Macroeconomic Determinants of Debt Finance in Developing Countries: A Cross Country Panel Analysis

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Abstract

Long-term private non-guaranteed (PNG) debt finance becoming a significant contributor to the real gross domestic product (GDP) for many countries. The fund is broadly distributing via number of institutions and agencies towards the potential clients. For a certain period, inflows have significant impact in GDP growth rate but outflows creating long term macroeconomics and financials instability. This study, covering the period from 1996 to 2015, makes an attempt to identify the macroeconomic determinants of long-term PNG debt finance to a panel of twenty lower middle-income countries and consider PNG finance as a dependent variable and thirteen relevant macroeconomic factors based on relational frame theory (RFT) are the explanatory variables. The study uses a panel data analysis by applying methodologies, viz., pooled ordinary least square (OLS) model, random effects and fixed effects models (REM & FEM). The study also conducts redundancy and Hausman tests. Regarding determinants of PNG finance, the elasticity of PNG with respect to gross domestic product per capita growth rate, current account balance, trade openness, export and government final consumption expenditure are significant which suggests that the lower-income level countries, macroeconomic factors have influenced the magnitude of PNG finance in different ways to the panel of 20 countries.

Keywords: Debt Finance, Macroeconomics, Developing Countries, Random & Fixed Effects, Hausman Test.

JFL Classification: F24

1. Introduction

Long-term private non-guaranteed foreign currency loans are being received by almost all middle or emerging countries from different development agencies (OPIC, UNDP, DFID, USAID), banks (World Bank, IBRD, EBRD, ADB, EXIM BANK, etc.) and other syndicate sources. All private foreign currency loans are publicly non-guaranteed, and the amount of loans received by developing countries is surging dramatically compared to ODA and FDI. According to a *Financial Times* report, the total debt occupied by 2,871 big companies in emerging market and developing countries alone is $2.78 trillion (Wheatley, April 2016). The report also mentioned that 78 per cent of GDP for private sector debt is carried by the average of eight big emerging markets (EMs): Brazil, India, Indonesia, Mexico, Russia, South Africa, China and Turkey. Many EM countries' corporations and large firms have had foreign currency loans for a long time, but the use of debt fund is completely new for some countries like Bangladesh, Vietnam, Tanzania, Ghana, Kenya, the Philippines, and so on. According to World Bank data, almost all middle-income countries' large corporations to medium size firms use foreign currency loans. Large flow of PNG finance in developing countries tend to be associated with expansionary economic policies and can trigger procyclical behaviour. These linkages can turn into an ambiguous and noisy macroeconomic environment whereas PNG loans are becoming a concern in developing countries in recent years. If these loans start to default, it can

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create long-term uncertainty in macroeconomics and sustainable financial growth can harshly divert. The study covering the period from 1996 to 2015, makes an attempt to identify the macroeconomic determinants of long-term private PNG debt finance to a panel of twenty lower middle-income countries and consider PNG as a dependent variable and thirteen relevant macroeconomic factors based on relational frame theory (RFT) are the explanatory variables. The study will refer to long-term net private non-guaranteed foreign currency loans as a PNG in the rest of the study.

2. Literature Review

Long-term non-guaranteed loans to developing countries can finance investment and foster economic growth, as well as increase welfare by facilitating consumption smoothing. However, debt finance can influence excessive monetary and credit expansion, multiply vulnerabilities associated with currency mismatches and distort asset prices, Magud et al. (2012). Number of studies have been done on aggregate dollarization of credit in emerging and transition countries e.g. Luca and Petrova (2008) studied the aggregate share of foreign currency loans for 21 transition countries in Eastern Europe and the former Soviet Union between 1990 and 2003. They found that aggregate export activity, interest rate differentials, domestic monetary volatility and deposit dollarization are positively correlated with foreign currency loans, whereas volatility of exchange rates is negatively related to the dollarization. Their finding also suggests that dollarization is lower in more developed foreign exchange markets and that credit dollarization is affected by prudential regulations that stipulate tighter open positions limit.

Basso, Clavo-Gonzalez and Jurgilas (2007) studied the aggregate credit dollarization for 24 transitions countries for the period of 2000 to 2006. They found that within these countries where banks that have a greater share of foreign funding offer a higher level of foreign currency loans to their clients. Arteta (2005) studied with a large sample in low-income countries and Barajas and Morales (2003) in Latin American countries confirm that higher exchange rate volatility reduces aggregate credit dollarization. Firm- level studies focus on financial statement of large industries using foreign currency denominated loans. Large US corporations match loans based on borrower sales (Kedia and Mozumdar, 2003). Keloharju and Niskanen (2001) studied large Finnish corporations and found that they also match loans and foreign currency. According to their suggestions, loan denominations are derived by interest rate differentials across countries. To reduce risk from any level of economic exposure, most export-oriented large firms in Mexico use natural hedge funds (Martinez and Werner, 2002; Gelos, 2003). For large Chilean firms, data studied by Benavente et al. (2003), and Cowan, et al. found similar results. Allayannis et al. (2003) found interest rate differentials as well as asset types explain the use of foreign currency in large East Asian corporations. Cowan (2006) studied the debt structure of 500 large corporations in a half dozen Latin American countries and found the same result.

Sebastian and Igal (2006) studied strict dollarization and economic performance and found that the probability of being a dollarized country depends on regional, geographical, political and structural variables. Their finding also suggests that GDP per capita growth has not been statistically different in dollarized and non-dollarized countries, but volatility is higher in dollarized economy than non-dollarized economy.

The studies done by Engel and Rose (2002), Eichengreen and Haussmann (1999) and Edwards (2001) found that countries with a local currency have had a higher rate of inflation than that of countries with dollarized dominated foreign currency. Foreign currency loans affect

real economic variables like employment, total investment, growth and volatility. Supporters of dollarization and its performance on economic growth have two points of view. First, dollarization will put pressure on banks to lower interest rates and, as a result, investment will go up and producing faster growth Dornbusch (2001). Second, by eliminating currency risk, a common currency will motivate international trade, producing faster growth. This trade philosophy is supported by Rose (2000) and Rose and Wincoop (2001), among others. However, there is an opposite and strong argument about dollarization and its impact on the economy. Parrado and Velasco (2002) and Broda (2001) found that dollarization creates a macroeconomic volatility and may even lead to lower economic growth.

The theoretical and empirical study shows that foreign currency loans, or dollarized finance, have immense effects on macroeconomics and overall economic performance. According to the theoretical point of view, many factors like risk management, low cost debt interest rates or the export of money that act as an incentive for a borrower. But among these, interest rate differential is most influential and motivational element for borrowers to take foreign currency loans from abroad. However, lenders look at different perspectives and when they see macroeconomic volatility and low exchange rate fluctuations, they are encouraged to offer foreign currency funds to developing markets borrowers. Surprisingly, it may impact the balance sheets of households, firms and countries equally and strongly. Consequently, it may make the whole economy debt ridden if it affects borrowing in a negative way. Still many empirical articles support the notion that cheap foreign currency loans have a great positive impact on total investment, the lowering of interest rates and the overall development of financial transparency. This study contributes to further literature by looking empirically at dollarized countries' PNG foreign currency loans and the loans' dynamic relationship with macroeconomic determinants in lower-middle-income economies.

3. Data and Methods

To explore the hypothesis, we make use of panel data including as many as forty countries over the period of 1996 to 2015. The empirical relationship between PNG and macroeconomic determinants is developed from Barro et.al (1998) is written as follows:

$$
\begin{aligned}
PNG_{\text{GDP}_{i,t}} = {} & \beta_0 + \beta_1 \text{lending interest rate}_{i,t} + \beta_2 \text{Inflation}_{i,t} + \beta_3 \text{Exchange rate}_{i,t} \\
& + \beta_4 \text{Population growth rate}_{i,t} + \beta_5 \text{HFCE}_{i,t\_}\text{GDP}_{i,t} + \beta_6 \text{GFCE}_{i,t\_}\text{GDP}_{i,t} \\
& + \beta_7 \text{Bank Deposits}_{i,t\_}\text{GDP}_{i,t} + \beta_8 \text{Total Investment}_{i,t\_}\text{GDP}_{i,t} \\
& + \beta_9 \text{Unemployment rate}_{i,t} + \beta_{10} \text{GDP per capita}_{i,t\_}\text{GDP}_{i,t} \\
& + \beta_{11} \text{Current Account Balance}_{i,t\_}\text{GDP}_{i,t} + \beta_{12} \text{Trade openness}_{i,t\_}\text{GDP}_{i,t} \\
& + \beta_{13} \text{Exports}_{i,t\_}\text{GDP}_{i,t} + \beta_{14} \text{Imports}_{i,t\_}\text{GDP}_{i,t} + \vartheta_{i,t} \\
& + \epsilon_{i,t} \dots\dots\dots\dots\dots\dots\dots\dots\dots (1)
\end{aligned}
$$

Panel Data Structure: The panel dataset has both a time series and a cross sectional dimension, where all cross-section units are observed during the entire time series period. The expression is $X_{it}, i = 1, \dots, N, t = 1, \dots, T$. *T is usually small*. Because of data availability and continuity, the study will primarily focus on the time-period from 1996 to 2015 for both selected case analyses. The standard static panel model with $i = 1, \dots, N, t = 1, \dots, T$. *is*

$$
y_{it} = \beta_0 + x'_{it}\beta + \epsilon_{it} \dots\dots\dots (a)
$$

x'_{it} is a K dimensional vector of independent variables ,

without a const. term, β_0 indicates the intercept , independent of i and t;

β, a $(k \times 1)$ vector , the slope,

independent of i and t, ; $\in_{it}$ is the error term , varies over i and t

Individual characteristics may be included with this model and equations can become

$$y_{it} = \beta_0 + x'_{it}\beta_1 + z'_{it}\beta_2 + \in_{it} \dots\dots\dots\dots (b)$$

In panel dataset analysis, there can be two types of problems: endogeneity and auto correlations in the errors. The individual unobserved heterogeneity problem can be solved where zi variables are not available. This problem may be captured by α_i and decomposing $\in_{it}$ into $\in_{it} = \alpha_i + U_{it}$; U_{it} has a mean zero is homoscedastic and not serially correlated. In addition, the panel dataset can be distinguished into two different models: fixed effects and random effects models.

In a fixed effects model, α_i are individual intercepts and $y_{it} = \alpha_i + X'_{it}\beta + U_{it}$ for given N. No overall intercept is included in the model and under FE, there does not need to be any consistency because the individual intercept and X'_{it} are uncorrelated. It must hold that $E[X_{it}U_{it}] = 0$ and there is N-1 additional parameter for capturing heterogeneity.

In the random effects model:

$$\alpha_i \sim iid(0, \sigma^2{}_\alpha) \ y_{it} = \beta_0 + X'_{it}\beta + \alpha_i + U_{it} , U_{it} \sim iid(0, \sigma^2{}_u) \dots\dots\dots\dots. (c).$$

The value of α_i is specific for an individual i. The alpha of different individuals is independent and has a mean of zero and their distribution is also assumed to be not far away from normality. The overall mean is captured in β_0; and α_i is homoscedastic across individuals and time invariant. Random effects has one additional parameter: $\sigma^2{}_\alpha$; $\sigma^2{}_\alpha$ which contributes to $corr(\in_{i,s}, \in_{i,t})$ and α_i determines both $\in_{i,s}$ and $\in_{i,t}$.

A random effects model is consistent as long as $E[X_{it} \in_{it}] = E[X_{it}(\alpha_i + U_{it})] = 0$, i.e. X_{it} are uncorrelated with α_i and U_{it}, the independent variables are exogenous and the estimations are consistent. STATA software is used for panel data analysis. Data are collected from World Bank development indicators and details data sources are annexed in appendix.

4. Results and Discussions
The study pursues three different tasks in this section. First, study identifies the appropriate model. Second, verified the model with appropriate tests. Finally, study describes the results following econometric methodology. The basic regression results of pooled OLS, random and fixed effects models are presented in Table1;1.1A, 1.1B and 1.1C, respectively. According to the pooled OLS, fixed and random effects regressions, the results are significant in explaining the relationship between the dependent and explanatory variables. The three estimation approaches explain the considerable proportion of variation in the dependent variable with an adjusted R square value of around 20 per cent. The Hausman hypothesis test result shows that (1.1C), the fixed effects model is appropriate to explain the result, rather than random effects. Moreover, the Breusch Pagan Lagrangian tests (Appendix- 4) identifies

whether random effects or pooled OLS regression is appropriate to explain the results but Pesaran CD tests confirm that FE model is much more appropriate than random effects to explain the result. The pooled OLS cannot reduce country specific effects whereas FE does. The test result and significance levels confirm that FE regression is appropriate to explain the result, rather than pooled OLS or random effects.

The result shows that the p-value is significant at 1 per cent level for few independent variables as follows: GDP per capita growth rate (0.000), current account balance (0.000) and imports (0.000). The coefficient values of these significant variables are: GDP per capita growth rate (0.210), current account balance (-0.227) and imports (-0.065). The coefficient value implies that 1 per cent increase in GDP per capita results in 21 per cent increase in PNG finance. The findings are opposite of Sebastian and Igal (2006) where they mentioned that GDP per capita growth rate has no effects in economy but result shows GDP per capita work as a determinants of PNG finance. Meantime, 1 per cent decrease in CAB and imports results 22.7 per cent and 6.5 per cent decrease in PNG respectively. Moreover, in five per cent significance level, GFCE and exchange rate works as a significant determinant. The rest of the selected variables p values are insignificant and contrast the study hypothesis. The study checked correlations among exports, imports and trade openness and finds a strong relationship among them.

To remove or control the correlation biasedness in the final results, the study separates them from one another and tests the rest of the variables with dependent variable. At first, I exclude exports and imports from the control variable list and test the rest of the selected variables with PNG. The result (1.1C) reveals that the significance levels remain same. Secondly, the study excludes trade openness and export from the control variables list and tests the rest of the variables with PNG. The result (1.1D) shows that the significance level changes for imports only (-0.065) and rest remains same as 1.1C. Finally, I exclude trade openness and imports from the control variables list and test the rest of the variables with PNG. The result (1.1E) shows that the significance levels for all variables are almost the same as 1.1C.

According to the correlation and separate FE regression results, PNG finance has a significant relationship with few selected independent variables. The result shows that per unit increase in GDP per capita has a significant and strong positive relationship with PNG (20.1 per cent). On the other hand, per unit current account deficit has a significant and strong negative association with PNG finance (decline 22.8 per cent). The findings suggest that GDP per capita largely determine the flow of PNG finance as well as consistently increase with GFCE and exchange rate appreciation.

The studies done by Engel and Rose (2002), Eichengreen and Haussmann (1999) and Edwards (2001) found that countries with a local currency have had a higher rate of inflation than that of countries with dollarized dominated foreign currency. But, the study has not found any significant relationship inflation and PNG finance though exchange rate has very small effect to determine the PNG finance flow. Allayannis et al. (2003) found interest rate differentials mostly encourage the firms to borrow the PNG finance but the findings are inconstance with their result. In contrast, current account deficits greatly discourage the flow of PNG and following the reduction of imports rate in lower-middle-income countries reduces the flow of PNG finance. In terms of market speculation, export-oriented firms are benefitted from this foreign currency loans.

Table 1.1: Result of PNG finance for all selected lower-middle-income countries from 1996 to 2015

Independent Variables	(1.1A) Pooled OLS	(1.1B) Random Effect	(1.1C) Fixed effect	(1.1D*) Fixed Effects	(1.1E*) Fixed effects
	PNG	PNG	PNG	PNG	PNG
Lending Interest rate	-0.01739	-0.00793	0.00724	0.00383	0.01022
	(0.02974)	(0.03173)	(0.03601)	(0.03563)	(0.03600)
Inflation	-0.01183	-0.01468	-0.00659	-0.00486	-0.01260
	(0.02268)	(0.02339)	(0.02569)	(0.02504)	(0.02566)
Exchange rate	-0.00001	0.00004	0.00035**	0.00043**	0.00029
	(0.00007)	(0.00008)	(0.00019)	(0.00019)	(0.00019)
GDPPGR	0.20924***	0.20693***	0.21054***	0.21013***	0.20602***
	(0.06058)	(0.05996)	(0.05949)	(0.05891)	(0.05972)
HFCE	-0.06843***	-0.04242**	0.01099	0.00925	0.02953
	(0.02209)	(0.02356)	(0.03032)	(0.02812)	(0.03320)
GFCE	-0.02531	0.02579	0.18050	0.14817	0.19474**
	(0.06756)	(0.07473)	(0.11197)	(0.11135)	(0.11227)
Trade Openness	0.01966***	0.01361**	-0.00796		
	(0.00710)	(0.00817)	(0.01443)		
Bank Deposit	0.01755	0.01686	0.01001	0.02528	0.00022
	(0.01387)	(0.01623)	(0.03295)	(0.03245)	(0.03280)
Current Account Balance	-0.24806***	-0.24275***	-0.22162***	-0.21471***	-0.22209***
	(0.03200)	(0.03211)	(0.03326)	(0.03304)	(0.03324)
Unemployment	-0.12109**	-0.10340	0.18391	0.21330	0.15840
	(0.06044)	(0.07245)	(0.15377)	(0.15164)	(0.15359)
Total Investment	-0.18416***	-0.15749***	-0.02988	-0.00588	-0.02399
	(0.03220)	(0.03626)	(0.05489)	(0.05510)	(0.05565)
Imports				-0.06580***	
				(0.02405)	
Exports					0.01827
					(0.02561)
Constant	8.28299***	5.60457**	-1.94875	-1.02926	-4.33188
	(2.56970)	(2.80270)	(3.94813)	(3.65680)	(4.22016)
Observations	400	400	400	400	400
R-squared	0.19172		0.17821	0.19392	0.17867
Number of ID		20	20	20	20

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
1.1C*= Selected Model to Explain the Result
1.1D*-1.1E*= After Correlations tests of Trade Openness, Export and Import

In summary, these results suggest that there has significance influence to attract the PNG finance by GDP per capita growth rate and government final consumption expenditure (GFCE) whereas current account balance and imports rate are playing significant indicators to detract the PNG finance.

5. Conclusion and Recommendations

This paper contributes to the current debate on macroeconomic determinants of debt finance in developing countries. This study focuses on number of macroeconomic factors which stimulate debt finance to these countries. Our empirical study aimed at understandings the macroeconomic determinants of private long-term non-guaranteed debt finance in developing countries using balanced panel data dynamic regressions. Results reveal that GDP per capita growth rate has significance influence to attract the private finance towards the lower middle-income countries which is opposite the findings of Sebastian and Igal (2006). However, balance sheet deficit has significant negative impact to reduce the private debt flow which is consistent with the speculations. In terms of theory, high interest rate and fluctuation of inflation motivate the lender towards the developing countries to lend debt fund, but study results do not reflect these factors are real determinants.

In contrast, the fact that we do not find convincing evidence that the lending interest rate, inflation, HFCE, bank deposits, export, total investments are work as a determinant for debt finance. Otherwise, country specific governments spending, imports level and currency appreciations are working as major determinants. According to Allayannis et al. (2003) firm level credit performance, capital structure, export orientated business has priority to get involve in foreign currency loans in developing countries in general. But, is this homogenous distribution or firm specific whenever only few macroeconomic determinants are pull factors? Finally, while our analysis focuses on developing market, number of financial events related to debt finance are happening developed countries where macroeconomic determinants are working as stimulating agents. The study in different continents, income base and firms level integration within and between can identify the pull factors for systematic resolve the problem.

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7. Appendices

Appendix 1: Lower Middle-Income Countries (20)

Bangladesh, India, Pakistan, Sri-Lanka, Bhutan, The Philippine, Indonesia, Vietnam, Nigeria, Tanzania, Kenya, Tajikistan, Egypt, Sudan, Morocco, Paraguay, Bolivia, Cameroon, Ghana and Papua New Guinea.

Appendix 2: Data Source

Dependent Variable FDI (% of GDP) / Independent	Data Source	Observation Time
	World Bank	1980-2015
Lending Interest rate (Average Commercial Lending rate)	Central Bank and IBRD	1980 to 2015
Inflation (CPI=Consumer Price Index)	IMF and World Bank	Same
Exchange rate (Yearly Averaged against $)	World Bank online data	Same
GDPPGR (Annual %)	World Bank	Same
HHFC (% GDP)	World Bank	Same
GFCE (%GDP)	World Bank	Same
Trade Openness (%GDP)	World Bank	Same
Bank Deposit (% of GDP; Demand, time and savings deposits)	World Bank	Same
Current Account Balance (% GDP)	World Bank	Same
Unemployment (% total labor force)	World Bank	Same
Total Investment (% of GDP)	World Bank	Same
Imports (% GDP)	World Bank	Same
Exports (% GDP)	World Bank	Same

Appendix 3: Hausman Test

```
. hausman fe re

                 ——— Coefficients ———
              |    (b)          (B)           (b-B)       sqrt(diag(V_b-V_B))
              |    fe           re          Difference          S.E.
--------------+----------------------------------------------------------------
       lnrate |  .0077655      .0152068      -.0074413          .021019
    Inflation | -.0098825     -.0219716       .012089           .0132249
       Exrate |  .0003859     -8.34e-06       .0003943          .0001775
        PopGR | -.9175977     -.4286729      -.4889248          .5324817
       GDPPGR |  .1580811      .1396886       .0183925          .0153742
         HFCE |  .0972255      .1274801      -.0302546          .0150442
         GFCE |  .2055629      .1690414       .0365214          .0870777
    TradeOpen | -.1480142     -.1693493       .021335           .028038
  BankDeposit |  .0183344      .0016595       .0166748          .0295387
          CAB | -.2090203     -.2274188       .0183985          .0125245
 Unemployment |  .1922994      .0031398       .1891596          .1380965
 TotalInves~t |  .1090729      .0693998       .0396732          .0436927
      Imports | -.0511709     -.0422424      -.0089285          .0053663
      Exports |  .2922548      .401309       -.1090542          .0513701
--------------+----------------------------------------------------------------

                   b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

     Test:  Ho:   difference in coefficients not systematic

               chi2(14) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                        =        35.52
               Prob>chi2 =      0.0012
               (V_b-V_B is not positive definite)
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Appendix 4: Breusch and Pagan Lagranigian multiplier test for random effects.

```
. quietly xtreg $y1list $x1list, re

. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        NPF[ID,t] = Xb + u[ID] + e[ID,t]

        Estimated results:
                            Var       sd = sqrt(Var)
                     _____

                 NPF |  16.07225         4.009021
                   e |  11.29758         3.361188
                   u |         0                0

        Test:   Var(u) = 0
                          chibar2(01) =     0.00
                        Prob > chibar2 =   1.0000
```

Appendix 5: Pesaran's CD Test, Wooldrige serial correlation test and Panel cointegration tests:

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Pesaran's test of cross sectional independence =    -1.259, Pr = 0.2079

Average absolute value of the off-diagonal elements =     0.235

. xtserial $f1list $a1list

Wooldridge test for autocorrelation in panel data
H0: no first-order autocorrelation
    F(  1,      19) =       9.844
          Prob > F =       0.0054

. xtdolshm $f1list $a1list


DOLS Hom. Panel data Coint. Estimation results  Number of obs     =       320
Group variable: ID                              Number of groups  =        20
Wald chi2(12) =    103.33                        Obs per group: min =        20
Prob > chi2   =     0.000                                        avg =        20
                                                                max =        20
                                                R-squared         =    0.3986
                                                Adj R-squared     =    0.1315
```