The Asian Crisis and the Mystery of the Missing Balance Sheet Effect

Pipat Luengnaruemitchai*
Economics Department
University of California, Berkeley

October 2, 2003

Preliminary and Incomplete–All Comments Welcome

Abstract

The negative balance sheet effect of currency depreciation is believed to play an important role in the development of economic crises. However, a series of firm-level studies have failed to discover evidence of this negative effect. This paper uses a sample of non-financial firms in Asia, a region where the importance of the balance sheet effect is believed to be prominent. I find three pieces of evidence supporting the view that the negative balance sheet effect from the currency depreciation on firms with foreign currency debt was not very strong in the Asian crisis. First, there is not a strong negative investment response on firms with foreign currency debt as predicted by the net worth model; if anything, the effect is positive. Second, firms with more revenue in foreign currency have more foreign debt. This suggests that firms in the sample match their foreign currency debt with their stream of foreign income. Third, firms with foreign debt are more profitable relative to other firms during the crisis. The firms with foreign currency debt are those who benefit from the currency depreciation, presumably by exporting. I explain these results by developing a model of optimal hedging by a firm that can choose the currency composition of the external finance that funds its investment.

*Email: lpipat@econ.berkeley.edu. I thank Professor Barry Eichengreen for his continuous support, encouragement, and valuable comments. I appreciate helpful comments from Maurice Obsfeld, James Wilcox, Roger Craine, and Janet Yellen. I also thank Julian di Giovanni for helpful discussions. All remaining errors are mine. Financial support from Anandamahidol Foundation is much appreciated.

1 Introduction

The recent literature on currency crises based on the so-called "third-generation models" (Aghion et al., 2001b; Krugman, 1999) focuses on the negative net worth, or balance-sheet, effects of currency depreciation on economies with large amounts of foreign currency-denominated debt. According to this literature, the contractionary effect resulting from damage to balance sheets could offset the expansionary effect of currency depreciation traditionally assumed in textbook models.

In the recent Asian crisis, this negative balance sheet effect is believed to have be strong. Asian economies were highly leveraged by the international standards (see table 1) Excessive reliance on foreign currency debt and currency mismatch in the corporate sector have been widely accepted as one of the important factors contributing to the vulnerability of the region's economies. As currencies depreciated, the adverse effect on the debt burdens of firms holding foreign currency debt diminished the market confidence and exacerbated the currency's decline (Goldstein, 1998).

However, most empirical evidence supporting this argument is at the aggregate level[1]. These aggregate measures tell us little about the effects of currency mismatch at the firm level. The lack of firm-level data on foreign debt and currency exposures makes it hard to draw any conclusion about the balance sheet effect. This paper is an attempt to fill this gap and to better understand the effect of currency depreciation on firms with foreign currency debt.

Theoretically, exchange rate changes have ambiguous effects on economic activity. The effects have been the subject of considerable attention in the recent theoretical studies. Currency depreciation is assumed to have expansionary effects in standard

[1]For example, Goldstein (1998) uses the ratio of short-term debt to international reserves and the net foreign assets of the banking system to M2 as a measure of liquidity/currency mismatch.

macroeconomic models (e.g. Mundell-Fleming model). Nevertheless, there is a growing theoretical literature on the 'third generation' of currency crises arguing that the depreciation is contractionary. One of the key mechanisms of these models is the deterioration of balance sheets caused by the currency depreciation. Currency depreciation leads to an increase in the debt burden of firms with net liabilities in foreign currency and hence a reduction in their net worth. (Aghion et al., 2001b; Krugman, 1999). The investment literature suggests that a reduction in a firm's net worth will increase the firm cost of capital and, as a result, reduce investment spending (Hubbard, 1998).

These theoretical studies are not yet supplemented, however, by much empirical support. A series of studies, using different firm-level data sets, have failed to discover evidence of the negative balance sheet effect. In the study closest in spirit to this one, Bleakley and Cowan (2002) use a sample of Latin American firms from the period 1992 to 1999. They find that firms with foreign currency denominated debt have higher investment spending relative to other firms following episodes of currency depreciation. Specifically, they find a significantly positive relationship between investment and lagged dollar debt interacted with exchange rate changes. The results are robust to the inclusion of controls for preexisting firm differences and macroeconomic variables.[2]

This result is counterintuitive and the opposite of what one would expect from simple net-worth models. The authors argue that this result is due to an "omitted variables" story: The coefficient on the interaction between the foreign debt and exchange rate changes is positively correlated with investment opportunities that arise from changing relative prices, i.e. firms match their currency composition of debt with the elasticity of income to the exchange rate. In the other words, firms with dollar denominated debt

[2]However, the Inter-American Development Bank (2002) comments that the study has "serious problems" in sample composition and coverage as more than half of the sample firms are from Brazil where the level of liability dollarization is low, and it includes a small number of observations during Mexico's Tequila crisis when balance sheet effects were most probably strong.

are the firms that are more likely to benefit from the depreciation. The benefits may outweigh the negative effect from the depreciation. Subsequent studies have confirmed this result. Fuentes (2003) uses a sample of Chilean firms with detailed data on the currency composition of their debt. He finds a positive relationship between the investment rate and the interaction between currency depreciation and long term debt, and a negative coefficient of the interaction between currency depreciation and short term debt. He conjectures that this indicates that firms contracting long-term dollar debt are the ones who benefit from a lower value of the domestic currency. A few studies, however, reaches opposing conclusion. For example, Aguiar (2002) using a sample of Mexican firms in the 1990s finds that firms with large exposure to short-term foreign debt before the crisis show a marked drop in investment after the devaluation.

In this study, I use a sample of non-financial firms in seven Asian economies, whose currencies depreciated considerably during the 1997-1998 crisis (see figure 1). Compared to other developing countries, balance sheet effects in Asia are believed to have been especially prominent. As shown in table 1, the private nonguaranteed external debts normalized by GDP of the five countries in East Asia were about twice as much as those of Latin American countries in the 1990s, the period prior to the Latin American and Asian crises.

To study the effect of currency depreciation on firm behavior, I model the firm's investment decision. The model is motivated by the standard investment literature and adds an exchange rate component. It highlights how exchange rate changes can affect the firm's investment spending through the two channels, competitiveness and net worth effects, that potentially offset one another. On the one hand, currency depreciation makes the firm more competitive and increases the marginal profitability of capital. On the other hand, exchange rate depreciation increase debt burdens in local currency for

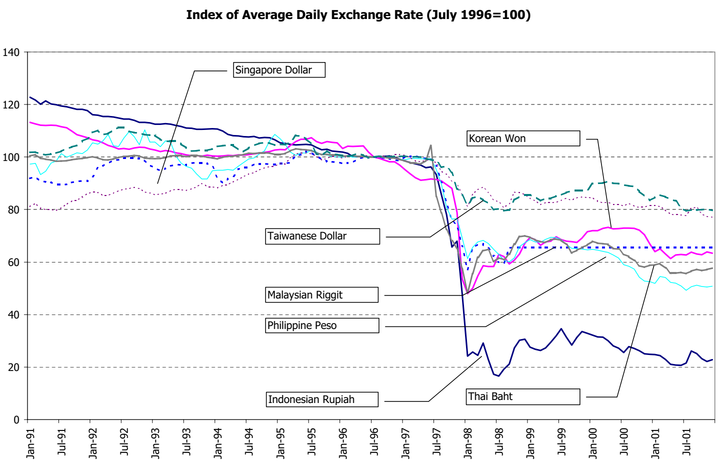

Figure 1: Index of Average Daily Exchange Rates (July 1996=100)

the firms with foreign currency debt. This increased debt burden lowers the firm's net worth and raises the risk premium it has to pay in order to raise new capital. This reduces the firm's investment spending.

I also model the firm's optimal hedging problem when it must commit on foreign currency debt before investing. The model builds on the risk management model by Froot et al. (1993). It illustrates the tradeoff between the benefits and costs of having foreign currency debt. I show that even if borrowing in foreign currency is not cheaper in expectation, it is still optimal for a firm whose revenue is correlated with the exchange rate to incur foreign currency debt. Given a concave payoff function in net worth, the firm is better off hedging its net worth against the exchange rate uncertainty.

Combining the accounting data from WorldScope database and the survey data of SBC Warburg Dillon Read, I create a unique dataset, which allows me to study a question that cannot be answered by the aggregate information or accounting data.

Using this sample, I find three consistent pieces of evidence supporting the argument that negative balance sheet effect in the Asian crisis were not as strong as asserted in the previous accounts. First, considering the corporate investment rate, I fail to find a strong negative effect of currency depreciation on investment through the net worth channel as predicted by the literature on balance sheet effects. Instead, after controlling for standard determinants of investment, I find that firms holding foreign currency debt increase their investment more than other firms following currency depreciation. These results are robust with respect to specification and bias adjustments. Second, consistent with my model of optimal hedging, I find that firms generating more income in foreign currency have more foreign currency debt. In the other words, firms in the sample naturally hedge their currency exposure by matching their foreign currency liabilities with streams of future income in foreign currency. These evidence seems to suggest that the currency mismatches were less of a problem at the non-financial firms in the sample. This is consistent with the results documented by Esho et al. (2001) Allayannis et al. (2002), Keloharju and Niskanen (2001), and Esho et al. (2001)[3]. Third, after controlling for the firm differences, I find that the firms with foreign currency debt experienced a larger increase (or a smaller decline) in *operating profits* (net income before income tax, interest expenses and other extraordinary items) than other firms during the crisis.

Thus I conclude that because Asian with foreign currency debt naturally hedged their foreign exchange exposures by matching income in foreign currency with the foreign currency debt, currency depreciation did not *directly* hurt them as much as one might have expected. They were even some that benefit from the currency depreciation. On average, firms were not adversely affected by the negative balance sheet effect just

[3]Using a sample of international syndicated loans issued by firms in Asia, Australia and New Zealand, Esho et al. (2001) find a positive relationship between the foreign currency debt and the firms' share of foreign sales, although the coefficient is not significant when only the Asian firms are included in the sample.

because they hold foreign currency debt when the exchange rates collapse. To be sure, there are firms in Asia, which incur a large amount of foreign debt with a currency mismatch problem. These firms may borrow in foreign currency without any exposure in foreign currency. They might be adversely affected by the currency depreciation. However, data suggest that they are not a good representative of firms in the sample.

Nevertheless, I do not imply that the currency depreciation do not hurt the corporate sectors in Asia. In fact, the currency depreciation can affect firms through other channels, including the credit crunches caused by the problems in the banking sector, and the fall in demand caused by the wealth effects. The banking sector is particularly important source of external finance for corporate sector in these economies. In the period prior to the crisis, the banking sector held a substantial amount of debt in foreign currency. With economic crises and large currency depreciation, banks found themselves with lower capital, causing them to pull back their loans. This induces the economy-wide credit crunches. In addition, economic crisis and currency depreciation caused a crash in asset prices and aggregate wealth of the economy. This led to a large drop in demand for goods and services. The liquidity crunches by the banks and the drop in demand affected firms whether they have foreign debt or not. Together with the fact that the firms with foreign currency debt benefited by the currency depreciation, these may explain why we do not find a strong negative balance sheet effect on firms with foreign currency debt in the data.

This paper revisits the issue of the effect of currency depreciation on a firm's investment decisions in emerging markets. The crisis episodes in Asia provide good case studies for this issue. Using this new dataset allows us to better understand the balance sheet channel of currency depreciation. The result also shed some light on the tradeoff between interest rate and exchange rate policies in managing economic crises.

The paper is organized as follows. Section 2 reviews the literature about the channels through which currency depreciation affect firms' balance sheets and the determinants of currency composition of debt. Section 3 develops a simple theoretical framework of how exchange rate changes affect the firm-level investment from standard investment models and how this relates to the investment literature. Section 4 describes the data set used in this study and presents the empirical results. Section 5 proposes an alternative model treating choice of foreign currency debt as endogenous and provides some corollary evidence supporting the matching hypothesis. Section 6 concludes.

2 Literature Review

2.1 Competitiveness Effects

Exchange rate changes affect firms and economy by altering the relative prices of goods and service internationally. By lowering the relative price of exports and imports, currency depreciation improves the competitiveness of local goods. A firm's revenues from foreign markets can be affected through a valuation channel and a volume channel (Clarida, 1997). Through the valuation channel, any exchange rate depreciation that is not fully passed through to the foreign currency price will result in an increase in the local currency value of export sales for any given volume of exports. Via the volume channel, any exchange rate depreciation that is at least partially passed through will lower the foreign currency price of export and thus increase exports. At the same time, the currency depreciation raises costs of production if imported inputs are required. Not only does the depreciation affect the firms with foreign transactions, it also changes the competitive landscapes and market structures of local firms.

A number of studies have sought to demonstrate that currency depreciation increases firms' profits. For example, Clarida (1997) uses aggregate data to study the effect of exchange rate changes on U.S. manufacturing profits and finds a significant positive relationship between the two variables. Other studies examine the effects of currency depreciation on investment behavior. Goldberg (1993) studies the effect of exchange rates on investment activity in U.S. industries in the 1980s. He finds that dollar depreciation is associated with investment contractions. Campa and Goldberg (1995) use a measure of external exposure, which includes each industry's share of export sales and imported inputs, to explore the linkage between exchange rates and investment in U.S. industries. They find that investment in low price-over-cost markup sectors are more responsive to exchange rate changes. Campa and Goldberg (1999) study the effect of exchange rate changes on investment at the two-digit level of industrial aggregation in Canada, Japan, United Kingdom and United States. They find that the magnitude of these effects are increasing in an industry's export share and decreasing in its imported input share. The effects also vary with industry's market power as measured by markups. Nucci and Pozzolo (2001) use a similar framework to investigate the relationship between exchange rate fluctuations and the investment decisions of a sample of Italian manufacturing firms and find similar results. Forbes (2002) examines the effect of large depreciations on firms' performance in 12 countries and finds that firms with a higher share of foreign sales exposure have significantly better performance and firms with higher debt ratios tend to have lower net income growth.

2.2 Net-Worth Effects

The recent literature on the third generation model of currency crises, pioneered by Krugman (1999) and summarized in models by Céspedes et al. (2000) and Aghion et al. (2001a), focuses on the deterioration of firms' balance sheets as a result of currency depreciation. In these models, informational asymmetries, costly monitoring, and moral hazard lead to imperfect substitutability between internal and external funds. The premium on external funds depends inversely on a borrower's net worth. Because when the borrower has little wealth to contribute to a project, the potential divergence of interests between the borrower and supplier of external funds are greater. Agency costs increase as a result. The suppliers of funds require a higher premium to compensate for the higher agency costs (Bernanke et al., 1998). If the firm's debt is denominated in foreign currency, currency depreciation reduces the firm's net worth as the value of debt in local currency is inflated and hence increases its risk premium.[4] This reduces the availability of funds for the firm to invest.[5] The key intuitions from these models include (1) uncollateralized external financing is more costly than internal financing; and (2) holding constant investment opportunities, a reduction in net worth reduces investment for firms facing information costs.

Investment has also been used in recent research on empirical macroeconomics to study the imperfections in financial systems. In particular, there is a large literature asking whether firms with free access to capital markets have different investment behavior than those who do not[6]. These studies help explain why firms facing liquidity constraint may invest less than their optimal level of investment. These studies, pioneered by Fazzari et al. (1988), attempt to group firms according to whether they belong to high information cost or low information cost categories, and test whether according to *a priori* grouping, the high information cost firms are more "constrained" than the low information cost firms or not. In principle, a value maximizing firm's optimal capital

[4]See Céspedes et al. (2000).

[5]See Hubbard (1998) for a summary about the link between the net worth and investment spending in the model of informational imperfections.

[6]See Chirinko (1993), and Bond and Van Reenen (2002) for reviews of the literature on microeconomic investment models, and the effect of capital market imperfection on investment.

stock is captured by the value of marginal q, which is a sufficient statistic summarizing the firm's investment opportunity. If financial frictions are unimportant (the firm is not financially constrained), internal and external financing are perfect substitutes, and information about changes in net worth should be irrelevant for the investment decision. Hence, a change in net worth should have no direct effect on investment, holding q constant. Most empirical studies use a firm's cash flow as a proxy for the change in net worth and Tobin's Q (the market value of the firm's capital) as a proxy of the marginal q. The grouping criteria employed by these studies are based on characteristics of a firm that are related to the degree of asymmetric information problem. These criteria include dividend payout ratio, size, age, association with industrial groups, and whether the firm's bond is rated by rating agencies. Recent studies use switching regression to group the firms into different regimes statistically rather than arbitrarily (Hu and Schiantarelli, 1998; Hovakimian and Titman, 2003).

2.3 Currency Composition of Debt

Another related branch of literature is the studies on currency composition of debt. Most of the studies in this area were focused the currency composition of sovereign debt. The main conclusion of this literature is that the foreign currency debt is a solution to time consistency problem of monetary policy (see, for example, Bohn (1990)). Not until recently did the currency composition of private debt receive much attention in the literature. An influential paper by Eichengreen and Hausmann (1999) leads to a series of papers asking why developing countries cannot borrow in its own currency, the situation also known as the "original sin" of international finance. In these studies, foreign currency debt arises because of several reasons including[7] moral hazard created

[7]See Jeanne (2003) and Caballero and Krishnamurthy (2003) for reviews of the literature on this issue.

by bailout guarantees (Burnside et al., 2001), the underdevelopment of financial sector (Caballero and Krishnamurthy, 2003), signaling problems at the domestic firms (Jeanne, 2000), and the lack of credibility in domestic monetary policy (Jeanne, 2003).

This paper tries to add to this literature by focusing on the role of foreign currency debt as a risk management instrument. The firm may want to borrow in foreign currency ro manage their exposure if their profit is positively correlated with the exchange rate changes. I also present a model, which supports this matching hypothesis story.

3 Theoretical Framework

In this section, I present a model of firm-level investment motivated by standard investment literature to explain how exchange rate changes affect firm's investment behavior.

Suppose a firm chooses investment I to maximize expected present value of future dividends V. I assume that capital K, the only quasi-fixed factor of production, is subject to depreciation rate δ, and that the cost of installing new capital, $\psi(I_t, K_{t-1})$ is increasing and convex in investment, I_t and decreasing in capital stock at the beginning of the period, K_{t-1}. Specifically, I assume that the investment adjustment function is of the form $\psi(I_t, K_{t-1}) = \frac{\chi}{2}\left(\frac{I_t^2}{K_{t-1}}\right)$.

For simplicity, assuming that the firm does not issue new shares and the firm does not hedge their foreign liabilities, the firm's cash flow identity can be written as

$$\begin{aligned} d_t = \; & \pi_t(K_{t-1}; e_t) - \psi(I_t, K_{t-1}) - I_t \\ & - i_{t-1}B_{t-1} - e_{t-1}i^*_{t-1}B^*_{t-1} - (e_t - e_{t-1})B^*_{t-1} \\ & + (B_t - B_{t-1}) + (e_tB^*_t - e_{t-1}B^*_{t-1}) \end{aligned} \quad (1)$$

where d_t is the firm's dividend payment at time t, $\pi_t(K_{t-1}, e_t)$ is the maximized profit function at time t, taking as given the beginning-of-period capital stock, K_{t-1}, and the exchange rate, e_t. The terms in the second line represent, in local currency, the interest expense from local currency debt, expense from debt in foreign currency, and the exchange loss from holding debt denominated in foreign currency. Items on the last line are net cash flows from domestic and foreign bonds. Note that sum of the last terms on the second and the third line is net new cash flows from foreign bonds, $e_t(B_t^* - B_{t-1}^*)$ if the firm were to refinance its foreign debt every period.

Managers chooses the optimal paths of investment and how much to borrow to maximize the value of the firm at time t, which is given by

$$V_t = \max_{\{I_{t+s}, B_{t+s}, B_{t+s}^*\}_{s=0}^{\infty}} d_t + \mathrm{E}_t \left[\sum_{s=1}^{\infty} \left[\prod_{j=1}^{s} (1 + r_{t+j-1})^{-1} \right] d_{t+s} \right] \tag{2}$$

subject to

$$d_t \geq 0 \tag{3}$$

$$K_t = (1 - \delta) K_{t-1} + I_t \tag{4}$$

where r_t is the required rate of return from holding a share of the firm from time t to $t+1$, and E_t is the expectation operator conditional on information at time t. For simplicity, I assume that exchange rate is the only source of uncertainty.

Because of the non-negativity of dividends, holding cash flow (i.e. profits) constant, the firm can increase investment spending only if it can acquire external finance. Therefore, if the currency depreciates and the firm is subject to the liquidity constraints and cannot borrow as much as it wishes, the firm may not be able to invest at its optimal level.

I assume that risk-neutral debt holders demand an "external finance premium" on bonds issued in domestic and foreign currencies such that the gross required rate of return on debt from period t to $t+1$ is,

$$1 + i_t = (1 + r_t)(1 + \nu_t) \tag{5}$$

where r_t is the risk adjusted interest rate. The external finance premium (ν_t) depends on, among other things, the company's net worth (or, alternatively, debts to capital ratio), e.g. $\nu_t = \nu\left(\frac{B_{t-1}+e_t B^*_{t-1}}{K_{t-1}}, ...\right)$, where $\nu(\cdot)$ is increasing and convex in total debt. Similarly, interest rate paid on foreign currency debt is $1 + i^*_t = (1 + r^*_t)(1 + \nu_t)$.[8,9] This is one of the key assumptions in this set up allowing exchange rate changes to affect investment through the net worth effect.

3.1 Unconstrained Optimal Investment Path

In this section, I assume that the firm is not subject to liquidity constraint (i.e. it can borrow as much as it wants at a constant market interest rate) and non-negative dividend constraint (3) is not binding (i.e. the firm can always borrow to absorb any negative shock and finance the optimal investment spending). The first-order conditions for (2) subject to (4) are

$$\begin{aligned} 0 &= -\left(\frac{\partial\psi(I_t, K_{t-1})}{\partial I_t} + 1\right) + \left(\frac{1}{1+r_t}\right) \mathrm{E}_t\left[\left(\frac{\partial\Pi_{t+1}(K_t; e_{t+1})}{\partial K_t} - \frac{\partial\psi(I_{t+1}, K_t)}{\partial K_t}\right)\right. \\ &\quad \left. +(1-\delta)\left(\frac{\partial\psi(I_{t+1}, K_t)}{\partial I_{t+1}} + 1\right)\right] \qquad (6) \\ 1 + i_t &= (1 + i^*_t) + \mathrm{E}_t\left[\frac{e_{t+1} - e_t}{e_t}\right] \qquad (7) \end{aligned}$$

Condition (6) is an investment Euler equation. It states that if a firm's planned investment path is optimal, it will not benefit from raising its installed capital plan by a

[8]For example, the finance premium can take a form of $\nu(x) = \max(0, ke^x - c)$ where k and c are constant parameters. That is, the external finance premium is greater than zero when the company total debts to capital exceed a certain level c (or equivalently when net-worth falls below a certain level). k represents the marginal information costs; the higher are the costs, the steeper is the premium.

[9]Because the risk premium is a function of firm-specific variables, the firm is subject to the same risk premium for both domestic and foreign borrowing.

unit on date t (at marginal cost of $\frac{\partial\psi(I_t,K_{t-1})}{\partial I_t}+1$, enjoying a higher marginal product and lower investment cost on date $t+1$ of $\frac{1}{1+r_t}\left(\frac{\partial\pi_{t+1}(K_t;e_{t+1})}{\partial K_t}-\frac{\partial\psi(I_{t+1},K_t)}{\partial K_t}\right)$ and then disinvesting the above-plan unit of capital at the end of $t+1$—a net marginal revenue of $\frac{1}{1+r_t}(1-\delta)\left(\frac{\partial\psi(I_{t+1},K_t)}{\partial I_{t+1}}+1\right)$ (Obstfeld and Rogoff, 1996). FOC (7) is the uncovered interest parity condition. It states that the firm will choose to borrow until interest rate paid in local currency equal to interest rate paid in foreign currency plus expected depreciation rate.

It should be noted that since under this framework we do not explicitly model the determinants of foreign currency debt rather than the interest rates, we will only get corner solutions. The firm will either borrow in local currency or in foreign currency depending on interest rates the firm is facing. Another argument why the firm wants to have foreign currency debt is the risk management story. The firm may want to hedge their exposure of future revenue in foreign currency by foreign currency debt. However, it is not possible to add the element of hedging this setup. Like Modigliani-Miller theorem, the capital structure does not matter to the value of the firm with linear payoff. However, I will try to model the foreign currency debt decision with concave objective function in the later section.

Using the transversality condition, the first order condition (6) can be solved forward and written as a function of discounted sum of future marginal marginal revenue (profits) over the life time of capital (Chirinko, 1993). The FOC becomes:

$$\frac{\partial\psi(I_t,K_{t-1})}{\partial I_t}+1 = \mathrm{E}_t\left[\sum_{s=1}^{\infty}\beta^s(1-\delta)^{s-1}\left(\frac{\partial\pi_{t+s}(K_{t+s-1};e_{t+s})}{\partial K_{t+s-1}}-\frac{\partial\psi(I_{t+s},K_{t+s-1})}{\partial K_{t+s-1}}\right)\right] \quad (8)$$

$$\equiv q_t \quad (9)$$

where q_t is the Lagrange multiplier of the capital accumulation constraint (4). This equation states that the firm should invest until the marginal cost of additional unit of capital equals the expected present value of the stream of marginal profitabilty of capital, i.e. the future profits generated by this additional unit of capital.

Taking the derivative of the investment adjustment cost and substituting into (8), the firm investment demand can be written as

$$\frac{I_t}{K_{t-1}} = \alpha \cdot \mathrm{E}_t \left[\sum_{s=1}^{\infty} \beta^s (1-\delta)^{s-1} \left(\frac{\partial \pi_{t+s}(K_{t+s-1}; e_{t+s})}{\partial K_{t+s-1}} - \frac{\partial \psi(I_{t+s}, K_{t+s-1})}{\partial K_{t+s-1}} \right) \right] \tag{10}$$

where $\alpha = 1/\chi$. That is, the optimal level of investment is a monotonic function of the sum of discounted future marginal profitability of capital.

3.2 Model with Borrowing Constraints

The previous section shows the derivation of investment function when the firm is not liquidity constrained. In this section, the firm can be liquidity constrained. Assume now that the cash flow (3) constraints can be binding and the firm is subject to positive external finance premium. Let λ_t be Lagrange multipliers for the non-negative dividend constraint (3). The firm's FOC w.r.t. K_{t+1}, B_t, and B_t^* are

$$\begin{aligned} \frac{\partial \psi(I_t, K_{t-1})}{\partial I_t} + 1 &= \mathrm{E}_t \left[\left(\frac{1}{1+r_t} \right) \left(\frac{1+\lambda_{t+1}}{1+\lambda_t} \right) \left(\frac{\partial \pi_{t+1}(K_t; e_{t+1})}{\partial K_t} - \frac{\partial \psi(K_t, I_{t+1})}{\partial K_t} \right. \right. \\ & \left. \left. + (1-\delta) \left(\frac{\partial \psi(I_{t+1}, K_t)}{\partial I_{t+1}} + 1 \right) \right) \right] &(11) \\ 1 &= \mathrm{E}_t \left[\left(\frac{1+\lambda_{t+1}}{1+\lambda_t} \right) \left(1 + \nu_t + \frac{\partial \nu_t}{\partial B_t} B_t \right) \right] &(12) \\ 1 &= \mathrm{E}_t \left[\left(\frac{1}{1+r_t} \right) \left(\frac{1+\lambda_{t+1}}{1+\lambda_t} \right) \left((1+r_t^*) \left(1 + \nu_t + \frac{\partial \nu_t}{\partial B_t^*} B_t^* \right) \right. \right. \\ & \left. \left. + \left(\frac{e_{t+1} - e_t}{e_t} \right) \right) \right] &(13) \end{aligned}$$

λ_t can be interpreted as the shadow cost of internally generated funds or the marginal value of payment to shareholders. Equations (12) and (13) say that the firm equates the appropriately discounted marginal utility of dividends over time. Assuming that UIP holds, (12) and (13) are essentially the same. I will use only the condition from (12). Compared to an unconstrained firm, a firm facing a high external finance premium (a liquidity constraint) has a lower value of $\left(\frac{1+\lambda_{t+1}}{1+\lambda_t}\right)$ and hence, in effect, incurs a higher marginal opportunity cost of investment today versus delaying it until tomorrow. In other words, it behaves as if it has a higher discount rate. All else equal the firm facing liquidity constraint will intertemporally substitute investment tomorrow for investment today (Whited, 1992).

3.3 Investment Function

Linearizing the first order conditions[10] and taking derivative of the adjustment function, the first order conditions can be written as a function of present value of future marginal profitability of capital and present value of future risk premium terms:[11]

$$\frac{I_t}{K_{t-1}} = \alpha + \gamma_1 \cdot PV_t^{MPK}(\ln e_t, ...) + \gamma_2 \cdot PV_t^{RPM}(\frac{e_t FD_{t-1}}{K_{t-1}}, ...) \tag{14}$$

where γ_1 is positive and γ_2 is negative.

Researchers have tried to estimate this equation using different methodologies. Abel and Blanchard (1986) and Gilchrist and Himmelberg (1998) estimate these present value terms using a vector autoregressive (VAR) model as an alternative to Tobin's Q. For empirical simplicity, I follow Laeven (2000) and use only the current values of marginal productivity of capital and risk premium term to forecast the present values of future profitability of investment and risk premia respectively.

$$\frac{I_t}{K_{t-1}} = \alpha + \gamma_1 \cdot MPK(\ln e_t, ...) + \gamma_2 \cdot \nu(\frac{e_t B^*_{t-1}}{K_{t-1}}, ...) \tag{15}$$

[10] See Appendix for details

[11] The standard Q model of investment is a special case of this model where risk premia are zero (there is no financial constraint). However, in addition to its well known measurement error problems, in this framework, Tobin's Q is not a theoretically proper measure of discounted sum of future marginal profitability (marginal q) because I assume that the firm is facing downward sloping demands (see Hayashi (1982)).

Exchange rate changes affect investment in this set up through two main channels: competitiveness effects and net-worth effects. Currency depreciation improves the marginal profitability of capital, which is an important determinant of investment demand. On the other hand, an increase in e_t raises the value of foreign currency denominated debt, and reduces the firm's net worth, which leads to an increase in external finance premium and the effective discount rate. The firm with a higher discount rate substitutes today's investment for tomorrow's.

Consider only the change in exchange rate, the above investment equation can be written in differential form:

$$\begin{aligned}\Delta \frac{I_t}{K_{t-1}} &= \gamma_1 \cdot \frac{\partial MPK_t}{\partial \ln e_t} \cdot \Delta \ln e_t \\ &\quad + \gamma_2 \cdot \frac{\partial \nu_t}{\partial(\frac{e_t B^*_{t-1}}{K_{t-1}})} \cdot \frac{e_{t-1} B^*_{t-1}}{K_{t-1}} \cdot \Delta \ln e_t \end{aligned} \tag{16}$$

where the last term uses the fact that $\Delta \ln e_t \simeq \Delta e_t / e_{t-1}$.

Even if the impact of depreciation is expected to be positive in the unconstrained case, the addition of the last term in (16) shows that it can be negative when investment is constrained by external finance and the firm faces an increasing cost of borrowing on the margin. With higher borrowing costs, the firm may want to postpone the investment until the later periods. This reduces the firm's investment spending.

4 Empirical Analysis

4.1 Specification

An important question of this study is how a firm's investment behavior is affected by the currency depreciation. Because of the limited availability of the foreign debt data, the result will rely more on the cross sectional variations. To emphasize the effect of currency depreciation on the *change* rather than the level of investment rate, variables are expressed in first differences. The investment model motivated above is implemented by the following specification:

$$\Delta\frac{I_{ijt}}{K_{i,j,t-1}} = \beta_0 + \beta_1\Delta\ln(e_{jt}) + \beta_2\left(\Delta\ln e_{jt}\times\frac{e_{j,t-1}B^*_{i,j,t-1}}{K_{i,j,t-1}}\right) + \beta_3\Delta\frac{CF_{ijt}}{K_{i,j,t-1}} + \beta_4\Delta i_{jt} + \beta_6\Delta y_{jt} + \Delta\Gamma'_{ijt}\gamma + s_t + f_j + \epsilon_{ijt} \tag{17}$$

where $\frac{I_{ijt}}{K_{i,j,t-1}}$ is the investment rate of firm i in country (or industry) j at time t. $\Delta(.)$ represents time first difference operator. i_{jt} is the lending rate of country j at time t; e_{jt} is the exchange rate in local currency per US\$1 so that an increase in e_t means depreciation; and y_{jt} is the natural log of real GDP. Γ_{it} is a set of other firm-specific variables that are associated with the likeliness the the firm is liquidity constrained, for example, the firm's cash flow, debt to asset ratio, coverage ratio (interest expense/interest expense+cash flows) etc. Industry- and country-specific fixed effects as well as time dummies are included.

The important coefficient of this analysis is β_2 because the investment response to the change in exchange rate can be written as $\frac{\partial\frac{I_t}{K_{t-1}}}{\partial\ln e_t} = \beta_1 + \beta_2\frac{e_{t-1}B^*_{i,j,t-1}}{K_{i,j,t-1}}$. The balance sheet channel literature expects that the expansionary effect of currency depreciation would be decreasing in the amount of foreign debt the firm is holding. The coefficient on β_2 is therefore expected to be negative.

4.2 Data

I create a panel of firm-specific variables from balance sheets, income statements, and statements of cash flows of firms in 7 countries (economies?) in East Asia, including Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan, and Thailand, from WorldScope database (accessed through Global Access service). For most firms, data are available from 1992-2000. An advantage of using WorldScope Database is that the database is designed to facilitate comparisons of the financial information of companies from different industries and countries despite the differences in accounting practices. The primary accounting data are examined and reformatted into more comparable standardized industry templates.

Banks and other financial institutions are dropped from the sample. In total, there are 8,753 firm-year observations from 1,286 different firms, although the actual number of observations usable for my analysis is considerably smaller, for reasons explained momentarily. The number of firms in the sample changes over time, mostly due to an increase in coverage of the database. The dependent variable, the investment rate I_t/K_{t-1}, is the ratio of investment spending of period t to capital stock at the beginning of period t. I use capital expenditure net of sales of fixed assets as the investment spending. This allows investment spending to be negative. Net property, plant and equipments are used as the capital stock. Following Fazzari et al. (1988) and Whited (1992), I use the perpetual inventory method to adjust the value of capital stock from book value to replacement value. This method adjusts the value of capital stock using producer price index of each country and allows for different depreciation rate for each firm.[12]

Because firms' fiscal years ended on different dates, I take into account this difference when applying the stock prices and exchange rates to the firms. For the exchange rates used to translate balance sheet items, I use the average of daily exchange rates of the month in which fiscal years are ended. When average exchange rates are needed, I use the average exchange rates of the preceding 12 months to the month in which the fiscal year is ended. Where applicable, I also use exchange rates of the 12 preceding

[12]The methodology and definitions of other variables are shown in the appendix.

months to calculate exchange rate volatility.

Foreign currency denominated debt are crucial to this analysis. However, since firms are not required to report the currency composition of their liability, the data are not available from publicly available accounting reports. The primary data source is SBC Warburg Dillon Read (SBC-WDR) equity reports from 1997-1998[13]. These report firms' level, currency composition (local or foreign)[14] and maturity (short term or long term) of debt and the percentage of foreign currency hedged with foreign exchange derivatives. The data set also provides the share of core earning before income tax earned abroad (foreign EBIT), which is important to study the effect of exchange rate on firms. These reports cover about 40 of the largest listed non-bank firms in each of the seven East Asian countries[15]. The source of data of these reports are the survey collected by SBC-WDR analysts in Asia through their direct contacts with the firms in sample. Because the survey may have been targeted for larger and better quality firms, cautions should be exercised in interpreting the results. This could be a source of selection bias, which will be considered in the following section.

I merge the survey data with the Worldscope data set. Because these two data sources are collected differently, following Allayannis et al. (2002), I verify data consistency between the two sources by comparing total debt from both sources and find a correlation of 89%.[16] The high correlation of total debt, the only available series in common, is reassuring. However, adding the survey data to the data set significantly reduces the number of observations. The number of firms and years in which the data are available is shown in table 2.

[13]The reports do not coincide exactly with calendar or fiscal years. However, they are mostly representative of calendar years 1996-1997.

[14]The reports do not provide the precise currency composition of debt.

[15]including Hong Kong/China, Indonesia, Korea, Malaysia, the Philippines, Singapore, Taiwan ROC, and Thailand. I exclude Hong Kong/China firms out of the sample.

[16]The correlation is 92% in Allayannis et al. (2002) sample.

4.3 Empirical Results

Table 5 provides baseline results of this study. The dependent variable is the first difference of investment rate ($\Delta\frac{I_t}{K_{t-1}}$). The table asks what happen to the firm's investment rate when the exchange rate changes. The differences of firms across industries and countries are controlled by the fixed effects. The industry fixed effects are created from 2-digit ISIC code of the firm primary product. I allow the constant term of each industry in each country to be different.

Column 1 includes the industry and country fixed effects. The effects of Tobin's Q and cash flows are positive and significant. According to the investment literature, this suggests an evidence of liquidity constraints. The other results are rather surprising: The coefficient on percentage change of exchange rate and the change of exchange rate interacted with ratio of foreign debt to capital are significantly positive. These suggest that firms in the sample, after controlling for industry-level differences, increase their investment rates following currency depreciation; competitiveness seems to dominate the net-worth effects. The positive coefficient on the interaction term suggests that the effect of currency depreciation on investment rate increases with foreign debt: The firm with more foreign debt (scaled by its capital stock) increases their investment rate relatively more than the other firms following a currency depreciation. Column 2 reports similar regression with country fixed effects. The result are no much different except that Tobin's Q loses its significance. Columns 3 and 4 control for the "level" of foreign debt. The coefficient on the interaction term is still positive and significant. The results do not change much when the lagged dependent variable is added to the regression; the coefficients on the interaction term are still positive, but marginally insignificant. Column 5 and 6 try to control for the leverage ratio and total assets. The coefficient on the interaction term remains positive and significant.

These results using sample of firms in Asia are consistent with Bleakley and Cowan (2002) who use a sample of firms in Latin American countries. The expansionary effect of currency depreciation seems to be increasing in foreign currency debt the firm is holding, which is not what one would expect from a simple net worth effect model.

4.4 Robustness Check

In this section, I try to test several alternative hypotheses that might have driven the results.

4.4.1 Sample Selection Bias

Because firms included in the above analysis are those surveyed by SBC-WDR analysts, one could argue that the results could be driven by the selectivity bias if sample are not randomly selected. To correct the bias, I estimate the Heckman (1979) selection model, which can be specified as follows,

$$\begin{aligned} & y = X'b + u_1, && u_1 \sim N(0,\sigma) \\ y \text{ is observed iff} \quad & Z'\gamma + u_2 > 0, && u_2 \sim N(0,1) \\ & corr(u_1,u_2) = \rho \end{aligned}$$

where Z is a set of selection variables. I use listed companies in 7 seven countries as the universe of firms. Firms are observed only if they were included in the SBC survey. The results are shown in table 6. Column 2 and 4 are the selection equations . Firms included in the sample tend to be bigger and less leveraged. After correcting for the selectivity bias, the interaction term is still positive and significant.

Because the universe of firms in the analysis is the listed companies, one could argue that they may be not a good representative of firms in these economies to begin with as they tend to be bigger and of better quality. However, the bigger firms are more likely to borrow in foreign currency. If this negative cannot be found in the bigger firms, it is unlikely to find in the sample with smaller firms.

4.4.2 Small Sample Size

The small number of observations due to limited availability of foreign debt data could be a potential problem. I try to extrapolate the foreign debt series to include more observations into the analysis. The foreign debt data is extrapolated by the following method. I take the foreign debt in US$ in 1996 and 1997 of each firm as given and assume that the value of foreign debt in other years grows at the same rate as the aggregate external debt of the country to which the firm belongs. The result is reported in table 7. The coefficient on the interaction term is positive and significant. It, however, became insignificant when lagged foreign debt is added.

4.4.3 Switching Regression with Unknown Sample Separation

One of the reasons one would expect firm with foreign currency debt to be worse off after currency depreciation is that after losing their net-worth from increased liabilities, the firms are more likely to face the liquidity constraints. Theory suggest that the investment response to the financial structure variables can be different between the two regimes. There has been studies trying to separate the sample of firms into each regime based on arbitrary firm-level characteristics [e.g....]. However, whether or not a firm is in the liquidity constraint regime (or high financial premium regime) is not directly observable, I use exogenous switching regression model with unknown sample selection [17] to compare the estimates in the two regimes. This technique was previously used

[17] see Maddala (1986)

to estimate cash flow sensitivities to investment by Hu and Schiantarelli (1998), and Hovakimian and Titman (2003). The basic setup of the model is the following. There are 2 true models:

$$\begin{aligned} y_{1i} &= x_i\beta_1 + u_{1i} \\ y_{2i} &= x_i\beta_2 + u_{2i} \\ \text{where} \quad y_i &= y_{1i} \quad \text{iff} \quad y_i^* = z_i\gamma + \epsilon_i < 0 \\ \text{and} \quad y_i &= y_{2i} \quad \text{iff} \quad y_i^* = z_i\gamma + \epsilon_i \geq 0 \end{aligned}$$

where x_i is a vector of the determinants of investment function and z_i is the vector of the determinants of the firm's likelihood of being in the first or the second investment regimes These include firm's size, earning before interest payment and income taxes (EBITDA), and leverage ratio. y_i is observed. y_i^* is a latent variable measuring the tendency of being in one of the regimes.

Here I assume that u_{1i}, u_{2i}, and ϵ_i are independently normally distributed. We can estimate the model using maximum likelihood method. The results are shown in table 8. Regime 1 represent the constrained regime and regime 2 is the unconstrained. From the selection equation, larger, more profitable and less leveraged firms are more likely to be in the unconstrained regimes. Both regimes show positive and significant coefficient on the interaction term between the exchange rate change and foreign currency debt.

The positive and significant coefficient on the interaction is robust to several specifications and bias adjustments. Currency depreciation does not make the firms with foreign currency debt reduce their investment spending. On the contrary, the results suggest that these firms increase their investment more than the other firms following the currency depreciation.

5 Corollary Evidence

The theoretical framework set up above, although consistent with discussion in the currency crisis literature, takes the foreign currency debt as given and assumes that foreign currency debt has no relationship with profitability of the firm other than the risk premium term. However, if foreign debts are correlated with the firm's investment response to the currency depreciation, this could bias the main result of the study.

If firms hold foreign currency liabilities to match their revenue stream in foreign currency (matching hypothesis), the firms with foreign currency debt are more likely benefit from the currency depreciation. If investment response to the exchange rate changes are correlated with how much firms have foreign currency debt, this could bias the coefficient. Referring back to equation (16), if the derivative of marginal profitability of capital with respect to the change in exchange rate, $\frac{\partial MPK_t}{\partial \ln e_t}$, is positively related to the amount of foreign debt, we will have a positive bias on the interaction term between the change in exchange rate and lagged foreign debt, as now

$$\frac{\partial}{\partial B^*_{t-1}} \frac{\partial \frac{I_t}{K_{t-1}}}{\partial \ln e_t} = \beta_2 + \gamma_1 \frac{\partial}{\partial B^*_{t-1}} \frac{\partial MPK_t(B^*_{t-1})}{\partial \ln e_t}. \tag{18}$$

There have been a few studies on why firms borrow in foreign currency [18]. One of the common findings in these studies is, among other things, firms borrow in foreign currency to match their streams of revenue in foreign currency. Although the investment response may not be observable in the data, the matching hypothesis would predict this correlation to be positive.

The next section tries to show whether this positive correlation is optimal for a profit maximizing firm in the model, and the following section will present some empirical

[18] see, for example, Esho et al. (2001), Goswami and Shrikhande (2001), Keloharju and Niskanen (2001), and Allayannis et al. (2002)

results supporting this hypothesis.

5.1 A Model of Foreign Debt Composition

In this section, I model the firm's optimal choices of corporate investment and composition of foreign currency debt. The firm chooses the level of foreign debt before investing the next period. This model is built on Froot et al. (1993)'s risk management model. I follow their setup to study the firm's optimal choice of foreign currency debt.

Intuitively, foreign currency debt is attractive to the firm for 2 reasons. First, the firm can borrow at a cheaper rate in foreign currency *ex post* if the exchange rate does not depreciate. Second, the firm with revenue positively correlated with the exchange rate may wants to hedge the exchange rate uncertainty by matching its revenue with foreign currency debt. However, if the currency depreciates, the increased in liabilities in domestic currency reduces the firm's net worth. Given the optimal level of investment, the firm has to borrow more and pay higher cost of borrowing. This may discourage the investment spending.

Consider a firm who enters period 0 with capital (internal resource or net worth) w_0. In period 0, the firm chooses the amount to borrow in foreign currency, b^*, to finance the investment in period 1. Assume that the firm can borrow in foreign currency only in period 0[19] and the firm can borrow only in domestic currency in period 1. The firm convert the foreign currency debt it borrows at the exchange rate e_0. The firm needs to borrow $b = I - \tilde{w}_1 - e_0 b^*$ in domestic currency in the next period in order to finance its investment, I.

Assume that the firm pays the interest at the rates equal to the market interest

[19] This assumption can be justified by the fact that it is more difficult for a firm to borrow in the international capital markets than it is for them to borrow at home.

rates plus a risk premium, $\rho(L)$, which is an increasing function of the external funds it raises. The market interest rates for domestic and foreign currency are constant at r and r^* respectively. Exchange rate is the only external shock in the model. After committing to the foreign debt b^* in period 0, the firm's net worth is subject to the uncertainty of the exchange rate,

$$\tilde{w_1} = w_0 - (\tilde{e} - e_0)b^*. \tag{19}$$

This is similar to assuming that the foreign creditor requires the firm to pay back (or equivalently, put aside) the increase in liabilities due to the depreciation as soon as the exchange rate realizes. The firm does not have to pay interest on this net worth change.

In period 1, the exchange rate is realized. The firm decides how much to invest in a project whose net present value is given by

$$F(I) = \alpha(\tilde{e}) \cdot f(I) - I \tag{20}$$

$$I = \tilde{w_1} + b + e_0 b^* \tag{21}$$

$$= \tilde{w_1} + L \tag{22}$$

where I is investment, $f(I)$ is the production function, $f' > 0$, and $f'' < 0$. $\alpha(\tilde{e})$ captures the correlation between with the exchange rate, $\tilde{e}$, and output. L is the total external finance.

Assume that the firm faces the same risk premium for domestic and foreign currency debt. The firm's cost of financing is given by

$$\begin{aligned} C(L) &= (r + \rho(L))b + e_0[r^* + \rho(L)]b^* + (\tilde{e} - e_0)b^* \\ &= rb + e_0 r^* b^* + \rho(L)(b + e_0 b^*) + (\tilde{e} - e_0)b^* \\ &= r(L - e_0 b^*) + e_0 r^* b^* + \rho(L)L + (\tilde{e} - e_0)b^* \end{aligned} \tag{23}$$

We can solve the model backward, starting with the firm's first period investment problem. Given the foreign currency debt, b^*, it committed last period, the firm chooses investment I (and thereby the amount of external financing (recall that the firm can borrow only in domestic currency in this period), $L = I - \tilde{w}_1 = b + e_0 b^*$) to maximize net expected profits:

$$\Pi(\tilde{w}_1) \quad = \quad \max_I F(I) - C(L) \tag{24}$$

The first order condition for this problem is

$$F_I = \alpha(e_1) f_I - 1 = r + \rho(L). \tag{25}$$

Note that the optimal level of investment is below the first-best level, which would set $\alpha(e_1) f_I = 1$.

Note that, compared to the model presented earlier, this model gives us a similar comparative statics of the change in investment with respect to the change in exchange rate. The implicit function theorem and the first order condition (25) imply

$$\frac{dI^*}{de} = -\frac{\alpha'(e) f_I - C_{LL} b^*}{\alpha(e) f_{II} - C_{LL}}. \tag{26}$$

Assuming that the second order condition of (24) holds, the denominator is always negative. If the firm has no foreign debt and the firm profit is positively correlated with the exchange rate ($\alpha'(e) > 0$), a currency depreciation increases the firm optimal investment. The firm with foreign currency debt may lower investment because of the higher borrowing costs.

Going back to period 0, the firm chooses the the foreign currency debt, b^*, to maximize expected profit:

$$\max_{b^*} \mathrm{E}[\Pi(w)] \tag{27}$$

where the expectation is taken with respect to $\tilde{e}$. The first order condition is

$$\mathrm{E}\left[\frac{\partial \Pi}{\partial w}\frac{\partial w}{\partial b^*} + \frac{\partial \Pi}{\partial b^*}\right] = 0 \tag{28}$$

$$\mathrm{E}\left[\Pi_w \cdot (e_0 - \tilde{e}) + \left\{e_0(r - r^*) + (\tilde{e} - e_0)\right\}\right] = 0 \tag{29}$$

$$\mathrm{E}\left[\Pi_w \cdot (e_0 - \tilde{e})\right] + e_0(r - r^*) + \mathrm{E}\left[(\tilde{e} - e_0)\right] = 0 \tag{30}$$

If the firm believes in uncovered interest parity (the costs of borrowing in either domestic or foreign currency are the same in expectation), the solution to this problem is reduced to the optimal hedging problem. Assuming that the expected value of the future exchange rate is the current period exchange rate, the first order condition becomes

$$\mathrm{cov}\left[\Pi_w, \tilde{e}\right] = 0. \tag{31}$$

The firm wants to borrows in foreign currency to insulates the marginal value of internal wealth (Π_w) from the changes in the exchange rate. Because the firm's payoff is concave in net worth (concave production function and convex borrowing cost), hedging raises average profits.

I still cannot solve this analytically[20], but the intuition suggests that the solution of optimal foreign debt b^* should be an increasing function of the correlation between the firm's payoff and exchange rate, $\alpha'(e)$. If there is no correlation between the investment opportunities and the available of internal funds, the firm should not have any foreign currency debt.

5.2 More Results

Now I turn to the empirical evidence supporting the matching hypothesis. Using foreign currency debt normalized by total assets[21] as a dependent variable, I find a positive

[20]Froot et al. (1993) assume normal distribution of shocks and get a nice closed form solution, which give us a similar intuition.

[21]The choice of normalization does not change the result.

coefficient on the share of the firm's earning before income tax (FEBIT) from foreign currency. I use this FEBIT variable as a proxy of how the firm's profit is correlated with the exchange rate. The firm with more more income generated in foreign currency is more likely to hold foreign currency debt. The result is show in table 9. I also control for the interest differences. The "Average Interest Rate Difference" is the average difference between the domestic lending rate and LIBOR from 1992-1996. The results suggest that firms with more revenue in foreign currency, who benefit from the currency depreciation, have more foreign currency debt. I also find that firms with foreign debt improve operating income relative to the other firms. See table 10. However, this result is not very robust with respect to different specifications.

6 Conclusion

[To be written]

References

Abel, A. B. and O. Blanchard (1986). The present value of profits and cyclical movements in investments. *Econometrica 54*, 249–273.

Aghion, P., P. Bachetta, and A. Banerjee (2001a). A corporate balance-sheet approach to currency crises. Working Papers from Swiss National Bank, Study Center Gerzensee.

Aghion, P., P. Bachetta, and A. Banerjee (2001b). Currency crises and monetary policy in an economy with credit constraints. *European Economic Review 45*(7), 1121–1150.

Aguiar, M. (2002). Investment, devaluation and foreign currency exposure: The case of mexico. mimeo, Graduate School of Business, University of Chicago.

Allayannis, G., G. W. Brown, and L. F. Klapper (2002, June). Capital structure and financial risk: Evidence from foreign debt use in East Asia. mimeo, The World Bank.

Bernanke, B., M. Gertler, and S. Gilchrist (1998). The Financial Accerator in a Quantitative Business Cycle Framework. NBER Working Paper No. 6455.

Bleakley, H. and K. Cowan (2002, March). Corporate dollar debt and devaluations: Much ado about nothing? mimeo, MIT.

Bohn, H. (1990). A positive theory of foreign currency debt. *Journal of International Economics 29*, 273–292.

Bond, S. and J. Van Reenen (2002). Microeconometric models of investment and employment. mimeo, Institute for Fiscal Studies.

Burnside, C., M. Eichenbaum, and S. Rebelo (2001). Hedging and financial fragility in fixed exchange rate regimes. *European Economic Review 45*, 1151–93.

Caballero, R. and A. Krishnamurthy (2003). Excessive dollar debt: Financial development and underinsurance. *Journal of Finance 58*(2), 867–93.

Campa, J. M. and L. S. Goldberg (1995). Investment in manufacturing, exchange rates and external exposure. *Journal of International Economics 38*, 291–320.

Campa, J. M. and L. S. Goldberg (1999). Investment, pass-through and exchange rates: A cross-country comparison. *International Economic Review 40*(2), 287–313.

Céspedes, L. F., R. Chang, and A. Velasco (2000). Balance sheet and exchange rate policy. NBER Working Paper No. 7840.

Chirinko, R. S. (1993). Business fixed investment spending: Modeling strategies, empirical results and policy implications. *Journal of Economic Literature 31*(4), 1875–1911.

Clarida, R. H. (1997). The real exchange rate and US manufacturing profits: A theoretical framework with some empirical support. *International Journal of Financial Economics 2*, 177–187.

Eichengreen, B. and R. Hausmann (1999). Exchange rates and financial fragility. NBER Working Paper 7418.

Esho, N., I. G. Sharpe, and K. H. Webster (2001, June). Hedging and choice of currency denomination in international syndicated loan markets. mimeo, University of New South Wales.

Fazzari, S. M., R. G. Hubbard, and B. C. Petersen (1988). Financing constraints and corporate investment. *Brookings Papers on Economic Activity 1*, 141–195.

Forbes, K. J. (2002, July). How do large depreciations affect firm performance? mimeo, MIT.

Froot, K., D. Scharfstein, and J. Stein (1993). Risk management: Coordinating investment and financing policies. *Journal of Finance 48*, 1629–1658.

Fuentes, M. (2003). Dollarization of financial contracts: Evidence from chilean firms. mimeo, Economics Department, University of California, Berkeley.

Gilchrist, S. and C. Himmelberg (1998). Investment, fundamentals and finance. NBER Working Paper No. 6652.

Goldberg, L. S. (1993). Exchange rates and investment in United States industry. *The Review of Economics and Statistics 75*(4), 575–588.

Goldstein, M. (1998, June). *The Asian Financial Crisis: Causes, Cures, and Systemic Implication*, Volume 55 of *Policy Analyses in International Economics*. Washington, DC: Institute for International Economics.

Goswami, G. and M. M. Shrikhande (2001). Economic exposure and debt financing choice. *Journal of Multinational Financial Management 11*, 39–58.

Hayashi, F. (1982). Tobin's marginal q and average q: A neoclassical interpretation. *Econometrica 50*(1), 213–224.

Heckman, J. (1979). Sample selection bias as a specification error. *Econometrica 47*(1), 153–161.

Hovakimian, G. and S. Titman (2003). Corporate investment with financial constraints: Sensitivity of investment to funds from voluntary asset sales. NBER Working Paper No. 9432.

Hu, X. and F. Schiantarelli (1998). Investment and capital market imperfections: A switching regression approach using US firm panel data. *Review of Economics and Statistics 80*(3), 466 – 479.

Hubbard, R. G. (1998). Capital-market imperfections and investment. *Journal of Economic Literature 36*(1), 193–225.

Inter-American Development Bank (2002). Debt composition and balance sheet effects of exchange and interest rate volatility: A firm level analysis. Terms of Reference for Research Proposals.

Jeanne, O. (2000). Foreign currency debt and the global financial architecture. *European Economic Review 44*, 719–727.

Jeanne, O. (2003). Why do emerging economies borrow in foreign currency. IMF Working Paper.

Keloharju, M. and M. Niskanen (2001). Why do firms raise foreign currency denominated debt? evidence from finland. *European Financial Management 7*(4), 481–496.

Krugman, P. (1999). Balance sheets, the transfer problem, and financial crises. *International Tax and Public Finance 6*(4), 459–472.

Laeven, L. (2000). Financial liberalization and financing constraints: Evidence from panel data on emerging economies. World Bank's Domestic Finance Working Paper No. 2467.

Maddala, G. S. (1986). *Handbook of Econometrics*, Volume III, Chapter Disequilibrium, Self-selection, and Switching Models, pp. 1634–1688. Elsevier Science Publisher.

Nucci, F. and A. F. Pozzolo (2001). Investment and the exchange rate: An analysis with firm-level panel data. *European Economic Review 45*, 259–283.

Obstfeld, M. and K. Rogoff (1996). *Foundations of International Macroeconomics*. Cambridge: MIT Press.

Primark Corporation (2000). *Worldscope Database: Data Definitions Guide*. Thomson Financial.

Whited, T. M. (1992). Debt, liquidity constraints, and corporate investment: Evidence from panel data. *Journal of Finance 47*(4), 1425–1460.

7 appendix

7.1 Linearized First Order Condition

This section shows the derivation of the linearized version of the first order condition (A-5). Some of the derivation in this appendix are drawn from Gilchrist and Himmelberg (1998).

Let MPK_t denote the marginal profit function net of adjustment costs. For simplicity, assume that the discount rate r_t is constant over time. Then the first order condition (11) can be written as

$$\begin{aligned} \frac{\partial \psi(I_t, K_{t-1})}{\partial I_t} + 1 &= \mathrm{E}_t \left[\sum_{s=1}^{\infty} \frac{(1-\delta)^{s-1}}{(1+r)^s} \left(\prod_{k=1}^{s} \left(\frac{1+\lambda_{t+k}}{1+\lambda_{t+k-1}} \right) \right) MPK_{t+s} \right] \\ &= \frac{1}{(1-\delta)} \mathrm{E}_t \left[\sum_{s=1}^{\infty} \beta^s \theta_{t,t+s} MPK_{t+s} \right] \qquad \text{(A-1)} \end{aligned}$$

where $\beta = (1-\delta)/(1-r)$ and $\theta_{t,t+s} = \prod_{k=1}^{s}(1+\lambda_{t+k})/(1+\lambda_{t+k-1})$.

To approximate the above equation, Gilchrist and Himmelberg (1998) use a first order Taylor approximation to linearize the term $\theta_{t,t+s} MPK_{t+s}$ and $\theta_{t,t+s}$.

From equation (A-1), assume that the mean of $\theta_{t,t+s}$ is close to one and that the mean of MPK_{t+s} is γ, we can use a first order Taylor approximation around their means to write

$$\begin{aligned} \theta_{t,t+s} MPK_{t+s} &\simeq \gamma + MPK_{t+s}(\theta_{t,t+s} - 1) + \theta_{t,t+s}(MPK_{t+s} - \gamma) \\ &\simeq -\gamma + \gamma \theta_{t,t+s} + MPK_{t+s}. \qquad \text{(A-2)} \end{aligned}$$

Furthermore, $\theta_{t,t+s}$ can be approximated by

$$\begin{aligned}
\theta_{t,t+s} &= \prod_{k=1}^{s}\left(\frac{1+\lambda_{t+k}}{1+\lambda_{t+k-1}}\right) \\
&= \exp\left\{\ln\left(\prod_{k=1}^{s}\left(\frac{1+\lambda_{t+k}}{1+\lambda_{t+k-1}}\right)\right)\right\} \\
&= \exp\left\{\sum_{k=1}^{s}\ln\left(\frac{1+\lambda_{t+k}}{1+\lambda_{t+k-1}}\right)\right\} \\
&= \exp\left\{\sum_{k=1}^{s}\ln\left(1+\left(\frac{1+\lambda_{t+k}}{1+\lambda_{t+k-1}}-1\right)\right)\right\} \qquad \text{(A-3)} \\
\ln(\theta_{t,t+s}) = \ln(1+(\theta_{t,t+s}-1)) &\simeq \sum_{k=1}^{s}\left(\frac{\lambda_{t+k}-\lambda_{t+k-1}}{1+\lambda_{t+k-1}}\right) \\
\theta_{t,t+s} &\simeq 1+\sum_{k=1}^{s}\left(\frac{\lambda_{t+k}-\lambda_{t+k-1}}{1+\lambda_{t+k-1}}\right) \qquad \text{(A-4)} \\
&\simeq const. - \sum_{k=1}^{s}\left(\nu_{t+k}+\frac{\partial\nu_{t+k}}{\partial B_{t+k}}B_{t+k}\right),
\end{aligned}$$

where I assume that the error terms in the expectation operator in (12) are log-normally distributed. To a first approximation, $(\lambda_{t+k}-\lambda_{t+k-1})/(1+\lambda_{t+k-1}) = -(\nu_{t+k}+\frac{\partial\nu_{t+k}}{\partial B_{t+k}}B_{t+k})$.

Again, from the equation (A-1),

$$\begin{aligned}
\mathrm{E}_t\left[\sum_{s=1}^{\infty}\beta^s\theta_{t,t+s}MPK_{t+s}\right] &\simeq const. + \gamma\mathrm{E}_t\sum_{s=1}^{\infty}\beta^s\theta_{t,t+s} + \mathrm{E}_t\sum_{s=1}^{\infty}\beta^s MPK_{t+s} \\
&\simeq const. - \gamma\mathrm{E}_t\sum_{s=1}^{\infty}\sum_{k=1}^{s}\beta^s\left(\nu_{t+k}+\frac{\partial\nu_{t+k}}{\partial B_{t+k}}B_{t+k}\right) \\
&\quad +\mathrm{E}_t\sum_{s=1}^{\infty}\beta^s MPK_{t+s}
\end{aligned}$$

Equation (A-1) can be written as the sum of discounted future terms of risk premia and marginal profitability of capital.

$$\begin{aligned} \frac{\partial\psi(I_t, K_{t-1})}{\partial I_t} + 1 &\simeq const. + \mathrm{E}_t \sum_{s=1}^{\infty} \beta^s MPK_{t+s} \\ &\quad - \gamma \mathrm{E}_t \sum_{s=1}^{\infty} \sum_{k=1}^{s} \beta^s \left(\nu_{t+k} + \frac{\partial \nu_{t+k}}{\partial B_{t+k}} B_{t+k}. \right) \end{aligned} \tag{A-5}$$

7.2 Data Appendix

This appendix describe the calculation of the underlying variables used to construct the regression variables. Most of the definitions are consistent with WorldScope Definitions (Primark Corporation (2000)).

Investment (I_t) is Capital Expenditure net of disposal of fixed assets. Capital expenditure represents the funds used to acquire fixed assets, which includes additions to property, plant and equipment, and investments in machinery and equipment. Disposal of Fixed Assets represent the amount a company received from the sale of property, plant and equipment.

Total Revenue (TR_t) is the gross sales and other operating revenue revenue net of discounts, returns, allowances and sales taxes.

Replacement Value of Capital Stock (K_t): K_t represent the capital stock at the end of period t (at the beginning of period $t+1$. Following Whited (1992) and Fazzari et al. (1988), the replacement value of capital stock is estimated from book values using the perpetual inventory method. First, I set the replacement value of capital stock equal to the book value of net property plant and equipment for the first year the firm appear in the dataset. Next I estimate the useful life of capital goods in any year using the formula:

$$L_t = \frac{NK_{t-1} + I_t}{Depr_t}. \tag{A-6}$$

L_t is the useful life of capital goods at time t and NK_{t-1} is the reported value of net property plant and equipment at time $t-1$. Then I take the average over time of L_t and use this average value, L in the following formula to define the replacement value of capital stock:

$$K_t = \left(K_{t-1} \left(\frac{P_t^K}{P_{t-1}^K} \right) + I_t \right) (1 - 1/L) \tag{A-7}$$

where P^K is the producer price index. The second term is based on the assumption that economic depreciation is single-declining balance.

Market Value of Equity (E_t) is calculated as the number of common shares outstanding times share price at the end of the year.

Market Value of Debt (D_t) is the book value of the sum of short term and long term debt.

Tobin's q: Q_t is calculated as follows:

$$Q_t = \frac{D_t + E_t - INV_t}{K_{t-1}} \tag{A-8}$$

$D_t + E_t - INV_t$ represents the market value of capital stock. The inventories are subtracted from the sum of market value of debt and equity because they are included in the market value of the firm but do not contribute to the market value of capital stock itself.

Cash Flows to Capital (CF) is the ratio of net income plus depreciation and amortization to capital stock at the beginning of period.

Table 1: Outstanding Private Nonguaranteed External Debt as Percentage of GDP

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Argentina	1.27%	0.95%	0.98%	2.69%	5.10%	6.23%	7.01%	7.99%	9.32%
Brazil	1.43%	1.92%	3.37%	4.77%	4.52%	4.38%	6.32%	9.39%	13.72%
Chile	14.06%	13.62%	13.38%	16.11%	17.68%	17.52%	22.65%	22.79%	32.25%
Colombia	2.76%	2.38%	2.54%	3.67%	3.78%	6.00%	8.40%	10.07%	10.22%
Mexico	2.22%	2.42%	2.94%	3.85%	4.06%	6.41%	6.12%	6.83%	8.84%
Latin America	**2.09%**	**2.32%**	**3.07%**	**4.42%**	**4.94%**	**5.85%**	**7.25%**	**9.18%**	**12.32%**
Indonesia	8.97%	10.28%	11.70%	8.88%	13.82%	16.39%	16.14%	20.61%	57.34%
Korea, Rep.	2.14%	2.05%	2.60%	3.02%	5.35%	3.49%	4.57%	8.03%	11.39%
Malaysia	4.16%	5.02%	6.78%	8.58%	12.69%	12.43%	12.79%	15.46%	21.87%
Philippines	2.71%	3.00%	1.94%	4.06%	4.60%	4.76%	5.92%	8.30%	16.69%
Thailand	8.57%	12.19%	12.36%	12.24%	13.94%	23.30%	26.55%	33.58%	37.92%
East Asia	**4.81%**	**5.68%**	**6.39%**	**6.36%**	**9.11%**	**10.16%**	**11.37%**	**14.99%**	**24.25%**

Source: World Development Indicator

Table 2: Number of Observations by Years and Countries

country	1997	1998	Total
Indonesia	27	25	52
Malaysia	35	33	68
Phillippines	25	14	39
Singapore	24	24	48
South Korea	18	16	34
Thailand	22	24	46
Taiwan	34	37	71
Total	185	173	358

Table 3: Descriptive Statistics

Country	Indonesia	Malaysia	Phillippines	Singapore	South Korea	Thailand	Taiwan
Investment Rate	0.26	0.23	0.65	0.32	0.26	0.69	0.35
Tobin's Q	6.68	7.50	3.74	5.87	2.21	9.06	9.22
Cash flows to Capital	0.04	0.50	1.15	0.59	0.10	6.29	0.35
Exchange Rates (LCU/US$)	6,207.53	3.45	37.26	1.60	1,372.06	39.85	32.20
Foreign EBIT Share	23.77%	7.88%	16.64%	42.96%	47.06%	23.56%	30.94%
Foreign Debt to Total Debt	84.37%	21.01%	44.75%	25.21%	45.74%	71.41%	23.69%

Table 4: Correlation Analysis

	$\frac{I_t}{K_{t-1}}$	$\Delta \ln e_t$	$\Delta \ln e_t \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	$\frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	ΔCF_t	ΔQ_t	Δ ln assets	Δ ln real GDP	Δ lending rate
$\frac{I_t}{K_{t-1}}$	1								
$\Delta \ln e_t$	-0.1071	1							
$\Delta \ln e_t \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.1973	0.1688	1						
$\frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.0229	0.16	0.8345	1					
ΔCF_t	0.1304	-0.0168	-0.3123	-0.4954	1				
ΔQ_t	-0.0315	0.0175	-0.4938	-0.5816	0.3859	1			
Δ ln assets	0.2137	-0.0986	0.1092	0.0117	0.0872	0.0467	1		
Δ ln real GDP	0.1604	-0.7836	-0.0439	-0.1254	0.0222	-0.0058	0.2757	1	
Δ lending rate	0.0865	-0.3362	0.1337	-0.0005	0.0054	-0.0213	0.3582	0.4825	1

Table 5: Baseline Regressions

	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln e_t$	2.112	1.978	0.916	1.570	0.582	0.788
	(2.67)**	(2.83)**	(1.19)	(2.21)*	(0.71)	(1.04)
$\Delta \ln e_t \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.191	0.150	0.495	0.269	0.487	0.494
	(4.06)**	(4.19)**	(7.14)**	(4.65)**	(6.99)**	(7.27)**
Δ Cash flow(t)/K(t-1)	0.088	0.051	0.044	0.035	0.048	0.034
	(4.27)**	(3.34)**	(2.10)*	(2.12)*	(2.27)*	(1.64)
Δ Tobin's Q	0.005	0.001	0.004	0.000	0.004	0.004
	(2.71)**	(0.86)	(2.26)*	(0.15)	(2.11)*	(2.18)*
GDP Real Growth Rate	-0.005	-0.008	-0.006	-0.008	-0.008	-0.010
	(0.25)	(0.43)	(0.29)	(0.43)	(0.43)	(0.53)
Δ lending rate	0.065	0.060	0.028	0.047	0.019	0.023
	(3.02)**	(3.14)**	(1.31)	(2.41)*	(0.83)	(1.10)
$\frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$			-0.180	-0.068	-0.177	-0.185
			(5.67)**	(2.60)**	(5.59)**	(5.95)**
Δ total debts/total assets					0.499	
					(1.17)	
Δ log total assets						0.515
						(3.03)**
Constant	-0.823	-0.519	-0.352	-0.400	-0.262	-0.381
	(3.28)**	(2.36)*	(1.41)	(1.80)	(1.01)	(1.56)
Observations	320	320	320	320	320	320
R-squared	0.22	0.14	0.32	0.16	0.33	0.35
Number of cty_x_indust	95		95		95	95
Number of group(country)		7		7		

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 6: Heckman Selection Model Estimation

	(1) Investment	(2) Select	(3) Investment	(4) Select
$\Delta \ln e_t$	-0.110		-0.280	
	(0.55)		(1.41)	
$\Delta \ln \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.133		0.430	
	(3.38)**		(5.64)**	
Δ Cash flow(t)/K(t-1)	0.032		0.015	
	(1.85)		(0.86)	
Δ Tobin's Q	0.009		0.009	
	(1.88)		(1.95)	
GDP Real Growth Rate	0.011		-0.003	
	(1.04)		(0.27)	
Δ lending rate	-0.005		-0.008	
	(0.83)		(1.47)	
$\frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$			-0.179	
			(4.49)**	
Total Assets (in US$ Million)		0.690		0.690
		(17.29)**		(17.28)**
EBITDA in US$		-0.000		-0.000
		(1.13)		(1.12)
Leverage Ratio		-0.949		-0.947
		(5.56)**		(5.56)**
Constant	-0.054	-9.508	0.019	-9.506
	(0.55)	(19.17)**	(0.19)	(19.16)**
Observations	315	2423	315	2423

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 7: Extrapolated Foreign Debt Series

	(1)	(2)
$\Delta \ln$ exchange rate	-0.283	-0.189
	(1.07)	(0.72)
$\Delta \ln e_t \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.236	0.066
	(5.89)**	(1.19)
$\frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$		0.086
		(4.36)**
Δ Cash flow(t)/K(t-1)	0.023	0.018
	(1.53)	(1.18)
Δ Tobin's Q	0.014	0.016
	(7.15)**	(8.00)**
GDP Real Growth Rate	0.013	0.012
	(0.93)	(0.85)
Δ lending rate	-0.002	0.003
	(0.32)	(0.41)
Constant	-0.169	-0.219
	(1.59)	(2.07)*
Observations	1028	1028
Number of cty_x_indust	95	95
R-squared	0.08	0.10

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 8: Switching Regression

	Investment Regime 1	Investment Regime 2	Selection Equation
$\Delta \ln$ exchange rate	-0.199	-1.642	
	(2.38)**	(1.68)	
$\Delta \ln e_t \times \frac{e_{t-1}B^*_{t-1}}{K_{t-1}}$	0.149	1.551	
	(4.64)**	(4.69)**	
Δ Cash flow(t)/K(t-1)	0.228	0.254	
	(7.89)**	(4.45)**	
Δ Tobin's Q	0.890	0.131	
	(2.13)**	(3.03)**	
GDP Real Growth Rate	-0.001	0.368	
	(0.21)	(6.22)**	
Δ lending rate	-0.003	-0.024	
	(0.99)	(1.10)	
Total Asset in US$			0.058
			(2.34)**
EBITDA in US$			0.000
			(15.60)**
Leverage Ratio			-0.459
			(4.40)**
Constant	-0.047	1.940	0.998
	(0.99)	(5.05)**	(3.08)**
R-squared	0.52	0.80	

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 9: Determinants of Foreign Currency Debt

	Foreign Debt/Total Debt		Foreign Debt/Total Assets	
	Pooled	Fixed Effects	Pooled	Fixed Effects
Average FEBIT	0.408	0.412	0.137	0.209
	(6.88)**	(4.86)**	(3.50)**	(2.87)**
log of Assets in US$	-0.054	0.041	-0.058	-0.077
	(3.42)**	(2.03)*	(5.55)**	(4.50)**
EBITDA/Total Assets	0.074	-0.044	-0.060	-0.151
	(0.37)	(0.24)	(0.45)	(0.96)
Leverage Ratio	0.559	0.216	0.596	0.546
	(6.13)**	(1.86)	(9.86)**	(5.69)**
Average Interest Rate Difference	0.041		0.013	
	(4.68)**		(2.29)*	
Constant	0.494	-0.390	0.538	0.901
	(2.13)*	(1.36)	(3.56)**	(3.71)**
Observations	291	291	302	302
R-squared	0.35	0.13	0.39	0.24
Number of cty_x_indust		88		91

Robust t statistics in parentheses
* significant at 5%; ** significant at 1%

Table 10: Change in Log Operating Income

	(1) Pooled	(2) Fixed Effects	(3) Pooled	(4) Fixed Effects
Foreign Debt/Total Debt	0.024	0.024	0.019	0.023
	(3.05)***	(1.71)*	(2.40)**	(1.63)
$\Delta \ln e_t$	-0.019	-0.003	-0.053	-0.012
	(0.40)	(0.04)	(1.11)	(0.17)
Average FEBIT	-0.022	-0.008	-0.022	-0.008
	(2.63)***	(0.51)	(2.66)***	(0.50)
GDP Real Growth Rate	0.002	0.004	0.003	0.004
	(1.45)	(1.43)	(1.97)**	(1.46)
log of Assets in US$	0.001	-0.010	-0.002	-0.011
	(0.25)	(2.78)***	(1.02)	(2.82)***
Leverage Ratio			0.047	0.013
			(3.25)***	(0.53)
Constant	-0.038	0.095	-0.027	0.094
	(1.23)	(1.72)*	(0.87)	(1.69)*
Observations	278	278	278	278
R-squared	0.05	0.07	0.08	0.07
Number of cty_x_indust		88		88

Absolute value of t statistics in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%