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Agency Effects in the Convertible Debt Puzzle: An Empirical Investigation

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Abstract

We suggest that the symmetry of stock price reactions observed to the issuance and subsequent redemption of convertible bonds can be partially explained by agency effects. Using a hand collected dataset we test whether the heterogeneity in cumulative abnormal returns at these two corporate event dates can be explained by agency problems. Our results confirm there exists heterogeneity in the observed negative stock market returns at these dates that are related to proxies for agency problems (between firm management and stockholder). Similarly, upon redemption, we find that forced conversion is more likely to happen in firms more likely to suffer from agency conflicts and in low value firms, which explains the negative stock market reaction at that date. Finally, we find that call redemptions of out-of-the money bonds experience a positive stock price reaction contrasting with the negative reaction seen for in-the-money bond calls which further supports the agency problems story.

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1. Introduction

The convertible bonds puzzle refers to the fact that stock market reactions to the announcement of convertible issuance and convertible redemption calls are both negative. This observed symmetry is inconsistent with the arguments put forward by Ingersoll (1977) and Brennan and Schwartz (1977) that conversion allows stock holders to capture the value of the option, thus predicting a positive price reaction.

Researchers often cite asymmetric information or price pressure as possible explanations for the observed symmetry of stock market reactions. In general, and from a theoretical perspective, asymmetric information models of convertible debt are only able to explain either the price effects at issuance or at conversion but not both simultaneously. Empirically, the evidence for either of these two explanations is mixed and best summarized by Brick, Palmon, and Patro (2007) who conclude that neither information asymmetry or price pressure are the sole explanation for the puzzle. This paper contributes to this debate by providing a complementary explanation of the convertible puzzle.

We propose that agency problems, in addition to asymmetric information, play an important role in the observed symmetric stock price reaction to convertible bonds issuance and redemption calls. From an agency theory perspective, debt plays a monitoring and disciplining role in corporations (Jensen (1986)). Entrenched managers dislike the disciplinary effects of debt and would take actions to eliminate debt or at least ameliorate its effects, even though such actions might hurt the interest of the stockholders of the firm. Entrenched managers might find convertible bonds attractive because they allow raising funds in the form of debt today and getting rid of it in the near future. In an environment where there exists uncertainty about the firm's type (high and low value) and also about the manager's type (shareholder-value-maximizing and

self-interested/entrenched managers), the issuance of convertible debt might not be a reliable signal of firm value, as first proposed by Stein (1992). We argue that in this context, self-interested managers of low value firms would attempt to hide their own type and mimic valuable firms by issuing convertibles, even if such action is detrimental to equity holders who will bear the costs associated with a higher likelihood of financial distress. It follows that both good mangers and entrenched managers issue convertible debt and the observed negative market respond to the issuance announcement reflects both asymmetric information effects as in Stein (1992) and the potential for agency problems.

Regarding the observed effects upon debt redemption announcements, we argue that the negative stock market reaction is likely to arise from the fact that entrenched managers will always convert when possible, even in situations where a less levered capital structure is associated with a lower firm value. For high value firms, both types of managers call the convertibles but only entrenched managers call the convertibles when firms are of low value. If manager types have not been fully revealed, the market reacts negatively to the redemption call because entrenched managers are forcing the conversion in order to reduce debt and its disciplining role.

In our empirical analysis, we analyze the relation between stock price reactions at both the issuance and call redemption announcement day and the size and extent of agency conflicts between firm management and stockholders. We find that the stock price reaction to both the announcement of a convertible issuance and the call announcement of a redemption is negatively associated with common proxies for agency problems. Further, we also find that the probability of a call-redemption (forced conversion) for a convertible bond is positively associated with ex-ante proxies of agency problems. Finally, and as further evidence of the role of agency problems, we

find a significant difference of almost 2% between the 3-day cumulative abnormal returns (CARs) of called bonds that are out-of-the-money and called bonds that are in-the-money, with the former having a mean CAR of 0.78% and the latter a mean CAR of -1.16%.[1] Out-of-the-money calls require use of cash to pay for the bond's redemption. Good managers have no problem using discretionary cash for redemption and cash payments are indicative of the lesser agency problems facing the firm. In contrast, because in-the-money callable bonds are converted, no discretionary cash is used and cash holdings remain at the mangers´ reach, a preferred alternative of entrenched managers and indicative of severe agency conflicts in the firm. Our results are consistent with this view and provide support for the role of agency problems in explaining the symmetry of stock price reactions to bond issuance and redemptions.

We contribute to the literature in the following ways. First, we investigate the dynamics between information asymmetry and agency problems likely to exist in convertible bonds and provide a plausible explanation for the symmetry of stock returns at the announcement of a new offering of convertible bonds and their subsequent calling and conversion. Second, we find that stock price reactions to the announcements of convertible issuance and call-redemptions are directly related to the ex-ante likelihood of agency problems. In this sense, and in line with Brick, Palmon, and Patro (2007), we show that there is heterogeneity in market reactions that cannot be explained by asymmetric information alone. Finally, we find that the probability of calling a convertible is directly related to agency problems proxies.

The remainder of this paper is organized as follows. Section 2 presents an institutional framework for convertible issuance, conversion, and the existence of the convertible bond information content puzzle. Section 3 introduces agency problems into

[1] Datta, Iskandar-Datta and Raman (2003) find that firms that force conversion of in-the-money convertible bonds underperform their peers by a median of 64% over the five years after the conversion.

the puzzle and presents the development of the hypotheses. The methodology and empirical results are presented in Section 4. Section 5 concludes the paper.

2. Convertible debt issuance, forced conversions, and the symmetry of stock price reaction to their announcements.

A convertible bond is a corporate debt instrument, usually a junior debenture that can be exchanged at the option of the holder for a specific number of shares of the issuing company's common stock. The amount of equity covered by each bond is determined by the conversion ratio, which is obtained dividing the face value of the bond by the conversion price. Convertible bonds are usually callable bonds. This means that the issuer has the right to redeem the debt (for its cash value or equity equivalent) at a pre-specified price (the call or redemption price) before the redemption date. A large body of literature has explored the reasons for the use of convertible securities, the type of firms that issue them, and the effects of their issuance on firm value. Even though there seems to be agreement on which types of firms issue convertible securities and on the stock price effects at announcement of the use of convertibles and their calls, the underlying factors that explain these effects remain to be identified.

Extant research documents two different effects of convertibles on firm value. First, there is an average negative stock price reaction at the announcement of a convertible bond issuance. Dann and Mikkelson (1984), Mikkelson and Partch (1986) and Eckbo (1986) were among the first to document a significant negative abnormal return at the initial announcement of a convertible debt offering. Stein (1992) summarizes several results from the empirical literature documenting market reactions between -1.3% and -2.3% and Kim and Stulz (1992) report an average abnormal return of -1.7% for a sample of 280 convertible bonds issued between 1965 and 1987. Second,

there is an average negative stock market reaction to the announcement of a forced conversion of callable convertibles (Mikkelson (1981), Ofer and Natarajan (1987), Asquith and Mullins (1991)).[2] This is the so-called convertible bonds puzzle. The puzzle arises from the fact that these negative stock market reactions are inconsistent with the arguments put forward by Ingersoll (1977) and Brennan and Schwartz (1977) where conversion allows stock holders to capture the value of the option, thus predicting a positive price reaction.

The puzzle also exists in terms of capital structure effects. A bond issuance increases leverage and a convertible debt redemption reduces it. If issuing and calling for redemption convertible debt is a matter of moving firms´ capital structures to a target, the observed market reactions would suggest that, on average, firms that issue convertible bonds are moving away from their target – firms had too much debt to begin with - and that is why negative stock price reactions occur. When firms force conversions, they should be moving away from their target leverage again to experience a negative stock market reaction, except that in this case they are moving in the opposite direction and, accordingly, they must have had less debt than their desired target.

Researchers have cited price pressure and asymmetric information as two possible explanations for the observed effects. Price pressure can result from either investors selling the shares as a result of the "forced" conversion or by bondholders short selling the stock to hedge the equity risk associated with the convertible bonds. These arguments are supported by Mazzeo and Moore (1992) who find a rebound on stock prices during the period after a forced conversion and Bechmann (1999) who finds that short selling of the underlying stock is related to the call of the convertible bond.

[2] Mikkelson (1981), Ofer and Natarajan (1987), and Asquith and Mullins (1991) are among the first papers to document significant adverse stock price reactions to calling announcements. Campbell, Ederington and Vankudre (1991) challenge the results in Ofer and Natarajan (1987), arguing that their sample is biased. Correcting for this bias they find that post-call cumulative abnormal returns are not significantly negative.

However, Brick, Palmon, and Patro (2007) after conducting and extensive investigation conclude that price pressure does not explain by itself the negative reaction to the redemption call. Further, the price pressure hypothesis does not explain the negative stock price reaction to the announcement of the convertible issuance.[3]

Signaling models based on information asymmetries between managers and market participants usually focus on either the issuance announcement date or on the redemption announcement date, but in general they are not aimed at explaining the symmetry of the stock price reaction.[4] The negative stock price reaction to the issuance of convertibles bonds is difficult to reconcile with the arguments put forward by signaling models focused on the issuance date (i.e.; Mayers (1998), Stein (1992)), since in these models convertibles are used as a costly signal of firm quality. The negative stock price reaction to the conversion calls results because calls reveal negative information about the firm. In the models of Harris and Raviv (1985), Kim and Kalberg (1998), and Cowan, Nayar, and Singh (2000), managers force conversion when they receive a bad signal regarding firm value in an effort to conserve cash flows and they let bondholders convert voluntarily when the signal is good. Both of these events, issuance and conversion, are treated separately in these models with the exception of Nyborg (1995).

In Nyborg (1995)'s model, conversion ("delayed equity") is conditioned to always lead to a drop in share price, allowing the existence of an equilibrium that supports the empirically observed symmetry of average negative stock price reactions.

[3] In order to assess the validity of the price pressure hypothesis we compute daily and monthly measures of liquidity and check if this variable is able to explain the cross section of CARs for the sample of bonds called and converted. Using the TAQ database, liquidity is proxied by the inverse of the effective spread for each firm, and then the average of this variable is taken by day (or by month) and by industry, where industry is defined at the two digit SIC level. Then, to each of the sample firms, we assign the daily (or monthly) liquidity of its corresponding industry. Even though the sample size is drastically reduced given the available information from the TAQ database, none of the (unreported) specifications yield significant results for the liquidity variable

[4] In Stein (1992)'s model, the issuance of callable convertible has a less adverse, but still negative, signal about the firm's prospectus than simply issuing equity and thus the stock price reaction should be less negative than the one observed for equity issuance.

In his model, forced conversions signal even worse prospectus than originally anticipated at the time convertibles were issued which explains why a forced conversion results in a negative stock price reaction. This should result in forced conversion being associated with poor performing firms and thus a bad signal. However, there appears to be at least three empirical issues that seem at odds with the implications in this model: (1) an increasingly growing percentage of convertible issues are callable, (2) a majority of the firms calling convertible bonds are not low performing firms as it would be implied by the model, and (3) it takes on average of about three years for a convertible issue to be called, a long enough period for information about firm's quality to be revealed prior to the call. Thus, an empirical investigation of this asymmetry introducing other factors such as agency problems is warranted.

Another pitfall of signaling models is that the predictions from these models are inconsistent with empirical facts that previous research has documented. For instance, Mayers (1998) argues that convertible bonds are the most efficient way for firms with high growth opportunities to fund a sequence of investments of uncertain timing and value. It is difficult to reconcile this proposition with the observed negative stock price reactions of issuers when they announce their intention to issue convertibles. Another example is Stein's (1992) model, which predicts a separating equilibrium in which low value firms have no incentive to issue convertible bonds, and thus these securities are issued only by firms which are optimistic about the future. There are also conflicting points of view regarding the timing of the calls. Models by Harris and Raviv (1985) and Nyborg (1995) propose that firms should delay the conversion of their outstanding convertibles rather than forcing conversion at the earliest opportunity. However, Asquith (1995) finds that there is no call delay phenomenon related to convertible bonds.

Empirical studies find support for information effects at the announcement of

convertible issues but mostly are not able to provide support for the information signaling at the announcement of conversion calls. Byrd (1992) and Byrd and Moore (1996) study financial analysts reactions to the announcements of conversion calls and do not find evidence supporting the information signaling arguments. The only study providing evidence of some sort of bad news conveyed to the market is Datta and Iskandar-Datta (1996) who find that calls lead to a significant loss in total firm value, though they conclude that most of the negative price reaction is due to the wealth transfer from stockholders to holders of straight debt in the firm resulting from the reduction in leverage. More importantly, Brick, Palmon, and Patro (2007) find that convertible bond issuers' cumulative abnormal returns (CARs) at the call announcement day are not related to common measures of asymmetric information. This evidence, together with the fact that convertibles are not called late, suggests that informational asymmetry alone is not able to explain the empirical regularities associated with convertible bonds.

3. Hypotheses development: Agency problems and asymmetric information.

In information-based models such as Stein (1992), the uncertainty or information asymmetry regards to the value of the firm. In this paper, we argue that allowing for agency problems might help to explain why a negative market reaction is observed when convertible bonds are issued, despite the fact that financial distress is costly, particularly, for low value firms. Introducing agency problems to an information-based setting implies at least the presence of two types of managers. In a world where there is uncertainty regarding the value of the firm (high value versus low value firms), and the type of managers in charge of these firms (good managers who are concerned about the wealth of their stock holders versus bad, self-interested managers), convertible debt can

be issued by both types of managers to fund projects. Good managers issue convertible securities to fund valuable investment projects. Since neither manager's type nor firm's type is observable at issuance date, entrenched managers can mimic good managers and issue convertible bonds. The possibility of managers hiding both their own type and their firm type would give rise to a signaling game in which investors have an incentive to infer the manager's type from his/her observable actions and bad type managers may have an incentive to mislead investors. Therefore, market reactions to convertible bond issuances should reflect uncertainty to both manager and firm's type.

We argue that the offering of a convertible bond generates changes in the market valuation of the stock of the issuing company that are related to the likelihood and extend of agency problems. The reason is that convertible debt can actually be "equity in disguise", and not only "backdoor equity", as in Stein (1992). In Stein´s model, good firms avoid the adverse-selection problem inherent to an equity issuance by issuing convertible bonds. According to the model, this debt can later on be called when the firm type is revealed, forcing bondholders to exercise their conversion option. Furthermore, since financial distress is costly, managers of low value firms, which will not be able to force conversion, find that mimicking good firms is too costly. But what if managers also care for their own (immediate) wealth? If managers of low value firms are self interested, then they might find it attractive to mimic the behavior of higher value firms and issue convertibles. For instance, they might be willing to face the possibility of financial distress tomorrow if the value they get from issuing overvalued securities today is high enough[5]. This framework represents the foundation for our first hypothesis:

[5] In this sense, the separating equilibrium obtained in Stein`s model may be not longer achievable.

H1: At the announcement date of convertibles, low value firms and firms likely to face agency conflicts should experience more negative returns.

Considering agency problems also helps understand the symmetric negative market reaction to the announcement of redemption of convertible bonds. We argue that since managers decide whether or not to call the convertible debt, this decision provides the market with a signal about the type of manager in charge of the firm. For firms who turn out to be high value firms, it is likely that both types of managers will call for redemption. Good managers might be willing to call to move the capital structure of the firm to a target leverage that is appropriate to specific characteristics of the firm. For instance, Mayers (1998) argues that convertible bonds are the most efficient way for firms with high growth opportunities to fund a sequence of investments of uncertain timing and value. Furthermore, this decision would be value maximizing for a firm with good investment opportunities (McConnell and Servaes (1995)). Bad managers will also call to avoid the disciplinary role of debt.

For a firm that turns out to be low value, managers acting on the best interests of the shareholders will not call the debt. On the contrary, managers who are exploiting the benefits of private control and who dislike the restraining element of debt will find attractive to call the convertible issue. In summary, when the protection period of the call option ends and it is possible to call, bad mangers always have incentives to do so, while good managers call only when their firm type is high value. Thus, a decision to call the debt issue generates a negative stock price reaction as it likely to indicate entrenchment of management. This result derives from the fact that only managers that are more concerned about the consumption of private perquisites than the wealth of their stockholders call their convertibles after the firm has been shown to be of the low value

type. Accordingly, there exists a relation between the probability of a bond being called and the extent and likelihood of agency conflicts. Thus, we formulate the following hypothesis:

H2: The probability of a bond being called increases with the presence of agency problems.

Upon redemption, convertible bonds can be in-the-money or out-of-the-money. So far, we have constructed our hypotheses on the basis that the calls were in the money. From an agency perspective, one should expect to observe a more adverse price reaction to call announcement of in-the-money bonds, since management is able to eliminate the burden of debt and cash holdings remain at their disposal. In contrast, when an out-of-the-money convertible is called, management uses cash to pay the debt, resulting in less discretionary funds available to managers and a reduction of potential agency problems or a signal to the market. Thus, we would expect the following:

H3: Firms that call out-of-the money bonds should experience milder negative stock price reactions than firms that call in-the-money bonds which should experience significantly negative abnormal returns.

Finally, under an scenario where enough time has passed after issuance of convertible for information about the firm to reach the market and for participants to know the type of firm but not the type of manager, the decision to call the convertibles convey information to the market primarily as to the type of manager. Because information about the firm type has arrived to investors by the time of the conversion

call, we argue that a reduced amount of uncertainty exists at the calling announcement date as compared to the issuance announcement date. This leads to the formulation of our last hypothesis:

H4: The stock price reaction to the conversion announcement is milder than the stock price reaction to the issue announcement.

4. Empirical Analysis

4.1. Data Description

Our sample of convertible bonds comes from the FISD (Fixed Income Security Database) and covers the period from December 1986 to March 2004. We decide to stop the sample period in 2004 to avoid having bonds in the sample with protection period ending too close to the financial crisis. The database contains 2,300 convertible bonds. We select a subsample of convertible bonds that satisfy the following criteria. We require that the issuance announcement day coincides between the FISD database and the information collected from Bloomberg. Convertible bonds must be classified as redeemable or callable, and it must be possible to uniquely match the CUSIP number of the issuer with the PERMNO variable in the Center for Research in Security Prices (CRSP) database. Exchangeable bonds are excluded from the sample. Our final sample is comprised of 340 bonds. Individual (quarterly) information for the issuing firms is obtained from COMPUSTAT.

The mean and median notional values in our sample are $368 million and $175 million, respectively.[6] The median value of assets for the firms in the sample is $1.24 million, while the median value of equity is $441 million (not reported). These figures

[6] The mean and median notional values for the complete FISD are $294 million and $150 million, respectively.

are similar to those in Datta, Iskandar-Datta, and Raman (2003) and Spies and Affleck-Graves (1995). Table 1 reports summary statistics adjusted by their respective industry medians, where industries are defined at the 4 digit SIC level.

Table 1 about here

The table reports several financial characteristics of the firms issuing convertible bonds: value of assets, expense and asset utilization ratios, and leverage, which is defined as long term debt over the book value of common equity. The firms are bigger and more levered than their industry peers. They also have higher expense and asset utilization ratios possibly indicating higher incidence of agency problems.

Table 1 also reports Tobin's *q*, defined as the product of the price at the third month of the corresponding quarter times the number of common shares outstanding, plus total assets, minus the book value of common equity, all divided by total assets. The firms in our sample have higher growth opportunities than their industry peers, as proxied by either Tobin's *q* and have slightly larger ratios of capital expenditures to assets and asset utilization ratios. Thus, the use of convertible securities seems to be an attractive alternative for high growth firms that are more likely ely to suffer from informational asymmetries.

4.2. Market Reactions at Issuance and Calling Dates

Changes in market valuation are measured by three-day market adjusted cumulative abnormal returns (CARs).[7] Results of CARs (-1, +1) computed using the equally weighted CRSP index as benchmark are presented in Table 2.

[7] Analysis performed using the (-1,0) and (-2,+2) windows yield qualitative similar results and are thus not reported.

Table 2 about here

There is a negative market reaction on the day the issuance of convertible bonds is announced, in line with the results of Dann and Mikkelson (1984), Stein (1992), and Kim and Stulz (1992). The 3-day CARs at issuance of convertible bonds is -2.09% which is significantly different from zero at conventional levels (Z-statistic of 6.61 and a t-statistic of 5.36).

We construct a sample of bonds that have been called and converted. The Fixed Income Security Database only includes information about the bonds at the time they were issued, so to find out their call and conversion status we use Bloomberg and LexisNexis. Bloomberg provides information on whether a bond has been called or not, but does not always specify if the bond was converted or redeemed. To find out the latter, we check in LexisNexis for information regarding conversion and redemption. Out of the 228 bonds that we were able to identify, 42% have information on LexisNexis. For the rest of the bonds, we check (using data from CRSP) if the conversion option was deep-in-the-money during the conversion period, where we define deep-in-the-money as having a conversion value at least 10% higher than the redemption value. If a bond is deep-in-the-money, we consider that the bond was completely converted.[8] There are 112 such bonds. The 3-day CAR at the call announcement date is -1.16% and is significantly different from zero at conventional levels (a Z-statistic of 2.59 and a t-statistic of 2.16). These results are consistent with previous studies and further document the symmetry of negative stock price reactions to the issuance and redemption of convertible bonds.

[8] We applied this rule to the bonds that have specific information regarding the conversion/redemption outcome, and found that for all but one of the bonds the rule works correctly.

4.1 Empirical results

In our hypothesis H1, we argue that at the announcement date of convertibles, low value firms and firms likely to face agency conflicts should experience more negative returns. Thus, we conduct our empirical analysis relating the 3-day CAR, centered at the issuance announcement day, with proxies for agency problems and firm value.[9]

We collect data on several variables that have been used in the literature as proxies for the likelihood and extent of agency problems, and for the probability of being a low or high value firm. We measure all proxy variables at the end of the quarter immediately before the issuance announcement day. We use the e*xpense ratio* to capture the presence of or exposure to agency problems. As defined by Ang, Cole, and Lin (2000), the expense ratio is computed as selling, general, and administrative expenses over net sales. The expense ratio captures how well the manager controls operating expenses, including perquisite consumption and non-monetary benefits. We hypothesize that this ratio will be positively related to the probability of agency problems and/or to the magnitude of the private benefits of control. For completeness, we also use *Asset Utilization Ratio (Sales to assets)* as an alternative measure of the extent of agency problems. As in Ang, Cole, and Lin (2000), we define this variable as net sales divided by total assets. The asset utilization ratio is likely to capture if the manager makes poor investment decisions, exerts low levels of effort and/or buys unproductive assets. The higher the asset utilization ratio, the lower the agency costs.[10] The severity of agency problems is likely related to the presence (or lack of) growth opportunities and investment opportunities. We use Tobins´ q to capture growth opportunities and the

[9] Using a 2-day window (-1, 0) yields qualitatively similar results as using 3-day windows (-1, +1). For brevity, all remaining tables present 3-day window results.

[10] By comparing the efficiency of firms that are managed by shareholders with the efficiency of firms managed by outsiders, the authors calculate the agency costs attributable to the separation of ownership and control. Even though their focus is on small corporations, their results suggest that both the expense ratio and the sales to assets ratio are adequate proxies for agency problems.

ratio of capital expenditures to total assets, *capex*, to capture the investments policies of the firms (Table 1 presents descriptive statistics for these variables). We argue that considering the interaction between growth opportunities and the investment policies better captures the extent of agency problems. These dynamics are illustrated in Panel A of Table 3.

Table 3 about here

We classify all firms into four portfolios depending on whether each firm is above or below its industry adjusted Tobin's *q* (capturing growth opportunities) and above or below its industry adjusted *capex* ratio (capturing investment policies). If the *q*-ratio effectively proxies for growth opportunities, firms in the high *q* and low *capex* portfolio are likely to be firms that have not been able to take full advantage of their growth opportunities. Accordingly, for these firms, issuing convertible debt should be good news, since it is likely that the funds raised will be used in efficient investments. We call firms in this portfolio "*efficient investors*". Similarly, firms classified in the low *q* and high *capex* portfolio are likely candidates for over-investing, and therefore the issuance of convertible securities would indicate that managers of these firms might be engaged in activities that increase the size of the assets under their control beyond the optimum. If this is the case, the stock reaction for these firms should be more negative than for efficient investors firms. We call firms in this portfolio "*empire builders*".

We then obtain the three day CARs for each portfolio. Results are presented in Panel B of Table 3. We are particularly interested in two out of these four portfolios, which are shaded in the table. The CARs associated with firms in the "empire builders" portfolio are more than twice as negative as those for firms classified in the "efficient investors" category. These differences are significant at the 1% level, as shown in Panel

C. The "efficient investors" firms exhibit the mildest negative price reactions of all groups, with their CARs being statistically indistinguishable from zero at the 5% level. This evidence supports the notion that firms that are more likely to have agency problems experience a stronger negative reaction to the issuance of convertible debt. Panel C also presents the results of a Kruskal-Wallis test that rejects the null hypothesis that the distribution of returns is the same across all four portfolios. Furthermore, not considering the *capex* classification, for firms in the Below Median Tobin´s *q* category, the average CAR is -2.82%, compared to -1.59% for the total of firms in the Above Median Tobin´s *q* category. This (unreported) difference is significant at the 1% level, suggesting that firms more likely to be of lower value exhibit more adverse price reactions upon the announcement of convertible debt issuance.

In sum, these results seem to suggest that, in accordance to the previously stated hypotheses, market reactions at the time convertible instruments are issued depend, at least partially, on investors´ perceptions about the most likely use of the funds raised.

We now proceed to conduct a multivariate regression analysis to test H1 regarding the relation between market responses and agency problems. To capture the dynamics presented in Table 3 we construct a dummy variable, q^{Dummy}, that takes the value of one (zero) if the firm's Tobin's *q* is above (below) the corresponding industry average of our sample of firms. Then, we include *capex*, Tobin's-*q*, and an interaction term between *capex* and q^{Dummy} in the econometric specification. We expect that for high growth opportunity firms ($q^{Dummy} = 1$), an additional dollar in capital expenditures should be associated with a milder adverse market reaction than an additional dollar in capital expenditures for low growth opportunity firms ($q^{Dummy} = 0$). We include the e*xpense ratio* and the *sales to assets* ratio to capture the presence of or exposure to agency problems. As an additional control, we consider *leverage* (measured as long term

debt over total assets) to capture the benefits of private control and firm value. The argument is that self-indulgent managers dislike the disciplinary role of debt, and therefore it is likely that they will try to keep low levels of leverage or eliminate leverage opportunistically. As shown by McConnell and Servaes (1995), leverage has a different impact on firm value depending on the firms' growth opportunity characteristics. Accordingly, we include an interaction term between leverage and q^{Dummy} in our regression analysis. Finally, we include the *relative offer size*, which corresponds to the ratio of the offering amount for each bond to the value of the corresponding firm's common equity, because it is reasonable to think that the size of the change in leverage may affect the size of the change in firms´ value. The model is of the following form:

$$\begin{aligned} CAR(-1,+1)^{Announcement} = {} & \beta_0 + \beta_1 \cdot \text{exp ratio} + \beta_2 \cdot \text{sales to assets} + \beta_3 \cdot q \\ & + \beta_4 \cdot capex + \beta_5 \cdot q^{Dummy} \cdot capex + \beta_6 \cdot \text{leverage} \\ & + \beta_7 \cdot q^{Dummy} \cdot \text{leverage} + \beta_8 \cdot \text{rel offer size} + \mu \end{aligned} \qquad (1.1)$$

where CAR(.) correspond to the 3-days cumulative abnormal returns around the announcement of issuance of the convertible bonds respectively. The market model and an equally weighted CRSP index for the market are used in the estimation of CARs. Independent variables other than dummies are industry adjusted at the 4 digit SIC code. All explanatory variables are measures at the quarter ending immediately before the announcement day. Results of the regression analyses are presented in column (1), Table 4.

Table 4 about here

From the results presented in column (1), the expense ratio coefficient is negative and significant at any standard level of significance. We interpret this as evidence that firms more likely to suffer from agency problems –i.e., those with higher expense ratios- exhibit more negative market reactions when they announce their plans to issue convertible securities. The effect of the expense ratio on market valuations is also economically significant[11]. The alternative measure of agency problems, the sales to assets ratio, is not significantly different from zero. Regarding the interaction between growth opportunities and *capex*, we find that its coefficient is positive and significant at the 5% level. Since the coefficient for *capex* is negative (though it only achieves significance at the 18% level), this result is consistent with the view that the issuance of convertible securities by firms with a high level of capital expenditures is perceived negatively by the market if the firm faces low growth opportunities ($q^{Dummy} = 0$) and positively if the firm faces high growth opportunities ($q^{Dummy} = 1$). The coefficient for the interaction between leverage and q^{Dummy} is statistically zero, as it is the coefficient of leverage itself. So it seems that the leverage of the firms at the time of the issuance announcement does not seem to significantly affect the change in firm value induced by the announcement.

In summary, the results for the interaction of *capex* and Tobin's *q* in column (1) are consistent with the results of Table 3 and suggest that the market perceptions regarding the issuance of convertible securities is influenced by the plausible use the firm will make of the funds raised. The more likely funds will be used for efficient investment, the less negative the abnormal returns; the most likely funds will be used to increase the number of assets under mangers' control in low growth firms, the more negative the abnormal returns. Finally, the significantly negative estimated coefficient

[11] A one standard deviation increase in the industry adjusted expense ratio increases the negative market reaction by 0.13% . This means that for the average bond-firm CAR in the sample, such a change in the level of expenses to total assets would increase the negative market reaction from -2.09% to -2.22%.

for the expense ratio provides additional support for this view.

In column (2) of Table 4 we present the results of the estimation of equation (1.1), but for market reactions at the redemption announcement date. We claim that if enough time passes between the issuance of conversion and the time of the redemption announcement, information about the economic value and prospects of firms should be already incorporated in market prices, so the ability of the regression to explain to explain CARs should be rather low (see H4). Variables are measured at the end of the quarter ending immediately before the redemption announcement date. The variable relative offer size is replaced by the relative redemption size, a variable capturing the amount of redemptions relative to the long-term debt of the firm:

$$\begin{aligned} CAR(-1,+1)^{Announcement} = {} & \beta_0 + \beta_1 \cdot \text{exp ratio} + \beta_2 \cdot \text{sales to assets} + \beta_3 \cdot q \\ & + \beta_4 \cdot capex + \beta_5 \cdot q^{Dummy} \cdot capex + \beta_6 \cdot \text{leverage} \\ & + \beta_7 \cdot q^{Dummy} \cdot \text{leverage} + \beta_8 \cdot \text{redemption size} + \mu \end{aligned} \qquad (1.2)$$

As shown in the table, the only variable that remains significant at the 10% level is the expense ratio, which is still negative. However, a global significance *F* test cannot reject the null hypothesis that all slope coefficients are zero. This result is consistent with a reduced amount of uncertainty remaining at the redemption announcement date. In this sense, since the variables proxying for firm characteristics do not affect CARs, it seems that the only (if any) uncertainty market participants face at this date is uncertainty about manager types.

We next proceed to test hypothesis H2 regarding the relation between market responses, agency problems, and the perceived probability of forced conversions. We investigate if firms associated with a higher probability of having agency conflicts at the issuance date are also more likely to call their in–the-money convertible bonds. This

result would provide support that self-indulgent managers call regardless of the realization of firm value. We use a logistic model to compute the probability that bonds are called for redemption when their conversion options are in the money. We use two specifications in the estimation procedure. First, we use a model where the explanatory variables are accounting base and correspond to the proxies for agency problems and firm valuation used in the previous analysis. The model for this first specification takes the following form:

$$\Pr[\text{call itm}] = \Gamma(\beta_0 + \beta_1 \cdot \text{exp ratio} + \beta_2 \cdot \text{sales to assets} + \beta_3 \cdot q + \beta_4 \cdot capex + \beta_5 \cdot \text{leverage}) \quad (1.3)$$

The dependent variable takes a value of one when the bonds are called in-the-money at the redemption announcement day, and zero otherwise. The independent variables are as defined earlier for Table 3.

The second specification uses only one market based variable, the three day CARs centered at the redemption announcement date. From the results presented in Table 3 and in column (1) of Table 4, we know that there is heterogeneity in stock price reactions at the time of the issuance announcement that is consistent with differential investor valuations of different types of firms, depending on observable characteristics that are related to the likelihood and scope of agency problems and firm value. In this sense, the stock price reactions at the issuance announcement of the convertible bonds are a good proxy for investors' priors regarding the extent of agency problems. Thus, the model for this second specification takes the form:

$$\Pr[\text{call itm}] = \Gamma\left(\beta_1 + \beta_2 \cdot CAR(-1,+1)^{Issuance}\right) \quad (1.4)$$

The dependent variable takes a value of one when the bonds are called in-the-money at the redemption announcement day, and zero otherwise. Table 5 presents the results of the estimation of equations (1.3) and (1.4). The table also reports the Hosmer and Lemeshow Goodness-of-Fit Test.

Table 5 about here

Colum (1) of the table presents the results for equation (1.3). The expense ratio, which is directly related to the probability of having an agency conflict, has a positive and significant coefficient. This suggests that the market is able, on average, to identify at the issuance day which firms are more likely to have an agency problem. The coefficient for *capex* is positive and significant, suggesting that firms that invest more than their industry peers are more likely to force conversion. These results are in accord with Mayers (1998) and his sequential financing motive. Leverage has a positive and significant coefficient: the higher the leverage of firm before it issues convertibles, the more likely is that it will force conversion.

Column (2) of Table 5 presents the results of the estimation of equation (1.4). The results indicate that a more negative market reaction at the announcement day is related to a higher probability of forcing conversion. This is result is consistent with the agency story if stock price reactions at the issuance announcement of the convertible bonds are a good proxy for investors' priors regarding the extent of agency problems

To further explore the relationship between CARs at call redemptions and agency problems present at the time of issuance, we form quartiles of our firm-bond observations according to their *expense ratio* at the issuance announcement date. Firms in the bottom (top) quartile are classified as firms with a low (high) probability of

having agency problems. We then compute CARs for the extreme quartiles at the redemption announcement date. Results of this analysis are presented in Table 6.

Table 6 about here

As expected, firms more likely to experience agency problems at the issuance announcement day have a negative reaction at the redemption announcement date, while those with a low ex-ante probability of agency problems experience a positive stock return to the announcement of conversion. The difference between these groups is statistically significant, with a p-value close to 3%. Given that at the issuance date, market reactions are related to the likelihood of agency problems and that at the redemption date all uncertainty is likely to be resolved, our results suggest that investors tend to be right when assessing the type of managers they are dealing with.

To test hypothesis H3, we split our sample between bonds whose convertible option was out-of-the-money and those that were in-the-money at the time of the redemption announcement and compute, for each sample, cumulative abnormal returns. The CARs for in- and out-of-the money samples are presented in Table 7.

Table 7 about here

When a bond is called out-of-the-money, the market reaction is positive and significant. This result is consistent to those found by Cowan, Nayar, and Singh (1993). On the other hand, stock reactions to bonds called in-the–money are negative and significant. This result is consistent with the results in Datta, Iskandar-Datta, and Raman (2003) where they find that common stock of firms who call their in-the-money convertible bonds underperforms by a median of 64% their peers over the five years

following forced conversion. The negative and significant market reaction observed for in-the-money sample might be in anticipation by the market to such future underperformance.

Finally, from H4, the market reaction at the issuance announcement day should be larger (in absolute value) than the market reaction observed at the call announcement day. As seen in Table 2, the mean CARs at the time bonds are issued is -2.09%. When the *in-the-money* bonds are called, the mean CAR is -1.16%. These percentages are statistically different from each other (Kruskal-Wallis test with a p-value equal to1.3%). Since CARs are basically changes in valuation, these results are consistent with our argument that a reduced amount of uncertainty exists at the calling announcement date as compared to the issuance announcement date.

5. Conclusions

Financial researchers have devoted a large amount of effort to explain the negative market reaction to the announcements of issuance of convertible bonds and the announcement of convertible bond calls (redemptions). Until today, the negative stock market reaction when convertibles are issued has generally been treated as a separate phenomenon from the stock price reaction to announcements of redemptions (force conversions). The theoretical explanations, based on information asymmetry, for the existence of negative returns at redemption calls are not able to also explain the existence of negative returns at issuance. In fact, empirical studies have not been able to provide to conclusive evidence that information or price pressure can explain the presence of the symmetry of stock price reactions to the issuance and call redemptions of convertible bonds. We argue that the explanation to this puzzle lies in additionally

considering agency problems likely to exist when issuing convertible debt. We offer four testable hypotheses regarding the interaction between agency conflicts and information asymmetry and the symmetry of stock price reactions to issuance and redemptions of convertible bonds.

We find evidence showing that the symmetry of stock price reactions to issuance and redemptions of convertibles are associated with the presence of agency problems at the issuance date. We also find that the probability of forcing a conversion is positively associated with accounting and market based proxies for agency problems. Further supporting the importance of agency problems in the redemption of convertibles, we find that when the option in the convertible bond is out of the money, the stock price reaction to the call is positive. This result provides evidence on the ability of the market to recognize agency problems. Incorporating agency problems to a model of asymmetric information is essential to developing a comprehensive model consistent with the empirical literature.

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Table 1. Descriptive Statistics.
Panel A presents descriptive statistics for the sample of firms used for analysis at the issuance announcement day. Tobin's *q* is defined as the product of the price at the third month of the corresponding quarter and the number of common shares outstanding, plus total assets, minus the book value of common equity, divided by total assets. Assets correspond to the value of total assets. Leverage is long term debt over total assets. The expense ratio is defined as selling, general, and administrative expenses over total sales. The capital expenditures ratio is defined as the ratio of capital expenditures to total assets. The asset utilization ratio is defined as the ratio of sales to total assets, Each variable is adjusted subtracting its industry median, where industry is defined at the 4 digit SIC level. A *t test* for the null hypothesis that the mean of each variable is equal to zero, and a sign and Wilcoxon tests for the null hypothesis that the median of each variable is equal to zero are also presented. p-values are reported under their respective statistics. Panel B presents the correlation matrix (Pearson correlation coefficients) for the variables included as regressors in the regression analysis at the issuance announcement day. p-values are reported under their respective statistics.

Panel A: Descriptive Statistics

	Raw data			**Industry adjusted**		
	Mean	**Median**	**Std. Dev.**	**Mean**	**Median**	**Std. Dev.**
Tobin's *q*	2.28	1.55	2.54	0.72	0.08	2.42
Assets (billions)	12.63	1.24	51.96	11.57	0.91	51.91
Leverage	1.32	0.71	4.50	1.07	0.48	4.49
Expense Ratio	0.31	0.24	0.32	0.02	-0.01	0.28
Capital Expenditures Ratio	0.03	0.02	0.06	0.01	0.00	0.05
Asset Utilization Ratio	0.19	0.14	0.18	-0.01	-0.03	0.13

Panel B: Correlation Matrix

	capex ratio	**exp ratio**	**sales to assets**	**leverage**
exp ratio	0.047			
	0.49			
sales to assets	-0.058	**-0.23**		
	0.32	**0.0006**		
leverage	**-0.119**	-0.079	**-0.13**	
	0.04	0.24	**0.03**	
Tobin's *q*	0.009	0.09	-0.06	0.01
	0.87	0.16	0.32	0.83

Table 2
This table presents Cumulative Abnormal Returns (CARs) computed using market adjusted returns, with the equally weighted CRSP index used as the market benchmark. (-1,+1) corresponds to a three day window centered at the event day. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 1-tail test.

Panel A: Market Reaction at Issuance Announcement Day.

	Issuance Announcement Day	
N = 319	Mean CAR	t stat
(-1,+1)	-2.09%	-5.36***

Panel B: Market Reaction at the Call Announcement Day for Bonds which Conversion Option is In the Money.

	Call Announcement Day	
N = 112	Mean CAR	t stat
(-1,+1)	-1.16%	-2.16*

Table 3. Industry Adjusted Capital Expenditures to Assets and Industry Adjusted *q*-Ratio.
This table presents results from a double sort of firms according to sample median Tobin's *q*, defined as the product of the price at the third month of the corresponding quarter and the number of common shares outstanding, plus total assets, minus the book value of common equity, divided by total assets, and sample median capital expenditures to assets. (-1,+1) corresponds to a three day window centered at the event day. CARs in Panel A are computed based on market adjusted returns. The equally weighted CRSP index is used as the market benchmark. The Kruskal-Wallis test and the test for equality of medians CARs across groups are shown in Panel B. The Kruskal-Wallis test and the Wilcoxon Two Sample Test between Above Median Tobin's *q* - Below Median CAPEX to assets CARs and Below Median Tobin's *q* - Above Median CAPEX to assets groups CARs are shown in Panel C. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 1-tail test.

Panel A

	Below Median Tobin's *q*	**Above Median Tobin's *q***
		Efficient Investors Category
Below Median CAPEX to Assets	These are low growth firms investing less than than their industry peers. We expect a negative market response to the issuance announcement.	These are firms with better investment opportunities than their industry counterparts, but that have been investing less than them. We expect less adverse market reactions to issuance announcement for this category than for the *Empire Builders* category.
	Empire Builders Category	
Above Median CAPEX to Assets	These are firms with lower investment opportunities than their industry counterparts but that have been investing more than them.	These are high growth firms investing more than their industry peers. We expect less adverse market reactions to issuance announcement for this category than for the Empire Builders category.

Panel B

	Below Median Tobin's *q*				**Above Median Tobin's *q***			
	N =86	Mean CAR	Patell Z	t stat	N =61	Mean CAR	Patell Z	t stat
Below Median CAPEX to Assets	(-1,+1)	-2.03%	-3.260***	-2.688**	(-1,+1)	-1.48%	-2.547**	-1.440$
	N =61	Mean CAR	Patell Z	t stat	N =87	Mean CAR	Patell Z	t stat
Above Median CAPEX to Assets	(-1,+1)	-3.94%	-4.523***	-3.856***	(-1,+1)	-1.66%	-3.180***	-2.289*

Panel C

Kruskal-Wallis Test and Test for Equality of Medians across groups.				Kruskal-Wallis Test and Test for Equality of Means between Above Median Tobin's *q* - Below Median CAPEX to assets and Below Median Tobin's *q* - Above Median CAPEX to assets groups.			
Kruskal-Wallis Test		Median Analysis		Kruskal-Wallis Test		Wilcoxon Two Sample Test	
χ^2	p value	χ^2	p value	χ^2	p value	Normal Approx	p value (1 tail)
7.5076	0.0574	5.6037	0.1326	6.3338	0.0118	-2.5141	0.006

Table 4. Relation between CARs at both the Issuance Announcement Day and at the Redemption Announcement Day and Proxy Variables for Agency Problems and Firm Value.
This table provides results for OLS estimation of equations (1.1) and (1.2), respectively. The dependent variable is 3-days CARs for the issuance announcement date for model (1) and 3-days CARs for the redemption announcement date for model (2). CARs are computed using a market model and an equally weighted CRSP index. The independent variables are the ratio of capital expenditures to total assets, the expense ratio, defined as selling, general, and administrative expenses over total sales, the ratio of sales to assets, leverage, defined as long term debt over total assets, Tobin's *q*, defined as the product of the price at the third month of the corresponding quarter and the number of common shares outstanding, plus total assets, minus the book value of common equity, divided by total assets, the interaction between capital expenditures and a dummy variable for Tobin's *q*, q^{Dummy}, which takes the value of one if a firm's *q* is above the corresponding industry average, the relative offer size which corresponds to the ratio of the offering amount for each bond to the value of the corresponding firm's common equity and the redemption size, defined as the redemption amount (in millions) divided by long term debt. Variables are industry adjusted at the 4 digit level SIC codes. All explanatory variables are measured at the quarter ending immediately before the issuance announcement day in column (1) and at the quarter ending immediately before the redemption announcement day in column (2). p-values are shown below parameters' estimates. The symbols *,**, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a 2-tail test.

	(1) Announcement Date		(2) Redemption Date	
intercept	-0.028	***	-0.007	*
	0.0001		0.0883	
exp ratio	-0.004	***	-0.004	*
	0.001		0.0765	
sales to assets	0.008		-0.011	
	0.821		0.6652	
Tobin's *q*	0.001		-0.001	
	0.345		0.4273	
capex ratio	-0.199		0.026	
	0.178		0.924	
q^{Dummy}*(capex ratio)	0.465	**	0.117	
	0.043		0.7516	
leverage	-0.0009		0.000	
	0.318		0.6118	
q^{Dummy} * leverage	0.0001		-0.001	
	0.972		0.5642	
relative offer size	-0.002			
	0.694			
redemption size			0.042	
			0.7455	
N	174		127	
F value	2.21	*	0.61	
p-value	0.0966		0.7639	
R^2	0.11		0.04	

Table 5. Logistic Regression: Relation between Proxy Variables for Agency Problems and the Probability of calling In-the-Money Convertible Bonds.

This table presents results from a logistic estimation of equations (1.3) and (1.4) in the paper. The logistic model computes the probability that the bonds are called for redemption when their conversion options are in the money. Weights are used in the estimation in column (1) and correspond to the ratio of the offering amount for each bond to the value of the corresponding firm's common equity. In column (1) the independent variables are the ratio of capital expenditure to total assets, the expense ratio, defined as selling, general, and administrative expenses over total sales, and the sales to assets ratio. All independent variables are measured at the issuance announcement day and adjusted according to their industry averages, where industry is defined by the 4 digit SIC code. In column (2) the independent variables are the cumulative abnormal returns for (-1,+1) windows centered at the issuance announcement day computed using market adjusted returns. The equally weighted CRSP index is used as the market benchmark. Weights in the logistic regression in column (2) correspond to the reciprocal of the variance of the cumulative abnormal returns. p-values are shown below parameters' estimates. The table also reports the Hosmer and Lemeshow Goodness-of-Fit Test. The null hypothesis is that there is no difference between the observed and predicted values of the response variable. The symbols *,**, and *** denote statistical significance at the 0.10, 0.05, and 0.01 levels, respectively, using a 2-tail test.

	(1)	(2)
intercept	-0.087***	-0.12***
	0.0001	0.0001
Capex ratio	1.76***	
	0.0001	
expense ratio	0.015***	
	0.0001	
sales to assets	0.06	
	0.1374	
leverage	0.006***	
	0.0013	
CAR (-1,+1)		-0.96***
		0.0001
N	125	193
in / out of the money	64 / 61	98 / 95
Hosmer and Lemeshow Goodness-of-Fit Test		
χ^2	8.08	8.86
p-value	0.43	0.35

Table 6. Relation between Agency Conflicts at the Issuance and Market Reactions to Conversion Calls.
This table presents results for market reactions at the redemption announcement day for convertible bonds divided in two groups according to the likelihood of having agency problems at the issuance announcement day. Bond firm observations are sorted according to the expense ratio, defined as selling, general, and administrative expenses over total sales, measured at the issuance announcement day. Firms in the bottom (top) quartile are classified as firms with a low (high) probability of having agency problems. Cumulative Abnormal Returns (CARs) are computed using market adjusted returns. The equally weighted CRSP index is used as the market benchmark (-1,+1) corresponds to a three day window around the conversion call announcement day. A Wilcoxon Two Sample Test for the differences in means between the two groups is also shown. The symbols $,*,**, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 1-tail test.

	Low Agency Problems	**High Agency Problems**	**Wilcoxon Two-Sample Test**	
			Z	p-value
CAR (-1, +1)	0.84%	-1.51%	2.11	0.035
N	33	34		

Table 7. In and Out of the Money Conversion Option at the Call Announcement Day.
This table presents results for market reactions at the redemption announcement day for convertible bonds divided in two groups according to the status of their conversion option at the even date. Panel A reports Cumulative Abnormal Returns (CARs) computed using market adjusted returns, with the equally weighted CRSP index used as the market benchmark. (-1,+1) corresponds to a three day window centered at the event day. The Kruskal-Wallis test and the Wilcoxon Two Sample Test are shown in Panel B. The symbols $, *, **, and *** denote statistical significance at the 0.10, 0.05, 0.01 and 0.001 levels, respectively, using a 1-tail test.

Panel A: Three-day CARs around the call announcement day for out-of-the money and in-the money convertible bonds

	Out of the Money				In the Money		
N = 100	Mean CAR	Patell Z	t stat	N = 112	Mean CAR	Patell Z	t stat
(-1,+1)	0.78%	1.66*	1.50$	(-1,+1)	-1.16%	-2.59**	-2.16*

Panel B: Kruskal-Wallis Test and Test for Equality of Means between groups

Wilcoxon 2 Sample Test		Kruskal-Wallis Test	
Normal Approx	p value (1 tail)	χ^2	p value
2.56	0.0047	6.75	0.01