Griffith UNIVERSITY

Griffith Business School

DISCUSSION PAPER SERIES

Economics and business statistics

Revisiting the debt-growth nexus: Empirical evidence from Sri Lanka

Panagodage Janaka Sampath Fernando Hasthimuni Nadeeka De Silva , Athula Naranpanawa, Chandika Gunasinghe

No. 2017-06

Series editors Dr Nicholas Rohde and Dr Athula Naranpanawa **ISSN** 1837-7750

Department of Accounting, Finance and Economics

Revisiting the debt-growth nexus: Empirical evidence from Sri Lanka[1]

Panagodage Janaka Sampath Fernando[2], Hasthimuni Nadeeka De Silva [3], Athula Naranpanawa[4], Chandika Gunasinghe [5]

Abstract

In this paper we analyze the impact of public debt on economic growth in Sri Lanka with special emphasis on the quality of borrowing and uses of borrowing. Although ample evidence documents on growth-debt nexuses, the focus on quality of borrowing and uses of borrowing has been largely ignored. We employed a relatively new specification, Auto Regressive Distributed Lag (ARDL) model to analyze the impact of debt on economic growth using data from 1960 to 2015. Our findings suggest that the quantity of debt stock as well as quality of the borrowings determine the impact of debt on economic growth. Low quality of borrowing (i.e. heavy borrowing) from non-concessional sources may be the key factor that determines the negative impact of debt on economic growth in Sri Lanka.

Key words: Economic Growth, Development

JEL Codes: 040

[1] The authors wish to thank the sponsor from Department of Foreign Affairs and Trade (DFAT), Australian Commonwealth Government, which supported the Sri Lankan Authors with an Australian Awards Fellowship to be trained at Griffith University, and this paper is an outcome of the training.

[2] Senior Lecturer in Business Economics, Department of Business Economics, Faculty of Management Studies and Commerce, University of Sri Jayewardenepura, Sri Lanka, pjsampath@sjp.ac.lk

[3] Lecturer in Economics, Department of Economics, Faculty of Humanities and Social Sciences, University of Ruhuna, Sri Lanka

[4] Associate Professor in Economics, Griffith Business School, Griffith University, Australia

[5] Phd candidate at Griffith Business School, Griffith University, Australia

1. Introduction

In the aftermath of recent debt crisis in Greece, the discussion of public debt and its potential impact on economic growth is has become of timely importance (Daud & Podivinsky, 2014). Addressing various dimensions of the debt-growth nexus, the literature provides ample evidence on the impact of rapid growth of debt on economic growth, debt overhang issues, debt servicing issues, threshold effect of debt, in addition to discussions around internal debt vs. external debt (Kaufman, 1986; Presbitero, 2005; Obstfeld, Shambaugh & Taylor, 2010).

However, revisiting the growth-debt nexus is warranted for two main reasons. First, the existing literature is not conclusive on the relationship between growth and debt (Pescatari & Panizza, 2014). Proponents argue that there is a positive impact of public debt on economic growth and recommend channelling external debt to the real sectors of the economy to enhance its impact on growth (Atique & Malik, 2012; Suleiman & Azeez, 2012; Hassan & Mamman, 2013). In contrast, opponents argue that the relationship between external debt and economic growth is negative (Reinhart & Rogoff, 2010; Kuman & Woo, 2010; Checherita & Rother, 2010; Cechetti et al., 2011). To illustrate, Alfredo & Francisco (2004) found that lower level of external debt were associated with higher growth rates in some Latin American and Caribbean countries.

Second, in a recent study, Pescatari and Panizza (2014) highlighted that debt trajectory is more important than level of debt in assessing the impact of debt on growth. Similarly, others have argued that efficiency of the use of debt more greatly affects economic growth than level of accumulated debt (Pattillo et al., 2002 as cited in Presbitero & Ricerca, 2005, 8). Moreover, these studies postulate that quality of the borrowing and its uses should be considered when assessing the growth-debt nexus. Nonetheless, most existing studies have employed total debt as a percentage of Gross Domestic Product (GDP) to explain the debt-growth nexus.

1.1. Objectives

To address these identified discrepancies, the present study intends to analyse the impact of public debt on economic growth placing a special emphasis on quality of the borrowing and uses of borrowing. We analyse the above relationship in the context of Sri Lanka and the specific objectives of this paper are three fold:

i. To analyse the impact of foreign debt on economic growth
ii. To analyse the impact of project loans on economic growth

iii. To analyse the impact commercial borrowing on economic growth

1.2. [Is] Sri Lanka in a debt crisis [?]

After three decades of civil war, Sri Lankan government has introduced a large number of mega projects intended to expedite the development process by leveraging internal and external debt. In 2015, Sri Lankan total government debt was LKR 8.5 trillion, which was 76% of the GDP (CBSL, 2015). Figure 1 exhibits the public debt as a percentage of GDP in Sri Lanka from 1950 to 2015. The figure highlights that the total debt as a percentage of GDP has comparatively, not been at an alarming level in recent years given it's decline from 106% in 2002 to 71% in 2014 before increasing to 76% in 2015. \. If we consider the situation in a "debt-torn" economy, for example, Greece, the outstanding government debt as a percentage of GDP has been above 100% since 1994 with this figure reaching 182% in the year 2013 (WDI, 2016). In the US, the largest economy in the world, this number has continued to be over 90% since 2011 with it peaking at 98% in the year 2014 (WDI, 2016). Therefore, compared not only to its past but also to countries like Greece and US, Sri Lanka is in a better situation in terms of total debt as a percentage of GDP.

Quality of the public borrowing in Sri Lanka has deteriorated over the last decade. Conversely, borrowings for non-project loans and borrowings from commercial sources have increased rapidly. Figure 2 shows government foreign borrowing by purpose, project loans and non-project loans, from 2001 to 2015. Accordingly, the share of the non-project loan from foreign sources increased rapidly from 13% in 2008 to 39% in 2015. In a similar vein, commercial borrowings, which are a special category of non-concessional loans, increased from 11% of total external debt in 2008 to 37% in 2015 as exhibited in Figure 3. As result, Sri Lanka is not in a healthy situation in terms of quality of public debt due to two reasons. First, borrowing for non-project loans does not generate an income source which can be used to repay the loans when they are due. Second, commercial borrowings generate a heavy burden on the debt servicing due to strict repayment conditions including high interest components and short repayment durations.

If one were to consider debt as a percentage of GDP as the yardstick of analysing the impact of debt on economic growth in Sri Lanka, it is not in a debt crisis. However, increasing access to commercial borrowings and borrowing for non-project loans indicate

that the country is not in a favourable situation. Therefore, Sri Lanka is a good case study to analyse the new dimension of the growth-debt nexus.

1.3. Significance of the study

This research paper contributes to the literature in several ways. In current studies, the debate of the growth-debt nexus has focused on quantity of the debt to assess the impact of debt on economic growth. In this study, we argue that the quantity of debt stock as well as quality of the borrowings determine the impact of debt on economic growth. Second, we employed a relatively new specification, Auto Regressive Distributed Lag (ARDL) model to analyse the impact of debt on growth. Third, in the context of Sri Lanka, the relationship between economic growth and public debt has not been well addressed. Further, this is the first study that attempts to employ an ARDL model to analyse the debt-growth nexus in the context of Sri Lanka.

The rest of this paper is structured as follows. Section 2 presents the current discussion of the growth-debt nexus, and model specification and the methodology is presented in Section 3. Empirical evidences derived using a liner ARDL model is next presented in Section 4 and finally, Section 5 presents the concluding remarks and policy recommendations.

2. Growth-Debt Nexus: Literature Review

Empirical literature exploring the relationship between debt and economic growth is typically limited with specific directions. Most studies on this topic explain the impact of external debt and debt restructuring on growth in developing countries, focusing on analyses across developed countries, particularly in the euro area (Westphal & Rother, 2012; Dritsaki, 2013). Furthermore, a a large number of studies have focused on the relationship between level of debt and economic growth, debt overhang issue, debt servicing issues, threshold effect of debt, and discussion on internal debt vs. external debt. (Kaufman, 1986; Presbitero, 2005; Obstfeld, Shambaugh & Taylor, 2010)

Patillo, Poirson and Ricci (2004) conducted research around the relationship between debt and growth considering the question of "how debt can affect that particular country's economic growth". The researchers found that lower debt levels have a positive effect on economic growth and there exists a threshold level after which an additional percent of debt reduces economic growth. They also talk to future research and suggest the importance of

investigating more deeply the quality of the policies in the countries and the importance of the debt flows**.**

A more recent contribution by Reinhart and Rogoff (2010) aimed to identify the relationship between public debt and economic growth in developed and developing countries. They found that a public debt of up to 90 percent of the GDP does not have a strong effect on growth, but if debt is to exceed this threshold level, GDP growth reduces by 1 percent. Furthermore, the researchers identified the impact of inflation and exchange rate on this relationship. According to their findings, inflation level is significantly higher in emerging economies when the public debt exceeds 90 percent of GDP. In addition, it was noted that because developing economies usually have debt in foreign currency, the economic growth in these countries can fall by 2 percent if the gross external debt exceeds the threshold level of 60 percent of GDP.

In other research conducted by Checherita and Rother in 2010, the relationship between government debt-to-GDP ratio and per-capita GDP growth rate was investigated. For this research, they used 12-euro area countries as a sample and covered the period from 1970 to 2011. In their results, they found a standing non-linear impact of public debt on per-capita GDP growth rate starting in 1970. It unveils a concave (inverted U-shape) relationship between public debt and the economic growth rate with the debt turning point at about 90-100% of GDP. The limitation is that they studied only the level of relationship between growth and debt.

Shifting to research that considers economic growth and external debt servicing, a study by Wijewardena, Dollery and Pathberiya (2005) investigated both the long run and short run relationship between external debt and gross national production in Sri Lanka from 1952 to 2002. One of major findings was that external debt service payments are found to extend a negative, but insignificant effect on GNP in the long run. In addition, they did not build up a significant short run relationship between debt service payment and GNP suggesting that external debt is not the only problem of Sri Lankan economic growth over the last fifty years.

It is evident from the above review that most current research has limited their analyses to consider only the level of debt and economic growth. There is also a mixed consensus around these findings with some researchers presenting a positive relationship between debt and growth, while others suggest a negative relationship between these two factors. In light of

this, we want to revisit this relationship, because we cannot identify any existing research that investigates the quality the borrowing on the relationship between debt and economic growth.

3. Methodology

In this study, we employed a linear ARDL model as the main quantitative tool to assess the relationship between growth and debt. The ARDL modelling has many advantages when employed to analyzs the long run equilibrium of economic variables (Murthy and Okunade, 2016, 68). These advantages help to overcome some of the fundamental econometric issues inherent to the growth-debt analysis. First, endogeneity needs to be addressed when assessing the relationship between growth and debt. Although it is assumed that debt affects economic growth, in contrast, economic growth also may also affect the amount of borrowing of a country in situations of economic crisis (Presbitero & Ricerca, 2005; Easterly, 2001 as cited in Presbitero, 2008, 3). As Murthy and Okunade (2016, 68) argue, the "endogeneity problem does not arise in the ARDL modelling when estimating both the short-run and long-run coefficients simultaneously and with lagged dependent and explanatory variables."

Second, the traditional cointegration methods of scholars such as Johansen and Juselius require all the variables to be order of I(1). The ARDL bound testing approach is capable of handling variables regardless of whether they are stationary, I(0), non-stationary, I(1), mutually integrated, or a combination of I(0) and I(1) (Pasaran et al., 2001). However, if the variables in the model are identified as in the order of I(2), the ARDL procedure does not work (Murthy and Okunade (2016). Third, the coefficients estimated using ARDL approach are highly consistent irrespective of sample size and for this reason the approach is recommended for both small and finite sample data (Bal & Rath, 2014). The error-correction modelling through the ARDL cointegration procedure facilitates both the short run and the long run causality (Murthy and Okunade, 2016).

Bahmani et al. (2016) employed an extended version of ARDL approach of Pesaran (2001) to study the J-curve hypothesis in international trade by combining short run and long run variables into the same equation. Following a similar approach, we consider the following general empirical model to estimate the impact of debt on economic growth, which is an extended version of the neoclassical growth model.

$$\Delta lnY_t = \alpha + \sum_{j=1}^{n1} \beta_j \, \Delta lnY_{t-j} + \sum_{j=0}^{n2} \gamma_j \, \Delta lnFDebt_{t-j} + \sum_{j=0}^{n3} \delta_j \, \Delta X_{t-j} + \theta_1 lnY_{t-1} + \theta_2 lnFDebt_{t-1} + \theta_3 X_{t-1} + \varepsilon_t$$

Where,

Y_t represents the per capita GDP in year t, Y_{t-j} represents per capita GDP in year t-j (j=1~8), and X_{t-j} represents a vector of other exogenous variables. The β_j γ_j δ_j are the short run parameters to be estimated and $\theta_1\theta_2\theta_3$ are the long run parameters to be estimated. Finally, ε_t is the normally distributed error term of the model.

Following data availability and empirical literature, we considered several key determinants as other exogenous variables, X_t. This comprises population growth (Afonsu & Jalles, 2013; Checherita-Westphal & Rother, 2012; Panizza & Presbitero, 2014), economic openness (Afonsu & Jalles, 2013; Panizza & Presbitero, 2014; Akram, 2013), government expenditure as a share of real GDP, inflation (Panizza & Presbitero, 2014; Akram, 2013, Afonso & Jalles, 2013), and gross fixed capital formation (Checherita-Westphal & Rother, 2012; Akram, 2013, Afonsu & Jalles, 2013). The impact of government expenditure was analysed with lag variables and other variables were considered as exogenous variable.

We employed three forms of the $FDebt_t$ variable as expressed in the following three models to analyse the impact of debt on economic growth.

Model 1: $FDebt_{t-j} = \ln(\frac{Foreign\ Debt}{GDP})_{t-j}, j = 0\sim8$

Model 2: $FDebt_{t-j} = \ln(\frac{Project\ loan}{GDP})_{t-j} + \ln(\frac{Non\ Project\ loan}{GDP})_t, j = 0\sim8$

Model 3: $FDebt_{t-j} = \ln(\frac{Non\ Consessional\ loan}{GDP})_{t-j} + \ln(\frac{Consessional\ loan}{GDP})_t, j = 0\sim8$

In Model 1, we re-assessed the growth-debt nexus using quantity of foreign debt as a share of GDP whereas in Model 2 and Model 3, the impact of quality of the foreign debt on economic growth have been analysed. Total foreign debt can be classified as project loans and non-project loans based on the purpose of borrowing. We assumed that the project loan has a continuous impact once invested in a project whereas non-project loans should not have such effects. Therefore, in Model 2, we considered project loans with lag values and non-project loans without lag values. As total foreign debt can also be classified as concessionary loan and non-concessionary loan based on the sources of borrowings, in Model 3, we consider non-concessionary loans with lag values and concessionary loans without lag values.

In this study, we developed three hypotheses to be tested. Following the debt overhang effect explained by Krugman (1998), we presume in the first hypothesis that foreign debt has a negative impact on economic growth. The second and third hypotheses address the quality aspect of the debt problem. We assume that depending on the purpose of borrowing, impact of debt on growth is not unique. Borrowings that do not translate into investments and thereby do not generate a series of income in the future have a negative effect on growth. More precisely, in the second hypothesis we assume that the non-project loan has a negative impact on economic growth. On contrary, project loans should not have such a negative effect in the long run. Further, we assume that the sources of borrowing significantly determine the growth effect of debt. If borrowed from non-concessional sources, heavy burden on debt servicing should affect the growth negatively. Therefore, in the third hypothesis, we assume that non-concessional loan has a negative impact on economic growth whereas concessional loan should not have such a negative effect.

We employed annual data from 1960 to 2015 to estimate Model 1 and Model 2 whereas Model 3 was estimated using annual data from 1970 to 2014. Secondary data used in this study was collected from the Central Bank Annual Reports published by the Central Bank of Sri Lanka and World Development Indicators published by the World Bank. Specifically, total debt, foreign debt, project loans, non-project loans, and government expenditure, were collected from Central Bank Annual Reports (various issues) and per capita GDP, exports, imports, population growth, inflation, gross fixed capital formation, concessional loans, and non-concessional loans, were collected from World Development Indicators (2016).

4. Findings and Analysis

As a prerequisite of the ARDL approach, we need to make sure that variables used in the models are a combination of I(0) and I(1). For this reason, we performed the traditional Augmented Dickey-Fuller (ADF) test with a trend and intercept to check the stationary measure of the variables. Results of the ADF test are presented in Table 1 together with the definitions of variables and descriptive statistics. However, as Perron (1989) points out, the traditional unit root tests such as ADF test do not account for the presence of structural breaks in the data generating process.

Table 1: Summary Statistics, Stationary Tests and Break Dates of the Variables Used in

Models

Variable	Abbreviation	Summary Statistics					Stationary Tests		Break Dates	
		Obs.	Mean	SD	Min	Max	ADF test	Breakpoint Unit Root Test	Level data	Differenced data
Log per capita GDP	LGDP_PC	56	11.84	0.55	11.06	12.93	I(1)***	I(1)***	2001**	2010**
Log (Foreign Debt/GDP)	L_FD_GDP	56	-1.36	0.78	-3.13	-0.48	I(1)***	I(0)**	1985***	
Log (Project Loan/GDP)	LPLOAN_GDP	56	-1.94	1.07	-4.11	-0.80	I(1)***	I(1)**	1982*	1989
Log (Non-project Loan / GDP)	L_NPLOAN_GDP	56	-2.50	0.72	-4.12	-1.45	I(1)***	I(1)***	2014	1996
Log (Concessional Loan/ DGP)	L_CONSES_LOAN_GDP	45	-4.85	0.82	-6.55	-3.91	I(1)***	I(0)***	1986	
Log(Non-concessional Loan/DGP)	L_NON_CONSESLOAN_GDP	45	-1.09	0.49	-2.29	-0.50	I(1)***	I(1)**	1998	1995
Log (Tot. Government Expenditure/GDP)	L_TOT_EXP_GDP	56	-1.30	0.19	-1.76	-0.85	I(1)***	I(0)***	2002	1981
Population growth	POP_GRO	56	1.39	0.66	0.56	2.99	I(0)***	I(0)***	1995	
Inflation	INFLA	56	8.40	5.95	-1.54	26.15	I(0)***	I(0)***	1978**	
Gross Fixed Capital Formation/GDP	GFCF_GDP	56	0.22	0.05	0.13	0.31	I(1)***	I(0)***	1978***	
Log trade openness)	L_TRADE_OPEN	56	-0.47	0.20	-0.84	-0.12	I(1)***	I(1)***	1978***	

Based on this argument, traditional test results will lend themselves to less-reliable statistics on unit root thereby misleading hypothesis testing results. As a remedial measure, we employed Breakpoint Unit Root Test using EViews Version 9, which endogenously accounts for a single structural break in a data series. Results of the Breakpoint Unit Root Test are presented in Table 1. Based on the results of both the ADF test and Breakpoint Unit Root test, it is clear that all variables in the models are I(0) or I(1). Therefore, the pre-condition to employ ARDL model is satisfied.

As per the Table 1, several break dates were identified endogenously. It should be noted that the year 1978 is a common break year for INFLA, GFC_GDP and L_TRADE_OPEN variables. Interestingly, Sri Lanka introduced its open market economic policies in 1977 after several years of closed economic policies. Although the policy was implemented in 1977, its implications should have been sighted in the preceding year onward. Therefore, we considered the year 1978 as the break date common for all the models. The year 2001 was

also endogenously identified as a break date in Model 1. Sri Lanka experienced its largest negative growth rate, -1.55 (CBSL, 2015), in the year 2001. Therefore, endogenously identified structural breaks; 1978 and 2001, reflect the real structural changes in the macroeconomic environment in Sri Lanka. In addition, the exogenously identified year 1973 was included as a break date in all the three models for two main reasons. First, inflation rate in Sri Lanka rose by 83% from 1972 to 1973 due to the first oil crisis in 1973 (CBSL, 2015). Second, in 1973, Sri Lankan economy recorded a growth rate of 7.06% growth in 1973 after experiencing a negative growth rate, -0.41%, in the year 1972 (CBSL, 2015).

The long run cointegration models estimated using ARDL specifications are presented in Table 2. In each model, we focus on the debt related variables to test the validity of our hypothesis. Highly significant and negative coefficients of L_FD_GDP in Model 1 show a negative impact of foreign debt on economic growth in the long run. The finding is not a surprise as there is ample evidences on the negative impact of debt on economic growth (Reinhart & Rogoff, 2010; Kuman & Woo, 2010; Checherita & Rother, 2010; Cechetti et al., 2011). Therefore, we fail to reject the first hypothesis of the study (i.e. foreign debt has a negative impact on debt). However, we derived interesting results in relation to the quality aspects of the debt, which were tested in Model 2 and Model 3.

In Model 2, highly significant and negative coefficients of both project loans and non-project loans indicate that the purpose of borrowing does not affect the initial findings of Model 1. Although we hypothesised that project loan should not have a negative impact on economic growth in the loan run, the results shows the contrary. However, as we expected, non-project loan have a negative impact on economic growth as indicated by negative and highly significant coefficient of L_NONPL_GDP. If borrowed funds are invested in income generating projects, at minimum, those borrowings should not have a negative impact on economic growth. In Model 3, we have clear evidences to say that quality of borrowing affects the economic growth of a country. Highly significant and negative coefficients of L_NON_CONSESLOAN_GDP suggest that borrowing non-concessional loans has a negative impact on economic growth. In contrast, we do not have supporting evidence to claim that borrowing on concessional terms affects the economic growth negatively. Based on the above evidences, we fail to reject the third hypothesis of the study.

The exiting growth-debt literature has provided a large volume of evidences to support the idea that debt negatively affects growth. While we support the same argument, we do

highlight the importance of focusing on quality of the debt stock. As indicated in Model 3, negative impact may result from borrowing on unfavourable conditions such as high interest rates and sorter repayment periods.

For the other controlled variables, we derived the expected signs except for the trade openness variable in Model 2. Investment, which is represented by GFCF_GDP, has been the key determinant of the long run growth in Sri Lanka as indicated by highly significant and positive coefficient of the GFCF_GDP variables in all the three models.

Highly significant error-correction terms in all the three models in Table 3 indicate a cointegration relationship among variables in ARDL models. Based on Model 1, 57% correction of the disequilibria in GDP per capita growth is arising from the shocks in the current period, which shows a speedy adjustment. Similarly, in Model 2, speed of adjustment is relatively strong and it accounts for 75% correction of the disequilibria of the GDP per capita growth towards long run equilibrium after one year. A 42% correction of the disequilibria in GDP in Model 3 indicates a relatively slow adjustment of the disequilibria in GDP after one year.

Table 2: The Long run ARDL Cointegration Models

	Model 1	Model 2	Model 3
Selected model	ARDL(1, 1, 6)[a]	ARDL(1, 0, 6)[a]	ARDL(1, 1, 0)[a]
Included observations	50	50	44
Bound Test F Statistics for small samples[b] with two endogenous variables (k=2)	19.57***	15.56***	5.02*
Endogenous Regressors			

L_FD_GDP	-0.117***		
L_PLOAN_GDP		-0.066***	
L_NONPL_GDP		-0.028***	
L_NON_CONSESLOAN_GDP			-077***
L_CONSES_LOAN_GDP			-0.032
Exogenous Regressors			
L_TOT_EXP_GDP	-0.141*	-0.102	-0.138***
POP_GRO	0.044**	0.057**	0.022
INFLA	-0.0001	-0.002**	-00002
GFCF_GDP	1.149***	1.158***	0.992***
L_TRADE_OPEN	-0.030	-0.081**	-0.063
BREAK1973	0.046*	0.010	0.027
BREAK1978	0.090**	0.0827***	0.087***
BREAK2001	-0.077**		
@TREND	0.037***	0.037***	0.033***

Notes: (a) The models were estimated with a trend and up to 8 lags of the dependent variable and the two endogenous variables. After evaluating 648 models, the best model was selected using the Schwarz Criteria criteria.
(b) Following Narayan (2005), the bound test statistic was adjusted for small samples. ***, **, and * denotes significance at the 1%, 5% and 10%, respectively.

Table 3: ARDL Cointegrating Short run Error-correction Models

	Model 1	Model 2	Model 3
Selected model Selected model based on Schwarz Criteria (SC)	ARDL(1, 1, 6)[a]	ARDL(1, 0, 6)[a]	ARDL(1, 1, 0)[a]
Included observations	50	50	44
Bound Test F Statistics for small samples[b] with two endogenous variables (k=2)	19.57***	15.56***	5.02*
Endogenous Regressors			
L_FD_GDP			

D(L_FD_GDP)	-0.021		
L_PLOAN_GDP		-0.00002	
D(L_NON_CONSESLOAN_GDP)			-0.013
L_TOT_EXP_GDP			-0.024**
D(L_TOT_EXP_GDP)	-0.095***	-0.126***	
D(L_TOT_EXP_GDP (-1))	-0.0003	-0.043*	
D(L_TOT_EXP_GDP (-2))	0.006	-0.004	
D(L_TOT_EXP_GDP (-3))	0.022	0.002	
D(L_TOT_EXP_GDP (-4))	-0.052**	-0.090***	
D(L_TOT_EXP_GDP (-5))	-0.054**	-0.083***	
Exogenous Regressors			
D(L_NONPL_GDP)		-0.018*	
D(L_CONSES_LOAN_GDP			-050
D(POP_GRO)	0.016**	0.020**	-0.017*
D(INFLA)	-0.0001	-0.001***	-0004
D(GFCF_GDP)	0.612***	0.844***	0.545***
D(L_TRADE_OPEN)	-0.001	-0.058**	0.015
D(BREAK1973)	0.001	0.010	0.028**
D(BREAK1978)	0.045***	0.046***	0.016
D(BREAK2001)	-0.034***		
C	5.2851***	7.666***	4.257**
CointEq(-1)	-0.572***	-0.753***	-0.417**

Notes: (a) The models were estimated with a trend and up to 8 lags of the dependent variable and the two endogenous variables. After evaluating 648 models, the best model was selected using the Schwarz Criteria.

(b) Following Narayan (2005), the bound test statistic was adjusted for small samples. ***, **, and * denotes significance at the 1%, 5% and 10%, respectively.

Robustness of the Findings

Parameter stability of the estimated model is an important criterion to validate the specification of the ARDL model (Bal,& Rath, 2014; Murthy & Okunade, 2016). We employed two common stability tests, namely, cumulative square (CUSUM) and cumulative sum of square (CUSUM of Square), to the recursive residuals of the estimated models. The test results are presented in Figures 4, 5 and 6, respectively for Model 1, Model 2, and Model 3. In Figure 4, both CUSUM and CUSUM of Square lie inside the critical boundaries of a 5% significance level. Therefore, the stability tests validate the robustness of the estimated ARDL (1,1,6) specification of Model 1. Similarly, in figures 5 and 6, both CUSUM and

CUSUM of Square lie inside the critical boundaries of 5% significance level validating the estimated ARDL (1,0,6) and ARDL (1,1,0), respectively.

In addition, we conducted several diagnostic tests namely, JB normality test, Correlogram Q-statistic, Breusch-Godfey serial correlation test, and Breusch-Pagan-Godfrey heteroscedasticity F-test to confirm the validity of the specified models. Test statistics for each model are presented in Table 4.

Table 4: Diagnostic Tests' Results

Diagnostic Test	Model 1	Model 2	Model 3
Q-statistic probability of the 1st lag[(a)]	0.722	0.662	0.858
Jarque-Bera normality test statistic[(b)]	0.757	2.024	1.189
	(0.685)	(0.364)	(0.552)
Breusch-Godfrey serial correlation LM test statistic[(b)]	0.166	0.318	0.022
	(0.848)	(0.730)	(0.979)
Breusch-Pagan-Godfrey heteroscedasticity F-test statistic[(b)]	1.244	1.0240	1.588
	(0.288)	(0.461)	(0.147)

Notes: (a) Probabilities were greater than 0.05 for the first 24 lags of Model 1 and Model 2. For Model 3, probabilities were greater than 0.05 for the first 19 lags.
(b) Figures in the parenthesis are probabilities of the test statistics

We employed Q-statistics to check the problem of autocorrelation in the models. Based on the probabilities of the Q-statistics, we failed to reject the null hypothesis that at the 5% significant level there is no autocorrelation up to 19 lags in Model 1 and 24 lags in Model 2 and Model 3. Alternatively, we employed Breusch-Godfrey serial correlation LM test as Model 1 had a problem with autocorrelation after 19th lag. However, we failed to reject the null hypotheses of Breusch-Godfrey serial correlation LM test that at the 1% significant level there is no serial correlation for all the models. The Jargue-Bera normality test was used to test the normality of the error terms of the estimated models. Again, for all the models we fail to reject the null hypothesis that at the 1% significant level the error terms are normally distributed. Finally, we employed Breusch-Pagan-Godfrey heteroscedasticity F-test to test whether the models are suffering from heteroscedasticity. As per the Table 4, we have strong evidences to say that we failed to reject the null hypothesis of the test; being that there is no heteroscedasticity. All the diagnostic tests suggest that the estimated models are free from any series diagnostic problems.

5. Conclusions

This research paper investigates the impact of quality of borrowing on economic growth while simultaneously focusing on the impact of quantity of borrowing on economic growth. We contribute to the literature in several ways. First, we argue that the quantity of debt stock as well as quality of the borrowings determine the impact of debt on economic growth. Low quality borrowing (i.e. heavy borrowing from non-concessional sources) may be the key factor that determines the negative impact debt on economic growth. Second, we employed a relatively new specification, Auto Regressive Distributed Lag (ARDL) model, to analyse the impact of debt on growth. This specification helps to overcome some inherent limitations of the analytical tools used in growth-debt analysis. Third, in the context of Sri Lanka the relationship between economic growth and public debt has not been well addressed. The limited literature has not properly accounted for the structural breaks in the data series making the existing findings less reliable. Further, this is the first study that attempts to employ an ARDL model to analyse the debt-growth nexus in the context of Sri Lanka.

References

Adam, C., & Bevan, D. (2005). Fiscal deficit and growing in developing countries. Journal of Public Economics, 89, 571–597.

Afonso, A., & Jalles, J. T. (2012). Fiscal volatility, financial crises and growth. Applied Economics Letters, 19(18), 1821–1826.

Aizenman, J., Kletzer K., Pinto B., 2007. Economic Growth with Constraints on Tax Revenues and Public Debt: Implications for Fiscal Policy and Cross- Country Differences. NBER Working Paper 12750.

Alfredo, S and Francisco, I. (2004). Debt and Economic Growth in Developing and Industrial Countries, Working Paper 2005:34, Columbia University, Department of Economics.

Atique, R., and Malik, K., (2012). Impact of Domestic and External Debt on the Economic Growth of Pakistan. Word Applied Sciences Journal. Vol. 20, No. 1, PP. 120-129.

Bahmani-Oskooee, M., Halicioglu, F., & Hegerty, S. W. (2016). Mexican bilateral trade and the J-curve: An application of the nonlinear ARDL model. *Economic Analysis and Policy, 50*, 23-40.

Cecchetti, S., Mohanty, M. and Zampolli, F. (2011). The Real Effects of Debt, Working Paper, European Central Bank.

Central Bank Annual Report (2015), Central Bank of Sri Lanka.

Checherita, C. and Rother, R. (2012). The Impact of high and growing Government Debt on Economic Growth: An Empirical Investigation for the Euro Area, European Economic Review, 56, pp. 1392-1405.

Daud, S.T.M; and Podivinsky, J (2014), Government debt and economic growth in Malayasia: the role of institutional quality, Applied Economics Letters, 21:17, 1179-1183, DOI: 10.1080/13504851.2014.916378

Hassan, S.U and Mamman, A (2013), External Debt and Economic Growth: Evidence from Nigeria, International Journal of Economics, Business and Finance, Vol. 1, No. 10, November 2013, PP: 360 -370, ISSN: 2327 – 8188

Kaufman, H (1986), Debt: The threat to economic and financial stability, Economic Review, Wyoming, 27:29

Krugman, P.(1988), Financing vs. forgiving a debt overhang. J. Dev. Econ. 29 (3), 253–268.

Kuman, M. and Woo, J. (2010). Public Debt and Growth, Working paper, IMF Publications.

Lee and Strazicich (2003) two break minimum LM unit root test (Model C: two breaks in the intercept and the trend)

Obstfeld, M; Shambaugh, J.C; and Taylor, A.M (2010), Financial Stability, the Trilemma, and International Reserves, American Economic Journal: Macroeconomics, Vol. 2, No.2, pp. 57-94, American Economic Association.

Oskooee, M.B; Halicioglu, F; Hegerty, S.W (2016), Mexican bilateral trade and J-curve: An application of the nonlinear ADRL model, Economic Analysis and Policy, Vol.50, pp: 23-40

Pattillo, C., Poirson, H. and Ricci, L. (2002). External Debt and Growth, IMF Working paper.

Panizza, U., Presbitero, A. F. (2014) Public debt and economic growth: is there a causal effect? J. Macroecon. 41, 21–41.

Pescatari, U and Presbitero, A.F (2014), Public debt and economic growth: Is there a causal effect?, Journal of Macroeconomics, volume 41, pp. 21–41

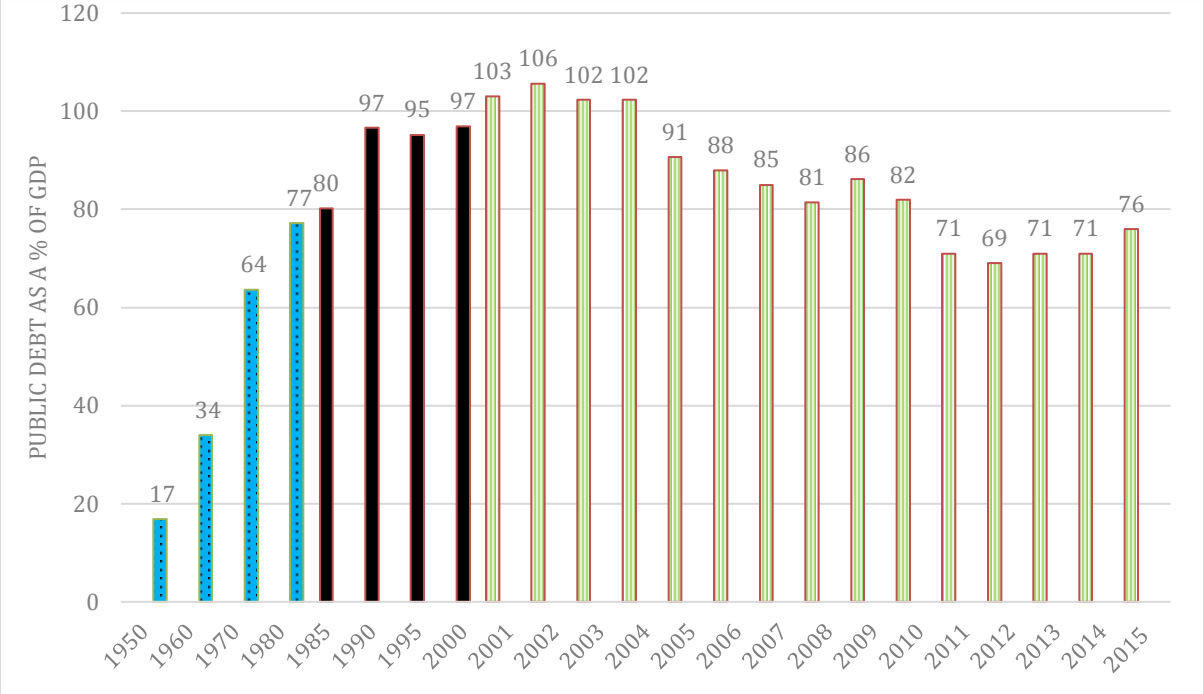
Presbitero, A.F (2005), The Debt-Growth Nexus: a Dynamic Panel Data Estimation, Dipartmento di Economia, Universita Politecnica delle Marche, Piazza Martelli 8, Italy

Reinhart, C. and Rogoff, K. (2010). Growth in a Time of Debt, American Economic Review, American Economic Association, 100 (2), pp. 573-578.

Saint-Paul, G., 1992. Fiscal policy in an endogenous growth model. Quart. J. Econ. 107 (4), 1243–1259.

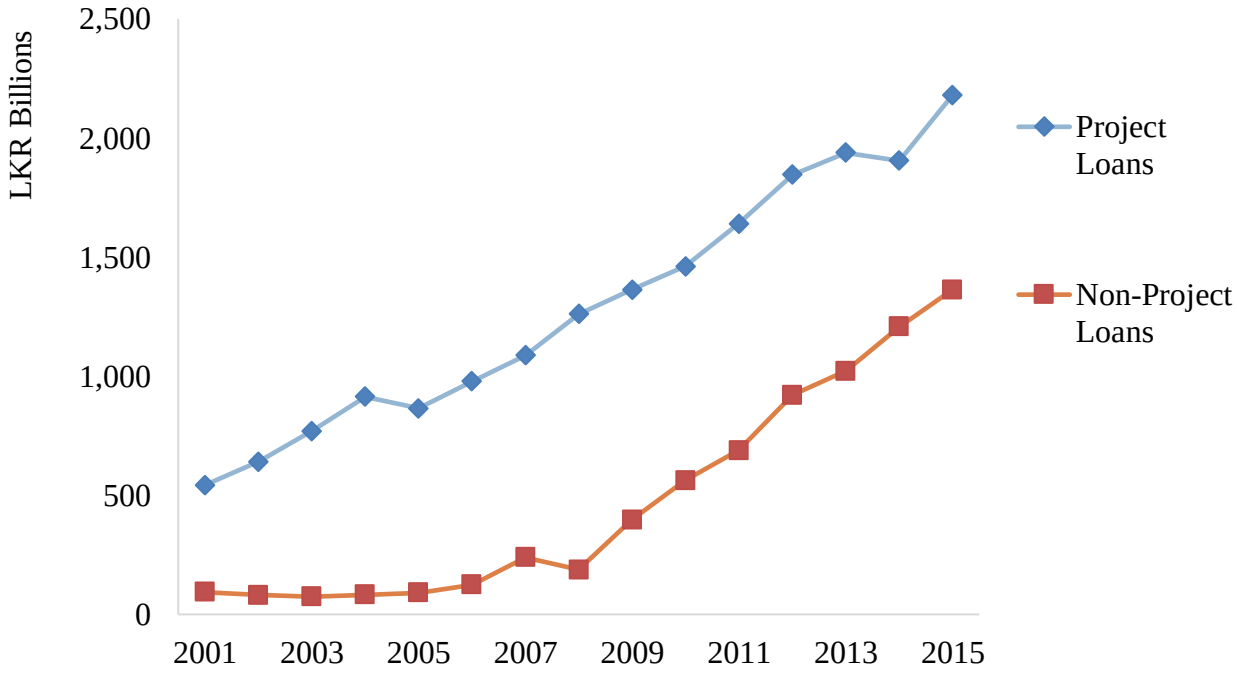
Sulaiman, L. A. and Azeez, B. A., (2012). Effect of External Debt on Economic Growth of Nigeria. Journal of Economics and Sustainable Development. Vol.3, No.8

Figure 1: Public Debt as a Percentage of GDP in Sri Lanka, 1950-2015



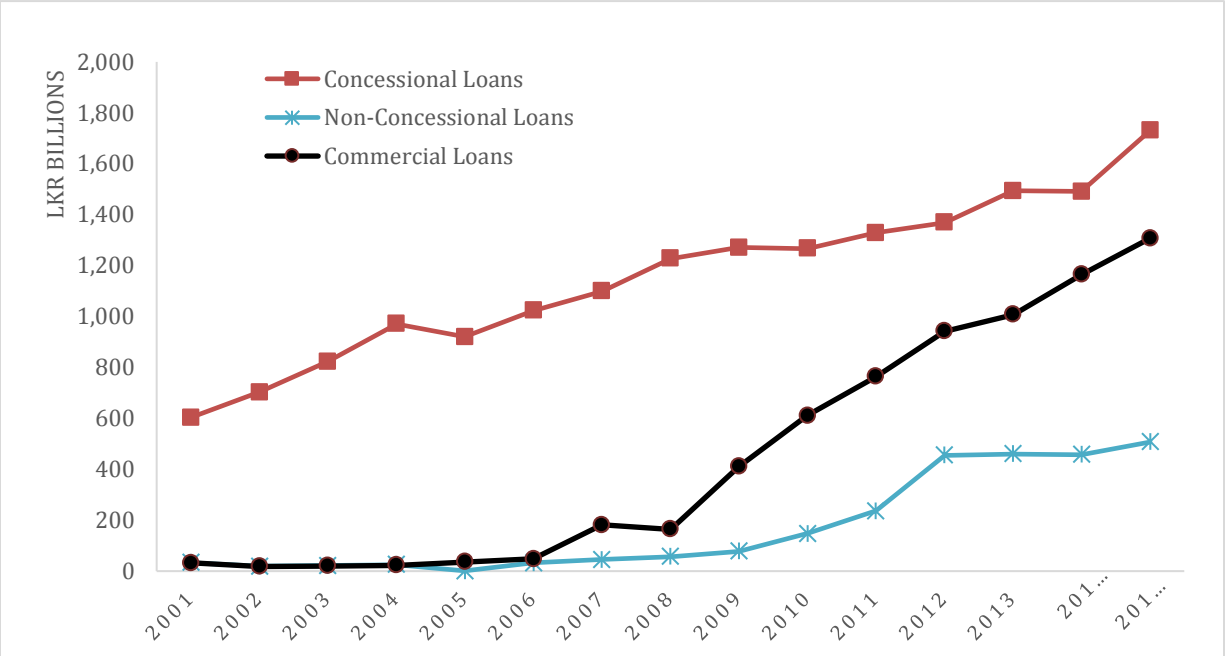
Source: Ganeshamoorthi (2011); Central Bank Annual Report (2015), Central Bank of Sri Lanka, 2016.

Figure 2: Public Foreign Debt by Purpose, 2001-2015



Source: Central Bank Annual Report (2015), Central Bank of Sri Lanka, 2016.

Figure 3: Public Foreign Debt by Institutions, 2001-2015



Source: Central Bank Annual Report (2015), Central Bank of Sri Lanka, 2016.

Figure 4: Stability Test of Recursive Residuals of Model 1

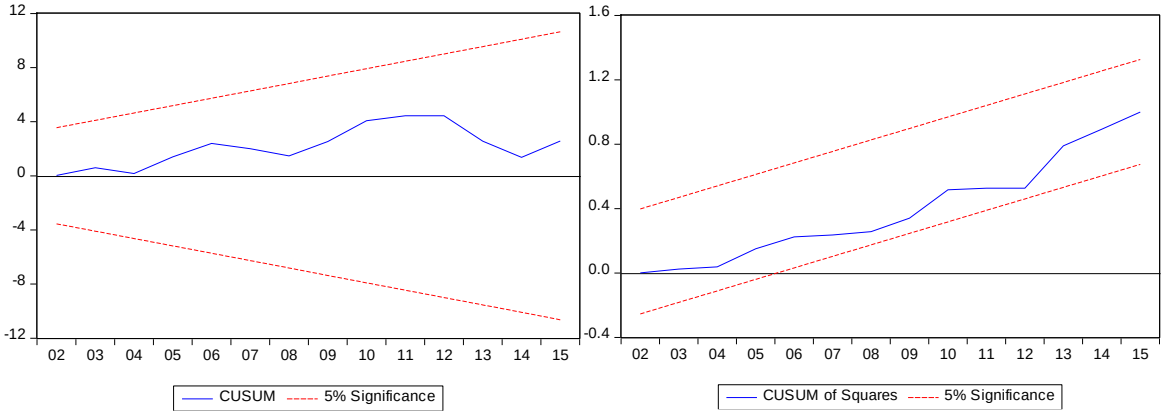


Figure 5: Stability Test of Recursive Residuals of Model 2

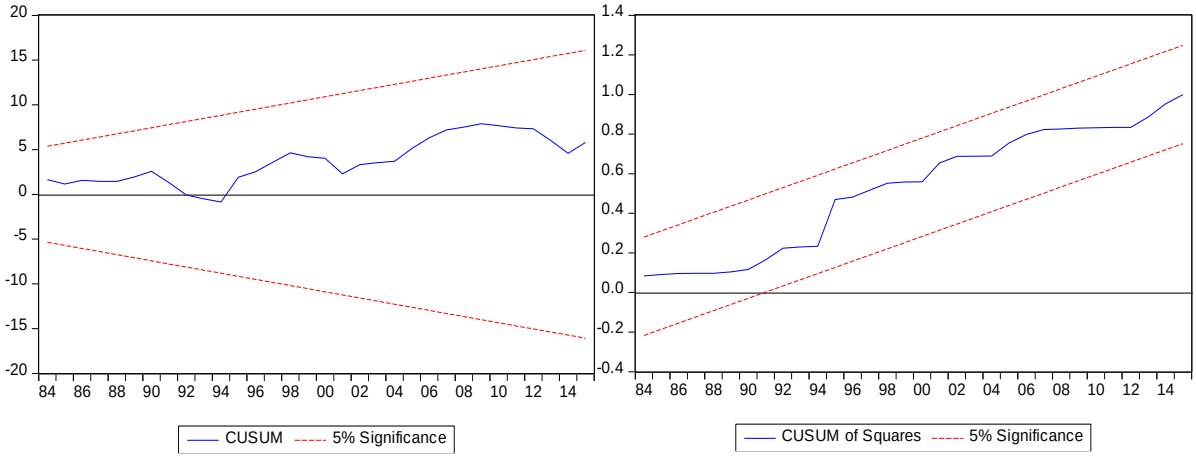
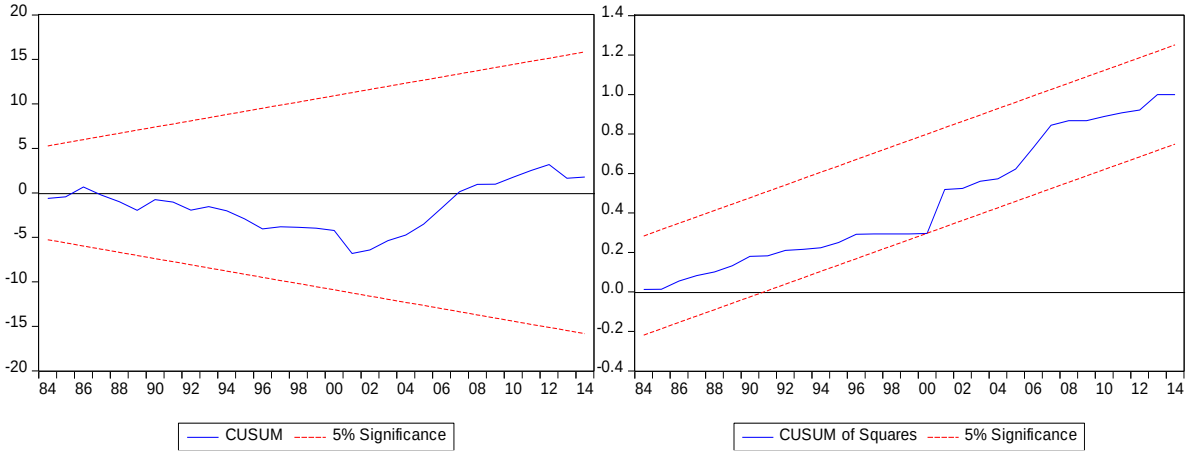
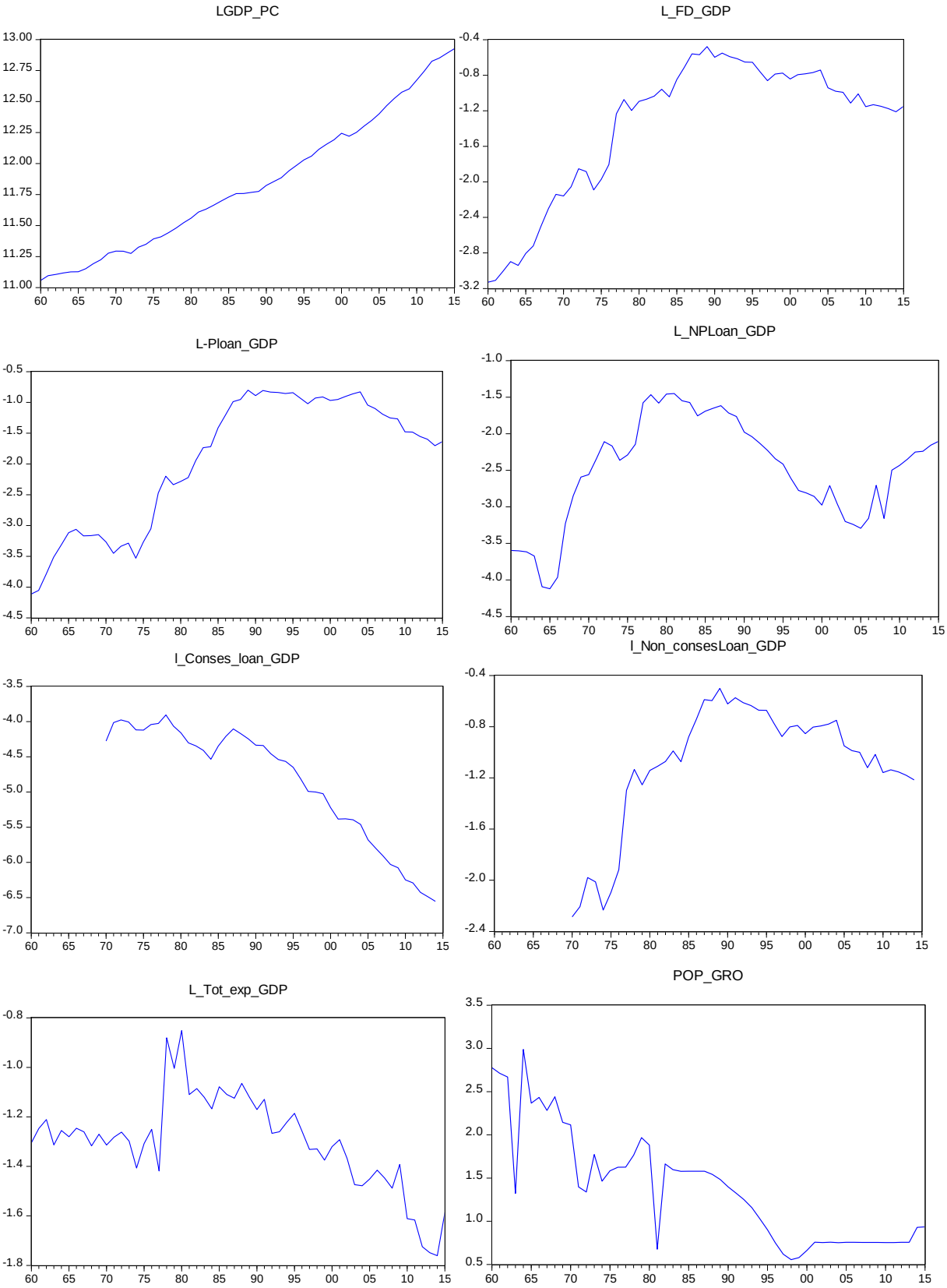
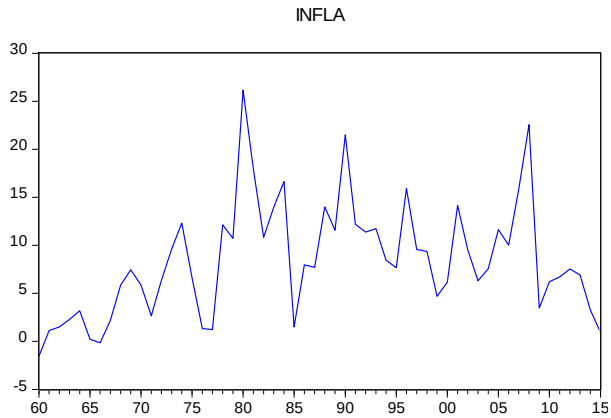


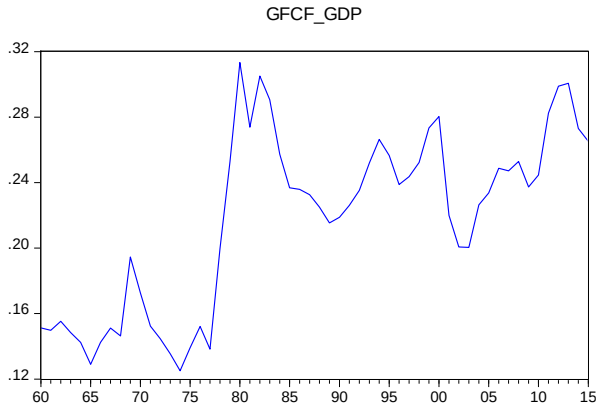
Figure 6: Stability Test of Recursive Residuals of Model 2

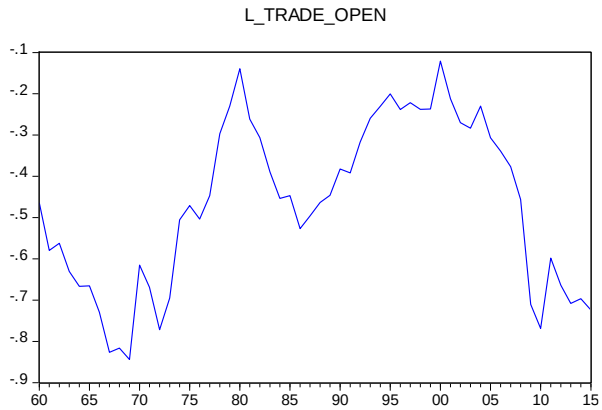


Annexure 1


LGDP_PC
L_FD_GDP
L-Ploan_GDP
L_NPLoan_GDP
l_Conses_loan_GDP
l_Non_consesLoan_GDP
L_Tot_exp_GDP
POP_GRO


INFLA
30
25
20
15
10
5
0
-5
60 65 70 75 80 85 90 95 00 05 10 15


GFCF_GDP
.32
.28
.24
.20
.16
.12
60 65 70 75 80 85 90 95 00 05 10 15


L_TRADE_OPEN
-.1
-.2
-.3
-.4
-.5
-.6
-.7
-.8
-.9
60 65 70 75 80 85 90 95 00 05 10 15