

Exchange Rate Movements and the Stock of Foreign Currency Denominated Government Debt: Some Panel Cointegration Evidence

November 11, 2010

Donneil Cain, Adrian Thaxter, Kadeshah Thomas and Apryl-Ann Walker¹

Abstract

In developing countries governments are often forced to issue debt in a foreign currency or commit the “original sin”. This is because their funding needs may not be met by issuing debt denominated in domestic currency. Committing the “original sin”exposes these countries to foreign exchange risks which could lead to such countries exhibiting high external debt. Substantially high external debt can cause problems for countries and no exchange rate regime can prevent an economic disaster in the event of an unfavourable external shock. Consequently, this paper examines the relationship between US dollar denominated government debt and exchange rate movements using unbalanced panel data cointegration techniques on 87 low and middle income countries over the period 1960 to 2007. Our findings led us to conclude that exchange rate Granger-causes the stock of foreign currency denominated debt. We did, however, find a bidirectional causality where exchange rate and external debt are concerned.

¹The authors acknowledge Dr. Darron Thomas for his guidance and contribution to this project. Without his help this paper would not have been possible.

1 Introduction

This paper uses an unbalanced panel for 87 low and middle income countries to model foreign debt. For this study the foreign debt or the stock of foreign currency denominated debt are used interchangeably with external debt. We define external debt as the debt a country incurs by borrowing in foreign currency. In low and middle income countries, governments are often forced to borrow in foreign currency or commit the “original sin”. This may be as a result of limited credit domestically and the need to diversify the debt portfolio among several other possibilities. Committing the “original sin” exposes the country to exchange rate risks whether under a fixed or flexible exchange rate regime. This is also true for interest rate risks. These risks could be detrimental to the external position of a country.

The paper develops a long-run model of external debt where the external debt is a function of consumption, gross domestic product, exchange rate, foreign interest rate, money demand and the net international reserve. The model is estimated using an Unrestricted Error-Correction Model which allowed for the derivation of the short-run dynamics and the long-run elasticities. The estimated model suggests that in the long-run there is a negative relationship between the exchange rate and the external debt, however, in the short-run a positive relationship exists.

This paper is divided into six sections. Section 2 gives a detailed review of the literature; section 3 develops the theoretical model; section 4 reviews the estimation techniques used and describes the estimation process of this research; section 5 conveys the findings and section 6 contains the closing remarks.

2 Literature Review

The great recession of 2008/2009 saw increasing prices and rising interest rates. The global recession eroded export earnings and from mid-2008 there was clearly a halt in credit, a surge in defaults and a decline in domestic demand in many countries. The appreciation of the US dollar added to the burden of repaying US dollar loans given the fact that many countries' external debt are denominated in US dollars. Thus those countries whose debts that were denominated in US dollars saw overwhelming increases in their external debts. It is therefore important for us to examine the relationship between exchange rate movements and the stock of foreign currency denominated government debt.

Foreign currency denominated debt refers to the debt a country incurs by borrowing in foreign currency. It is this debt that Eichengreen et al called "original sin". Foreign currency denominated debts are exposed to various risks, particularly currency risks or exchange rate movements. A Currency Risk is the volatility of debt servicing due to unexpected foreign exchange rate movements (Eichengreen et al, 1996). Jeane (2005) and Miller (1997) posit that risks associated with a large net currency exposure and the existence of deep and liquid domestic capital markets are the main reasons why the governments of most industrial countries have limited their issuance of foreign currency debt. They argue that only few, if any, advanced economies issue foreign currency debt. In addition a number of smaller, advanced economies, including Belgium, Denmark, and New Zealand, have stopped issuing foreign currency debt, except to replenish their foreign currency reserves. In Ireland, gross foreign currency borrowing is limited to the level of maturing foreign currency debt. Spain and Sweden issue foreign currency debt but hedge their currency risk through swaps or swap options.

In developing countries, however, governments are often forced to issue debt

in a foreign currency if their funding needs cannot be met by issuing debt denominated in the domestic currency. They often need to access international debt markets to offset a shortage of domestic savings, lengthen the maturity of their debt, diversify their interest rate risk exposure across various asset markets or accumulate foreign exchange reserves. As such, developing economies tend to have high levels of external debt. Here we make the hypothesis that the foreign currency borrowing comes from a lack of financial development. This is consistent with Eichengreen, Hausmann and Panizza (2003) who state that the “original sin”, is more frequently observed in developing countries than in other developed countries and financial centers. This paper does not attempt to contribute to the literature on the “original sin ” or explain how currency mismatches come about; but take these circumstances as given. Again, the objective of the is to determine the relationship(s) between movements in the exchange rate and the stock of external debt.

Typically, countries borrow to fill the gap between desired expenditure and domestically available resources. In the short term, the borrowing of money locally by governments pushes up domestic interest rates and so crowds out private sector borrowing. Foreign borrowing tends to avoid this crowding-out effect in the short run (Turner, 2002). A key incentive for governments to use foreign currency debt is to minimize current interest costs (Miller, 1997). This leaves the country vulnerable to “contagion” and other risks, as the bonds may become hard to re-finance if there is a crisis affecting the country, a neighboring country or “similar” countries (Eichengreen et al, 1996).

The optimal currency structure of foreign debt is largely determined by relative magnitudes of exchange rates variances and the covariances between domestic fundamentals and the exchange rates. In practice, however, not much guidance can be expected from the estimated covariances of nominal exchange rates with the domestic primary balance (Bohn, 1990a). This is due to the inability of fundamentals to forecast exchange rates (Engel and

West, 2005) and the high degree of noise incorporated in exchange rates (De Grauwe and Grimaldi, 2005; and Melecky, 2007).

According to Berman and Berthou (2005), if firms' borrowing behavior is characterized by an important share of foreign currency loans, then exchange rate depreciations may have a negative impact on the firms' balance sheets. They suggest that the effect of exchange rate movements on the firms' balance sheet is non-linear and so depreciation of the exchange rate will result in big changes in the firms' balance sheets. If firms use foreign currency borrowing as a large part of their financing, this will result in a more negative reaction to exchange rate depreciation than when firms borrow in their own currency.

We extend this argument by Berman and Berthou to exchange rate movements and a country's foreign currency denominated debt. It should become increasingly obvious that movements in the exchange rate will greatly impact on a country's external debt to the extent that we posit that the relationship between exchange rate movements and external debt is non-linear. We suspect that the relationship between movements in the exchange rate and a country's foreign currency denominated debt is exponential. Strictly speaking, we anticipate that our results will show that minimal movements in the exchange rate will result in huge movements in the stock of foreign currency denominated debt.

A substantial foreign-currency debt causes problems for countries, despite their exchange-rate regime. Reinhart and Rogoff (2008) postulate that the use of fixed exchange rates complicates the choice of currencies for denominating foreign debt because it is not clear why debt managers should rely on the promise of the central bank to sustain a peg to a certain currency. Artus (2010) explains that the required real depreciation of the exchange rate can result only from a fall in prices and wages, leading to a sharp recession. On the other hand, Artus also points out that the real exchange rate results from that of the nominal exchange rate which leads to a solvency crisis among

borrowers with foreign currency debt. For developing countries undesirable effects of external shocks are imminent. Artus argues that it is in the best interest of these countries to use a flexible exchange rate regime with locally denominated debt as this exchange rate regime provides protection against shocks. It is important to also note that Reinhart and Rogoff (2008) theorize that the volatility of managed exchange rates has proven to be no smaller than the volatility of floating exchange rates over a medium to long-term horizon.

If the country is in a fixed exchange-rate regime against a major currency (dollar, euro), the rebalancing of the external debt market requires a real depreciation of the exchange rate that can be obtained only through a fall in prices and wages, and hence through a deep recession; if the country is in a flexible exchange-rate regime, the rebalancing of the external debt market is provided by a depreciation of the exchange rate, which increases the value in local currency of the indebtedness and causes a solvency crisis among borrowing countries. This points us to the conclusion that it is a ‘lose-lose ’ situation when a country’s debt is denominated in a major foreign currency. Put differently, when a developing country has committed the “original sin” then no exchange-rate system can prevent an economic disaster in the event of an unfavourable external shock.

3 The Model

The Theoretical Model

This model was adopted and modified from the work of Siregar and Pontines (2005). The model derives the short-run and long- run equilibrium in three different markets, namely: The Goods Market; The Money Market and The International Market. For this paper the steady state solution is of interest. The equations are specified in log linear form.

The Goods Market

Equation (1) shows the dynamics of changes in the general prices in the goods market and Equation (2) is aggregate demand in the economy.

$$\dot{p} = \Pi(y^d - y) \quad (1)$$

$$y_d = \beta_0(e - p) + \beta_1 y + c \quad (2)$$

where: \dot{p} is domestic inflation; y^d is aggregate demand in the domestic economy; and $(e-p)$ real exchange rate. p is the domestic price level; e is the nominal exchange rate and c is the total government and consumer spending

Equation (1) states that inflation is a function of the aggregate demand and supply imbalance in the economy. Higher levels of aggregate demand put upward pressure on prices if the rate of output growth is not as fast as that of aggregate demand. Aggregate demand is shown as a function of real exchange rate, income, and consumption. The coefficients on exchange rate and income are both positive.

The Money Market

In the money market, the money supply (m^s) is assumed to be exogenously determined by the central bank. Equation (3) shows the demand for money which is inversely related to domestic interest rates and is positively related to the price level and income.

$$m^d = p + \phi y - \lambda i \quad (3)$$

Where m^d is domestic demand for money. The money market equilibrium is then $m^s = m^d = m$ where m is the log of the domestic stock of money.

The International Asset Market

International interaction can be depicted by equation (4) which is the interest rate parity condition. The interest rate parity condition suggests that

domestic interest rates must be equal to the returns on investment abroad accounting for expected exchange rate movements and risk premium.

$$i^d = i^f + E(\dot{e}) + RP + \beta NIR \quad (4)$$

and

$$RP = \alpha F \quad (5)$$

where i^d is domestic interest rate; i^f is foreign interest rate; e is nominal exchange rate; \bar{e} is long-run nominal exchange rate; $E(\dot{e}) = \theta(\bar{e} - e)$ which is expected growth in nominal spot exchange rate; RP is risk premium and F is foreign debt.

The risk premium is said to be increasing in the stock of foreign debt. This is captured by the coefficient α . Siregar and Pontines (2005) assumed that foreign debt was exogenous but for this paper foreign debt will be determined endogenously. If we substitute Equation (5) into (4) then we see that:

Here we anticipate that α and β will have opposite signs. This is in keeping with the findings of Truman(2004) and Yongding(2007) that there is a negative relationship between the risk premium and the NIR.

$$i^d = i^f + E(\dot{e}) + \alpha F + \beta NIR \quad (6)$$

Equation (5) is augmented with Net International Reserve(NIR), which intuitively suggest that the exchange rate is managed.

Long-run Equilibrium

In the long run the three markets are operating in steady state. This is depicted by Equations (7) to (9).

$$\bar{p} = e + \frac{c}{\beta_0} - \frac{(1 - \beta_1)}{\beta_o} y \quad (7)$$

$$\bar{p} = m - \phi y + \lambda(i^f + \alpha F + \beta NIR) \quad (8)$$

$$\dot{e} = \bar{e} \quad (9)$$

Since there is equilibrium in all three markets, Equation (7) can be set equal to Equation (8). Solving for \bar{F} yields:

$$\bar{F} = \frac{1}{\alpha\lambda} \left[\bar{e} + \frac{c}{\beta_0} - \left[\frac{1 - \beta_1}{\beta_0} - \phi \right] y - m - \lambda i^f - \beta \lambda NIR \right] \quad (10)$$

Equation (10) suggest that in the long foreign debt is positively related to the depreciation of the domestic currency and consumption, however, foreign debt is inversely related to income, money supply, foreign interest rate and the Net International Reserve.

The Empirical Model

The empirical model to be estimated is:

$$F = \psi_1 \bar{e} + \psi_2 c + \psi_3 y + \psi_4 m + \psi_5 i^f + \psi_6 NIR + \varepsilon \quad (11)$$

Where again F is the stock of foreign debt; \bar{e} is the long-run equilibrium exchange rate; c is consumption by households and government; y is national income (GDP); M is the money stock; i^f is foreign interest rate and NIR is net international reserve.

Apriori Expectations

The stock of foreign debt will increase if: the exchange rate increases (the domestic currency depreciates); the cost of debt servicing abroad increases; or if the cost imports increase. Increases in consumption by households and the government will lead to increased demand for domestic and foreign goods. An increase in the demand for imports will increase the current account deficit and thus will also increase the foreign debt stock. If a country is able to increase its real GDP, however, then its exports could increase or the

domestic inflation could be curbed. Additionally, this increase in real GDP could result in the government receiving more revenue from taxes which would reduce the need for borrowing externally. A negative relationship is also expected between interest rate abroad and the stock of foreign debt.

If there is an increase in interest rates abroad then then government will seek to: (1) borrow from the domestic market (borrowing less from the foreign market) and; (2) exercise fiscal discipline. The choice the government makes is dependent on the sensitivity of demand for foreign credit to changes in foreign interest rate. Domestic liquidity is also expected to be negatively related to foreign debt. This is due to the fact that a loose liquidity position signifies that credit is available domestically; as such foreign borrowing is not desirable. Where credit is constrained external credit will be sought. The Net International Reserve (NIR) is expected to be negatively related to the external debt. The NIR is used by countries as a means of managing the exchange rate as well as make debt payments in some instances.

4 Methodology

The methodology employed in this paper makes use of cointegration techniques with panel data. The use of panel data is highly preferred as it allows for the control of time specific events and heterogeneity across cross section units. Results generated using effective modeling techniques and proper diagnostics are usually preferred because they are efficient and robust and allows for improved testing of economic theories. This paper examines the impact of exchange rate movements on the stock of foreign debt and based on the literature, low and middle income countries rely heavily on official assistance from multilateral and bilateral donors. These are provided at concessional rates and thus the choice of currency denomination for their debt is usually determined by the supply side. It is against this background that our panel was selected. Cointegration tests were conducted. Fisher (1932) and Maddala and Wu (1999) were used, after establishing that the variables were $I(1)$.

The unit root tests employed are: Levin, Lin and Chu (2002; Im, Pesaran and Shim (2003); and the Augmented Dickey-Fuller-Fisher (ADFF) tests.

Unit Root Testing

The literature identifies several unit root tests in panel data: Levin, Lin and Chu (2002), Bretung (2000), Im, Pesaran and Shim (2003), Maddala and Wu (1999) and Choi (2001) and the Augmented Dickey-Fuller-Fisher tests . However, the Levin, Lin and Chu (2002) and Im, Pesaran and Shim (2003) were employed while the ADFF was used to substantiate our findings. The unit root tests were conducted with a constant and a trend component where appropriate.

Description of Unit Root Test to be employed:

Levin, Lin and Chu (2002)

Levin, Lin and Chu (2002) employ the assumption that the persistence parameters are common across cross-sections. Consider an AR(1) process for the panel data.

$$y_{it} = \rho_i y_{it-1} + x_{it} \delta_i + \epsilon_{it} \quad (12)$$

where $i = 1, 2, \dots, N$ cross-section units or series, that are observed over periods $t = 1, 2, \dots, T$. x_{it} is any exogenous variable, which could be a trend and or a fixed or individual effect, ρ_i is the auto-regressive coefficient for the i^{th} cross section and ϵ_{it} the mutually independent idiosyncratic disturbance. If $|\rho_i| = 1$ the series has a unit root. If $|\rho_i| < 1$ the series is stationary. The LLC test assumes a common unit root $\rho_i = \rho$ across all cross-sections. Therefore using the general specification of an Augmented Dickey-Fuller function (ADF):

$$\Delta y_{i,t} = \alpha y_{i,t-1} + \sum_{j=1}^{p_i} \beta_{i,j} \Delta y_{i,t-j} + x'_{it} \delta + \epsilon_{it} \quad (13)$$

where $\alpha = \rho - 1$ and the lag length across cross-section may differ. The null is specified (there is a unit root) and the alternative is that there is no unit root. That is,

$$H_0 : \alpha = 0 \tag{14}$$

$$H_1 : \alpha < 0 \tag{15}$$

Im, Pesaran and Shim

Im, Pesaran and Shim assume that the individual unit root varies across cross-sections. The resulting test is a combination of individual unit roots test across cross-section. It takes the average of the t-statistics for each unit test to derive the appropriate test statistics. Using the ADF (see Equation (13)) the null hypothesis is specified as:

$$H_1 : \alpha_i = 0, \text{ for all } i \tag{16}$$

and the alternative:

$$H_1 : \begin{cases} \alpha_i = 0, \text{ for } i = 1, 2, \dots, N_1 \\ \alpha_i < 0, \text{ for } i = N+1, N+2, \dots, N \end{cases} \tag{17}$$

The lag length is fixed across cross-sections. Like LLC, the IPS test is said to have an asymptotically normal distribution.

Cointegration

Fisher (1932) and Maddala and Wu (1999)

Fisher (1932) is a Johansen based cointegration approach which combines

the results of the individual independent cross section cointegration. Maddala and Wu (1999) updated and applied Fisher's results. He proposed testing for cointegration in panels by combining the tests from individual cross-sections to obtain a test statistic for the panel. If Π_i is the probability of rejecting the null hypothesis of no cointegration for an individual cross section, then under the null hypothesis for the panel the joint probabilities are insignificant and the alternative is that the joint probability is different from zero. The test statistic is as follows:

$$-2\sum_{i=1}^n \log(\Pi_i) \rightarrow \chi^2(2n) \quad (18)$$

The test statistic values are chi-square (χ^2) distributed and are based on MacKinnon-Haug-Michelis (1999) p-values for Johansen's cointegration trace test and maximum eigenvalue test.

Unrestricted Error-Correction Model

To examine further the stock of foreign debt, an unrestricted error correction model (URECM) was used. This formula has the advantage of estimating both the short-run and long-run relationship, without prior knowledge of the order of integration in one equation. Additionally, its results are not sensitive to the mixture of I(0) and I(1) variables. Given that an appropriate lag length is selected, the ARDL model has been shown to capture the data generating process through the application of a general to specific modeling procedure.

Consider the following ARDL(1,1) model:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + \gamma_0 X_t + \gamma_1 X_{t-1} + \varepsilon_t \quad (19)$$

which can also be rearranged as:

$$\Delta Y_t = \beta_0 + \beta_1 \Delta X_t + \eta_1 y_{t-1} + \eta_2 X_{t-1} + \mu_t \quad (20)$$

is an unrestricted error correction model (URECM) with a long-run multiplier $-(\eta_2/\eta_1)$. Thus, an ARDL(p,q) model can be written as:

$$\Delta Y_t = \phi_0 + \sum_{i=1}^{p-1} \gamma_i \Delta Y_{t-i} + \sum_{i=0}^{q-1} \delta_i \Delta X_{t-i} + \alpha_i Y_{t-1} + \beta_i X_{t-1} \varepsilon_t \quad (21)$$

where ϕ and γ are the short-run coefficients, α and β are the level effects and thus the long-run coefficients are computed as β and α . α also represents the speed of adjustment to the long-run relationship. ε_t is a disturbance term which satisfies the classical assumptions.

To this end, foreign debt is modeled using the general to specific whilst correcting for cross section heteroskedasticity and correlation. The appropriate lag length of 6 is selected using the Akaike Information Criterion (AIC) and Schwarz Information Criterion (SBC).

Data and Issues

This paper uses an unbalanced panel with annual data spanning the period 1960 to 2006 for 87 low to middle income countries as defined by the World Bank's World Development Indicator 2007. The compiled data set came from the International Monetary Fund's (IMF) International Financial Statistics (IFS 2008) and the World Bank's World Development Indicators 2007 (WDI 2007).

The variables used in this research are: foreign debt (FD) as a ratio of GDP, domestic exchange rate per unit of US dollar (EX-RATE), consumption (household and government) (C), gross domestic product(GDP), narrow money (M1), foreign interest rate (i^f) and the Net International Reserve (NIR) as ratio of GDP. These variables were taken as defined by their re-

spective data set and entered the empirical model as logs of the level variable. See Appendix: Table 8 for the definition of the variables.

5 Discussion of Findings

For our panel of low and middle income countries, the Levin, Lin and Chul (LLC) test, the Im Pesoran and Shim (IPS) test and the Augmented Dickey-Fuller-Fisher (ADFF) test all showed that external debt, GDP, NIR and M1 were integrated of order 1. There were mixed results where the treasury bill rate and the exchange rate were concerned. The LLC was the only unit root test that concluded that the treasury bill was $I(1)$. Likewise the ADF was the only test that confirmed that exchange rate was $I(1)$. Consumption which is the sum of government spending and household consumption was found to be $I(0)$ by all three unit root tests (see Table 1). The variables were entered into a VAR structure to examine the endogeneity of the variables using the block Exogeneity-Wald tests/granger causality. The optimal lag length for the Exogeneity-Wald test was selected using the Final Prediction Error, Schwarz, Akaike and Hannan Quinn. The results of the Exogeneity-Wald test suggest that M1, T-bill, consumption, exchange rate and the NIR Granger-caused the external debt. GDP was found to not granger cause external debt, however, all the variables jointly granger-cause the external balance. All variables exhibit endogeneity properties (see Table 2). The causality test was carried out in first differences and as such we proceeded to determine whether or not the variables were cointegrated.

The Johansen Fisher Panel Cointegration Test was used to examine the cointegrating relationship among the variables: external debt, GDP, M1, T-bill and exchange rate. The test revealed that there were at most four cointegrating equations (see Table 3). With the non-existence of a unique cointegrating vector, an unrestricted ordinary least square model was used to model external debt. The model derived both the long-run elasticities and the short-run

dynamics of the relationship between external debt and consumption, GDP, exchange rate, US t-bill, NIR and M1. With the inclusion of dummies the model was equipped to handle structural breaks. The long-run equilibrium is characterized by a negative relationship between GDP, exchange rate and NIR and the external debt. On the contrary, there is an estimated positive relationship between consumption, the US Treasury bill rate and external debt. M1 did not enter the long-run equation for external debt. In the short-run, changes in consumption, NIR and M1 had a negative impact on external debt. On the other hand, changes in GDP, exchange rate and US Treasury bill rate are positively related to changes in the external debt.

The tests confirm some of the apriori expectations such as the negative coefficient on GDP and the positive coefficient on consumption. The long-run elasticity suggests that a unit increase (decrease) in GDP in the long-run would result in a 1.7 unit decrease (increase) in the external debt. On the other hand, a unit increase (decrease) in consumption would lead to 2.11 unit increase (decrease) in external debt. The tests also confirm the negative relationship between the NIR and external debt both in the short-run and the long-run. The NIR is used by many low to middle income countries as a means of managing their exchange rate problems. Additionally, debt payments are sometimes made out of the NIR especially in cases where the government borrows from the central bank to meet its international obligations. Although M1 was not entered into the long-run relationship, it is important to point out that it is negatively related to short-run changes in the external debt.

In the long-run equilibrium a 100 per cent increase/depreciation (decrease/appreciation) in the exchange rate will lead to a decrease (increase) in the external debt by about 52 per cent. This may be explained by the fact that the cost of borrowing in foreign currency or committing the “original sin” becomes more apparent in the long-run. The short run dynamics showed a positive relationship between the external debt and the exchange rate. This is explained

by the fact that government borrowing in foreign currency exposes the state to exchange risk and volatility. If the domestic currency depreciates then it increases the nominal value of the foreign debt stock. In the short-run 13 per cent of the changes in exchange rate are passed through to the debt stock for these low to middle income countries. The obvious recommendation to low and middle income countries is that they hedge against exchange rate risks and if possible they should avoid committing the original sin. Another interesting finding is the positive relationship between external debt and foreign exchange rate in the long-run. The model suggests that if foreign interest rate doubles then the foreign debt increase by 50 per cent. This suggests that low and middle income countries should engage in fixed interest rates foreign debt as varying instrument could expose the countries to significant interest rate risks. The positive sign on the short-run interest rate coefficient was unexpected and cannot be explained. It is important to note that dummies were included to capture shocks and some diagnostics were carried out to check for stationarity and normality in the residuals (see Tables 4-6 Figure 1).

6 Our Model Versus Reality

After executing an in-sample forecast, the model seemed fairly accurate in the total panel with a root mean square error of 13.2 and Theil statistic of 0.07 (see Figure 2). The data for Jamaica was extracted and the root mean square error found to be 0.43. This is significantly above the panel estimate. A closer examination of the forecast and actual figures revealed that the model forecast well before the liberalization of the exchange rate in 1992. The forecast errors are large however beyond 1992 (see Figure 3).

7 Conclusion

This paper examines the determinants of foreign debt of 87 low and middle income countries for the period 1970-2006. With special interest into how the exchange rate impacts the stock of foreign debt. The other determinants included in the framework are: consumption, GDP, US t-bill, NIR and M1.

The finding suggests that in the long-run GDP, exchange rate and NIR are all inversely related to the external debt, however, there is positive relationship between consumption and the external debt and the US t-bill rate and the external debt. M1 does not significantly impact external debt in the long-run. In the short-run, changes in consumption, NIR and M1 negatively impact the external debt. On the other hand, changes in the external debt are positively related to changes in GDP, exchange rate and US t-bill.

Volatility in the exchange rate and the interest rates presents risk to the external debt position of these countries. As such, it is important for these countries to find ways to mitigate the associated risk. These include entering into fixed exchange rate instruments, fixed interest rate instruments, forward contracts, diversifying the currency denomination of the external debt and when possible to borrow from the domestic market.

8 References

Artus, P. (2010). “No Solution When the (emerging) Country’s External Debt is Denominated in Foreign Currencies”. *Flash Economics (Economic Research)*, 14.

Berman, N. and Berthou, A (2005). “Finance and Trade: Non-Linear Effect of Exchange Rate movements on exports”. *Working Paper*.

Bohn, Henning, (1990). "A positive theory of foreign currency debt," *Journal of International Economics*, 29(3): 273-292.

Broner, F. A. and Martin, A. and Ventura, J.(2007). "Sovereign Risk and Secondary Markets," *CEPR Discussion Papers 6055, C.E.P.R. Discussion Papers*

Choi, I. (2001). "Unit Root Tests for Panel Data," *Journal of International Money and Finance*, 20: 249-272.

De Grauwe, P. and Grimaldi, M. (2005): "The Exchange Rate and its Fundamentals in a Complex World", *Review of International Economics*, 13(3): 549-575.

Eichengreen, B, Hausmann, R and Panizza, U. (2003). "Currency mismatches, debt intolerance and original sin: Why they are not the same and why it matters". *NBER Working Paper 10036, Cambridge*.

Eichengreen, B, Rose, A.K. and Wyplosz, C. (1996). "Contagious currency crises". *NBER Working Paper 5681. Cambridge*.

Engel, C and West, K.D. (2005). "Exchange rates and fundamentals". *Journal of Political Economy*, 113(3): 487-517.

Fisher, M.E., Seater, J.J. (1993). "Long-Run Neutrality and Super Neutrality in an ARIMA framework". *American Economic Review* 83: 402-415.

Fratzscher, M. (2009). "What explains the global exchange rate movements during the crisis?" *European Central Bank*.

Gray, P and Irwin, T. (2003). "Exchange Rate Risk: Allocating Exchange

Rate Risk in Private Infrastructure Projects”. *World Bank: Public Policy for the Private Sector*, Note Number 226.

Im, K. S., Pesaran, M.H. and Shin, Y. (2003). “Testing for Unit Roots in Heterogeneous Panels,” *Journal of Econometrics*, 115: 53-74.

Jeanne, O. (2005). “Why do emerging economies borrow in foreign currency?”. In: Eichengreen, B and Hausmann, R (eds). “Other People’s Money: Debt Denomination and Financial Instability in Emerging Market Economies”. University of Chicago Press: Chicago.

Levin, A., Lin, C.F. and Chu, C. (2002). “Unit Root Tests in Panel Data: Asymptotic and Finite-Sample Properties,” *Journal of Econometrics*, 108: 1-24.

Maddala, G. S. and Wu, S. (1999). “A Comparative Study of Unit Root Tests with Panel Data and A New Simple Test”. *Oxford Bulletin of Economics and Statistics*, 61: 631-652.

Melecky, M. (2007). “A structural investigation of third-currency shocks to bilateral exchange rates”, University Library of Munich, Germany, Reinhart and Rogoff. MPRA Paper 5114.

Miller, V. (1992). “Why a Government Might Want to Consider Foreign Currency Denominated Debt, Economics Letters”. *Monetary and Economic Studies*, 10(2): 31-62.

Obstfeld, M. and Kenneth R. (1998). “Foundations of International Macroeconomics”. Cambridge: MIT Press.

Pedroni, P. (2004). “Panel cointegration: Asymptotic and finite sample prop-

erties of pooled time series tests with and application to the PPP hypothesis”.

Econometric Theory 20: 597-565.

Siregar, R. and Pontines, V. (2005). “External Debt and Exchange Rate Overshooting: The case of selected East Asian Countries”. The University of Adelaide, Australia School of Economics. Working Paper.

Tille, C. (2003). “The Impact of Exchange Rate Movements on US Foreign Debt”. *Current Issues in Economics and Finance, Federal Reserve Bank of New York*, 9(1).

Truman, E. (2004). “Budget and External Deficits: Not Twins but the Same Family”. *Working Paper*.

Yongding, Y. (2007). “Global Imbalances: Chinas Perspective”. *Working Paper*.