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**What Effect has Bond Market  
Development in Asia had on the Issue  
of Corporate Bonds**

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# The response of the external finance premium in Asian corporate bond markets to financial characteristics, financial constraints and two financial crises

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## Abstract

Empirical investigation of the external finance premium has been conducted on the margin between internal finance and bank borrowing or equities but little attention has been given to corporate bonds, especially for the emerging Asian market. In this paper, we hypothesize that balance sheet indicators of creditworthiness could affect the external finance premium for bonds as they do for premia in other markets. Using bond-specific and firm-specific data for China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand during 1995-2009 we find that firms with better financial health face lower external finance premia in all countries. When we introduce firm-level heterogeneity, we show that financial variables appear to be both statistically and quantitatively more important for financially constrained firms. Finally, when we examine the effects of the 1997-98 Asian crisis and the 2007-09 global financial crisis, we find that the sensitivity of the premium is greater for constrained firms during the Asian crisis compared to other times.

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## 1. Introduction

The last decade and a half has seen phenomenal growth in the theoretical and empirical investigation of corporate financial decisions through imperfect credit markets. Building on the pathbreaking theoretical work of Stiglitz and Weiss (1981) on asymmetric information, Chari et al. (1995), Bernanke et al. (1999), Christiano et al. (2003, 2007, 2010) and Smets and Wouters (2003, 2007) provide an agency cost model of external borrowing from financial markets. Among the many implications of this literature is the observation that corporate financial structure will differ in relation to the observable characteristics used by lenders to determine their creditworthiness (Gertler and Gilchrist (1994)), and will be affected by constraints arising from the availability and cost of external finance to firms.

It is generally accepted that firms that are constrained on the financial markets, will face higher agency costs of borrowing - a higher ‘external premium’ - for raising capital from financial markets compared with the cost of internal finance funded from retained earnings as explained by Bernanke and Gertler (1995) with subsequent effects on real activity.<sup>1</sup>

Furthermore, the external premium can vary with macroeconomic conditions that bring about sharp reductions in lending during credit crunches or recessions. Levin et al. (2004) measure expected default risk and credit spreads on publicly-traded debt for US non-financial firms, finding that financial market frictions exhibit strong cyclical patterns.<sup>2</sup> Our data show that Asian emerging markets saw the average spread on corporate bonds issued by all firms leap from 100-200 basis points to around 1200 basis points during the Asian crisis of 1997, followed by a persistent drop in volumes (also noted in Eichengreen et al. (2006)). We also show that in the recent global financial crisis the average spread rose less dramatically, from approximately 200 basis points to around 600 basis points. We are not aware of any studies

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<sup>1</sup>A large and growing set of empirical studies has documented the extent to which the financing constraint dimension influences firms’ fixed investment and employment decisions under imperfect financial markets (see Fazzari et al. (1988), Guariglia (2008) and Spaliara (2009)). The degree of sophistication of the relationship between financial variables and real activity is further reflected in papers by Levin et al. (2004), Covas and Wouter (2007) and Gilchrist et al. (2009).

<sup>2</sup>This result is also supported by Mody and Taylor (2004) and Gilchrist et al. (2009) who consider the movement of the external finance premium as a predictor for real economic activity.

that compare the effect of these crises on the external finance premium.

In this paper we analyze the influence of firms' financial characteristics, financial constraints and the impact of the 1997 Asian crisis and the recent global financial crisis on the external financial premium at the level of the individual firm. Much of the empirical investigation of the external finance premium has been conducted on the margin between internal finance and bank borrowing or on the margin for raising external finance through equity markets, but we focus on bond markets.<sup>3</sup> Bond financing appears to be increasingly important for firms in Asian economies since the ASEAN countries have encouraged deeper, more integrated sovereign and corporate bond markets through initiatives such as the Pan Asian Bond Index Fund (PAIF), the Fund of Bond Funds (FoBF) and the Asian Bond Market Initiative (ABMI) proposal.<sup>4</sup> At the end of 2007, the seven Asian economies included in this study - China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand - had foreign currency bonds outstanding of over \$324 billion. This figure stands in sharp contrast with \$77 billion outstanding in 1995. It represents a significant increase in foreign financing through bond markets following the Asian crisis, suggesting the Asian corporate bond market is better able to provide external finance to firms than a decade earlier.

The present study improves on the existing empirical studies in three important ways. First, we provide a firm-level study of the response of premia in emerging Asian bond markets that takes full account of the heterogeneity of Asian firms operating in China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand. We seek to determine whether the external finance premium, as measured by the credit spread, is inversely related to the strength of the balance sheet, and therefore do firms with better financial health face lower external finance premia and vice versa?

Second, because there is considerably greater information asymmetry in Asian countries

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<sup>3</sup>The bank borrowing literature includes papers by Kashyap et al. (1993) and Bernanke and Gertler (1995). Equity premia are investigated by Campello and Chen (2010) and Whited and Wu (2006). This strand of literature is concerned with questions central to finance such as the nature of equity returns and risk pricing rather than the implications of the scale of the external finance premium for the financial accelerator as such.

<sup>4</sup>According to Eichengreen et al. (2006), East Asian markets are larger when assessed relative to other emerging markets such as the Latin American economies.

due to the limited engagement with internationally comparable ratings agencies and lower reporting requirements, we expect financing constraints to be more likely to affect pricing in the bond markets than in Western countries. Our work considers the external premium for financially constrained and unconstrained firms using criteria consistent with the literature on financing constraints (see Fazzari et al. (1988); Guariglia (2008) and Spaliara (2009)).

Third, we document for the first time the differences in the responses to the Asian crisis and the recent global financial crisis for constrained and unconstrained firms in Asia. We find that constrained firms were more sensitive to financial variables than unconstrained firms, and that they were more sensitive during periods of financial crisis. In the Asian crisis these firms experienced higher premia when they had greater leverage or risk of bankruptcy. During the recent financial crisis the premium has been more responsive to profitability and return on equity, and less responsive to leverage or risk.

The rest of the paper is organized as follows. Section 2 provides a brief theoretical framework for analysis of the external finance premium based on Bernanke et al. (1999). Section 3 describes the empirical specifications and econometric methodology. In Section 4 we document our data sources and provide some summary statistics. Section 5 presents the empirical evidence and Section 6 concludes.

## **2. Theoretical background**

Theoretical models incorporating financial accelerator effects are particularly useful in demonstrating how balance sheet indicators influence access to external finance. The influential paper by Bernanke et al. (1999) provides the theoretical basis for our paper, but we could equally have taken one of the models by Chari et al. (1995), Christiano et al. (2003, 2007, 2010), or Smets and Wouters (2003, 2007).

The Bernanke et al. (1999) model incorporates the costly-state verification (CSV) debt contracting problem into an otherwise standard dynamic new Keynesian general equilibrium model. In the model there are three agents: households, entrepreneurs, and retailers. En-

trepreneurs, who are assumed to be risk-neutral and have finite horizons, acquire physical capital  $K$  at a price  $Q$  at the end of period  $t$ , for use in production in period  $t + 1$ . At the end of period  $t$  entrepreneur  $j$  has available net worth  $N_{t+1}^j$  and finances capital with internal funds supplemented by external borrowing from a financier:  $B_{t+1}^j = Q_t K_{t+1}^j - N_{t+1}^j$ . Ex ante, the expected revenue from the investment project is given by  $R_{t+1}^k Q_t K_{t+1}^j$ , where  $R_{t+1}^k$  is the aggregate gross rate of return on capital investment. The realized revenue in the next period is given by  $\omega^j R_{t+1}^k Q_t K_{t+1}^j$ , where  $\omega^j$  is a productivity disturbance which is i.i.d. across firms and time.

Adopting the CSV approach, an agency problem arises because financiers cannot observe  $\omega^j$  and need to pay an auditing cost if they wish to observe the outcome. The financial contract is a standard debt contract including the following bankruptcy clause:

If  $\omega^j \geq \bar{\omega}^j$  the entrepreneur pays off the debt in full from revenues and keeps the residual. The financier receives  $\bar{\omega}^j R_{t+1}^k Q_t K_{t+1}^j = Z_{t+1}^j B_{t+1}^j$ , where  $Z_{t+1}^j$  is the non-default rate on debt.

If  $\omega^j < \bar{\omega}^j$  the firm defaults on its loan. The lender pays an auditing cost  $\mu$  and receives what is found, namely  $(1 - \mu)\bar{\omega}^j R_{t+1}^k Q_t K_{t+1}^j$ . A defaulting entrepreneur receives nothing.

It is reasonable to assume that the financier will accept debt only if the expected gross return to the entrepreneur equals the financier's opportunity cost. Because the debt risk is perfectly diversifiable, the relevant opportunity cost to the financier is the risk-free rate  $R_{t+1}$ . Consequently, the financier's expected return is a function of  $\bar{\omega}^j$ , the default trigger. Higher levels of  $\bar{\omega}^j$  raise the non-default pay off to the financier, but also raise the probability of default ( $F(\bar{\omega})$ ).

The Bernanke et al. (1999) model is concerned with the entrepreneur's problem of demand for capital. In this model the cost of finance depends on the financial health of firms and is negatively associated with the level of internal funds (net worth,  $N_{t+1}$ ) relative to total financing requirements. Let  $s = E\left[\frac{R_{t+1}^k}{R_{t+1}}\right]$  be expected discounted return on capital.<sup>5</sup> Then

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<sup>5</sup> As Bernanke et al. (1999) suggest, the ratio of the cost of finance to the risk-free rate may be equally well interpreted as the external finance premium.

$$E_t[R_{t+1}^k] = s\left[\frac{N_t}{Q_t K_{t+1}}\right]R_{t+1} \quad (1)$$

The above equation shows how the firm's return on capital depends inversely on the share of the firm's capital investment financed by its own net worth. If the firm can self finance its investment projects, there is no need for external financing and the equilibrium return to capital is equal to the risk-free rate. In this case the external finance premium is zero. Similarly, if the firm needs to borrow, the required return on capital will be higher reflecting expected agency costs faced by the financier, and the premium will reflect this. Thus, the initial financial position of the entrepreneur becomes a key determinant of the cost of external finance.

The role of the financial accelerator mechanism in the model can be seen from the definition of aggregate entrepreneurial net worth:  $N_{t+1} = \gamma V_{t+1} + W_{t+1}^e$ . Bernanke et al. (1999) assume that entrepreneurs supplement their income by working in the general labor market. Thus, the aggregate net worth is the sum of the entrepreneurial equity ( $V_{t+1}$ ) and the entrepreneurial wage  $W_{t+1}^e$ . Entrepreneurial equity equals earnings from capital employed from  $t$  to  $t + 1$  minus the debt repayment

$$V_{t+1} = R_{t+1}^k Q_t K_{t+1} - (R_{t+1} + EFP_t)(Q_t K_{t+1} - N_t) \quad (2)$$

with

$$EFP_t = \frac{\mu \int_0^{\bar{\omega}} \omega R_{t+1}^k Q_t K_{t+1} dF(\omega)}{Q_t K_{t+1} - N_t} \quad (3)$$

where  $EFP_t$  is the ratio of default costs to the amount borrowed and reflects the premium for external finance.

Equation (3) connects the theory with our empirical approach in the following sections.

Changes in net worth will affect the spread between the contractual rate on debt or bond and the risk-free rate. This could be affected by the profitability of the firm, its return on equity or its indebtedness. For example, if a firm is highly leveraged, a shock to project returns will have a larger impact on internal funds (and the EFP) compared to a firm that has lower leverage. An investor may demand a higher premium if the firm is perceived to be more risky, as measured by a bankruptcy risks measure like the Altman Z-score.

The shock  $\omega^j$  is idiosyncratic to the firm in the Bernanke et al. (1999) version of the model, but it is equally possible to interpret an adverse shock as a negative outcome triggered by a crisis event as we have discussed in the introduction. Indeed, the most recent papers in this literature have considered shocks that emanate from sources other than the firm, and especially from the financial system (c.f. Christiano et al. (2010)). While lenders can diversify to counter idiosyncratic shocks, it is more difficult to completely avoid exposure to shocks that are common to a region (an Asian crisis) or global shocks (the global financial crisis). Lenders may instead raise premiums to compensate for the higher risks that they take when crises occur, which tends to amplify further the countercyclical response in the external financial premium.

Empirical evidence on the external finance premium is provided by de Bondt (2004), who considers the emerging euro bond market, examining the impact of macroeconomic and financial health indicators on the corporate bond spread with Granger causality tests, multiple regressions and impulse responses. Despite a short sample of data the results suggest there is evidence of a balance sheet channel in operation that influences bond spreads. In addition, Campello and Chen (2010) address risk pricing in equity markets. They report evidence that equity returns of financially constrained US firms command higher ex ante excess risk premia and these premia move countercyclically with economic and financial conditions. Our study, however, is concerned with the Asian bond markets which is important since the value of bonds issued by emerging economies has increased rapidly during the last two decades (Genberg and Sulstarova (2008)).



### 3. Empirical implementation

#### 3.1. Baseline specification

In this paper we assess the external finance premium on the bond market using an economic approach which fully reflects the impact of information asymmetry between the borrower and the external financier embedded in the theoretical analysis by Bernanke et al. (1999).

We consider the following baseline model:

$$y_{it} = \alpha_i + X_{it}\beta + Z_{it}\gamma + \epsilon_{it} \quad (4)$$

where  $i = 1, 2, \dots, N$  refers to a cross section of units (firms in this study),  $t = 1, 2, \dots, T$  refers to time period, and  $y_{it}$  denotes the dependent variable, while  $X_{it}$  denotes the vector of explanatory variables for the firm  $i$  and year  $t$  and  $Z_{it}$  refers to characteristics of the bonds issued.  $\alpha_i$  is a vector capturing firm-specific intercepts,  $\beta$  and  $\gamma$  are coefficient matrices, and  $\epsilon_{it}$  are the disturbance terms that vary with time and across firms. To control for cyclical factors originating from the business cycle we include time dummies in our regressions, we also incorporate industry dummies to control for fixed effects across industries. We include country dummies to control for any country-based institutional differences. Finally, all our standard errors are White-corrected, which are robust to within cluster correlation. We cluster by firm, to allow for the fact that observations over time may be correlated within each firm, but must be independent across firms.

The dependent variable is the external finance premium on corporate bonds, measured as the spread between corporate bond yields and Treasury bond yields. To calculate an overall firm-specific corporate bond yield, we averaged the yields on the firm's outstanding bonds, using the product of market values of bonds and their effective durations as weights.<sup>6</sup>

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<sup>6</sup> See Choi and Park (2002) for details on the approximation of a bond portfolio yield.

Thus,  $YTM^{corp} = \frac{\sum_{i=1}^N y_i P_i D_i}{\sum_{i=1}^N P_i D_i}$ , where  $y_i$  is the yield to maturity on the  $i$ th bond,  $P_i$  and  $D_i$  are the market value and the duration of the  $i$ th bond, respectively. The credit spread is the difference between yield to maturity for corporate and government bonds:  $SPREAD = YTM_{t,T}^{corp} - YTM_{t,T}^{gov}$ , where  $YTM_{t,T}^{corp}$  represents the yield to maturity at time  $t$  of a corporate bond that matures at time  $T$  and  $YTM_{t,T}^{gov}$  the yield to maturity of a government bond with the same maturity.<sup>7</sup>

Vector  $X_{it}$  includes a set of financial variables that capture the role of financial health as suggested by the theoretical model of Bernanke et al. (1999) and the previous empirical literature on the determinants of credit spread. In particular, structural models of Black and Scholes (1973) or Merton (1974) relate the credit event to the firm's asset value and capital structure. A firm defaults on its debt if its asset value falls below its debt value. Accordingly, we employ the following firm-specific financial variables: leverage, profitability, return on equity and a control for idiosyncratic probability of bankruptcy, namely the Z-score. We introduce leverage (LEV) defined as total debt over total assets, as a measure of firms' indebtedness, since Bougheas et al. (2006); Spaliara (2009) and Lu et al. (2010) argue that higher leverage implies a weaker balance sheet. Thus we expect high levels of leverage to be associated with higher levels of external finance premium.

We also include a profitability ratio (PROF), defined as earnings before interest and taxes relative to total assets, to measure a firm's ability to generate revenue. More profitable firms have a greater cushion for servicing debt and should pay lower spreads on their loans (see Güntay and Hackbarth (2010)). Therefore, we expect a negative relationship between this ratio and the external finance premium.

Following Cremers et al. (2008) and Güntay and Hackbarth (2010), we add equity returns (ROE), measured as net income over shareholders' equity, to control for the expected value of the firm. A positive equity return, signals an improvement in the firm's business operations and therefore should be negatively related with the external finance premium.

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<sup>7</sup>See Güntay and Hackbarth (2010) for a similar approach on the definition of corporate bond credit spread.

In our study we seek to control for bankruptcy risk by including Z-scores. The Z-score (ZSCORE) measures the number of standard deviations below the mean by which profits would have to fall in order to eliminate the firm's equity. Hence it is an indicator of bankruptcy risk. The higher the Z-score the lower the firm's risk, so we expect this variable to have a negative effect on the bond premium.

Vector  $Z_{it}$  includes a choice of bond-specific control variables guided by the existing empirical literature on the determinants of yield spreads. Specifically, we control for the maturity of the bonds, and following Tsuji (2005) we construct a dummy which takes the value one if the maturity of the bond is over 6 years, and equal to zero otherwise (MATDUM). Bonds with maturity of less than 6 years are generally considered to be short-term bonds, while those with maturity above 6 years are considered to be medium and long-term bonds. We expect a positive coefficient since yield spreads generally increase with maturity for investment grade bonds. In addition, we augment our models with the logarithm of the dollar amount originally issued (LNAMOUNT). According to Lu et al. (2010), the amount of bond issue can be used as an external liquidity proxy and should be negatively related with bond spreads since larger bond issues are associated with greater bond liquidity and consequently lower spreads.

### 3.2. Financial constraints

We investigate whether particular segments of firms face a higher external finance premium by considering the response of external finance premium to different groups of firms. We follow the established financing constraints literature and define financially constrained and unconstrained firms using three classification schemes to ensure the robustness of our results, these are size, creditworthiness and indebtedness. We use a 30 percent cut-off point in keeping with the normal practice in the literature.<sup>8</sup> We also allow firms to transit between firm classes.<sup>9</sup> Therefore, we generate a dummy variable  $Cons_{it}$  which indicates in turn small,

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<sup>8</sup>Campello and Chen (2010) rank the sampled firms into constrained and unconstrained using 30 percent and 70 percent cut-off points respectively from the Fama-French portfolios.

<sup>9</sup> For this reason, our empirical analysis will focus on firm-years rather than simply firms. See Kaplan

risky and highly indebted firms. Size was employed as a criterion by Bougheas et al. (2006) and Spaliara (2009) and is the key proxy for capital market access by manufacturing firms in Gertler and Gilchrist (1994) because small firms are more vulnerable to capital market imperfections and thus more likely to be financially constrained. Firms that are more indebted (based on the leverage ratio) are more likely to pay a higher external finance premium on bonds since they have a greater probability of bankruptcy (Bougheas et al. (2006)), which can raise the cost of borrowing, and negatively affect the availability of credit. Finally, the coverage ratio, measured as earnings before interest and taxes over total debt, can be used as a financial sample separation criterion because it measures project quality. Interest coverage was used by Gertler and Gilchrist (1994) and Guariglia (1999) as an indicator of the extent to which financial constraints drive differences in inventory investment. The estimated model is specified as follows:

$$y_{it} = \alpha_i + X_{it}Cons_{it}\beta_1 + X_{it}(1 - Cons_{it})\beta_2 + Z_{it}\gamma + \epsilon_{it} \quad (5)$$

This specification captures the impact of financial constraints on the response to balance sheet characteristics. If the difference of the coefficients of the interacted financial variables is statistically significant we can conclude that firms classified as constrained face a higher premium compared to their unconstrained counterparts.

### *3.3. The effects of financial crises*

Our sample spans two important extreme economic events, namely the 1997-98 Asian financial crisis and the most recent global financial crisis. Therefore, it provides a natural experiment to explore the impact of two separate financial crises on the external finance premium. We use a similar methodological approach to previous studies that test for differences in the response of real variables in periods of recession versus non-recession (c.f. Gertler and Zingales (1997) for a similar approach.

Gilchrist (1994), Vermeulen (2002) and Mody and Taylor (2004)) using interactions of a crisis dummy ( $CRISIS_t$ ) with financial variables in vector  $X_{it}$  and the financial constraints dummy ( $Cons_{it}$ ).

$$y_{it} = \alpha_i + X_{it}Cons_{it}CRISIS_t\beta_1 + X_{it}Cons_{it}(1 - CRISIS_t)\beta_2 + X_{it}(1 - Cons_{it})CRISIS_t\beta_3 + X_{it}(1 - Cons_{it})(1 - CRISIS_t)\beta_4 + Z_{it}\gamma + \epsilon_{it} \quad (6)$$

$CRISIS_t = ACD_t$  takes the value one in years 1997-98 and zero otherwise to allow for the fact that the second half of 1997 saw the unprecedented collapse of the stock markets and currencies of five Asian countries – Thailand, Indonesia, Malaysia, the Philippines and South Korea with secondary effects through the rest of Asia. There is evidence that the Asian crisis adversely influenced the ability of firms to access credit on international markets (see Calvo (1999)) and therefore it is possible that financially constrained firms were hit the hardest.  $CRISIS_t = GFCD_t$ , which takes the value one in years 2007-09 and zero otherwise, determines the impact of the recent financial crisis on the external finance premium.

If the interacted terms during a crisis are significantly different from the same terms outside of a crisis, then the additional response of the external finance premium to financial variables during the crisis is detectable compared to tranquil periods.

## 4. Data and summary statistics

### 4.1. Sample characterization

The data for this paper are drawn from Dealogic Bondware, Bloomberg, and Thomson Financial Primark. We use Bondware to identify all corporate bonds issued in international markets. This database contains information about the issue dates, denomination, currency and the maturity in the bonds measured. We are also able to identify the type of the coupon

(i.e zero coupon, fixed and floating). All bonds issued in hard currency in China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand were included in the sample.<sup>10</sup> The selection of the above countries takes into account the fact that there is a wide degree of development in the Asian markets.

We use Bloomberg to match all bonds issued in the domestic Asian markets with the corresponding bond yields for the period 1995 to 2009. We collect end-of-December bond yields so as to guarantee consistency with our firm-specific data. Bloomberg also contains data on the duration of each bond issue and its market value. The matching of the bonds with the corporate yield was made feasible using bond tickers. To address a potential concern regarding illiquidity noise in our sample, we take two steps. First, in the absence of bid-ask spread data, we focus on bonds with maturity greater than one year, since bonds that are near the end of their life tend to trade less frequently. Second, we cross check the names of the sampled firms with those in the i-Traxx Asia ex-Japan index. This index is made up by the more liquid CDS contracts, which can thus be traded as portfolios (see Remolona and Shim (2008)). The use of such instruments has contributed to liquid, flexible and diverse corporate bond markets. We are able to identify more than 25 percent of our sample in the i-Traxx index and these firms will be the most liquid firms. Following Durbin and Ng (2005) and Peter and Grandes (2005), we make reference to international placements in US dollars, which necessarily excludes placements in local currency. This will help us to avoid any currency or transfer risk which is associated with sovereign bonds.<sup>11</sup> Our data contains the benchmark Treasury yields from Datastream for maturities of 3, 5, 7, 10, and 30 years. For each corporate bond that matures at time  $t$ , a US Treasury that has the same maturity is used to provide the risk-free rate referred to in Bernanke et al. (1999), and in those cases where there is no corresponding government bond, the equivalent government

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<sup>10</sup> Due to data limitations we were unable to retrieve any data on foreign currency corporate bond yields for Malaysian firms.

<sup>11</sup> A potential downside of considering only international placements is that we do not capture the full picture on Asian emerging markets since fewer corporates can issue bonds denominated in hard currency, but we believe it is essential to avoid the distortion that currency risks introduce, see Domowitz et al. (1998).

bond is constructed and its yield estimated using a simple linear interpolation method.

Balance sheet data for firms in China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand were taken from the Thomson Financial Primark database. Following normal selection criteria used in the literature, we excluded companies that did not have complete records on our explanatory variables and firm-years with negative sales. Most of firms report information on their balance sheets and profit (loss) accounts at the end of December (financial year-end). For firms report that report at the end of March or in other months, we weight information from current and previous annual reports to adjust all our firm-specific variables to record information at the year end in December. To control for the potential influence of outliers, we excluded observations in the 0.5 percent from upper and lower tails of the distribution of the regression variables.

Our combined sample contains data for 264 bonds issued by 91 Asian firms that traded between 1995 and 2009 in a variety of sectors including manufacturing, utilities, resources, services and financials. The panel has an unbalanced structure with the number of observations on each firm varying between three and fifteen. To ensure that our sample is representative we provide some graphical analysis. Specifically, we are interested to show that our dataset is an accurate reflection of the universe of companies in Asia as recorded in the World Development Indicators (WDI) database, which is provided by the World Bank. In Figure 1 we compare the average market capitalization as a percentage of GDP between our dataset to all listed firms as recorded in the WDI database. If the pattern between the two lines is similar we can conclude that our sample is representative across the dimension mentioned above. We observe that the two series are highly correlated and exhibit virtually identical business cycle dynamics. We conclude therefore that our sample is representative of the universe of listed companies in Asia.

#### *4.2. Descriptive analysis*

By way of preliminary analysis, we show in Figure 2 the average credit spread between

corporate and government bonds of the same maturity issued by Asian firms in their respective bond markets across all countries. The most notable feature of this figure is the sharp response to adverse economic events. Thus the increase in the spread at the onset of the 1997-98 Asian crisis can be easily observed. While the average spread increased during the crisis it is also clear that in the financial turbulence that followed during the Brazilian crisis in 1998 and the Russian default in 1999, it remained at elevated levels before returning to pre-crisis values until 2004. Moreover, the credit spread has grown steadily since 2007 reflecting the most recent global financial crisis, but in terms of its magnitude the increase in the credit spread during the final years of our sample is much smaller than the increase around the time of the Asian crisis.

In Table 1 we present summary statistics for the external finance premium, as measured by the credit spreads. First, we begin by analyzing spreads by credit quality. Firms with Z-score above 1.91, which are generally considered as safe firms, face lower spreads compared to risky firms (Z-score less or equal to 1.91) but the difference is not statistically significant, as shown by the p-value reported in the final column. When the sample is separated by the average maturity of the bonds, we find that bonds with average maturity longer than 6 years (medium and long-term bonds) have higher spreads and the difference is statistically significant.

Second, we analyze spreads for smaller firms, firms with higher indebtedness and those with low coverage ratios, which measure the extent to which firms are likely to be financially constrained. We observe that constrained firms, irrespective of the definition, experience higher spreads compared to their unconstrained counterparts. The difference between these categories is significant in all cases but one. Taken together, these preliminary statistics suggest that the external finance premium is larger for firms classified as financially constrained versus firms that are unconstrained using three different definitions.

Third, during the Asian crisis the mean external finance premium was 8.45, while in the later global financial crisis the mean was 4.72. The premium was considerably smaller



during the non-Asian crisis period (i.e during the sample period 1995 to 2009 but excluding the years 1997-98) and the non-global crisis period. The difference for the mean external finance premium is statistically significant for the Asian crisis only.

To further illustrate the relevance of firm-level heterogeneity in examining the credit spread, we present graphs of the evolution of the credit spread broken down for those firms that are likely to be financially constrained and those that are unconstrained on three different criteria. Figure 3 shows that the average credit spread takes a higher value for firms that are small, highly indebted and risky compared to firms that are large, less indebted and relatively safe. This is what we would expect, but we also see a larger and more persistent effect following the Asian crisis for these firms, compared to firms less likely to be financially constrained. The response of the external financial premium for these types of firms in the recent global financial crisis has been a little higher but not much compared to unconstrained companies. Only small firms have seen a response in their spreads comparable to the Asian crisis episode.

Having shown statistics for the external finance premium, we now turn to the firm-specific indicators that we employ in our empirical analysis. The upper panel of Table 2 reports means, standard deviations and the number of observations for the full sample. In the middle panel of the Table we show the same information for the firms in the upper 70th percentile and 30th percentile of the spread distribution. In the bottom panel of the Table we distinguish between the Asian crisis and the global financial crisis. We find that firms in the lower 30th percentile of the credit spread distribution are less indebted, more profitable, less risky and have higher equity returns compared to the median, and compared to firms in the upper 70th percentile. When we examine the two financial crises, we observe that Asian firms displayed better financial health, in lower leverage, higher profitability and lower bankruptcy risk, during the most recent financial crisis compared to the Asian crisis. In sum, these preliminary statistics suggest that the scale of the external finance premium is inversely related to the strength of the balance sheet, and therefore firms with better financial health

face lower external finance premia and vice versa. In addition, they highlight the recent good financial health that Asian firms exhibited in contrast to the Asian crisis.

In the sections that follow we test the extent to which the external finance premium varies with firms' financial condition, and how this effect differs at firms more and less likely to face financing constraints both during and after financial crises.

## 5. Results

### 5.1. *External finance premium and firm-specific characteristics*

We begin our enquiry with a baseline model as shown in Equation (4). Our empirical models are estimated using a fixed effects approach to control for any unobserved heterogeneity.<sup>12</sup> Moreover, the choice of fixed effects approach is formally justified by using the Hausman test. We report p-values of this test at the foot of the tables of results. In all cases the Hausman test does not reject the null of no correlation between the regressors and the individual effects, vindicating the fixed effects estimator.<sup>13</sup>

Table 3 reports the estimated coefficients on the explanatory variables, LEV, PROF, ROE, ZSCORE, MATDUM and LNAMOUNT in the baseline model, which allows for country, time and industry dummies. The resulting coefficient estimates offer the response averaged over all sectors, all size classes and all years in response to each of the firm specific financial variables. We show that firms with higher leverage (LEV) will face a higher external finance premium compared to those with lower leverage, since the coefficient of 0.161 implies an elasticity of the bond premium with respect to leverage, evaluated at sample means, of

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<sup>12</sup>For example consider the firm's reputation which can be acquired in the financial markets.

<sup>13</sup> While our model is robust to firm-specific heterogeneity since we account for these factors explicitly in our model, we may still encounter endogeneity bias. The usual solution to endogeneity bias would be a dynamic GMM estimator with instrumental variables, but we are unable to estimate a dynamic panel GMM-estimator because of two important considerations. First, the Asian crisis occurs close to the beginning of our sample, and thus the dynamic GMM-procedure poses a problem for our study since the requirement for instruments and the use of first differences and lags of dependent variable would lead to a considerable loss of observations, including the recession period. This would substantially undermine the asymmetric effects of the financial accelerator, which are vitally important for this study. Second, our sample is relatively short and when applying dynamic panel data estimators to short samples one might be confronted with severe bias in the estimates. In short samples Mulkay et al. (2000) point out that static estimation procedure provides more precise estimates.

0.853. A 10% increase in leverage leads therefore to a 8.53% increase in credit spread. Profitability (PROF) appears not to be a significant determinant of credit spreads, but a firm with a higher return on equity (ROE) commands a lower external finance premium consistent with the view that higher equity returns increase the firm value thereby reducing the risk of default. The elasticities of bond premium with respect to equity returns is relatively small at -0.071. The Z-score variable also has a significant negative coefficient implying that firms with high Z-score and therefore with lower bankruptcy risk, face a smaller premium, but here the elasticity is larger at -0.635, suggesting the risk measure has a greater impact on the spread than the return on equity. Finally, the coefficients on the bond-specific controls (maturity dummy and log of amount issued) are poorly determined suggesting that these variables do not play a statistically significant effect on the external finance premium.<sup>14</sup>

While our results refer to a panel of seven economies, we are able to assess country differences by looking at the corresponding country dummies.<sup>15</sup> We find that relative to Hong Kong - here used as the reference country - all countries, with the exception of China, show a negative sign of the coefficient, although they are not significant. The country dummy on China turns out to be positive and significant. In other words, we find that firms located in China, pay a higher external finance premium compared to firms in Hong Kong, while firms in all other countries do not have significantly different premia compared to Hong Kong, all else equal.

The estimated coefficients on the balance sheet variables have the correct sign as predicted by the financial accelerator theory (see Bernanke et al. (1999)) as well as previous studies in the determinants of credit spreads (see for instance Collin-Dufresne et al. (2001); Cremers et al. (2008) and Guntay and Hackbarth (2010)), and suggest that leverage and the risk of bankruptcy are highly significant determinants of the bond market external finance premium.

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<sup>14</sup>We have also attempted to remove these bond-specific controls from our model and the results remain unchanged.

<sup>15</sup>Ideally, we would like to run regressions on a country-by-country basis, but due to the limited number of observations we were not able to carry-out such an econometric exercise.

## 5.2. The role of financial constraints

We now consider the impact of financial constraints on the response to balance sheet characteristics as shown in Equation (5). We use three different categorization methods for determining whether a firm is constrained ( $Cons_{it}$ ) or unconstrained ( $1 - Cons_{it}$ ) based on size, creditworthiness and the degree of indebtedness. Our results are remarkably consistent across these categories and document an ‘excess sensitivity’ of financial variables for constrained Asian firms. We report formal tests of equality of coefficients at the foot of the Table of results. The upshot is that the external finance premium for bonds is larger for firms classified as financially constrained versus firms that are unconstrained on a wide range of classifications of financially constrained.

Results are reported in Table 4. We observe that leverage (LEV) has a positive and significant effect for both types of firms (constrained and unconstrained). However, the coefficients on constrained and unconstrained firms are significantly different from each other for two out of three measures we use to identify firms as financially constrained. This result shows that greater leverage is more acute for constrained firms lending support to the financing constraints story. The effect of leverage on the spread is not only statistically but also economically important. For instance, using our results for firms sorted on their size, as shown in Column 1 of Table 4, the elasticity of spread with respect to leverage is 0.63 for constrained Asian firms. Thus a 10% increase in leverage for constrained firms implies a 6.3% increase in credit spread.<sup>16</sup>

The profitability measure, PROF, has negative and significant coefficients only for firms which face binding financing constraints, and only when COV is used as sorting device, while it is generally insignificant for unconstrained companies. In addition, formal tests of equality reported at the foot of the table reveal that the interacted coefficients are significantly different from each other. In terms of economic significance, the effect of profits on constrained

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<sup>16</sup>This elasticity refers to Column 1 when we use SIZE to determine constraints, but similar elasticities emerge for using COV as an alternative classification scheme.

and unconstrained firms is different, but relatively small when significant.

The return on equity, ROE, has a negative coefficient for both constrained and unconstrained firms but the coefficients are insignificant for both types of firms. Our results in Table 4 do not suggest an important role for equity returns in the external finance premium even when we differentiate between constrained and unconstrained firms.

The risk of default, as measured by the Z-SCORE, is found to be negative and significant for the constrained group of firms for all three measures, while for unconstrained firms we find only one case where it has a negative and significant effect. We identify one case where the coefficients are statistically different between constrained and unconstrained firms. In keeping with our previous results we find that this variable has a strong influence on the premium, but we reveal here that the influence is much stronger on constrained firms than unconstrained firms, where the risk of bankruptcy is likely to be much higher.

Our results show that it is the constrained firms, by any definition we used, that show greater sensitivity to financial variables, with special emphasis on leverage and the risk of default. Fazzari et al. (1988), Guariglia (2008) and Spaliara (2009) found that capital market imperfections are important in influencing firms' real activities such as investment, inventory and employment. We find that the external premium on corporate bonds is also more sensitive to balance sheet characteristics for constrained firms than for unconstrained firms. This is a new result that complements the earlier work by de Bondt (2004) and Campello and Chen (2010) and highlights the role of capital market imperfections in the Asian bond markets. Greater sensitivity may result from the greater information asymmetries in Asia between firms and the 'arms-length' investors in bonds, and this results to some degree from the smaller, less liquid and transparent bond market in the Asian region compared to the West.<sup>17</sup>

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<sup>17</sup> It should be noted that there is a range of financial development in Asia, and certainly Hong Kong, Korea and Singapore are well developed compared to the other Asian countries in our paper. Nevertheless, there is some recognition in the region that the bond market is relatively underdeveloped and that corporate finance is primarily bank based, or for larger firms, equity based.

### 5.3. Responses to crises

#### 5.3.1. The Asian crisis

This section addresses the response to the crisis by examining the sensitivity of the external premium to financial variables in the 1997-98 crisis for the Asian firms. We report coefficients on variables interacted with the dummy variable  $ACD_t$  (Asian crisis) and interacted with  $(1 - ACD_t)$  (out of Asian crisis) for constrained and unconstrained firms.

Our results in Table 5 give a clear indication that there is a significantly different response of the external finance premium during the crisis with respect to financial variables compared to other times. When  $ACD_t$  is interacted with constrained ( $Cons_{it}$ ) and unconstrained ( $1 - Cons_{it}$ ) firms, we find significant effects for constrained firms in terms of sensitivity to LEV, PROF and ZSCORE during the crisis (i.e rows where the  $ACD_t * (Cons_{it})$  interaction is explored) but insignificant results for other periods. Our results show that where there is a significant difference in the response for constrained versus unconstrained firms, the external finance premium is more sensitive to LEV, PROF and ZSCORE for constrained firms in the crisis.

In Table 4 we found greater sensitivity for constrained firms, but did not differentiate between crisis and non-crisis episodes. Table 5 shows that the Asian crisis intensified the effects of the constraints and many constrained firms with higher leverage or risk of default and lower profits faced significant increases in their external finance premia. The impact is measurable, based on elasticities at the mean. We calculate that a 10% rise in leverage is associated with a 1.41% increase in credit spread, while an identical increase in profitability and Z-score is associated with a 0.2% and a 1.05% fall in the credit spread for constrained firms during the Asian crisis period. We conclude that the 1997-98 crisis had a considerable impact through the balance sheet on external finance premium in the Asian bond market.

#### 5.3.2. The global financial crisis

We carry-out a similar exercise to the previous sub-section, but our focus is on the most

recent financial crisis. It is well known that the 2007-09 financial crisis and global economic downturn did not originate in Asia, with the US being the epicenter of the crisis. In addition, compared to 1997-98, Asian countries in structural terms were generally in good shape. For instance, Kim (2010) notes that Korean companies during the 1997-98 crisis had substantially higher debt ratios and considerably lower interest coverage ratios compared with the global financial crisis. This is also confirmed in our data, since we show in Table 2 that Asian firms during the 1997-98 crisis were more indebted, less profitable and riskier compared to the later years of our sample which span the 2007-09 global financial crisis. Nonetheless, the second round effects of the crisis have influenced Asia as investors have withdrawn capital to home markets, and have required higher returns to compensate for the perceived risks of investing abroad.

To assess whether the external finance premium in the bond market was significantly higher during the global crisis for constrained firms relative to their unconstrained counterparts, we estimate Equation (6) interacted with the dummy variable  $GFCD_t$  (2007-09 crisis) and interacted with  $(1 - GFCD_t)$  (out of 2007-09 crisis) for constrained ( $Cons_{it}$ ) and unconstrained ( $1 - Cons_{it}$ ) firms.

The results are shown in Table 6. We find much less sensitivity to leverage and risk in the recent crisis compared to the response to the Asian crisis. External finance premia do rise by a similar magnitude in response to these variables for constrained firms, but the effect is not as statistically significant, and less consistent across measures of financial constraints. We find instead that profitability and return on equity become more important than they were in the Asian crisis, with Table 6 showing much stronger significance for these variables than Table 5. Based on results in Column 1 of Table 6, a 10% rise in profitability leads to a 21.9% fall in external premium for constrained Asian firm-years during the global financial crisis.

The differences may reflect the fact the Asian firms were more indebted at the onset of the Asian crisis, and more sensitive to the withdrawal of external finance; bankruptcy was a

real possibility for many firms as credit tightened. In the recent crisis Asian firms have lower debt levels, and much more internal finance to fall back on when external finance is limited in supply. Asian financial institutions entered the global financial crisis with limited exposure to subprime-related instruments, and most had relatively healthy financial positions and strong capital buffers. Moreover, the currencies of these countries were protected by large foreign exchange reserves, lowering the currency risk of investors in these countries. It is also a reflection of the second-round impact of the global financial crisis, as first round effects on credit and demand impacted on Asian firms and reduced their profitability and return on equity so investors raised the premiums they required on bond finance.

We conclude that the external shocks emanating from advanced economies were better weathered by Asian economies during 2009 compared with the 1997-98 Asian crisis. The period of the global financial crisis only moderately affected the external finance premium for constrained firms across the Asian region and mostly through the channels of profitability and return on equity rather than leverage and risk of bankruptcy.

## **6. Conclusions**

In this paper we examine how the external premium responds to firm-level balance sheet information using an asymmetric information framework to explore the effect of firm-level heterogeneity, credit constraints and crisis episodes on the bond spread (or external finance premium). Our results based on firm-level data for Asian bond markets during the period 1995-2009 suggest that firms with better financial health, as measured by balance sheet indicators such as leverage, risk of bankruptcy, profitability and return on equity, face a lower external finance premium. After separating firms into constrained and unconstrained categories using three different classification schemes we find firms that are credit constrained tend to face higher premia compared to unconstrained firms if their financial position deteriorates. We also find that constrained firms were more sensitive to leverage and risk of bankruptcy measures during the Asian crisis of 1997, but were less responsive to these mea-



tures in the most recent crisis, when profitability and return on equity were the determinants of the external finance premium.

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Figure 1: Aggregate market capitalization

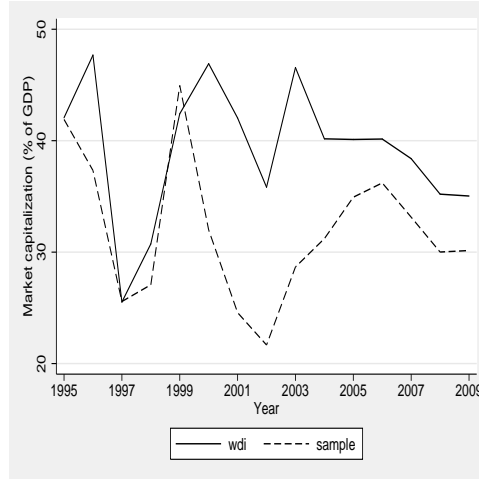


Figure 2: The evolution of credit spread

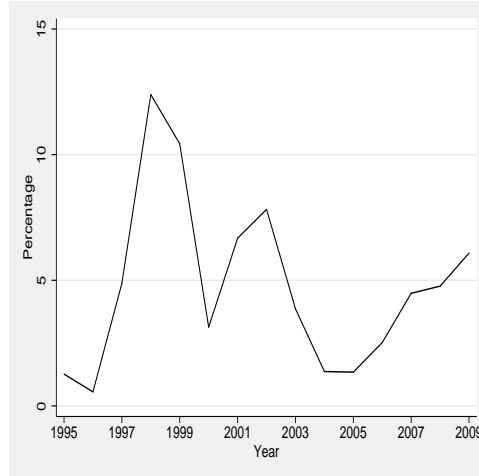


Figure 3: Credit spread for different types of firms

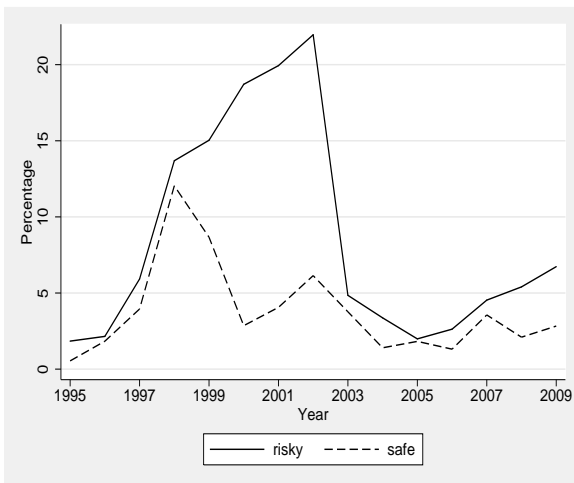
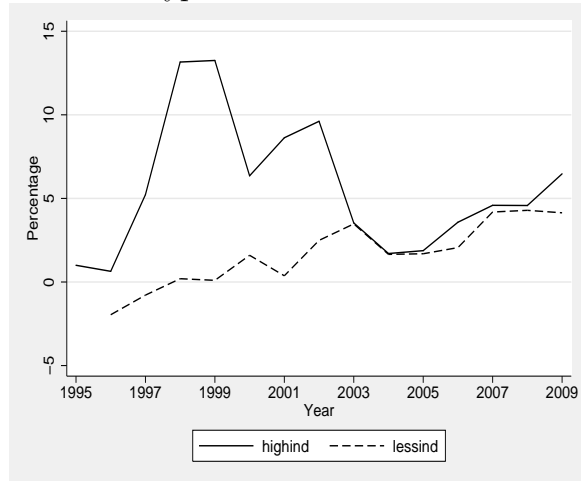
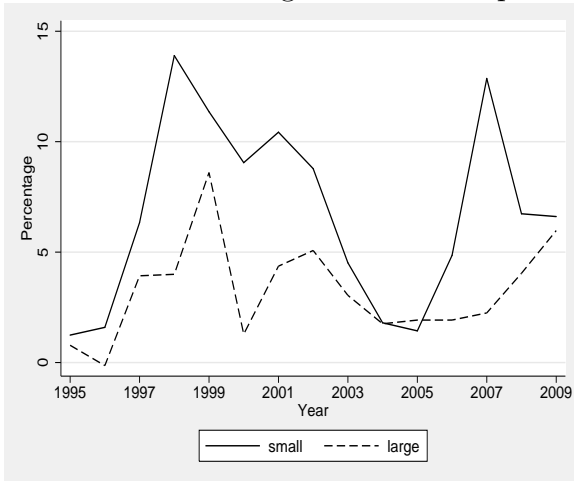


Table 1: Summary statistics for the credit spread

	Mean (1)	St. Deviation (2)	Observations (3)	Diff. (4)
<b>Full sample</b>	4.38	(12.68)	718	
<b>Z-score</b>				
above 1.91	3.67	(7.03)	342	0.15
less or equal 1.91	5.03	(16.18)	376	
<b>Maturity</b>				
above 6 years	5.15	(15.25)	458	0.03
less or equal 6 years	3.04	(5.67)	260	
<b>Firm types</b>				
<i>Small<sub>it</sub></i>	4.95	(11.07)	195	0.46
<i>Large<sub>it</sub></i>	4.17	(13.24)	523	
<i>H.Coverage<sub>it</sub></i>	3.91	(11.25)	594	0.02
<i>L.Coverage<sub>it</sub></i>	6.65	(17.91)	124	
<i>H.Indebted<sub>it</sub></i>	5.18	(14.53)	532	0.00
<i>L.Indebted<sub>it</sub></i>	2.12	(3.29)	186	
<b>Time periods</b>				
97-98 Asian crisis	8.45	(20.26)	82	0.00
Non-Asian crisis	3.86	(11.26)	636	
07-09 global crisis	4.72	(9.94)	70	0.81
Non-global crisis	4.35	(12.95)	648	

Notes: The table presents descriptive statistics for the firm-specific credit spread ( $SPREAD_{it}$ ). The subscript  $i$  indexes firms, and the subscript  $t$ , time, where  $t = 1995-2009$ .

Table 2: Summary statistics for firm-specific variables

	$LEV_{it}$ (1)	Obs. (2)	Diff. (3)	$PROF_{it}$ (4)	Obs. (5)	Diff. (6)	$ZSCORE_{it}$ (7)	Obs. (8)	Diff. (9)	$ROE_{it}$ (10)	Obs. (11)	Diff. (12)
<b>Full sample</b>	31.99 (22.87)	1761		5.51 (11.29)	1761		1.92 (2.14)	1379		17.16 (19.87)	992	
<b>Spread Groups</b>												
Lower 30th	33.31 (21.99)	204	0.08	6.73 (9.02)	204	0.60	2.51 (2.42)	171	0.00	7.52 (22.68)	204	0.08
Upper 70th	37.31 (24.09)	194		6.19 (11.17)	194		1.25 (2.07)	178		0.94 (55.39)	194	
<b>Time periods</b>												
97-98 Asian crisis	35.72 (23.87)	275	0.00	4.21 (8.34)	275	0.00	1.64 (1.84)	259	0.00	1.63 (11.85)	275	0.64
07-09 global crisis	26.61 (15.10)	86		8.07 (9.91)	86		2.57 (2.20)	52		1.04 (1.81)	86	

Notes: The Table reports sample means with standard deviations in parentheses for the firm-specific variables used in the empirical analysis. The p-value of a test of the equality of means is reported. The subscript  $i$  indexes firms, and the subscript  $t$ , time, where  $t = 1995-2009$ .  $LEV_{it}$ : Total debt to total assets.  $PROF_{it}$ : Earnings before interest and taxes relative to total assets.  $ZSCORE_{it}$ : Altman's Z-score, which is an indicator of bankruptcy risk.  $ROE_{it}$ : Net income over shareholders' equity.

Table 3: External finance premium and firm characteristics

$LEV_{it}$	0.161*** (2.78)
$PROF_{it}$	0.130 (1.18)
$ROE_{it}$	-0.344* (-1.95)
$ZSCORE_{it}$	-1.457* (-1.95)
$MATDUM$	1.206 (0.52)
$LNAMOUNT$	-0.340 (-0.53)
$R^2$	0.10
$Hausman(p - value)$	0.00

*Notes:* The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity. Robust  $t$ -statistics are reported in the round brackets. The standard errors are corrected for clustering. Time dummies, industry dummies and country dummies were included in the specification.  $MATDUM$  is a dummy which takes the value one if the maturity of the bond is over 6 years, and equal to zero otherwise.  $LNAMOUNT$  denotes the log of amount issued. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. Numbers of firms and of observations are 91 and 594, respectively. Also see notes to Table 2. \*significant at 10 %; \*\* significant at 5 %; \*\*\* significant at 1 %.

Table 4: The role of financial constraints

	SIZE	COV	INDEBT
	(1)	(2)	(3)
$LEV_{it} * Cons$	0.275*** (3.60)	0.419*** (4.67)	0.232*** (3.95)
$LEV_{it} * (1 - Cons)$	0.144** (2.38)	0.128** (2.34)	0.174 (0.61)
$PROF_{it} * Cons$	-0.219 (-1.10)	-0.987** (-2.10)	-0.104 (-0.90)
$PROF_{it} * (1 - Cons)$	0.114 (1.01)	0.205** (1.97)	0.216 (1.13)
$ROE_{it} * Cons$	-0.029 (-0.66)	-0.050 (-1.05)	-0.030 (-1.45)
$ROE_{it} * (1 - Cons)$	-0.024 (-1.03)	-0.001 (-0.04)	0.029 (0.18)
$ZSCORE_{it} * Cons$	-1.574* (-1.88)	-3.212** (-2.79)	-1.933** (-2.32)
$ZSCORE_{it} * (1 - Cons)$	-1.369 (-1.29)	-1.518** (-1.97)	-1.597 (-1.32)
$MATDUM$	-0.620 (-0.25)	-1.502 (-0.63)	-1.457 (-0.60)
$LNAMOUNT$	0.103 (0.15)	-0.356 (-0.56)	-0.266 (-0.40)
$R^2$	0.12	0.18	0.12
$Hausman(p - value)$	0.04	0.00	0.10
Test of equality (p-value): LEV	0.07	0.00	0.83
Test of equality (p-value): PROF	0.09	0.01	0.08
Test of equality (p-value): ROE	0.91	0.34	0.71
Test of equality (p-value): ZSCORE	0.84	0.08	0.77

*Notes:* The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity. The dummy variable Cons indicates in turn Small, Risky and Highly indebted firms. Robust  $t$ -statistics are reported in the round brackets. The standard errors are corrected for clustering. Time dummies, industry dummies and country dummies were included in the specifications. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. Numbers of firms and of observations are 91 and 594, respectively. Also see notes to Table 2. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.



Table 5: Responses to the Asian crisis

	SIZE (1)	COV (2)	INDEBT (3)
$LEV_{it} * Cons * ACD$	0.423** (2.14)	0.546** (2.22)	0.205* (1.81)
$LEV_{it} * Cons * (1 - ACD)$	0.194 (1.34)	0.375 (1.59)	0.172** (2.46)
$LEV_{it} * (1 - Cons) * ACD$	0.089 (1.33)	0.100 (1.46)	18.680 (0.75)
$LEV_{it} * (1 - Cons) * (1 - ACD)$	0.122 (1.03)	0.117 (1.58)	0.131 (0.46)
$PROF_{it} * Cons * ACD$	-1.871*** (-3.82)	-2.684** (-2.32)	-1.033*** (-3.49)
$PROF_{it} * Cons * (1 - ACD)$	0.074 (0.49)	-0.014 (-0.02)	0.033 (0.26)
$PROF_{it} * (1 - Cons) * ACD$	-0.260 (-1.42)	0.061 (0.24)	-116.934 (-0.75)
$PROF_{it} * (1 - Cons) * (1 - ACD)$	0.123 (1.22)	0.206* (1.98)	0.248 (1.31)
$ROE_{it} * Cons * ACD$	-0.052 (-1.36)	-0.043 (-1.39)	-0.042 (-1.45)
$ROE_{it} * Cons * (1 - ACD)$	0.048 (1.15)	-0.006 (-0.07)	-0.025 (-0.93)
$ROE_{it} * (1 - Cons) * ACD$	-0.009 (-1.08)	-0.010 (-1.45)	0.094 (0.04)
$ROE_{it} * (1 - Cons) * (1 - ACD)$	-0.029* (-1.76)	0.001 (0.04)	0.015 (0.09)
$ZSCORE_{it} * Cons * ACD$	-6.770** (-2.12)	-11.484** (-2.50)	-5.329*** (-3.56)
$ZSCORE_{it} * Cons * (1 - ACD)$	-1.227 (-0.65)	-2.023** (-2.29)	-1.689** (-2.00)
$ZSCORE_{it} * (1 - Cons) * ACD$	-3.967** (-2.29)	-4.737*** (-3.56)	-27.773 (-0.79)
$ZSCORE_{it} * (1 - Cons) * (1 - ACD)$	-1.264 (-1.38)	-1.190 (-0.90)	-1.583 (-1.32)
$MATDUM$	-1.298 (-0.53)	-2.089 (-0.89)	-0.925 (-0.38)
$LNAMOUNT$	-0.260 (-0.50)	-0.357 (-0.66)	-0.448 (-0.68)
$R^2$	0.19	0.22	0.15
$Hausman(p - value)$	0.00	0.00	0.00
Test of equality (p-value): $LEV*Cons$	0.33	0.38	0.78
Test of equality (p-value): $LEV*1-Cons$	0.66	0.75	0.45
Test of equality (p-value): $PROF*Cons$	0.00	0.02	0.00
Test of equality (p-value): $PROF*1-Cons$	0.04	0.46	0.45
Test of equality (p-value): $ROE*Cons$	0.09	0.69	0.67
Test of equality (p-value): $ROE*1-Cons$	0.17	0.54	0.97
Test of equality (p-value): $ZSCORE*Cons$	0.09	0.03	0.01
Test of equality (p-value): $ZSCORE*1-Cons$	0.22	0.02	0.43

Notes: The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity.  $ACD$  is a dummy variable, which takes value 1 for the 1997-98 Asian crisis period, and 0 otherwise. The dummy variable  $Cons$  indicates in turn Small, Risky and Highly indebted firms. Robust  $t$ -statistics are reported in the round brackets. The standard errors are corrected for clustering. Time dummies, industry dummies and country dummies were included in the specifications. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. Numbers of firms and of observations are 91 and 594, respectively. Also see notes to Table 2. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Table 6: The 2007-09 global financial crisis

	SIZE (1)	COV (2)	INDEBT (3)
$LEV_{it} * Cons * GFCD$	0.594* (1.83)	0.003 (0.01)	0.268* (1.77)
$LEV_{it} * Cons * (1 - GFCD)$	0.316*** (4.12)	0.435* (1.88)	0.225* (1.88)
$LEV_{it} * (1 - Cons) * GFCD$	0.032 (0.13)	0.117 (1.42)	0.473 (1.23)
$LEV_{it} * (1 - Cons) * (1 - GFCD)$	0.160*** (2.66)	0.121 (1.55)	0.115 (0.50)
$PROF_{it} * Cons * GFCD$	-12.755*** (-3.47)	-2.861** (-2.25)	0.807 (0.82)
$PROF_{it} * Cons * (1 - GFCD)$	-0.190 (-0.97)	-0.086 (-0.10)	-0.101 (-0.88)
$PROF_{it} * (1 - Cons) * GFCD$	0.340 (0.54)	0.674 (1.41)	0.133 (0.42)
$PROF_{it} * (1 - Cons) * (1 - GFCD)$	0.098 (0.86)	0.201* (1.85)	0.219** (2.11)
$ROE_{it} * Cons * GFCD$	-4.785*** (-2.84)	-0.052 (-0.51)	-0.961 (-1.12)
$ROE_{it} * Cons * (1 - GFCD)$	-0.032 (-0.73)	0.009 (0.09)	-0.029* (-1.98)
$ROE_{it} * (1 - Cons) * GFCD$	0.082 (0.15)	-0.359 (-0.71)	0.261 (0.62)
$ROE_{it} * (1 - Cons) * (1 - GFCD)$	-0.023 (-1.01)	0.000 (0.02)	-0.011 (-0.12)
$ZSCORE_{it} * Cons * GFCD$	-9.315* (-1.93)	-6.007 (-1.47)	0.283 (0.11)
$ZSCORE_{it} * Cons * (1 - GFCD)$	-2.145** (-1.97)	-2.691*** (-2.70)	-2.201* (-1.92)
$ZSCORE_{it} * (1 - Cons) * GFCD$	-1.159 (-0.71)	-0.902 (-0.51)	-1.590 (-1.04)
$ZSCORE_{it} * (1 - Cons) * (1 - GFCD)$	-1.759** (-2.09)	-1.605 (-1.39)	-1.702* (-1.70)
$MATDUM$	-0.709 (-0.29)	-2.529 (-1.07)	-1.331 (-0.63)
$LNAMOUNT$	0.174 (0.26)	-0.279 (-0.54)	-0.201 (-0.38)
$R^2$	0.16	0.21	0.13
$Hausman(p - value)$	0.00	0.00	0.35
Test of equality (p-value): $LEV*Cons$	0.38	0.95	0.76
Test of equality (p-value): $LEV*1-Cons$	0.59	0.09	0.21
Test of equality (p-value): $PROF*Cons$	0.00	0.08	0.35
Test of equality (p-value): $PROF*1-Cons$	0.70	0.32	0.79
Test of equality (p-value): $ROE*Cons$	0.00	0.76	0.28
Test of equality (p-value): $ROE*1-Cons$	0.85	0.47	0.48
Test of equality (p-value): $ZSCORE*Cons$	0.08	0.41	0.22
Test of equality (p-value): $ZSCORE*1-Cons$	0.70	0.53	0.92

*Notes:* The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity. *GFCD* is a dummy variable, which takes value 1 for the global financial crisis period 2007-09, and 0 otherwise. The dummy variable *Cons* indicates in turn Small, Risky and Highly indebted firms. Robust *t*-statistics are reported in the round brackets. The standard errors are corrected for clustering. Time dummies, industry dummies and country dummies were included in the specifications. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. Numbers of firms and of observations are 91 and 594, respectively. Also see notes to Table 2. \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.