DEBT COMPOSITION AND BALANCE SHEET EFFECTS OF EXCHANGE AND INTEREST RATE VOLATILITY: THE CASE OF PERU

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DEBT COMPOSITION AND BALANCE SHEET EFFECTS OF EXCHANGE AND INTEREST RATE VOLATILITY: A FIRM LEVEL ANALYSIS

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I. Introduction

What is the impact of the exchange rate volatility on economic activity? This seems to be one of the most compelling questions in the economic literature in recent times, as the currency crisis during the 90´s were characterized not only by massive exchange rate depreciations but also by a drastic drop in economic activity and the collapse of the financial system. The more striking characteristics of these currency crisis were that, previous to the crisis themselves, the degree of exchange rate misalignment was considered small, and the standard macroeconomic fundamentals were considered sound (in terms of inflation, fiscal deficit, monetary expansion, among other variables).

On the theoretical side, a large body of literature is being developed around the "open economy Bernanke-Gertler" framework (a phrase coined by Krugman), which refers to the inclusion of some sort of imperfection in the domestic financial market within an standard model of open economy, along the lines of the Mundell-Fleming workhorse. In this type of models, if there exists a significant currency mismatch in the economy[1], a large devaluation will deteriorate the firm's net worth. As the firm's risk increases, credit becomes more expensive and more restricted, which finally affects investment and therefore, aggregate demand. Therefore the key variable in explaining the contractionary effects of a real exchange rate depreciation is the currency mismatch in the economy. Using this balance-sheet channel, Krugman (1999) and Aghion, Bacchetta and Banerjee (2000) present models with multiple equilibrium. This feature is needed to explain large depreciations without significant changes in macroeconomic fundamentals.

Besides the balance sheet channel, there are two other direct channels by which the exchange rate affects economic activity. First, a real depreciation increases the cost of imported inputs, which can be seen as a negative supply shock by the firms. This channel reinforces the balance sheet one**,** and there is ample evidence in the literature about the way it operates. See for example Edwards (1989), Agenor and Montiel (1996) and more recently Reif (2001).

[1] A currency mismatch means that a large fraction of firm's debt is dollar denominated while the flow of income as well as assets are mostly denominated in domestic currency.

Second, a real depreciation can have expansionary effects through increasing the operating profits in the export sector, as well as increasing the cost of the imported final goods. Whether or not the competitiveness effect offsets the other two negative effects is an empirical question for which the evidence is not conclusive. On one hand, for example, Bleakley and Cowan (2002) found evidence that the competitiveness effect is much stronger than the balance-sheet effect, using a sample of enterprises from several Latin-American countries. On the other hand, Aguiar (2002) studied the case of Mexican firms, finding that, after the 1994 Mexican peso crisis, there was a contraction on investment driven by the weak balance sheet position of the firms.

Given that this empirical issue is not resolved yet, the final answer heavily depends on the debt composition and the output orientation of the firm, as well as the macroeconomic characteristic of the country. In this paper we study the case of Peru and try to find out an empirical answer to the question posed at the very beginning of this paper.

The Peruvian case is particularly interesting because it did not experienced a traumatic depreciation, as the ones experienced by Asian or other Latin-American countries. On the contrary, by most standards a real depreciation of almost 20 % in a one year period (March-98 to March-99) can be considered normal or even small. However, such a small depreciation had strong negative effects on the internal Peruvian demand, as aggregate investment plummeted. Moreover, the economy remained in recession for a long time and, by the end of 2002, private investment had not yet recovered its previous level, hovering around 2/3 of the levels reached at the end of 1997.

To understand the behavior of the Peruvian economy, we develop a two-step strategy. First, at the macroeconomic level, we use an unrestricted VAR to analyze the response of GDP to real exchange rate variation, taking into account a differentiation of output by primary and non-primary sectors. At this level, we found that the strengthen of the balance sheet effect is reinforced by a different channel, a bank-lending channel. This mechanism operates through the synchronization between bank-lending standards and the business cycle[2].

Second, at the microeconomic level, we estimate the final impact of exchange rate variation on investments and sales with accounting data from 163 Peruvian firms for the period 1994-2000. We find evidence that, in the Peruvian economy, the balance sheet effect more than compensated the

[2] For the case of US economy see Asea and Blomberg (1998).

competitiveness effect, both at the aggregate and at the firm level. Also, firm level evidence supports the findings that aggregate credit conditions are important to determine firm's investment decisions.

These results are interesting for two reasons. First, this is a case in which a small real exchange rate depreciation triggers a large balance-sheet effect. Second, we found evidence that, as the banks' net worth deteriorates, credit conditions became more strict; therefore, the balance sheet effect is reinforced by a bank-lending channel. This finding is crucial because in the literature the role of banks has been either overlooked or not well addressed.

The rest of the paper is structured as follows. The next section discusses the macroeconomic conditions in Peru during the 90s. In the third section a partial equilibrium model of investment decisions under borrowing constraints is presented. The description of the firm level data is made in the fourth section and the econometric results are presented in the fifth section. Finally, some policy recommendations are discussed in the conclusions.

II. A Macroeconomic Perspective

A. The Peruvian Economy in the 90s

Economic developments in Peru during the early 90s illustrate one of the most remarkable cases of structural reforms and serve as an example of economic growth with macroeconomic adjustment. At the end of 1990, the Peruvian economy was in a critical condition: the inflation rate exceeded 7,600 %, fiscal deficit reached 7,8 % of GDP, public external debt was around 63 % of GDP, and in such a deteriorated macroeconomic environment, the GDP shrank by 5,1 %.

By the end of 1997, a new economic scenario had emerged. A combination of prudent macroeconomic policies and an aggressive program of structural reforms was applied, yielding an impressive economic recovery. The average GDP growth rate during the post-adjustment period (1993-1997) reached 7 %, inflation rate converged to a one digit figure; investment, as well as savings, went from 16,5 % and 11,8 % of GDP in 1990 to 24,6 % and 19,4 % of GDP in 1997, respectively. But the most impressive performance took place on the fiscal side: by 1997 the Peruvian economy experienced a modest fiscal surplus (0,2 % of GDP) for the first time in more than two decades.

This performance was achieved at expenses of incurring in severe macroeconomic risks, as some of the most important structural weaknesses of the Peruvian economy remained throughout the decade[3]:

- *A low level of internal savings*. Since the total savings in the economy did not grew at the same pace as investment, external savings were needed to finance GDP growth. As a result, current account deficits were high and increasing (see Figure A1.1).
- *A highly concentration of exports*. Four commodities (gold, copper, fishmeal and zinc) represent more than 50 % of total exports (see Table A1.1).
- *A loss of confidence in the domestic currency*. Due to the hyperinflation in the 80´s, the domestic currency was replaced by the US dollar in several functions, specially as a store of value. Therefore, as people saved in dollar denominated accounts, commercial banks also lent in US dollars, transferring the exchange rate risk to lenders (see Figure A1.2).

The macroeconomic weaknesses explained the fragility in the financial system:

- *The dollarization of the financial system*. By the end of 1997, the commercial banking system was highly dollarized. Deposits in dollars were 74 % of total deposits, while credit in dollars represented 75 % of total credit (see Figure A1.3).
- *A high exposure to short-term capital inflows.* The financial system used short-term credit lines form foreign banks to increase its loanable funds. In just three and a half years, from 1994 to June 1998, the short-term foreign liabilities of the commercial banking grew by 830 %, reaching US$ 3,701 millions, which represented more than 25 % of total banking credit (see Figure A1.4).
- *The short-term maturity of banking credit.* By the end of 1999, the banking credit with maturity less than one month was higher than 25 % of the total credit and for credits with maturity less than one year the percentage reached almost 65 %.

These structural characteristics of the Peruvian economy explained the long lasting effects of the liquidity crisis of 1998, which resulted from the contagion of the Russian crisis. Therefore, by the end of 1998, the macroeconomic picture was quite different. After the international liquidity contraction and the real depreciation of the currency, the Peruvian economy suffered a severe

downturn in investment, aggregate demand, and output. There are four characteristics of this recession that should be emphasized:

- First, the contraction in aggregate production was asymmetric: on one hand, the domestic market-oriented firms were severely affected by the plummeting of the internal demand, but on the other hand, the export-oriented firms performed relatively well, avoiding a deeper recession.

- Second, the economic recession is still in place after almost four years and the standard measures to restore internal demand have failed. In fact, monetary and fiscal policies have been ineffective to impulse internal demand in a sustainable manner.

- Third, the recession negatively affected the quality of banks' assets. The non-performing loans doubled in a few months and have remained high since then. A severe credit crunch followed immediately after the real depreciation and the credit remained restricted since then, even when access to international credit markets were restored and domestic banks were quite liquid.

- Fourth, asset prices and firms' benefits declined in the aftermath of the crisis and have remained weak until 2002.

B. Econometric evidence

How important was the real exchange rate depreciation to explain these results? What were the main transmission mechanisms in the Peruvian experience? To answer these questions at an aggregate level, we use an unrestricted VAR model with six endogenous variables: an index of real non-primary GDP (1994=100), the ratio of non-performing loans, banking credit to private sector (in US dollars), real exchange rate index (1994=100), a measure of international liquidity (given by the external credit lines of commercial banks in US dollars), and an index of real primary GDP (1994=100)[4]. As all these variables were I(1), the series were filtered using Hodrick-Prescott

[3] Some graphs are presented in Appendix 1.
[4] Primary GDP is the flow of output coming from primary productive sectors, such as agriculture, fishing and mining, as well manufacturing activities related to such sectors (for example, fishmeal).

technique and the model was estimated for the transitory components[5]. The results does not change if we estimated the model using the first differences of the series.

The order of the variables reflects the degree of endogeneity, being the real primary GDP the most exogenous. Other variables such as the stock market index or the domestic interest rates, among others, are excluded because they showed no significance. On the other hand, we include some control variables such as terms of trade, the international interest rate, a dummy variable for political turmoil, another dummy variable to account for "El Niño", and finally a dummy variable to reflect the government's program to support the banking sector at the end of 1999, exchanging nonperforming loans with Treasury Bonds. The model is estimated using monthly data from the period January 1992-January 2003.

From the impulse response function, we can draw some conclusions[6]:

- Regarding a positive shock in international liquidity:
    - There will be a positive impact on economic activity. After the shock occurs, non-primary real GDP starts to increase immediately and to decline afterwards. The initial impact is the only one that is significant. On the other hand, the impact on primary GDP is not significant as mining projects are more related to foreign direct investment than short-term capital inflows.
    - A period of real exchange rate appreciation follows, reaching the peak at the third month, and then it becomes not significant.
    - The impact on banking credit will also be positive, but short lived; while there is no significant impact on nonperforming loans.

- Regarding the exchange rate, after a real depreciation:
    - There is a strong contraction of economic activity, measured by non-primary GDP, starting almost immediately and reaching the lowest point at the second month, whereas there is no significant evidence of a positive competitiveness effect on the primary GDP sector.

[5] As expected the transitory components of the series are I(0).
[6] The impulse-response functions are presented in Appendix 2.

- There is a rapid increase in nonperforming loans, reaching its peak at the fifth month. It should be noticed that only in this period the impact is statistically significant.
- Finally, the banking credit to the private sector declines, in part explained by the higher credit risk.

These results obtained at an aggregate level show that the real exchange depreciation affects negatively economic activity, evidencing that the balance-sheet effect is stronger than the competitiveness effect. Moreover, as the export sector is a supply-driven sector, at least in the short run, we find evidence of an statistically insignificant competitiveness effect, as primary GDP does not strongly react to real exchange rate variations.

Moreover, we have found evidence that the balance sheet effect is reinforced by a bank-lending channel, which is associated with the change experienced in the banks behavior when macroeconomic conditions deteriorate. As nonperforming loans increase, banking credit to the private sector declines, which in turn affects economic activity. In fact, the existence of a relationship between bank-lending standards and aggregate fluctuations helps to explain the amplification and propagation of the business cycle.

In addition, it should be noticed that we did not find evidence that the financial cost channel (reflected by a higher interest rates in the economy) and the asset-price channel (reflected by a fall in the stock market index) were empirically significant to explain the output dynamics in the economy.

III. Theoretical Framework

In this section we present a very simple, partial equilibrium model of firm's profit maximization. We will use this model in order to understand how variations of the real exchange rate, as well as of the interest rate, affect firm's investment decisions.

Our model follows closely the model by Bleakly and Cowan (2002), but there are two important differences. First, we take a different approach to model credit market imperfections and the way in which the net worth channel works. In their paper, changes in the firm's net worth negatively affect the interest rate at which the firm is borrowing (price channel), that is,

$$\frac{\partial r(W)}{\partial W} < 0$$

where r is the gross interest rate and W is the firm's net worth.

On the contrary, in our model, changes in the net worth affect the borrowing constraint, limiting the amount of credit available to the firm (quantity channel), while the interest rate is affected by aggregate liquidity conditions. The reason to do this is that the credit imperfections are due to an enforcement problem, as lenders cannot force borrowers to repay their debt, but they can seize a fraction □ of the borrower's final net worth. In this respect the amount of credit cannot be greater than the firm's enforceable net worth, that is,

$$rL \leq \square W$$

where L is the loan. This approach is more in line with the new developments in financial theory that start with the seminal work of Stiglitz and Weiss (1981) and has been followed very recently by Aghion, Bacchetta and Banerjee (2001), among others. Also, as it has been discussed in previous sections, this approach is more relevant for the Peruvian case where, after the shock, the interest rate came down quickly but credit remained sluggish up to the first half of 2002, almost four years after the liquidity crisis.

Second, in our model we take into account the difference between short term and long term borrowing, as excessive short term exposure can trigger a liquidity crisis even for a healthy and financially sound firm.

A. The Model

In this model there are two periods. Firms enter into the first period with some level and some composition of debt. That is, we take as given the level of total indebtedness of the firm as well as the currency and the maturity composition of such debt. For simplicity we assume that the real exchange rate at which the debt was contracted was equal to one and no variation was anticipated. During the first period, after a real exchange rate devaluation occurs, firms have to make investment decisions (K_{t+1}) taking into account a budget constraint and a borrowing constraint, that is,

$$Max\left\{g(e_{t+1})F(K_{t+1}) - e_{t+1}r^{*}L^{*} - rL - e_{t+1}r_{s}^{*}S^{*} - r_{s}S\right\} \quad (1)$$

subject to

$$e_{t}K_{t+1} + V_{t} + e_{t}V_{t}^{*} \leq e_{t}S^{*} + S \quad (2)$$

$$e_{t+1}r_{s}^{*}S^{*} + r_{s}S \leq \theta\left(g(e_{t+1})F(K_{t+1}) - e_{t+1}r^{*}L^{*} - rL\right) \quad (3)$$

where e_{t+1} is the expected real exchange rate in second period; L^* and L are the long term borrowing in foreign and domestic currency contracted before the devaluation took place and payable in the last period; S^* and S are the short term borrowing in foreign and domestic currency contracted at the first period and payable at the last period; V^* and V are the net cash position in foreign and domestic currency at the first period, which can be positive (net liabilities due in the first period) or negative (positive net current assets).

Moreover, $g(e_{t+1}) = (\square e_{t+1} + (1-\square))$ is the implicit unit price of the firm, where $\square$ is the fraction of exported production. In our model, $F(K_{t+1})$ should be taken as output net of input, including imports, therefore $\square$ is the net-export coefficient in the price function.

Notice that in this definition $g(\cdot)$ does not depend on the firm's debt composition as in Bleakley and Cowan. Also, we assume that $e_{t+1} = \square(e_t)$, with

$$\frac{\partial \mu(e_t)}{\partial e_t} > 0$$

Equation (2) is the budget constraint, which it will be assumed to hold with equality and in which the capital goods are all imported; while equation (3) is the borrowing constraint. If the borrowing constraint is binding, the investment decision will be suboptimal because the capital demand function will depend on the firm's net worth. If the borrowing constraint is not binding, the capital demand function will be unrestricted. In other words, variations in the real exchange rate will have different impacts on the firm's investment decisions, not only depending on the degree of tradable/non tradable production (given by $\square$) or the degree of currency composition but also on the net worth position of the firm.

Assuming that the currency composition of the debt is not a decision variable, but rather it is taken as given[7] (in particular we will assume for simplicity that all short-term debt is denominated in foreign currency), equations (1) –(3) can be written as:

$$Max\left\{g(e_{t+1})F(K_{t+1}) - e_{t+1}r^*L^* - rL - e_{t+1}r_s^*S^*\right\} \quad (4)$$

subject to

$$e_t K_{t+1} + V_t + e_t V_t^* \le e_t S^* \quad (5)$$

$$e_{t+1}r_s^*S^* \le \theta\left(g(e_{t+1})F(K_{t+1}) - e_{t+1}r^*L^* - rL\right) \quad (6)$$

Notice that the currency and maturity composition of the outstanding net liabilities (L, L^*, V and V^*) at the time of depreciation are crucial in the sense that large depreciations can deteriorate the financial position of firms that are heavily indebted in foreign currency and, at the time, trigger a liquidity crisis.

B. Investment decisions for small (undercapitalized) firms

Given that the small (undercapitalized) firms will be credit constrained, the choice of K_{t+1} depends on *the* credit availability rather that on *the* optimality conditions. Therefore, as we can see in Figure 1, K_{t+1} will be determined by replacing restriction (5) in (6):

$$K_{t+1} = \frac{\theta}{e_{t+1}r^*}\left(g(e_{t+1})F(K_{t+1}) - e_{t+1}r^*L^* - rL\right) - V_t^* - V_t / e_t \quad (7)$$

[FIGURE 1 HERE]

Taking implicit derivatives with respect to K_{t+1} and e_t, we obtain equation (8):

[7] Notice that once the exchange rate depreciation has been observed, the currency composition of new short term debt is irrelevant for the investment decision given that, by the interest parity condition:

$$r_s = r_s^* + \mu(e_t)/e_t$$

$$\frac{\Delta K_{t+1}}{\Delta e_t} = \frac{\theta}{e_{t+1}r^* - \theta g(e_{t+1})F'(K_{t+1})}\left(g'(e_{t+1})\mu'(e_t)F(K_{t+1}) - \mu'(e_t)r^*L^* - \frac{\mu'(e_t)}{e_{t+1}}\left(g(e_{t+1})F(K_{t+1}) - e_{t+1}r^*L^* - rL\right) + \frac{e_{t+1}r^*V_t}{e_t\theta e_t}\right) \quad (8)$$

It is not clear the sign of the right-hand side of this last equation. Given that the interest rate is higher than the marginal productivity (assumption of small firm), our concern is the sign of the expression inside the parenthesis, where we can find three types of mechanisms:

1. A competitiveness effect. A higher exchange rate will imply a higher implicit unit price if the firm is in the export sector. This effect is given by the expression:

$$g'(e_{t+1})\mu'(e_t)F(K_{t+1}) > 0 \quad (9)$$

2. A traditional financial cost effect. It has its origin in the higher financial payments (interest rate plus amortization) that have to be satisfied due to the exchange rate depreciation. This effect could be positive if the firms buy foreign capital with capital borrowed in domestic currency, that is:

$$\left(-\mu'(e_t)r^*L^* + \frac{e_{t+1}r^*V_t}{e_t\theta e_t} \right) >/< 0 \quad (10)$$

3. The balance-sheet effect. Which comes from the fact that a higher exchange rate reduces the borrowing capacity of the firm, given that the debt is in foreign currency. This effect is given by:

$$-\frac{\mu'(e_t)}{e_{t+1}}\left(g(e_{t+1})F(K_{t+1}) - e_{t+1}r^*L^* - rL\right) < 0 \quad (11)$$

It should be noticed that what matters for the competitive effect is the level of the real exchange rate, whereas the real exchange rate variation is the relevant variable for both the financial cost and the balance-sheet effects.

If the competitive effect is stronger than the financial and balance sheet effects, a real exchange rate depreciation will have a positive impact on investment. In Figure 2 this can be seen as an outward

movement of the *G*-curve. In case of a highly indebted firm, a strong negative balance sheet effect could produce the financial collapse as the *G*-curve would never intersect the *I*-curve, as depicted in Figure 3.

[FIGURES 2 and 3 HERE]

C. Investment decisions for large (well capitalized) firms

In the case of large and well capitalized firms, the balance sheet effect tends to be diluted, as the access to borrowing is not constrained. In this case, firms will maximize equation (1) subject to the budget constraint only (equation 2). Assuming that the composition of short-term debt is not a choice and that □ represents the fraction of dollar debt to total debt, the optimality condition for such problem becomes:

$$g(e_{t+1})F'(K_{t+1}) - (\beta e_{t+1} r_s^* + (1-\beta) r_s e_t) = 0 \qquad (12)$$

which is the standard optimality condition: marginal product equals to average interest rate, taking exchange rate and outstanding debt as given. Now, taking implicit derivatives with respect to K_{t+1} and e_t, we obtain:

$$\frac{\Delta K_{t+1}}{\Delta e_t} = \frac{(\beta r_s^* \mu'(e_t) + (1-\beta) r_s) - g'(e_{t+1})\mu'(e_t)F'(K_{t+1})}{g(e_{t+1})F''(K_{t+1})} \qquad (13)$$

The impact of exchange rate variations on the value of outstanding debt will be important only in terms of changes in the net worth but, as we are dealing with large firms, investment decisions will exclusively depend on next-period expected marginal returns, which are not related to the firm's net worth. As the denominator will always be negative, the sign of equation (13) depends on the sign of the numerator which, in turn, depends on the relative values of □ and □.

This relationship is represented in Figure 4. In the shadowed area, the competitiveness effect is stronger than the financial effect. Remember that there is not balance sheet effect. It is clear that, when □ = □ = *1*, the impact of an exchange rate depreciation on investment is null because the optimality condition remains unchanged, while when □ = □ =*0,* the numerator of (13) is positive and equal to $r_{s.}$

[FIGURE 4 HERE]

IV. The Data

A. On the data collection

Our database consists of firm-level accounting information for 163 non-financial Peruvian firms from 1994 to 2001. It may seem somehow disappointing that our database only registers 163 firms for the panel data analysis. In fact, our initial purpose was to obtain a much bigger database, but we gradually learnt that obtaining reliable financial information at the firm level in Peru was a real Herculean task. Hence, we will try to explain the main problems we had to deal with along the data gathering process, problems that finally forced us to rely on this relatively small sample.

- *Delay in the sign of the Confidentiality Agreement*

  First of all, we were required to sign a Confidentiality Agreement with the Comisión Nacional Supervisora de Empresas y Valores (CONASEV) in order to have access to the data at the firm level. CONASEV is supposed to have all the relevant financial information of the 218 firms that are listed in the Bolsa de Valores de Lima (Lima Stock Exchange) and of some additional 3,000 firms not listed. We faced our first obstacle at the time of signing the Agreement. It was severely delayed because of internal problems in CONASEV. We finally signed the Agreement by the end of October, 2002.

- *Incomplete and unprocessed information*

  CONASEV presents in its web site the financial statements and its financial notes, for the 218 firms listed for years 1996 to 2001[8]. The 2001 data is complete as it contains the financial statements and notes for the 218 firms. Once we started going back in time, several problems with the information started to show up. The financial notes are present only in 50 % of the firms for the 2000 data and they are almost completely absent in the 1996-99 data.

  The data from 1994 to 1998 have not been processed by CONASEV yet and hence, we had to start an archeological work at the physical archives of the entity. We had to manually copy down the data on paper from the archives and then put that information in our database. The

[8] Note that 218 is the current number of firms listed at the BVL, but there used to be a larger number of listed firms in past years. Due to several bankruptcies and mergers, this number has been reduced.

data at the physical archives is filed in boxes and the employees at CONASEV helped us indicating the place of every firm and year. However, there seems to be holes in the CONASEV database system as their officers were unable to indicate us the precise places of the financial information in different years. In many other cases, they were surprised as it became clear that some firms had not fulfilled the obligation to present their financial data or that the information has simply disappeared .

- *Non consecutive data*

  CONASEV sent us a list of some 800 firms that were not publicly traded at the BVL for which this entity had financial information for the years 1994-96 (of course, in physical archives). When we revised the data looking for firms that showed data for these three years, we only found one (1) firm that fulfilled this condition. This episode describes the kind of problems with firm level data that we encountered. Considering the scarcity of information, we were forced to accept firms with at least three consecutive data entries. Being more strict would have eliminated even more observations from our panel data analysis.

- *Poor quality of data*

  The main quality problems that appeared when gathering the financial data were the following:

  a) *Absence of Financial Notes*. The Notes are fundamental because only there we can find crucial information such as the debt breakdown, number of workers and exports ratio. However, in many cases we were unable to find the Financial Notes at the CONASEV archives.
  b) *Heterogeneous data*. Not every Note contains the same information. For example, there were a lot of cases in which the firms do not state their debt currency composition but only their net dollar position. Some Notes state the exports ratio, others do not.
  c) *Poor data quality*. In many cases, we were forced to eliminate firms because of the poor quality of their information. For example, we found discrepancies between the Balance Sheet and the Notes, such as fractions that surpassed totals (i.e. Dollar Debt Ratios superior to 100%). In other cases, we eliminated firms that registered extreme volatility in their debt or investment ratios, since we found these swings to be unlikely.

Hence, once we eliminated the financial and insurance firms from the CONASEV database, those firms that had less than three consecutive years of data and those firms with unusual

volatility in their ratios, we obtained a final database for econometric purposes that contains information for 163 firms.

Finally, it is of paramount importance to note that the task of gathering financial data at the firm level in order to analyze their debt composition or their investment decision making is a pioneer work in Peru as there are no previous studies to base upon. The officers of CONASEV confirmed us that it was the very first time that any researcher is allowed to have access to their physical archives. Our obstacles and difficulties to obtain abundant and reliable data show the troubles faced by every researcher that tries to do empirical work in countries with weak institutionalism like Peru.

B. Description of the Data

Our sample of 163 firms has the following characteristics:

- Manufacturing ⇒ 87 firms (53%)
- Agriculture ⇒ 10 firms (6%)
- Commerce ⇒ 4 firms (2%)
- Construction ⇒ 3 firms (2%)
- Mining ⇒ 25 firms (15%)
- Fishing ⇒ 3 firms (2%)
- Services ⇒ 31 firms (19%)

We identified 125 firms as operating in the "tradable" sector and 38 firms as operating in the "non-tradable" sector depending on their specific activity. Consequently, these 38 non-tradable firms are the ones corresponding to the Services, Construction and Commerce activities.

Considering year 2001 as a reference, we observed that for that year the average size of the firms across the sample was 470,1 millions of soles (measured as total assets) with a standard deviation of 1.094,1 millions.[9] A majority of the firms, 81 %, were under the mean while only 21 % of the firms were considered "large" as they were above the mean. On the other hand, the median of the size distribution was 140,8 millions of soles. Note that the mean is almost three

times the median so an important bias can arise if we consider "large" only the ones above the average line. So, in our analysis we will consider "large" firms those above the median line.

Our main goal was to determine if firms improve their economic condition in the aftermath of a currency devaluation or not, so we needed to have a measure of that outcome. Bleakley and Cowan (2002)[10] identify the firms' "condition" with their investment expenditures. Here we followed the BC approach using the investment to capital ratio $(K_t - K_{t-1}) / K_{t-1}$ as our investment measure. Our definition of K_t is only Gross Fixed Capital, so our investment variable does not include inventories investment but mostly machinery, equipment and construction.

However, we considered that identifying the firms' economic health only with investment expenditures is too restrictive. Thus, we evaluated if the currency devaluation can also have impact on firms sales. We eliminated scale problems by using a sales to assets ratio defined as Total Sales/Total Assets.

To analyze the behavior of these two dependent variables (investment and sales ratios), we considered the following instruments as our benchmark regressors:

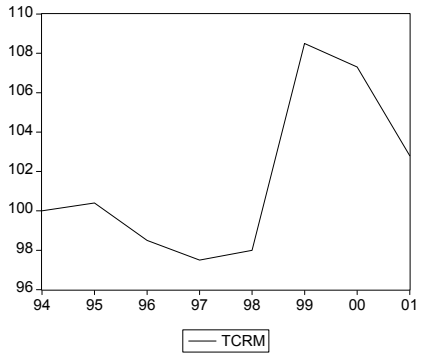
- The dollar debt ratio as percentage of total debt (DME). This is a crucial variable as the balance sheet effect negatively impacts on the financial health of domestic firms through their dollar debt burden as an initial direct channel.

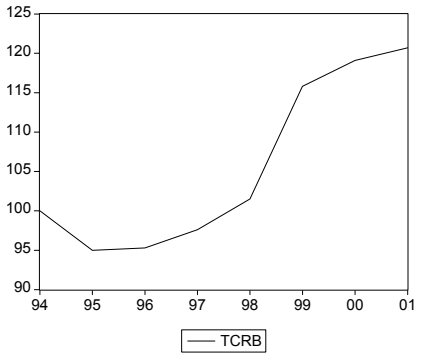
- The short term liabilities ratio as percentage of total liabilities (PC). We wanted to evaluate if the term composition of debt is important to explain different firms behavior after real exchange adjustments. Moreover, if Peruvian firms are exposed to credit and liquidity constraints this variable can be useful to determine the firms creditworthiness and the banking behavior as well.

- The real exchange rate can be measured by the bilateral real exchange rate (TCRB), which is the RER between the sol and the dollar adjusted for the inflation differential between Peru and USA. Or by the multilateral real exchange rate (TCRM) which is the

[9] With a nominal exchange rate of 3,5 soles /dollar in 2001, this means that the average size of firms´ total assets was around US$ 134 million.

RER between the sol and the currencies of our main trading partners, adjusting for the inflation differentials and weighing each currency by the specific importance of the corresponding country in the Peruvian international trade. This TCRM is calculated monthly by the Central Bank of Peru. Both definitions of RER are indexes with 1994 = 100. Someone can ask why is this difference important? The answer is that the TCRB (bilateral) and the TCRM (multilateral) observed a quite different behavior in the period under study as shown in the following graphs. Take note that in the period between 1995 and 1998, while the multilateral RER was declining, the bilateral RER was increasing. After the sharp increase in the real exchange rate operated under both definitions in 1999, the behavior thereafter has been again distinct: the TCRM fell while the TCRB augmented.





- Real Gross Domestic Product (PBI). As a determinant of aggregate economic conditions. Index with 1994 = 100.

- A political dummy (DPOLITIC). This dummy tries to capture the severe political instability occurred in Peru, crisis that began by mid-2000 with the fraudulent general election won by Alberto Fujimori and ended up with the final triumph of Alejandro Toledo in the presidential race of mid-2001. We consider that this episode in our recent history was so particular and challenging for the Peruvian society that ought to be considered when estimating economic behavior during this period. Hence, our political dummy values 1 in years 2000 and 2001, 0 in the rest.

[10] BC henceforth

- The average lending interest rate in dollars (TAMEX). As the dollar-denominated credit represented around three quarters of total banking credit during the period under study, the dollar lending rate is the proper rate to consider as the cost of capital for investors.

- The real credit of the banking system to the private sector (CRSP) as a proxy of the general credit market conditions. In particular the credit availability that domestic firms face and the lending stance of the banking system.

In Table 1 we present the main statistics (mean, median and standard deviation) of the firms variables of interest, i.e. dollar debt ratio, sales ratio, short term debt ratio and investment ratio. The dollar debt ratio (DME) observes an increasing pattern along the years of the sample with its mean starting at a level of 53,1% in 1994 and finishing at 63,3% in 2001 after a peak of 67,7% in 1998 (pre-crisis year) while the median also increases from 53% to 71% in the same period. The sales/assets ratio shows on the contrary, a declining pattern with a mean of 97,0% in 1994 and an ending level of 68,5% after having fallen to its lowest level during years 1999 and 2000, while its median also falls from 87,5% to 54%. The short term debt ratio (PC) registers a downward trend, starting at 74,6% in 1994 and ending the year 2001 at 61,6%, while the median observes the same pattern falling from 78% in 1994 to 57,5% in 2001. Note that both the dollar debt ratio (DME) and the short term debt ratio (PC) observe similar statistical characteristics at present: the DME ratio mean is 63 % and its standard deviation is 0,26 while the PC ratio mean is 62 % and its standard deviation is 0,28. Finally, we observe a dramatic fall in the investment ratio from a mean of 17,1 % in 1994 to a 2,3% level in 2001, slump that is shared by the median of the sample which falls from 5,6% to 1,0%. It is interesting to note that the investment downtrend turns into collapse from 1999 onwards.

[TABLE 1 HERE]

V. Econometric Results

A. Explaining Debt Composition

What does it determine the debt composition of the Peruvian firms? Do large firms tend to have more dollar denominated debt than smaller firms? Do tradable sector firms exhibit more dollar debt compared to non tradable sector firms? These are the kind of questions we wanted to address regarding the debt composition of the Peruvian firms. For these purposes, one standard route is to perform a panel data analysis. However, we took two different routes: (i) we performed sequential cross section regressions and (ii) we made a panel data analysis.

By making sequential cross section regressions we can capture eventual shifts or changes in the behavior of debt determinants than could remain hidden under a standard panel data analysis. So we performed two-variable cross section regressions for each year (1994-2001) trying to find statistical significance among regressors that would help to understand what determines: (i) the dollar debt ratio (DME), and (ii) the short term debt ratio (PC). Our possible explicatory variables were size, tradability and export potential.

We measured size by the total assets that every firm registered each year. An important question is how to classify "large" and "small" as any distinction is clearly arbitrary. A line has to be drawn to determine whether firms are considered "large" or "small". We drew the line considering the median of the size distribution because, as we mentioned before, the presence of a bunch of huge firms can bias the mean upwards, leaving an important amount of large firms in the "small" group. Thus, we created a dummy variables for size that classifies "large" and "small" firms depending on whether they are above or under the median of the assets size distribution.

The tradable/non tradable definition considers manufacturing, mining, agriculture and oil as tradable, while most services and construction are considered non tradable. In the case of export/non export, we could not find reliable information regarding the exports of every firm. In fact, that information was absent in most financial statements under review. So we applied the export ratio that the INEI (National Institute of Statistics) assigns in its input-output matrix.[11]

[11] This input-output matrix consigns export ratios for 45 economic sectors. The base year is 1994.

Once every firm is mapped into the corresponding economic sector of the input-output matrix it assumes the corresponding export/total sales ratio.

Table 2A shows the correlations for the dollar debt ratio from 1994 to 2001. The size dummy (median definition) shows no significance except in year 1995 (at a 10% level of significance) and year 1999. Hence, we cannot reject the hypothesis that the currency composition of the debt among Peruvian firms is independent of their size. It is also important to distinguish here a banking behavior behind this finding: creditors seem not to take into account the firms' size when deciding to lend in soles or dollars.

Do the tradable sector firms tend to have more dollar denominated debt than non tradable sector firms? We did not find any evidence that tradable sector firms have different debt composition than non tradable sector firms. In fact, the tradability coefficient lacks of significance for the whole period under study.

However, when we tested the significance of the export dummy it became important from 1997 onwards (except year 1999). Our hypothesis here is that after the Asian crisis, the banks seem to have modified its lending criteria favoring the export firms more than the rest. This fact appears to be contradictory with the tradable/non tradable story described above. However, we think that they are not necessarily in contradiction for the following two reasons: (i) export firms are only a small sub group of the tradable sector firms[12]; and (ii) exporters are more immune to balance sheets effects as even tradable firms that operate in the domestic market would not have fully transferred exchange rate hikes to domestic prices. Hence, exporters seem to have gained creditworthiness since the inception of the Asian crisis.

[TABLE 2A HERE]

Table 2B shows the correlations for the short term debt ratio for the period 1994-2001. The first important conclusion is that larger firms tend to have lower short term ratios. In other words, there is a strong evidence that larger firms are the only ones that have access to longer term credits than smaller firms. This evidence is quite robust except for year 1999 that - as we mentioned before – was a very atypical year. The export potential variable is not significant for

every year in the sample, while the "tradability" of the sector appears to be important from 1998 onwards, i.e. after the Asian crisis.

[TABLE 2B HERE]

The panel data analysis is very consistent with our sequential cross section analysis. Table 3 show the results of regressing Dollar Debt Ratio (DME) and Short Term Debt Ratio (PC) against a constant term, size dummy, tradable dummy and export ratio. In the DME equation shows that neither size nor tradability is statistically significant, but that exports ratio is positive and very significant. In the PC equation, size is negative and important reinforcing our previous finding that "larger" firms tend to have access to longer term credit. Tradability is also significative and positive which is consistent with our previous results.

[TABLE 3 HERE]

B. Explaining Investment and Sales with Static Panel Data Analysis

As we mentioned before, we focused on two types of measures of the "economic health" of firms to evaluate if they performed better or worse after a real exchange rate devaluation. First, we focused on investment in gross fixed capital relative to its previous level, i.e. $K_t - K_{t-1}/K_{t-1}$. In second place, we focused on sales measured as total sales/total assets.

In this section we present the results of estimating fixed effects for the panel data, i.e. different intercepts for each pool member. The estimation method is feasible generalized least squares (FGLS) assuming the presence of heteroskedasticity which is a common feature in cross section analysis[13]. The use of this method implies that each pool equation is downweighted by an estimate of the cross-section residual deviation.

Investment Equations

Table 4 presents the estimates of the negative effects on investment derived from holding dollar debt during a RER devaluation. The reason for considering the alternative RER definitions in

[12] Note that exports represent only around 14 % of Peruvian GDP. The means of the export ratio within the sample were 16,7 % (2001), 16,4 % (2000), 15,9 % (1999), 15,5 % (1998), 15,7 % (1997), 14,8 % (1996), 15,9 % (1995) and 15,5 % (1994).
[13] In fact, we found evidence of heteroskedasticity in the regressions of debt composition.

levels and differences is that we wanted to test if multilateral real exchange rate is related more directly with competitiveness while the bilateral real exchange variation is more related with the problems arising from a dollar indebtedness (i.e. measuring balance sheet effect).[14]

[TABLE 4 HERE]

Equation 1 is presented here just for the record as it is a rather poor regression. What it is important to note is that most signs are inverted compared with what we expected. In particular, it is quite surprising that the dollar debt ratio is positive (though not significant), the level of multilateral real exchange rate is negative denoting a negative competitiveness effect, the difference of the real exchange rate is positive denoting an anti-balance sheet effect and the GDP is negative which indicates a quite implausible countercyclical investment function. Finally, the political dummy has also an inverted sign as we would understand that during the chaotic years 2000 and 2001 investment fell – not rose – in response to the political instability.

In Equations 2 and 3, we homogenized the definitions of the real exchange rates using both multilateral and bilateral RER for both levels and differences respectively. The results improve partially as the political dummy turns negative and significant while the competitiveness effect becomes non significant. What is noteworthy is that the difference of the real exchange rate in both specifications show a negative and significant coefficient indicating the existence of evidence of a negative balance sheet effect on investment. Finally, in both equations the political dummy turns negative and significant, while the lagged GDP shows no significance, in line with our expectations.

Equations 4 and 5, present alternative definitions of the real exchange rate in both levels and differences, but also include a variable for the credit market conditions as measured by the real banking credit to the private sector (CRSP). This variable shows a positive sign as expected and it is significative at a 5 % level in both equations. The dollar debt ratio shows no evidence of significance except in Equation 4 (at a 10% level) and the sign remains inverted along the five equations. However, the difference of the RER, in particular in the bilateral case, shows a negative coefficient and signification at the 1% level (Equation 5) indicating that real

[14] Recall that our theoretical model derives an expression for both the competitiveness effect and the balance sheet effect. The former depending on the level of the real exchange rate and the latter depending on the difference of the real exchange rate.

devaluations tend to affect negatively the investment expenditures of firms which is very supportive of the BSE hypothesis.

The next step was to include some interaction effects and non linearities into the investment specifications in order to replicate and to expand the Bleakley-Cowan analysis. Bleakley and Cowan (2002) examined the behavior of corporate investment across 500 firms in five Latin America countries (none of them is Peru). The main question they try to answer is whether firms with more dollar debt invest less in the aftermath of a devaluation. To do so, the key variable in their analysis is $(Dollar\ Debt)_{i,t-1}\ x\ (\Delta\ ln\ Real\ Exchange\ Rate)_t$ which they call the "interaction effect". They decompose this interaction effect into two components that have opposite signs: (i) net worth channel and (ii) competitiveness channel. The sign of this "interaction effect" would depend on which channel dominates and the key determinant for that is how strongly the currency composition of debt is related to the exchange rate sensitivity of profits at the firm level.

Their main empirical result is that the sign of this "interaction effect" is positive, i.e. firms holding dollar debt invest more than firms holding peso debt after a devaluation. They argue that this result is due to the match between the currency composition of their debt and the sensibility of their income to the real exchange rate. Accordingly, they argue that after a devaluation, earnings are higher in those firms holding more dollar debt.

We wanted to replicate the basic features of the BC estimation with our database doing some adjustments and including additional controls. One important difference between the BC estimation and ours is that we do not derive any "interaction effect" to be estimated from our theoretical model. In the BC model the "interaction effect" arises from their definition of relative price[15] so that the relative price of output not only depends on the real exchange rate but also in the fraction of firm debt denominated in dollars (β). On the contrary, in our model, the relative price depends only on the real exchange rate. Of course, in our model we do identify the elements of the competitiveness and the net-worth channels but they depend on the level and difference of the real exchange rate respectively. Another important difference is that the BC estimation presents fixed effects by countries while our estimates calculate one different intercept (fixed effects) for each firm.

As we mentioned, the main finding of the BC paper is that the interaction of lagged dollar debt and the change in the real exchange rate ($D^*x\ \Delta e$) is positive and significant. Hence, they conclude that firms that hold dollar debt during a devaluation actually go on to substantially increase their investment (in both fixed capital and inventories) relative to peso-indebted firms and consequently, they do not find any evidence of the detrimental effect of the exchange rate on investment that balance sheet effect models predict.

It is important to take into account that BC argue that this positive effect of real exchange rate adjustments is due to the degree of match between currency composition of debt and the elasticity of their income to the exchange rate. In fact, they mentioned that in their sample, dollarization of liabilities was higher in firms whose income was expected to be more positively correlated with the real exchange rate: firms in the tradable sector. On the contrary, in our sample we found that the dollar composition of debt showed no difference (at least statistically) among firms in the tradable or non-tradable sectors (see our Table 2). This feature is a key ingredient for explaining our divergent results.

[TABLE 5 HERE]

Table 5 shows the results of replicating the BC basic equation with our adjustments and extensions. Equation 1 is quite similar to the baseline equation of the BC paper. We find a positive "interaction effect" just as BC did but in our case it lacks of significance. Unlike them, we also find strong negative effects of both the dollar debt ratio and the difference in the real exchange rate. The magnitudes of the coefficients indicate that the detrimental effects of dollar debt ratio and RER surpass way long the positive effect of ($D^*x\ \Delta e$). Finally, the total indebtedness ratio shows no significance.

Equation 2 includes two controls: lagged GDP and the political dummy variable which has proven to be crucial to explain investment in our sample. These inclusions do not alter the basic findings of above: positive interaction effect (significant at a 10% level) that is completely outweighed by the dollar debt ratio and the difference in the real exchange rate, both significant at the 1% level. The political dummy shows strong negative effects and the lagged GDP surprisingly shows a negative and significant coefficient. Finally, the real banking credit to the private sector has positive sign and shows significance at the 10% level.

[15] See equation 1 in Bleakley and Cowan (2002).

In equations 3 and 4, we include the interaction effect, dollar debt ratio, short term debt ratio, RER level and differences and political dummy, differing in the inclusion or not of the lagged GDP. Both equations are very supportive of the BSE hypothesis. First of all, the dollar debt ratio shows strong negative effects on investment, in both cases the coefficients are significant at 5% level at least. Second, the difference of the RER shows a very strong negative and significative effect on firms' investment, which is quite opposed to the BC study. Third, the "interaction effect" shows a positive and significant coefficient (as in the BC study), but the negative effects of both the dollar debt ratio and the difference in RER offset this timid positive effect. Note that the level of the real exchange rate shows a positive coefficient (just as our theoretical model predicts) but is non significant. On the other hand, the political dummy is negative and significant as we expected, and the lagged GDP coefficients present mixed signs and lack of significance. Finally, the short term debt ratio shows a positive sign and statistical significance at the 1% level in both specifications, what can appear to be surprising at first sight but we think that it reflects the liquidity conditions in the credit market.

Equations 5 and 6 include non linearities for the RER variations. It is quite plausible that investment decisions not only depend negatively on real exchange volatility but also that the influence of this volatility is non linear, meaning that if RER depreciation exceeds some critical levels its effects on investments are magnified. Thus, we included a non linear multilateral RER variable, defined as the squared D(TCRM). Non linear RER volatility shows strong negative effects in both specifications and at a 1% level of statistical significance. The interaction effect is still positive but lacks of significance. On the contrary, both equations are again, quite supportive of the BSE. The dollar debt ratio shows negative and very significant coefficients. The political dummy is negative and significant as before, while the short term debt ratio remains positive and significant. The inclusion of lagged GDP shows no significance.[16]

Finally, we constructed an "interaction effect" for the non linear RER volatility which is defined as $(\Delta^2 e \times D^*)$[17]. Equation 7 shows that this interaction effects portrays a negative coefficient at 5% significance level while the main findings remain the same: negative and significant dollar debt ratio coefficient, positive and significant short term debt effect, positive

[16] We did not include any difference of RER variable in these equations, as the "interaction effect" already includes D(TCRB) and we can loose degrees of freedom including excessive macroeconomic variables.
[17] We defined this variable as [DTCRM^2*DME(-1)]

but non significant RER level (the competitiveness channel in our theoretical model), negative and significant at the 10% level coefficient of the difference of multilateral RER and very strong evidence of the negative effects of political instability on investment. It is noteworthy that in Equation 7, the GDP shows a significant positive coefficient, in line with a plausible procyclical investment function.

In Equation 8, we included the real banking credit to the private sector (CRSP) which had shown pretty good adjustment in former specifications. In this case, CRSP again showed a positive and significant value while the non linear interaction effect remained negative but non significative. Equation 8 is again very supportive of our balance sheet effect (BSE) hypothesis as both the dollar debt ratio and the difference of RER show negative coefficients, both significant a the 1% level. The competitiveness channel seems positive and statistically significant but is largely compensated by the negative BSE exerted from the RER depreciation and the dollar debt burden.

Equations 9 to 12 include "interaction effect" terms that try to capture the effects of interest rate volatility on invest. Hence, for Equations 9 and 10, we constructed an interaction term defined as *(TAMEX x D*(-1))* that should capture the effects of interest rate volatility through the dollar denominated indebtedness. As we expected, this effect showed negative coefficients and became significative at the 5% level when real credit was included (Equation 10). It is noteworthy that the main features of the former equations remain intact: positive interaction effect (BC definition) counterbalanced by the negative balance sheet effect evidence derived from both the dollar debt ratio and the difference of the RER, and negative and significant political dummy.

Equations 11 and 12 include a second interest rate volatility interaction effect, this time trying to capture the effects of interest rate volatility through the short term debt ratio. Hence, we constructed an interaction term defined as *(TAMEX x PC(-1))*. In principle, one would expect that the larger the short term debt ratio, the larger the negative impact of interest rate volatility on investment. However, Equations 11 and 12 show strong evidence on the contrary. This interaction effect shows a positive sign when tested alone (Equation 11) while the rest of variables keep their former signs and significance. It is very interesting to check what happened when we joined both "interest rate volatility interaction effects" in the same specification. The

(TAMEX*DME_{-1}) variable keeps a negative sign but lacks of significance. On the other hand, the (TAMEX*PC_{-1}) variable shows a positive sign and it significative at the 5% level.

How can we explain this astonishing result? The answer is liquidity constraint. We must interpret the first interaction term as capturing the compound effect of interest rate volatility and indebtedness, consequently it embodies the increasing financial costs linked to leveraging. On the other hand, we must comprehend the second interaction term as capturing the compound effect of interest rate volatility and short term indebtedness in a liquidity constrained environment. Recall that most of the credit in Peru is short term credit. In fact, by 1999 estimates 90% of total credit of the banking system had one year or less maturity. The yield curve virtually collapsed to the short end of the curve, in particular after the Asian crisis. Hence, a firm that showed increasing short term debt ratio was plausibly taking fresh resources, while firms that showed declining short term debt ratio was probably repaying debt and suffering working capital scarcity. In consequence, this second interaction term captures that liquidity constrained economy in which the firms that had access to fresh debt were the only ones able to invest in new capital formation; the key ingredient is that most of that new indebtedness was short term credit.

Finally, we tested if "tradability", exports and size were important factors explaining the investment function in our sample. Our tests showed that neither tradability (that is, whether the firm is operating in a tradable sector) nor exports were relevant. However, the size was positive and significant (equation 13) indicating that large firms tend to invest more than smaller firms. When including a interaction term for size [Size dummy x TCRM], this effect maintained its positive sign and statistical significance as shown in equation 14.

Therefore, we can conclude that after analyzing different investment specifications we found robust evidence of the following features:

- A negative and significative effect of the firms' dollar debt ratio. This evidence is very supportive of our BSE hypothesis. Firms that show higher levels of dollar denominated debt to total debt tend to reduce investments after a devaluation in comparison with firms that show higher levels of soles denominated debt.

- A negative and significative effect of the variation of the real exchange rate on investment. This finding is clearly in line with the our theoretical model developed above and this coefficient is – again - very supportive of a negative balance sheet effect and congruent with the credit constraints that firms would face after a real devaluation.

- The competitiveness effect seems to be positive as our theoretical model establishes, but lacks of statistical significance in most specifications. When the competitiveness effect is defined as an "interaction effect" ($D^*x\ \Delta e$) in line with Bleakley and Cowan (2002), it shows - in general – small positive coefficients and seem not to be statistically robust. In any case, our results show that the negative effects of both the RER depreciation and the dollar debt burden largely counterweigh this positive competitiveness effect.

- Real exchange rate volatility seems to portray non linear influence on investment decisions. It is quite plausible that investors not only observe the variations in RER, but that when this volatility exceeds some critical limits the "animal sprits" seem to panic and to postpone their investment decisions, probably due to their difficulties to evaluate projects in an accurate manner under severe RER volatility.

- A negative and significative effect of the political instability on investment. This feature is consistent with modern theories of investment that not only take into account the economic environment but political and juridical stability as well. Considering that in many specifications the investment function seems to be countercyclical, the inclusion of this variable is crucial to explain the plummeting investment ratios in years of a still growing economy.

- A positive and significative effect of the credit availability. This finding is consistent with the fact that Peruvian firms tend to finance their investment projects based on financial leverage more than in their own savings or earnings. Hence, it is quite logical that the general availability of credit shows explanatory power.

- We found strong evidence that the short term debt ratio is positive and significant, which would indicate that a higher short term leverage indicator can improve firms' creditworthiness. A possible explanation can be derived from D.W. Diamond's paper

on debt maturity composition. He claims that "good" firms borrow short term as a way to signalling that in fact they are "good" firms.[18] Another explanations is that it reflects a liquidity constrained economy in which only those firms that have access to fresh resources are able to invest, but theses fresh resources are mainly short term debt.

- Interest rate volatility appears to have a mixed effect on investment. On one hand, interest rate volatility increases financial costs derived from leverage. On the other hand, interest rate volatility when compound with short term indebtedness displays a surprising positive and significative coefficient. Our explanation is related to the fact that most of the credit in Peru is short term credit. Hence, a firm that showed increasing short term debt ratio was plausibly taking fresh resources, while firms that showed declining short term debt ratio was probably repaying debt and suffering illiquidity. In consequence, this second positive effect seem to capture the fact that firms having access to (short term) fresh debt were more prone to invest in new capital formation.

- Size matters, i.e. larger firms tend to invest more than small ones.

Sales Equations

Table 6 presents nine different specifications for the sales ratio function. We want to draw attention to the extraordinary high R^2 statistics of these equations. We used the multilateral real exchange rate in levels and both the bilateral and multilateral real exchange rate in differences to address the competitiveness and the balance sheet effects respectively. Shifting real exchange definitions does not substantially alter the results. Another important feature is that in all these equations we used contemporary GDP as we consider that current economic conditions are important to explain current sales. Recall that in the above investment equations, we have used lagged GDP, as the investment function is intrinsically intertemporal.

[TABLE 6 HERE]

Equation 1 shows that every variable except the competitiveness effect of real exchange rate is significative at a 1% level. The dollar debt ratio is negative and significative indicating that

[18] Diamond, D.W. (1991): "Debt Maturity Structure and Liquidity Risk" Quarterly Journal of Economics, 106, pp. 710-737. Harvard University, MIT Press.

firms that hold a higher dollar denominated debt tend to suffer in their sales after a real exchange devaluation. The short term debt ratio also shows a positive and significative coefficient. The coefficient of D(TCRB) denotes a negative and strong balance sheet effect. The only surprising result is the inverted sign of GDP that would denote an unlikely countercyclical sales function. This phenomenon is explained –as we mentioned before - by the fact that in the years of political turmoil, sales went down while GDP kept growing. Therefore, we included the political dummy in the second equation to capture this phenomenon. Hence, equation 2 shares the basic features of the previous equation, but in this case the sign of GDP turns positive while the political dummy shows a negative and very significative coefficient. The other variables are strongly supportive of the balance sheet effect as the dollar debt ratio and the RER depreciation both exert significant impact on firms' sales. The competitiveness channel appears to be positive and the short term debt ratio remains positive and statistically significant. It is noteworthy that five of six variables are significant at the 1% level and each coefficient has proper signs.

Equations 3 and 4, include "interaction effects" in the same definition of Bleakey-Cowan, i.e. *(Δ RER x lagged DME)* but only showed statistical significance in the first case with the RER volatility is referred to its multilateral definition. The main findings remain the same in both equations: negative and significant effect of dollar debt ratio (at 1% level), positive and significant coefficient of short term debt ratio (at 1% level), positive and significant effect of the level of real multilateral exchange rate (at 1% level), negative and significant effect of the RER depreciation in both multilateral and bilateral definitions (both at the 1% level) and negative and significant effect of political instability (at the 1% level). The current GDP coefficient shows an inverted negative sign and is also statistically significant a the 1% level (Equation 4).

Equation 5 tests if the RER volatility shows evidence of non linearity as was found in the investment specifications. The squared depreciation of the multilateral RER showed to exert a negative impact on sales but its significance was only achieved at a 10% level. Equations 6 and 7, constructed an "interaction effect" of this squared depreciation multiplied by the lagged dollar debt ratio (DME_{-1}). The results are not supportive of a significant "interaction effect" of this non linearity. But take note of the robustness of the signs and statistical significance of the main variables: dollar debt ratio, short term ratio, multilateral RER in level, difference of the RER in both definitions (multilateral and bilateral as well), GDP and political dummy. In fact,

every single coefficient of equations 6 and 7 is significant at the 1% level, and everyone with exception of GDP has the expected sign.

In Equations 8 and 9 we included the interactions effects of interest rate volatility explained before. Again, the variable *(TAMEX x DME_{-1})* showed a negative sign but was non significant. The other interest rate volatility interaction term *(TAMEX x PC_{-1})* showed a positive sign as in the investment specifications but in this case, its coefficient was not statistically different from zero.

Finally, we tested if "tradability", exports and size were important factors explaining the sales function in our sample. As before, our tests showed that neither tradability nor exports were relevant (we do not exhibit these results). However, the size (median definition) was negative and significant (equation 10) indicating that smaller firms tend to sell more than larger firms. When including a interaction term for size [Size dummy x TCRM], this effect maintained its negative sign and statistical significance as shown in equation 11.

In light of the previous results, we can conclude that we have found robust evidence of the following effects in the sales equations:

- A strong negative effect of the dollar debt ratio. Thus, firms with higher dollar debt to total debt ratio tend to observe lower sales after devaluations. This evidence is supportive of a BSE on sales.

- A positive competitiveness effect of the real exchange rate. Even though we have not derived a theoretical framework for sales, we can employ the same logic behind the competitiveness channel for investment, i.e. firms would observe their sales to benefit from a higher RER level through a demand shift from imported goods to domestic goods (in the case of tradable firms) and from a reduction in domestic costs compared to incomes (in the cases of exporters).

- A negative effect of the variation of the real exchange rate on sales. Note that the coefficients of D(TCRB) and D(TCRM) exceed the RER level coefficient. Hence, we found strong evidence of a negative balance sheet effect that largely counterbalances the positive competitiveness effect in sales.

- A positive effect of the short term debt ratio. This finding would reflect the fact that firms tend to increase sales when they have access to more short term credit (i.e. working capital). In other words, more liquid firms tend to sell more as a percentage of their assets. Under a banking perspective, this coefficient can reflect that banks tend to lend in shorter tenures to those firms that exhibit higher sales rotation.

- A negative effect of the political instability on sales. This clearly indicates that firms sales were severely affected during that period of political instability. The procyclical behavior of sales weakens once we control by the political dummy.

- We found only weak evidence of the negative effects of non linearities in the RER devaluations on sales. This contrasts with the strong evidence found in the investment equations.

- Interest rate volatility does not appear to have significant effects on firms sales. Again, it contrasts with the supportive evidence of liquidity /credit constraints found in the investment equations.

- Size matter but in a rather counterintuitive manner. Our evidence suggest that smaller firms sell more (as an asset ratio) than larger firms. This effect is opposite with the size effect on the investment equations.

In sum, having evaluated the investment and sales behavior of the firms in our sample, we found robust evidence of a negative balance sheet effect (BSE) of currency volatility in both functions. This evidence is so robust that appears no matter what different channel or specification of this BSE we include in our tests (Δ RER, Dollar Debt Ratio or both compound). The real exchange rate volatility has shown bold impacts on investment and sales in different specifications (multilateral and bilateral), and there is some evidence regarding non linearity in these impacts, in particular in the investment case. Theses BSE effects counterbalance any eventual positive competitiveness effect, whether included in direct form or as an "interactive effect". Finally, we found that the positive effects of short term debt ratio on investment and sales is consistent with a liquidity/credit constrained economy, evidence that is ratified when compound with interest rate volatility.

As we mentioned before, the main finding of the BC paper is that firms that hold dollar debt during a devaluation actually go on to substantially increase their investment (in both fixed capital and inventories) relative to peso-indebted firms and consequently, they do not find any evidence of the detrimental effect of the exchange rate on investment that balance sheet effect models predict. They argue that this positive effect of real exchange rate adjustments is due to the degree of match between currency composition of debt and the elasticity of their income to the exchange rate. In fact, dollarization of liabilities in their sample was higher in firms whose income was expected to be more positively correlated with the real exchange rate, i.e. firms in the tradable sector. On the contrary, in our sample we found that the dollar composition of debt showed no difference (at least statistically) among firms in the tradable or non-tradable sectors so we conclude that this feature is a key ingredient for explaining our divergent results.

C. Explaining Investment and Sales with Dynamic Panel Data Analysis

In this section we introduce a dynamic specification in our investment and sales model, adding lagged values of both dependent variables. Due to the biases arising from fixed effects estimation in small samples when lagged values of the dependent variable are included[19], our approach consists in applying the GMM method first proposed by Arellano and Bond (1991)[20].

The specification that we will use in our estimations takes the following form:

$$\Delta y_{i,t} = \alpha_0 + \sum_{j=1}^{m} \alpha_{t-j} \Delta y_{i,t-j} + \sum_{k=1}^{n} \beta_{t-k} \Delta x_{i,t-k} + \gamma' \pi_{t-z} + \varepsilon_{i,t} \quad (1)$$

Since we will use only the first lag of the dependent variable, the above expression converges to[21]:

$$\Delta y_{i,t} = \alpha_0 + \alpha_1 \Delta y_{t-1} + \sum_{k=0}^{n} \beta_{t-k} \Delta x_{i,t-k} + \gamma' \pi_{t-z} + \Delta \varepsilon_{i,t} \quad (2)$$

[19] This problem was first addressed by Anderson and Hsiao (1982). They suggested including further lags of the difference of the dependent variable to instrument the lagged dependent variables included in a dynamic panel data model after the random effects had been removed by first differencing.

[20] The Arellano and Bond estimator relies on the GMM framework proposed by Hansen (1982). In particular, it is based on taking first differences to the dynamic equation with the objective of eliminating the specific firm effects (random effect), using lagged first differences of the dependent variable and lags of levels and exogenous variables as instruments. However, the weakness of the instruments employed is a major concern in estimating the parameters (Arellano and Bover, 1995). For more details, see Baltagi (2001) and Greene (2003).

[21] Data availability is an obstacle to include more lags.

where $\Delta y_{i,t-j}$ represents the first lag of the dependent variable, $\Delta x_{t,j-k}$ is a matrix of strictly exogenous variables up to lag "k" and π_{t-z} is a matrix of time-specific common macroeconomic variables (such as GDP or exchange rate).

Investment Equations

To contrast the findings obtained in the static case, we applied the specification in (2) to equations 3 and 5 from Table 4 and equations and all the equations shown in Table 5, except equations 1, 2 and 7. The results obtained by the Arellano and Bond estimators are shown in tables 7 and 8.

[Table 7]

[Table 8]

Equations 3a and 5a from Table 7 shows no influence of past values of investment in actual values of this variable. However, we find a counterintuitive positive influence of dollar debt on investment. Also, in equation 2a, 5a and 12a, the political dummy shows a negative sign. The lack of significance of the depreciation coefficients (measured by the difference in both multilateral and bilateral RER) show no influence of a balance sheet effect on investment[22].

Table 8 reports the estimates of the dynamic specification of the investment equations, introducing interaction terms and nonlinearities. Again, lagged values of investment are not statistically different from zero. Equation 2a shows the negative influence of total liabilities on investment and supports the BSE hypothesis. We find that the main effects of currency depreciation arise after one year. Also, the coefficient of short term ratio are positive (equation 3a). The same results are observed in equation 4a.

Equation 8a exhibits a positive competitiveness effect on investment but this effect is largely counterbalanced by the balance sheet effect caught by the difference in the multilateral RER. Finally, equations 10a and 12a introduce interaction effects and nonlinearities. The volatility

[22] These odd findings could be a byproduct of problems in the data. Besides the short time span of our panel database, we found some multicollinearity problems in preliminary estimations.

effects of interest rates are highly significative (at 1% level). As in the static specification, we observe a positive interaction term, counterbalanced by the negative balance sheet effect evidence, and negative and significant political dummy. Finally, equation 12a shows evidence of a liquidity constraint, as the interaction coefficient of [TAMEX x Lagged Short Term Debt Ratio] is positive and significative. On the other hand, the coefficients of [TAMEX x Lagged Dollar Debt Ratio] are negative in equations 10a and 12a, but only in the former is statistically different from zero.

In equations 13a and 14a, we tested if the firms' size was still an important factor in a dynamic specification. In consistence with our previous results, the size dummy both alone and as an interaction effect with lagged dollar debt showed a positive and significant coefficient in both cases.

Therefore, we can conclude that in the dynamic panel data specification for investment there is evidence of the following features:

- No inertia.
- Positive effect of dollar debt ratio on investment.
- Strong presence of a negative balance sheet effect in the current year and after one year.
- Influence of interest rate volatility on investment consistent with our prior credit constraint economy.
- Significant political environment.
- Positive effect of credit availability.
- Lager firms tend to invest more than smaller ones.

Sales Equations

We now apply the specification in (2) to equations 3, 4, 6, 7, 8 and 9 from Table 6. As the equations are estimated via GMM, the Wald test now indicates the joint significance of the estimated parameters. The main difference with the former sales equations (besides including the lagged value of the sales ratio) is the inclusion of lagged differences in multilateral or bilateral real exchange rate.

[Table 9]

Equation 3a shows that the lagged sales parameter is significant at the 1% level, and the other parameters, except the interaction effect and the lagged difference in multilateral RER, are significant at the 5% or 10% level. The lagged sales parameter shows a coefficient of 0.45, which is consistent with the high persistence of past values in determining the actual sales ratio. As in equation 3, the coefficient signs show: a negative impact of the dollar debt ratio, a positive value of the short term debt ratio, and a strong impact of a currency depreciation on sales. Also, the coefficients of GDP and the political dummy show the expected signs. In the case of equation 4a, both the present and lagged values of the difference in bilateral RER present statistical significance. It is important to note that the magnitude of the present value of the depreciation is far larger (about four times more) than the lagged value. Also, the interaction effect is not statistically different from zero in both equations.

Equations 6a and 7a include the real banking credit to the private sector as a regressor. The results show that the non linearity hypothesis (represented by the variable $[D(TCRM)^2 * DME(-1)]$) cannot be accepted. However, the significance and signs of the other variables are quite important. The coefficients of the depreciation variable (bilateral and multilateral) show the expected sign and larger values than those present in the static specifications. In contrast to equation 6 and 7, these equations present a positive sign of the GDP coefficient.

Equation 8a introduces the variable $TAMEX * DME_{-1}$, which is statistically significant, with a negative sign. All of the other variables have the expected sign, although the dollar debt ratio was not significant. In equation 9a, the volatility interaction term $TAMEX * PC_{-1}$ shows a negative sign but was not significant. Finally, equations 10a and 11a test the importance of size in the sales behavior. As in the static specifications, we found that size is an significative variable and shows a negative coefficient, meaning that smaller firms tend to sell more than larger firms.

To summarize, we can conclude that the dynamic specification has the following characteristics:

- There is strong evidence that lagged sales have a substantial influence on present sales (about 50%). Hence, the sales function appears to exhibit a strong inertia.

- A negative effect of the dollar debt ratio though the results are not as strong as in the case of the static specification.

- A positive competitiveness effect of the real exchange rate. However, the negative effect of the variation of the real exchange rate on sales, both in present and lagged values. As in the case of the static specifications, the negative effect of this variation exceeds the competitiveness effect. This is evidence of a Balance Sheet Effect.

- A positive effect of the short term debt ratio consistent with previous evidence. As before, we believe that this fact is related to our credit constraint hypothesis.

- A negative effect of the political instability on sales. The values obtained by this method exceed largely the ones obtained in the static specification.

- The effect of nonlinearities on sales cannot be accepted.

- Also, interest rate volatility exhibits weak effects on sales, especially in the case of total dollar debt.

- Smaller firms tend to show a better sales behavior than larger firms.

VI. Conclusions

In this paper we found evidence that the balance sheet effect more than compensated the competitiveness effect in the Peruvian economy. The reasons behind these results are: (i) the high degree of liability dollarization and currency mismatch, (ii) the strong bank-lending channel that followed and reinforced the balance sheet effect and (iii) the relatively small and poor diversified export sector.

What should be done before a crisis? On the structural side: (i) to increase the degree of openness of the real sector of the economy, which reduces the macroeconomic currency mismatch, (ii) to dedollarize the economy through prudential regulations (increasing general provisions for loans in dollars to the non tradable sector and increasing capital requirements

depending on the degree of balance dollarization) and create an inflation-indexed saving instrument to replace the dollar in the store-of-value function, and (iii) on the prudential side, a procyclical provision could be a good way to smooth credit cycles out, so as to reduce excessive business fluctuations.

What should be done in the aftermath of a crisis? On the macroeconomic policy side, monetary policy should be as prudent as possible, taking into account that a period of banking illiquidity should be faced by the central bank. Domestic interest rate can go as high as needed to fight speculative attacks against the currency without no impact on the real sector, as long as short-term debt in domestic currency is rather small. Regarding fiscal policy, it can be counter cyclical if public sector financial needs can be funded, otherwise it could be another source of instability (through deterioration of credibility).

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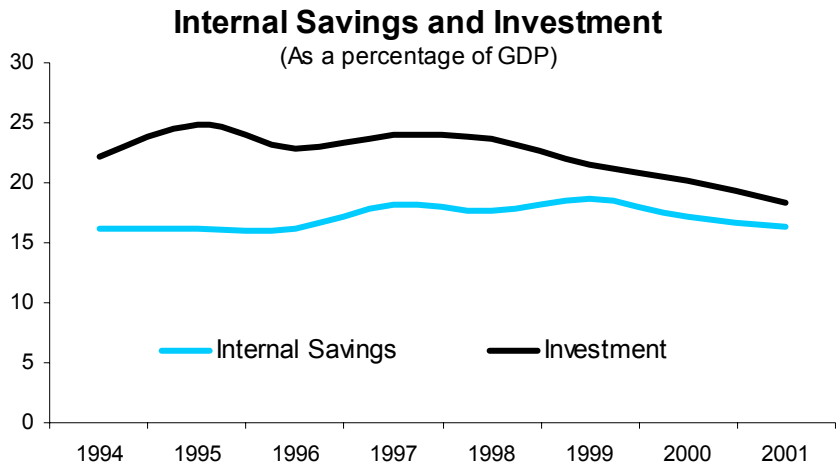
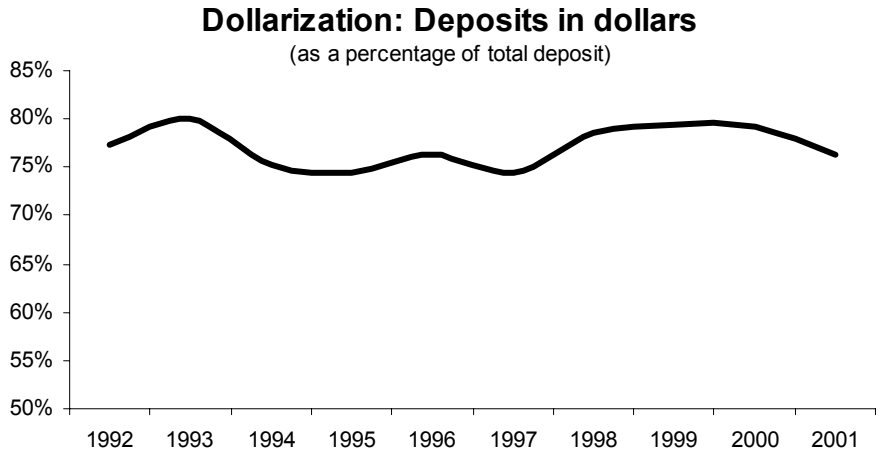
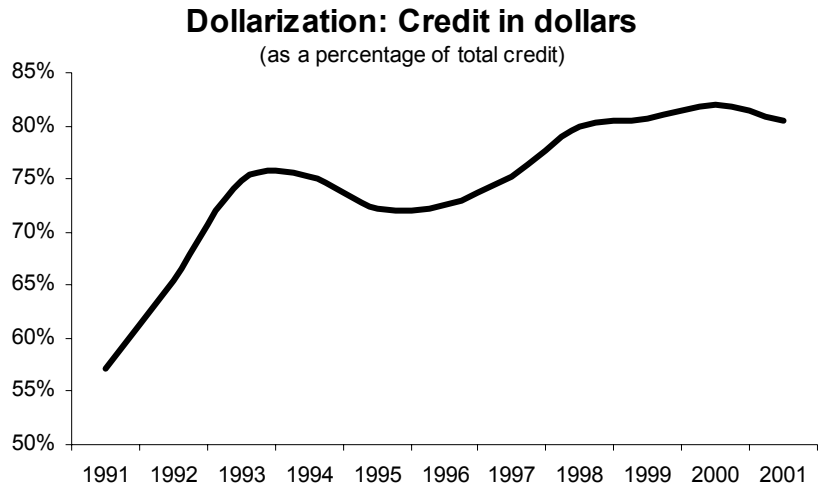
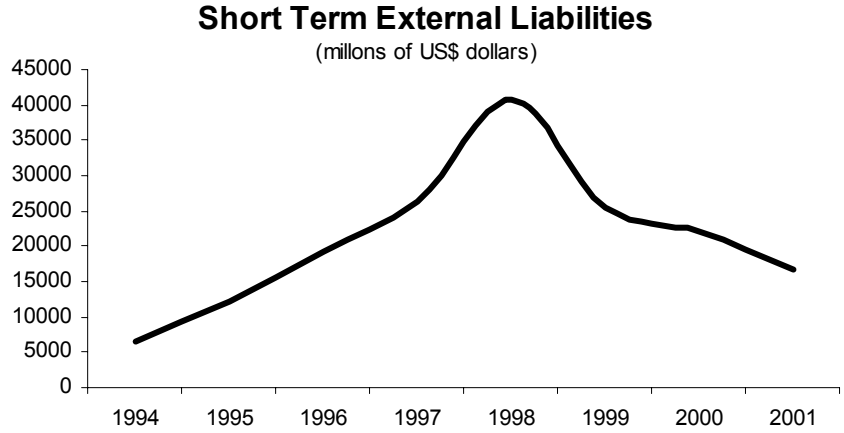
Appendix 1



Composition of Exports (Exports in 2001 as a percentage of Total)	
Gold	16.4
Copper	13.9
Fishmeal	11.7
Zinc	5.9
Traditional Products	66.7
Non - Traditional Products	32.3


Dollarization: Deposits in dollars
(as a percentage of total deposit)
85%
80%
75%
70%
65%
60%
55%
50%
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001

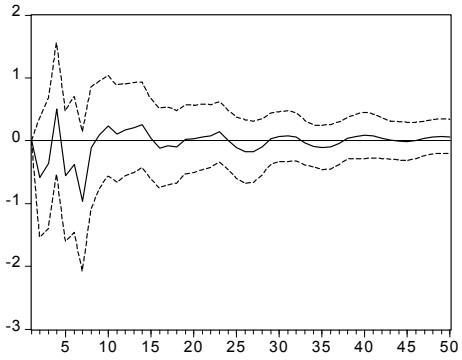

Dollarization: Credit in dollars
(as a percentage of total credit)
85%
80%
75%
70%
65%
60%
55%
50%
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001


Short Term External Liabilities
(millons of US$ dollars)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1994
1995
1996
1997
1998
1999
2000
2001

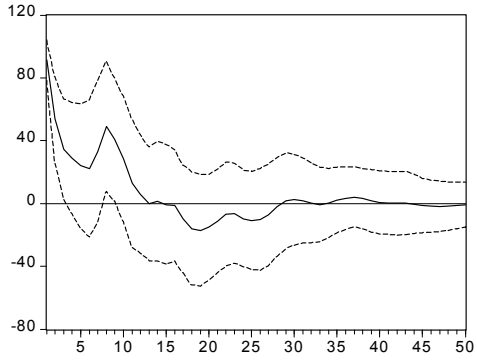
Appendix 2

Response to Cholesky One S.D. Innovations ± 2 S.E.

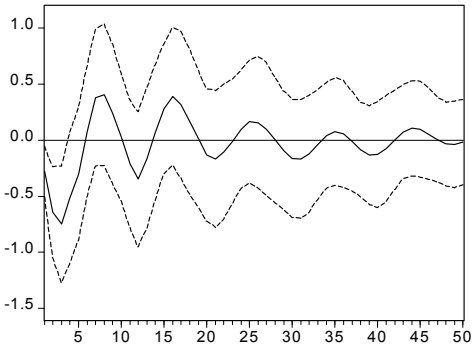
Response of BREHPPBI_PSA to BREHPADEUDADOS



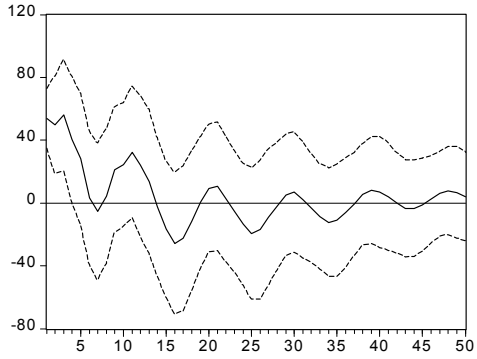
Response of BREHPADEUDADOS to BREHPADEUDADOS



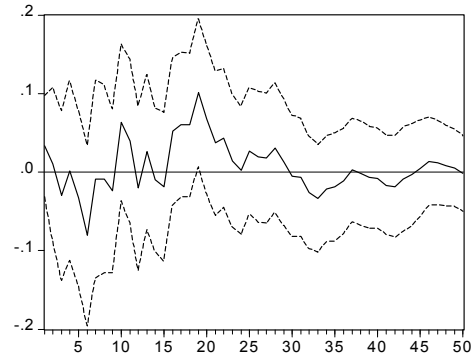
Response of BREHPTCR to BREHPADEUDADOS



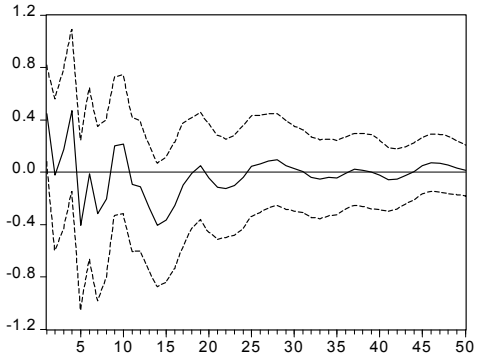
Response of BREHPCSP_US to BREHPADEUDADOS



Response of BREHPMORO to BREHPADEUDADOS

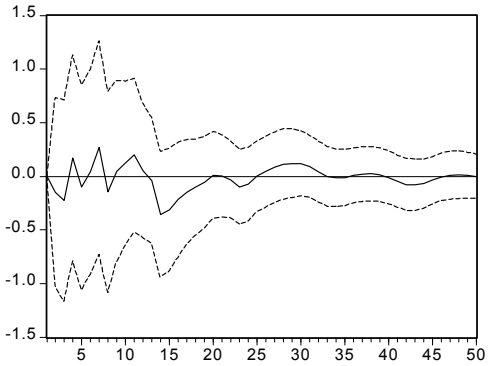


Response of BREHPPBI_NPSA to BREHPADEUDADOS



Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of BREHPPBI_PSA to BREHPCSP_US



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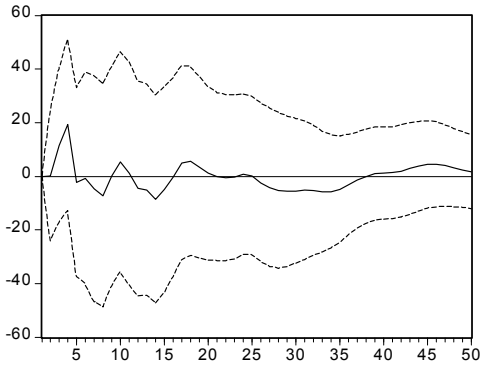

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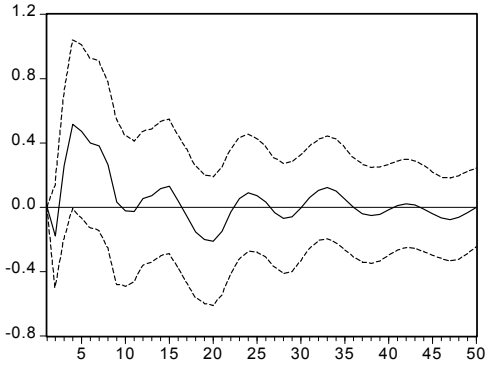

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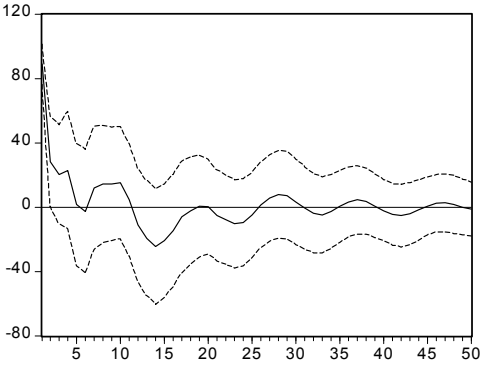

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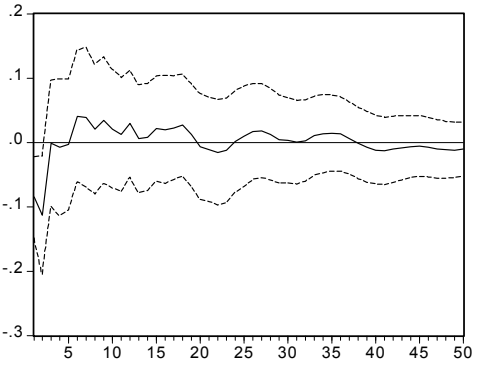
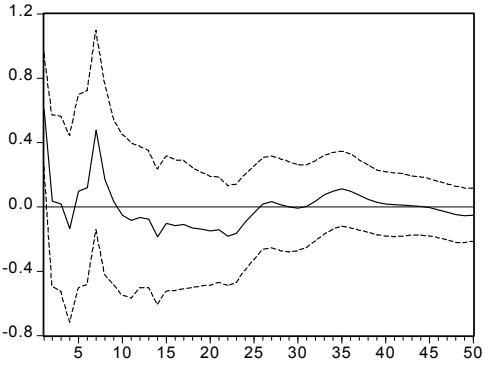
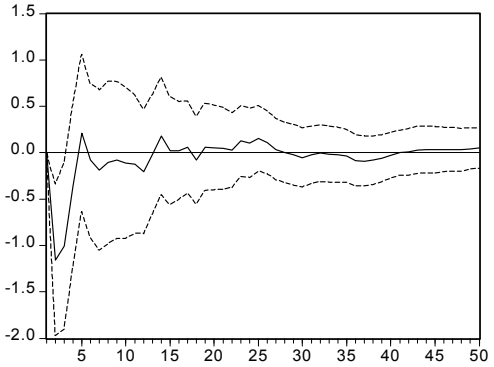


Response of BREHPPBI_NPSA to BREHPCSP_US

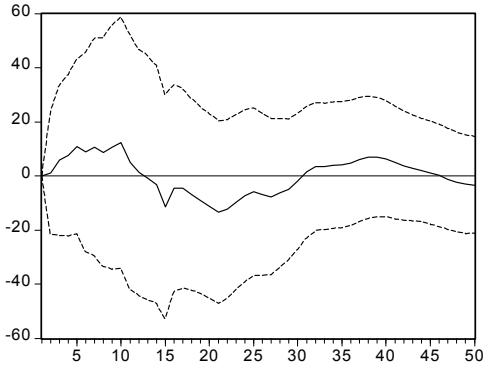


Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of BREHPPBI_PSA to BREHPMORO



Response of BREHPADEUDADOS to BREHPMORO



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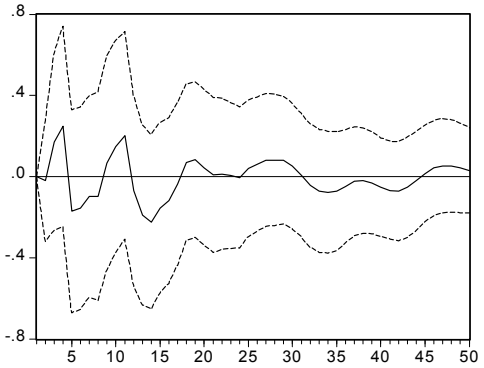

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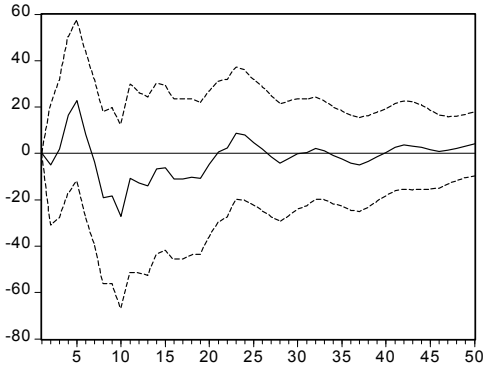
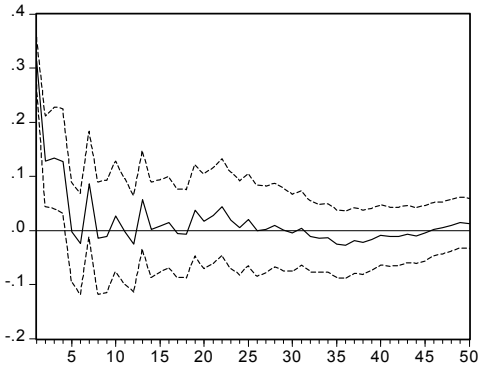
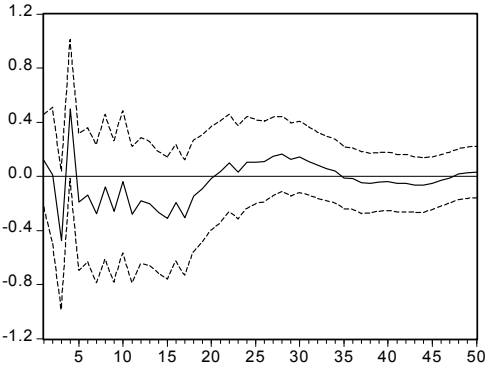


Response of BREHPMORO to BREHPMORO

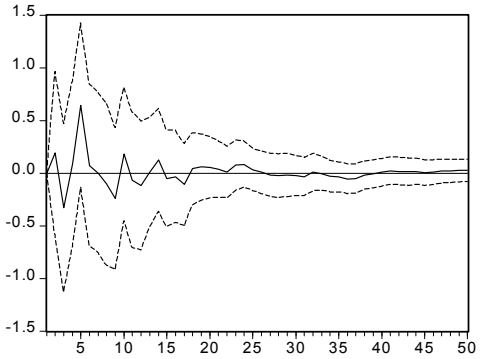


Response of BREHPPBI_NPSA to BREHPMORO

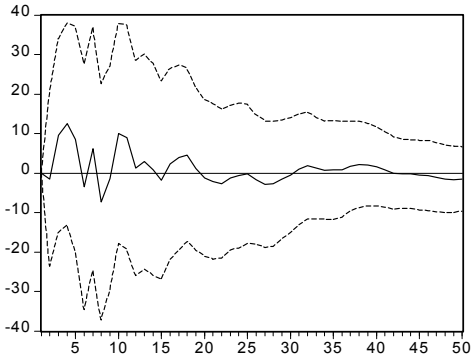


Response to Cholesky One S.D. Innovations ± 2 S.E.

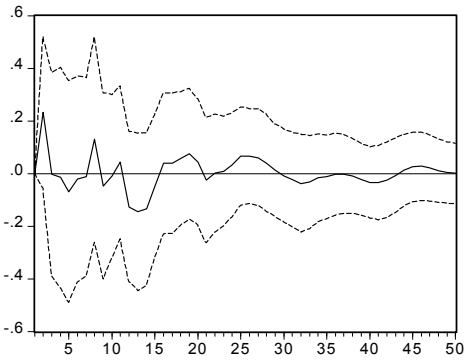
Response of BREHPPBI_PSA to BREHPPBI_NPSA



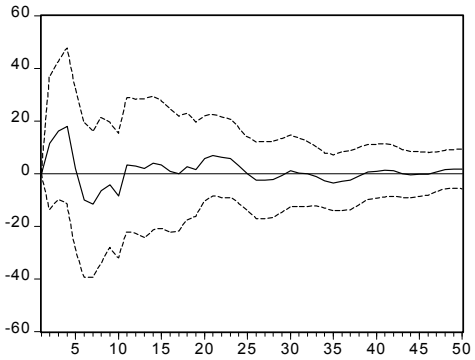
Response of BREHPADEUDADOS to BREHPPBI_NPSA



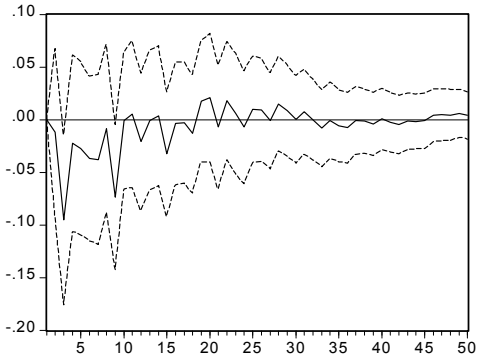
Response of BREHPTCR to BREHPPBI_NPSA



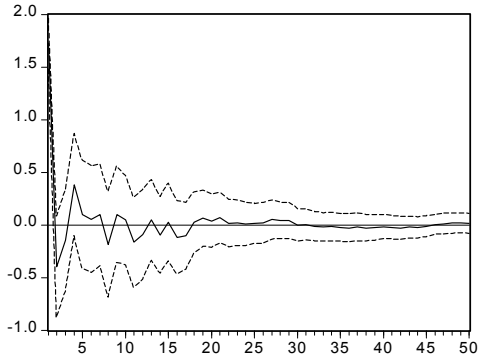
Response of BREHPCSP_US to BREHPPBI_NPSA



Response of BREHPMORO to BREHPPBI_NPSA

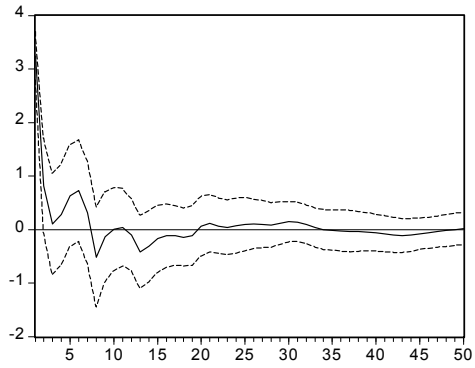


Response of BREHPPBI_NPSA to BREHPPBI_NPSA

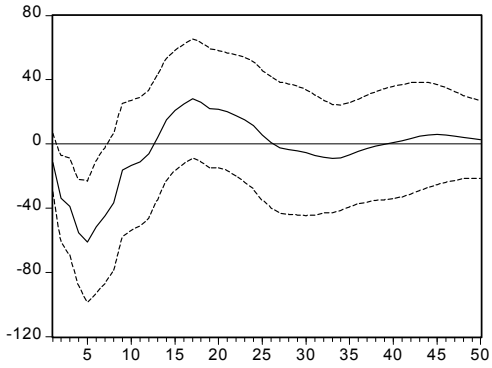


Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of BREHPPBI_PSA to BREHPPBI_PSA



Response of BREHPADEUDADOS to BREHPPBI_PSA



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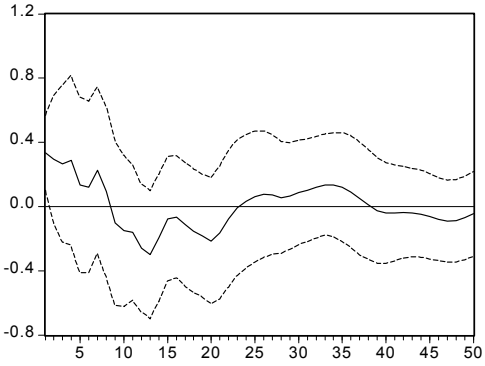
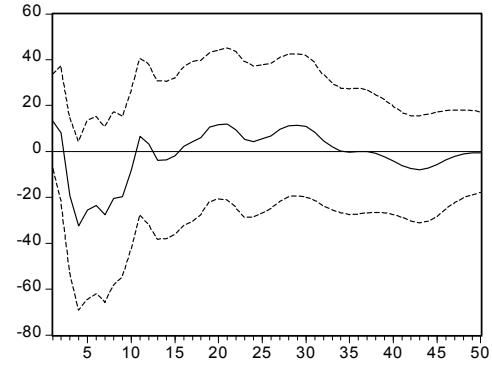
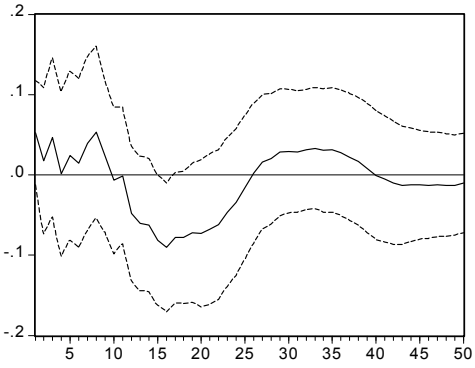


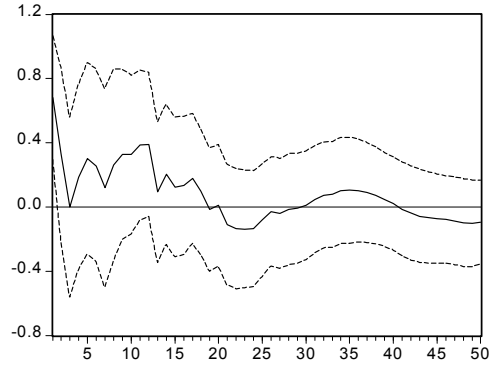
Response of BREHPCSP_US to BREHPPBI_PSA



Response of BREHPMORO to BREHPPBI_PSA

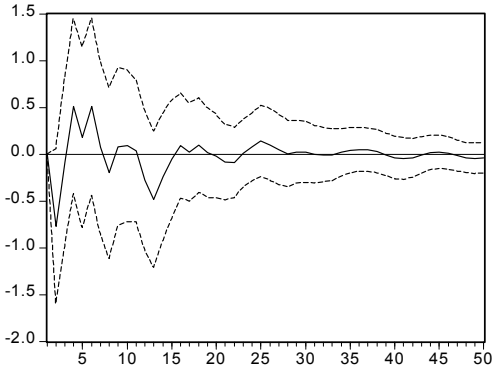


Response of BREHPPBI_NPSA to BREHPPBI_PSA

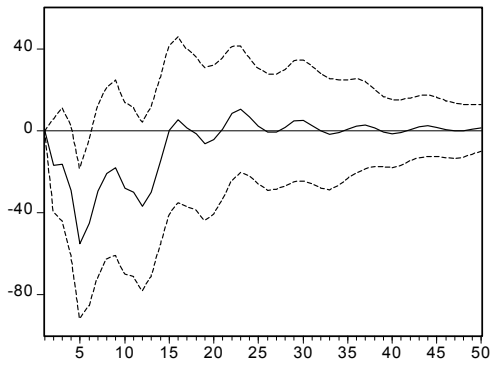


Response to Cholesky One S.D. Innovations ± 2 S.E.

Response of BREHPPBI_PSA to BREHPTCR



Response of BREHPADEUDADOS to BREHPTCR



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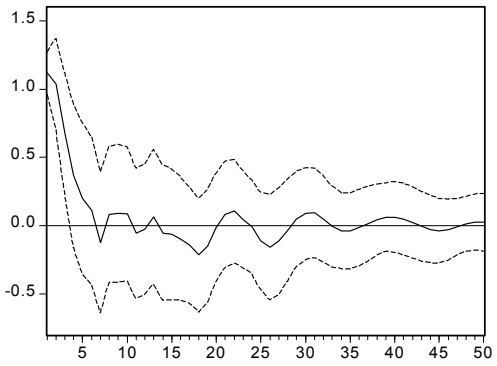
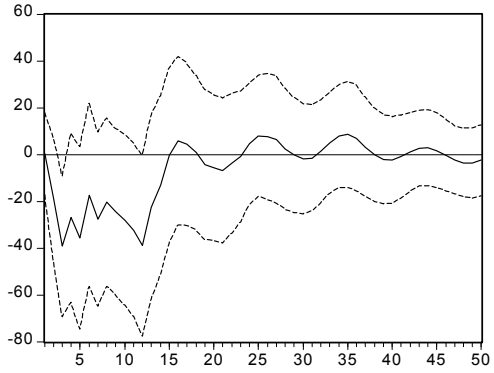
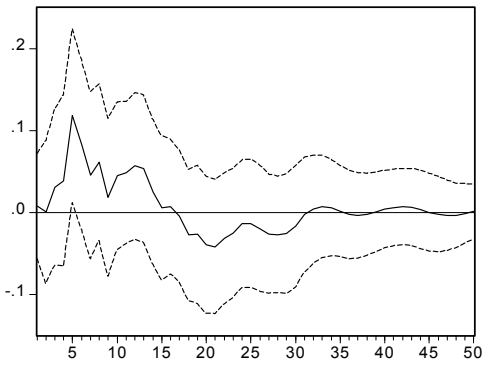


Response of BREHPCSP_US to BREHPTCR



Response of BREHPMORO to BREHPTCR



Response of BREHPPBI_NPSA to BREHPTCR

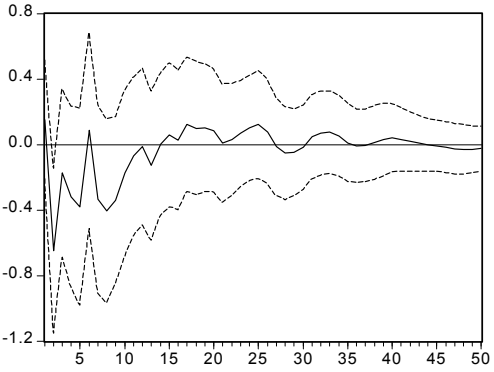


Figure 1

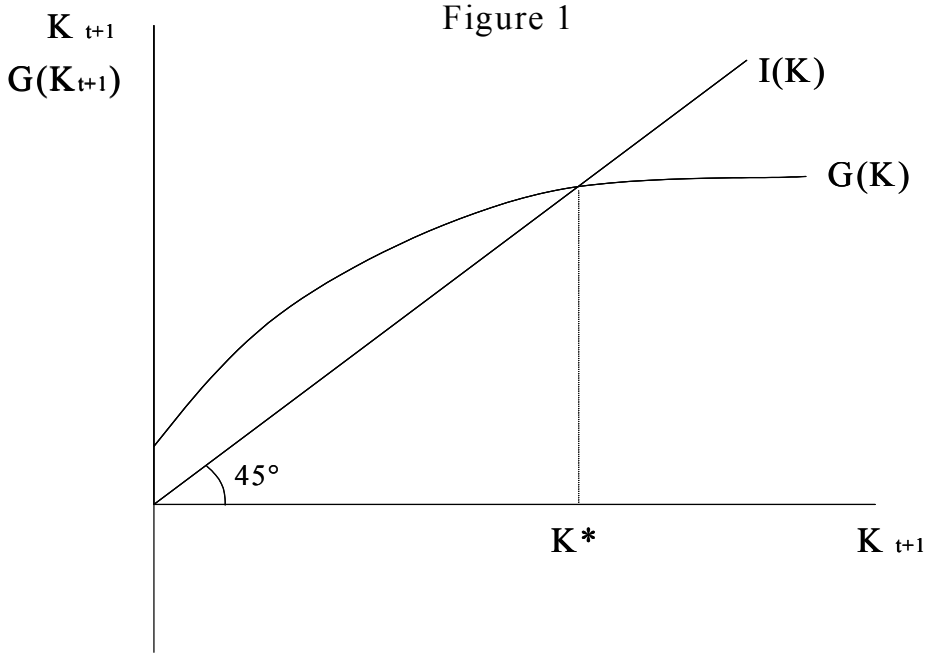


Figure 2

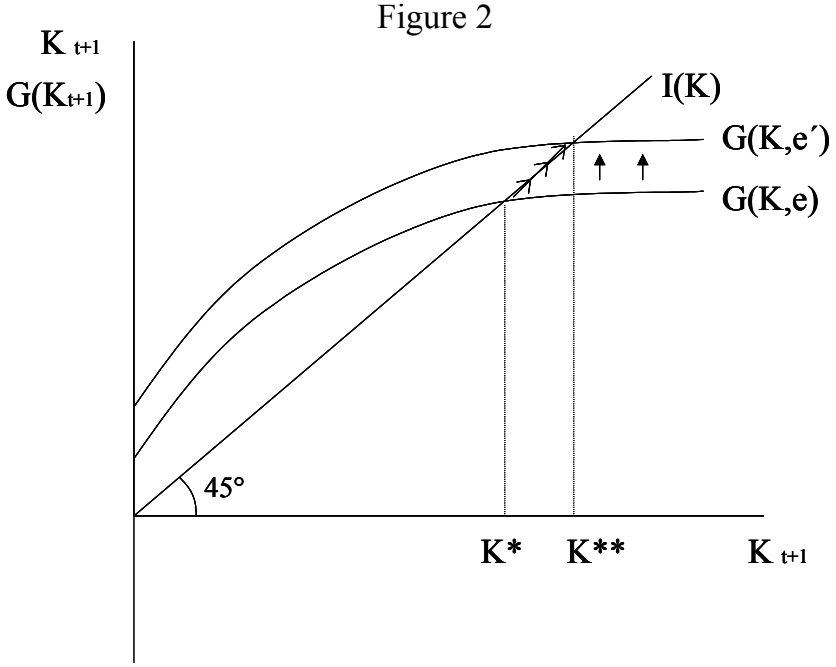


Figure 3

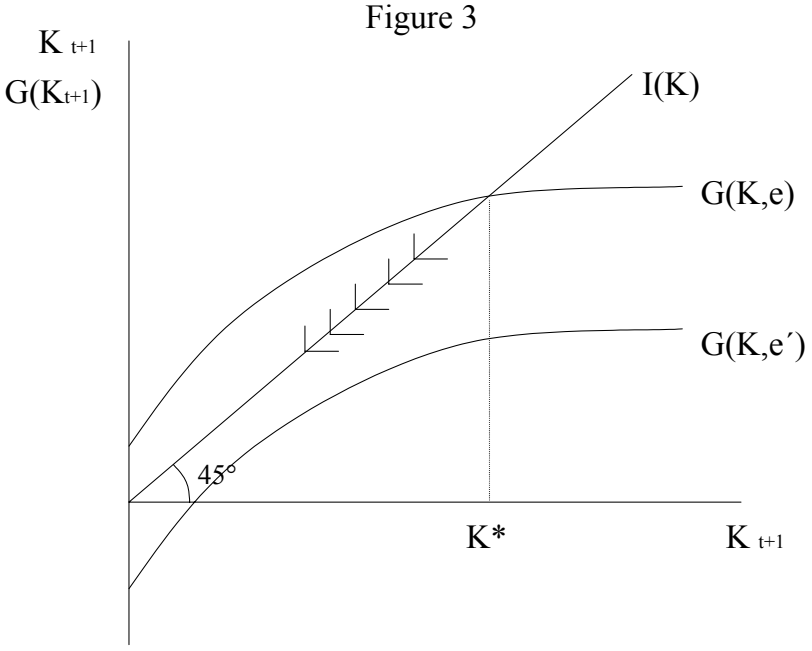


Figure 4

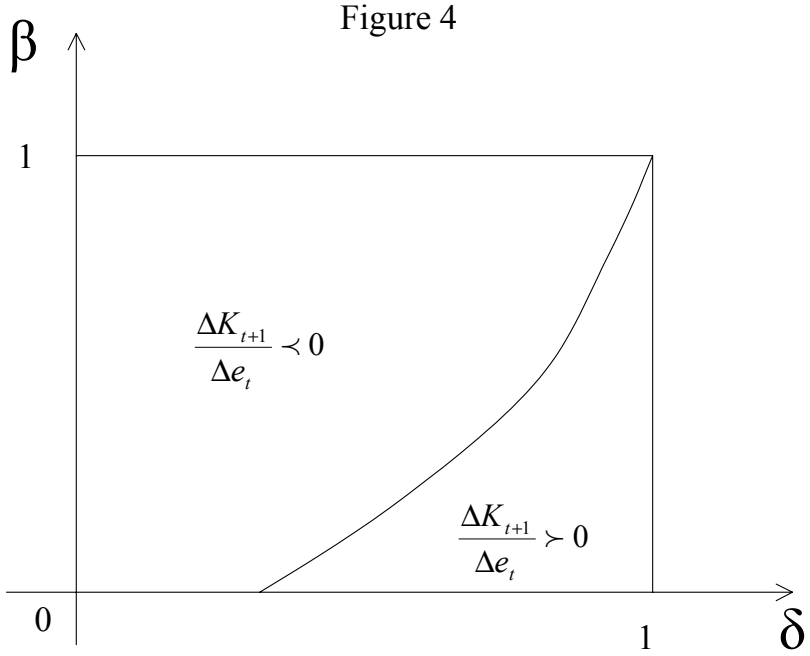


TABLE 1: SAMPLE STATISTICS

DOLLAR DEBT RATIO			
YEAR	MEAN	MEDIAN	STD DEVIATION
1994	53.1%	53.0%	25.4%
1995	57.8%	62.3%	26.5%
1996	59.8%	62.3%	25.9%
1997	59.3%	62.8%	26.5%
1998	67.7%	74.1%	26.1%
1999	64.1%	72.3%	26.4%
2000	63.2%	66.9%	25.8%
2001	63.3%	71.0%	25.9%

SALES/ASSETS RATIO			
YEAR	MEAN	MEDIAN	STD DEVIATION
1994	97.0%	87.5%	57.6%
1995	90.9%	86.0%	50.8%
1996	82.8%	78.1%	51.4%
1997	78.2%	71.6%	50.7%
1998	70.2%	60.7%	51.2%
1999	66.1%	53.5%	48.5%
2000	67.4%	54.9%	49.5%
2001	68.5%	54.0%	51.5%

SHORT TERM DEBT RATIO			
YEAR	MEAN	MEDIAN	STD DEVIATION
1994	74.6%	78.0%	19.6%
1995	74.6%	78.3%	19.4%
1996	74.8%	76.8%	19.5%
1997	72.8%	76.7%	23.7%
1998	70.3%	72.2%	24.0%
1999	68.3%	71.0%	24.2%
2000	64.6%	63.7%	26.5%
2001	61.6%	57.5%	27.7%

INVESTMENT RATIO			
YEAR	MEAN	MEDIAN	STD DEVIATION
1994	17.1%	5.6%	35.2%
1995	9.2%	4.7%	17.9%
1996	8.5%	4.1%	23.8%
1997	12.5%	4.4%	33.1%
1998	11.2%	5.0%	31.4%
1999	6.9%	2.1%	30.8%
2000	3.2%	1.9%	25.4%
2001	2.3%	1.0%	23.5%

Table 2A: DOLLAR DEBT RATIO CORRELATIONS WITH EXPLANATORY VARIABLES

	Dependent Variable: Dollar Debt Ratio							
Variables	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Size (median definition)	0.0049 (0.046)	0.0806* (0.047)	-0.0169 (0.046)	-0.0402 (0.045)	0.0247 (0.045)	-0.1032** (0.050)	-0.0602 (0.047)	-0.0179 (0.048)
Tradable/No Tradable	0.0493 (0.064)	0.0855 (0.065)	0.058 (0.061)	0.0191 (0.056)	-0.0043 (0.058)	0.0162 (0.061)	0.0015 (0.061)	0.0508 (0.062)
Export Ratio	0.0457 (0.063)	0.0937 (0.063)	0.0847 (0.062)	0.1766*** (0.057)	0.2065*** (0.059)	0.1554** (0.065)	0.0998 (0.064)	0.1413** (0.063)

Standard errors in parentheses: */**/*** significant at the .10/.05/.01 level

Table 2B: SHORT TERM DEBT RATIO CORRELATIONS WITH EXPLANATORY VARIABLES

	Dependent Variable: Short Term Debt Ratio							
Variables	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**
Size (median definition)	-0.1017*** (0.034)	-0.0689** (0.034)	-0.0997*** (0.031)	-0.1554*** (0.036)	-0.1304*** (0.039)	-0.0231 (0.059)	-0.1854*** (0.045)	-0.1905*** (0.047)
Tradable/No Tradable	0.0389 (0.046)	0.0791* (0.046)	0.0355 (0.042)	0.0098 (0.048)	0.0979* (0.051)	0.1568*** (0.052)	0.1365** (0.059)	0.1513** (0.063)
Export Ratio	-0.0683 (0.048)	-0.0012 (0.046)	0.008 (0.044)	-0.0692 (0.054)	-0.0433 (0.060)	0.0458 (0.064)	-0.0062 0.070	-0.0546 (0.078)

Standard errors in parentheses: */**/*** significant at the .10/.05/.01 level

Table 3: PANEL DATA ANALYSIS FOR DEBT COMPOSITION

	DEBT RATIOS	
VARIABLES	**DOLLAR**	**SHORT TERM**
Constant term	57.0519*** (2.105)	71.3309*** (1.758)
Size (median definition)	-0.6312 (1.636)	-11.5992*** (1.396)
Tradable/No Tradable	1.4149 (2.186)	7.4701*** (1.829)
Export Ratio	0.2154*** (0.035)	-0.050 (0.030)

Standard errors in parentheses: */**/*** significant at the .10/.05/.01 level

TABLE 4. Effect of Dollar Debt Ratio and Real Exchange Movements on Investment

	Dependent Variable: Investment [(Kt - Kt-1)/Kt-1]				
Independent Variables	**Equation 1**	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**
Dollar Debt Ratio	0.0113	0.0154	0.0156	0.0294*	0.0193
	(0.014)	(0.015)	(0.016)	(0.016)	(0.017)
Short Term Debt Ratio	0.0024	-0.0051	-0.0086	-0.0153	-0.0195
	(0.014)	(0.014)	(0.015)	(0.015)	(0.017)
Multilateral Real Exchange Rate (TCRM)	-0.5206***	0.2373		-0.0154	
	(0.189)	(0.253)		(0.273)	
D(TCRM)		-0.5034*		-0.3197	
		(0.262)		(0.272)	
Bilateral Real Exchange Rate (TCRB)			-0.0158		0.0245
			(0.070)		(0.075)
D(TCRB)	0.2961		-0.2372**		-0.3853***
	(0.214)		(0.115)		(0.130)
Gross Domestic Product (-1)	-0.3582***	-0.0691	-0.0430	-0.3163**	-0.2138**
	(0.123)	(0.075)	(0.058)	(0.126)	(0.097)
Political Dummy	1.0104	-7.6241***	-4.6153***	-4.4949	-4.8929**
	(2.267)	(2.937)	(1.737)	(3.194)	(1.954)
Real Banking Credit to the Private Sector				0.0312**	0.0354**
				(0.013)	(0.014)
Regression Statistics					
N observations	893	893	893	893	893
R2 (Weighted Statistics)	0.621	0.559	0.495	0.555	0.474
R2 (Unweighted Statistics)	0.193	0.194	0.192	0.193	0.192

Standard errors in parenthesis. */**/*** denote statistical significance at the .10/.05/.01 level

TABLE 5. Effect of Dollar Debt Ratio and Real Exchange Movements on Investmer
Including Interaction Terms and Non-Linearities

	Dependent Variable: Investment [(Kt - Kt						
Independent Variables	**Equation 1**	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**	**Equation 6**	**Equation 7**
Lagged Dollar Debt x TAMEX							
Lagged Short Term Debt Ratio x TAMEX							
Lagged Dollar Debt x D(TCRB)	0.0019 (0.002)	0.0026* (0.002)	0.0038*** (0.002)	0.0037** (0.002)	0.0005 (0.001)	0.0009 (0.001)	
Dollar Debt Ratio	-0.056*** (0.016)	-0.0230 (0.017)	-0.0453*** (0.016)	-0.0414** (0.016)	-0.0907*** (0.014)	-0.0559*** (0.015)	-0.0631*** (0.015)
Total Liabilities/(Assets - Liabilities)	-0.0015 (0.001)	-0.0013 (0.001)					
Short Term Debt Ratio			0.0480*** (0.018)	0.0505*** (0.018)	0.0497*** (0.018)	0.0382** (0.016)	0.0379** (0.018)
Multilateral Real Exchange Rate (TCRM)			0.0080 (0.165)	0.0270 (0.164)			0.3829 (0.271)
Difference in Bilateral RER [D(TCRB)]	-0.2450** (0.106)	-0.4675*** (0.126)	-0.6615*** (0.206)	-0.5408*** (0.200)			
Difference in Multilateral RER [D(TCRM)]							-0.5309* (0.295)
Lagged GDP [PBI(-1)]		-0.1466*** (0.042)	-0.0320 (0.135)	0.0709 (0.126)		-0.0854 (0.052)	0.0940** (0.047)
Political Dummy		-4.3113*** (0.723)	-5.4795*** (2.079)	-5.4608*** (2.074)	-4.8377*** (0.629)	-4.1084*** (0.760)	-9.9567*** (2.896)
Real Banking Credit		0.0174* (0.010)	0.0219* (0.012)				
Squared Depreciation [D(TCRM)^2]					-0.0319*** (0.005)	-0.0304*** (0.009)	
Non-linear Interaction Term [D(TCRM)^2 * DME(-1)]							-0.0003** (0.000)
Size Dummy (Median) [SM]							
Size Interaction Term [TCRM * SM]							
Regression Statistics							
N observations	739	739	741	741	741	741	756
R2 (Weighted Statistics)	0.485	0.622	0.535	0.535	0.604	0.491	0.505
R2 (Unweighted Statistics)	0.229	0.241	0.239	0.239	0.240	0.239	0.234

Standard errors in parenthesis. */**/*** denote statistical significance at the .10/.05/.01 level

TABLE 6. Effect of Dollar Debt Ratio and Real Exchange Movements on Sales

	Dependent Variable: Sales to Assets Ratio										
Independent Variables	Equation 1	Equation 2	Equation 3	Equation 4	Equation 5	Equation 6	Equation 7	Equation 8	Equation 9	Equation 10	Equation 11
Lagged Dollar Debt x TAMEX								-0.0001			
								(0.002)			
Lagged Short Term Debt Ratio x TAMEX									0.0019		
									(0.001)		
Lagged Dollar Debt x D(TCRB)			-0.0063***	-8.55E-05				-0.0065***	-0.0061***	-0.0065***	-0.0065***
			(0.001)	(0.002)				(0.002)	(0.001)	(0.002)	(0.002)
Dollar Debt Ratio	-0.0867***	-0.0863***	-0.0844***	-0.0978***	-0.0949***	-0.0707***	-0.1070***	-0.0900***	-0.0823***	-0.0529***	-0.0572***
	(0.022)	(0.022)	(0.017)	(0.013)	(0.023)	(0.020)	(0.014)	(0.016)	(0.017)	(0.018)	(0.018)
Short Term Debt Ratio	0.1035***	0.0978***	0.1136***	0.1228***	0.0989***	0.1375***	0.1463***	0.1106***	0.1067***	0.1273***	0.1253***
	(0.022)	(0.022)	(0.021)	(0.021)	(0.022)	(0.019)	(0.020)	(0.021)	(0.021)	(0.020)	(0.021)
Multilateral Real Exchange Rate (TCRM)	-0.0105	0.7834***	1.3030***	0.3413***	-0.0594	1.0843***	0.3417***	1.2479***	1.2503***	1.3036***	1.3818***
	(0.095)	(0.201)	(0.367)	(0.096)	(0.171)	(0.334)	(0.097)	(0.387)	(0.369)	(0.363)	(0.352)
Difference in Multilateral RER [D(TCRM)]			-1.2034***			-1.2031***		-1.1366***	-1.1634***	-1.2184***	-1.2169***
			(0.365)			(0.356)		(0.387)	(0.376)	(0.371)	(0.362)
Bilateral Real Exchange Rate (TCRB)											
Difference in Bilateral RER [D(TCRB)]	-0.4140***	-1.2643***		-0.7144***			-0.7370***				
	(0.076)	(0.204)		(0.151)			(0.087)				
Gross Domestic Product	-0.4463***	0.289*	-0.1894	-0.2106***	-0.7223***	-0.6234***	-0.2791***	-0.1673	-0.2088	-0.3231**	-0.3156**
	(0.064)	(0.169)	(0.129)	(0.079)	(0.063)	(0.088)	(0.095)	(0.129)	(0.130)	(0.146)	(0.146)
Political Dummy		-11.4123***	-14.5483***	-4.9305***	1.0274	-10.3921***	-4.4895***	-14.0989***	-13.2924***	-14.5806***	-14.6684***
		(2.446)	(4.179)	(1.080)	(1.332)	(3.721)	(1.193)	(4.328)	(4.258)	(4.162)	(4.068)
Squared Depreciation [D(TCRM)^2]					-0.0293*						
					(0.017)						
Non-linear Interaction Term [D(TCRM)^2 * DME(-1)]						-0.003*	4.00E-05				
						(0.000)	(0.000)				
Size Dummy (Median) [SM]										-12.4747***	
										(2.391)	
Size Interaction Term [TCRM * SM]											-0.1207***
											(0.023)
Regression Statistics											
N observations	1006	1006	815	815	815	833	833	815	815	815	815
R2 (Weighted Statistics)	0.974	0.968	0.982	0.999	0.965	0.986	0.994	0.981	0.982	0.985	0.987
R2 (Unweighted Statistics)	0.839	0.840	0.854	0.853	0.839	0.850	0.850	0.854	0.853	0.856	0.856

Standard errors in parenthesis. */**/*** denote statistical significance at the .10/.05/.01 level

TABLE 7. Dynamic Panel Data Estimation for Investment

Dependent Variable: Investment [(Kt - Kt-1)/Kt-1]

	Equation 3a	Equation 5a
Lagged Investment	-0.0020	-0.0082
	[0.02312]	[0.0178|
Dollar Debt Ratio	0.2266 ***	0.1778 ***
	[0.0725]	[0.0697]
Short Term Debt Ratio	-0.0058	-0.0103
	[0.0577]	[0.0511]
Multilateral Real Exchange Rate (TCRM)		
D(TCRM)		
Bilateral Real Exchange Rate (TCRB)	-0.1746	0.0773
	[0.1225]	[0.3458]
D(TCRB)	0.0441	-0.3875
	[0.2222]	[0.4948]
Gross Domestic Product (-1)	-0.1050	-0.9376
	[0.4340]	[0.7712]
Political Dummy	-4.2747 ***	
	[1.4473]	
Real Banking Credit to the Private Sector		0.1625 *
		[0.1166]
N observations	**448**	**448**
Sargan Test - chisq		
P-value	0.4584	0.4584
H0: No autocorrelation of order 1		
P-value	0.0323	0.0323
H0: No autocorrelation of order 2		
P-value	0.0628	0.0628

TABLE 8. Dynamic Panel Data Estimation for Investment + Interaction Effects and Non Linearities

Dependent Variable: Investment [(Kt - Kt-1)/Kt-1]

	Equation 2a	Equation 3a	Equation 4a	Equation 5a	Equation 8a	Equation 10a	Equation 12a	Equation 13a	Equation 14a
Lagged Investment	-0.0033	0.0123	0.0123	-0.0070	-0.0195	0.0150	-0.0019	-0.0099	-0.0099
	[0.0126]	[0.0133]	[0.0133]	[0.0119]	[0.0316]	[0.0146]	[0.0126]	[0.0120]	[0.0120]
Lagged Dollar Debt x TAMEX						-0.0435 ***	-0.0106		
						[0.0160]	[0.0148]		
Lagged Short Term Debt Ratio x TAMEX							0.0084 **		
							[0.0039]		
Lagged Dollar Debt x Size (median)									0.0570 **
									[0.0222]
Lagged Dollar Debt x D(TCRB)	0.0009 **	-0.0003	-0.0003	0.0005		0.0059 ***	0.0019	0.0059 **	0.0058 **
	[0.0004]	[0.0004]	[0.0004]	[0.0004]		[0.0022]	[0.0020]	[0.0028]	[0.0029]
Dollar Debt Ratio	0.0558	0.0560	0.0560	0.1213 *	0.0875	0.1488 **	0.1501 **	0.0463	0.0464
	[0.0660]	[0.0632]	[0.0632]	[0.0586]	[0.1475]	[0.0639]	[0.0661]	[0.0541]	[0.0540]
Total Liabilities/(Assets - Liabilities)	-0.0056 **								
	[0.0026]								
Short Term Debt Ratio		0.1336 **	0.1336 **	-0.0192	0.0010	-0.0139	-0.0196	-0.0293	-0.0322
		[0.0574]	[0.0574]	[0.0502]	[0.0795]	[0.0705]	[0.0612]	[0.0494]	[0.0495]
Multilateral Real Exchange Rate (TCRM)		0.0854	0.2045		6.6506 *	-0.0996	-0.2931	0.2601	0.2326
		[0.2158]	[0.1809]		[3.7976]	[0.2168]	[0.2847]	[0.2141]	[0.2138]
Difference in Multilateral RER [D(TCRM)]					-7.0935 *				
					[3.6562]				
Lagged Difference in TCRM					-7.5886 *				
					[3.9475]				
Difference in Bilateral RER [D(TCRB)]	-0.2927			-0.0295		-0.7051 ***	-0.2931	-0.6061 **	-0.6074 **
	[0.2149]			[0.0204]		[0.1880]	[0.2848]	[0.2894]	[0.2894]
Lagged Difference in Bilateral RER	-0.0979	-0.2664 **	-0.3667 ***	0.0050		-0.9694 ***			
	[0.4243]	[0.1194]	[0.0995]	[0.0161]		[0.2532]			
Second Lagged Difference in Bilateral RER		-0.2965 ***	-0.6117 ***						
		[0.1109]	[0.2280]						
Lagged GDP [PBI(-1)]	-0.5174		0.5282						
	[0.6701]		[0.4741]						
Political Dummy	-4.5237			-7.3169 *			-6.6529 *	-6.4977 ***	-6.5715 ***
	[7.1952]			[3.8886]			[4.0148]	[2.0336]	[2.0359]
Lagged Political Dummy					-89.1142 **				
					[45.5647]				
Size (median)								6.3973 **	
								[2.2374]	
Real Banking Credit	0.0543	0.0511				0.1655 ***			
	[0.1226]	[0.0459]				[0.0568]			
Squared Depreciation [D(TCRM)^2]				-0.0383					
				[0.0569]					
Nonlinear Interaction Term [D(TCRM)^2*DME(-1)]					0.0008				
					[0.0006]				
N observations	**532**	**348**	**348**	**532**	**439**	**346**	**439**	**517**	**517**
Sargan Test - chisq									
P-value	0.1281	0.2221	0.1102	0.5714	(*)	0.1943	0.9653	0.9999	0.9999
H0: No autocorrelation of order 1									
P-value	0.0044	0.0157	0.0195	0.0172	0.0182	0.0162	0.0186	0.0000	0.0492
H0: No autocorrelation of order 2									
P-value	0.0820	0.1640	0.1971	0.1046	0.0579	0.2383	0.1738	0.5697	0.2081

(*) Under the robust error specification to control for heteroskedasticity, the distribution of the Sargan Test statistic is unknown. Thus, the p-values are not reported in this case.

TABLE 9. Dynamic Panel Data Estimation for Sales

Dependent Variable: Sales to Assets Ratio

	Equation 3a	Equation 4a	Equation 6a	Equation 7a	Equation 8a	Equation 9a	Equation10a	Equation 11a
Lagged Sales	0.4469 ***	0.4469 ***	0.4477 ***	0.4477 ***	0.4396 ***	0.4460 ***	0.4301 ***	0.4324 ***
	[0.0869]	[0.0869]	[0.0879]	[0.0879]	[0.0861]	[0.0860]	[0.0864]	[0.0866]
Lagged Dollar Debt TAMEX					-0.0340 *			
					[0.0219]			
Lagged Short Term Debt Ratio x TAMEX						-0.0011		
						[0.0042]		
Lagged Dollar Debt Size (median)								-0.0916 *
								[0.0506]
Lagged Dollar Debt D(TCRB)	0.0003	0.0003			0.0063 *	0.0002	0.0002	0.0002
	[0.0006]	[0.0006]			[0.0034]	[0.0006]	[0.0006]	[0.0006]
Dollar Debt Ratio	-0.1189 *	-0.1189	-0.1128 *	-0.1128 *	-0.1076	-0.1174 *	-0.1192 *	-0.1129 *
	[0.0661]	[0.0661]	[0.0683]	[0.0683]	[0.0659]	[0.0662]	[0.0657]	[0.0658]
Short Term Debt Ra io	0.1489 **	0.1489 **	0.1450 **	0.1450 **	0.1550 **	0.1502 **	0.1503 **	0.1513 **
	[0.0686]	[0.0686]	[0.0680]	[0.0680]	[0.0684]	[0.0667]	[0.0678]	[0.0679]
Multilateral Real Ex hange Rate (TCRM)	4.7280 **	3.1460 **	4.5374 **	3.0708 **	4.8232 **	4.7418 **	4.8435 **	4.8741 **
	[1.9419]	[1.3109]	[2.0291]	[1.3432]	[1.9348]	[1.9453]	[1.9228]	[1.9271]
Difference in Multila eral RER D(TCRM)	-4.9615 **		-4.9772 **		-5.3414 ***	-4.9810 **	-5.1324 **	-5.1094 ***
	[1.9503]		[1.9562]		[1.9535]	[1.9531]	[1.9326]	[1.9355]
Lagged Difference i Multilateral RER	-0.3878		-0.2664		-0.1372	-0.3712	-0.3944	-0.3941
	[0.2923]		[0.4073]		[0.3226]	[0.2963]	[0.2892]	[0.2897]
Bilateral Real Exchange Rate (TCRB)								
Difference in Bilate l RER D(TCRB)		-3.1856 **		-3.3083 **				
		[1.2576]		[1.2814]				
Lagged Difference i Bilateral RER		-0.7459 **		-0.6511				
		[0.3595]		[0.4267]				
Gross Domestic Product	1.1267 *	1.8198 **	1.1559 *	1.7906 **	1.0516 *	1.1738 *	1.1021 *	1.1045 *
	[0.6365]	[0.8865]	[0.6375]	[0.8947]	[0.6349]	[0.6371]	[0.6297]	[0.6307]
Political Dummy	-50.3074 **	-27.8789 **	-49.8138 **	-27.9700 **	-63.5230 ***	-51.1091 **	-52.3308 **	-50.0772 **
	[21.0235]	[12.4641]	[21.1826]	[12.4997]	[22.1640]	[21.2110]	[20.8830]	[20.8691]
Size (Median)							-10.1285 **	
							[5.1413]	
Squared Depreciati D(TCRM)^2								
Nonlinear Interaction Term			0.0003	0.0003				
			[0.0007]	[0.0007]				
Regression Statisti								
N observations	**546**	**546**	**546**	**546**	**546**	**545**	**546**	**546**
Sargan Test - chis								
P-value	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999	0.9999
H0: No autocorrelation of order 1								
P-value	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
H0: No autocorrelation of order 2								
P-value	0.7214	0.7214	0.7020	0.7020	0.7576	0.6551	0.7899	0.7840