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Abstract

This paper is concerned with the role of debt composition on the firm-level investment by raising a main question: whether firms with high foreign currency or short maturity debts have less investment following a financial crisis. This paper finds that firms with more dollar debt have significantly less investment due to exchange rate depreciations. Accordingly, the balance sheet effects of exchange rate devaluations undermine the competitiveness of listed firms in Indonesia, so that the effects of crisis have been exacerbated and prolonged through corporate balance sheet channel. Firms with higher foreign asset would have less dollar debt, which may be due to their export activities. Another important finding is that firms with majority foreign ownership have less dollar debt. This paper uses 179 listed companies in Jakarta Stock Exchange, with at least 5 consecutive years during 1994 – 2004 as samples of study, and a dynamic panel data or GMM analysis is employed.

Keywords: maturity mismatch, firm investment, balance sheet effect,
financial crisis

JEL Classifications: D92, E32, G32

1. Introduction

The question of how such huge crisis happened in such a fairly good macro economic performance around Asian countries is still vibrant until nowadays. Recently, it is widely accepted that the real problem of most Asian countries is not just in macro side, but also in micro one. Krugman (1999) argue that by normal criteria, crises should not be happened in Asian countries. Government budgets were in good shape, whereas current account deficits were relatively moderate in Korea and Indonesia. He also argued that despite some slowdown in growth on the onset of crisis, there was not a strong case that any of the countries in Asian

region needed devaluation for competitive or macroeconomic reasons. It is likely true that macro economic factor cannot be solely responsible.

The role of micro sector on the financial fragility and macro economic vulnerability becomes a prevalent analysis in the studies of crisis following a series of financial turmoil in around the world[1]. Balance-sheet approach considers the micro factors as important source of the macro economic turbulence. It is therefore indispensable to link micro sectors and macro economic in analysing the fashionable financial crises.

As many previous researches, this study argue that the macro economic stability in Asian countries is actually misleading. There are several arguments behind the macro economic stability. The first is that underneath the apparent soundness of macroeconomic policy was a large, hidden subsidy to investment via implicit government guarantees to banks (Krugman, 1999). He added that the apparent soundness of budgetary and macroeconomic policy was an illusion in which under the surface, the governments were actually engaged in reckless and unsustainable spending. Meanwhile, Corsetti, Pesenti, and Roubini (1998) describe that implicit guarantees led banks to engage in moral hazard lending; it represented a hidden government budget deficit, and the unfunded liabilities of these banks represented a hidden government debt.

There is a consensus that the currency crisis in 1990s exhibited features that were mostly absent in the crisis episodes of the 1970s and the 1980s. The recent crisis is referred to as a third generation of crisis which consider balance sheet of the micro sectors, namely banking, financial and non-financial sector, contribute to the mechanism. Balance sheet effect

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[1] In the decade of 1990s, waves of crisis hit regions around the world: the collapse of western European's Exchange Rate Mechanism in the fall of 1992, the collapse of the Mexican country in the winter 1994 -1995, and the East Asian countries in the mid of 1997-1998.

happens if firms and financial institutions faced large increases in the cost of debt that significantly weakened their balance sheet when the currency crises occurred[2].

This paper intends to translate the balance sheet approach by bringing the empirical evidence on the relation of firm-level investment and the currency mismatch in Indonesia. The main question is whether firms with higher debts in foreign currency have less investment when the currency depreciation is present. Basically, exchange rate depreciations have two channels to affect firm-level condition. First, firms with high leverage in foreign currency will have low marginal propensity to import. Second large foreign currency debt with low revenue from export activities will reduce the net-worth of the firms. In short world, debt composition of the firms plays important role in propagating crisis.

In Indonesia, the 1997 currency depreciation is associated with poor performance due to unsound capital structures, where firms depend excessively on short-term bank loans to finance their longer-term projects. It bears the maturity mismatch. Meanwhile, the crisis reveals the vulnerabilities of using un-hedged short-term foreign currency borrowings to finance domestic investment projects. In latter case, the currency mismatch is present.

To investigate the effect of currency depreciation on the firm-level investment, this paper links directly the interaction of currency depreciation, debt composition and firm-level investment by using listed companies in Jakarta Stock Exchange (JSX). According to the maturity-mismatch hypothesis, firms with higher exposure in dollar debt should suffer more from the aggregate capital outflow. The main question of this paper is whether firms with higher dollar debt maturity have less investment due to currency depreciation in Indonesia. We use the standard reduced-form investment model to investigate the relation of the

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[2] Definition given by Martinez (2003) in his dissertation titled "Currency Mismatches in Emerging Markets: Causes and Implications for Firms' Investment during Currency Crisis", submitted to the Faculty of the Graduate School of the University of Maryland, College Park, unpublished.

currency mismatch and firm-level investment. In this study we include 179 firms listed in the JSX in the period of 1994 – 2004. Panel data analysis is employed in this study.

2. Related Studies

This research is based upon two pivotal hypotheses. First, firm with more dollar debt should invest substantially less following exchange rate depreciation. Second, firm with more short-term debt would have a similar effect. Maturity and currency mismatch should undermine the firm net worth, which affect the supply of long-term credit for investment and the availability of short-term working capital. The latter drop will reduce the firm's capacity to purchase intermediate goods and pay for variable factors of production. It is therefore important to survey theory related to the balance sheet channels in the financial crisis.

In broader sense, balance sheet approach focuses on the differences in the values of the foreign currency denominated assets and liabilities on the balance sheets of households, firms, the government and the economy as a whole. For a firm, the currency mismatch derives from the relationship between net foreign-currency denominated liabilities and the net present value of domestic-currency denominated cash flow. A firm with a currency mismatch will experience an adverse balance-sheet effect if exchange-rate depreciation raises the value of its net foreign-currency denominated liabilities relative to the net present value of its cash flow.

Following a series of crises around the world the balance sheet approach is therefore considered as an appropriate tool of analysis. Huge research agenda employ this approach. Some studies focus on the net worth effects of shocks to the exchange rate in the presence of foreign currency denominated liabilities[3].

In conventional explanation, currency depreciation could enhance firm performance for tradable sector or sector which gains revenues in foreign currency for their production and

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[3] See for example Eichengreen, Hausmann and Panizza (2005)

sales activities. It is a "competitiveness effect" of the currency depreciation. But, in the case of firms highly indebted on the foreign liabilities, depreciation decreases net worth of the firms through "balance sheet effect". In this channel, firms with high foreign leverages should be suffering more in the case of the presence of currency depreciation. Due to financial globalization and currency fluctuation, firm financing policies contribute significantly on firm vulnerability.

The concern of this paper is actually on the choice of the financial structure of the firms and their impact on the firm investment around exchange rate depreciations in Indonesia. To investigate the impact of the currency depreciation on the firm-level investment behaviour, we link directly the debt composition of the firms and their investment level. According to the maturity-mismatch hypothesis, firms with higher exposure in short-term debt should suffer more from the aggregate currency depreciation. Meanwhile, currency-mismatch hypothesis describe that firms with higher dollar debt should less investment after interaction with currency depreciation.

In most developing countries, excessive external debt of the corporate sector is due to the bank-dependency of the financing policies, which coincides with the weaknesses of the financial sector supervision and governance. In many Asian countries bank commonly offer credit more exclusively for the connected corporate sector. In Indonesia, at the onset of crisis, the credit approval is actually based on two principal reasons. For private banks, loan is preferably channelled to the related firms in the same groups or conglomerate. And for state banks, the relation revealed the memo-credit behaviour that means credit would be disbursed as if any references from high level of government officers or important political leaders. Banking and financial sector are actually lack of the good governance in the well-design institution arrangement. One of the implications is the absence of the risk assessment in the credit approval.

Firms with heavy short-term foreign currency-denominated debt become vulnerable to both exchange rate and interest rate shocks through currency and maturity mismatches. Bernanke, Gertler, and Gilchrist, (1999) explain that the soaring of interest rate can lead to a rollover risk and a decline in the net worth of the firms with higher short term debt magnifying the conventional interest rate channel as postulated by the financial accelerator mechanism.

In the so-called third generation crisis models, currency composition as well as maturity debt becomes a central problem, which could exacerbate the currency crisis. As noted by IMF (2005) "both currency and maturity mismatches can exacerbate the impact of exogenous shocks in emerging markets, increase the severity of crises, and slow down the post crisis adjustment".

One of the most important consequences of the financial crisis is the investment behaviour in firm level, which induces directly the economic growth. Froot, Sharfstein, and Stein (1993) develop a model in which the cost of financial distress is the loss of investment opportunities.

Many studies provide empirical evidence that maturity mismatch in emerging countries become one of the most important factor inducing financial fragility that ended by financial crisis. Before the period of crisis in Asia, most countries in the region preferred to employ external short-term debt, which become a problem when the depreciation of local currencies were present. Most of companies could no repay their debt, and many among them have to reduce their investment level if not liquidate. Since this phenomenon was common, on the aggregate level, economies become more fragile since the investment was collapse that coincided with the reversal of capital account.

Radelet and Sachs (1998) mention this condition as the financial panic where the liquidity holder preferred to move their investment into other currencies. However herd behaviour of the liquidity holders revealed the financial panic is sourced by the fundamental weaknesses of the economy. Corporate sector, which was highly leveraged become one of the

source of the fundamental weakness, particularly that much of this indebtedness was at the short term.

Although this risk is microeconomic in nature, the evidence advanced thus far has taken the form of macro correlations (Bleakley and Cowan 2003). Firstly, this microeconomic risk will exacerbate the currency depreciation by considering the behaviour of financial panic and secondly this capital account reversal commonly would be accompanied with a decline in investment.

Several researches are concern on the issue of the balance sheet effects of the exchange rate depreciation. Aguiar (2002) using large listed firms in Mexico describe that there is a balance sheet effect mechanism. It is found that dollar debt and firm investment have significant negative correlation, which means that firms with higher dollar debt have smaller investment due to currency depreciation. Allayanis *et al*. (2003) find the same finding that firms with higher dollar debt invest less in depreciation period for the case of large listed companies in Asian countries (Hong Kong, South Korea, Indonesia, Philippines, Malaysia, Thailand and Taiwan). Bonomo *et al*. (2004) using large listed companies also find the same findings for the case of Brazil. Pratap *et al*. (2003) find the negative and significant relation of the dollar debt and firm-level investment in the case of Mexico.

Meanwhile Bleakley and Cowan (2002) find inversely that the relation is positive and significant in the case of Latin American countries (Argentina, Brazil, Chile, Colombia and Mexico). They explain that there is not balance sheet effect in which currency depreciation do not refrain the investment of firms indebted in dollar. In the case of Asian countries, Luengnaruemitchai (2003) finds comparably that the relation between dollar debt and firm investment is not significant.

Accordingly, debate on the balance sheet effect of the currency crisis is far from exhaustive since there are the conflicting evidences among different researches. This paper

believes that empirical evidence in this issue is always challenging since further research program is always needed for development of the ideas.

Liberalization policies in Indonesia have been excessively implemented in the 1980s, due to the sharp declines in oil revenues in late 1982, and again in 1986. Facing such condition, Harris, Schiantarelli and Siregar (1992) identify two principal policies responses. First, non-oil exports had to be increased in order to maintain the flow of imports essential for continued development. Second, with the decline in oil revenues, fewer resources were now available to the public sector and therefore it became necessary to stimulate private savings mobilization.

Financial liberalization is an important momentum to bear financial fragility that finally ended by financial crisis. Capital account liberalization was supposed to stimulate growth in the developing world by channelling scarce capital to deserving economies and facilitating international risk sharing (Eichengreen and Hausmann, 2003). But actually, the dream did not come true. Instead, they find that private financial markets have been engine of instability and since 1998 debt flows to developing countries have become negative. As we know in nowadays, after the series of crisis around the world, it seems that the international financial integration has not worked as promised.

In the mid of 1997, severe crisis hit Indonesia together with other neighbouring Asian countries, such as Thailand, South Korea, Malaysia and the Philippines. The major important impact of the crisis is on the economic growth, which drops dramatically in 1998 (-13 percent). It is due to the collapse of the investment of the real sector, especially the corporate sector.

In the aftermath of crisis, Indonesia comes upon low level of investment. Instead of expanding their investment firms prefer to consolidate their activities first. Firm-level investment was strongly impacted by tight money policy applied by Bank Indonesia in

dealing with exchange rate volatility. Following rapid currency depreciation in the mid of 1997, Bank Indonesia as the monetary authority in Indonesia enhanced interest rate into 70.44 percent on August 1998. In such condition, firm sector technically collapsed. Impact of currency crisis was huge on Indonesian economic performance: GDP contracted by 13 percent and inflation reached 58.5 percent in the end of 1998[4]. In the following years from the 1997 crisis, Indonesia's economy is subjected to poor performance.

After a long journey in severe crisis, investment in Indonesia is still under performing. Impact of crisis has been enduring a couple of years following a financial crisis. Even for exporter firms, depreciation could not enhance the competitiveness. In conventional trade theory, currency devaluation will stimulate export since the value of export should be cheaper or in other way domestic firms will have exchange rate competitiveness.

Since the value of the rupiah plummeted from around 2,000 rupiah to around 8,000 rupiah to the U.S. dollar, Indonesian exports should be comparatively inexpensive relative to pre-devaluation prices, however worldwide demand seemed steady, structural barriers to Indonesian products appeared to be weakening and credit crunch that lead to financial constraints for corporate sector was present (Blalock and Roy, 2005).

This paper tries to link possibility that crisis is exacerbated by the debt policies by employing the study in the micro-level study. The description below shows how debt level condition and investment behaviour come across in Indonesia.

Table 7.1 shows that Indonesia has a high non-performing loans compared to other countries in the region. Table 7.2 reveals that the foreign borrowing rate of banking sector is relatively high in fourth quarter of 1998.

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[4] In following years, economic activities in Indonesia were relatively slow by GDP growth of 0.2 percent in 1999 and 4.5 percent in 2000. Meanwhile, in 2001 GDP growth downed into 3.4 percent, and rebounded into 3.7 percent in 2002.

Table 7.1. Non-Performing Loans (NPLs) among Asian Countries

	NPLs as % of loans	Capital as % of loans	Provisions as % of NPLs	NPLs less Provisions as % of capital	As at 1998	NPLs as % of loans (1995)	NPLs as % of loans (end of 2000)
China	25	4	-	-	Dec	20	25
Korea	7	5	-	-	Dec	5	6
Indonesia	36	2	33	1,430	Aug	10	24
Malaysia	9	13	56	47	Dec	6	10
Philippines	11	-	28	-	Aug	-	15
Thailand	48	10	24	370	Dec	7	18

Note: The figures of 2000 are the ones over 3 months past due loans.

Source: Hawkins and Philip Turner (1999). Completed and suggested by Masumi Kishi (2006)[5].

Table 7.2. Bank Borrowings from Foreign Banks

	As percentage of domestic credit			*Change in billions of US$, annualized*		
	1990	1997 Q2	1998Q4	1995Q1-96Q3	1996Q4-97Q2	1997Q3-98Q4
China	5	8	6	11	10	-1
Korea	16	30	23	19	17	-23
Indonesia	11	18	27	2	5	-5
Malaysia	14	24	24	5	8	-5
Philippines	70	25	27	2	5	-1
Thailand	17	46	31	24	3	-26

Source: same from previous table

3. Data and Methodology

3.1. Data

We use database provided by JSX and ECFIN. We sort data of non-financial firms with at least 5 consecutive years from the database. Fortunately, database provides us the data of maturity debts. However, since the data of debt composition were not provided by both sources, we construct manually by accessing directly the annual report of the firms. We have great difficulties for that, since debt composition of the firms do not reported in financial report. They are attached in the note to the financial report in each annual report of the firms.

First we documented foreign debt of the firms in various currencies and convert it in the local currency (Indonesian Rupiah or IDR). Since, after July 1997, exchange rate

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[5] Thanks to Masumi Kishi who provide this table in his comments to me during the presentation of paper in The 5th International Conference of the Japan Economic Policy Association (JEPA), December 2-3, 2006.

fluctuates freely, we use monthly exchange rate benchmark launched by Bank Indonesia to convert foreign debt from foreign currencies to local currency.

Afterwards, all of financial ratio is deflated by wholesale price index (WPI) in 2000 for obtaining the constant value. For this study we have 179 firms as samples in the period of study 1994 – 2004. We strictly include firms with at least 5 consecutive years in their financial reports as samples.

Data on investment rate below shows that in 1998, most listed firms in Indonesia have negative rate of investment. Figure 7.4 demonstrates the net worth effect, which is measured by total sales and total debt.

Figure 7.1. Delta (ln) Real Exchange Rate

Source : IFS
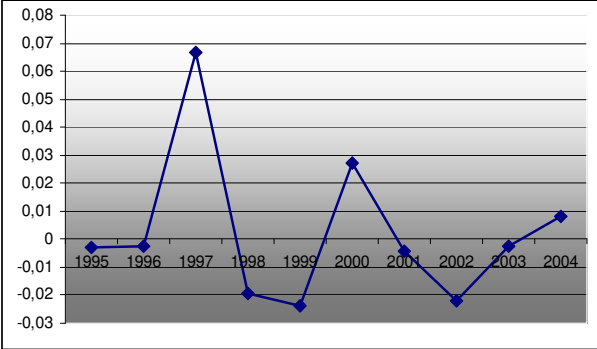
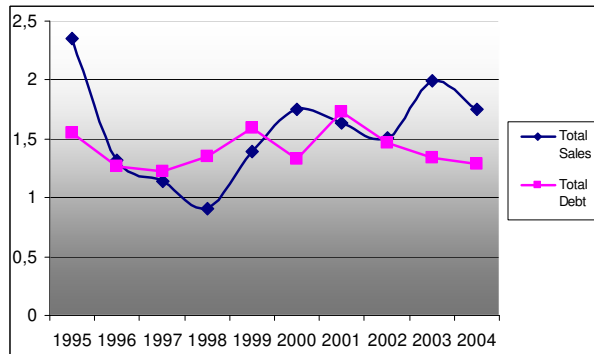| Table 7.3. Rate of Firm-Level Investment		
	Median	*Mean*
1995	0,3130	0,8742
1996	0,1389	1,4879
1997	0,1756	0,3085
1998	-0,4074	0,1636
1999	-0,0960	0,0157
2000	-0,1393	-0,0107
2001	-0,0397	6,6199
2002	-0,0501	0,0249
2003	0,0009	0,2817

Source: calculated from sample

Figure 7.2. Median Investment rate (%)
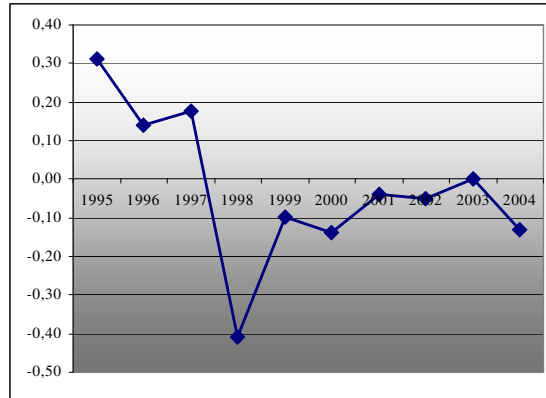
Source: Author calculation based on data from JSX's database

Figure 7.3. Median Net worth Effect (%)

Source: Author calculation based on data from JSX's database

3.2. Simple Model

The main concern of this paper is the question of whether firms with higher short-term and dollar exposure invest less in the aftermath of crisis. To do this, we run estimation procedures by employing reduced-form equation for investment. We apply Bleakley and Cowan's (2003) equation in capturing the interaction of (dollar) debt exposure and capital flows as written as follows.

$$(\text{Dollar debt exposure})_{i,t-1} \text{ x } (\text{Currency Depreciation})_t$$

Where i is firm and t is time.

Dependent variables are investments level of the firms, which proxied by investment in fixed assets and inventories. The main explanatory variable is debt exposure, which could

be dollar debt or short-term debt, which is all liabilities coming due in the upcoming fiscal year.

We employ inventory as dependent variable since a shortage of working capital reduces firm capacity to purchase intermediate goods and pay for variable factors of production, leading to a reduction in output. The main macroeconomic variable employed in the present study is real exchange rate (RER) [6].

We employ a simple regression equation developed by Bleakley and Cowan (2003) allowing to estimating the different responses of the firms to currency depreciation with different maturity and composition structures of their balance sheet. We are concerned with both, maturity and currency mismatch. For examining currency mismatch we employ the equation as follows.

$$\frac{I_{it}}{K_{it-1}} = \alpha \frac{I_{it-1}}{K_{it-2}} + \gamma \left(\frac{D^*_{it-1}}{K_{it-1}} \Delta \ln RER_t \right) + \delta \frac{D^*_{it-1}}{K_{it-1}} + \varphi \frac{D_{it-1}}{K_{it-1}} + \eta_t + \mu_i + \upsilon_{it} \qquad (1)$$

where firms are represented by $i=1..N$ and time by $t=1...T$. Meanwhile, I represents investment, K represents capital stock, D^* dollar debt and D total debt. And $\Delta \ln RER_t$ is the change in the real exchange rate between time t and $t-1$. The main question of this study is represented by the coefficient γ, which captures the investment response of holding dollar debt during a currency depreciation. Meanwhile, the direct effect of dollar debt on investment is captured by the coefficient δ.

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[6] Real Exchange Rate (RER) = $\frac{E_N * WPI_{USA}}{WPI_{IND}}$, where E_n is nominal exchange rate and WPI is wholesales price index

While, η_t represents the firm-invariants time specific effects capturing potential effect of currency depreciation, whereas μ_i represents time-invariant unobservable firm-specific effects, which capture the firm characteristics. And υ_{it} is error term such that $\upsilon_{it} - idd(0, \sigma_\upsilon^2)$

For capturing the impact of maturity mismatch problem, we employ the estimation as follows

$$\frac{I_{it}}{K_{it-1}} = \alpha \frac{I_{it-1}}{K_{it-2}} + \gamma \left(\frac{STD_{it-1}}{K_{it-1}} \Delta \log RER_t \right) + \delta \frac{STD_{it-1}}{K_{it-1}} + \varphi \frac{D_{it-1}}{K_{it-1}} + \eta_t + \mu_i + \upsilon_{it} \qquad (2)$$

We replace the dollar debt with short-term debt and the main question is comparable in which whether firm with short-term debt interact positively (or negatively) to the investment due to depreciation.

For methodology, since investment and debt composition decisions are dynamic through time, we have to model the behaviour as such. Generalized Method of Moment (GMM) provides an alternative estimator for dynamic relations. This study employs two GMM estimators, namely GMM difference and GMM system. The GMM difference estimator assumes that the innovation in the error term υ_{it} can be correlated with current and future realization of the independent variable but not with past values. Hansen (1982); Arellano and Bond (1991) provide GMM technique to find asymptotically efficient estimators with the moment condition $E(Z \Delta \upsilon_i) = 0$. Here $Z_i = (Z_{i1} ... Z_{iT-2})$ where $i = 1, ..., N$ are lagged values of the independent variables that can be used as instruments and $\Delta \upsilon_i = (\Delta \upsilon_{i3}, \Delta \upsilon_{i4}, ... \Delta \upsilon_{iT})$ where $i = 1, ..., N$ refer to the first differenced errors terms.

The GMM system estimator uses the similar moment conditions as the difference estimator, but in addition, it also assumes that the fixed effect is uncorrelated with the independent variables.

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We use the lagged variables in levels as instruments for the first differences of the regressors. We use the Hansen/Sargan-test of overidentifying restrictions as a joint test of model specification and instrument selection. AR (1) and AR (2) tests of serial correlation of the first differenced residuals are employed. Both the AR (1) and AR (2) test are asymptotically standard normal under the null hypothesis of no serial correlation in υ_{it}.

This study is also concerned on the impact of debt policies on firm competitiveness. For measuring the impact of debt policies or composition on competitiveness, the equation is as follows.

$$\frac{EBIT_{it}}{K_{it-1}} = \gamma \left(\frac{D^*_{it-1}}{K_{it-1}} \Delta \log RER_t \right) + \delta \frac{D^*_{it-1}}{K_{it-1}} + \varphi \frac{D_{it-1}}{K_{it-1}} + \alpha \frac{FA_{it-1}}{K_{it-1}} + MNCdummy + \eta_t + \mu_i + \upsilon_{it} \qquad (3)$$

Meanwhile, for examining the determinants of dollar debts and short-term debts, the equation as follows is employed.

$$\frac{D^*_{it}}{K_{it-1}} = \gamma \frac{TA_{it}}{K_{it-1}} + \delta \frac{CA_{it}}{K_{it-1}} + \varphi \frac{TD_{it}}{K_{it-1}} + \phi \frac{EBIT_{it}}{K_{it-1}} + \alpha \frac{FA_{it}}{K_{it-1}} + MNCdummy + \eta_t + \mu_i + \upsilon_{it} \qquad (4)$$

Where TA is total asset, CA is current asset, TD is total debt, EBIT is earning before tax, FA is fixed asset and MNC dummy is 1 if firms have more than 50 percent foreign ownership participation (0 for otherwise). Dependent variable is dollar debt (D^*). OLS, within groups, GMM difference and GMM system are employed for examining the relations.

For examining the determinants of short-term debt, we replace D^* (dollar debt) with STD (short term debt) and eliminate the variable of FA (foreign asset), which is by theory not relevant for the problem of debt maturity.

4. Empirical Evidence

4.1. Determinants of Debt Composition

Table (3) demonstrates the results of regression for determinants of dollar debt. Total asset is predicted to have positive correlation with dollar debt in GMM system estimate. In contrast current asset is negatively and significantly related to dollar debt, which means that for accessing debt listed-firms in Indonesia do not need collateral in current asset. GMM system provides a highest coefficient correlation value (-50 percent) with 99 percent of confidence level.

Total debt is naturally positively related to dollar debt. The increase of 10 percent of total debt would be predicted to comprise more dollar debt in the composition of debt by 45 percent. This prediction is consistent with other studies, which argue that firms in Asian countries contain an important proportion of dollar debt to finance their activities.

Table 7.3. Determinants of Dollar Debt				
	GMM Diff		*GMM System*	
Total Assets	0,3598		0,5081	***
	(0,3404)		(0,1615)	
Current Assets	0,0700		-0,4996	***
	(0,1481)		(0,1164)	
Total Debts	0,0868		0,4479	***
	(0,0705)		(0,0677)	
Earning Before Interest and Tax	-1,1057	**	-0,4835	**
	(0,4667)		(0,2174)	
Foreign Assets	0,5360	***	0,6415	***
	(0,2018)		(0,0802)	
MNC	-0,5912		-0,8806	*
	(0,9579)		(0,4908)	
Continued				
Year dummies	Yes		Yes	
Observation	805		904	
Sargan/Hansen test	95.45		75.08	
p-value	*1.000*		*0.091*	
AR(1)	-2.36		-5.77	
p-value	*0.018*		*0.000*	
AR(2)	-0.86		-1.45	
p-value	*0.387*		*0.148*	

Table 7.3 also shows that earning before interest and tax (EBIT) as a proxy of firm-level profitability is negatively related to foreign debt. It would be predicted that if a firm decreased its profitability it would have a higher dollar debt. This evidence is consistent with the evidence for current asset. The negative correlation of both variable, EBIT and current asset to dollar debt reveals that a firm in Indonesia tends to increase their dollar debt during its decline in performance proxied by return and current asset.

As predicted by many theories, foreign asset is positively related to dollar debt. It means that firms with higher foreign asset naturally would have higher dollar debt. It may be due to the export activities. Unfortunately, sector dummy is dropped in GMM difference and GMM system[7]. Meanwhile, foreign ownership participation is not an important factor in determining the composition of dollar debt.

Table 7.4 summarises the results of regression for examining the determinants of short-term debt. Factors determining short-term debt are more difficult to be analysed than dollar debt. By GMM system, total asset is positively related to short-term debt. It is also the similar case for current asset. Within group predicts that current asset should be positively related to short-term debt, but GMM system inversely predicts that it should be negatively related to short-term debt. However, it could be argued that a listed company in Indonesia tends to increase their short-term debt in such a condition that total asset and current asset diminish.

Table 7.4. Determinants of Short-Term Debt				
	GMM Diff		*GMM System*	
Total Assets	0,7664	***	0,3476	**
	(0,2843)		(0,1617)	
Current Assets	-0,4085	***	-0,1680	**
	(0,1200)		(0,0823)	
Total Debts	1,2073	***	1,0509	***
	(0,0795)		(0,0553)	
Earning Before Tax	1,1464	***	1,1028	***

[7] We actually include sector dummy, 1 for tradable sector and 0 for non-tradable sector, but GMM difference and GMM system drop this variable due to collinearity problem.

	(0,0450)		(0,0511)	
MNC	3,5585	*	0,9153	*
	(2,1595)		(0,4969)	
Year dummies	Yes		Yes	
Observation	805		904	
Sargan/Hansen test	92.89		100.93	
p-value	1.000		0.000	
AR(1)	-1.28		-8.08	
p-value	0.202		0.000	
AR(2)	-0.81		-0.54	
p-value	0.420		0.587	

Total debt is predicted to have positive relation with short-term debt. It is important evidence that the proportion of short-term debt in the total debt composition is relatively important. It is also evidence that a firm with majority foreign ownership tends to have more short-term debt than other firm with less important foreign ownership. Table 4 shows that firm return is positively related to short-term debt.

4.2. Main Results

The main concern of this paper is to examine the interaction between the foreign currency debt exchange rate devaluation. The main relation is captured by the equation (1), which evaluates so called "currency mismatch" problem. If the relation is negative, the interpretation is that exchange rate devaluations affect more adversely a firm with higher foreign debt. Meanwhile, equation (2) focuses on "maturity mismatch" problem in which if the relation is negative, it means that exchanger rate devaluation affect negatively a firm with higher short-term debt.

Bleakley and Cowan (2002) find that, for the case of Mexico, an exchange rate devaluation affect positively to a firm with higher dollar debt composition. Pratab, Lobato and Somuano (2003) adversely find for the case of Mexico that a firm with higher dollar debt would have less investment due to exchange rate depreciations.

Moreover, many studies find adversely for other Latin American countries, such as Bonomo, Martins and Pinto (2004) for the case of Brazil; Benavente and Johnson (2003) for Chilean case; De Brun, Gandelman and Barbieri (2002) for the case of Uruguay. Meanwhile, Gilchrist and Sim (2006) also finds the negative impact of holding dollar debt for the case of Korea. Hemet (2003) confirms the negative relation between dollar debt and firm-level investment for Korean firms.

Table 7.5 demonstrates the result of regression for the case of currency mismatch. This study uses GMM difference and GMM system estimates. The GMM difference estimator uses the equation in difference form, and uses lagged difference of explanatory variables as instruments. The GMM system estimator uses both lagged difference and levels of explanatory variables as instruments.

Table 7.5. Investment I : Currency Mismatch

Dependent variable is investment in previous year (t-1) deflated by capital stock in previous year (t-1) or $\frac{I_{it-1}}{K_{it-1}}$. Main independent variable is $\left(\frac{D^*_{it-1}}{K_{it-1}}\Delta\log RER_t\right)$, which is the interaction of dollar debt in previous year and the change of natural logarithm of real exchange rate (RER) in the year t. Following Bonomo *et al.* (2004), I include several controlling variables: investment in previous period, dollar debt, total debt. All variables are deflated by capital stock. I also include year for controlling the regression. Ordinary Least Square is employed by heteroscedasticity correction. For GMM difference and GMM System use lag t-2 and t-3 for instruments. Sargan/Hansen test is used for overidentification test.

	GMM-Diff		*GMM-Sys*	
Lagged Investment	0,000		-0,001	***
	(0,001)		(0,000)	
DD*RER	-3,478	**	-1,379	
	(4,244)		(1,731)	
Dollar debts	-0,241	***	-0,497	***
	(0,113)		(0,115)	
Total debts	0,336		0,380	***
	(0,025)		(0,022)	
Year dummies	Yes		Yes	
Observation	714		813	
Sargan/Hansen test	92.63		37.91	
p-value	0.375		0.124	
AR(1)	-1.27		-1.32	
p-value	*0.203*		*0.187*	

AR(2)	-0.79	-0.50
p-value	*0.431*	*0.617*

The results of regression are significant and negative for GMM difference and negative but not significant for GMM system. The coefficient correlation ranges from -3.47 for GMM difference, with level of significance 5 percent. This finding can be interpreted that firm with higher dollar debt composition would be predicted to have lower investment level due to exchange rate depreciation. It suggests that the exchange rate balance sheet effects are exist in Indonesia. Most firms in Indonesia have a currency mismatch.

Meanwhile, dollar debt is negatively related to investment in both estimates. GMM system shows the important relation between dollar debt and firm-level investment by -0.49 in 1 percent significant level. It indicates that firms have higher local currency debt to finance their investment. Higher investment does not need higher dollar debt. Meanwhile, total debt is positively and significantly related to investment by exception for GMM difference.

The coefficient of external debt investment in previous year (t-1) is negative in GMM system, whereas the correlations are very little. In GMM difference lagged investment is not important variable to investment. Then, in general, lagged investment is not important variable determining the firm-level investment.

Table 7.6 examines the impact of maturity mismatch on firm-level investment. The question is whether a firm with higher short-term debt is predicted to have less investment due to exchange rate depreciations. The findings show that short-term debt is not important factor interacting with exchange rate depreciation. In this table we just can see that total debt is strongly positively related to investment, which could mean that investment is mainly supported by debt. But the maturity mismatch itself is not found as an important factor.

Table 7.6. Investment II : Maturity Mismatch

Dependent variable is investment in previous year (t-1) deflated by capital stock in previous year (t-1) or $\frac{I_{it-1}}{K_{it-1}}$. Main independent variable is $\left(\frac{STD^*_{it-1}}{K_{it-1}}\Delta\log RER\right)$, which is the interaction of short-term debt in previous year and the change of natural logarithm of real exchange rate (RER) in the year t. for controlling variable I include investment in previous period, short-term debt, total debt. All variables are deflated by capital stock. I also include year for controlling the regression. Ordinary Least Square is employed by heteroscedasticity correction. For GMM difference and GMM System use lag t-2 and t-3 for instruments. Hansen test is used for overidentification test.

	GMM-Diff		GMM-System	
Lagged Investment	-0,0010		0,0004	
	(0,0010)		(0,0010)	
STD*RER	-2,1526		-2,9449	
	(1,9946)		(3,2619)	
STD	-0,0020		-0,3430	
	(0,3297)		(0,3320)	
Total debts	0,2910	**	0,4101	***
	(0,1218)		(0,1275)	
Year dummies	Yes		Yes	
Observation	714		813	
Sargan/Hansen test	93.96		65.31	
p-value	0.339		0.000	
AR(1)	-1.33		-1.68	
p-value	0.183		0.093	
AR(2)	-1.52		-1.67	
p-value	0.129		0.096	

The result of the interaction between the dollar debt and exchange rate devaluation implies a negative competitiveness effect of a higher proportion of imported input in the firms with higher external debt.

Table 7.7 shows the result of competitive effect. We use sales and earning before interest and tax for benchmark of competitiveness. Two estimation methods are employed, namely GMM difference and GMM system. Equation (3) is used to observe the determinants of competitiveness effect of exchange rate depreciation.

Table 7.7. Competitive Effect							
	Sales				**Earning Before Tax**		
	GMM Difference		*GMM System*		*GMM Difference*		*GMM System*
Dollar debt*DlnRER	-2,1713		-2,7620		-4,2832	***	-5,0088	***
	(2,9539)		(5,1048)		(1,2824)		(1,4798)	
Dollar debts	-0,5487	*	-1,2435	***	-0,1496	**	-0,2218	***
	(0,3211)		(0,1577)		(0,0755)		(0,0457)	
Total debts	0,5008	***	0,5951	***	0,0850	***	0,1058	***
	(0,0491)		(0,0414)		(0,0128)		(0,0120)	
Foreign assets	1,7058	***	2,7328	***	-0,4364	***	-0,4124	***
	(0,4448)		(0,3966)		(0,1717)		(0,1150)	
MNC dummy	-7,7395		-2,2343	**	-3,4537	**	-0,4563	
	(6,0057)		(1,1670)		(1,6141)		(0,3383)	
Year dummies	Yes		Yes		Yes		Yes	
Obs	813		912		813		912	
Sargan/Hansen test	95.77		108.66		98.10		58.62	
p-value	0.942		0.000		0.919		0.036	
AR(1)	-0.41		-4.05		-2.05		-2.14	
p-value	0.680		0.000		0.041		0.033	
AR(2)	-0.22		0.32		-1.90		-1.12	
p-value	0.828		0.750		0.057		0.264	

The interaction of dollar debt and exchange rate depreciations is adversely associated with earning, whereas it has no significant effect to sales. Dollar debt is negatively related to sales and EBIT. More dollar debt would be predicted to diminish sales and earning of the firms. Total debt increase with sales and earning. It means that listed-firms in Indonesia employ debt to maintain its activities.

5. Conclusion

The basic argument of this paper is that debt composition of the firm plays a pivotal role of the mechanism of crisis by which exchange rate depreciation linked to firms' investment. In developing countries like Indonesia, asymmetric information on the credit market is commonly present. In such a situation, balance sheet channel is expected to link the macro economic fluctuation and firm-level investment.

This paper answers the question of what the impact of exchange rate depreciation on the private investment when foreign currency denominated debt is present. In this study, we

found a robust negative balance sheet effect of exchange rate depreciations on firm-level investment. GMM difference and GMM system help us to provide relatively pertinent results of estimations. Firm with higher proportion of dollar debt would be predicted to have less investment. It can therefore be argued that currency mismatch is common among listed-companies in Indonesia. However, the impact of short-term debt on firm-level investment is not evident. It need further research to find the more pertinent findings.

This research also finds that in Indonesia the balance sheet effects of exchange rate devaluations undermine the competitiveness of listed firms. Another important finding is that firms with majority foreign ownership have less dollar debt, whereas firms with higher foreign asset would have less dollar debt, which may be due to their export activities. Unfortunately, we cannot examine the impact of export to the balance sheet effect mechanism, since the data of export is absent. We plan to complete the data of export from the each annual report of listed companies in order to understand the effect of export activities in the mechanism of balance sheet effect of currency depreciation in Indonesia. It should be interesting to check the finding of this actual study.

In this research we do not address directly the heterogeneity effect of exchange rate shocks. It should be interesting also to investigate the different impact of exchange rate shocks among different characteristic of the firms, such as firm size, export size, firm age etc.

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