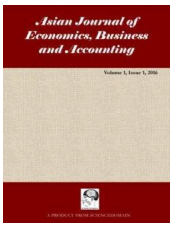

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Determinants and Transmission Channel of External Debt: Evidence from Malaysia

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Authors' contributions

Authors EU and RAMR both contributed equally in undertaking this study. Both authors read and approved the final manuscript.

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ABSTRACT

Malaysia's external debt has been on an increase, which has become a national concern. Data used for this study was from 1970 to 2013. The VECM results showed that external debt had no transitory but a permanent relationship with the determinant variables. Exchange rate, recurrent and capital expenditures all posted a positive longrun relationship while GDP had a negative relationship with external debt. Granger causality test was conducted to determine the direction of causation between the variables. The results indicate that only capital expenditure had a unidirectional causality effect on external debt and the transmission channel showed that GDP impacts external debt through its impact on capital expenditure. This validates the claim that in the longrun Malaysia has been able to tie its external debts to capital projects which is desirable.

Keywords: Malaysia; external debt; cointegration; vector error correction model; causality.

JEL classification: E62, F34, H63.

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1. INTRODUCTION

The definition of total external debt indicates that it is finances owed to non-residents and repayments can be through supply of goods, services or foreign currency for which debtors do not necessarily have to be governments (national or sub-national) as companies and/or citizens also incur foreign debts. External debt comprise long-term debt that is guaranteed by public and private entities (some of which do not bear any guarantees), short-term marketable debt instruments, and loans by multinationals such as the IMF [1]. External debt is key in developing international relations and facilitating global interdependence. Developed countries have the opportunity to contribute to the growth of developing countries while expanding the market for its industrial products and services.

There are several characteristics common to most developing countries. Developing countries have challenges in resource availability, which can negatively affect prioritization [2]. The lack of sufficient resources to fast-track economic growth plagues most developing countries [3]. Despite these challenges, developing countries must solve financing problems in a way that allows them to sustainably grow. If a country's public savings ratio is less than required investment, one quick solution is for the country is to incur external debt to finance its desired level of economic development [4].

However, external debt may also create problems for developing countries. Failure to match growth with returns compromises the sustainability of debt financing. Again, challenges in repayment of external debt can be exacerbated by poor economic and financial returns. In addition to these factors, accumulation of external debt over a certain threshold can create problems for the sustainable macroeconomic fundamentals as well. Past events have increased international trepidations about the possible negative outcomes of the extensive debt increase for developing countries. The debt overhang in the early 1980s of countries like Mexico and Argentina contributed to this fear. In sum, sustainability of external debt and the consequences of accretion of external debt on economic growth and investment in a country are common lingering questions of concern for policymakers and academicians alike [1]. There remains no consensus on the sustainability of external debt, much less the relationship between external debt and other macroeconomic fundamentals. This lack of consensus deserves further attention.

Malaysia as one of the Asian tigers has used external debt to achieve one of the most successful macroeconomic performances among all developing countries. The success of the country in growth and development has grabbed the attention of the world and of researchers [5]. Most of the success in the 20th century was attributed to the affirmative action program referred to as the New Economic Policy (NEP) adopted in 1971 and aimed to transform Malaysia into an industrialized country. However, Malaysia has not been without its own fair share of crises, one being its increasing external debt with concerns about its sustainability in the last two decades. Based on Fig. 1, it is clear that significant trend in Malaysia's external debt were reported from 2000.

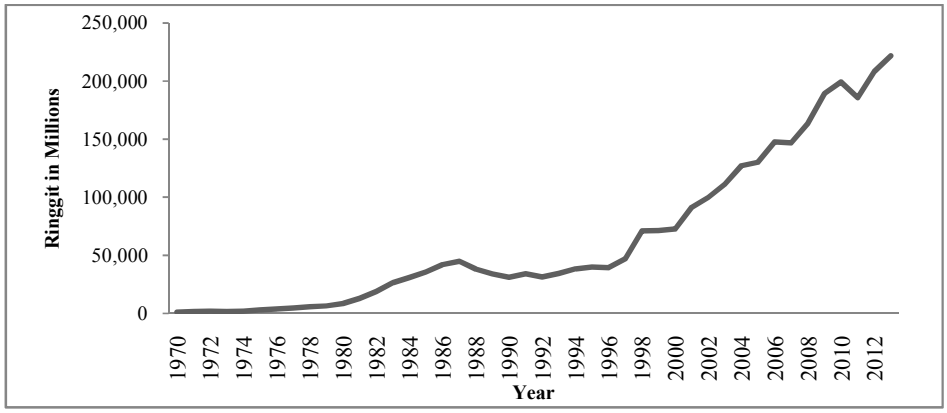

Fig. 1. Malaysia's external debt

One way countries avoid the overreliance on this source of capital is to establish a debt ceiling, which guides policies at the national level. As indicated by Arnone, Bandiera, & Presbitero [6], the existence of a debt ceiling provides guidance on the maximum amount of debt that can be acquired at any time. However, for Malaysia it is worrying as the statutory ceiling has been raised multiple times by the Barisan National government (BN) over the past decade to legalize the federal debt level, which has been increasing faster than the GDP [7]. The ceiling rose from a limit of 40% (excluding Shariah) in April 2003 to 45% in June 2008 and to 55% in July 2009. However, unlike the US where the debt ceiling has also been raised many times in the past decade, Malaysia's limit is not legally binding and is discretionary to the Minister of Finance [7].

In discussing debt sustainability issues, it is common for analysts to harp on one key benchmark the debt-to-GDP ratio. Empirical findings showed that if debt-to-GDP ratio is equal or exceeds the 90% benchmark level, public debt would definitely hinder economic growth [**Error! Reference source not found.**]. Malaysia's debt-to-GDP ratio is 50%, which does not surpass this threshold. Notwithstanding, overemphasis on the debt-to-GDP measure alone can be misleading, because a country could pile up unknown risks outside of this ratio and destabilize the country's macroeconomic condition [8].

The findings of this paper will have policy implications for policymakers and technocrats in developing countries. This paper could give insights about the capacity of a nation to fulfill its future debt obligations to creditors during the lending process. The next section reviews the empirical and theoretical literature. Section 3 provides an outline the data collection and methods of analysis while the empirical analysis and findings are presented in section 4. Section 5 offers conclusion and recommendation.

2. REVIEW OF LITERATURE

Theoretical models on debt examine the relationship between changes in debt and its commensurate effect on economic growth. The theoretical perspective provides guidance regarding the optimal amounts of debt that propagate financial growth in a country. One of such theories is the debt overhang hypothesis. It outlines that when the level of indebtedness is high, it discourages investment and adversely infleunces growth as prospective higher tax rates are set to repay the debt [1]. Moreover, a high level of external debt increases a country's probability of default.

Elmendorf & Mankiw [9] reiterate that a nation that has massive debts has a high likelihood of facing singificant high rates of interest with resounding pressure on the monetary policies. Since foreign borrowing provides capital at interest rates lower than that of the home country, external debt looks more appropriate and compulsory to hasten economic growth. Therefore, if the nation acquires investments in infrastructure, the invested funds can result to faster growth and socioeconomic development [10]. Nonetheless, debts have to be repaid. Funds borrowed are merely postponed taxation. Were [11] advised that high borrowing from overseas introduce more conditionality from multilateral agencies.

Another supporting theory is the debt Laffer curve model. It indicates that countries with larger stocks of debt, whether external or internal, have a higher chance of failing to repay or service the debt [12]. The Laffer curve is an explanation of the debt overhang hypothesis and it theorizes that a curve indicates the optimal level for each country's debt. Once the quantity exceeds the optimal amount that the country can service, the ability to repay the debt drops significantly. Theoretically, the highest point at the Laffer curve represents the stage where external financing becomes a tax on the country's investments and a hindrance to economic policies.

Though debt overhang model fails to analyze the outcome of growth directly as it focuses on the quantitative aspects of the debt. The model is clear on the incentive effects of debt, since a rise in the debt causes a lessening in the ability to implement reforms that focus on economic growth and efficiency. The most common strategies become less viable under excessive amounts of debt, and these strategies include fiscal adjustments and liberalization of trade [6].

Recently, the "dual gap" analysis has become popular in external debt literature [13]. It explains that a nation's advancement has a venture element. For such a venture, domestic savings are not sufficient to safeguard growth. In an open economy, there must be the chance of acquiring the needed resources from overseas locations. A

saving-investment gap exists when the applicable domestic savings fall short of the required level that is compulsory to accomplish the objective rates of growth. Likewise, if there is an import condition greater than the current level of exports that is required to accomplish the desired development, then there is a foreign exchange gap in exports and import [14].

The World Bank [15] argued that the enormous debt package settlement created by LDCs depressed their development and structural arrangement. A corroborative study by Hassan, Hagen, & Haj [16] determined whether the economic effects of external debt were mythical or realistic. The results included data from 82 countries with significant challenges in external debt over a 10-year period. The findings show that debt overhang was a reality and capable of compounding the economic challenges facing a country. Mencinger et al. [17] focused on a growing level of external debt, such as the scenario experienced in Malaysia. The findings show that there was no statistical significant difference in the member countries in their ability to manage the growing external debt. Saibene & Sicouri [18] highlighted the effects of foreign-denominated debt on the economic growth of developing countries. The difference in the value of currencies increased the sustainability of debt, especially if the currency in which the debt was denominated fluctuated more than the domestic currency and vice versa. The study indicated that developing countries with US Dollar-denominated debts faced significant challenges if they were not able to participate in international trade, since the fluctuations in exchange values compromised the ability of their domestic reserves to handle the debt.

3. METHODOLOGY

Time series secondary data spanning from 1970 to 2013 will be used for this study. The data is sourced from the World Bank, IMF, and Malaysia's Ministry of Finance. This aim of the study is to indicate the link between the external debt of Malaysia and a number of macroeconomics factors namely gross domestic product (GDP), exchange rate (EXR), recurrent expenditure (REXP), and capital expenditure (CEXP).

The estimated model will rely on adoption of the cointegration and vector error correction models. The model will distinguish between long and short-term effects and will then determine the causalities among the variables. For purposes of estimation, the relationship between the variables is outlined as follows;

$$ED = f(GDP, EXR, REXP, CEXP) \quad (1)$$

Where:

ED = External debt,
GDP = Gross domestic product,
EXR = Exchange rate,
REXP = Recurrent expenditure,
CEXP = Capital expenditure.

Adding the error term and linearising the variables, the explicit model becomes:

$$\ln ED_t = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln EXR_t + \beta_3 \ln REXP_t + \beta_4 \ln CEXP_t + \varepsilon_t \quad (2)$$

The a priori expectations of the explanatory variables are as follows:

$$\beta_1 < 0;\ \beta_2, \beta_3, \beta_4 > 0$$

The coefficients β_1, β_2, β_3 and β_4 determine the impacts on external debt. It is expected that there should be inverse relationships between gross domestic product and external debt. According to Benedict, Ehikioya & Asin [19], an increase in GDP result to a decrease in external debt due to the existence of domestically generated financial resources for utilization in the expenditure. On the other hand, it is expected that there should be positive relationships between exchange rate and external debt, recurrent and capital expenditures with external debt. According to Awan, Anjum & Rahim [20] the value of external debt rises if the value of the currency of the debtor weakens in comparison to the creditor's currency. Thus, if exchange rate increases external debt will increase. Though undesirable, Ribiero et al. [21] stated that it is habitual for countries to borrow in order to finance recurrent expenditure. Recurrent expenditures are part of the total financial commitments of the government. Eviews software was used to conduct the econometric tests.

4. EMPIRICAL ANALYSIS AND DISCUSSION OF RESULTS

This section discusses the findings from the empirical analysis of unit root tests, cointegration analysis, vector error correction estimation, and Granger causality tests. As shown in Fig. 2, there was an upward trend in all of the variables except for exchange rate when natural logarithm

was applied. This may have indicated that non-stationarity existed when the variables did not oscillate around the mean. Due to this, a formal unit root testing will be applied.

4.1 Test for Stationarity

To investigate the presence of stochastic nonstationarity in the series, the progression of integration of specific time series was established through the unit root tests. The tests of the stationarity of the variables adopted were ADF, PP, and KPSS. The summary of the unit root test can be seen in Table 1 in the Appendix. Test findings reveal that all the series were non-stationary at their levels. We fail to reject the null hypothesis under ADF and PP, while we reject the null hypothesis under KPSS. Further analysis indicates that all of the variables are integrated of order one, I(1). Thus, the use of contemporary econometric techniques such as OLS and its *t* statistics and *F* tests will lead to a spurious result. Instead, a cointegration test is better suited for the data.

4.2 Cointegration Test

In order to proceed with cointegration, first the finding of optimal lag selection is performed since all inference are based on the correct chosen lag length. By using Akaike, Schwarz and Hannan-Quinn information criterions, the optimal lag selection turns out to be one as seen in Table 2.

It is important to check if the VAR model was well specified. The LM test result in the Appendix shows no serial correlation at 1 lag. Next, the result of the cointegration of the 5 variables is shown in Table 3 using lag 1. 10% critical value was chosen not to severely penalise due to the size of dataset.

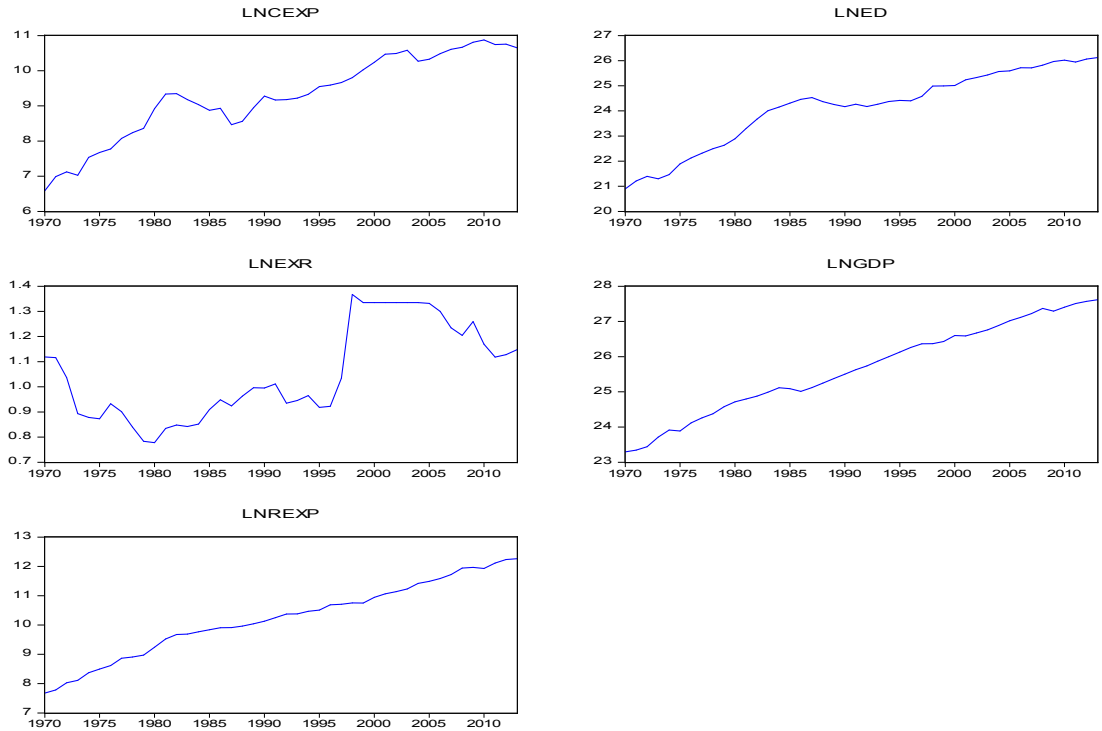

Fig. 2. Time series trend of variables under natural logarithm

Table 1. VAR Lag order selection criteria results

Lag	AIC	SC	HQ
0	0.917782	1.126.755	0.993878
1	**-10.88721***	**-9.633381***	**-10.43064***
2	-1.057.379	-8.275.099	-9.736.735
3	-1.071.086	-7.367.308	-9.493.325

*Note: * denotes lag order selected by the criterion*

Based on the findings, the first null hypothesis was rejected at level since the trace statistic was larger than the critical level at alpha of 10%. A unique cointegrating vector was observed as test indicated 1 cointegrating equation. Thus, a longrun relationship could be inferred between the variables. Results for the normalized cointegrating coefficients are stated in Table 3.

Therefore, the cointegrating vector can be rewritten as;

$$LNED = 0.0862lnEXR - 0.7829lnGDP + 0.861lnREXP + 0.9796lnCEXP + \varepsilon_t \quad (3)$$

The signs of all parameters in the longrun cointegrating equation comply with apriori expectations. However, the significance of the coefficients will later be determined and the presence of one cointegating vector between the non-stationary variables makes it possible to estimate VECM and to capture the dynamic adjustment.

4.3 Vector Error Correction Method Results

Based on the results of the Johanssen cointegration model, a longrun relationship was established between external debt and the independent factors. At this stage, the shortrun dynamics is investigated.

By including intercept, the cointegrating equation becomes;

$$LNED = 26.238 + 0.0862lnEXR0.7829lnGDP + 0.861lnREXP + 0.9796lnCEXP + \varepsilon_t \quad (4)$$

Based on Table 4, ED convergence moderately to its longrun equilibrium level by 26% every year due to the contribution of CEXP, EXR, GDP, and REXP and was statistically significant at 1% level. Unfortunately, no significant short-run relationship can be observed in the results. Meanwhile, the longrun relationship is interpreted that if EXR in the past year increases by 1%, ED in the current year will increase by 0.09%. If GDP in the past year increases by 1%, ED of the current year will decrease by 0.78%. A 1% increase in REXP in the past year leads to a 0.86% increase in current ED. Lastly, a 1% increase in one year lagged CEXP leads to a 0.98% increase in current ED. It can be observed that none of the determinants is elastic to ED. Based on the apriori expectations, all the variables had their correct signs and were significant at 5% significant level except for EXR that was insignificant.

Table 2. Cointegration test results

Null hypothesis	Eigenvalue	Trace statistics	10% critical value
H_0: r = 0	0.553575	69.57108*	65.8197
H_0: r ≤ 1	0.342632	35.69872	44.49359

*Note: * denotes rejection of the null hypothesis at 10% critical value level*

Table 3. Normalized cointegrating coefficients results

lnED	lnEXR	lnGDP	lnREXP	lnCEXP
1.000000	-0.086271	0.782960	-0.861093	-0.979664
	(0.25133)	(0.31983)	(0.34866)	(0.13550)

Note: Standard error in parentheses

Table 4. VECM results

Result	Variable	Coefficient	Standard Error	*t* Statistic
Speed of adjustment	ΔlnED	-0.258	0.089	-2.875
Short run relationship	ΔlnEXR(-1)	0.581	0.350	1.605
	ΔlnGDP(-1)	0.225	0.287	0.722
	ΔlnREXP(-1)	0.065	0.251	-0.231
	ΔlnCEXP(-1)	0.261	0.117	-0.746
Long run relationship	lnEXR(-1)	-0.086	0.251	-0.343
	lnGDP(-1)	0.783*	0.319	2.448
	lnREXP(-1)	-0.861*	0.349	-2.469
	lnCEXP(-1)	-0.979*	0.135	-7.230

*Note: * indicates the coefficient is significant*

4.4 Granger (non-)causality

It is important to check the direction of causality between the variables to ascertain its direction of impact. This paper makes an interesting modification where most used a pair wise method. This is necessary because as Toda & Yamamoto [22] argued that when any of the variables are non-stationary (whether or not they are cointegrated), the usual Wald test statistic will not hold. The modified Wald test result is presented in the Appendix. The null hypothesis of the model is that there is no causal relationship between the regressand and regressors. The findings show that there is only a unidirectional causality relationships running from CEXP to ED in the model. This confirms the cointegration test of a unique cointegrating equation.

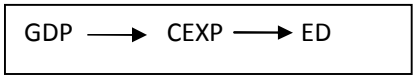

Fig. 3. Malaysia external debt transmission channel

The causality relationship can help elucidate on the transmission channel of external debt in Malaysia. This is presented below in Fig. 3. It goes to show that it is decreases in income that causes the federal government to increase external debts through investments in capital projects. This channel also shows that it is increases in income that is used to pay or reduce external debts through the realisation of the investment projects. This is a very interesting finding as it proves that over the years Malaysia has been able to tie its external debt to investment projects.

5. CONCLUSION AND RECOMMENDATION

Since all of the variables were only stationary after first difference, cointegration test indicated that there is a maximum of one cointegrating vector under the optimal lag selection of one. The VECM test was performed to determine the short-run and longrun relationships between the dependent variable and explanatory variables. The results indicated that there is no significant short-run relationship but there was a longrun relationship as proven by cointegration result. The Granger (non-)causality test indicated that it was only capital expenditure that precedes movements in external debt. Overall, only a unidirectional relationship can be observed in the Granger causality test. Using the result from the Granger (non-) causality test, the analysis went further to determine the transmission mechanism of external debt and concluded that it is the increase in GDP that first increases capital expenditure, which then increases external debt. This is an interesting finding as it goes to show that Malaysia's external debts are investment and development driven.

All four expectations were met and statistically different from zero at 1% level through the long-run relationships except for exchange rate, which followed economic expectations but was insignificant. The government manage to reduce external debt by increasing GDP. But, the government increases capital expenditure by increasing external debt. This supports economic theory because in order to sustain debt, a government should increase capital expenditure in order to repay external debt. In addition, the possibility of sustaining the debt can be contradicted due to the fact that recurrent expenditure increases along with capital expenditure and it looks as if external debt is diverted to recurrent expenditure which is unproductive. However, it should be noted that its longrun relationship to external debt is inelastic and the Granger (non-) causality does not show a one-one effect. Based on the four explanatory variables, it is clear that Malaysian government rely on GDP for the repayment of external debt.

Against this backdrop, there is a need for the government to put in place policies capable of ensuring quality deployment of external debts through budgeting rules like the Fiscal Responsibility Act that is being used in successful economies. It is well known that Malaysia is a one-product economy. Any dip in the international price of crude oil affects the treasury functions of the state. To this end, it is expedient for the government to build in modern project management methods into its budgeting systems to ensure high capital budget implementation rate. Malaysia's institutions like the Public Procurement Bureau must be reformed and strengthened to create an enabling platform for the private sector take the driving seat in infrastructure development and investment through Public Private Partnership (PPP) models.

Finally, the surreptitious way of concealing extra budgetary items and recurrent expenditures

through creative accounting methods outside of parliament-approved procedures should be eradicated because it results in huge and sustained financial leakage in the economy. As a result, it obscures information and makes it more difficult to arrive at reliable budget data. This happens because the system greatly hides the true extent of the external debt portfolio and its use.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Table 1. ADF, PP unit root and KPSS stationary test results

Statistics (level)	lnED	Lag	lnGDP	Lag	lnEXR	lag	lnREXP	lag	lnCEXP	Lag
τT (ADF)	3.29***	4	2.10	0	2.36	0	2.46	4	2.32	1
τμ (ADF)	1.77	1	1.78	0	1.18	0	2.02	0	1.75	1
τ (ADF)	2.29	1	8.92	0	0.14	0	7.91	0	2.68	0
τT (PP)	1.76	3	2.11	1	2.36	0	2.53	4	2.30	0
τμ (PP)	2.44	3	1.78	0	1.18	0	2.13	4	2.31	1
τ (PP)	3.51	4	8.52	3	0.17	1	6.98	3	2.32	2
τT (KPSS)	0.15**	5	0.41***	4	0.12***	4	0.14***	5	0.09	4
τμ (KPSS)	0.78*	5	0.84*	5	0.53**	5	0.83*	5	0.79*	5
Statistics (First difference)	**lnED**	**Lag**	**lnGDP**	**Lag**	**lnEXR**	**lag**	**lnREXP**	**lag**	**lnCEXP**	**Lag**
τT (ADF)	4.31*	0	6.45*	0	5.01*	0	2.44	3	5.21*	0
τμ (ADF)	4.09*	0	6.041*	0	5.03*	0	2.48	3	5.08*	0
τ (ADF)	3.11*	0	1.46	2	5.09*	0	1.45	3	4.59*	0
τT (PP)	4.36*	1	6.48*	2	4.94*	5	6.18*	2	5.18*	3
τμ (PP)	4.06*	2	6.03*	3	4.95*	5	5.84*	0	5.08*	2
τ (PP)	3.08*	1	2.60**	4	5.02*	5	2.72*	1	4.59*	1
τT (KPSS)	0.09	3	0.04	0	0.12**	2	0.14**	3	0.08	0
τμ (KPSS)	0.32	4	0.29	2	0.15	2	0.35	1	0.27	1

*Note: ED represents external debt; GDP represents gross domestic product; EXR represents exchange rate; REXP represents recurrent expenditure; CEXP represents capital expenditure. τ_T represents the most general model with a drift and trend; τ_μ is the model with a drift and without trend; τ is the most restricted model without a drift and trend. Both in ADF and PP tests, unit root tests were performed from the most general to the least specific model by eliminating trend and intercept across the models. *, **, and *** denote rejection of the null hypothesis at the 1%, 5%, and 10% levels, respectively*

Table 2. Result of LM test VAR residual serial correlation LM tests

Null hypothesis: no serial correlation at lag order h
Date: 01/14/17 Time: 06:13
Sample: 1970 2013
Included observations: 43

Lags	LM-stat	Prob
1	23.50646	0.5480
2	31.46940	0.1739
3	23.11339	0.5709
4	24.26367	0.5042
5	38.06386	0.0456
6	28.18648	0.2993
7	8.774978	0.9989
8	24.92642	0.4665
9	33.83525	0.1115
10	31.95752	0.1592
11	22.39956	0.6126
12	33.85951	0.1109

Probs from chi-square with 25 df

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