# WEALTH EFFECTS OF CONVERTIBLE BOND ISSUES – FURTHER EVIDENCE OF AGENCY COSTS AND MANAGERIAL ENTRENCHMENT

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**Abstract**

There is still some ambiguity about the company's motivation for using the hybrid finance instrument of convertible bonds. Although manifold theoretical approaches provide varying assumptions about the rationale behind the issuance of convertible bonds, the empirical evidence about the major issuance reasons and the subsequent wealth impacts for the issuer remains mixed. The purpose of our study is to evaluate the relevance of these various theoretical approaches to explain empirically the motivation and characteristics of a company when issuing convertible debt and the resulting wealth effects for the company's shareholders.

**Keywords:** Convertible Bonds, Short-Term and Long-Term Wealth Effects, Wealth Impacts

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## 1. Introduction

In 2007 convertible bond sales on the primary market rose to a record high of $183 billion an increase of 47 percent compared to 2006 (Glover, 2007). In contrast to its market success, there is still a lack of evidence to explain why convertible bonds are issued. Ross et al. (2005) state that "*probably there is no other area of corporate finance where real-world practitioners get as confused as they do on the reasons for issuing convertible debt*".

According to several surveys of financial managers, convertible bonds are used because of their lower coupon rate, as delayed equity, or as "sweetening" of debt securities (Billingsley and Smith, 1996; Graham and Harvey, 2001; Bancel and Mittoo, 2004). Academics relate the use of convertibles to information asymmetries and principal agent problems (Myers and Majluf, 1984). In a setting of imperfect capital markets principals are less informed about the investments and financial states of a firm than their agents. Agents often abuse this discrepancy to conduct low profitable projects or investments that are not in favor of the shareholders welfare. However, strong adverse selection risk faced by the principal often entails higher financing costs for a firm than for firms with a low adverse selection risk. Firms acting in favor of the shareholders welfare avoid these high financing costs by reducing the principal-agent discrepancies through issuing debt instead of equity (Heinkel, 1982). By issuing debt the firm sends the signal to generate sufficient cash flow with its investments in order to repay the provided funds and interest charges. Hence, debt financing monitors the actions of the agent in favor of the principal as the obligatory repayments of the debt forces agents to invest in profitable projects (Jensen, 1986). Although the issuance of debt securities sends more positive signals towards the capital market, agents tend to issue equity in case the stock is overvalued. As a consequence the issuance of equity is often followed by a decline in stock returns. Among others, Asquith and Mullis (1986) provide empirical support for this thesis as they discover a 2.7 percent abnormal drop in stock returns following an announcement of new equity issues.

Convertible bonds feature characteristics of debt and equity financing instruments. According to a number of theoretical models, convertible bonds can mitigate the specific costs of "straight" debt without inducing the same strong negative signals as equity instruments. Not surprisingly, the announcement of convertible bonds issuance causes less negative abnormal returns than equity offerings (Loncarski et

al., 2008). However, if compared to the abnormal returns of plain bonds convertible bonds report a lower issuance announcement performance. The empirical evidence even documents a decline in stock prices after the issuance of a convertible bond, which is in line with theoretical implications on shareholder wealth after a convertible bond offering. The negative impacts also continue in the long-run performance of companies issuing convertible bonds (Abhyankar & Ho, 1996). These findings are inconsistent with the predictions of the theoretical models. Regarding the theoretical models, firms should not underperform abnormally in the long-term post-issuance period of a convertible offering, for efficient markets theories to hold true. Hence, the question arises, why theoretical implications coincide with the empirical results in the short run and deviate from each other in the long run. It also entails questions concerning the appropriate theory explaining the motivation of a firm to issue a convertible bond.

To answer those questions we analyze and discuss the size and determinants of short- and long-term wealth effects of convertible bond issues and relate these effects to a company's motivation to issue convertible debt. In a first step, theories on capital structure as well as the theoretical models from which testable hypotheses are derived as to why companies issue convertible bonds are reviewed. To compare the theoretical implications with a consistent empirical data sample we illustrate the short- and long-term stock reactions of convertible bond offerings in the U.S. market, for the period of 1980 to 2005. Finally, we intend to determine the crucial parameters of the performance after a convertible bond offering by regressing issue and issuer characteristics on announcement-, and issue date effects as well as on long-term performance. By the help of the received results we discuss the postulated hypotheses and draw implications on the motives of convertible bond financing.

## *2. Related Literature and Theoretical Background*

Convertible bonds and the motivation of firms to issue those are widely discussed and examined. The suggested reasons for the issuance of this financing instrument are manifold. Loncarski et al. (2008) give a helpful summarization of the different assumptions in the following categories: Theories based on asymmetric information, theories based on managerial entrenchment, theories based on rationing in the equity markets and market timing, whereas the asymmetric information theories are considered as the classical explanation about the wealth effects for firms after the announcement of convertible bond offerings. Additionally, we introduce a fourth category for theories based on convertible arbitrage.

### 2.1 Theories based on Asymmetric Information

Adverse selection models analyze the role of convertible bonds as a signalling instrument to diminish the information asymmetries between principals and agents. To determine the provided signals from the issuance of a hybrid financial instrument as a convertible bond and to build assumptions concerning wealth implications for the shareholders, the information signals from the issuance of straight debt and equity instruments are applied. If managers tend to reduce the monitoring costs of the principals they rather issue debt or debt like securities instead of equity instruments. Lower monitoring costs also entail reduced financing costs. Subsequently, the issuance of equity or equity-like instruments should affect the stock price more negatively than debt or debt-like instruments. This leads to the first hypotheses for the theories based on information asymmetries and agency issues:

*H1a: Stock price reactions for convertible bonds are more negative than stock price reactions of debt offerings and less negative than stock price reactions of equity offerings.*

*H1b: Stock price reactions are more negative for equity-like convertibles than for debt-like convertibles.*

*H1c: Stock price reactions are less negative for larger companies, since larger companies are more transparent to the market and less information search is required.*

*H1d: Firms with good growth opportunities (higher book-to-market ratios) should face less negative stock price reactions. De Jong and Veld (2001) argue that positive future expectations lower adverse selection and agency cost.*

*H1e: Announcement period abnormal returns are positively related to the face value of the convertible issue (Abhyankar and Dunning, 1999).*

In addition to these general theses about the effect of convertible bond issuance in an information asymmetry setting Brennan and Schwartz (1988) and Brennan and Kraus (1987) state that convertible bonds help to estimate the risk of values and returns of a firm's assets. The investor is not capable of estimating a firm's risk. These investment inefficiencies arise due to information asymmetry issues in the framework of Myers and Majluf (1984) and Heinkel (1982). Investors are willing to pay more for a convertible bond than for a straight bond due to its hybrid nature. Convertible bonds are relatively insensitive to the risk of the issuing company. For example, a higher operational risk reduces the value of the debt part of the convertible bond whereas the option component increases in value due to the increased volatility.

Bondholders seek low levels of risk whereas shareholders favor high levels of risk because of the upward potential for gains. Regarding Brennan and Schwartz (1988) this fact increases the agency cost of

straight debt. Convertibles reduce these inefficiencies, as their value is less sensitive to the changes in the riskiness of the underlying equity. Convertibles serve as an ideal signaling instrument for companies that the market perceives as risky, in terms of the assessment of risk and the prediction of the future payment policy. In order to measure whether the risk insensitivity theory of Brennan and Schwartz holds true, the following hypotheses need to be tested to assess the company's level of debt and risk of financial distress:

*H2a: Higher financial leverage has a negative effect on the stock price of the issuing company at announcement of the convertible, in particular for more debt-like convertibles.*

*H2b: A higher interest coverage before tax (ICBT) has a positive effect on the company's stock price at announcement of the convertible.*

In the asymmetric information model of Kim (1990), the convertible bond issue and in particular the conversion ratio serve as a signal for the firm's quality type. The conversion ratio can be interpreted as a signal of a company's future earnings. To be attractive to investors, worse type companies have to offer a higher conversion ratio for the convertible bonds which implies more shares per bond and a higher dilution of future earnings. Future earnings must be shared with a larger amount of new shareholders. This will have a negative impact on the abnormal common stock returns at the announcement date of the convertible. As a consequence, the following hypotheses can be examined to prove whether Kim's model holds true:

*H3a: A higher conversion ratio will lead to more negative announcement period abnormal returns, since higher conversion ratios imply worse type firms.*

Stein (1992) argues that convertible bonds are issued in order to receive equity through the "back door". According to his theory, convertibles are offered in situations where equity issues are intended but unattractive due to high issuance costs (e.g. underpricing cost) and dilution caused by information asymmetries (Myers & Majluf, 1984). According to this theory, well-performing firms issue debt, while medium-performing firms issue convertible debt to differentiate themselves from low-performing firms that issue equity. Hence, the financing choice therefore serves as a signal to the market. This is in line with the adverse selection models of capital structure (Myers & Majluf, 1984). As a consequence, the following hypotheses are postulated regarding the assumptions by Stein:

*H4a: A period of positively growing abnormal returns preceding the announcement date negatively affects announcement period abnormal returns. The run-up of pre-announcement returns is a sign of overvaluation and according to Myers and Majluf an indication for equity issuance.*

*H4b: A period of positive abnormal market returns preceding the announcement date positively affects announcement period abnormal returns (Ammann et al., 2004). Bull markets induce equity as financing instrument.*

*H4c: Dividend payments have a positive effect on announcement period abnormal returns. High dividend payments induce equity as financing instruments.*

The following theories change the focus of the examination and consider long-term performance of firms that issued convertible bonds to find out more about the motives and whether the "classical explanations" of the information asymmetry theories hold true.

## 2.2 Theories Based on Managerial Entrenchment

Compared to the previously described approaches to explain the use of convertible bonds, Isagawa (2002) analyzes the use of convertibles in a setting where corporate financial policy is not chosen to maximize shareholder's wealth. In this setting the management chooses a financial policy that secures their control over the firm and furthers empire building expansion projects. However, without the threat of hostile takeovers, managers will not issue debt to follow their financial policy since this would increase the probability of bankruptcy. If managers are required to issue debt, they are committed not to undertake value-dissipating projects.

According to Isagawa (2002), managers can reduce the probability of bankruptcy by issuing callable convertibles. The security will be converted into equity in the future and therefore allows the manager to undertake expansion projects. Consequently, the convertible is an effective instrument for an entrenched manager. Nevertheless, it is not effective to increase the firm's value. With the usage of convertible bonds the firm's value decreases since the probability decreases that the entrenched manager will be replaced:

*H5a: The theory of entrenched managers is supported by a negative long-term performance of convertible bond offerings.*

## 2.3 Theories based on Market Timing

According to Lee and Loughran (1998), MacLaughlin, Safiedenne, and Vasudevan (1998), as well as Lewis, Rogalski, and Seward (2001), convertible bond offerings are followed by a significant long-term underperformance of the firm's stock prices. A theory to explain the long-term underperformance of convertible bond offerings is market timing. Managers issue equity or equity-like securities when stock valuation is high and repurchase when valuation is low. According to the research of Loughran and Ritter (1997), poor post-issue performance arises from the fact that firms use windows of opportunity to issue stock when it is overvalued. A further boost in earnings performance around the issuance date is associated with poorer post-issue performance since

investors extrapolate earnings patterns from the past into the future. The market-timed offering allows firms, and in particular managers of firms, to increase the amount of financial slack and to undertake expansion projects.

Lee and Loughran (1998) and Lewis et al. (2001) provide evidence that convertible debt issues occur after large increases in the issuer's stock price. Mann et al. (1999) find similar evidence to support the market timing hypothesis. According to their study, convertible debt issues are conducted in hot issue markets when a lot of firms issue convertible debt, which leads to the following assumptions:

*H6a: If the market timing hypothesis holds true, the relative long-term performance of stocks is negative.*

*H6b: There is a negative correlation between prior-issuance stock price run-up and long-term performance of stocks.*

Another theory to explain the long-term underperformance of convertible bond offerings is the theory of rationing in equity markets proposed by Lewis et al. (2001). They argue firms may face difficulties to get access to the equity market due to reluctances of investors to provide firms with a high uncertainty about their post-issue performance with funds. The firm's high performance uncertainty also constrains the issuance of straight debt due to the seniority of this financing type. However, firms can issue convertibles to raise capital. Convertibles can be screened by investors until they finally decide whether they want to convert them into equity. In the case that earnings decline, they still have a downside protection through the bond component. Due to the fact that convertible issuers were rationed out of the equity market they might suffer from a similar underperformance as measured for seasoned equity issuers (Loughran and Ritter, 1995).

The rationing assumption is difficult to examine because it cannot be clearly identified why the convertible bond issuers were rationed out of the equity market. Possible reasons might be poor pre-issue performance projected into the future or poor future earnings prospects. However, long-term underperformance measured for convertible issuers supports the rationing thesis:

*H7a: The rationing theory is supported by a negative long- term performance of convertible bond offerings.*

## 2.4 Convertible Arbitrage Theory

Another approach to understand the rationale for issuing convertible bonds is to change the point of view from supply driven motives to demand driven motives. Mitchell et al. (2007) as well as Choi et al. (2007) state that it is a widespread belief among Wall Street practitioners that 70 to 80 percent of the convertible debt offered in primary markets is absorbed by convertible bond arbitrage hedge funds. Hedge funds do not buy convertibles because of the previously described reasons, but because of a strategy called convertible arbitrage. They yield arbitrage profits by taking a short position in the underlying stock of a company that issues convertible bonds. The proceeds of the short sell are then used to buy the convertible bonds. Convertible bonds are sometimes inefficiently priced relatively to the underlying stock as for example due to liquidity reasons. Convertible arbitrage represents a zero investment strategy where hedge funds can profit from the equity option of the convertible and the apparently cheap source of volatility.

The profitability of this strategy is shown on the extent of the negative abnormal returns around the issue date. The more stocks are shortened on the issuance day, the more hedge funds employ the arbitrage tactic which entails stronger negative abnormal returns. In order to measure the impact of the hedge fund arbitrage strategy, the wealth effects of convertible bonds around the issue date are analyzed:

*H8a: To confirm the negative wealth impact of convertible arbitrage, post-issuance period abnormal returns should be significantly negative.*

## 3. Data and Methodology

The complete sample consists of convertible bonds issued from August 1980 to December 2005 by U.S. American companies. Data on announcement dates, issue dates, and other characteristics were obtained from the Securities Data Company (SDC) global new issues database. For liquidity purposes, the outstanding amount of the convertible bonds has to be more than $100 million with no upper limits on the outstanding amount (Arshanapalli et al., 2004). All firms either trade on the New York Stock Exchange (NYSE), the American Exchange (AMEX), or the over-the-counter (NASDAQ) market. The final sample consists of 341 convertible bond issues. About 16 percent of the issuing companies are engaged in the financial industry. This fact is taken into account in the following regression analyses. Moreover, predominant industries are the Energy/Power, High Technology, and Media/Entertainment industry. The average amount issued over the time period is around $450 million, whereas the median amount is $275 million. The average years to maturity of the sample data is 15.26 years with a standard deviation of 10 years. The amount of convertibles with a perpetual maturity is 26.7 percent. The average conversion premium of the convertibles is 28.24 percent with a standard deviation of 46.6 percent. In order to estimate the announcement and issuance effects of convertible bond offerings, standard event study methodology is used with S&P 500 as benchmark market portfolio. To test the statistical significance of the abnormal returns, the test of Boehmer et al. (1991) is used. Their test employs a standardized cross-sectional method in which abnormal returns are standardized using the estimation period standard deviation. The standardization accounts for the

problem of event induced variance increases (Boehmer et al., 1991).

A long-horizon event study is conducted to test the post-issue stock price performance in the subsequent months of the issuance. Firstly, a long-run analysis of buy-and-hold abnormal returns (BHAR) is conducted. Secondly, calendar-time portfolio abnormal returns are calculated (CTAR) to verify the robustness of the results. The returns of the Center for Research in Security Prices (CRSP) equal- and value-weighted indices are used to proxy the expected security return for the corresponding period of the reference portfolios. The CRSP returns, the size and book-to-market portfolios and the respective breakpoints are retrieved from the Kenneth R. French data library[7]. To build the portfolios, the reference stocks are categorized according to their market value into two size portfolios. In a second step these size portfolios are further partitioned into three book-to-market quintiles. The Fama and French portfolios are rebalanced and adjusted for newly listed firms only once a year what diminishes the respective biases.

To test the statistical significance of the BHARs under the assumption of cross-correlation and skewness biases Lyon et al. (1999) propose a bootstrapped skewness-adjusted t-statistic. This test is calculated in two steps. In a first step the skewness-adjusted t-statistic according to Johnson (1978) is calculated. The skewness-adjusted t-statistic adapts the usual t-statistic, by the function of skewness of the distribution of abnormal returns (Lyon et al., 1999). In a next step, the skewness-adjusted t-statistic is further refined. Sutton (1993) argues that if skewness is severe and the sample size is small then Johnson's (1978) skewness-adjusted t-test can also be noticeably inaccurate. Therefore, a bootstrapped distribution of the skewness-adjusted t-statistic is constructed on the basis of randomly selected resamples and compared with the sample skewness-adjusted t-statistic to determine the results' significance.

The fact that the event firms all take part in a corporate action induces that the sample firms might not be randomly selected. However, in non-randomly selected samples the calendar-time portfolio method often yields more robust results (Lyon et al., 1999). In order to control for the effects that convertible bond offerings are clustered in calendar-time, a calendar time analysis is applied. The use of a monthly cross-sectional average avoids any assumptions about cross-sectional independence.

In this study a calendar-time portfolio application of the three factor model of Fama and French (1993) is used to capture systematic patterns in average returns. The dependent variable in the regression analysis is the monthly excess return of an equally- weighted calendar-time portfolio that includes all convertible offerings during the last twenty months. The calendar-time portfolio is equally-weighted because a value-weighted approach may underestimate abnormal returns (Loughran and Ritter, 2000). The calendar-time portfolios are created between January 1978 and August 2005 on rolling monthly basis and include all convertible bond offerings of the previous twenty months. Offerings that are older than twenty months are dropped from the calendar-time portfolio.

## 4. Empirical Results

### 4.1 Announcement Day Effects

The results of the study are compared to the hypotheses postulated. In appendix 20 an overview of the hypotheses can be found. In Table 1 the Cumulative Average Abnormal Returns (CAAR) for different event windows are presented. The table shows the CAAR for the whole sample as well as delta specific CAAR. With these results Hypothesis 1, regarding the wealth effects associated with the announcement of convertible bond offerings, can be examined.

***[Insert table 1 about here]***

Panel A of table 1 shows the results for the total sample. The CAARs are significantly negative over different event windows of the sample. In the event window (-1, 1), which most closely covers the announcement day effect, a highly significant negative average abnormal return of -1.58 percent is measured. These results are in accordance with the studies of Loncarski et al. (2008), as presented in chapter 2. Furthermore, this confirms hypothesis 1a since the results depict values between the announcement effects of debt offerings and equity offerings. A tendency towards more negative announcement effects can be explained by the more equity-like nature of the total sample. The panels B and C of Table 1 present the CAAR for the more equity- and more debt-like subsamples with a delta value of above 0.5 and below 0.5 respectively. In case of the more equity-like convertibles the most negative CAAR are in the event window (0, 20), with a significant negative -3.39 percent. The more debt-like convertibles experience the most negative abnormal return in the event window (0, 20) with a significant -2.13 percent. From the results in Table 1 the conclusion can be drawn that the wealth effects associated with convertible bond offerings are significantly more negative for the more equity-like convertibles than for more debt-like convertibles. This confirms Hypothesis 1b.

The rebound prior to the announcement of around 0.5 percent for the whole sample and of around 0.9 percent for the more equity-like sample becomes significantly negative after the announcement and therefore shows the negative

[7] Kenneth R. French provides on his websites (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html) CRSP returns for different benchmark portfolios and the Fama-French three factor model.

wealth effects. The significant stock price run-up prior to the announcement of the equity-like subsample and the whole sample, which is more equity-like in nature support hypothesis 4a. These results suggest that issuers try to time their announcements after periods of favorable stock price movements. It also seems as if the capital market participants mostly perceive the companies issuing rather equity-like convertible bonds as overvalued. This assumption is stressed by the significant positive stock price run-up before the announcement day and the negative stock price reactions in the subsequent days.

### 4.2 Issuance Day Effects

The time period between the announcement of a convertible offering and the day of issuance is often relatively short and sometimes within 48 hours. To discover the impact of issuance date effects a new sample is defined where the period between the announcement and the issue is at least two days. Of the former 341 convertible offerings, 274 in the new subsample fulfill this criterion. Table 2 shows the results for the issuance effects of the subsample.

***[Insert table 2 about here]***

The significant issuance day wealth effects are even more negative in comparable event period windows than the announcement day wealth effects. This might be due to an overlap of announcement and issue date effects. The previously revealed announcement effects exhibit a strong negative growth which is even more pronounced for more equity-like convertibles. These effects probably have a negative influence on the issue day effects. However, the relatively high and significant effect of the two day event period (0, 1) in particular fosters the assumption of issuance effects detached from announcement wealth effects. These results are in line with previous research on convertible arbitrage in the U.S. market conducted by Arshanapalli et al. (2004). The findings support hypothesis 8a and the idea that there is arbitrage activity and short-selling of the issuing company's stock due to convertible bond arbitrage strategies employed by hedge funds.

### 4.3 Results of the Cross-Sectional Study

In order to analyze the impact on the size of the wealth effect of convertible bond offerings, a number of cross-sectional regression analyses are performed. Within the regression analyses the impact of the design of the convertibles (more debt- or more equity-like) and the different characteristics of the convertible bond issuers in respect to the hypotheses of section 3 are analyzed. In all deducted regression analyses, the dependent variable is the CAAR of the event window (-10, 10). The results of the regression for the total sample are presented in Table 3. In a first regression specification the hypotheses regarding the effects of firm size, growth opportunities and face value of the convertible bond (hypothesis 1c-1e), the effects asymmetric information theories (hypothesis 2a and 2b), and the effect the dividend payments (hypothesis 4c) are tested.

***[Insert table 3 about here]***

Based on the results of the first specification in Table 3 hypotheses 2a and 2b are supported. Leverage (LEV) has a significant negative influence on the market valuation of convertible bonds. Furthermore, the interest coverage before tax (ICBT) has a significant positive influence on the market valuation of convertible bonds. These results support the theory of Brennan and Schwartz (1988) that convertible bonds are an adequate financing instrument when firms are expected to face high debt-related costs due to the risk of financial distress and the threat of bankruptcy. The debt-related costs are caused by high financial leverage and low earnings that are not sufficiently large to service interest payments. In order to obtain an even more comprehensive overview about the theory of Brennan and Schwartz (1988), the more debt-like subsample needs to be analyzed more closely. The coefficient for the dividend yield (DY) variable is expected to be positive, since an increase in dividend payments should have positive effects on the announcement CAAR. Although not significant, the effect of the dividend yield is positive and therefore in line with the disciplining role of a dividend payout policy. The effect of dividend payments needs to be further examined in the more equity-like subsample. The coefficient related to the growth opportunities (BtoM) of the issuing companies is highly significant. This result is in accordance with the theory that value companies with higher book-to-market ratios face limited growth opportunities. As a consequence, the announcement effects of convertible debt will be more negative for these companies. This confirms hypothesis 1d. The coefficients for the market value of the issuing companies and the face value of the convertible bond have no significant influence on the market valuation.

In the second specification in Table 3 the proxies regarding conversion premium, market run-up, and stock run-up prior to the convertible bond issuance are included. Based on the results of specification two, hypothesis 4a and 4b can be confirmed. The market valuation declines significantly after a stock price run-up prior to the announcement of the convertible bond. This implies that an 8% increase in the stock price run-up of the estimation period would decrease the announcement related CAAR by one percent. This confirms the hypothesis that investors are more concerned about overvaluation of the company if they discover that the announcement of the convertible bond offering is preceded by a stock price run-up. Furthermore, the coefficient of market price run-up is highly significant and positive. These results show

that the CAAR are significantly higher (less negative) in times of good markets, as asymmetric information signals about the risk and valuation are often less recognized in a weak stock market environment. Therefore, the issuance of convertibles in weak markets might be seen as a signal for financial distress. Not surprisingly, the coefficient for the conversion ratio parameter is significantly negative. This result is in line with the theory that a higher conversion ratio will lead to more negative announcement returns, since higher conversion ratios imply worse type firms which approves hypothesis 3a.

In the last regression specification, the financial industry, hot issuance period, and delta proxies are additionally analyzed. The financial industry proxy does not have a significant influence on the market valuation and therefore does not confound the results of the whole sample. Furthermore, hot issuance periods do not have a significant effect. This result requires further investigation. Although the market run-up prior to the announcement of the convertible has a positive impact on abnormal returns, hot issuance periods seem to have a negative impact. This implies that hot issuance periods do not necessarily correlate with bull markets and convertible bonds are issued out of rationing in the equity market motives. The delta proxy is added to take the design of the convertible into account. More equity-like convertibles are expected to have more negative announcement returns. As a consequence, the coefficient of the delta proxy is expected to be more negative, due to the more equity-like nature of the whole sample of convertibles. Although the effect of delta on CAAR is negative, it is not significant. Further analysis is needed on the basis of the equity- and debt-like subsamples. The overall results suggest that stock price and market run-up, leverage, interest coverage before tax, conversion ratio as well as the book-to-market ratio have a significant influence on the firm‘s wealth effect when announcing a convertible bond issuance.

In order to examine the hypotheses postulated in chapter 2 and their sensitivity to the more debt- and equity-pronounced subsamples in more debth, two additional regression analyses are conducted. The subsamples are divided according to the delta measure as described previously Table 4 presents the results for the two subsamples, split by the delta measure cut-off value of 0.5.

***[Insert table 4 about here]***

Panel A of Table 4 shows the results for the more debt-like convertibles. All coefficients except the coefficient for the conversion ratio are not significant[8]. The regression analysis of the more debt-like subsample can neither provide further support nor denial for the postulated hypotheses because of its weak explanatory power. In Panel B the results for more equity-like convertibles are shown. All coefficients exhibit the same significance level as reported in Table 4. The significant results of the subsample regression analyses are in line with the results obtained from the analysis of the whole sample.

## 4.4 Long-Term Wealth Effects

Table 5 presents the results for the BHAR analysis. The average buy-and-hold raw returns during the 20-month post-issue period are 9.6 percent for the convertible debt sample. The average buy-and-hold abnormal returns (BHAR) are -23.43 percent for the value-weighted CRSP control portfolio and -35.65 percent for the equally-weighted CRSP control portfolio.

***[Insert table 5 about here]***

The results for the average buy-and-hold raw returns are in line with the studies of Lewis et al. (2001) and Lee and Loughran (1998). However, the BHAR seem to be more pronounced than in other studies which report yearly average BHAR ranging between around -3 and -11 percent per year. The positive abnormal raw returns of 9.6 percent for the post-issue period of the convertible bond offering and the elevated positive returns of the value- and market-weighted CRSP reference portfolios are the reasons for the relatively large BHARs. Stocks of convertible bond issuers seem to underperform relatively to the market in the post-issuance period. This result confirms hypothesis 5a, 6a, and 7a.

To assess the robustness of these results, a bootstrapped skewness-adjusted t-test is conducted. Firstly, the skewness-adjusted t-test is calculated since the examined samples are mostly right-skewed (skewness is greater than zero) and platykurtic (kurtosis smaller than three). As it can be inferred from Table 5 the skewness-adjusted t-test provides the same significant results as the conventional t-test. All examined long-term abnormal returns are highly significant. As a further refinement the boostrapped-skewness-adjusted t-test is used as explained in section 3.5. In Table 5, the different confidence intervals for the bootstrapped tests are shown. All the measured t-values for the skewness-adjusted t-statistics are within the respective confidence intervals. As a consequence, the null-hypothesis, that the mean long-run abnormal return is zero, cannot be rejected at all significance levels. However, the significant results from the t-statistics as well as from the skewness-adjusted t-statistics support the significance of the negative BHARs. As pointed out by Sutton (1993), the results of the skeweness-adjusted t-statistic are noticeably inaccurate if the sample size is small and skewness is severe, which is not the case for this data sample. However, the results of the bootstrapped test demand a further analysis of the reported long-term underperformance within the

[8] The insufficient size of the more debt-like subsample might have an influence on the results

Fama and French three factor model. Mitchel and Stafford (2000) argue that the measuring of long-term performance with BHARs in conjunction with bootstrapping is not an adequate methodology, because the aspect of cross-correlation is not considered.

In order to discover the reasons for the relative underperformance of the convertible issuers in the post-issue period, a cross-sectional regression analysis is conducted. With buy-and-hold raw returns as well as BHARs as dependent variables. The results of this analysis are presented in Table 6.

***[Insert table 6 about here]***

Considering the results of Panel A, in which buy-and-hold raw returns are regressed, the only significant coefficients of interest are the stock price run-up and the conversion ratio. A remarkable result is the significant negative influence of the coefficient of the conversion ratio. This result underlines the assumption set in hypothesis 3a over the long horizon. The significant negative influence of the stock price run-up further supports hypothesis 4a and confirms hypothesis 6b. This result emphasizes the assumption that the pre-issue share price run-up is correlated with the degree of a company's overvaluation. Stronger stock price declines should be observed for companies with higher pre-issue share price appreciations. However, the regression results of Panel A have a low explanatory power. Nevertheless, this result is indirectly confirmed by the regression results in Panel B. The value-weighted BHARs are significantly influenced by a pre-issue stock price run-up. This result is not as unambiguous as for the buy-and-hold raw returns. The BHARs are calculated as the difference between buy-and-hold raw return and reference portfolio variables. Nevertheless, it further supports the undervaluation assumption. The market run-up prior to the issuance of the convertible bond has a significant positive influence. A higher pre-issue run-up of the market has a positive influence on the post-issuance market performance and consequently results in a relative underperformance of the BHARs. Furthermore, the coefficient of the book-to-market ratio has a significant negative influence and therefore supports the results already discovered in the short-term analysis. The results presented in Panel C for the equally-weighted BHARs are similar to the results of Panel B und support the set assumption derived from the different theories.

Overall, the determinants of raw returns as well as the magnitude of BHARs significantly support the timing hypothesis. The discovered results lead to the conclusion that convertible debt issuers are somewhat overvalued at issuance and underperform in their post issuance period relatively to the market. Furthermore, the evidence of long-term underperformance strengthens the argument to the rationing phenomenon in equity markets as well as the presence of managerial entrenchment theories. Considering the managerial entrenchment theory, managers might exploit windows of opportunity. These windows arise since investors set their expectations of future operating performance on past trends. They incorrectly believe that a strong past performance will continue in the future. However, it cannot be recognized that overvaluation is exploited to make a future conversion of the convertible impossible. The moderate years to maturity and conversion premium characteristics of the sample do not support the idea of misuse. Moreover, the significant results for Kim's conversion ratio hypothesis suggest contrary evidence to the idea of "debt sweetening" (Billingsley & Smith 1996) and misusage of convertible bonds.

In order to assess whether the results about the magnitude of post-issue stock returns is robust to variations in computation methods, the calendar-time portfolio approach, using the Fama-French three factor model, is employed. This test accounts for cross-correlation and skewness issues as discussed in chapter 3.5. The results of the analysis are presented in Table 7.

***[Insert table 7 about here]***

The intercept in the regression provides an estimate of the average monthly abnormal returns. According to the model, the average monthly abnormal return is -0.72 percent (-14.2 percent cumulated for the 20 month period). The intercept coefficient is highly significant at the 1 percent level. Moreover, the excess return and SMB coefficients are significant at the 1 percent level. The HML coefficient is significant at the 10 percent level. The results of the three factor model support and underline the results discovered in the BHAR analysis. This reconfirms the theories about the timing and rationing hypotheses.

## 5. Summary and Evaluation of Theories

The results of the short-term analyses for the whole convertible debt sample indicate accordance between the wealth effects of convertible bond issues and the asymmetric information framework theories, in particular with the theory by Myers and Majluf (1984). Convertible bond offerings exhibit stronger negative wealth impacts than debt offerings but a better performance than equity offerings (H1a and H1b confirmed). Furthermore, it can be stated that adverse selection in general can be mitigated for growth firms with lower book-to-market ratios (H1d confirmed). The face-value of the convertible bond as well as the size of the issuing company has no significant influence on the wealth effects (H1c and H1e not confirmed). Concerning the more debt-like asymmetric information cost, as discussed by Brennan and Schwartz (1988), the level of leverage and the interest coverage before tax have a significant influence on the wealth effects of the whole sample (H2a mainly confirmed and H2b confirmed).

Moreover, the more equity-like asymmetric information cost, as discussed by Kim (1990) and Stein (1992), and expressed by the conversion ratio, market-, and stock price run-up have a significant influence on abnormal announcement returns (H3a confirmed, H4a and H4b confirmed). The equity-like agency cost of dividend payments has no significant influence (H4c not confirmed). The case is similar if the hybrid nature of convertibles is taken into account and the sample is split into more debt- and more equity-like convertibles. In the subsample analysis of the more equity-like convertibles, the hypotheses H3a, H4a, and H4b are reconfirmed on the basis of a regression with strong explanatory power. The more debt-like subsample has a low explanatory power and therefore does not support the asymmetric information theory as proposed by Brennan and Schwartz (1988). However, significant support is given for hypothesis 3a, Kim's theory of the conversion ratio as signaling device.

The accomplished results do not show an impact of the agency costs on the firm's performance after an issuance of a convertible bond, at least not in the sense of the asymmetric information model as proposed by Brennan and Schwartz (1988). There is no clear evidence for the theory that agency costs of debt induce wealth effects, in particular not for more debt-like convertibles. Considering the complete sample, the influence of leverage and interest coverage before tax is not obvious since it has both debt- and equity-like components. The results are also not in favor of the risk intensity hypothesis of Brennan and Schwartz (1988). Thus it cannot be inferred that convertible debt is seen as a substitute for straight debt. However, considering the more equity-like asymmetric information cost, more significant and clear effects were discovered. If the focus is on the immediate announcement wealth effects of convertible issues, issuers of more equity-like convertibles usually perform better by issuing convertible debt than equity. The rationale behind these results is the negative influence of the higher agency cost for equity instruments. This implies that convertibles in such settings are good alternatives to bare equity offerings, since they are not 100 percent debt- or equity-like and therefore induce less negative market responses. This conclusion supports the motives for the use of convertibles as proposed by Stein (1992) and Kim (1990).

The results of the long-term analyses foster the assumption that the long-term wealth effects of convertible bond issues are in line with the timing hypothesis. Convertible bond issuers are rather overvalued at issuance and underperform in their post issuance period in comparison to the overall market. Therefore hypotheses 6a and 6b are confirmed. Furthermore, the long-term underperformance supports hypothesis 5a and 7a and therefore rationing and managerial entrenchment theories.

The fact that significant evidence is detected for the timing hypothesis supports the entrenched management hypothesis. The results indicate an exploitation of the windows of opportunity by the convertible bond issuing firms. But, further investigations are required to examine whether the windows of opportunity are used by managers for empire building projects. However, companies certainly do not exploit overvaluation to make a future conversion of the convertible bond impossible. Sample characteristics, as well as the significant results of Kim's conversion ratio hypothesis, do not support this theory of "debt sweetening" or cheap debt.

The evidence does not support the models of Green (1984) and Mayers (1998) who argue that convertible debt issuances can solve adverse investment incentives created by risk-shifting problems. According to their models, a firm should experience improved operating performance (as expressed in the stock price) after a convertible offering relative to a reference portfolio with similar firms that have not issued these securities. However, the long-run stock market performance evidence does not support these models. As a consequence, convertible debt issuers might be the firms that have been rationed out of the equity market by investors and thus suffer from a post-offer underperformance similar to that measured for seasoned equity issuers (Loughran and Ritter, 1995). The rationing hypothesis is in spirit to the theory of Stein (1992) who suggests that convertible debt is issued as "back-door" equity financing when adverse selection costs are high. This unites the results of the short- and long-horizon examination of wealth effects of convertible issues. When the perspective is changed and demand side induced wealth effects are considered, hypothesis 8a, which suggests that convertible arbitrage activity has negative wealth effects, is confirmed.

## Conclusion

This paper analyzes the dimension and determinants of wealth effects associated with the announcement and long-term performance of convertible debt offerings on the U.S. market in the period from 1980 to 2005. Similar to previous research, our investigation illustrates significant negative wealth effects at the announcement of convertible debt offerings. The wealth effects are more pronounced for equity-like convertibles than for debt-like convertibles. Furthermore, we also discover significant negative wealth effects related to the time of issuance. Long-term analysis reveals an underperformance in the post-issuance period of the issuing companies.

The analysis also strengthens the hypotheses concerning the negative impact of equity-related agency cost. The results illuminate that proxies of more equity-like asymmetric information cost have a robust significant negative influence on more equity-like convertibles. On the contrary, the proxies of more debt-like asymmetric information cost do not significantly affect more debt-like convertibles. In

addition, the hypothesis of convertible arbitrage activity is confirmed. However, convertible arbitrage becomes attractive again due to the volatile markets in 2007, 2008 and most recently in 2009. Considering the determinants of the long-term underperformance, significant evidence for the theory of market timing is found. Furthermore, the managerial entrenchment and rationing in the equity market theories are supported. When combining the discovered determinants of short- and long-horizon wealth effects with the motivations for issuing convertible bonds, there is a strong indication that convertibles are used as a substitute for equity as proposed by Stein (1992).

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## Appendices

**Table 1.** Announcement day CAAR for different event windows, from own source

| CAAR | Panel A Total Sample n = 341 | | | Panel B $\Delta_i > 0.5$ n=196 | | | Panel C $\Delta_i < 0.5$ n=101 | | |
|---|---|---|---|---|---|---|---|---|---|
| | CAAR | Boehmer-t | sig. | CAAR | Boehmer-t | sig. | CAAR | Boehmer-t | sig. |
| -10:-2 | 0.0061 | 1.6281 | | 0.0075 | 1.4636 | | 0.0049 | 0.4663 | |
| -5:-2 | -0.0021 | -0.8074 | | -0.0036 | -0.8073 | | -0.0028 | -1.1018 | |
| -20:0 | 0.0055 | 0.5292 | | 0.0138 | 1.2512 | | 0.0003 | -0.371 | |
| -20:20 | -0.0203 | -2.4786 | *** | -0.015 | -1.5947 | * | -0.0142 | -1.7415 | * |
| -10:10 | -0.0177 | -2.3887 | *** | -0.0183 | -1.6377 | * | -0.0091 | -1.5469 | * |
| -1:1 | -0.0158 | -5.5618 | *** | -0.0152 | -3.7058 | *** | -0.0099 | -2.4852 | ** |
| -1:2 | -0.0168 | -5.2537 | *** | -0.0161 | -3.4813 | *** | -0.0093 | -2.1766 | ** |
| 0:1 | -0.0138 | -5.9684 | *** | -0.0124 | -3.6814 | *** | -0.0093 | -2.8231 | ** |
| 0:10 | -0.0218 | -4.7527 | *** | -0.0229 | -3.4889 | *** | -0.0134 | -2.506 | ** |
| 0:20 | -0.0326 | -5.2499 | *** | -0.0339 | -4.3996 | *** | -0.0213 | -2.8358 | *** |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero. The delta-split subsamples are smaller due to missing data necessary to calculate the delta measure.

Delta Measure: Convertible bonds can be classified into more debt-like and more equity-like convertibles, due to their hybrid nature. The classification of convertibles is an important measure for wealth effects associated with the announcement of a convertible bond issue. For the classification different authors propose several measures (Burlacu, 2000, pp. 442-444). The classification measure mostly used is the delta measure (DELTA). It measures sensitivity of the convertible bond value to its underlying equity. For the measure, the stock price volatility is measured by the annualized volatility of the stock returns over the period (-200,-20) relative to the announcement date of the offering. The risk free rate is proxied by the 10 year U.S. treasury rate. The the delta measure takes values between 0 and 1. Values closer to 1 indicate a high sensitivity of the convertible bond value to the underlying equity value, therefore the convertible has a high equity component. The break off value between more debt- and more equity-like convertibles is 0.5. Convertibles with a delta below 0.5 are considered more debt-like and convertibles with a delta above 0.5 as more equity-like. (Loncarski et al., 2007).

**Table 2.** Issuance day CAAR for different event windows, from own source

| CAAR | Total Sample n=274 | | | |
|---|---|---|---|---|
| | CAAR | Boehmer-t | sig. | |
| -10:-2 | -0.015 | -3.7354 | *** | |
| -5:-2 | -0.0161 | -5.4613 | *** | |
| -20:0 | -0.0252 | -4.2014 | *** | |
| -20:20 | -0.0231 | -2.7786 | *** | |
| -10:10 | -0.0264 | -4.4981 | *** | |
| -1:1 | -0.0219 | -7.1779 | *** | |
| -1:2 | -0.0204 | -5.8098 | *** | |
| 0:1 | -0.014 | -5.9212 | *** | |
| 0:10 | -0.0035 | -0.8737 | | |
| 0:20 | -0.0139 | -2.0438 | ** | |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero.

**Table 3.** OLS regression analysis of the announcement day CAAR in the event window (-10, 10) for whole sample, from own source

| Specification | *1* | | | *2* | | | *3* | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | *coefficient* | *t-value* | *sig.* | *Coefficient* | *t-value* | *sig.* | *coefficient* | *t-value* | *sig.* |
| BTOM | -0.0418818 | -2.6711 | *** | -0.0643177 | -3.1270 | *** | -0.0492630 | -2.2324 | ** |
| DY | 0.0028058 | 0.7384 | | -0.0035038 | -0.7506 | | -0.0069855 | -1.1601 | |
| ICBT | 0.0000537 | 1.8384 | * | 0.0000477 | 1.6759 | * | 0.0000486 | 1.7181 | * |
| LEV | -0.0000074 | -2.0345 | ** | -0.0000034 | -0.8905 | | -0.0000027 | -0.7110 | |
| LN_FV | 0.0070839 | 0.6180 | | -0.0003373 | -0.0263 | | 0.0047799 | 0.3654 | |
| LN_MV | -0.0016125 | -0.2252 | | 0.0004994 | 0.0584 | | -0.0027294 | -0.3063 | |
| CONVR | | | | -0.0002839 | -1.9540 | ** | -0.0002703 | -1.8748 | * |
| MKTRP | | | | 0.2605964 | 3.7630 | *** | 0.2242090 | 2.9522 | *** |
| STPRP | | | | -0.1173128 | -5.5500 | *** | -0.1122476 | -5.2702 | *** |
| FINAN | | | | | | | 0.0265189 | 1.1746 | |
| DELTA | | | | | | | -0.0156672 | -0.4672 | |
| HOTI | | | | | | | -0.0189671 | -0.9574 | |
| Intercept | -0.0203922 | -0.3910 | | 0.0543245 | 0.8349 | | 0.0609466 | 0.8288 | |
| N | 317 | | | 216 | | | 213 | | |
| Adj. $R^2$ | 0.028 | | | 0.168 | | | 0.150 | | |
| F-test | ** | | | *** | | | *** | | |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero. The subsamples are smaller due to missing data within the different variable categories.

Proxies: The book-to-market ratio (BTOM) compares the book value of a firm to its market value, as expressed by its current market capitalization. The dividend yield (DY) is the company's last full dividend payment divided by its market capitalization. The interest coverage before tax (ICBT) is expressed as the ratio of earnings before interest and taxes (EBIT) and interest expense. It defines how many times the profit before interest is greater than the interest expense and therefore signals the firm's debt service coverage. Leverage (LEV) measures the ratio between the book value of total debt and equity. The natural logarithm of the face value of the convertible bond (LN_FV) and the market value (LN_MV) of the issuing company are employed as control variables. The conversion ratio (CONVR) denotes the number of common shares received at the time of conversion. The market run-up (MKTRP) und stock price run-up (STPRP) are the compounded stock and market returns over the 180 days estimation period of the market model. The variable Financials (FINAN) controls for the impact of the financial industry on the results and the variable of the hot issuance periods (HOTI) for the influence of periods with a clustering of convertible bond offerings.

**Table 4.** OLS regression analysis of the announcement day CAAR in the event window (-10, 10) for delta split subsample, from own source

| | Panel A - ( $\Delta_i$ < 0.5) | | | Panel B - ( $\Delta_i$ > 0.5) | | |
|---|---|---|---|---|---|---|
| Variable | *coefficient* | *t-value* | *sig.* | *coefficient* | *t-value* | *sig.* |
| BTOM | -0.0475389 | -0.8878 | | -0.0500362 | -1.9740 | ** |
| DY | -0.0005964 | -0.0935 | | -0.0116762 | -1.0267 | |
| ICBT | -0.0004171 | -0.3310 | | 0.0000501 | 1.6683 | * |
| LEV | 0.0000662 | 0.8980 | | -0.0000028 | -0.6921 | |
| LN_FV | 0.0138110 | 0.6506 | | -0.0050794 | -0.3039 | |
| LN_MV | -0.0012762 | -0.0731 | | 0.0029106 | 0.2793 | |
| CONVR | 0.0017117 | 2.1982 | ** | -0.0003073 | -1.9571 | ** |
| MKTRP | 0.0674404 | 0.4576 | | 0.2311386 | 2.4851 | ** |
| STPRP | 0.0195606 | 0.2187 | | -0.1184302 | -5.0697 | *** |
| FINAN | 0.0216449 | 0.5782 | | 0.0227725 | 0.7720 | |
| HOTI | 0.0068402 | 0.1933 | | -0.0162512 | -0.6630 | |
| Intercept | -0.0931185 | -0.5686 | | 0.0648255 | 0.8222 | |
| n | 49 | | | 162 | | |
| Adj. $R^2$ | 0.013 | | | 0.170 | | |
| F-test | | | | *** | | |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero. The subsamples are smaller due to missing data within the different variable categories.

**Table 5.** Buy-and-Hold Abnormal Returns, from own source

| | Raw Returns | CRSP value-weighted | CRSP equally-weighted |
|---|---|---|---|
| Returns | 0.096 | -0.2343 | -0.3556 |
| standard t-test | 2.9282 [***] | -7.2166 [***] | -10.6438 [***] |
| skewness-adjusted t-test | 3.1062 [***] | -6.2987 [***] | -8.4892 [***] |
| bootstrap confidence interval | | | |
| with alpha = 0.05 | [3.0477; 3.165] | [-6.3179; -6.2724] | [-8.5005; -8.4694] |
| bootstrap confidence interval | | | |
| with alpha = 0.01 | [3.0198; 3.1986] | [-6.3235; -6.2628] | [-8.5049, -8.4622] |

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

**Table 2.** OLS regression analysis of the announcement day BHAR, from own source

| | Panel A - Raw returns | | | Panel B - BHAR value | | | Panel C - BHAR equal | | |
|---|---|---|---|---|---|---|---|---|---|
| Variable | coefficient | t | sig. | Coefficient | t | sig. | coefficient | t | sig. |
| BTOM | -0.1202185 | -1.1725 | | -0.2031791 | -1.9622 | ** | -0.2032470 | -1.9596 | ** |
| LEV | 0.0000051 | 0.2608 | | -0.0000031 | -0.1546 | | -0.0000081 | -0.4060 | |
| ICBT | -0.0000120 | -1.3608 | | -0.0000139 | -1.5615 | | -0.0000113 | -1.2609 | |
| CONVR | -0.0015388 | -2.0800 | ** | -0.0011550 | -1.5459 | | -0.0009621 | -1.2855 | |
| LN_MV | -0.0567956 | -1.4082 | | -0.0536312 | -1.3167 | | -0.0609956 | -1.4950 | |
| LN_FV | 0.0130980 | 0.2122 | | -0.0025924 | -0.0416 | | 0.0041991 | 0.0673 | |
| MKTRP | 0.3948134 | 1.1211 | | 0.6444268 | 1.8119 | * | 1.2007141 | 3.3703 | *** |
| STPRP | -0.1883698 | -1.8248 | * | -0.1954796 | -1.8751 | * | -0.1253067 | -1.2000 | |
| Intercept | 0.6248376 | 1.8766 | * | 0.3776405 | 1.1231 | | 0.2109330 | 0.6262 | |
| N | 223 | | | 223 | | | 223 | | |
| Adj. $R^2$ | 0.017 | | | 0.067 | | | 0.067 | | |
| F-test | | | | *** | | | *** | | |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero.

**Table 3.** Fama-French three factor model

| Specification | Fama- French three factor model | | |
|---|---|---|---|
| Variable | *coefficient* | *t-value* | *sig.* |
| Rm_Rf | 1.3696476 | 28.3782 | *** |
| SMB | 0.3198128 | 5.2393 | *** |
| HML | 0.1174462 | 1.6361 | * |
| Intercept | -0.7271027 | -3.8237 | *** |
| N | 324 | | |
| Adj. $R^2$ | 0.769 | | |
| F-test | *** | | |

* denotes significance at the below 10% level, **-denotes significance at the below 5% level, and ***-denotes significance at the below 1% level under the null hypothesis that CAAR equals zero.