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Exchange Rate Risk Management

Evidence from East Asia

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In a large sample of East Asian nonfinancial corporations, firms using foreign currency derivatives had distinctive characteristics, such as larger size and foreign debt exposures. Unlike in studies of U.S. firms, there was only weak evidence that liquidity-constrained firms with greater growth opportunities hedged more. Firms appeared to use foreign earnings as a substitute for hedging with derivatives, and to engage in "selective" hedging. There was no evidence that East Asian firms eliminated their foreign exchange exposure by using derivatives. And firms using derivatives before the crisis performed just as poorly as nonhedgers during the crisis.

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Summary findings

The recent East Asian financial crisis provides a natural experiment for investigating foreign exchange risk management by nonfinancial corporations. During this period, the financial crisis exposed local firms to large depreciations in exchange rates and reduced access to foreign capital.

Allayannis, Brown, and Klapper explore the exchange rate hedging practices of firms that hedged exposure to foreign debt in eight East Asian countries between 1996 and 1998.

They identify and characterize East Asian companies that used foreign currency derivatives, documenting differences in size, financial characteristics, and exposure to domestic and foreign debt.

They investigate the factors important in the use of foreign currency derivatives. Unlike studies of U.S. firms, they find limited support for existing theories of optimal hedging. Instead, they find that firms use foreign earnings as a substitute for hedging with derivatives. And they find evidence that firms engage in "selective" hedging.

They investigate the relative performance of hedgers during and after the crisis. They find no evidence that East Asian firms eliminated their foreign exchange exposure by using derivatives. Firms that used derivatives before the crisis performed just as poorly as nonhedgers during the crisis. After the crisis, firms that hedged performed somewhat better than nonhedgers, but this result appears to be explained by a larger post-crisis currency exposure for hedgers (an exchange rate risk premium), which had limited access to derivatives during this period.

This paper—a product of Finance, Development Research Group—is part of a larger effort in the group to study corporate finance and risk management. Copies of the paper are available free from the World Bank, 1818 H Street NW, Washington, DC 20433. Please contact Agnes Yaptenco, room MC3-446, telephone 202-473-1823, fax 202-522-1155, email address ayaptenco@worldbank.org. Policy Research Working Papers are also posted on the Web at http://econ.worldbank.org. The authors may be contacted at allayannisy@darden.virginia.edu, gregwbrown@unc.edu, or lklapper@worldbank.org. May 2001. (44 pages)

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1 Introduction

The 1997 East Asian (EA) financial crisis is a type of event that a financial risk management program is designed to protect against. For example, financial theory suggests that hedging exchange rate risk with financial derivative contracts such as forwards, swaps, and options can increase firm value by reducing the chance of financial distress. Prior to the EA crisis, many large firms in the region used foreign currency derivative contracts as protection against a depreciation of domestic currency. In this analysis we explore the efficacy of foreign exchange risk management during and following the currency crisis. Specifically, we examine the exchange rate hedging practices of a sample of EA non-financial corporations and investigate the effect of risk management on firm performance.

In the Modigliani and Miller (1958) paradigm, the financial risk management of a firm is irrelevant to shareholders that have access to the same risk management tools as corporate managers. However, more recent theories suggest that hedging could be a value-increasing strategy for many firms. In particular, the likelihood of incurring deadweight costs associated with financial distress or accessing external capital markets can be minimized by following certain financial risk management strategies (see, among others, Smith and Stulz (1984), Shapiro and Titman (1985), and Froot, et al. (1993)). Previous empirical research has also sought to identify which hedging theories best describe a firm's choice to use derivatives. Géczy, et al. (1997) examine currency hedging activities of large US-based corporations and find that the use of currency derivatives is positively related to growth opportunities, consistent with the Froot, et al. (1993) theory of hedging.

Our paper extends this literature by looking at a cross-section of firms during a turbulent period when risk management should be very valuable. For example, we examine whether EA hedging policies are consistent with the findings for US firms or if other factors motivate hedging behavior in these less developed economies. Our sample consists of 327 of the largest non-financial firms in eight East Asian countries. We study the risk management practices of these companies during a three-year period (1996-1998) surrounding the 1997 currency crisis.[1]

Several facets of the EA financial crisis provide for a unique natural experiment.[2] First, the extreme depreciation of many regional currencies and the ensuing economic fallout are examples of the types of risk that might challenge the effectiveness of a risk management

[1] In the paper we often use 'hedging' and 'the use of derivatives' interchangeably. However, we do not assume that the use of derivatives is necessarily equivalent to hedging, but instead, we provide tests to examine whether derivatives are used as a hedging tool. We also explicitly consider alternative risk management tools besides derivatives.

program. Second, the crisis provides a brief but extreme event followed by a recovery where markets settle to a new equilibrium. This allows for the examination of firms' hedging practices and performance pre-crisis, intra-crisis, and post-crisis. Third, because the economies and exchange rates in the region were affected differently by the crisis, our analysis can investigate differences in institutional factors and exchange rate movements across countries. Finally, many firms in emerging EA countries have large foreign currency exposures and growth potential and are liquidity constrained, making them good candidates for the type of firms that theory suggests will benefit most from financial risk management.

One interesting facet of our study is the form of the foreign exchange exposure of the typical firm in our sample. As has been documented by other studies (see Harvey and Roper (1999) for a summary), unusually large amounts of foreign debt contributed significantly to the poor financial performance of EA firms during the Asian crisis.[3] This is counter to the common use of foreign debt by US corporations as a hedge for foreign exchange exposure arising from foreign sales or procurement costs (see, e.g., Allayannis and Ofek (1999)). For example, the average firm in our sample has a much smaller percentage of foreign sales (19.8% of sales) compared to foreign debt (50.3% of sales). In contrast, for US firms, Géczy et al. (1997) find that foreign debt represents a mere 2.3% of total assets in a sample of Fortune 500 firms.

In general, foreign debt was perceived as substantially less costly than local debt in East Asia because of differences in interest rates. For example, treasury manager T. Duongporn of Thailand's CP Intertrade stated in early 1993,

> "The financial markets in Thailand are in the process of changing. There are more financial products in the market. People are borrowing more in US Dollars and other currencies...In our case, we borrow in US Dollars, Yen and Deutschmarks... The [cost of borrowing] Baht is so high that most of us are borrowing in other currencies, and once you do that you have currency risk."
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> --Euromoney Treasury Management, Nov. 5, 1993

In fact, some studies (see, e.g., Kregel (1998) and Pomerleano (1998)) have attributed the Asian crisis in part to the increase in foreign debt, which was encouraged by the central banks' policies

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[2] Since most of the regions' currencies were at least loosely pegged to the US dollar prior to the crisis, it is likely that risk management programs were designed to protect against a currency devaluation and not small exchange rate movements.

[3] Harvey and Roper (1999) suggest that "corporate managers levered up their investment in a period of declining performance in an attempt to 'bet' on the long-run performance of their firms and increased the stake by using foreign currency denominated debt; hence, to the extent that foreign debt is left unhedged, the bet also involves the direction of the country's exchange rate."

of pegging the currencies to the US dollar. Foreign debt was often short-term and was sometimes used for imprudent ventures (Berkeley APEC Study Center, 1998).

Since our sample firms report the use of currency derivatives conditional on their use of foreign debt, we first examine the factors that determine the use of foreign debt. We find a strong positive relationship between foreign debt usage and committed capital expenditures thus reinforcing the notion that firms are using foreign debt as a source of funding. We also find that firms' use of foreign debt is positively related to the percent of foreign cash, suggesting that firms are better able to use foreign debt if they have some reserves in foreign currency. Most importantly, CP Intertrade's story illustrated above is also confirmed in our data: East Asian firms are more likely to borrow abroad when the interest rate differential between the local rate and LIBOR is high.[4]

Next, we examine the extent of foreign debt hedged with foreign currency derivatives (controlling for the estimated probability that a firm uses foreign debt) and find strong evidence that firms use foreign earnings before interest and taxes (EBIT) as a substitute for hedging with derivatives.[5] Contrary to theory and evidence in the US, a strong positive association exists between the extent of currency derivatives use and profit margin. A probable explanation for this result is that more profitable companies with better credit have easier access to derivative markets. Also in contrast to findings from US firms, we find only limited evidence supporting the Froot, et al. (1993) theory of hedging, that firms with low liquidity but high investment opportunities are more likely to hedge. In addition, we find no evidence that size or institutional ownership have any impact on firms' decision to use derivatives. However, we find significant evidence at the country level that EA firms engage in "selective" hedging (see Stulz (1996) for a discussion of selective hedging). Specifically, most firms hedge only a fraction of their foreign debt with derivatives and tend to hedge less if the interest-rate differential between the local rate and LIBOR is high.

Whereas previous research has examined the factors that influence a firm's decision to use derivatives within an industry or across industries within one country, ours is the first study to examine the decision of firms to use derivatives across several countries.[6] This is interesting, as it can potentially uncover alternative, country-specific institutional factors, not previously explored. Specifically, our data spans eight East Asian countries – Hong Kong and China, Indonesia, Malaysia, Philippines, Singapore, Taiwan, and Thailand – which differ in their institutional

[4] Kim and Stulz (1988) suggest that firms may be able to exploit temporary finance opportunities and issue bonds in the market where interest costs are lowest.

[5] For a discussion of alternative risk management practices see, Géczy, Minton, and Schrand (2000).

frameworks and stage of economic and financial development. This allows us to differentiate between firm, industry, and country characteristics that influence a firm's decision to use derivatives to protect against currency exposure.[7] A surprising result from this analysis is that, despite wide variation in derivative usage rates and market liquidity across countries, much of the variation is explained by firm-specific variables. We have examined many country and currency specific factors (such as creditor rights, legal origin, derivative market size and depth, etc.) and find that, with the exception of the interest rate differential, these variables do not (marginally) explain differences in hedging behavior. The only exception is Philippine firms, which tend to hedge significantly less than similar firms in the region, possibly due to lower liquidity in the Peso derivatives market.

A primary focus of our analysis is the examination of hedgers' performance during and after the Asian crisis. Our data on the hedging practices of EA firms amidst the crisis allows us to examine the usefulness of derivatives for managing risk during a major financial shock. Specifically, we use measures of financial performance, equity returns, and exchange rate sensitivity to directly test for the effectiveness of currency derivative use in insulating firms from the unanticipated currency fluctuations during and after 1997.

First, we examine the differences in stock market performance and equity risk factors. In univariate tests, we find no significant difference between the stock performance of hedgers and nonhedgers during the crisis. After the crisis, hedgers perform somewhat better than nonhedgers. This differential performance is not related to firms' domestic equity betas. Instead, hedgers appear to have greater sensitivity to exchange rates post-crisis. We conjecture and find supporting evidence that, on average, hedgers had a difficult time maintaining their derivative hedges during and immediately following the crisis due in part to derivative market illiquidity and credit constraints. This in turn seems to explain the greater exchange rate exposure post-crisis. The increased exposure combined with stabilization, and in several cases, rebound of the local currency (i.e., good news), probably lead to the relative outperformance of hedgers.

Multivariate tests of performance also indicate that the use of derivatives had a weak impact on equity returns. However, alternative means of hedging such as foreign EBIT had a positive and significant effect on equity returns. Not surprisingly, we find foreign debt levels to be strongly negatively related to both equity and financial performance during the crisis. Finally, the evidence indicates that economic and business risks, as measured by changes in sales, profitability, and growth opportunities, are important determinants for equity returns.

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[6] Bodnar and Gebhardt (1999) examines differences in the use of derivatives between US and German firms.

[7] Our sample for Hong Kong includes "red-chip" firms operating in China.

In our final test we examine potential differences in performance between hedgers and nonhedgers using several alternative performance measures such as interest coverage and market-to-book ratios. Given the large number of corporations that experienced financial distress at the same time, we devise tests that examine differences in the cross-section of firms. For example, 32% of the firms in our sample have interest coverage ratios less than 1.0 in fiscal year 1998. However, we find no evidence that firms in the region improve their performance using derivatives – in fact, hedgers' performance is statistically indistinguishable from that of nonhedgers.[8]

Overall, it appears that hedgers used derivatives to reduce their exchange rate exposures to levels on par with nonhedgers. This supports the hypothesis that there is an optimal amount of financial risk a firm should bear as opposed to the view that firms always benefit from further reductions in financial risk. However, hedgers may have underestimated the effectiveness of derivatives as a long-term risk management strategy. The fact that foreign currency derivatives users are actually more sensitive to changes in foreign exchange rates after the crisis suggests that hedging with derivatives backfired when market liquidity dried up in 1997 and 1998.[9]

The remainder of the paper is organized as follows: Section 2 describes the East Asian currency crisis and the characteristics of the firms in our sample that use foreign currency derivatives. Section 3 examines the determinants of the decision to use foreign debt as well as the decision to hedge using foreign currency derivatives. Section 4 presents tests of the relation between the use of derivatives and firm performance. Section 5 concludes.

2 The East Asian Crisis and Data on Non-financial Corporations

2.1 The Currency Crisis in East Asia

During the first half of the 1990s, East Asian firms underwent rapid investment in fixed assets (see, e.g., Pomerleano (1998)). On average, internally generated funds were not sufficient for financing this expansion, and as a result, most firms depended on external financing. In general, new equity was used less than debt, often because stock markets were perceived as under-performing, and insiders preferred to retain management control of their companies. Consequently, domestic and foreign borrowing and measures of firms' financial leverage increased significantly in the years up to 1996. For example, prior to the crisis in 1996, the average listed firm in South Korea and Thailand had a debt-to-equity ratio of 3.5 and 2.3

[8] See Allayannis and Weston (2001) for evidence on US firms.

[9] Although hedgers were unable to rollover their derivatives positions, anecdotal evidence suggests that outstanding contracts were honored by counterparties.

respectively, relative to ratios in the US and Germany of 1.1 and 1.5, respectively.[10] Furthermore, much of the debt was short-term and denominated in foreign currency. Because of their large foreign currency denominated debt, EA firms were harshly exposed to falls in Asian currencies against the US dollar (USD) and worsening macroeconomic conditions. Corsetti, et al. (1998) find an indication of financial fragility, the ratio of short-term external liabilities to foreign reserves, was above 100% in Thailand, Indonesia, and Korea.

The EA financial crisis is an unusual event in economic and exchange rate history. As late as one year prior to the crisis most equity and foreign exchange markets showed little sign of the impending calamity. Table 1 shows exchange rate volatility and equity market returns for the eight EA countries in our sample. We define three periods (fixed for all countries) that describe the general state of markets: Pre-crisis (June 29, 1996 to June 27, 1997), intra-crisis (June 28, 1997 to June 26, 1998), and post-crisis (June 27, 1998 to June 25, 1999).[11] Panel A shows annual exchange rate volatility (as measured by the standard deviation of weekly percent changes in exchange rates versus the USD) by country for each of the three periods. Panel B shows equity returns for the major market index in each country (see the Appendix for details).

In the pre-crisis period, exchange rate volatility is very low across the region, averaging only 2.7%. For no country does pre-crisis exchange rate volatility exceed that of the Japanese Yen (against the USD). Equity returns in the region were mixed, but only Thailand and South Korea showed a decline of more than 20%.

On July 2, 1997, the Bank of Thailand announced a managed float of the Baht and called on the International Monetary Fund for "technical assistance." This announcement effectively devalued the Baht by about 20% and is considered a trigger for the East Asian crisis. (See http://www.stern.nyu.edu/~nroubini/ for a detailed timeline of the Asian crisis.) Figure 1 shows a plot of USD exchange rates from July 1996 to July 1999. Soon after the Baht depreciation, other EA currencies followed. By the end of 1997, the Thai Baht (THB), Malaysian Ringgit (MYR), Indonesian Rupiah (IND), South Korean Won (KRW), and Philippine Peso (PHP) were all down more than 30% against the USD; the Singapore Dollar (SGD), and Taiwan Dollar (TWD) were each down about 15%. Only Hong Kong and China were able to maintain a stable exchange rate against the USD. Table 1 shows that during this crisis period, exchange rate volatilities increase

[10] For a detailed discussion of corporate debt in East Asia see Claessens, Djankov, and Ferri (1999).

[11] Because all countries were not struck simultaneously, these dates are somewhat arbitrary. However, this interval classification includes all of the significant exchange rate depreciation in the "crisis" period. Furthermore each period is one year long, which facilitates the use of annual accounting data in the subsequent analysis. The break at the end of June is also convenient since it allows time for the reporting of the previous year's financial results.

more than tenfold to an average of 35.1% and equity markets across the region slumped an average of 51.5%.

By the middle of 1998, the worst of the currency crisis was over; exchange rates stabilized, and equity markets started to rebound. During the following year (the post-crisis period), local currencies tended to appreciate somewhat against the USD.[12] Exchange rate volatilities moderated averaging only 15.9% (less than for the Japanese Yen over the same period) and equity markets in all countries rebounded significantly, up an average of 75.4%.

2.2 Data

Our primary data source is a set of *SBC Warburg Dillon Read* (SBC-WDR) equity reports from 1997 to 1999, which report firm's level and mix of debt (short-term, long-term, foreign, and local), the percentage of foreign debt that is hedged, the level of foreign cash, and the percentage of EBIT earned abroad, among other items, for 1996 to 1998. These reports cover about 40 of the largest exchange-listed non-bank firms for each of the eight East Asian countries.[13] Because these data are not from a commercial vendor and were often collected through direct contact with the firms in the sample, we attempted to verify the data accuracy by searching through a subset of firms' annual reports. We selected hedgers and nonhedgers alphabetically from each country so that we would have at least five nonhedgers and the minimum of all or five hedgers from each country. For the 68 firms searched we find no reference to hedging debt with derivatives for all but one of the non-hedging firms. Furthermore, we find only two firms that use derivatives but do not hedge foreign debt. For example, Singapore's Cycle and Carriage uses forward contracts to manage foreign currency liabilities on imports (1997 annual report) but not foreign debt exposure. For hedgers, we find specific references to derivative use for all but two firms. This crosschecking leads us to conclude that the quality of the hedging data is very good.

We augment this dataset with the WorldScope database, which provides additional balance sheet and income statement data for publicly traded firms. For firms with data not available on WorldScope we searched Hoover's Online, WorldVest, and company annual reports (in that order) to fill in as much missing data as possible. Equity returns are obtained from

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[12] Singapore showed a slight decline, Hong Kong and China retained their pegs despite attacks by speculators, and Malaysia instituted currency controls.

[13] The reports do not coincide exactly with calendar or fiscal years. However, by cross-referencing variables also available in the WorldScope database it is apparent that the data are most representative of calendar years 1996 to 1998. Table 2, discussed subsequently, reports the number of firms from each country for 1996 data. The exact set of firms surveyed changes slightly from the 1997 to 1998 reports. The project was curtailed in the middle of the data collection stage for 1998 data so many of the firms have missing observations for this year.

DataStream. For companies not in DataStream we obtained price data from the listing exchange or company websites when available. Data for some additional variables (for example, foreign sales, family affiliation, number of shareholders, etc.) are obtained from the Asian Company Handbook and Claessens et al. (2000). Detailed definitions of all variables are provided in the Appendix. Our final dataset has data for nearly all companies. Specifically, we have, at a minimum, basic accounting data and equity return data for 1996-97 for 320 of the 327 firms in the 1997 SBC-WDR report. Basic 1998 accounting data are available for 303 of the 327 firms.

Given the widespread financial distress in EA during the sample period, we are also concerned with potential survivorship bias. Surprisingly, only eight firms exited the sample because of a change in organization from 1996 to 1998. We conjecture that the generally large size of the firms in the SBC-WDR reports results in a lower proportion of the firms in our sample (as compared to all publicly traded EA firms) being forced to merge or liquidate. Of the eight firms, four merged with other firms, three went bankrupt, and one was nationalized. Two of the eight firms were hedgers, roughly the same percentage as in the overall sample (21.5%). Given these facts, we are confident that the performance results are not tainted by a significant survival bias.

3 Determinants of Exchange Rate Risk Management

One contribution of this study is that we are the first to provide a detailed description of derivative and foreign debt use by East Asian non-financial corporations. While the focus of this paper is not on foreign debt issuance (or capital structure decisions), we provide some evidence on foreign debt usage since the use of derivatives by our sample firms is conditional on the existence of foreign debt.[14]

3.1 The Decision to Use Foreign Debt

3.1.1 Univariate Results

In our entire sample of 327 firms, 202 (61.8%) use foreign debt in 1996 (167 out of 292 excluding Korean firms). Table 2 reports summary statistics for foreign debt users and non-users by country.[15] As most of these statistics are raw (i.e., do not take into account differences in

[14] See Kedia and Mozumdar (1999) for a detailed investigation of the determinants of foreign debt issuance in a sample of large US multinationals.

[15] We do not have data on the currency denomination of the foreign debt. Anecdotal evidence suggests that the majority of foreign debt was denominated in US dollars and the remaining part in "strong" currencies such as the Japanese Yen or the Deutschmark. It is therefore safe to assume that the vast majority of the foreign debt assumed by EA firms was exposed to currency risk and to a potential depreciation of the local currencies against these currencies.

country or industry averages) we discuss them here briefly and defer a more detailed discussion to the multivariate analysis. Usage rates vary considerably between countries from a low of 29.3% (12 out of 41) for Malaysian firms to 100% (35 out of 35) for South Korean firms. For foreign debt users, there is also variation in the percentage of total debt that is foreign; 14.8% of foreign debt users have less than 20% of their total debt abroad and 10.9% have all of their debt abroad. However, this dispersion is not explained just by home country. In all countries, foreign debt users have an average of more than 30% of their debt denominated in foreign currency. Overall though, the percentage of foreign debt is the highest among firms within the middle income countries (68.1%).[16]

Although the statistics on Table 2 should be used with caution when comparing firms across countries, several patterns emerge that allow us to put forth hypotheses for the average firm in the region. For example, we hypothesize that larger firms would be able to access foreign debt markets more easily or are more likely to have a relationship with a foreign bank than smaller firms. Indeed, as shown on Table 2, foreign debt users tend to be larger than non-users as measured by sales. As noted already, two explanations often cited for foreign debt issuance by EA firms are (1) that local debt markets are insufficiently deep (i.e., tapped out) and (2) that foreign debt is cheaper.[17] The first explanation suggests that foreign debt is a complement to local debt and the second a substitute. As shown in Table 2, foreign debt issuers have higher levels of overall debt (as measured by the debt-to-asset ratio[18]) in all countries, suggesting that foreign debt usage is in addition to local debt usage.

We hypothesize that cash flows in a foreign currency would increase the foreign debt capacity of EA firms since this would tend to lower the exchange rate risk for companies (and thereby decrease credit risk for lenders). Likewise, foreign cash reserves could act as collateral for borrowing. The evidence from these univariate tests appears to support these arguments; foreign debt issuers tend to have higher levels of foreign EBIT and cash reserves.[19] However, these results vary considerably from country to country.

Next, we consider gross margin, a measure of operating profitability defined as EBIT divided by total sales. A firm with a higher gross margin could more easily make interest

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[16] Middle income countries, as defined by IMF, include Indonesia, South Korea, Malaysia, the Philippines and Thailand.

[17] See, for example, "The Overseas Option," *AsiaRISK*, February 1997, p. 19.

[18] We use debt-to-assets instead of debt-to-equity because market value of equity is extremely volatile during our sample period as compared to total asset values. Consequently, debt-to-assets better captures variation in leverage due to changes in the level of debt.

[19] We are concerned that higher levels of foreign cash could be from proceeds of foreign bond offerings that have not been utilized or converted to local currency. Anecdotal evidence suggests that since the vast majority of the debt was bank debt, which is likely to be immediately utilized, this is not the case.

payments and would therefore be more likely to use foreign debt. Alternatively, more profitable firms may be able to fund investments more cost-effectively with internally generated funds instead of debt (or foreign debt if it is a complement to local debt) suggesting a negative relationship between gross margin and the use of foreign debt. In general, the univariate results support neither case: there is no consistent difference in gross margin between foreign debt users and non-users.

For comparison, Table 2 also reports mean values for the quick ratio, interest coverage ratio, and current ratio, as we will be using these in our subsequent analysis. Each of these ratios, which measure a firm's financial condition, tends to be lower for foreign debt users. Thus, on average, companies with foreign debt are in overall weaker financial condition and therefore more exposed to financial distress caused by adverse exchange rate movements.

The growth potential of firms using foreign debt is also of concern since risk management theory suggests higher growth potential firms should have a greater incentive to hedge. Typically, higher debt levels are associated with more mature businesses that have more stable cash flows and usually lower growth potential. In our sample, foreign debt users tend to have lower market-to-book ratios though not in all countries. Capital expenditure (beyond replacement) as a percent of sales is also an indicator of growth potential since these investments are in essence a type of growth.[20] For foreign debt users capital expenditures on fixed assets such as buildings or roads can also act as collateral that makes foreign debt access easier. The foreign debt users in our sample have higher committed capital expenditures over the next 12 months (as a percent of sales) in all countries except Singapore.

3.1.2 Multivariate Results

We test the above hypotheses jointly in a multivariate setting by estimating a two-stage model. In the first stage, we use a LOGIT specification to model the decision to issue foreign debt. The dependent variable is equal to one if the firm uses foreign debt and zero otherwise. In the second stage, using only those firms that issue foreign debt, we examine the extent of foreign debt use in an OLS specification.[21] We exclude South Korean firms from the estimation since we are primarily concerned with foreign debt issuance as it relates to hedging with derivatives and South Korean firms are, for all practical purposes, prohibited by law from using exchange rate

[20] An additional proxy for growth potential is expenditures on research and development (R&D). We do not include this variable in our analysis since it is unavailable for the majority of our sample firms.

[21] Although specification tests consistently select the two-stage model (for the reported and alternative specifications) at the 5% confidence level, we also estimated a (restricted) one-stage version of the model using a TOBIT specification. Results are available from the authors on request. In general, the same

derivatives to hedge foreign debt.[22] Also, recall from Table 2 that all South Korean firms used foreign debt. Excluding these firms does not change the qualitative nature of the results presented here.

Given the focus of our paper and to conserve space, we only report (in Table 3) coefficient estimates and standard errors from a few alternative specifications for the first stage of the two-stage estimation. (We briefly discuss results for the second stage and tabulated results are available from the authors upon request.) Column (1) reports results on the decision to issue foreign debt using country factors as explanatory variables in addition to firm-specific ones suggested by theory. In column (2) we substitute country factors with a variable measuring the difference between local interest rates and LIBOR.

As in the univariate case, larger firms as measured by sales are more likely to have foreign debt.[23] We also include a dummy variable equal to one for firms that are listed on an exchange besides their domestic market. Our prior is that this variable should be related to a firm's access to foreign debt markets, however we do not find it to be significantly associated with foreign debt issuance. Overall local debt levels, as measured by the local debt-to-assets ratio, tend to be negatively related to the decision to use foreign debt. However, the coefficients are not uniformly significant across specifications. This result indicates, contrary to the univariate results, that foreign debt is, if anything, a substitute for local debt rather than a complement. The maturity structure of local debt may also be indicative of the type of borrower that uses foreign debt. Consistent with evidence from the US, we hypothesize that borrowers with lower credit ratings will tend to borrow shorter-term. If this is the case, the significant negative relationship between short-term-to-total local debt suggests that firms with relatively lower ratings are less likely to use foreign debt.[24]

As noted before, we expect a positive relationship between foreign debt issuance and measures of foreign cash flow or cash levels. In support of this hypothesis, foreign cash is a significant positive predictor of the decision to use foreign debt. (Foreign sales, used in alternative specifications not reported here, is also significantly positively related to foreign debt

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factors are significant but because of the more restictive specification we cannot separate factors that determine the decision to use foreign debt and the decision of how much foreign debt to use.

[22] See, "A Game of Two Halves," *AsiaRISK*, November 1996, p. 39, for a detailed discussion of derivative use in South Korea.

[23] This finding is similar to Allayannis and Ofek (1999) who examine foreign debt issuance in a sample of large US firms.

[24] Since most of the firms in our sample are not rated, it is not practical to use credit ratings directly.

use.) Surprisingly, the percent of EBIT earned abroad is not significantly associated with foreign debt issuance though the estimated coefficients tend to be positive.[25]

There is no evidence that growth opportunities, as measured by the market-to-book ratio, are important in the decision to issue foreign debt (in contrast to the univariate results). Instead, the ratio of committed capital expenditures-to-sales appears to capture any contribution of growth opportunities. As in the univariate analysis, gross margin is not a significant predictor of foreign debt use and quick ratios are significantly lower for foreign debt users. This suggests that, even though foreign debt may act as a substitute for local debt, the overall financial condition of EA foreign debt users is probably weak relative to EA firms that do not use foreign debt.[26]

With a few exceptions, our results from second stage regressions on the amount of foreign debt use are similar to those explaining the first-stage decision to issue foreign debt. First, firm size is not a predictor of the amount of foreign debt. This may be explained by the low variation in size among our generally large firms. Second, we find a significant positive relation between foreign EBIT and the level of foreign debt, which again supports the hypothesis that foreign financial activity is related to foreign debt use.

Inspection of the coefficients on the country dummy variables in column (1) indicates that Thai and Indonesian firms tend to be more likely to use foreign debt than similar firms from other countries in the region. The extent of foreign debt use (results not reported) appears independent of a firm's home country, once firm and industry-specific factors are considered. As an alternative to country dummies we have used several country specific variables such as creditor rights, judicial efficiency, legal origin, GDP per capita, international country risk, percentage of family-related businesses, and foreign bank presence (results not reported). However, one country-specific factor, the difference between the local country short-term interest rate and LIBOR, appears to be of major importance. The interest rate differential is significantly positively related to both the probability of foreign debt usage and the amount of foreign debt (at the 1% level in both cases).[27] As noted before, foreign debt was perceived as substantially less costly than local debt because of differences in interest rates. This perceived benefit increases with the interest rate differential. While some of the other country-specific variables are significantly different from zero individually, none remain significant when the interest rate

[25] We use foreign EBIT in our specifications, given the less consistent reporting of foreign sales in the segment data for our sample firms.

[26] We obtain similar results using the Altman (1968) Z-score instead of the quick ratio and the local debt level as a proxy for a firm's probability of distress.

[27] We are confident in using the local currency – USD interest rate spread since BIS (1999) data shows that average OTC foreign exchange derivative turnover in the region is on average 97.24 percent denominated in USD.

differential is also included in the estimation. We show in the next section that the interest rate differential is also an important variable for explaining derivative use.[28]

Many popular press accounts of the Asian crisis noted significant debt buildup in specific industries such as real estate; hence we conjecture that industry factors may be important explanatory variables for foreign debt use. Table 3 shows that there is actually little difference across industries once other factors are considered.[29]

Finally, we note that the explanatory power of the regressions in Table 3 is quite high. This is reassuring since it suggests less chance of a significant omitted variables bias in our reported results. (It is also gratifying since we use the inverse Mills ratio from the LOGIT estimation in column (1) in the subsequent analysis.)

3.2 Hedging Foreign Debt with Derivatives

In this section we examine the use of currency derivatives by East Asian corporations. As little is currently known about the risk management practices of EA non-financial corporations, we begin our analysis by documenting the characteristics of EA derivative users. We then test theories of optimal risk management using our sample firms. These theories break into two general groups. First, there are theories examined in prior research using other, mainly US, samples. Our analysis provides an out-of-sample test for these results–although, as mentioned before, several of these theories may not be as applicable to firms in less developed markets. In addition, our sample allows us to examine whether country-specific factors are also important in the decision to use derivatives, or whether firm-specific factors are the main determinants of such decision, as prior research asserts. This is interesting since little evidence exists on how determinants of risk management practices differ among regions and countries. More importantly, in smaller or less developed markets, exchange rate risk is more likely to be relevant to non-financial corporations; in this sense East Asia represents a more natural choice of location to examine exchange rate hedging practices.[30] Second, there are theories that are better suited to tests with our sample. For example, since foreign debt gives rise to the primary

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[28] Results are similar in alternative specifications that include interest-rate differentials, where we de-mean the remaining explanatory variables by their respective country means.

[29] We tried several different groupings of SIC codes. We have reported results where SICs beginning with 2 and 3, 5 and 6, and 7 and 8 are grouped together. There are not statistically different coefficients for these pairs in any of the analysis in the paper and including separate dummy variables for each one-digit SIC does not change the results. We choose these groupings to minimize the number of industry variables.

[30] One drawback to East Asia is the generally less developed derivative markets. However, with the exception of South Korea, which we exclude from the sample, derivatives were readily available to at least the larger EA corporate customers. For more information on EA derivative markets and common hedging strategies see, "Forex Swaps in Demand," *AsiaRISK*, November 1995, p. 4, and "Special FX," *AsiaRISK*, October 1997, p. 28.

currency exposure for EA firms, our data provide a clean measure of direct exchange rate exposure. Hence, we can use our data on foreign cash and foreign EBIT and our multi-country sample to better investigate alternatives to derivatives that may impact derivative use.

3.2.1 An Example of an East Asian Hedger

Because the definition of hedger in our sample is in some ways different than in prior studies, it is instructive to consider an example of a typical hedging firm. Banpu Public Company Limited of Thailand is a producer of coal, industrial minerals, and electricity. In 1996, the company employed about 1,300 workers and had 5.67 billion Baht (225 million USD) in total revenues, putting it slightly below the median firm in our sample in both categories. Banpu has limited foreign operations: It is developing a coal mine in Indonesia and has a joint venture for producing ball clay in Vietnam. Foreign sales (and consequently foreign EBIT) are negligible. However, Banpu uses a substantial amount of foreign debt. For example, in June 1997 at the onset of the Asian crisis, Banpu had about $310 million (USD equivalent) in long-term foreign debt (primarily convertible debentures). According to the 1997 annual report,

> "The company had to borrow foreign currencies in funding its investment, thus becoming more exposed to foreign exchange fluctuations. ... The company has always been searching for low cost funding sources while controlling [sic] appropriate debt to equity ratio. The company has a policy to balance timely foreign exchange risk coverages and competitive all-in costs of funds to assure acceptable returns on projects."

Banpu is also an extensive user of currency swaps. Just prior to the crisis (June 1997), the company had approximately 162 million USD (equivalent notional principal) in Baht-based cross-currency swaps. For example, the 1997 annual report notes,

> "The company has entered into cross currency swaps with financial institutions as the following: ... A ten-year cross-currency swap contract of USD 41.96 million has been swapped into Baht 1,065.88 million. The interest rate in USD is 5.95% per annum when swapped into Thai Baht, interest rate becomes approximately 8.00%-9.00% per annum for the period from August 15, 1996 to February 15, 2007..."

Clearly, Banpu is not using foreign debt as a hedge for existing foreign currency exposure nor, is it using swaps for any purpose other than hedging the currency exposure created by foreign debt. In this sense, Banpu is typical of the "hedgers" in our sample.

3.2.2 Prior Literature and Hypotheses

Several theories of optimal hedging strategies offer us insight into the potential motives and benefits derived from hedging. For example, Smith and Stulz (1985) suggest that the transaction costs of financial distress may prompt firms to undertake hedging activities. Froot, et al. (1993) suggest firms hedge to reduce underinvestment when cash flow is volatile and access to external financing is costly. Leland (1998) shows that a firm can increase its debt capacity (and consequently its debt tax shield and value) by hedging. Similarly, Stulz (1996) suggests that firms hedge to reduce the chance of costly "lower-tail" outcomes thus allowing firms to substitute debt for equity.

Empirical examination of hedging theories has been affected by the general unavailability of clean data on hedging activities. It is only in the last decade that corporations have been required to report, in the footnotes to their annual reports, the notional amount of derivatives they are using. As a result, researchers have generally used a dummy variable to indicate a firm's derivatives usage in a large cross-section of firms. Géczy, et al. (1997) examine currency-hedging activities for a sample of US Fortune 500 firms and find that US firms' use of currency derivatives is positively related to the amount of research and development expenditures (R&D) and firm size, and negatively related to a firm's quick ratio. The authors also find a positive relationship between hedging and the interaction of a firm's long-term debt ratio and market-to-book ratio, which is consistent with the use of hedging to reduce underinvestment (e.g., Froot, et al. (1993)).[31] Graham and Rogers (2000) find evidence consistent with Leland's (1998) theory that the use of derivatives allows firms to increase their debt capacity, without deteriorating their credit-worthiness and therefore enjoy the resulting tax benefits.

More recently, several papers have examined the impact of derivatives on risk, investment, and value. For example, Guay (1999), Allayannis and Ofek (1999) and He and Ng (1998) find that the use of currency derivatives by US and Japanese firms reduces their exchange rate risk. Allayannis and Mozumdar (1999) find that the use of currency derivatives reduces the impact of cash flow on investment (i.e., hedging allows firms to smooth their investment) while Allayannis and Weston (2001) find that the use of currency derivatives increases firm value. While Allayannis and Weston offer evidence regarding the benefits of financial hedging for a sample of US multinationals, this paper is the first to examine the effect of financial hedging on

[31] Tufano (1996) and Haushalter (2000) examined commodity hedging activities in a sample of gold mining firms and oil and gas producers and find respectively evidence consistent with theories of managerial risk-aversion (e.g. Stulz (1984)) and consistent with theories of transactions costs of financial distress (e.g., Smith and Stulz (1985)). Visvanathan (1998), among others, examines interest rate hedging and finds evidence consistent with theories of transaction costs of financial distress. Finally, Mian (1996) investigates currency, interest rate and commodity derivatives for a large cross-section of US firms and finds strong evidence of economies of scale in hedging, as size is strongly positively related to the use of derivatives.

performance across countries and during a period when it should matter the most. Brown (2001) describes currency hedging at a large US-based multinational and finds earnings smoothing and competitive factors are the primary motivators for risk management.

In this paper, we examine an additional theory, which suggests that firms engage in selective hedging of their foreign debt exposure. Specifically, evidence in the previous section (see also Harvey and Roper (1999)) suggests that EA foreign debt is a type of indirect speculation on exchange rate stability. Local interest rates in EA countries were considerably higher than equivalent rates in the US, Europe, and Japan. By borrowing in foreign currencies EA companies would be able to significantly lower their borrowing costs if the local currency did not depreciate significantly. This type of speculation relates directly to risk management with derivatives since using derivatives to hedge the exchange rate risk eliminates much of the cost advantage of foreign debt. We shed light on this issue by examining whether the cost differential reflected in the difference between the local interest rate and the LIBOR is related to the use of currency derivatives by East Asian firms. More specifically, we examine whether firms may be less inclined to use derivatives when the interest-rate differential is high thereby taking advantage of such cost differential. Hence, a negative relationship between the use of derivatives and interest-rate differential may be indicative of selective hedging.

3.2.3 Univariate Hedging Results

Table 4 reports summary statistics for hedgers and nonhedgers by country for the sub-sample of 202 firms with foreign debt. We exclude South Korean firms from the remainder of this analysis, since they were not allowed to (directly) use derivatives to hedge foreign debt. Across all countries 42% (70/167) of foreign debt users hedge their exchange rate exposure with derivatives. However, among the hedgers, the average percentage of foreign debt hedged is relatively high (66.5%) and less than 50% only in Taiwan.

For firms subject to financial distress costs, hedging exchange rate risk should increase foreign debt capacity by decreasing total firm risk per unit of foreign borrowing. In support of this hypothesis, firms that hedge tend to have higher levels of foreign debt (65.9% versus 58.7% as a percent of total debt for all countries). However, if we instead consider total debt-to-asset ratios, then we find no clear pattern. In Hong Kong and Malaysia, nonhedgers actually have significantly more total debt than hedgers. These results differ from Graham and Rogers (2000), which find a positive relationship between hedging and total debt for US firms. This suggests

that hedging is less important for determining overall debt capacity but instead lets firms substitute toward generally cheaper foreign debt.[32]

Although several studies have found a positive relationship between firm size and derivative use, suggesting significant fixed costs for using derivatives, we find that only in Hong Kong are hedgers significantly larger than nonhedgers (as measured by USD sales). This result may be due to the size bias inherent in our sample of generally large firms and the tendency for larger firms on our sample to be foreign debt users.

A unique aspect of our dataset is our statistics on foreign cash and foreign EBIT. These two variables are often unavailable for US as well as foreign firms. Both variables can play an important role in a firm's exchange rate risk management decisions. To see this, consider a firm with foreign debt that is not hedged with derivatives. The firm could obtain foreign currency to service the debt from a variety of sources. First, it might convert local-currency denominated cash into foreign currency on an as-needed basis. In this case, the company bears 100% of the exchange rate risk. Second, a firm could use foreign currency derived from foreign operations (i.e., foreign EBIT). To the extent that this offsets liabilities from foreign debt, foreign EBIT will act as a hedge and a substitute for derivatives. Finally, even if a firm does not receive cash flows in foreign currency, it could keep cash reserves (or other liquid investments) that are denominated in a foreign currency. To the extent that these reserves can be used to service foreign debt, this will also act as a simplistic hedge against exchange rate fluctuations and, again, as a substitute for derivatives.

On the other hand, if currency derivatives are costly, foreign EBIT and foreign cash may act as complements to derivatives. For example, consider a company with a low credit rating or a company that resides in a country where it is costly to access the currency derivatives market (i.e., liquidity is relatively low as is the case for several EA derivative markets). This company may have limited access to derivative markets and may not be able to satisfy its exchange rate risk management needs with derivatives.[33]

Because we have data on both foreign EBIT and foreign cash, our analysis can shed light on whether foreign EBIT and cash are used as substitutes or complements to derivatives. The univariate results in Table 4 show that for most countries (and all countries together) foreign EBIT is significantly lower for hedgers. This supports the hypothesis that foreign EBIT acts as a

[32] Recall that if a firm hedges 100%, interest expenses will not generally be lowered by using foreign debt. However, if a firm hedges less than 100% then it will derive a savings in interest expenses. Also, other costs of debt (e.g., issuance costs) may be lower for foreign debt.

[33] See Petersen and Thiagarajan (2000), Géczy, et al. (2000), and Opler, et al. (1999) for a more detailed discussion of alternatives to hedging with derivatives.

substitute for derivatives. For foreign cash we find the opposite for most individual countries (and all countries together). Foreign cash levels are significantly higher for hedgers in four of seven countries and significantly lower only in Taiwan. This supports the hypothesis that foreign cash may act as a complement to hedging with derivatives. This finding is not too surprising if we consider the relative costs of obtaining foreign EBIT and foreign cash. Foreign EBIT will be expensive if it means physically relocating operations abroad. On the other hand, keeping foreign cash reserves incurs only the opportunity cost of not using the cash for positive NPV projects. Foreign cash may also have the additional advantage of lower credit risk since many local financial institutions became financially distressed during the crisis.

Theory also suggests that a firm's competitive position should be related to its risk management policy (see, Allayannis and Weston (1999) for empirical evidence). Specifically, firms in more competitive industries will wish to hedge more since they are generally less profitable and therefore more susceptible to financial distress. As before, we use a firm's gross margin as a measure of profitability and industry-level competition. Surprisingly, we find that hedgers tend to have larger gross margins than nonhedgers. A possible explanation is that more profitable EA companies (with less credit risk) are given easier access to the derivatives market.

As before, we use a firm's market-to-book value of equity and committed capital expenditures (divided by sales) as proxies for growth opportunities. Recall that theory suggests firms with greater growth opportunities will be more likely to hedge. There is not a consistent difference between hedgers and nonhedgers in univariate tests for either of these variables. Hedgers have a significantly higher average market-to-book ratio only in Taiwan and Malaysia. Theory also suggests that the more financially constrained a firm, the more likely that firm is to hedge. We use the quick ratio, interest coverage ratio, and current ratio as proxies for liquidity. In the univariate tests, there is again little evidence of differences between hedgers and nonhedgers.

Overall, conclusions from the univariate tests are not consistent with similar results for US firms. However, there may be systematic differences across countries and industries that confound the analysis. Consequently, we now turn to multivariate tests of the determinants of hedging.

3.2.4 Multivariate Hedging Results

To examine the determinants of firms' extent of hedging, we use a continuous dependent variable, the percent of total foreign debt hedged with currency derivatives during 1996. Because

this variable is left-censored at 0% and right censored at 100%, we estimate TOBIT regressions.[34] Given that our foreign currency derivatives data is conditional on foreign debt use, we include the inverse Mills ratio estimated in the LOGIT model of foreign debt usage mentioned earlier (Table 3). Table 5 reports results from several alternative TOBIT specifications. Column 1 (2) presents results without (with) controls for industry and country factors, while column 3 includes country-specific interest-rate differentials in lieu of country dummies.

Consistent with the univariate tests, foreign EBIT is inversely related to hedging with derivatives thus supporting the hypothesis that it acts as a substitute for hedging with derivatives. The positive relationship between hedging and foreign cash holdings is only significant when country dummies are not included in the analysis (column 1). Including country, but not industry dummies (results not reported), also results in the coefficient on foreign cash becoming insignificantly different from zero. This suggests that the use of foreign cash is country-specific and indirectly supports the hypothesis that firms in countries with less liquid derivative markets will use foreign cash as a complement to hedging with derivatives.

In contrast to evidence from US firms, size is not positively related to derivative use. Again, we suspect the inherent sample bias towards large firms may account for this finding, so we also consider firms listing on nondomestic exchanges. We conjecture that these firms might have a closer relationship with foreign financial institutions that could in turn lead to better access to derivatives. However, the coefficient on the nondomestic exchange-listing (dummy) variable is not significant.

We find only limited support for the under-investment and financial distress theories. As before, the extent of hedging does not appear to be related to levels of total debt (as a percent of assets) or foreign debt (as a percent of total debt). In addition, we generally find no significant association between hedging and either market-to-book or committed capital expenditures. However, there is a consistently significant negative relationship between hedging and liquidity as measured by the quick ratio providing some support for financial distress theories of hedging. Interacting market-to-book with debt-to-assets will help reveal if high-growth firms that are more financially constrained tend to hedge more. The coefficient for this term is positive, as predicted by theory, but statistically insignificant.

The strongest and most consistently significant firm-specific predictor of the extent of derivative use is a firm's gross margin. Recall that the positive relationship is opposite from what

[34] We also estimate a two-stage approach, similar to the one performed before regarding the use of foreign debt. In the first stage, we examine the decision to use derivatives and in the second stage the decision on the level of derivative use for those firms that chose to use derivatives. We obtain similar results to those presented here and we do not include them in the paper for brevity.

is predicted by theory. However, we are very confident of the validity of the result—especially given its persistence in the multivariate analysis and other specifications we do not report. A probable explanation is that gross margin is a proxy for credit quality. Since this result is counter to both theory and empirical evidence from the US, we contacted derivative dealers in East Asia to further investigate the finding. It appears that there is a close relationship between credit quality and access to currency derivatives. Specifically, dealers estimate a "fractional exposure[35]" which is similar to a value-at-risk number for currency derivatives. The fractional exposure is then charged against the available line of credit for the firm. Consequently, firms with lower available credit lines will have less access to currency derivatives, ceteris paribus. (In the next section we discuss how this procedure was also important for rolling over hedges during the crisis itself.) Other anecdotal evidence also suggests that credit quality is an important determinant of derivative usage in East Asia.[36]

The univariate results in Tables 4 suggest that some firms might be more likely to hedge simply because of their home country. Recall, that more than half of the companies from Thailand hedge whereas only 17% (4 out of 24) of firms based in the Philippines hedge. We also document significant variation in the average percentage of foreign debt hedged across countries. Inclusion of the country dummies in the TOBIT estimation (column 2) lets us control for differences between countries. Interestingly, the bulk of our findings appear to be firm-specific rather than country-specific, i.e., results do not change with inclusion of country dummies. Interpreting the coefficients on the country dummies suggests only Philippine firms use derivatives significantly less (at the 10% level) than similar firms in other countries in the region. We also control for the effect of a firm's primary industry. Although we expected manufacturing firms to be more prone to using derivatives, we do not find any significant differences with the other sectors.[37]

It is interesting to comment further on some of the variables that we do not find significantly related to the use of derivatives. More specifically, our finding that firms in East Asia do not generally use derivatives in a manner that is prescribed by the Froot, et al. (1993) theory of hedging. We explore a variety of alternative specifications and variables that may

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[35] This is the term used by Chase Manhattan Bank. Other banks have similar procedures but different terms.

[36] For more on credit risk in East Asian derivative markets see, "Reading Between the Credit Lines," *AsiaRISK*, July 1996, p. 9, and "A Credit Risk Nightmare," *AsiaRISK*, December 1999, p. 28.

[37] In alternative specifications, we exclude some explanatory variables that are statistically insignificant and strongly related to industry (such as committed capital expenditures, market-to-book, and debt-to-assets) and the differences between industries are larger. For brevity, we report only the weaker findings.

proxy for the interaction of liquidity and investment opportunity, such as foreign EBIT and market-to-book or quick ratio and market-to-book, but none of these variables are significant. Hence, the evidence presented here regarding the reasons behind the use of currency derivatives suggests that East Asian firms may have somewhat different risk management motivations than their US counterparts.

The relatively large number of countries in our sample and variation in country-specific factors gives us a unique opportunity to further explore other factors that may effect hedging. For example, it is possible that companies that are located in more developed countries, as proxied by their GDP per capita, or have better functioning capital markets, as proxied by legal origin variables or total foreign bank assets, may be more likely to use derivatives. We have examined a large number of factors by replacing the country dummy variables by country-specific variables (results not reported). We find that the following are significantly positively related to derivative use (at the 5% level or better): English legal origin[38], international country risk, GDP per capita, creditor rights, judicial efficiency, and derivative market trading volume in 1996. The percent of foreign bank assets is negatively related to derivative use. Surprisingly, an estimate of spreads in the local currency derivatives market is not a significant predictor of derivative use nor is the percentage of companies affiliated with a family group. However, we give only passing mention of these variables because all are dominated by the interest rate differential, i.e., each of these variables becomes insignificantly different from zero when the interest rate differential is also included in the regression. Results for the specification with the interest rate differential are reported in the last column of Table 5.

As shown earlier, one important motivation for EA firms to issue foreign debt was to reduce their apparent cost of capital by taking advantage of lower interest rates elsewhere in the world. If a firm uses derivatives to hedge its foreign debt obligation, then the cost differential related to interest rates would be eliminated. On the other hand, leaving this foreign debt position unhedged exposes firms to significant exchange rate risk in the event of a depreciation of the local currency. The highly significant and negative coefficient on the interest rate differential shows that many EA firms hedge less with derivatives when the difference between the domestic short rate and that of the foreign benchmark (LIBOR) is large. Put another way, this suggests that EA firms engage in selective hedging. Such behavior, although apparent in anecdotal evidence and surveys of US firms (see Bodnar, et al. (1998) and Stulz (1996) for a discussion), has not been revealed in prior statistical analysis of hedging. This result is confirmed by our discussions with derivative dealers in East Asia. One dealer even recounted the story of a non-financial

corporation in Indonesia that used derivatives to add exposure to the Rupiah in an attempt to create zero-cost debt. (This firm is not in our sample).[39]

The remaining factors in this test appear to have similar signs and significance levels as before with a couple of exceptions. Size, which is now negative and weakly significant, indicates that relatively smaller firms are more likely to use derivatives—evidence that is consistent with Warner's (1977) theory.[40] The probability of issuing foreign debt (inverse Mills ratio) is now significant and positive suggesting that factors related to foreign debt usage are also related to derivative usage.

We examine one other possible factor effecting use of derivatives: family affiliation. Numerous other researchers have found family affiliation to be an important factor for corporate decisions in East Asia.[41] We hypothesize that family affiliation could have two opposing effects on derivative use. First, firms that are part of a family may have easier access to derivatives or risk management advice through their family relationships thus making them more likely to use derivatives. In contrast, it may be that family-related firms believe they have an implicit hedge against financial distress from parent (or related) firms and therefore are less likely to use derivatives. We use a dummy variable that is equal to one if a firm is a member of a corporate family and examine the explanatory power of this variable in specifications similar to those in Table 5 (results not reported). The coefficient is consistently positive but not significantly different from zero. We also interact the dummy with other variables in the analysis such as size and gross margin and find no consistently significant relationship; hence it appears that family relationships are not an important determinant of the extent of derivative use.

In conclusion, we find that the risk management practices of EA firms generally differ from those in the US and there is evidence that these companies engage in selective hedging.

4 Hedging and Firm Performance

The most interesting aspect of this dataset, as compared to those used in other studies, is the potential it provides for examining how firms performed during an exchange rate shock. Intuitively, one would expect that firms hedging their foreign exchange exposure performed

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[38] Specifically, Hong Kong, Malaysia, Singapore and Thailand have English legal origins; Indonesia and the Philippines have French legal origins; and Korea and Taiwan have German legal origins.

[39] Results are similar in alternative specifications that include interest-rate differentials, where we de-mean the remaining explanatory variables by their respective country means.

[40] Warner (1977) suggests that smaller firms have proportionally higher bankruptcy costs than larger firms. Therefore, to the extent that hedging reduces the probability of bankruptcy, it is more beneficial for smaller than for larger firms. Nance, et al. (1993) find empirical evidence on the use of derivatives consistent with Warner's theory.

better than firms that did not hedge. Some anecdotal evidence suggests this to be true.[42] Alternatively, hedgers could be using derivatives because they have a larger pre-hedging exchange rate exposure. Therefore, the hedgers might not perform better, or might even perform worse, during the crisis than nonhedgers.

We undertake two general types of tests. First we look at equity returns. We find no difference in returns between hedgers and nonhedgers during the crisis, but hedgers slightly outperform nonhedgers post-crisis. Interestingly, this differential performance appears related to exchange rates but not directly to hedging with derivatives. The second set of tests uses accounting measures of performance. In these tests we again find that hedging with derivatives does not appear to have benefited EA corporations. We also consider foreign EBIT and foreign cash and examine whether these factors acted as effective exchange rate hedges.

Table 6 shows the relative market performance of hedgers versus nonhedgers by country during and after the exchange rate crisis. The reported values are differences in median equity returns between hedgers and nonhedgers. Significance is measured by a nonparameteric (Wilcoxon) difference in samples test.[43] During the crisis equity returns for hedgers are not significantly different than returns for nonhedgers in any country. On average, the difference is close to zero (2.2%). Post-crisis, the story is somewhat different: hedgers tend to outperform nonhedgers and the difference is more pronounced in middle-income countries. Perhaps not coincidentally, these countries experienced the worst depreciations during the crisis. The return difference is fairly large for all countries together (13.9%) and significant at the 5% level. At the country level, hedgers outperform nonhedgers in all countries except Singapore and in Thailand, but the difference is statistically significant only in the Philippines.

There are several possible explanations for these general findings. First, investors may not have appreciated the benefits of hedging until after the crisis was over and were able to observe the superior financial performance of hedgers. Second, hedgers could be on average riskier companies, may in turn have a larger equity beta, and therefore may outperform nonhedgers during a major market upswing such as the post-crisis period. However, this suggests that hedgers should have performed worse in the major market decline during the crisis period. A third explanation for the differential performance is that hedgers have a greater exposure to exchange rate risk only post-crisis, that exchange rate risk is a priced risk factor to these countries

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[41] See for example, Claessens, Djankov, and Klapper (2000); Claessens, Djankov, and Lang (2000); and Hoshi, Kashyap and Scharfstein (1990).

[42] See, "Lessons Not Learned," *AsiaRISK*, December 1999, p. 5.

[43] We report medians instead of means since single outliers substantially alter means for some individual countries.

after the crisis, and that the realization of exchange rates is favorable during this period. In general, the data support this last view.

To test the first hypothesis, that the market did not realize the benefits of hedging with derivatives until financial data were available post-crisis, we look ahead to the results on financial performance. We find no evidence that hedging with derivatives significantly improved the financial condition of hedgers. Consequently, there does not appear to have been any benefit to hedging for the market to react to, during the crisis *or* afterwards.

The second hypothesis suggests that there is a fundamental difference in the riskiness of hedgers that is unrelated to exchange rate exposure or hedging. The middle part of Table 6 shows differences in equity betas relative to the local market index. In none of the countries are average equity betas higher for hedgers than nonhedgers either during or after the crisis. This may be because of estimation error in the betas. However, this seems unlikely since in the multivariate results shown in Table 7 equity betas are a significant explanatory variable for equity returns during the crisis (the coefficient is negative because markets were declining during this period) and after the crisis.

Several pieces of evidence point toward the third hypothesis. First, the last part of Table 6 shows that hedgers are significantly more sensitive to exchange rate risk during the post-crisis period. Substantial evidence indicates that liquidity in the foreign exchange derivatives market dried up during the currency crisis. Several EA countries went so far as to discourage the writing of derivative contracts to deter attacks by speculators. This drought persisted into the post-crisis period.[44] Consequently, companies that had initially hedged could not easily rollover their derivative positions and were left with additional unhedged exposure. Bank for International Settlements (BIS, 1999) data shows that countries in EA had virtually no swap transactions in 1998 with maturities greater than one year. However, 73% of firms' foreign debt in these countries had a maturity of greater than one year in 1997. This highlights the probable maturity mismatch between foreign debt and available derivative products, which would expose firms unable to rollover their hedges during the crisis. Data on the actual hedging practices of our sample firms are consistent with this conclusion. For 1997, we have data on 67 of the 70 firms that hedged in 1996: 25 (37.3%) decreased their percent hedged and 7 (10.5%) increased their percent hedged; the average percent of foreign debt hedged fell from 65.8% to 49.1%. For 1998

[44] For example, the TMA Journal, Sept/Oct 99, reported: "During periods of extreme volatility, liquidity in Asian currencies evaporated, making the cost of hedging astronomically high...liquidity dropped to record low levels, as indicated by the widening of the bid-offer spread. For the Rupiah, the spread widened to 40 percent, from pre-crisis level of 1 percent, pointing to the existence of a one-sided market (as everyone rushed to hedge against the depreciating Asian currencies)." See also, "Currency Special Report: Asia Gets

we have data on 39 of the 70 firms that hedged in 1996: 32 (82.1%) decreased their percent hedged and 3 (7.7%) increased their percent hedged; the average percent hedged fell drastically from 58.6% to 14.9%.

It also seems likely that exchange rate risk is a priced risk factor during this period. It was widely believed by market participants that further depreciation could lead to a spread of the political unrest seen in Indonesia and a further weakening of equity markets. Since derivative markets were a less viable alternative for hedging against exchange rate movements, equity prices most likely adjusted to include a risk premium related to the chance of additional currency declines.[45] Finally, it is clear that during this period the depreciation of currencies stopped, exchange rate volatilities declined significantly, and equity markets rebounded. The combination of these effects suggests that hedgers most likely outperformed nonhedgers in the post-crisis period due to an exchange rate risk premium and a generally favorable exchange rate realization. This hypothesis is further supported by the multivariate tests. In particular, during the post-crisis period exchange rate sensitivity is a significant explanatory variable for equity returns (at the 10% level). The positive coefficient is consistent with an exchange rate risk premium.

The multivariate results reported in Table 7 provide a direct test of the impact of hedging on returns and generally support our conclusions from the univariate tests. They also allow us to consider other factors that may impact returns, such as the alternatives to hedging with derivatives. In Tables 7 and 8, we measure hedging as the notional value of derivatives as a percent of assets to capture the economic magnitude of the amount of hedging. In Table 7, the coefficient on this variable is negative and significant at the 10% level in column (1) indicating that hedging was not associated with better equity returns during the crisis. We repeat the tests (results not reported) using a hedge dummy variable, which equals one if a firm hedged more than 50%, 75%, or 90% of their foreign debt. In none of these alternative specifications is hedging with derivatives significantly positively related to equity returns. Post-crisis, hedging with derivatives is positively related to equity returns again at the 10% level. These findings are consistent with the evidence indicating that firms were not able to maintain their derivative positions during and after the crisis.

The results reported in Table 5 suggest that foreign EBIT, and to a lesser extent, foreign cash, could be alternatives to hedging with derivatives. Table 7 shows that foreign EBIT is

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Older and Wiser," *AsiaRISK*, October 1999, p. 23. Finally, our discussions with dealers confirm the lack of a liquid currency derivatives market during the crisis.

[45] In the countries that had devalued their currencies during the crisis, equity returns were highly correlated with changes in exchange rates during the post-crisis period. In a recent paper, Gerard and Thanyalakpark (2000) also find that post-crisis, currency volatility is a significant component of increases in dollar denominated return volatility.

positively and significantly related to equity returns during the crisis.[46] This finding supports our earlier finding that foreign EBIT is a substitute for derivatives. It is also consistent with the anecdotal evidence suggesting firms with foreign revenues were better able to weather the crisis. Post-crisis, the coefficient on foreign EBIT remains positive but is not significant. Foreign cash is not significantly related to equity returns during or after the crisis.

We also find that other factors besides those related to hedging have the expected sign and are significantly associated with returns during the crisis. More specifically, levels of total debt (debt-to-assets), foreign debt, and the equity beta are all strongly negatively related to equity returns. Firm operating performance during the crisis is also very important. Declines in sales and gross margins are significantly related to returns. Finally, larger firms performed significantly better during the crisis while those firms listed on nondomestic exchanges fared somewhat worse. Overall, the explanatory power of the regression is high (adjusted $R^2 = 52.1\%$).

Taken as a whole, we conclude that there is little, if any, evidence that the use of derivatives leads to higher equity returns during the crisis. However, the possible alternative means of hedging with foreign EBIT seems to have added value. In addition, the slight out-performance of hedgers post-crisis appears to be due to the greater exchange rate exposure of the hedgers (probably due in part to the inability to continue hedging with derivatives in this period) and a lucky turn-around in equity and currency markets.

Despite the evidence to the contrary, it is possible that equity markets in the region responded to non-fundamental factors[47] and that hedging with derivatives did help the financial performance of firms. To investigate such a possibility, we examine the impact of hedging on firms' interest coverage and current ratios, and changes in market to book ratios.[48] First, we use the change in interest coverage pre-crisis to post-crisis (FY1998 minus FY1996) as a dependent variable and hedging pre-crisis (1996) along with other factors as explanatory variables. Column (1) in Table 8 shows results of estimating an OLS regression with the change in interest coverage as a continuous variable.[49] As before, hedging with derivatives is not a significant explanatory variable, suggesting that hedging did not preserve firms' financial condition. This is a striking

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[46] As with the hedging variable, we also measure foreign EBIT and foreign cash as a percent of total assets in the analysis for Tables 7 and 8.

[47] Several commentators, including US Federal Reserve Chairman Greenspan, suggested that the crisis was due at least in part to a "panic" by investors.

[48] Note that the market-to-book ratio is not associated to hedging in our earlier tests when it was used as an explanatory variable of the decision to hedge.

[49] Interest coverage takes on extreme values when interest expenses are very small; consequently we set equal to 10 all values greater in magnitude than 10. Likewise, we set interest coverage equal to zero, if operating cash flow is negative. Estimating model (1) in Table 8 using TOBIT to account for this truncation leads to qualitatively similar results.

result since in the same regression foreign debt (as a percent of total debt) is the most statistically powerful predictor of changes in interest coverage—even more so than the total level of debt as measured by the debt-to-asset ratio.

We also include in the analysis foreign EBIT and foreign cash as hedging alternatives. Both variables have the predicted positive coefficients, but none are statistically significant. Otherwise, only the change in sales appears to explain changes in interest coverage over this period; as we would expect, a relatively greater change in sales improves a firms' interest coverage ratio.

Other researchers have used an interest coverage ratio less than one as a proxy for financial distress. This may provide a cleaner test of the ability of hedging to help prevent financial distress. Specifically, the goal of hedging with derivatives may not be to generate a large interest coverage ratio only to provide enough protection to avoid financial distress. Consequently, we also define a binary variable, which equals one if interest coverage in 1998 is greater than one and zero otherwise. Column (2) in Table 8 reports results from a LOGIT estimation with this binary dependent variable. The results from this specification also show that firms using derivatives were not more likely to avoid financial distress than firms that did not use derivatives. The remainder of the results are also similar. Again, foreign EBIT and foreign cash have both positive coefficients though in neither case are the coefficients statistically significant. In this specification, total debt (debt-to-assets) is significantly negatively related to financial distress though the change in sales is no longer significant. Together, these results suggest that the market out-performance of hedgers after the crisis is not related to a superior financial condition due to hedging.

We also try other specifications not reported here. For example, we use fiscal year 1997 instead of 1998 accounting data. In general, we feel that 1998 data are better because the full operating impact of the crisis is not felt until the latter half of 1997, and for most firms, financial conditions continue to deteriorate in 1998. Nevertheless, it is possible that hedgers benefit from the use of derivatives in 1997, but the benefits are overcome in 1998 when some hedgers have a difficult time rolling-over their positions. Repeating the tests in columns (1) and (2) of Table 8 using 1997 data leads to the same conclusion: derivatives were not effective in relieving financial distress. In another specification, we use the level of interest coverage (continuous variable) in 1998 as a dependent variable. We find again that hedging with derivatives does not affect performance although both foreign EBIT and foreign cash are positive and significant (at the 10% level), indicating that they may both have some effectiveness as alternatives to derivatives.

We also use other alternative measures of financial condition, such as the current ratio, as the dependent variable and repeat the tests in the first two columns of Table 8. As is the case with interest coverage, we find no significant benefit to hedging with derivatives using both 1997 and 1998 data.

In our final test of the effectiveness of hedging, we examine whether changes in market-to-book values are related to the use of currency derivatives by EA firms. Changes in market-to-book can proxy for a change in a firm's growth opportunities, or alternatively, for a change in a firm's value. (Both interpretations have been used previously in the risk management literature; see Géczy, et al. (1997) and Allayannis and Weston (2001); see also Lang and Stulz (1994) for the use of market-to-book as a simple alternative to Tobin's Q to measure firm value.) The last set of results in Table 8 reports estimates from an OLS regression in which changes in market-to-book from 1996 to 1998 (FY1998 minus FY1996) is the dependent variable. Again, we find no evidence that hedging leads to higher firm value, or alternatively higher growth opportunities.

In general, this section yields two broad and complimentary conclusions. First, the evidence supports the hypothesis that hedgers are inherently more exposed to exchange rate fluctuations than nonhedgers, and as a result, their underlying value is more sensitive to changes in exchange rates in the post-crisis period. This increased exposure may be due to the inability of hedgers to completely rollover their hedges during and after the crisis when derivatives became prohibitively expensive. In this sense, the use of exchange rate derivatives is an attempt to mitigate currency risk, and hedging firms are successful to the extent that their market and financial performance is nearly indistinguishable from non-hedging firms *during* the crisis. On the other hand, if the goal of risk management was to completely insulate derivative users from a potential currency crisis, then EA firms were not successful as evidenced by the fact that their financial condition after the crisis is not better than that of nonhedgers. Consequently, if currencies in the region had continued to depreciate, it is likely that the hedging firms would have underperformed the market. We also speculate on the impact of selective hedging on performance: it could be that "under-hedging" due to selective hedging (or equivalently outright speculation) is responsible for the absence of superior performance by hedgers. In short, the best we can say is that managing exchange rate risk with derivatives did not make matters significantly worse for foreign debt users during the crisis.

5 Conclusions

In this study we analyze the exchange rate risk management practices for a large sample of East Asian non-financial corporations. Our analysis concentrates on two general questions.

First, what firm, country, and industry specific characteristics determine the extent to which firms hedge their currency exposure related to foreign debt? We document that hedging with derivatives is positively related to operating profitability (probably a proxy for credit quality) and that firms appear to use foreign cashflow as a substitute for hedging with derivatives. In contrast to empirical studies based on US companies, we find only weak evidence that liquidity constrained firms with greater growth opportunities hedge more. At the country-level, we find a powerful result that suggests firms selectively hedge. Specifically, there is a strong negative relationship between the extent of hedging and the difference between local and foreign interest rates indicating that firms are less likely to hedge when they perceive that the benefit from borrowing abroad is high.

The second question that we address concerns the performance of hedgers during the crisis. We find no evidence that hedgers outperformed nonhedgers due to the use of derivatives. This result, combined with an apparent greater underlying exposure to exchange rates, leads us to conclude that hedgers use derivatives to reduce their risk to levels similar to those of nonhedgers. However, during the crisis, the liquidity in the derivatives market declined so dramatically that hedgers had a difficult time maintaining their positions. Fortunately for hedgers, currency markets stabilized in 1998 preventing further losses from exchange rate exposure.

However, the real lesson concerning exchange rate risk management may be much larger. Hedgers and nonhedgers alike experienced massive declines in market value during the crisis period. Thus, if exchange rate risk management was an attempt to completely insulate firm value from currency depreciation, it failed. The use of foreign currency derivatives was selective, too narrow in scope, and interrupted once the crisis began. Consequently, our research raises the bigger question of whether such hedging practices can insure against systemic currency crisis.

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Appendix: Definition of Variables

Much of the data is acquired from SBC Warburg Dillon Reed from the *Valuation Issues—Reality Check* series published by the Asian equity research group. The primary purpose of the reports we use is to determine the foreign debt exposure of East Asian corporations. Some of these data are collected by direct contact with the firms in the sample. The studies' authors note that,

> "We also highlight that for Asian corporates in general disclosure is poor and transparency low. It is difficult to be confident as to the level of hedging of foreign debt that has been undertaken. Where in doubt we have taken the view to record the debt as still unhedged, which we think is an appropriate and conservative approach."

The following reports variable definitions, the primary data source for the variable or its underlying factors, and any other relevant considerations for all variables reported in one of the Tables.

Variables:

Committed Capital Expenditures – As reported by SBC Warburg Dillon Reed for the next 12 months. Each value is standardized by dividing by *Sales* as reported by Worldscope.

Current Ratio – Data are from WorldScope. The ratio of current assets to current liabilities. Current assets and liabilities are not available for 22 firms in 1998. 13 of these firms are in Indonesia and Taiwan and 4 are hedgers in 1996.

Debt-to-Assets – Total debt in USD as reported SBC Warburg Dillon Reed divided by total assets in USD as reported by WorldScope.

Exchange Rate Sensitivity and *Equity Beta* – These values are estimated coefficients from weekly regressions for each of the three sub-periods. The two independent variables are weekly exchange rate changes against the US Dollar (USD) measured in USD per foreign currency unit (FCU) and the orthogonalized equity index returns. The equity index returns are orthogonalized by taking the residuals from a regression of weekly exchange rate percent changes on the equity index returns, since these two variables were highly correlated during the crisis and post-crisis periods. Average betas are 0.83, 0.94, and 0.88 for the pre-crisis, intra-crisis, and post-crisis periods, respectively. For all subperiods combined the 10^{th} percentile is –0.02 and the 90^{th} percentile is 1.67. The exchange rate data used for Hong Kong / China is an equal-weighted average of the USD against the Thai Baht, Indonesian Rupiah, Singapore Dollar, Taiwan Dollar, and South Korean Won. Since Malaysia instituted exchange controls during the post-crisis period we use this index to calculate Malaysian exchange rate sensitivities (for only the post-crisis period).

Exchange Rate Volatility – Exchange rate volatility is calculated as the standard deviation of weekly log-differences in the USD/FCU exchange rate for each of the three sub-periods.

Equity Market Index Returns – As reported by DataStream including distributions for primary local equity indices: Hong Kong / China – Hang Seng Index; Indonesia – Jakarta Composite; Malaysia – KLSE Composite; Philippines – PSE Composite; Singapore – Strait Times Index; South Korea – Seoul Composite; Thailand – SET Composite; Taiwan – Taiwan Weighted Index.

Family Dummy (%) – Variable is set to a value of 1 (zero otherwise) if the company is identified as affiliated with a family-related cross-holding structure.

Foreign Cash (%) – As reported by SBC Warburg Dillon Reed. Calculated as the percentage of total firm cash held in foreign currency.

Foreign Cash (% total assets) – As reported by SBC Warburg Dillon Reed. Calculated as the percentage of total assets as reported by Worldscope.

Foreign Debt: Short-term / Total – As reported by SBC Warburg Dillon Reed. Nominal short-term (less than 12 month maturity) foreign debt divided by nominal total foreign debt. Both are measured in US Dollars.

Foreign Debt / Total Debt – As reported by SBC Warburg Dillon Reed. Foreign debt as measured in local currency divided by total firm debt calculated using prevailing exchange rates at the time of the report.

Foreign Debt-to-Sales – Foreign debt denominated in USD as reported by SBC Warburg Dillon Reed for 1996 divided by *Sales* in USD.

Foreign EBIT (%) – As reported by SBC Warburg Dillon Reed. The percentage of total earnings before interest and taxes (EBIT) earned in foreign currency.

Foreign EBIT (% total assets) – *Foreign EBIT (%)* multiplied by total EBIT (as reported by Worldscope) divided by total assets (as reported by Worldscope).

Foreign Sales (%) – As reported by the Asian Company Handbook for 1996. Many of the firms in our sample are not listed in the Asian Company Handbook. For these firms we collected geographical segment data when available. If a firm did not report geographical segment data or reported geographical segment data for only its home country we set the variable equal to zero. Consequently, our measure of foreign sales may underestimate the actual level of foreign sales.

Gross Margin – Total EBIT as reported by Worldscope divided by *Sales*.

Hedge (%) – As reported by SBC Warburg Dillon Reed. The percentage of foreign debt hedged with foreign currency derivatives.

Hedge (notional value as a % of total assets) – Calculated by taking the percentage of foreign debt hedged with foreign currency derivatives, *Hedge (%)*, times the total amount of foreign debt in local currency divided by total assets (as reported by Worldscope).

Hedge (dummy) – Set to a value of 1 for firms with *Hedge (%)* not equal to zero and a value of zero otherwise.

Industry Dummies – SIC codes are as reported by WorldScope for 1996. Dummy variables are set to a value of one if the first digit of the primary SIC code corresponds to the respective dummy variable.

Interest Coverage – Data are from WorldScope. Calculated as total EBIT divided by interest expense. Because some firms have very low interest expense or negative EBIT we truncate the

series at 0 and 10. For the full sample 14.3% of observations are truncated at 0 and 6.8% are truncated at 10.

Interest Rate Differential – The difference between local lending rates as reported by the World Bank and LIBOR in December 1996.

Local Debt / Assets – Local debt is from SBC Warburg Dillon Reed. The sum of short-term and long-term debt denominated in local currency divided by total assets from WorldScope.

Local Debt: Short-term / Total – As reported by SBC Warburg Dillon Reed. The ratio of short-term local currency debt and total local currency debt.

Market-to-Book – Data from WorldScope. Market Value of Equity divided by book value of common shareholders' equity defined as total assets less total liabilities less outstanding preferred stock. We truncate this variable at 20 due to 3 outlier observations (0.94% of sample).

Multiple Exchange Listing (dummy) – Variable equals 1 if the firm trades on more than one exchange and 0 otherwise.

Nondomestic Exchange (dummy) – Variable equals 1 if the firm trades on an exchange not in its home country and 0 otherwise.

Quick Ratio – Data are from Worldscope. Calculated as quick assets divided by current liabilities. Quick assets are defined as cash plus net accounts receivable.

Sales – Total revenues as reported by WorldScope. When reported in USD we use the exchange rate from Worldcope.

Figure 1
USD Exchange Rates
US dollars per foreign currency unit; weekly data; indexed to week ending July 5, 1996 = 100.

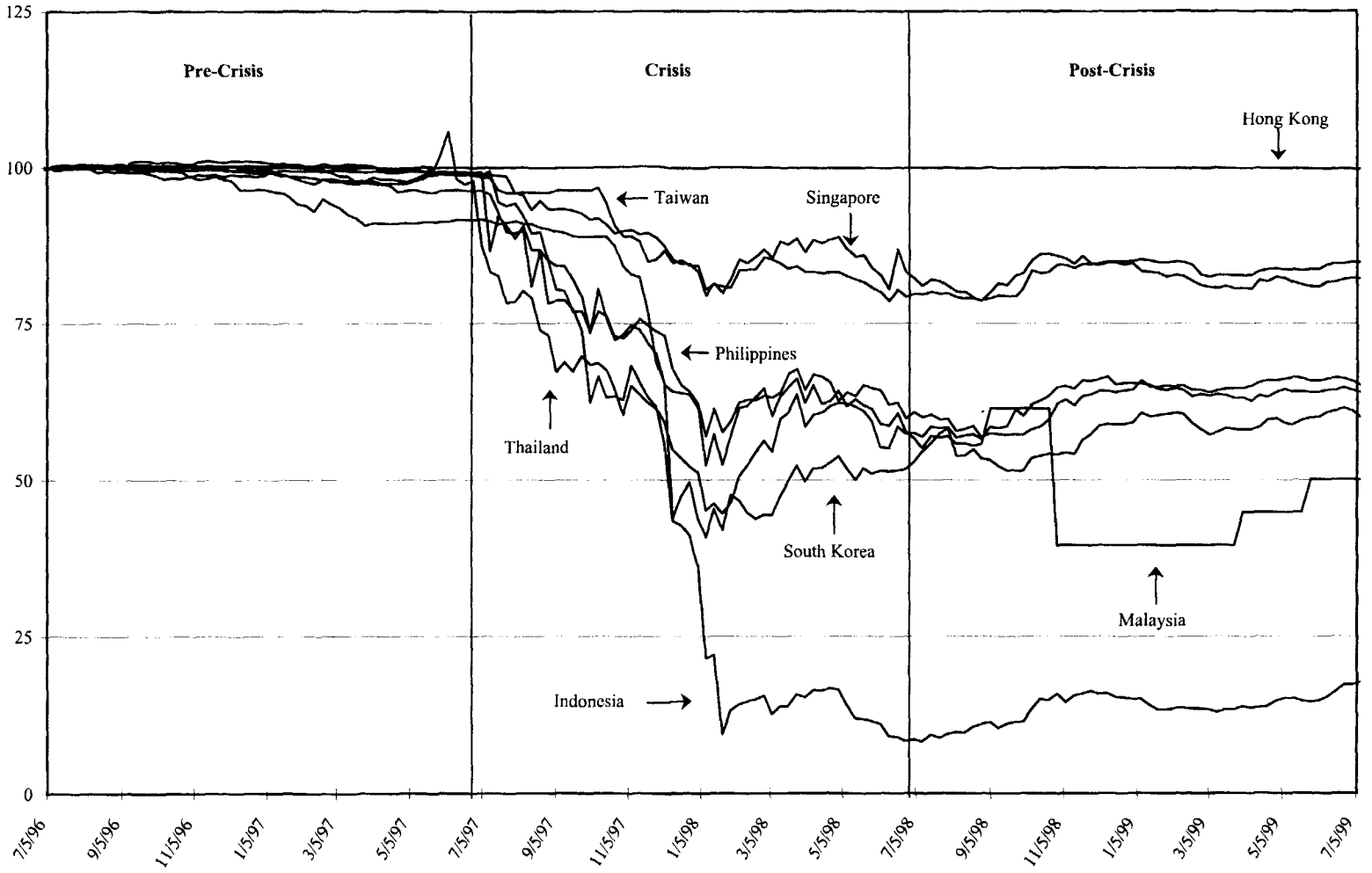

Table 1
Exchange Rate Volatility & Market Returns

Panel A reports the standard deviation of weekly percent changes in foreign exchange rates versus the USD. Panel B reports average holding-period equity index returns as reported by DataStream for the major domestic market index. The pre-crisis period is from June 29, 1996 to June 27, 1997. The crisis period is from June 28, 1997 to June 26, 1998. The post-crisis period is from June 27, 1998 to June 25, 1999. Each subperiod contains 52 weeks. Middle Income and High Income are as defined by the IMF. Aggregates are equal-weighted arithmetic means of individual countries. In Panel A, a separate aggregation is reported for middle income currencies excluding Malaysia because during the post-crisis period Malaysia instituted foreign exchange controls at several exchange-rate levels thus making the reported value for post-crisis volatility (47.8%) uninformative.

Panel A: Exchange-Rate Volatility

	Pre-Crisis	Crisis	Post-Crisis
All Countries	2.7%	35.1%	15.9%
High Income	1.2%	8.4%	4.0%
Hong Kong	0.3%	0.4%	0.2%
Singapore	2.2%	14.6%	6.6%
Taiwan	1.1%	10.3%	5.0%
Middle Income	3.6%	51.1%	23.0%
Middle Income (ex. Malaysia)	3.9%	55.4%	16.8%
Indonesia	2.0%	109.5%	35.9%
Malaysia	2.7%	33.7%	47.8%
Philippines	0.4%	27.7%	8.6%
South Korea	3.9%	50.8%	13.3%
Thailand	9.1%	33.6%	9.3%
memo: Japan	10.0%	14.6%	20.1%

Panel B: Equity Market Index Returns

	Pre-Crisis	Crisis	Post-Crisis
All Countries	-6.1%	-51.5%	75.4%
High Income	16.0%	-38.9%	50.2%
Hong Kong	39.8%	-52.8%	48.3%
Singapore	-16.7%	-38.0%	85.1%
Taiwan	24.9%	-25.9%	17.3%
Middle Income	-19.4%	-59.1%	90.6%
Indonesia	14.8%	-55.4%	50.1%
Malaysia	-9.9%	-67.4%	65.9%
Philippines	-18.9%	-44.5%	38.8%
South Korea	-20.1%	-62.8%	192.2%
Thailand	-62.9%	-65.4%	105.8%

Table 2

Summary Statistics (Means) of Sample Firms in East Asia, 1996

This table reports mean values for some of the variables used in the subsequent analysis. Firms are separated by foreign debt issuers. Data are for 1996. Variables are defined in detail in the Appendix. Firms included in the sample are those identified by SBC Warburg Dillon Read as among the largest in their respective home countries. Aggregate measures are provided for High Income and Middle Income countries (as defined by the IMF) and for all countries. Chinese "Red Chip" companies are included with Hong Kong Companies. Asterisks (***, **, *) denote statistical significance at the 1%, 5%, and 10% level (respectively) for a two-tailed Wilcoxon two-sample test. Asterisks are placed next to the value that is significantly larger.

	Foreign Debt	Obs.	Foreign Debt / Total Debt (%)	Sales (USD millions)	Debt-to-Assets	Foreign EBIT (%)	Foreign Cash (%)	Gross Margin (%)	Market-to-Book	Commit CapEx / Sales	Quick Ratio	Interest Coverage	Current Ratio
All Countries	No	125	0	687.7	0.16	16.7%	3.4%	23.0%	2.93 **	16.4%	1.62 ***	6.19 ***	2.15 ***
(excl. South Korea)	Yes	167	61.7%	1028.1	0.35 ***	20.8% **	15.7% ***	23.3%	2.37	47.8% ***	1.37	3.16	2.01
High Income	No	75	0	710.7	0.17	24.3%	3.6%	21.8%	2.47 **	19.2%	1.61 ***	6.17 ***	2.17 ***
	Yes	67	52.1%	1549.5 ***	0.29 ***	26.3% *	18.2% ***	22.2%	1.90	37.5% *	1.16	4.18	1.51
Hong Kong / China	No	26	0	593.3	0.17	16.2%	3.7%	32.2%	2.33	28.7%	2.04 ***	6.03 ***	2.29 ***
	Yes	36	53.1%	1919.7 ***	0.29 ***	18.6%	18.9% ***	30.2%	1.71	53.7% *	1.45	3.92	1.59
Singapore	No	25	0	717.9	0.17	25.2%	5.6%	19.2%	2.37	12.0%	1.31 *	5.86	1.86
	Yes	15	62.0%	826.5	0.31 ***	42.7% **	31.4% ***	15.5%	2.06	9.7%	0.85	5.07	1.37
Taiwan	No	24	0	825.5	0.16	32.0%	1.5%	13.7%	2.73 *	16.7%	1.48 **	6.64 *	2.35 *
	Yes	16	40.7%	1383.9 **	0.26 ***	28.2%	4.2% *	9.8%	2.20	26.4% **	0.75	3.95	1.44
Middle Income	No	50	0	653.7	0.14	5.3%	3.2%	24.7% **	3.61 **	12.4%	1.64 ***	6.21 ***	2.12 ***
(excl. South Korea)	Yes	100	68.1%	684.0 ***	0.39 ***	17.2% ***	14.1% ***	24.1%	2.69	54.6% ***	1.52	2.48	2.36
Indonesia	No	2	0	438.7	0.01	7.5%	32.7% *	29.7%	3.19 *	29.7%	2.78	5.49	3.16 *
	Yes	38	79.5%	624.3	0.34 ***	19.5%	20.2%	22.3%	2.17	39.2%	1.49	2.50	2.54
Malaysia	No	29	0	976.1	0.14	5.0%	0.0%	24.9%	4.08 *	7.3%	1.43 **	6.82 ***	1.78 ***
	Yes	12	46.1%	1225.9 *	0.38 ***	11.3%	6.4% *	21.1%	2.92	37.2% ***	1.28	2.71	1.46
Philippines	No	16	0	174.5	0.19	0.4%	0.0%	23.3%	2.61	21.0%	1.53	4.50	2.29
	Yes	24	59.2%	561.3	0.45 ***	12.7% **	12.1% **	31.7% *	3.21	81.8% ***	1.98	2.69	3.24
South Korea	No	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Yes	35	34.1%	6875.5	0.49	29.0%	10.0%	8.1%	0.93	11.0%	0.64	1.66	0.98
Thailand	No	3	0	235.8	0.02	33.7%	30.2%	26.6%	4.59	4.0%	3.37 ***	10.00 ***	3.86 **
	Yes	26	70.0%	634.3 **	0.41 ***	20.7%	10.7%	21.0%	2.85	60.2% *	1.34	2.14	1.88

Table 3
Determinants of Foreign Debt

This table presents results from LOGIT regressions using all sample firms except South Korean firms. The dependent variable is equal to 1 if the firm has foreign debt in 1996 (166 of 276 firms). Independent variables are defined in detail in the Appendix. Coefficients (Coef.) and standard errors (SE) are reported. Korean firms are excluded since these companies were forbidden by law from using derivatives to hedge foreign debt. Asterisks (***, **, *) denote significance in a two-tailed test at the 1%, 5%, and 10% level, respectively. P-values are from Wald chi-squared tests against a null of 0.0.

	Dependent Variable: Foreign Debt Dummy			
	(1)		(2)	
Variable	**Coef.**	**SE**	**Coef.**	**SE**
Sales (log, USD)	0.577 ***	0.185	0.194 ***	0.056
Nondomestic Exchange (Dummy)	0.482	0.463	0.020	0.417
Local Debt / Assets	-1.193	1.292	-3.365 ***	1.159
Local Debt: Short-term / Total	-1.898 ***	0.542	-1.654 ***	0.470
Foreign EBIT (%)	0.938	0.663	0.434	0.578
Foreign Cash (%)	2.475 ***	0.945	3.285 ***	0.904
Market-to-Book	-0.117	0.107	-0.179 *	0.097
Committed CapEx / Sales	1.518 **	0.641	1.532 ***	0.574
Gross Margin	0.433	0.987	0.073	0.864
Quick Ratio	-0.279 ***	0.087	-0.299 ***	0.074
Control Variables				
Interest Rate Differential			15.956 ***	4.146
Country Dummies				
Hong Kong / China	-5.982 **	2.723		
Singapore	-6.804 ***	2.663		
Taiwan	-6.939 ***	2.757		
Indonesia	-2.588	2.617		
Malaysia	-6.897 ***	2.785		
Philippines	-4.868 **	2.516		
Thailand	-3.319	2.652		
Industry Dummies				
Manufacturing	-0.457	0.717	-1.097 *	0.602
Transportation	-0.426	0.754	-0.736	0.668
Wholesale and Retail Trade	-0.467	0.761	-0.970	0.653
Services	-0.237	0.930	-0.916	0.793
Number of Observations	276		276	
% Concordant	87.2%		81.9%	

Table 4

Summary Statistics (Means) of Firms with Foreign Debt in East Asia, 1996

This table reports mean values for some of the variables used in the subsequent analysis. Firms are separated by hedgers (derivative users) and nonhedgers. Data are for 1996. Variables are defined in detail in the Appendix. Firms included in the sample are those identified by SBC Warburg Dillon Read as among the largest in their respective home countries. Aggregate measures are provided for High Income and Middle Income countries (as defined by the IMF) and for all countries. Chinese "Red Chip" companies are included with Hong Kong Companies. Asterisks (***, **, *) denote statistical significance at the 1%, 5%, and 10% level (respectively) for a two-tailed Wilcoxon two-sample test. Asterisks are placed next to the value that is significantly larger.

	Hedge	Obs.	Hedge (%)	Foreign Debt / Total Debt (%)	Sales (USD millions)	Debt-to-Assets	Foreign EBIT (%)	Foreign Cash (%)	Gross Margin (%)	Market-to-Book	Commit CapEx / Sales	Quick Ratio	Interest Coverage	Current Ratio
All Countries	No	97	0	58.7%	830.0	0.36	24.5% **	10.5%	21.4%	2.28	54.6%	1.39	3.01	2.07
(excl. South Korea)	Yes	70	66.5%	65.9% **	1299.7	0.34	15.8%	23.0% ***	26.1% *	2.50	38.6%	1.35	3.36	1.92
High Income	No	38	0	50.7%	986.6	0.30	28.3% *	9.6%	19.4%	1.88	40.3%	1.08	3.82	1.57
	Yes	29	76.0%	54.0% *	2267.6 *	0.27	23.6%	29.4% ***	25.8% *	1.93	34.0%	1.26	4.65 **	1.42
Hong Kong / China	No	19	0	56.7%	880.1	0.33 **	27.4% *	9.5%	24.8%	1.72	58.8%	1.28	3.39	1.75
	Yes	17	87.5%	49.1%	3081.5 *	0.24	8.8%	29.4% ***	36.2%	1.69	48.1%	1.65	4.51 *	1.42
Singapore	No	8	0	56.2%	894.8	0.29	28.0%	14.9%	17.7%	2.09	9.1%	0.90	4.30	1.32
	Yes	7	87.1%	68.6% **	748.6	0.33	59.4% *	50.4% ***	12.8%	2.01	10.3% **	0.79	5.95 *	1.42 **
Taiwan	No	11	0	36.3%	1262.4	0.25	30.1%	6.0% **	10.5%	1.99	29.9%	0.85 ***	4.24	1.43
	Yes	5	21.4%	50.4% *	1627.1	0.27	24.0%	0.0%	8.3% *	2.63	19.6%	0.56	3.31	1.45
Middle Income	No	59	0	63.8%	731.9	0.39	22.0% *	11.1%	22.6%	2.54	63.5% *	1.59	2.49	2.41
(excl. South Korea)	Yes	41	59.8%	74.4%	615.1	0.39	10.2%	18.5% *	26.2%	2.90	41.9%	1.42	2.45	2.30
Indonesia	No	21	0	73.8%	542.2	0.28	23.3% *	14.9%	24.1%	2.03 **	51.7% ***	1.68 **	2.52	3.14 ***
	Yes	17	59.4%	86.4% *	725.7	0.41 ***	14.8%	26.7% *	20.1%	2.34	23.7%	1.25	2.47	1.84
Malaysia	No	7	0	55.2% *	1342.1	0.37	15.1% *	10.9%	13.6%	1.95	27.4%	0.75	3.11	0.89
	Yes	5	85.2%	33.4%	1063.4	0.41 *	6.0%	0.0%	31.5% *	4.28 ***	50.9%	2.03 *	2.14 *	2.27 **
Philippines	No	20	0	56.2%	599.2	0.48	15.2% *	6.7%	27.9%	3.17	91.2%	1.96	2.79	2.51
	Yes	4	62.5%	73.9% **	372.2	0.28	0.0%	38.9% ***	50.8% **	3.41 *	34.9%	2.11 ***	2.21	9.40
South Korea	No	35	0.0%	34.1%	6875.5	0.49	29.0%	10.0%	8.1%	0.93	11.0%	0.64	1.66	0.98
	Yes	0	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Thailand	No	11	0	64.0%	946.8	0.44 *	36.2% ***	12.0%	15.7%	2.73	58.8%	1.38	1.51	1.88
	Yes	15	51.1%	74.4% *	405.1	0.39	9.3%	9.8%	25.0% *	2.93	61.2%	1.32	2.59	1.88

Table 5

Determinants of the Extent of Hedging

Results are from TOBIT regressions with the dependent variable equal to the percentage of foreign debt hedged in 1996. Coefficients (Coef.) and standard errors (SE) are reported. Only firms that had foreign debt outstanding are included in the estimation since the hedging data are for foreign debt. The dependent variable is censored at 0% and 100% (the number of firms in each group are reported in the last two rows). Reported p-values are from a Wald chi-squared test against a null of 0.0. Korean firms are excluded since these companies were forbidden by law from using derivatives to hedge foreign debt. Foreign Debt is the inverse Mills ratio from the LOGIT estimation in Column (1) of Table 3. Other independent variables are for 1996 and are defined in detail in the Appendix. Asterisks (***, **, *) denote significance in a two-tailed test at the 1%, 5%, and 10% level, respectively.

	Dependent Variable: Percent of Foreign Debt Hedged					
	(1)		**(2)**		**(3)**	
Variable	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Foreign EBIT (%)	-0.559 *	0.327	-0.663 **	0.330	-0.771 **	0.323
Foreign Cash (%)	0.808 **	0.367	0.307	0.390	0.041	0.340
Sales (log, USD)	0.058	0.090	-0.121	0.100	-0.148 *	0.091
Nondomestic Exchange (Dummy)	0.114	0.254	0.147	0.248	0.143	0.224
Foreign Debt / Total Debt	0.396	0.397	0.326	0.362	0.413	0.356
Debt-to-Assets	-0.965	1.010	-0.186	0.969	0.161	0.923
Gross Margin	1.907 ***	0.570	1.673 ***	0.584	1.435 ***	0.535
Market-to-Book	-0.081	0.136	0.027	0.134	0.065	0.127
Committed Capital Expenditures	-0.082	0.145	-0.194	0.176	-0.265 *	0.160
Quick Ratio	-0.137 ***	0.048	-0.092 **	0.044	-0.081 *	0.043
Market-to-Book * Debt-to-Assets	0.223	0.340	0.129	0.329	0.074	0.313
Intercept	-1.126	1.343			0.805	1.263
Control Variables						
Foreign Debt (Inverse Mills Ratio)	0.135	0.503	0.843	0.724	1.297 ***	0.533
Interest Rate Differential					-13.941 ***	3.321
Country Dummies						
Hong Kong / China			0.562	1.341		
Singapore			0.776	1.316		
Taiwan			0.507	1.354		
Indonesia			0.022	1.264		
Malaysia			1.184	1.381		
Philippines			-0.946	1.289		
Thailand			0.552	1.271		
Industry Dummies						
Manufacturing			0.133	0.354	0.011	0.339
Transportation			-0.520	0.379	-0.485	0.373
Wholesale and Retail Trade			0.722 **	0.370	0.581 *	0.357
Services			-0.868	0.543	-0.977 *	0.550
Number of Observations	166		166		166	
Left Censored	97		97		97	
Right Censored	19		19		19	

Table 6

Comparison of Hedgers and Nonhedgers

This table reports median values for differences between firms that hedge and firms that do not hedge for three variables: excess equity returns (first block), domestic equity betas (second block), and exchange rate sensitivities (third block). Excess equity return is defined as the holding period return for each company in the sample minus the domestic market index holding return. Exchange rate sensitivities and domestic equity betas for each firm and sub-period are coefficients from a linear regression with weekly firm market returns as the dependent variable and weekly domestic equity index return and percent changes in the domestic currency against the US Dollar as independent variables (corrected by standard errors). Because these two variables are highly collinear, domestic equity index returns are residuals from a regression of weekly percent changes in the domestic currency against the US Dollar on the domestic equity index returns. This orthogonalization has little effect on the estimated equity betas and increases the explanatory power of exchange-rate changes. See the Appendix for details. The crisis period is from June 28, 1997 to June 26, 1998. The post-crisis period is from June 27, 1996 to June 25, 1997. Each subperiod contains 52 weeks. "Hedgers / Nonhedgers" reports the number of firms in each category. Asterisks (***, **, *) denote significance in a two-tailed Wilcoxon two-sample test at the 1%, 5%, and 10% level respectively.

		Difference in Median Excess Equity Return (Hedgers - Nonhedgers)				**Difference in Median Domestic Equity Beta** (Hedgers - Nonhedgers)				**Difference in Median Exchange-Rate Sensitivity** (Hedgers - Nonhedgers)			
	Hedgers /	Crisis		Post-Crisis		Crisis		Post-Crisis		Crisis		Post-Crisis	
	NonHedgers	Difference (%)	p-val	Difference (%)	p-val	Difference	p-val	Difference	p-val	Difference	p-val	Difference	p-val
All Firms	70 / 97	2.2%	0.569	13.9% **	0.040	-0.043	0.435	-0.024	0.857	-0.030	0.717	0.214 *	0.086
High Income	29 / 38	1.2%	0.481	3.5%	0.179	-0.257	0.382	0.081	0.828	-0.169	0.869	0.426	0.196
Hong Kong / China	17 / 19	33.2%	0.204	21.2%	0.125	-0.322	0.797	0.006	0.573	-0.746	0.824	-0.568	0.443
Singapore	7 / 8	-4.5%	0.776	-25.5%	0.776	-0.098	0.909	-0.121	0.400	-0.077	0.909	-0.556	0.400
Taiwan	5 / 11	0.7%	0.738	37.4%	0.161	-0.124	0.275	0.160	0.656	-0.122	0.507	1.624 **	0.016
Middle Income	41/59	-9.7%	0.317	20.8% *	0.074	0.028	0.941	-0.144	0.862	0.322	0.522	0.281 *	0.096
Indonesia	17 / 21	2.6%	0.751	18.3%	0.576	-0.315	0.225	0.013	0.391	0.397	0.497	0.474	0.273
Malaysia	5 / 7	1.4%	0.980	20.0%	0.636	0.202	0.873	-0.215	0.909	1.120	0.874	0.526	0.187
Philippines	4 / 20	-24.5%	0.242	30.1% *	0.082	0.329	0.188	0.088	0.789	2.643 **	0.017	2.400 **	0.014
Thailand	15 / 11	-7.8%	0.309	-7.8%	0.359	0.172	0.386	-0.161	0.837	0.824	0.158	-0.176	0.474

Table 7
Hedging and Market Returns

This table reports results from OLS regressions with firms' excess equity returns as the dependent variables. Excess equity return is defined as the holding period return for each company in the sample minus the domestic market index holding return. The first set of coefficients reports results from a regression using equity returns for the crisis period (June, 28 1997 to June 26, 1998). The second set of coefficients reports results from a regression using equity returns for the post-crisis period (June, 27 1998 to June 25, 1999). Explanatory variables are defined in detail in the Appendix. All results exclude South Korean firms because they were prevented by law from hedging foreign debt. Asterisks (***, **, *) denote significance in a two-tailed test at the 1%, 5%, and 10% level, respectively.

	Dependent Variable: Excess Equity Returns			
	(1) Crisis		**(2) Post-Crisis**	
Variable	**Coef.**	**SE**	**Coef.**	**SE**
Hedge (notional value as % of total assets)	-0.527 *	0.296	1.421 *	0.766
Foreign EBIT (% total assets)	1.125 ***	0.443	0.489	1.149
Foreign Cash (% total assets)	-0.070	0.070	-0.047	0.182
Debt-to-Assets	-0.084 ***	0.028	0.035	0.074
Foreign Debt / Total Debt	-0.128 **	0.066	-0.141	0.172
Exchange Rate Sensitivity	-0.072 ***	0.013	0.064 *	0.034
Equity Beta	-0.302 ***	0.042	-0.031	0.109
Change in Sales (log-difference)	0.136 *	0.074	0.010	0.192
Change in Gross Margin	0.217 ***	0.061	-0.152	0.157
Quick Ratio	0.014	0.013	-0.065 *	0.034
Sales (log, US)	0.049 **	0.020	0.041	0.052
Nondomestic Exchange (Dummy)	-0.118 **	0.056	0.169	0.146
Control Variables				
Country Dummies				
Hong Kong	-0.192	0.329	-1.159	0.852
Singapore	-0.685	0.433	-0.612	1.121
Taiwan	-0.091	0.315	-1.089	0.817
Indonesia	-0.248	0.343	-1.154	0.889
Malaysia	-0.217	0.294	-0.885	0.763
Philippines	-0.385	0.355	-1.092	0.921
Thailand	-0.339	0.343	-0.863	0.888
Industry Dummies				
Manufacturing	0.079	0.076	0.156	0.197
Transportation	0.154 *	0.082	0.153	0.212
Wholesale and Retail Trade	0.081	0.082	0.210	0.212
Services	0.048	0.097	0.227	0.251
Number of Observations	253		246	
Adjusted R^2	52.1%		7.9%	

Table 8
Hedging and Firm Performance

This table reports estimates from regressions with interest coverage and market-to-book as the dependent variables. The first column shows results from an OLS specification with changes in interest coverage from 1996 to 1998 as the dependent variable. The second assumes interest coverage is a proxy for financial distress and the dependent variable is set to a value of 1 if interest coverage is greater than 1.0. The model is estimated using LOGIT. The third column reports results from an OLS specification with changes in market-to-book from 1996 to 1998 as the dependent variable. Independent variables are defined in detail in the Appendix. Asterisks (***, **, *) denote significance in a two-tailed test at the 1%, 5%, and 10% level respectively.

	(1)		(2)		(3)	
	OLS: Dep. Variable = Interest Coverage (1998) - Interest Coverage (1996)		LOGIT: Dependent Variable = 1 if Interest Coverage 1998 >1		OLS: Dep. Variable = Market-to-Book (1998) - Market-to-Book (1996)	
Variable	**Coef.**	**SE**	**Coef.**	**SE**	**Coef.**	**SE**
Hedge (not. value as % of tot. assets)	4.532	3.130	-1.358	2.227	-2.353	2.798
Foreign EBIT (% total assets)	4.266	4.731	4.416	5.258	4.666	4.230
Foreign Cash (% total assets)	0.465	0.747	1.140	3.532	-0.584	0.668
Debt-to-Assets	0.249	0.302	-0.487 **	0.233	0.520 *	0.270
Foreign Debt (%)	-1.929 ***	0.718	-1.240 **	0.557	0.908	0.642
Change in Sales (log-difference)	0.829 **	0.410	0.463	0.311	-0.124	0.367
Change in Gross Margin	-0.424	0.567	0.789	0.605	-0.467	0.507
Nondomestic Exchange (Dummy)	0.657	0.605	-0.243	0.446	0.083	0.541
Control Variables						
Country Dummies						
Hong Kong / China	-1.877 **	0.899	1.844 ***	0.739	-1.776 **	0.804
Singapore	-2.617 ***	1.017	0.294	0.765	0.156	0.909
Taiwan	-3.291 ***	0.939	0.569	0.691	-2.733 ***	0.839
Indonesia	-2.647 ***	1.045	2.637 ***	0.984	-3.637 ***	0.935
Malaysia	-2.479 ***	0.927	0.589	0.701	-1.600 **	0.829
Philippines	-2.601 ***	0.966	0.294	0.707	-0.900	0.864
Thailand	-0.603	0.992	1.863 **	0.769	-1.976 **	0.887
Industry Dummies						
Manufacturing	0.584	0.829	0.786	0.634	0.514	0.741
Transportation	0.688	0.884	0.417	0.673	0.435	0.790
Wholesale and Retail Trade	0.387	0.868	0.201	0.661	1.152	0.776
Services	0.583	1.050	0.260	0.773	0.535	0.939
Number of Observations	242		242		242	
Adjusted R^2 / % Concordant	29.1%		74.8%		13.9%	

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