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Evidence on the External Finance Premium from the US and Emerging Asian Corporate Bond Markets

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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 the United States, China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand during 1995-2005 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 in the Asian market than in the US. Finally, the premium is more sensitive to firm-level variables during credit crunches, recessions and sudden stops than other periods, with stronger effects for the Asian bond market.

JEL classification: F34, G32

Key words: Financing Constraints, External Finance Premium, Asian Bond Markets

1 Introduction

At the end of 2005, the seven Asian economies included in this study-China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand- had foreign currency bonds outstanding of almost $195 billion. The above figure stands in sharp contrast with $63 billion outstanding in 1995. This represents more than a threefold increase in foreign financing through bond markets following the Asian crisis, suggesting that with improving economic conditions and greater globalization of finance, the Asian corporate bond market is better able to provide external finance to firms than a decade earlier. Asian countries have sought to increase financial market development to avoid dependence on foreign capital as was the case in the 1990s around the time of the 1997-8 Asian crisis.

For this reason efforts have been made by the Asian Development Bank to encourage deeper, more integrated sovereign and corporate bond markets (see Ma and Remolona (2005)) 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 brought by the ASEAN+3 Finance Ministers. Gyntelberg et al. (2005) discuss the limitations that a small domestic bond market imposes on the East Asian economies, and evaluate the prospects for future development. They are optimistic that larger bond markets will emerge as firms became larger and seek unsecured, longer-dated financial arrangements that improve corporate credit structure, competition and growth.

Some research has been undertaken to evaluate the state of bond market development in Asian markets by Eichengreen et al. (2006) and Borensztein et al. (2008). They show, using data on individual corporate bonds issued on both domestic and foreign markets in Asia and Latin America, that while Asian bond markets are larger and better capitalized, and the maturity of Asian bonds is longer than Latin American markets, Latin American bond markets are more liquid by most measures, and they have had more success in attracting foreign investor participation. Although the comparison is primarily between Asian and Latin American experiences, they also consider the extent of bond market development and foreign investor participation compared to developed bond markets such as the United States.

Our aim in this paper is to make a more direct comparison with the United States by asking three new questions. Do Asian firms have to offer a higher rate of return compared to firms in the United States to obtain external finance from the bond markets? Are firms expected to offer a higher rate of return for essentially similar firm-specific characteristics such as debt to assets, profitability and risk? Do they need to pay higher rates when financially constrained or during credit crunches and recessions compared to US firms in similar circumstances?

There are several difficulties in attempting to answer these questions. First, it is difficult to establish what is a risk free rate for bond issuers to benchmark against in Asia, since local sovereign bonds for Asia ex-Japan include default risk. The definition of emerging markets employed by Standard & Poor's

is that the sovereign bond rating is less than BBB+ to qualify for the S&P EMBI+ bond index, and therefore the sovereign bond benchmark is not a risk free rate. If we were to attempt to assess the spread of local currency corporate bonds over these local sovereign bonds we would include "transfer risk" documented by Durbin and Ng (2005), which is the risk that governments would transfer its own repayment problems to firms in the form of additional taxes, currency controls, or seizure of assets. While many countries in Asia ex-Japan have consistency had better ratings than BBB+, such as Hong Kong, Singapore and Korea, we could only assess the corporate bond issues in these countries.

Second, there is considerably greater information asymmetry in Asian countries due to the absence of internationally comparable ratings, lower reporting requirements, etc (c.f. Eichengreen et al. (2006)). Financial models of credit spreads in corporate bond markets using structural models of Black and Scholes (1973) or Merton (1974) and reduced form models of Duffie and Singleton (1997) documented in Tsuji (2005), rely on assessments of default using market information that is often more difficult to obtain in Asia. We follow Tsuji (2005) in assessing the spreads using an economic approach, but for data from Asia ex-Japan, and the economic model we use fully reflects the impact of information asymmetry between the borrower and the external financier. Models by Jaffee and Russell (1976) and Stiglitz and Weiss (1981) on asymmetric information, which were extended by Bernanke et al. (1999) and Carlstrom and Fuerst (1997), provide an agency cost model of external borrowing from financial markets. Firms 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 due to information asymmetry and this external finance premium is inversely related to the firms' balance sheet i.e. net worth.

Third, it is also likely that the external premium varies with financial constraints and with macroeconomic conditions that bring about sharp reductions in lending during credit crunches or recessions.[1] The experience of the US corporate bond market after the credit meltdown and recession in 2001 and 2002 is an example of this response. Kwan (2002) documents that commercial paper and bank loans declined considerably in relation to previous years in the US, and the recession that followed in 2001 also appears to have had a noticeable effect on access to credit for US firms.[2] In emerging economies

[1]Evidence for the euro area bond market in de Bondt (2004) examines the impact of macroeconomic and financial health indicators on the corporate bond spread finding evidence of a balance sheet channel that influences bond spreads. Campello and Chen (2005) report that bonds of financially constrained US firms in the Lehman Brothers Fixed Income Database command higher *ex ante* excess risk premia and these premia move countercyclically with economic and financial conditions. This result is also supported by Mody and Taylor (2004) who consider the movement of high yield bonds over government debt, i.e the external finance premium, as a predictor for real economic activity. Levin et al. (2004) measures expected default risk and credit spreads on publicly-traded debt for US non-financial firms, finding that financial market frictions exhibit strong cyclical patterns.

[2] There is evidence that real variables such as investment and inventory activity responded to the availability of cash flow during this period, since the literature shows significantly different coefficient values for low growth and high growth (Gertler and Gilchrist (1994)), and for credit crunch and non-credit crunch years (Kashyap et al. (1993)). As Vermeulen (2002) notes, the effects of financial constraints and downturns are more likely to affect small firms than large firms and indeed firms that are weaker on other criteria c.f Bougheas et al. (2006).

Eichengreen et al. (2001) shows this resulted in a sustained rise in bond spreads after the first half of 1997, and a persistent drop in volumes. The difficulty is in assessing the extent to which credit crunches and recessions in different regions are comparable, but our work illustrates the extent of any effect from these events on the external premium.

In this paper we ask whether international currency denominated bonds in Asian markets differ from the much larger and more developed US market, particularly in the relationship between the spread of corporate and government bond yields and firm-specific characteristics. This is therefore a firm-level study of the response of premia in emerging and developed bond markets that takes full account of the heterogeneity of East Asian firms operating in China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand which are smaller, predominantly bank financed and have lower coverage ratios which may mean a higher proportion are likely to be financially constrained in some financial markets, see Harrison et al. (2004). Previous empirical investigations of the external finance premium have been conducted on the margin between internal finance and bank borrowing or on the margin for raising external finance through equity markets, but we consider the premium in the bond market.[3] The majority of papers that consider the bond market in comparison with the equity market focus on developed countries and relatively little attention has been devoted to the external finance premium on securities-based external finance in emerging markets, which is somewhat surprising given that the value of bonds issued by emerging economies has increased rapidly during the last two decades (see Genberg and Sulstarova (2008)). We add to the literature by comparing 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 recession/credit crunch episodes on the premium.

The rest of the paper is organized as follows. Section two offers a brief summary of the theoretical basis for our analysis of the external finance premium, section three discusses the data, the methodology for determining financially constrained firms and downturns, and the estimation technology. Sections four and five present the empirical evidence and report some robustness checks. Section six concludes.

2 Theoretical background

The influential paper by Bernanke et al. (1999) (BGG, hereafter) provides the theoretical basis for our paper. The BGG model incorporates the costly-state verification (CSV) debt contracting problem into an otherwise standard dynamic new Keynesian general equilibrium model. In the model there

[3]The bank borrowing literature includes papers by Kashyap et al. (1993) and Bernanke and Gertler (1995). Equity premia are investigated by Campello and Chen (2005) 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. Campello and Chen (2005) address risk pricing in equity and bond markets, where bond data confirm findings for equity prices.

are three agents: households, entrepreneurs, and retailers. Entrepreneurs, who are assumed to be risk-neutral and have finite horizons, acquire physical capital K_{t+1} at a price Q_t 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^j_{t+1} and finances capital with internal funds supplemented by external borrowing from a financier: $B^j_{t+1} = Q_t K^j_{t+1} - N^j_{t+1}$. Ex ante, the expected revenue from the investment project is given by $R^k_{t+1} Q_t K^j_{t+1}$, where R^k_{t+1} is the aggregate gross rate of return on capital investment. The realized revenue in the next period is given by $\omega^j R^k_{t+1} Q_t K^j_{t+1}$, where ω^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 ω^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 $\bar{\omega}^j R^k_{t+1} Q_t K^j_{t+1} = Z^j_{t+1} B^j_{t+1}$, where Z^j_{t+1} 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 μ and receives what is found, namely $(1-\mu)\bar{\omega}^j R^k_{t+1} Q_t K^j_{t+1}$. 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 riskleless 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 BGG 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 $s = E[\frac{R^k_{t+1}}{R_{t+1}}]$ be expected discounted return on capital.[4] Then

$$E_t[R^k_{t+1}] = s[\frac{N_t}{Q_t K_{t+1}}]R_{t+1} \tag{2.1}$$

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.

[4] As BGG suggest, the ratio of the cost of finance to the risk-free rate may be equally well interpreted as the external finance premium.

The role of the financial accelerator mechanism in the model can be seen from the definition of aggregate entrepreneurial net worth: $N_{t+1} = \gamma V_{t+1} + W^e_{t+1}$. BGG 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^e_{t+1}. Entrepreneurial equity equals earnings from capital employed from t to $t+1$ minus the debt repayment.

$$V_{t+1} = R^k_{t+1} Q_t K_{t+1} - (R_{t+1} + EFP_t)(Q_t K_{t+1} - N_t) \tag{2.2}$$

with

$$EFP_t = \frac{\mu \int_0^{\bar{\omega}} \omega R^k_{t+1} Q_t K_{t+1} dF(\omega)}{Q_t K_{t+1} - N_t} \tag{2.3}$$

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

Equation (2.2) shows that net worth would be affected by unexpected changes in the return on capital, changes in the price of capital, in leverage and in default costs. These changes in net worth will in turn affect the spread between the contractual rate on debt or bond and the risk-free rate. For a highly leveraged firm, a shock to project returns will have a higher impact on internal funds (and finance premia) compared to a firm that has low leverage. To the extent that a borrower's net worth is procyclical, the external finance premium will be countercyclical enhancing swings in borrowing and fluctuations of macroeconomic variables will be magnified and propagated through the economy. The model therefore provides theoretical grounding for the intuition that firms with worse balance sheets tend to face higher external finance premia and tend to be more vulnerable to adverse economic shocks.

3 Data, classification methodologies, and estimation method

3.1 *Data*

The data for this paper are drawn from Dealogic Bondware, Bloomberg, Datastream 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.[5] 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 internationally with the corresponding bond yields for the period 1995 to 2005. 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 Asian 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. For the US sample we rely on Datastream to record the annual average of daily observations on bond yields for the period 1995 to 2005. The analysis includes the universe of domestic corporate US dollar denominated bonds with Datastream coverage. 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 bond is constructed and its yield estimated using a simple linear interpolation method. For the Asian data, 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 and will make our results comparable with the US sample.[6]

Balance sheet data for firms in China, Hong Kong, Indonesia, Korea, Philippines, Singapore and Thailand were taken from the Thomson Financial Primark database. For the US we have linked market prices of their outstanding securities to Datastream's balance sheet statements. 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. 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.

[5] Due to data limitations we were unable to retrieve any data on foreign currency corporate bond yields for Malaysian firms.

[6] 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 if we are to make a fair comparison with US bond issues, see Domowitz et al. (1998).

Our combined sample contains data for 2729 bonds issued by 652 US firms and 258 bonds issued by 85 Asian firms that traded between 1995 and 2005 in a variety of sectors including manufacturing, utilities, resources, services and financials.[7] The panel has an unbalanced structure with the number of observations on each firm varying between three and eleven.

Our dependent variable measures the external finance premium on corporate bonds using the spread between corporate bond yields and Treasury bond yields[8]. 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.[9] 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 ith bond, P_i and D_i are the market value and the duration of the ith 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. The plots of the average spread and the percentiles of the distribution are provided in Figures 1 and 2.

[Insert Figure 1 here]
[Insert Figure 2 here]

Figure 1 shows the average credit spread between corporate and government bonds of the same maturity issued by US and Asian firms in their respective bond markets. The most notable feature of the figures, one for the US and the other for emerging Asia, is the sharp response to adverse economic events. Thus the increase in the spread at the onset of the US recession/credit crunch and the 1997-98 Asian crisis can be easily observed. During this period the average credit spread widened for both countries, but substantially more so for Asian firms since the spread was up to 10 times higher than the corresponding US bond spread. 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. Likewise, although much smaller in scale, the US spread increased in the period 1999 until 2000 in the aftermath of the Russian default and the collapse of Long Term Capital Management in year 1998. The spread remained persistently above the pre-crunch/recession level until 2004 and there is a notable spike in 2002-2003, marking the burst of the dotcom bubble.

[7] Our sample includes both non-financial and financial firms. However, non-financial firms dominate in our dataset; for example, only 23% of the observations in the US sample correspond to financials, insurance, investment and real estate firms.

[8] We make comparison with the US because it has a deep, liquid bond market in a highly market-oriented financial system - therefore it is a benchmark in the sense that it has a well functioning bond market with (presumably) fair-priced premia for firms with given characteristics issuing corporate bonds.

[9] See Choi and Park (2002) for details on the approximation of a bond portfolio yield.

Figure 2 illustrates the variation in corporate spreads over time across firms in our sample, broken down by percentiles. The variation in the spreads in the US was similar irrespective of whether the firm was in the 70th, 50th or 30th percentile of the distribution with respect to the spreads. For Asian firms, the deviation was substantial, and firms in the 70th percentile of the distribution faced much higher spreads than those in the 50th or 30th percentiles. For the firms with median and lower tail there was little variation over time in the spreads, but for firms in the 70th percentile, spreads increased by up to 900 basis points during the crisis. This serves to illustrate the heterogeneity in the spreads.

The indicators of firms' balance sheets are a central issue in this study and therefore we consider a set of financial variables previously employed in empirical studies (see Tsuji (2005) and Cavallo and Valenzuela (2007)). We introduce leverage (LEV) defined as total debt over total assets, as a measure of firms' indebtness, since Vermeulen (2002) and Bougheas et al. (2006) argue that higher leverage implies a weaker the balance sheet. 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. Therefore we expect a negative relationship between this ratio and the external finance premium. Finally, in our study we seek to control for idiosyncratic probability of bankruptcy 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. Following Hale and Santos (2008), we calculate the Z-score as follows: $Z = \frac{1}{S_r}[\frac{1}{n}\sum_{j=1}^{n}\frac{2\tilde{\pi_j}}{A_j+A_{j-1}} + \frac{1}{n}\sum_{j=1}^{n}\frac{E_j+E_{j-1}}{A_j+A_{j-1}}]$, where A is the firm's assets, E is its equity, $\tilde{\pi}$ is its profits and S_r is the estimated standard deviation of r, the firms' return on assets.[10] The higher the Z-score the lower the firm's risk, so we expect this variable to have a negative effect on the bond spread. In addition to balance sheet indicators, 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. We expect a positive coefficient since yield spreads generally increase with maturity for investment grade bonds.

[Insert Table 1 here]

Table 1 provides summary statistics of the financial variables used in our study. As expected, we observe that US firms are less leveraged, more profitable, less risky and have substantially lower credit spreads compared to Asian firms. These preliminary statistics show that US firms have healthier balance sheets compared to Asian firms. However, given that our Asian sample is relatively small we provide further graphical analysis to ensure that it is representative across two dimensions. First, we

[10] Like Hale and Santos (2008) we set n=2 and lag the variables one year. The volatility of earnings growth S_r is computed using data for the five years preceding the sample, scaled by average assets for that period.

check whether our sample is an accurate reflection of the universe of companies in Asia as recorded in the Thomson Primark database. Second, we ensure that our sampled firms are representative of the firms that issue bonds in Asia as shown in Bondware and Bloomberg.

[Insert Figure 3 here]

Figure 3 contains three panels which correspond to our financial variables included in our regressions. We compare the average leverage, profitability and Z-score between our dataset to all listed firms as recorded in the Thomson Primark database, and all Asian firms with bond issues (both local and foreign currency). The three series in each panel are highly correlated and exhibit virtually identical business cycle dynamics. Clearly evident is a steep increase in leverage until 1997 and a corresponding drop in profits. The Z-score drops at the time of the crisis and trends upwards for all bond issuers thereafter. All in all, we conclude that our measures of financial strength and probability of default are representative of the the corresponding variables of the universe of listed companies in Asia as well as of the Asian bond issuers. We now turn to the question of how to classify financially constrained versus unconstrained firms and recessions/credit crunches.

3.2 *Classification Schemes*

A large literature has considered the impact of financial constraints on investment in fixed capital, inventory investment, employment and R&D activities (see Bond and Reenen (2006)). However, the nature of the results is somewhat dependent on the categorization process determining whether firms are financially "constrained" or "unconstrained" (see, e.g, Fazzari et al. (1988); Kaplan and Zingales (1997)). The scholarly literature has not settled on a particular strategy to identify financially "constrained" and "unconstrained" firms empirically, but the classification scheme can be critically important for the conclusions of these studies. Therefore, in this paper we use three different measures of financial constraints to ensure the robustness of our results, these are size, indebtness and creditworthiness.

Size was employed as a criterion by Bougheas et al. (2006) 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) as an indicator of the extent to which financial constraints drive differences in inventory

investment. We report results using all three classification schemes. We use a 30 percent cut-off point in keeping with the normal practice in the literature.[11] We also allow firms to transit between firm classes.[12]

3.3 *Recession and credit crunch*

We specify a time-period dummy variable to indicate that the firms faced recession, credit crunch or Asian crisis. Focusing on the US, the identification of downturns and out-of-downturns follows the Business Cycle Dating Committee of the National Bureau of Economic Research which determined that a trough in business activity occurred in the US economy in November 2001. The trough marked the end of the recession that began in March 2001 and the beginning of an expansion.[13] The credit crunch, when some firms were excluded from gaining access to credit lasted from 2001- 2002, and was closely associated with the recession (Kwan (2002)). During the years 2001-2002 bad debts increased on bank loans, commercial paper issuance fell and default rates in the US bond market associated with most rating categories were at post-war highs. Similarly, for the Asian economies we specify a crisis dummy to capture 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 crisis adversely influenced the ability of firms to access credit on international market.

3.4 *Panel estimation technology*

We employ panel data methods to test the hypothesis that firms with different characteristics face different external finance premia in the bond markets. Consider a standard static linear model of the following form:

$$y_{it} = X_{it}\beta + \lambda_t + \eta_i + \epsilon_{it} \tag{3.1}$$

where $i = 1,2,\ldots, N$ refers to a cross section of units (firms in this study), $t = 1,2,\ldots, T$ refers to time period, and denote respectively the dependent variable and the vector of non-stochastic explanatory variables for the firm i and year t. λ_t represents firm-invariant time-specific effects, η_i is the time invariant unobservable firm specific effects and ϵ_{it} are the disturbance terms that vary with time

[11] Campello and Chen (2005) rank the sampled firms into constrained and unconstrained using 30 percent and 70 percent cut-off points respectively from the Fama-French portfolios.

[12] For this reason, our empirical analysis will focus on firm-years rather than simply firms. See Kaplan and Zingales (1997) for a similar approach.

[13] For more details see the latest report of the Business Cycle Dating Committee of the National Bureau of Economic Research. July 17, 2003.

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. In the model in which we pool seven Asian economies, in addition to time and industry dummies we also include country dummies to control for any country-based institutional differences.

Equation (3.1) confronts us with some econometric issues regarding the most appropriate estimation method.[14] In the presence of the firm-specific effects η_i, ordinary least squares (OLS) estimation would produce biased results. If these firm-specific effects are uncorrelated with X_{it} then the random effects estimator is unbiased and efficient. If on the other hand, the firm-specific effects are correlated with X_{it} but remain strictly exogenous then the random effects estimator will be biased, but the within-groups estimator will be unbiased. Given that our sample is drawn from a large population it is more likely that firm-specific terms are distributed randomly across cross-section units, and therefore uncorrelated with X_{it} variables, thus we take a random effects approach to control for unobserved heterogeneity.[15] This choice is formally justified by using both the Hausman and Breusch Pagan Langrangian Multiplier tests. We report these tests at the foot of the tables of results. In all cases the Hausmann test does not reject the null of no correlation between the regressors and the individual effects, and the LM test rejects the null that the individual effect is zero[16].

4 Results

In this section we report estimates of the random effects model using interaction terms for the estimations to identify the asymmetric effects of the financial accelerator.[17] Unless otherwise specified the columns of each Table indicate the estimation results for different firm-years according to size (SIZE, column 1), level of indebtness (INDEBT, column 2) and creditworthiness (COV, column 3).

[14] We would like to thank Steve Bond for his comments on the econometric modeling strategy adopted in this paper.

[15] Note that the above assumption closely relates to our decision on whether the sample can be considered as part of a larger population since we consider only firms that issue bonds not the universe of US and Asian firms. All estimations were carried out in STATA 10.

[16] While our model is robust to firm-specific heterogeneity since we account for these factors explicitly in our model, we may still encounter endogenity bias. The usual solution to endogeneity bias would be a 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. Nevertheless, when we applied a *static* GMM procedure to the US sample we found that the results were very similar to the random effects estimates (results are available from the authors upon request). We conclude therefore that the extent of endogeneity is very limited in our US sample.

[17] Using interaction terms allows us to avoid problems of endogenous variable selection, to gain degrees of freedom, and to take into account that firms can transit between groups.

4.1 *External finance premium and firm-specific characteristics*

An important assumption of the financial accelerator theory is that borrowers' net worth (financial health) is inversely related to the external finance premium and that firms with weak balance sheets are likely to be more vulnerable to real or economic shocks. In this section we test whether an inverse relationship between balance sheet indicators and external finance premium holds for firms in the US and Asian bond market. Initially, we estimate the empirical model without distinguishing between constrained and unconstrained firms.

[Insert Table 2 here]

Table 2 reports the estimated coefficients on the explanatory variables, LEV, PROF, ZSCORE and MATDUM in the baseline model for the US and Asia in separate columns. The results show that firms with higher LEV will face a higher external finance premium compared to those with lower leverage because the coefficient on leverage is positive and significant. PROF has significant negative coefficients showing that the greater the profitability of the firms the lower the external premium. 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. Finally, the coefficients on the maturity dummy enter with the expected positive sign but they are insignificant for both countries. Overall, the results appear similar in terms of sign and statistical significance for both panels but their magnitudes reveal considerable differences. Taking the results for LEV as a case in point, the estimate for LEV in the US sample (0.012) indicates that the elasticity of credit spread with respect to leverage, evaluated at sample means, is 0.306, so that a 10% increase in leverage implies a 3.06% increase in credit spread. Looking at the coefficient on LEV for the Asian sample (0.170), this shows that the elasticity of credit spread with respect to leverage, evaluated at sample means, is 1.057. A 10% increase in leverage leads therefore to a 10.57% increase in credit spread. In other words, leverage appears to be economically more significant in Asia and a similar increase results in ten times increase in the spread. Similar differences in magnitudes are observed between the US and Asian firms for the remaining financial variables. We conclude therefore that firms' financial health is important for the external finance premium for both countries but with much higher magnitudes for the Asian sample. The estimated coefficients on the balance sheet variables measure the average effect over all sectors, all size classes and all years with the correct sign as predicted by the financial accelerator theory, and suggest that balance sheet characteristics and the risk of bankruptcy are highly significant determinants of the bond market external finance premium. This confirms that there is an inverse correlation between the external finance premium in the bond market and the firm's financial health as predicted by the economic model under asymmetric information.

4.2 *The financial accelerator and financial constraints*

We now consider the impact of financial constraints on the response to balance sheet characteristics in Table 3. We use three different categorization methods for determining whether a firm is constrained (Cons) or unconstrained (1-Cons) based on size, degree of indebtness and creditworthiness. Once again, our results are reported separately for the US and Asian firms in Columns 1-3 and 4-6 respectively. Our results are remarkably consistent across these categories and document an 'excess sensitivity' of financial variables for constrained Asian firms but not for their US counterparts. We report formal tests of equality of coefficients at the foot of the Table. The upshot is that for firms with similar characteristics the premium is higher in Asia compared to the US.

[Insert Table 3 here]

For the US, in Columns 1-3, we observe that LEV has estimated coefficients that are positive and significant for constrained firms, but the coefficients are not significantly different from each other. We conclude that the external finance premium in the US bond market rises for constrained and unconstrained firms with higher leverage. However, a completely different picture emerges for the Asian model. Leverage is highly significant only for firms which face binding financing constraints, while it is insignificant for unconstrained firms. Consider the comparison of Columns 1 and 3: the point estimates suggest that leverage has a weaker effect on US firms' external finance premium since the elasticity of spread with respect to leverage is 0.09 for US firms, compared to 0.77 for the Asian sample. This result implies that leverage is more acute for constrained Asian firms lending support to the financing constraints story when we use SIZE to determine constraints, but similar elasticities emerge for using INDEBT and COV as classification schemes.

Profitability measure, PROF, has a negative coefficient as predicted by the financial accelerator theory for all types of firms in the US and Asia. The coefficients are not statistically different from each other when we compare constrained and unconstrained firms in the US. For the Asian sample of firms we find significant differences between constrained and unconstrained firms because the negative coefficients are highly significant for constrained firms but insignificant for their unconstrained counterparts. Once again, formal tests reveal that the coefficients are always significantly different from each other. Looking at Columns 1 and 3, the elasticities evaluated at sample means suggest that a 10% rise in profit is associated with a 0.58% fall in credit spread for constrained US firm-years, and a 2.40% fall for their Asian counterparts. We interpret this finding as a further support for the excess sensitivity story.

The risk of default, as measured by the Z-SCORE, is found to be significant for both types of firms but is not statistically different between constrained and unconstrained firms in the US. The same is true for the Asian sample where Z-SCORE is always negative and significant for both constrained

and unconstrained firms. The coefficients indicate that a 10% rise in Z-score leads to a 0.88% fall in external premium for constrained US firm-years, and to a 5.69% fall for constrained Asian firm-years.

Our results show that it is the constrained firms, by any definition we used, that show greater sensitivity to firm characteristics when comparing US and Asian firms. Fazzari et al. (1988), Gertler and Gilchrist (1994), Kaplan and Zingales (1997) and Bougheas et al. (2006) found that the external premium for bank loans moves countercyclically with balance sheet characteristics, and is more sensitive for firms that are financially constrained. We find similar results for the external premium on corporate bonds: the premium is more sensitive to balance sheet characteristics for constrained firms but this is dependent on the financial system under scrutiny. This is a new result that complements the earlier work.

Two main implications can be highlighted from our results. First, balance sheet indicators appear to be very important in determining the credit spread both in the US and in Asia but they play a more prominent role in the latter market. Second, the impact of firm-specific characteristics on the external premium for corporate bonds differs for constrained and unconstrained firms when we consider the Asian sample, but not for the US sample. These results confirm that the balance sheet channel is operative through the bond market, supporting earlier evidence from the US and Europe in de Bondt (2004), Levin et al. (2004) and Campello and Chen (2005), but there is further evidence on the implications of the bond market underdevelopment in Asia. For example, Eichengreen and Luengnaruemitchai (2004), Eichengreen et al. (2006) and Borensztein et al. (2008) suggest that in East Asia the process of bond market development remains slow despite their attempts to harmonize the regulations and create an integrated regional bond market.[18] In this paper, we document that capital market imperfections play a more important role in the Asian bond finance, in contrast to the US bond market, where there is not evidence of a significantly different response to balance sheet characteristics for financially constrained firms. We argue that the greater sensitivity results from the greater information asymmetries in Asia between firms and the "arms-length" potential buyers of bonds, and this results to some degree from the smaller and less efficient operation of the bond market in the Asian region.[19] We suggest therefore that the underdevelopment in the Asian markets magnifies the impact of financial factors.

[18]It is a reasonable hypothesis to suggest that bond market development even if it is largely confined to the public sector debt market could be a spur to corporate bond issues. Lejot et al. (2008) make similar arguments.

[19] 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.

4.3 *Responses to the recession, credit crunch and Asian crisis*

To explore the response to firm-specific characteristics when the firms faced a recession/credit crunch we interact the explanatory variables with a recession/credit crunch dummy, D. Previous evidence suggests that there is significant difference in the response of real variables in periods of recession versus non-recession (c.f. Gertler and Gilchrist (1994), Vermeulen (2002) and Mody and Taylor (2004)). There is anecdotal evidence in Kwan (2002) that the credit crunch of 2001-2002 also influenced access to commercial paper and bank finance for US firms. As far as we are aware a comparison of the recession/credit crunch and the Asian crisis has not been explored for bond finance, and this section addresses this issue by examining the sensitivity of the external premium to balance sheet variables in the 2001-02 recession/credit crunch episode versus other times for the US firms, and for the 1997-98 crisis for the Asian firms. Table 4 reports coefficients on variables interacted with the dummy variable D (recession/credit crunch) and interacted with 1-D (out of recession/credit crunch) for constrained and unconstrained firms.

[Insert Table 4 here]

Our results in Table 4 give a clear indication that there is a significantly different response in recessions/credit crunches with respect to financial variables in Asia but not in the US. Taking the US bond market, when the recession/credit crunch dummy (D) is interacted with constrained (Cons) and unconstrained (1-Cons) firms we are unable to observe any significant difference between coefficients during recessions and out of recessions periods. On the other hand, when we look at the Asian case, we find that there is greater sensitivity to LEV, PROF and ZSCORE for constrained firms during the Asian crisis but insignificant results for other periods (i.e rows where the D*(Cons) interaction is explored). In addition, our results show that where there is a significant difference in the response for constrained versus unconstrained firms for Asian firms the external finance premium is more sensitive to LEV, PROF and ZSCORE for constrained firms in the recession/credit crunch confirming earlier results in Table 3. We conclude that the 1997-98 crisis had a considerable impact through the balance sheet on external finance premia in the Asian bond market, and could have operated alongside other channels to influence real variables.

5 Robustness

We have subjected our model to some degree of robustness testing already by using three different measures of financial constraint, which results in findings that are very similar for all three measures. In this section we provide a robustness analysis of our results by considering the potential selection bias problem.

5.1 *Panel Attrition and Selectivity Bias*

One feature of our data that could influence biases and inconsistencies in the regression estimates is its unbalanced structure since the number of observations on each firm varies between three and eleven. In this paper we perform an Added-Variable procedure (or Quasi-Hausman test) as suggested by Verbeek and Nijman (1992) by constructing an artificial variable that tests for attrition bias. The results for the balance sheet indicators and credit spread are shown in Table 5.

[Insert Table 5 here]

We re-estimate Table 3 with the random effects method including the artificial variable, Attrition, which takes a value of unity if the firm is observed for the full sample, and zero otherwise.[20] Under the null-hypothesis of non-selective response in our panel structure, the estimated coefficient for the Attrition is statistically insignificant and thus the estimated model is appropriate. Under the alternative hypothesis of sample selectivity, however, the coefficient is non-zero and static panel data models yield biased and inconsistent estimation results. The estimated coefficient of the attrition variable is negative but statistically insignificant in all the specifications (both the US and Asian) suggesting that our findings are not affected by biases resulting from endogenous panel data attrition. Additionally, the coefficients on the other variables are similar to those obtained in Table 3. We therefore conclude that this exercise confirms that sample selection is unlikely to introduce strong biases in our estimated coefficients.

6 Conclusion

Firms in Asian countries have been very reliant on external finance form foreign countries, but following the Asian crisis in 1997, steps were taken to develop financial markets in the region. The ABF is one such initiative that has been taken, although its effects as yet are small according to McCauley and Remolona (2004); Eichengreen and Luengnaruemitchai (2004) and Eichengreen et al. (2006).

Unlike previous papers we take an economic approach to the bond spread (or external finance premium) that reflects information asymmetry problems following Bernanke et al. (1999). The vast majority of empirical studies on the external finance premium have focused on the margin between internal finance and bank borrowing or equities and relatively little attention has been given to corporate bonds. Even fewer papers have considered the differences between emerging market and developed country bond market premia. Our results based on firm-level data for the US and Asian bond markets

[20] We define an indicator variable $response_{it}$ such as $response_{it} = 1$ if (y_{it}, x_{it}) is observed and 0 otherwise. Next, we construct the attrition variable as $attrition_i = \sum_{t=1}^{T} response_{it}$, indicating the total number of periods the ith individual is observed, and include $attrition_i$ as additional regressor in our random effects model.

during the period 1995-2005 suggest that firms with better financial health, as measured by balance sheet indicators, 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 have higher premia than unconstrained firms in the Asian market, but similarly defined firms in the US show no significant differences. This implies that the premium on bond finance is higher in Asian markets for these types of firms, reflecting the higher risk characteristics associated with firms that are financially constrained and subject to grater information asymmetries. When we compare the effects of the recession/credit crunch episode in 2001-02 for the US firms and the Asian crisis in the 1997-98 for Asian firms, we find that the sensitivity of the premium is greater for constrained firms during the Asian crisis compared to other times, but there is no difference in the sensitivity of the premium for US firms in the recession/credit crunch.

These results provide new evidence that firm-level heterogeneity, financing constraints and capital shortages raise the external finance premium in the Asian bond markets compared to the US due to the effects of greater information asymmetry in the Asian region.

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TABLE 1
SUMMARY STATISTICS

Variable	Mean	St.Dev.	N
US			
$SPREAD_{it}$	1.21	1.89	2794
LEV_{it}	28.94	17.38	6693
$PROF_{it}$	8.46	7.12	6587
$ZSCORE_{it}$	3.97	2.00	5358
ASIA			
$SPREAD_{it}$	4.42	13.58	299
LEV_{it}	32.77	23.79	773
$PROF_{it}$	5.33	11.03	773
$ZSCORE_{it}$	1.83	2.09	616

Notes: The subscript i indexes firms, and the subscript t, time, where t = 1995-2005. $SPREAD_{it}$: The difference between corporate bond yields and government bond yields of the same maturity. LEV_{it}: Total debt to total assets. $PROF_{it}$: Earnings before interest and taxes relative to total assets. $ZSCORE_{it}$: An indicator of bankruptcy risk. See page 8 for the definition of *ZSCORE* we use.

TABLE 2
EXTERNAL FINANCE PREMIUM
AND FIRM CHARACTERISTICS

	US	Asia
LEV_{it}	0.012***	0.170**
	(2.80)	(2.31)
$PROF_{it}$	-0.030***	-0.359*
	(-4.16)	(-1.67)
$ZSCORE_{it}$	-0.122***	-3.593**
	(-2.83)	(-2.07)
$MATDUM$	0.043	0.404
	(0.21)	(0.13)
Constant	1.363***	16.336
	(3.17)	(1.13)
R^2	0.17	0.27
Hausman	5.62	11.02
LM	725.99***	170.40***
Time Dummies	Yes	Yes
Industry Dummies	Yes	Yes
Country Dummies	No	Yes

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 z-statistics are reported in the round brackets. The standard errors are corrected for clustering. MATDUM is a dummy which takes the value one if the maturity of the bond is over 6 years, and equal to zero otherwise. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. The Langrangian Multiplier Test (LM test) is distributed as chi-squared and the null is that the individual effect is zero. Numbers of firms and of observations are 635 and 2657, respectively in the US. Numbers of firms and of observations are 81 and 255, respectively in the Asian sample. Also see notes to Table 1. *significant at 10 %; ** significant at 5 %; *** significant at 1 %.

TABLE 3
FINANCIAL ACCELERATOR
AND FINANCIAL CONSTRAINTS

	US			ASIA		
	SIZE	INDEBT	COV	SIZE	INDEBT	COV
	(1)	(2)	(3)	(4)	(5)	(6)
$LEV_{it} * Cons$	0.016***	0.007**	0.008*	0.370***	0.191***	0.500***
	(2.77)	(2.09)	(1.69)	(3.65)	(2.63)	(3.82)
$LEV_{it} * (1 - Cons)$	0.010**	0.007	0.004	0.106	0.006	0.095
	(2.41)	(0.98)	(1.49)	(1.50)	(0.014)	(1.59)
$PROF_{it} * Cons$	-0.036**	-0.025***	-0.031**	-0.850***	-0.521***	-2.676***
	(-2.35)	(-3.48)	(-2.19)	(-3.63)	(-3.25)	(-4.12)
$PROF_{it} * (1 - Cons)$	-0.029***	-0.016	-0.006	-0.108	0.001	0.039
	(-4.19)	(-1.64)	(-0.83)	(-0.65)	(0.0052)	(0.28)
$ZSCORE_{it} * Cons$	-0.119**	-0.024	0.007	-4.604***	-3.861***	-3.732**
	(-2.24)	(-0.77)	(0.17)	(-3.03)	(-3.21)	(-2.17)
$ZSCORE_{it} * (1 - Cons)$	-0.137***	-0.030	-0.049*	-2.407*	-2.861	-2.166**
	(-3.18)	(-0.82)	(-1.68)	(-1.86)	(-1.41)	(-1.98)
$MATDUM$	0.053	0.086	0.074	0.831	0.204	1.481
	(0.26)	(0.40)	(0.34)	(0.27)	(0.064)	(0.59)
$Constant$	1.523***	1.066***	1.021***	26.144	19.548	0.525
	(3.59)	(2.97)	(2.85)	(1.36)	(1.15)	(0.035)
R^2	0.16	0.15	0.15	0.29	0.28	0.28
$Hausman$	9.74	19.98	9.98	12.12	27.81	14.76
LM	678.66***	686.23***	672.94***	195.14***	160.26***	156.02***
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	Yes	Yes	Yes
Test of equality (p-value): LEV	0.12	0.98	0.38	0.00	0.65	0.00
Test of equality (p-value): PROF	0.66	0.44	0.11	0.00	0.06	0.00
Test of equality (p-value): ZSCORE	0.67	0.87	0.14	0.16	0.60	0.40

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, HIGHLY INDEBTED, and RISKY firms. Robust z-statistics are reported in the round brackets. The standard errors are corrected for clustering. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. The Langrangian Multiplier Test (LM test) is distributed as chi-squared and the null is that the individual effect is zero. Numbers of firms and of observations are 635 and 2657, respectively in the US. Numbers of firms and of observations are 81 and 255, respectively in the Asian sample. Also see notes to Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 4
Responses to the Recession/Crunch and Asian crisis

	US			ASIA		
	SIZE	INDEBT	COV	SIZE	INDEBT	COV
	(1)	(2)	(3)	(4)	(5)	(6)
$LEV_{it} * Cons * D$	0.019**	0.008	0.005	0.574***	0.243*	0.554*
	(2.13)	(1.50)	(0.76)	(3.15)	(1.85)	(1.88)
$LEV_{it} * Cons * (1 - D)$	0.015***	0.008**	0.011*	0.098	0.011	0.350**
	(2.63)	(2.03) (	1.80)	(0.87)	(0.12)	(2.42)
$LEV_{it} * (1 - Cons) * D$	0.008*	0.009	0.007	0.137	0.549	0.127
	(1.70)	(1.07)	(1.64)	(1.27)	(0.47)	(1.23)
$LEV_{it} * (1 - Cons) * (1 - D)$	0.011***	0.005	0.003	0.042	-0.284	0.049
	(2.61)	(0.62)	(0.90)	(0.49)	(-0.81)	(0.66)
$PROF_{it} * Cons * D$	-0.070**	-0.030**	-0.030	-2.479***	-1.762***	-3.575***
	(-2.03)	(-2.39)	(-1.35)	(-4.54)	(-4.63)	(-3.17)
$PROF_{it} * Cons * (1 - D)$	-0.018*	-0.021***	-0.034*	-0.044	-0.213	-0.814
	(-1.65)	(-3.21)	(-1.91)	(-0.17)	(-1.19)	(-0.76)
$PROF_{it} * (1 - Cons) * D$	-0.028***	-0.017	-0.009	-0.378	1.034	-0.255
	(-3.21)	(-1.35)	(-0.97)	(-0.76)	(0.20)	(-0.50)
$PROF_{it} * (1 - Cons) * (1 - D)$	-0.031***	-0.014	-0.003	-0.065	0.023	0.077
	(-3.71)	(-1.27)	(-0.49)	(-0.39)	(0.10)	(0.54)
$ZSCORE_{it} * Cons * D$	-0.046	0.006	0.064	-10.890***	-8.113***	-13.077***
	(-0.58)	(0.14)	(1.12)	(-3.18)	(-3.72)	(-3.47)
$ZSCORE_{it} * Cons * (1 - D)$	-0.159***	-0.043	-0.031	-3.608**	-3.921***	-2.205
	(-3.09)	(-1.50)	(-0.63)	(-2.40)	(-3.23)	(-1.17)
$ZSCORE_{it} * (1 - Cons) * D$	-0.139***	-0.011	-0.030	-5.446**	-14.700	-4.944**
	(-2.85)	(-0.24)	(-0.74)	(-2.25)	(-0.22)	(-2.18)
$ZSCORE_{it} * (1 - Cons) * (1 - D)$	-0.136***	-0.040	-0.059**	-2.645**	-2.802	-2.479**
	(-3.17)	(-0.93)	(-2.00)	(-2.09)	(-1.55)	(-2.19)
$MATDUM$	0.052	0.084	0.070	2.160	2.052	1.624
	(0.25)	(0.39)	(0.33)	(0.72)	(0.65)	(0.60)
$Constant$	1.438***	1.038***	1.076***	27.332*	33.936**	13.195
	(3.31)	(2.78)	(3.00)	(1.81)	(2.02)	(0.87)
R^2	0.17	0.15	0.15	0.33	0.33	0.40
$Hausman$	21.64	50.84*	30.98	5.16	5.42	10.07
LM	1304.67***	1243.75***	1276.61***	221.75***	179.55***	113.43***
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	No	No	No	Yes	Yes	Yes
Test of equality (p-value): LEV*Cons	0.35	0.96	0.20	0.01	0.01	0.53
Test of equality (p-value): LEV*1-Cons	0.28	0.63	0.27	0.47	0.46	0.52
Test of equality (p-value): PROF*Cons	0.00	0.49	0.79	0.00	0.00	0.06
Test of equality (p-value): PROF*1-Cons	0.69	0.77	0.60	0.53	0.52	0.52
Test of equality (p-value): ZSCORE*Cons	0.00	0.21	0.03	0.03	0.03	0.00
Test of equality (p-value): ZSCORE*1-Cons	0.90	0.59	0.37	0.22	0.23	0.23

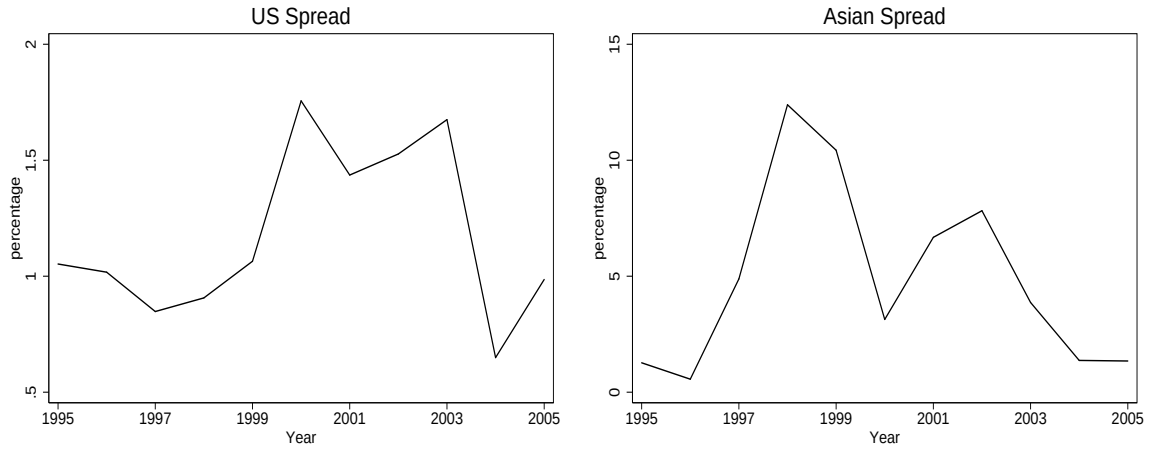
Notes: The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity. D is a dummy variable, which takes value 1 for the recession/credit crunch period, and 0 otherwise. The dummy variable CONS indicates in turn SMALL, HIGHLY INDEBTED, and RISKY firms. Robust z-statistics are reported in the round brackets. The standard errors are corrected for clustering. The Hausman Test is distributed as a chi-squared distribution under the null of no correlation between the regressors and the individual effects. The Langrangian Multiplier Test (LM test) is distributed as chi-squared and the null is that the individual effect is zero. Numbers of firms and of observations are 635 and 2657, respectively in the US. Numbers of firms and of observations are 81 and 255, respectively in the Asian sample. Also see notes to Table 1. * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5
Selectivity Bias test

	US			ASIA		
	SIZE	INDEBT	COV	SIZE	INDEBT	COV
	(1)	(2)	(3)	(4)	(5)	(6)
$LEV_{it} * Cons$	0.017***	0.007**	0.008*	0.354***	0.184**	0.514***
	(2.84)	(2.09)	(1.64)	(3.45)	(2.46)	(3.88)
$LEV_{it} * (1 - Cons)$	0.010**	0.007	0.004	0.087	-0.003	0.105*
	(2.44)	(1.14)	(1.52)	(1.20)	(-0.0071)	(1.72)
$PROF_{it} * Cons$	-0.036**	-0.025***	-0.030**	-0.872***	-0.514***	-2.770***
	(-2.35)	(-3.53)	(-2.32)	(-3.71)	(-3.18)	(-4.21)
$PROF_{it} * (1 - Cons)$	-0.029***	-0.016*	-0.006	-0.083	-0.001	0.042
	(-4.16)	(-1.81)	(-0.78)	(-0.49)	(-0.0051)	(0.30)
$ZSCORE_{it} * Cons$	-0.126**	-0.025	0.006	-4.649***	-3.905***	-3.908**
	(-2.44)	(-0.82)	(0.13)	(-3.05)	(-3.23)	(-2.27)
$ZSCORE_{it} * (1 - Cons)$	-0.142***	-0.032	-0.051*	-2.426*	-2.866	-2.147*
	(-3.37)	(-0.86)	(-1.72)	(-1.88)	(-1.42)	(-1.96)
$MATDUM$	0.061	0.092	0.080	0.890	0.224	1.552
	(0.30)	(0.48)	(0.42)	(0.29)	(0.070)	(0.62)
Attrition	-0.456	-0.279	-0.285	-5.605	-2.110	-3.510
	(-1.13)	(-0.68)	(-0.69)	(-1.13)	(-0.41)	(-0.87)
$Constant$	1.501***	1.048***	1.002***	27.017	32.324*	0.106
	(3.53)	(3.32)	(3.19)	(1.41)	(1.91)	(0.071)
R^2	0.15	0.16	0.15	0.29	0.30	0.48

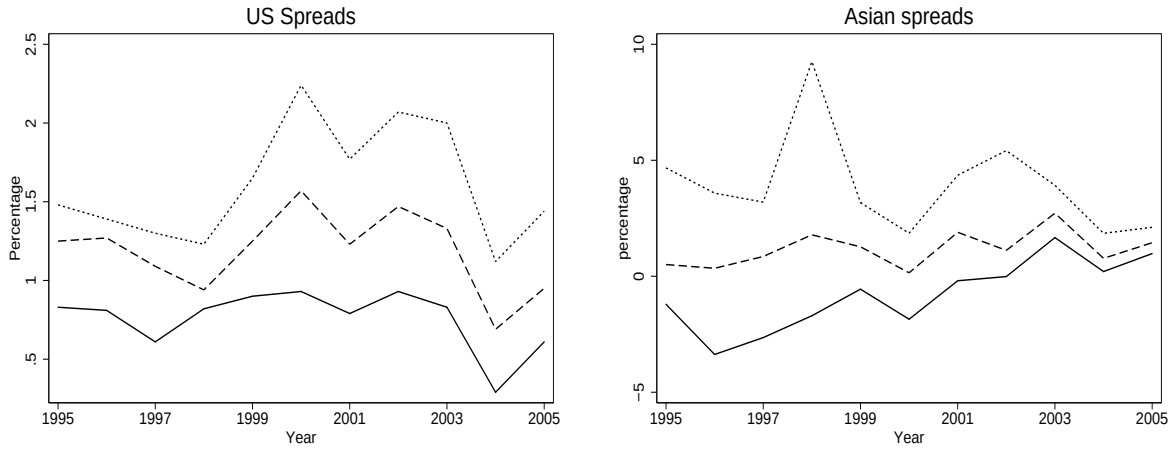
Notes: The dependent variable is the credit spread, as defined by the difference between corporate bond yields and government bond yields of the same maturity. *Attrition* is a binary artificial variable taking the value one if the individual is observed over the entire period (balanced sample) and zero otherwise. Statistically insignificant coefficients suggest that the model is not affected by attrition bias. Numbers of firms and of observations are 635 and 2657, respectively in the US. Numbers of firms and of observations are 81 and 255, respectively in the Asian sample. *significant at 10%; ** significant at 5%; *** significant at 1%.

Figure 1: The average spread



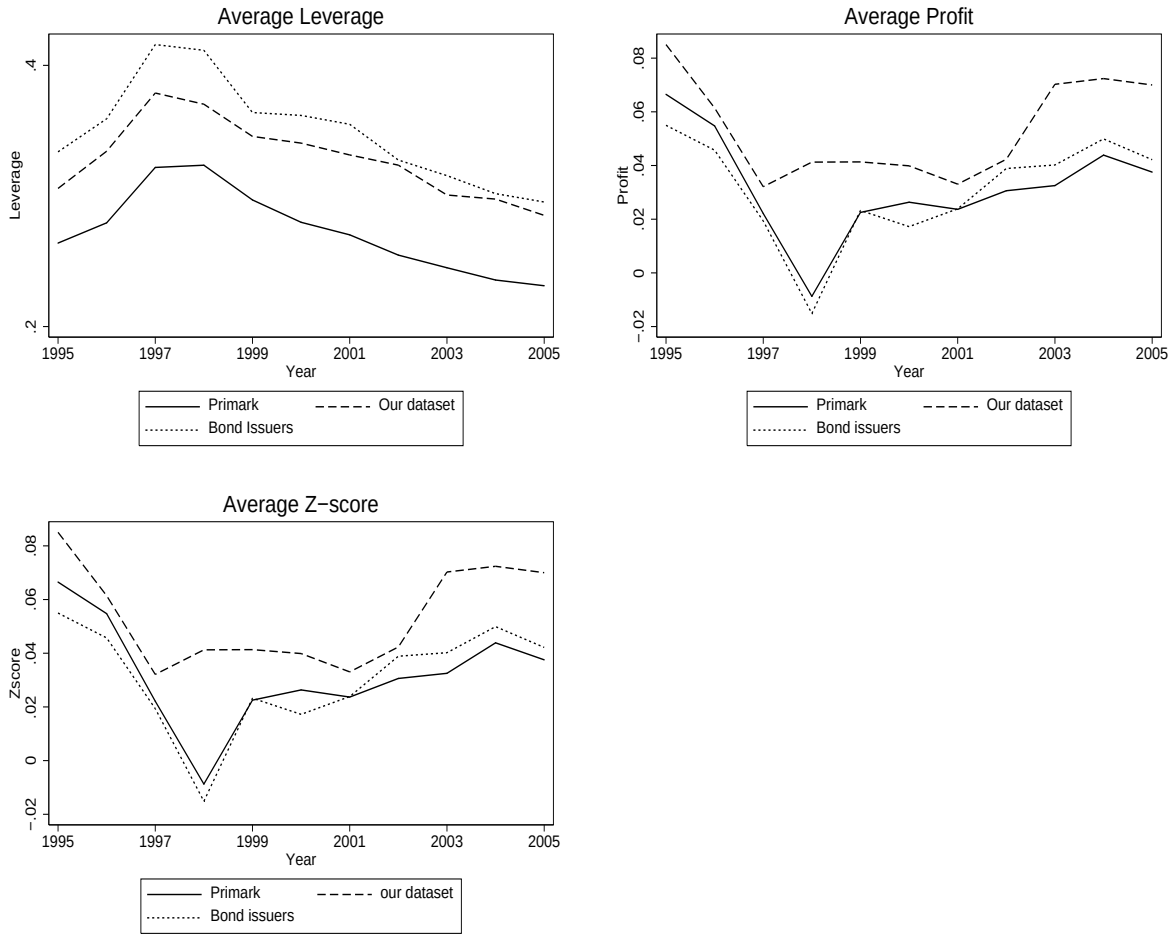
Notes: The credit spread is the difference between corporate bond yields and government bond yields of the same maturity.

Figure 2: Percentiles of distribution of spreads



Notes: Percentiles from top to bottom are 70th, 50th, 30th. The the upper tail of the distribution refers to higher spreads.

Figure 3: Aggregate Corporate Balance Sheets



Working Paper List 2005

Number	Author	Title
05/02	Simona Mateut and Alessandra Guariglia	Credit channel, trade credit channel, and inventory investment: evidence from a panel of UK firms
05/01	Simona Mateut, Spiros Bougheas and Paul Mizen	Trade Credit, Bank Lending and Monetary Policy Transmission