-step approach is followed to address the question. First, the contract design and the most relevant contract characteristics are reviewed. Empirical predictions about their likely impact on stock price performance are formulated. Second, a relationship between the contract characteristics and the future stock price performance is empirically tested before and after controlling for operating performance. Controlling for operating performance is critical to disentangle the faulty contract hypothesis from the last-resort hypothesis.

6.1. Contract Characteristics: General Description and Hypotheses

Floating-priced convertibles are not standardized contracts. Table 6 summarizes the most relevant contract characteristics on i) the lock-up period, ii) the conversion discount, iii) the look-back ratio, iv) caps and floors, v) warrants and vi) short-selling restrictions. Each one is discussed below.

Lock-up period: Investors have to wait on average 86 calendar days from the closing date to be able to convert at the floating conversion price. This waiting period is called the lock-up period. The existence of a lock-up period is consistent with the argument that issuers believe that good news will be revealed in the near future. The stock is currently under-valued but will be fairly valued at the end of the lock-up period. This suggests that issues with a lock-up provision should be associated with a higher post-issue abnormal performance.

Conversion discount: The floating-priced convertible allows investors to convert at a discount from a reference price in a look-back period. The average conversion discount d is equal to 15.5% of the *reference* price. The conversion discount is negative in some cases, i.e., the conversion price is at a premium from the reference price. This does not necessarily mean that the bondholders have no opportunities to convert at a discount from the *market* price at the time of conversion. For example, even if the contract states that the conversion price is set at a 5% premium of the average price in a 10-day look-back period, investors may still be able to buy shares at a discount from the market price at the time of conversion. Ideally, the conversion discount should be measured relative to the market price rather than the reference price at the time of conversion. This information on when conversions take place is not available. The empirical tests assume that the discount relative to the reference price is highly correlated with the discount relative to the market price at the time of conversion. The discount is usually a constant but may vary over time. In a few issues, the conversion discount increases, presumably to convince investors to delay conversion. For a number of reasons explained above, the faulty contract design hypothesis predicts the stock price under-performance to be increasing with the conversion discount.

Look-back ratio: The reference price in the look-back period is the average of the n lowest closing prices in a period of t days. The two parameters n and t have a mean equal to 6 and 10, respectively and a median equal to 5 in both cases. Summary statistics on the look-back ratio, defined as n/t, are also reported. The median ratio is equal to the maximum of 100%. This implies that investors have the right to convert at a discount from the average closing price, i.e., in a 5-day look-back period. The flexibility to select the reference price provides convertible holders with a valuable option. *Ceteris paribus*, the flexibility is an increasing function of the look-back period as measured by the parameter t. The option value increases with t and is particularly valuable when the stocks are volatile or subject to price jumps[13]. To increase their expected returns, investors have incentives to wait and to refrain from converting or selling short. *Ceteris paribus*, the smaller the number of prices, n, used to calculate the reference price, the larger the value of the option. For example, an option to convert at a discount from the lowest price $n=1$ in a 10-day look-back period is more valuable than the option to convert at the average price $n=10$ in a 10-day look-back period.

Summarizing, when the look-back ratio n/t decreases, the value of the look-back option increases. This implies that lower look-back ratios should be associated with a higher

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[13] Consider for example the case of $n=t=1$. This allows investors to convert at the discount from yesterday's closing price. Suppose the current stock price is \$ 12.50, the nominal value of the convertible is \$ 1000 and the conversion discount is 20 %. If the stock price increases tomorrow to \$ 15.0, the maximum proceeds from selling the 100 shares obtained through conversion are \$ 1500. Consider now the case where $n=1$ and $t=5$. The

post-issue abnormal performance because it reduces the incentive to sell short prior to the conversion. As an alternative to short-selling, bondholders have the ability to exploit possible price jumps to increase returns.

Caps and floors: Contracts may have caps and floors on the conversion price. Four types of contracts are observed. The most common contract is a convertible where the conversion price is capped, followed by those with no cap and no floor. Their frequency is 56% and 30%, respectively. Contracts with both a cap and a floor are observed in 52 cases and the least popular contracts are those without a cap but with a floor. Their respective frequency is 11% and 3%. The contracts with the largest potential gain for the convertible holders, those with a cap and no floor, are the most popular. Conversely, the contracts with the smallest potential gain, those with no cap and a floor, are almost non-existent. A cap (floor) makes convertible holders more (less) interested in a stock price increase (decrease). Contracts with a cap and a floor should lessen investors' incentives to sell short the stock and benefit from "abnormal" returns generated by price pressure. This suggests that these contracts should be associated with a higher abnormal post-issue performance.

Warrants: Convertible holders are given warrants to buy common stocks in 198 cases and to buy additional preferred stock in 12 cases. The warrants may or may not have provisions that reset the strike price at a lower level if the stock price falls. As is the case for caps on the conversion price, warrants on the common stock make investors more interested in the long-term upward potential of the firm and reduces benefits from selling pressure as well as incentives to short sell. This suggests that contracts with warrants, relative to those without, should be associated with a higher abnormal post-issue performance.

Short selling constraints: A solution to reduce the selling pressure on the stock is to prohibit short selling. Surprisingly, the offer prospectus prohibits short selling in only 58

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investor has the option to convert at a 20 % discount of the lowest price during the previous 5 days. As long as the lowest stock price is below $ 12.5, the proceeds will be higher than $ 1500.

cases. It explicitly mentions the fact that convertible holders are allowed to sell short in 406 cases. Information on short selling was not found in 23 cases. Floating-priced convertible investors argue that they need to short to hedge their positions, especially in contracts with a cap on the conversion price. To the extent that short-selling constraints are effective at reducing the short-selling pressure, contracts that include short-selling constraints should be associated with a higher abnormal post-issue performance.

The examination of the time-series and cross-sectional behavior of the contract characteristics reveals that more recent contracts include warrants and have lower look-back ratios and conversion discounts. All these changes have the effect of reducing incentives to sell short the stock. This suggests that investment bankers have tried to improve the design of the instrument over time. The finding that additional warrants, caps on the conversion price and more valuable look-back options i.e., smaller look-back ratios are associated with lower conversion discounts is consistent with this interpretation. Detailed results are available from the authors.

6.2 De-listing Probability and Contract Design

Testing the relationship between long-term returns and contract characteristics is subject to two econometric problems. First, the sample size decreases over time because of de-listing. An estimation performed on a sample that includes only survivors produces biased results. Second, the power of the tests is low because the issuers' stock return volatility is unusually high. This argues against the use of stock returns.

Alternative empirical tests are suggested below. They exploit the information contained in the de-listing status. Unlike returns, the de-listing status is available for every single observation in the sample. To the extent that the de-listing is a good proxy for performance, the impact of contract characteristics on performance can be investigated by regressing de-listing on the contract characteristics. This is done by estimating the parameters of a Logit model with the de-listing as the dependent variable and the contract characteristics as the explanatory variables. Both unconditional and conditional tests are suggested below. They differ with respect to the way de-listing is defined.

6.2.1 Unconditional Tests

In the unconditional tests, the dependent variable is a dummy variable that takes a value of 1 if the stock is de-listed as of December 1999 and 0 otherwise. A stock is classified as de-listed for CRSP de-listing codes above or equal to 400. The de-listing dummy is regressed on 15 explanatory variables. They can be split into three groups. The first group contains 8 contract characteristics including the conversion discount, the look-back ratio, the relative issue size and 5 dummy variables that capture the existence of caps, floors, short-sale constraints and lock-up periods. The second group contains 6 variables that capture the pre-operating performance of the issuers, namely OIBD/Assets, Profit Margin, ROA, OIBD/Sales, (CE+RD)/Assets, Market/Book. The reason for controlling for pre-issue operating performance is that the operating performance possibly influences the terms the firm must offer to issue a floating-priced convertible. For example, poorer performers may have to issue convertibles at a deeper conversion discount. Unless prior performance is controlled for, the relationship between the conversion discount and the probability of de-listing cannot be properly investigated. The last group contains a single variable, "elapsed time", that measures the time elapsed between the issue announcement date and 12/31/99. This captures the fact that the probability of de-listing increases most likely with the elapsed time following issuance. Logit models are estimated on three samples that include all the events, exclude the follow-up issues and exclude the first issues, respectively. In addition to the parameter estimate and its p-value, odds ratios are reported. They indicate the probability of the event occurring, i.e., de-listing, given a unit increase in the corresponding variable *ceteris paribus*. The unit is either a 0 to 1 change for the dummy variables or a one standard deviation change for the remaining variables. For example, an odds ratio of 2 means that the odds of such an event when the dummy is equal to 1 is twice as high as the odds of an event when the dummy is equal to 0.

The maximum likelihood estimates of the regression parameters are computed using an iteratively re-weighted least-squares algorithm. The null hypothesis that the explanatory variables have no impact on the probability of de-listing is tested using a likelihood ratio test, which has a chi-square distribution under the null. The results are presented in Table 7.

Robust conclusions emerge from the regressions. First, regardless of the sample, the null hypothesis that the explanatory variables have no effect on the de-listing probability is rejected at a very high level of statistical significance. Second, the most discriminating variable is the conversion discount. The parameter estimate is positive, i.e., the deeper the discount, the higher the probability of de-listing. It is highly statistically significant in every single model though less significant for the first issues that for the follow-up issues. A one standard deviation increase in the conversion discount increases the de-listing probability by more than 50% for the first issues and by more than 100% for the follow-up issues! The evidence is strongly consistent with the prediction of the faulty contract hypothesis. Deep discount issues generate more dilution and attract short-sellers. This in turn causes stock prices to fall. Third, the second most consistent and statistically significant variable is the look-back ratio. As predicted, it is positively related to the probability of de-listing. Finally, there is no systematic evidence that the pre-issue operating performance has any impact on the de-listing probability.

A surprising result is the fact that the “elapsed time” estimate is negative. This means that the more recent issuers are more likely to be de-listed. This is consistent with the evidence that the average de-listing time is equal to 36.5, 25.08, 16.91 and 9.04 months for those issues that took place in 1995, 1996, 1997, and 1998, respectively. Two possible explanations may be advanced. First, the market is getting more efficient over time as market participants learn the financial innovation. Second, no information is available about the issuing firms de-listed after December 1999. This means that the variable that measures the time to de-listing is censored and the truncation bias affects more those firms that issued later in the sample period.

6.2.2 Conditional Tests

Additional insights about the relevance of the contract characteristics can be gained by looking at the de-listing time, defined as the time between the de-listing date and the issue date. The justification for including warrants, a cap, a floor, short-sale constraints and a look-back option, is to give fewer incentives to market participants to sell short the stock. Given that short selling may drive the stock price down and possibly below the level necessary to maintain a listing, any characteristic that reduces the incentives to sell short should, if effective, lengthen the survival time. Conversely, the absence of such a characteristic, if effective, should shorten the survival time.

In the conditional tests, three additional de-listing dummies are created to test the null hypothesis that the contract characteristics have no impact on the time to de-listing. The first dummy takes a value of 1 if the stock is de-listed in the first 12 months after the issue and 0 otherwise. The second dummy takes a value of 1 if the stock is de-listed in the first 24 months after the issue and 0 otherwise, conditional on the stock not being de-listed in the first 12 months. The last dummy takes a value of 1 if the stock is de-listed 24 months after the issue date and 0 otherwise, conditional on the stock not being de-listed in the first 24 months. They are regressed on the same explanatory variables as in the unconditional tests, except for the "elapsed time" variable, i.e., a total of 14 variables.

The results are presented in Table 8. The chi-square statistics suggest that the hypothesis that the explanatory variables have an impact on the likelihood of de-listing is rejected only for horizons of 12 months or more. The conversion discount emerges as the only variable with the most consistent explanatory power. Both the statistical significance and the odds ratio increase monotonically with the horizon. The estimate is statistically significant in the last two periods. The odds ratio to predict de-listing during the first 12 months is 1.13 but increases to 2.40 after 24 months. The fact that the discount has less explanatory power in the short-run is not surprising given that firms are de-listed only after trading below $ 1.0 for several months. Not a single measure of pre-issue operating performance is statistically significant.

Summarizing, the contract characteristics have an impact on the de-listing probability. The best predictor of de-listing is the conversion discount. Regardless of whether the issue is a first issue or a follow-up issue the conversion discount is a statistically significant variable. The statistical and economic significance of the conversion discount increases monotonically with the time to de-listing. It is statistically significant only for horizons of one year and above. This finding is consistent with the contract design hypothesis. As the *pre-issue* operating performance is controlled for, the findings cannot be explained by the alternative hypothesis that poorer performers require a deeper discount

Alternatively, the predictive power of the conversion discount could still be explained by the last-resort financing hypothesis. This would be the case if deep discount issuers systematically experience worse *post-issue* operating performance than low discount issuers. When the sample is split according to the size of the discount, no significant difference in post- operating performance between deep discount and low discount issuers is uncovered. The results are available on request.

7. Conclusion

In theory, a floating-priced convertible is an ideal financing instrument for small risky firms, where agency costs of debt and asymmetric information are large. The instrument should be appealing to managers who are reluctant to issue equity at current market prices because they believe their stock is currently under-valued. The issue proceeds are received immediately but the issue price is determined later, hopefully when the market becomes efficient.

This hypothesis, referred to as the "under-valuation hypothesis", is strongly rejected by the data. The empirical evidence reported in the paper shows that investors who buy the issuers' common stock lose 34 % of their wealth on average during the year following the issue. This result is not due to outliers. Negative returns are experienced by 85 % of the issuing firms in the year after the issue. These results are remarkable, considering that the sample period coincides with one of the strongest bull markets in U.S. history.

Several flaws in the design of floating-priced convertibles have been highlighted. There are a number of *ex-ante* reasons that make this "faulty contract hypothesis" plausible. First, the design of the contract may encourage convertible holders to increase their expected returns by shorting and converting. Second, professional short-sellers can lower the value of the stock by increasing the dilution that results from converting at low stock prices. The resulting price pressure and dilution does not have a temporary but a permanent negative effect on the underlying share value. Small risky firms are the most vulnerable to short selling pressure. This is unfortunate as they are the ones that, theoretically, should benefit the most from this new financing technique.

Consistent with the "faulty contract design" hypothesis, we find that the conversion discount is negatively and significantly correlated with the issuers' long-term performance. The probability of being de-listed after the issue increases significantly with the conversion discount. This result holds after controlling for the post-issue operating performance. There is also evidence that contract design has changed over time. Issuers and investment bankers have eliminated the worst features of the contracts. Conversion discounts have been decreased and, in return, investors have been rewarded with more valuable look-back options and additional warrants.

However, several findings are also consistent with the "last-resort financing" hypothesis, according to which firms issue floating-priced convertibles because they are unable to raise equity at their current over-valued share price. First, the value of the underlying assets falls during the year after the issue announcement. This suggests that the stock price decline is not a simple wealth transfer from common stockholders to convertible investors. Second, issuers are perceived as firms with high growth opportunities but display poor operating performance at the time of the announcement. This means they are cash-poor but need money for investment. Third, the likelihood of issuing a floating-priced convertible, as measured by propensity scores, is negatively related to various measures of operating performance in the year prior to the issue. Fourth, managers, who typically own a significant fraction of the equity, approve their issuance in spite of their tarnished reputation. Last, accounting-based measures of operating performance tend to decline on average during the years after the issue relative to comparable firms.

This paper adds to a long list of studies that report anomalous long-term abnormal returns after corporate events. Our findings cannot be explained by a failure to adjust for risk, as it is difficult to imagine a model of market equilibrium that would predict small, risky firms to earn an average rate of return of –34 % per year in an unprecedented bull market. Neither is the "window of opportunity" hypothesis, according to which firms issue (repurchase) equity to take advantage of an over-valued (under-valued) stock price, likely to explain the results. Arguments based on despair, or ignorance, rather than opportunism are more appropriate.

Table 1

Cumulative Abnormal Monthly Returns Around the Announcement of Floating-Priced Convertibles

Cumulative average raw returns (CARR), cumulative average abnormal returns relative to the equally-weighted market index (CAREW) and the value-weighted market index (CARVW) for selected samples and sub-periods. The estimate CARFF is measured using Ibbotson's (1975) Returns Across Time and Securities (RATS) methodology and the Fama-French (1993) three-factor model. The monthly returns are aligned in event time with the month 0 representing the issue announcement month. The cross-sectional regression:

$$\left(R_{i,t} - R_{f,t}\right) = a_t + b_t\left(R_{m,t} - R_{f,t}\right) + s_t SMB_t + h_t HML_t + e_{i,t},$$

is run in each month t. The monthly return on the security i, the market index and the risk-free asset in event month t is denoted by $R_{i,t}$, $R_{m,t}$ and $R_{f,t}$, respectively. The monthly rate of return on the size and book-to-market factor in month t is denoted by SMB_t and HML_t, respectively. The intercept of the regression a_t is an estimate of the average abnormal performance in month t. The cumulative abnormal performance CARFF estimate is obtained by summing the a_t's over the relevant months of interest. The issues are sorted in three samples. The first sample contains the 467 announcements in the sample period, ("All issues included"). The second sample contains 261 observations and excludes all the follow-up issues of floating-priced convertibles made by the same firm, ("Follow-up issues excluded"). The third sample contains 206 observations and excludes all the first issues, ("First issues excluded"). Two sub-periods are investigated. The pre-announcement sub-period spans the months –12 to –1. The post-announcement sub-period spans the months 0 to +12. The T–statistics appear in parentheses.

PANEL 1A: All issues included

Sub-period	CARR	CAREW	CARVW	CARFF
[-12 to -1]	14.7 % (3.22)	-5.1% (-1.12)	-10.75% (-2.44)	-13.91% (-2.26)
[0 to +12]	-30.1% (-3.51)	-40.4% (-4.71)	-54% (-6.38)	-29.03% (-3.33)

PANEL 1B: Follow-up issues excluded

Sub-period	CARR	CAREW	CARVW	CARFF
[-12 to -1]	12.44% (1.63)	-7.7 % (-0.99)	-13.10 (-1.73)	-12.55% (-1.65)
[0 to +12]	-14.7% (-1.31)	-26% (-2.37)	-39% (-3.56)	-15.63% (-1.41)

PANEL 1C: First issues excluded

Sub-period	CARR	CAREW	CARVW	CARFF
[-12 to -1]	17.58% (2.37)	-1.74 % (-.25)	-7.83% (-1.15)	-14.93% (-1.61)
[0 to +12]	-51.39% (-5.20)	-60.01% (-6.04)	-74.49% (-7.57)	-50.52% (-4.43)

Table 2

Cross-Sectional Distribution of the Change in the Market Value of Assets Over the One Year Period Following the Issue Announcement Date

This table provides summary statistics on the cross-sectional distribution of the change in the market value of assets over the one year period following the issue announcement date, $\Delta V = (V_1 - V_0)/V_0$ where V_1 is the market value of the common stock outstanding one year after the issue, plus the book value of the non-converted convertible issue one year after the issue and V_0 is the market value of the common stock on the issue announcement date, plus the proceeds of the convertible issue. The Wilcoxon signed rank test and the sign test are used to test the null hypothesis that the median is equal to zero. The sample is based on the 157 firms that made a single issue and for which the data is available.

Minimum	Lower quartile	Median	Mean	Upper quartile	Maximum	Standard Deviation
-98%	-72%	-43%	-12%	-1%	883%	125%

Wilcoxon signed rank test: -3204 (p-value < .001)
Sign test: -36.5 (p-value < .001)

Table 3

Median Operating Performance Measures and Market-to-Book Ratios for the Issuers and Matching Non-issuers in the Fiscal Year –1.

The two panels report median ratios for the issuing firms present on COMPUSTAT in the year before the issue. Two different matching algorithms are used to select the non-issuing firms. In Panel A, matching non-issuing firms are selected using Loughran and Ritter (1997) matching algorithm. In Panel B, matching non-issuing firms are selected using the propensity score algorithm. The COMPUSTAT data items to calculate the ratios are operating income before depreciation/assets (OIBD + interest income (items 13 + 62)/assets (item 6)), profit margin (net income including extraordinary items (item 172)/sales (item 12)), return on assets (net income (item 172)/assets (item 6)), OIBD/sales (OIBD + interest income (items 13 + 62)/sales (item 12)), CE + RD/assets (capital expenditures (item 128) + research and development expense (item 46)/assets (item 6)), market value/book value (shares (item 54) times price (item 199)/book value of equity (item 60)).

Ratio / z-statistic	OIBD/Assets	Profit Margin	ROA	OIBD/Sales	CE + RD/Assets	Market/Book	Propensity Score	Number of Firms
Panel 3A: The Loughran and Ritter (1997) Matched Sample								
Issuer median	-29.0%	-84.0%	-47.1%	-50.4%	19.1%	4.47	N.A	415
Non-issuer median	-10.6%	-12.7%	-18.2%	-7.1%	11.9%	2.07	N.A.	415
z-statistic	-12.66	-9.47	-11.15	-9.32	5.91	3.93	N.A	415
Panel 3B: The Propensity Score Matched Sample								
Issuer median	-24.9%	-77.0%	-44.6%	-48.0%	17.42%	4.50	0.29	402
Non-issuer median	-30.7%	-86.0%	-48.7%	-53.0%	19.43%	3.21	0.29	402
z-statistic	1.07	0.42	1.55	0.34	0.25	1.22	1.29	402

Table 4

Cross-sectional Correlation Between the Propensity Scores and the Pre-issue Operating Performance Measures

This table shows the cross-sectional correlation coefficients between 6 measures of operating performance ratios in the year before the issue and the propensity score. The COMPUSTAT data items to calculate the ratios are operating income before depreciation/assets (OIBD + interest income (items 13 + 62)/assets (item 6)), profit margin (net income including extraordinary items (item 172)/sales (item 12)), return on assets (net income (item 172)/assets (item 6)), OIBD/sales (OIBD + interest income (items 13 + 62)/sales (item 12)), CE + RD/assets (capital expenditures (item 128) + research and development expense (item 46)/assets (item 6)), market value/book value (shares (item 54) times price (item 199)/book value of equity (item 60)). The results are based on the 402 announcements for which data on COMPUSTAT are available.

	OIBD/Assets	Profit Margin	ROA	OIBD/Sales	CE+RD/Sales	Market/Book
ISSUERS	-0.77	-0.22	-0.77	-0.21	0.17	-0.06
	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(<0.01)	(0.20)
NON-ISSUERS	-0.36	-0.12	-0.37	-0.11	0.27	-0.07
	(<0.01)	(0.02)	(<0.01)	(0.02)	(<0.01)	(0.13)

Table 5

Median Operating Performance and Market-to-Book Ratios for the Issuers and Matching Non-issuers Before and After the Issue Date.

Panel 5A and Panel 5B report median ratios for the issuing firms and the non-issuing matching firms, respectively, from 4 years before the issue year until 2 years afterwards. The industry constrained propensity score algorithm is used to select the matching non-issuing firms. The COMPUSTAT data items to calculate the ratios are operating income before depreciation/assets (OIBD + interest income (items 13 + 62)/assets (item 6)), profit margin (net income including extraordinary items (item 172)/sales (item 12)), return on assets (net income (item 172)/assets (item 6)), OIBD/sales (OIBD + interest income (items 13 + 62)/sales (item 12)), CE + RD/assets (capital expenditures (item 128) + research and development expense (item 46)/assets (item 6)), market value/book value (shares (item 54) times price (item 199)/book value of equity (item 60)). Panel 5C tests whether in a given year relative to the issue year, the median ratio is significantly different for issuers and non-issuers. Panel 5D tests whether in a specific period relative to the issue year, the median ratios are significantly different for issuers and non-issuers.

Ratio / Year relative to offering	OIBD/Assets	Profit Margin	ROA	OIBD/Sales	CE + RD/Assets	Market/Book	Number of Firms
Panel 5A: Issuer Median							
-4	-16.4%	-43.9%	-26.6%	-24.4%	16.4%	3.32	281
-3	-21.66%	-45.6%	-30.5%	-31.2%	13.9%	3.03	335
-2	-22.6%	-55.6%	-34.1%	-30.2%	15.3%	3.89	383
-1	-24.9%	-77.0%	-44.6%	-48.0%	17.4%	4.51	402
0	-28.1%	-71.7%	-48.5%	-45.6%	18.2%	3.00	372
1	-22.4%	-55.9%	-38.5%	-35.4%	15.9%	2.57	327
2	-24.0%	-48.5%	-44.7%	-26.2%	13.8%	1.94	239
Panel 5B: Non-Issuer Median							
-4	-5.5%	-9.9%	-11.0%	-4.0%	13.3%	2.68	281
-3	-11.8%	-28.8%	-23.8%	-11.1%	14.6%	2.63	335
-2	-18.5%	-40.8%	-31.3%	-28.9%	18.2%	2.74	383
-1	-30.8%	-86.0%	-48.7%	-53.0%	19.4%	3.21	402
0	-26.4%	-66.2%	-34.7%	-35.8%	20.0%	2.36	372
1	-22.9%	-60.2%	-39.7%	-44.4%	19.3%	1.98	327
2	-22.8%	-56.7%	-26.7%	-48.3%	15.5%	1.14	239
Panel 5C: Z-statistics Testing the Yearly Equality of Distributions Between the Issuers and Matching Non-Issuers Using the Wilcoxon Matched-Pairs Signed-Ranks Test							
-4	-3.77	-4.00	-3.93	-3.97	2.43	0.47	281
-3	-3.92	-1.29	-3.10	-1.93	0.72	0.89	335
-2	-3.42	-1.27	-3.49	-1.75	0.69	3.56	383
-1	1.07	0.42	1.55	0.34	0.25	1.22	402
0	-3.83	-0.09	-5.43	0.26	0.76	-1.10	372
1	-1.14	-0.10	-1.90	-0.28	-0.90	0.85	327
2	-2.02	0.25	-4.14	-1.50	-0.96	2.91	239
Panel 5D: Z-Statistics Testing the Equality of Distributions Between the Change in the Ratios in Periods from Year-1 to Various Years After the Issue							
–1 to 0	-5.26	-0.62	-5.34	0.09	-1.33	-0.82	372
–1 to+1	-2.28	-0.52	-2.50	-0.49	-0.50	0.64	327
–1 to +2	-2.02	0.15	-4.34	1.77	-0.50	1.3	239

Table 6

Summary Statistics on Floating-Priced Convertible Contracts

The characteristics are (1) the lock-up period, i.e., the number of days an investor has to wait to be able to convert, (2) the placement fees relative to the proceeds of the issue, (3) the size of the issue relative to the market capitalization at the time of the issue, (4) the conversion discount, i.e., the discount of the conversion price relative to the reference price (5) the look-back period, i.e., the number of trading days relevant to determine the reference price. The number of look-back prices is the number of trading days in the look-back period used to calculate the reference price. The look-back ratio is calculated as the ratio of the number of look-back prices by the number of days in the look-back period. The sample includes all 467 issues for which CRSP returns are available on the announcement date.

Characteristic	Mean	Median	Standard Deviation	Maximum	Minimum
Lockup period (days)	86	78	85	730	0
Fees (% of gross amount issued)	8	7.4	4.1	24.2	0.2
Issue size (% of market capitalization)	13.1	9.3	17.5	218	0.4
Conversion discounts (%)	15.5	17	10.2	50	-5
Look					
N° of look-back prices	6	5	5	40	1
Look-back ratio	82%	100%	35%	100%	3.3%

Table 7

Logit Model of De-listing Status on Contract Characteristics and Pre-issue Operating Performance Measures

The regression estimates the probability of de-listing given a set of 15 explanatory variables. The dependent variable is a dummy variable that takes a value of 1 if the firm is de-listed before Dec 31, 1999 and 0 otherwise. The contract characteristics are captured by 8 variables, the conversion discount, the look-back ratio, the relative issue size (proceeds) and 5 dummy variables that capture the existence of a cap, a floor, short-sale constraints and a lock-up period, respectively. The dummy variable takes a value of 1 when the contract includes the characteristic and zero otherwise. The variable "passage of time" measures the time (in months) between the issue month and December 1999. The remaining 6 variables capture the pre-issue operating performance (OIBD/assets, profit margin, ROA, OIBD/sales, (CE+RD)/Assets, market/book). The maximum likelihood estimates of the regression parameters are computed using an iteratively reweighed least-squares algorithm. For each parameter, a Wald chi-squared statistic is computed as the square of the parameter estimate divided by its standard error estimate. The p -value of the Wald chi-square statistic appears below the parameter estimate in parentheses, while the odds ratio appears next to the estimate. Odds ratios measure the change in the odds for an increase of one unit in the corresponding variable. The unit is either a 0 to 1 change for the dummy variables or a one-standard deviation change for the other variables. The null hypothesis that none of the explanatory variables has any effect on the probability of listing is tested using a likelihood ratio test that has a chi-square under the null.

SAMPLE / REGRESSOR	ALL EVENTS INCLUDED		FOLLOW-UP EXCLUDED		FIRST ISSUES EXCLUDED	
SAMPLE SIZE						
DELISTED	189		90		99	
LISTED	190		126		64	
INTERCEPT	-0.54	N.A.	-1.08	N.A.	-0.14	N.A.
(p-value)	(0.34)		(0.17)		(0.89)	
WARRANT	-0.46	0.63	-0.83	0.44	-0.02	0.98
(p-value)	(0.07)		(0.02)		(0.97)	
CAP	-0.31	0.73	-0.48	0.62	-0.03	0.98
(p-value)	(0.22)		(0.19)		(0.95)	
FLOOR	-0.38	0.68	-0.83	0.44	0.22	1.25
(p-value)	(0.30)		(0.12)		(0.70)	
SHORT SALE	0.47	1.60	1.09	2.99	0.28	1.32
(p-value)	(0.19)		(0.26)		(0.68)	
LOCK-UP	0.27	1.32	0.29	1.64	0.02	1.02
(p-value)	(0.27)		(0.17)		(0.96)	
DISCOUNT	4.18	1.56	4.14	1.57	7.43	2.13
(p-value)	(<0.01)		(0.02)		(<0.01)	
LOOKBACK	1.54	1.67	1.59	1.74	1.09	1.40
(p-value)	(<0.01)		(0.02)		(0.23)	
PROCEEDS	1.66	1.37	1.11	0.21	4.39	2.48
(p-value)	(0.09)		(0.23)		(0.08)	
ELAPSED TIME	-0.04	0.70	-0.02	0.81	-0.08	0.53
(p-value)	(<0.01)		(0.27)		(<0.01)	
OIBD/ASSETS*	-0.99	0 .85	-1.93	0.66	1.68	1.04
(p-value)	(0.08)		(0.02)		(0.21)	
PROFIT MARGIN*	-0.02	0.89	-0.14	0.95	0.04	1.00
(p-value)	(0.41)		(0.10)		(0.32)	
ROA*	0.59	1.11	1.52	1.41	-1.78	1.00
(p-value)	(0.17)		(0.03)		(0.11)	
OIBD/SALES*	0.03	1.13	0.16	1.05	-0.05	1.00
(p-value)	(0.39)		(0.10)		(0.34)	
CE+RD/ASSETS*	-0.54	0.76	-0.29	0.84	0.14	1.02
(p-value)	(0.24)		(0.62)		(0.90)	
MARKET/BOOK*	0.42	1.15	0.14	1.06	0.74	1.02
(p-value)	(0.31)		(0.79)		(0.34)	
?^{2} STAT	78.40		55.45		41.34	
	(<0.01)		(<0.01)		(<0.01)	

*: Estimates are multiplied by 100.

Table 8

Logit Model of De-listing Time on Contract Characteristics and Pre-issue Operating Performance Measures

The regression estimates the probability of being de-listed in 3 different post-issue announcement periods given a set of 14 explanatory variables. The dependent variable is a dummy variable that takes a value of 1 if the firm is de-listed within a particular time period and 0 otherwise. More specifically, the first dummy variable takes a 1 value if the firm is de-listed within the first 12 months after the issue announcement date and 0 otherwise. The second dummy variable takes a value of 1 if the firm is de-listed within a 24-month period following the issue announcement date conditional on not being de-listed in the first 12 months and 0 otherwise. The third dummy variable takes a value of 1 if the firm is de-listed in a period that starts 24 months after the issue announcement date conditional on not being de-listed in the first 24 months and 0 otherwise. The regression estimates the probability of de-listing given a set of 14 explanatory variables. The contract characteristics are captured by 8 variables, the conversion discount, the look-back ratio, the relative issue size (proceeds) and 5 dummy variables that capture the existence of a cap, a floor, short-sale constraints and a lock-up period, respectively. The dummy variable takes a value of 1 when the contract includes the characteristic and zero otherwise. The remaining 6 variables capture the pre-issue operating performance (OIBD/assets, profit margin, ROA, OIBD/sales, (CE+RD)/Assets, market/book). The maximum likelihood estimates of the regression parameters are computed using an iteratively reweighed least-squares algorithm. For each parameter, a Wald chi-squared statistic is computed as the square of the parameter estimate divided by its standard error estimate. The p -value of the Wald chi-square statistic appears below the parameter estimate in parentheses, while the odds ratio appears next to the estimate. Odds ratios measure the change in the odds for an increase of one unit in the corresponding variable. The unit is either a 0 to 1 change for dummy variables or a one-standard deviation change for the other variables. The null hypothesis that none of the explanatory variables has any effect on the probability of listing is tested using a likelihood ratio test that has a chi-square under the null.

REGRESSOR \ SAMPLE	= 1 YEAR		> 1 = 2 YEARS		> 2 YEARS	
SAMPLE SIZE						
DELISTED	56		76		55	
LISTED	317		241		192	
INTERCEPT	-2.60	N.A.	-2.09	N.A.	-2.27	N.A.
(p-value)	(<.01)		(<.01)		(<0.01)	
WARRANT	0.15	1.17	-0.13	0.88	-1.12	0.32
(p-value)	(0.64)		(0.68)		(<0.01)	
CAP	-0.46	0.63	-0.10	0.90	-0.10	0.91
(p-value)	(0.14)		(0.74)		(0.80)	
FLOOR	-1.35	0.26	0.08	1.09	-0.07	0.93
(p-value)	(0.07)		(0.84)		(0.88)	
SHORT SALE	-0.02	0.98	-0.42	0.66	0.88	2.41
(p-value)	(0.97)		(0.39)		(0.07)	
LOCK-UP	-0.01	0.99	0.67	1.95	-0.31	0.73
(p-value)	(0.98)		(0.02)		(0.41)	
DISCOUNT	1.13	1.13	3.26	1.42	8.41	2.40
(p-value)	(0.52)		(0.03)		(<0.01)	
LOOKBACK	0.96	1.38	0.38	1.14	N.A.	
(p-value)	(0.14)		(0.49)			
PROCEEDS	1.44	1.31	1.12	1.18	0.98	1.16
(p-value)	(0.04)		(0.17)		(0.35)	
OIBD/ASSETS*	-0.54	0.91	-0.98	0.84	-0.56	0.99
(p-value)	(0.38)		(0.17)		(0.39)	
PROFIT MARGIN*	-0.04	0.83	0.09	1.53	-0.02	0.88
(p-value)	(0.19)		(0.40)		(0.50)	
ROA*	0.41	1.08	0.81	1.17	0.40	1.09
(p-value)	(0.49)		(0.40)		(0.51)	
OIBD/SALES*	0.05	1.22	-0.06	0.74	0.03	1.17
(p-value)	(0.21)		(0.55)		(0.45)	
CE+RD/ASSETS*	-0.11	0.94	0.04	1.02	-0.29	0.84
(p-value)	(0.76)		(0.92)		(0.59)	
MARKET/BOOK*	0.47	1.16	0.90	1.37	0.15	1.06
(p-value)	(0.51)		(0.16)		(0.78)	
?^{2} STAT	22.07	(<0.08)	24.64	(<.01)	48.02	(<0.01)

*: Estimates are multiplied by 100.

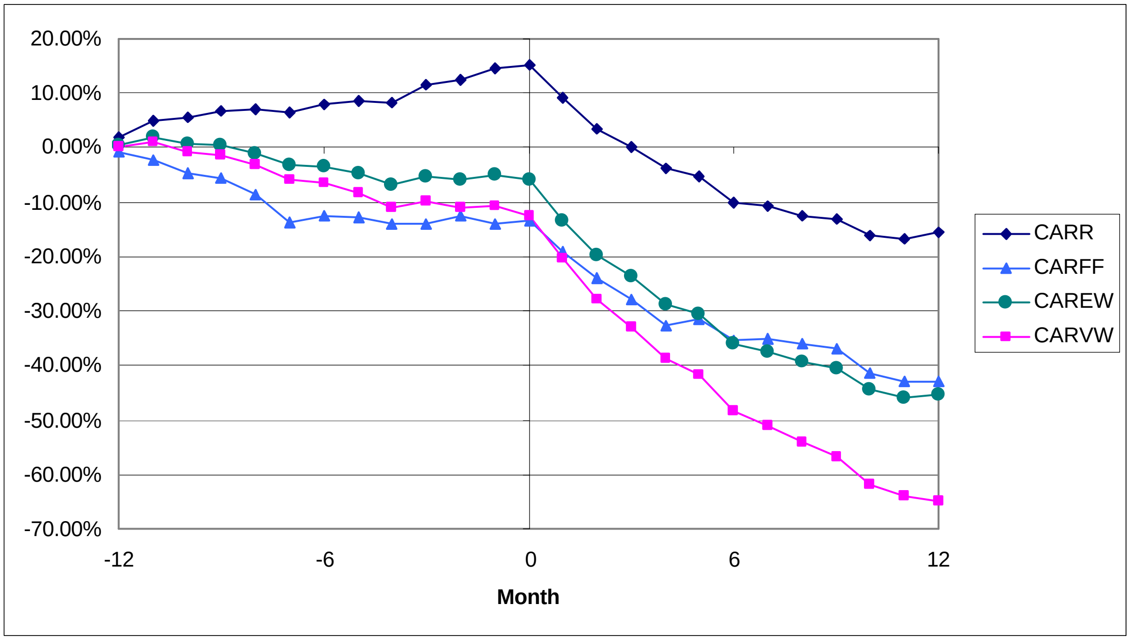

Figure 1: Price Behavior Around Floating-Priced Convertible Issue Announcements.

This figure shows the cumulative average raw return (CARR), the cumulative average abnormal return relative to the equally-weighted index (CAREW), the cumulative average abnormal return relative to the value-weighted index (CARVW), and the cumulative average abnormal return using the Fama-French three factor model (CARFF), 12 months before the announcement until 12 months after the announcement of all 467 floating-priced convertibles announced prior to August 1998.

References

Barber, Brad and John Lyon, 1996, Detecting abnormal operating performance: the empirical power and specification of tests statistics, *Journal of Financial Economics* 41, 359-399.

Barber, Brad and John Lyon, 1997, Detecting long-run abnormal returns: the empirical power and specifications of test-statistics, *Journal of Financial Economics* 43, 341-372

Brav, Alan, 2000, Inference in long-horizon event studies: A Bayesian approach with application to initial public offerings, *Journal of Finance* 55, 1979-2016.

Brennan, Michael, 1985, Costless financing policies under asymmetric information, unpublished manuscript, UCLA

Dehejia, R. and S. Wahba, 1998, Propensity score matching methods for non-experimental studies, NBER working paper, #6829.

Fama, Eugene F. and Kenneth R. French, 1993, Common risk factors in the returns on stocks and bonds, *Journal of Financial Economics* 43, 3-56

Friese, Robert C. and Jahan P. Raisi, 1999, Junk equity deals can harm stock, *National Tax Journal*, February 15 1999

Ibbotson, Roger G. 1975, Price performance of common stock new issues, *Journal of Financial Economics* 2, 235-272

Korman, Richard, If toxic convertibles drive up, watch for sinkholes, New York Times, May 17, 1998

Kothari, S. and Jerold B. Warner, 1997, Measuring long-horizon security price performance, *Journal of Financial Economics* 43, 301-339

Lalonde, R., (1986), Evaluating the econometric evaluations of training programs, *American Economic Review*, 76, 604-620.

Loughran Tim and Jay R. Ritter, 1995, The new issues puzzle, *Journal of Finance* 50, 23-51.

Loughran Tim and Jay R. Ritter, 1997, The operating performance of firms conducting seasoned equity offerings, *Journal of Finance* 52, 1823-1850

Mitchell Mark and Erik Stafford, 2000, Managerial decisions and long-term stock price performance, *Journal of Business* 73, 287-329.

Myers, Stewart, 1977, The determinants of corporate borrowing, *Journal of Financial Economics* 5, 147-175

Myers, Stewart and N. Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics*, 13, 453-476.

Villalonga, B., 2001, Does diversification cause the diversification discount?, University of California at Los Angeles, Mimeo.