

# Some Empirical Evidences on ASEAN 5 Fiscal Policy Regime and Monetary and Fiscal Policy Interactions

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## Abstract

The interest of common currency among Asian countries have spurred many events happening for the past few years, notably the declaration of Asian Currency Unit in 2006 by Asia Development Bank (ADB). Hence, research papers examining on the integration of monetary policies are abundance. However, paper on examining fiscal policy regime and interaction between monetary and fiscal policy on ASEAN countries, is lacking.

The success of monetary union relies on the price stability of member nations. However, joining a monetary union means the lost of monetary policy sovereignty. Therefore, fiscal policy turns to be the next important tool to maintain price stability. This is reflected from the EMU countries after year 1999, where national monetary policies are completely centralized to the European Central Bank (ECB). The European System of Central Banks (ESCB) combines unity of decisions with participation of national central banks in the decision making process and implementation. Nevertheless, national fiscal policies of the member countries are still in the hands of the national governments.

This paper intents to examine the type of fiscal policy regime practiced by ASEAN 5 countries. Using macro-economic data for Indonesia, Malaysia, Philippines, Singapore and Thailand, the interrelationship of government surplus/deficits and liabilities is analyzed using Correlation test, Vector Autoregression (VAR) and Impulse response (IR) function to determine whether a Ricardian or Non-Ricardian fiscal policy has been implemented. Also, comparison of monetary and fiscal policy interactions between some EMU countries and ASEAN 5 are made. The results indicate interactions among inter EMU countries and inter ASEAN countries are generally comparable.

*Keywords:* Monetary union, Ricardian Fiscal Policy, VAR model, Impulse Response Functions

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## INTRODUCTION

The creation of the Economic and Monetary Union (EMU) since the last decade has led to a new framework of monetary and fiscal policy in the European Union (EU). It has also stimulated a renewed interest in the design, implementation and transmission of monetary and fiscal policy in Europe. The successful design and implementation of the common monetary policy, in which maneuvered by the ECB, has required a detailed knowledge of the transmission mechanisms of monetary policy. With the EMU in place, it gives insight into the effects of the common monetary policy on the Euro-area economy, since the member country of the EMU has individual fiscal authorities but the monetary policy is pursued by a single monetary authority, the ECB. On the other hand, the possible diverging effects of the common monetary policy on individual EMU countries may, also be observed and studied.

Viewing from another perspective, the study on whether fiscal adjustments have significant effects on monetary union have received considerable interest recently. Fiscal adjustments have played a crucial role in the EMU context as the fiscal convergence criteria stipulated in the Maastricht Treaty formed an important incentive for EU countries to improve their fiscal balances. Due to these reasons, a large number of fiscal policy adjustments have been undertaken during the last decade. As a result, many countries have made progress on fiscal consolidation and implemented various reforms of government spending and taxation.

EMU has stimulated a considerable academic literature on the transmission of monetary and fiscal policy in the Euro area. However, similar paper on the this topic, especially on ASEAN countries, is lacking. Therefore, it would be very interesting to examine whether ASEAN countries will result in the same interaction findings as per in the Euro area. As known to all that although the main benefit for monetary union is currency exchange rate stabilization, the loss of monetary sovereignty is unavoidable and destined to be the major forgo. Therefore, question arise on how far the remaining effective instrument for financial intervention, namely fiscal policy, can result in successful intervention? Following literatures like Zhang et.al (2004) and Yuen (2001) that supports Asia and ASEAN monetary union base on supply, demand and monetary shocks comovement, it will be interesting to further explore whether ASEAN 5 countries have been using fiscal policy as an effective tool to stabilize the countries financial situation.

The aim of this paper is to examine the nature of ASEAN 5 countries on whether they are of Ricardian or non Ricardian regime. If it is Non Ricardian ( hence will be called NR ) regime, fiscal policy is the nominal anchor , while in Ricardian ( hence will be called R ) regime, monetary policy plays the role. On top of that, the interactions between fiscal and monetary policy when these policies are used as tools of macroeconomic stabilization is also analyzed.

This paper is structured to address the followings: (i) R or NR regime for ASEAN 5 (ii) Possible clustering of groups of ASEAN 5 base on the regime they belongs (iii) Examine the fiscal and monetary interactions among the ASEAN 5 countries. The paper consists

of five sections. Following this introduction, section two layouts literature reviews. Section three reviews the methodology and data analysis. Section four discuss the analysis results and its implications. The final section concludes.

## LITERATURES REVIEW

The formation of a monetary union in Europe and the debate about the Stability and Growth Pact make the analysis of fiscal and monetary interactions an especially interesting topic. According to Lombardo, G. and Sutherland, A. (2003), it is often argued that the loss of monetary policy flexibility due to the merger of currencies increases the potential role of fiscal policy as a stabilization tool and increases the need for fiscal policy cooperation within Europe. The issue of fiscal and monetary interaction also arises at the global level where concern about large fiscal and current account imbalances has added to the debate about policy coordination between the major world economies. With the widespread shift to a separation of powers between fiscal and monetary authorities, the question arises of how the two policies interact when the policy makers' objectives differ.

The role of monetary policy in leveraging the economics of a country has been a major topic of research for past few years. Much focuses have been on the welfare implications of monetary policy regimes, especially in cases where there is some degree of nominal rigidity. These welfare effects of monetary policy have also been an important topic in open economy research. In this context the role and scope for international monetary cooperation has been extensively analyzed. Monetary policy in a monetary union can not replicate the flexible price equilibrium but many of the results regarding fiscal policy continue to apply to the monetary union case. The successful of a monetary union depends on how effective fiscal policy is in counteracting asymmetric real disturbances. If an absorption shock, interpreted as a fiscal policy shock, explains a great deal of the forecast errors in output, the retention of fiscal policy would be important to stabilize output.

Although monetary union does not imply uniform fiscal policy, the Pact for Stability and Growth will constrain the countries to follow a more uniform fiscal policy. On top of that, Lombardo, G. and Sutherland, A. (2003) found that activist fiscal policy yields welfare gains and there are welfare gains to fiscal policy cooperation. But it is also true that non-activist fiscal policy can yield higher welfare than non-cooperative fiscal policy when the cross country correlation of shocks is strongly negative.

Now, what is the interrelationship between surplus/deficit and fiscal solvency? Canzoneri, M. et al. (2001) outlined that if primary surplus/deficit move automatically to assure fiscal solvency for any path the price level might take (prices are determined in a conventional way, say by money supply and demand), this is called a Ricardian (R) fiscal regime, following Woodford (1995). On the other hand, if primary surplus/deficit follow an arbitrary process, then the equilibrium path of prices is determined by the requirement of fiscal solvency. This means the price level has to rise to satisfy a present value budget constraint. With this, it is called a Non-Ricardian (NR) regime. The basic distinction

between the two regimes is whether monetary policy or fiscal policy provides the nominal anchor for the economy. In R regimes, monetary policy play the anchor role, while in NR regimes, fiscal policy becomes the important factor. Canzoneri, M et al (1997) show that monetary policy alone can not peg the exchange rate in an NR regime. To keep the exchange rate fixed, fiscal policy needs the discipline of an R regime.

Woodford (1995) further illustrated that price level is not pinned down if the central bank tries to peg the interest rate in an R regime, but that it would be uniquely determined in an NR regime. In addition, the choice of regime affects the way in which fixed exchange rate systems can be modeled. He emphasizes that in the so-called "Ricardian" policy regime, the fiscal considerations fail to play any role in the price-level determination.

Hence, the R and NR regimes can be defined formally in terms of the present value constraint. If primary surplus/deficit to GDP ratios are determined by an arbitrary process (unrelated to the level of the debt), then nominal income must be in equilibrium. This shall be called a NR regime. If the situation is on the contrary, it is called a R regime. This means, nominal income is determined by the needs of fiscal solvency in an NR regime; it can be determined in more conventional ways in an R regime.

### **The Fiscal Theory of Price Level Determination (FTPL )**

The "Fiscal Theory of the Price Level" (FTPL) was mainly developed namely by Sims (1997) and Woodford (1995). According to the theory, the price level must assure that the real value of nominal government debt equals the present value of expected future fiscal surplus/deficit, assuring intertemporal government budget balance (Woodford 1995). This approach studies the impact of a fiscal policy that has been termed "non-Ricardian", which specifies the time paths of government debt, expenditure and taxes without respecting the government's intertemporal solvency constraint such that in equilibrium the price level has to adjust in order to ensure government solvency. The introduction of this non-Ricardian fiscal policy into an otherwise standard New Keysian monetary sticky price model has been shown to alter the stability conditions associated with the central bank's interest rate policy. The analysis of monetary and fiscal policy interactions has also been extended to open economies and examples include Leith and Wren-Lewis (2000), Melitz (2000), van Aarle et al.(2002), Sims (1997), Chamberlin et al. (2002), Clausen and Wohltmann (2001) and Beetsma and Jensen (2002). The monetary and fiscal policy interactions between two or more countries, especially between the member states of EMU are usually the focuses of above research papers.

Following Daniel B.C (2003), the explanation of Ricardian and Non Ricardian regime under FTPL is as follow:

A government's real primary surplus/deficit inclusive of seigniorage revenue is as follows

$$s_t = \tau_t - g_t + \left( \frac{i_t}{1+i_t} \right) \frac{M_t}{P_t} \quad (1)$$

where  $s_t$  = government's real primary surplus/deficit

$\tau_t$  = real tax

$g_t$  = real government spending

$i_t$  = nominal interest rate

$M_t$  = nominal end of period money balance

$P_t$  = price level

Nominal government debt inclusive of interest is

$$D_t = (1+i_t) B_t + M_t \quad (2)$$

where  $B_t$  = nominal end of period bond

By combining (1) and (2), we get the government's flow budget constraint as

$$D_t = (1 + i_t) (D_{t-1} - s_t P_t) \quad (3)$$

Imposing  $\lim_{T \rightarrow \infty} D_T \prod_{t=0}^{T-1} \left( \frac{1}{1+i_t} \right) = 0$  and assuming that the government does not

default under perfect foresight, the government's intertemporal budget constraint from period 0 becomes:

$$\frac{D_{-1}}{P_0} = \sum_{t=0}^{\infty} s_t R_{0,t} \quad (4)$$

where

$$R_{j,t} = \prod_j^t \left( \frac{1}{1+r_{j-1}} \right) \quad j \geq 0; R_{0,0} = 1$$

$$1 + r_{j-1} = (1 + i_{j-1}) \frac{P_{j-1}}{P_j} = \frac{(1+i_{j-1})}{1+\pi_j} \quad (5)$$

$\pi_j$  is the inflation rate between periods  $j-1$  and  $j$ . The intertemporal budget constraint of equation (4) states simply that the present value of future government surplus/deficit, inclusive of seigniorage, must equal the real value of initial debt. The intertemporal budget constraint must hold in equilibrium. At a minimum, the existence of equilibrium requires that the present-value of surplus/deficit must be positive whenever there is initial positive government debt.

A government is said to be Ricardian if it adjusts surplus/deficit to assure that equation (4) holds at any price level ( $P_0$ ). This makes surplus/deficit endogenous to the quantity of real government debt. It also implies that intertemporal government budget balance places no restrictions on the price level, leaving the price level to be determined by other conditions in the economy.

Alternatively, a government is non-Ricardian if it chooses present-value surplus/deficit independently of the initial stock of real government debt, and hence, independently of the initial price level. If the right hand side of equation (4) is independent of the price level, then the only way that intertemporal government budget balance can hold is if the price level adjusts to assure that it holds. This is the assumption made under the fiscal theory of the price level. According to Thams (2007), there seems to be empirical evidence that Ricardian fiscal policies are possible and likely.

## METHODOLOGY

Canzoneri, et al. (2001) pointed out that it is difficult to develop formal tests that discriminate between R and NR regimes, since both regimes use exactly the same equations to explain a given data set. In a Ricardian regime, the surplus/deficit pays off part of the debt and the next period's liabilities fall. In a non-Ricardian regime, there are two possibilities. Firstly, an innovation in surplus/deficit is not correlated with future surplus/deficit. In this case, the next periods' liabilities will not be affected by the innovation in surplus/deficit. Secondly, if an innovation in surplus/deficit is positively correlated with future surplus/deficit, the next periods' liabilities will rise. Therefore, impulse response functions from a VAR in surplus/deficit and liabilities would help differentiate between Ricardian and non-Ricardian regimes. If the next period's liabilities fall following a positive innovation surplus/deficit, then we have a Ricardian regime. If not, we have a non-Ricardian regime. Note that a negative response can be reconciled with a non-Ricardian regime, supposing there is negative correlation in the surplus/deficit process at longer horizons and the correlation is strong enough to lower the present value of surplus/deficit.

### Vector Autoregression (VAR) and Impulse Response Function

Vector Autoregression (VAR), first populated by Sims (1980), permits all variables to interact linearly with their own and each others current and past values. Therefore, one can determine the quantitative impact that each variable has on its own future value and the future values of the other variables. For this paper, an empirical research on the monetary and fiscal policy interactions in the Euro-area was done by employing a VAR mode. Following Canzoneri, Cumby and Diba (2001) (referred later as CCD), "Ricardian" or "non-Ricardian" fiscal regime of the ASEAN 5 are to be tested so that judgment can be made whether the assumption for the FTPL holds in reality. CCD test the interactions of two variables, surplus/deficit and government liabilities on US data with two different ordering. In the first ordering, (surplus/deficit)/GDP comes first. This allows for a contemporaneous effect on liabilities/GDP, as is consistent with an NR regime, where surplus/deficit are exogenous factor. In the second ordering, liabilities/GDP comes first. This ordering favours a R regime, because it does not allow contemporaneous effect on liabilities/GDP and allows the identification of shocks to (surplus/deficit)/GDP in R regime.

There are two conditions here which we need to analyze: Using impulse response functions, the response of (surplus/deficit)/GDP to innovation in the

(surplus/deficit)/GDP has to be observed. Referring to figure 12 by CCD, if the surplus/deficit are positively correlated regardless of what ordering, it is hence referred as a R regime. But if the surplus/deficit are negatively correlated, this may be the case of a R or NR regime. The second condition will be: If the response of liabilities/GDP to an innovation in (surplus/deficit)/ GDP is negative and significant, regardless of the ordering used, this would arise naturally in an R regime, as per shown in figure 13. However, if a positive shock to surplus/deficit increases the liabilities in the subsequent period, this leads to an NR regime

### Granger Causality Test

Granger (1969) approach to the question of whether x causes y is to see how much of the current y can be explained by past values of y and then to see whether adding lagged values of x can improve the explanation. y is said to be Granger-caused by x if x helps in the prediction of y, or equivalently if the coefficients on the lagged x's are statistically significant. In our case, Granger-Causality test will tell whether there exists any causality between the fiscal and monetary instruments.

We will first undertake this test for monetary and fiscal policy instruments of ASEAN 5 and then refer to some evidence of the same interactions in the Euro-area from Semmler and Zhang (2004). Surplus/deficit and short-term interest rate are used as the fiscal and monetary policy instruments respectively. Since according to the FTPL that fiscal regime plays a role in the price level determination, we also examine the granger cause between surplus/deficit and inflation ( changes in consumer price index).

Following the approach of Semmler and Zhang (2004),  $\Delta S$ ,  $\Delta R$  and  $\Delta \pi$  denote the changes in surplus/deficit, short term interest rate and inflation rate respectively and " $\rightarrow$ " stands for "Granger-causes". "Yes" indicates that one variable Granger-causes the other and "No" indicates that one variable does not Granger-cause the other.

### Data

The major data sources used in this paper are from IFS (International Financial Statistics), which covers ASEAN 5 countries over the 27 years (1980– 2006). Surplus/deficit, liabilities (Total net borrowing), short term interest rate and Consumer Price Index ( CPI ) are used. For Philippines, the cash balance data is not available. In this case we simulate by using both domestic borrowing and foreign borrowing data. Some data of Malaysia and Indonesia are obtained from Malaysia Economic Statistics Time Series 2005, IMF Staff Country Report: Malaysia Statistical Appendix and Indonesia Statistical Appendix. Both surplus/deficit and liability are scaled down by dividing with nominal GDP. All data are annually and seasonally unadjusted.

The time series properties of the variables have been investigated, and it was found that most variables are I(1), based on the Phillips-Peron and KPSS tests. Therefore, the first differences of all variables are used to ensure the stationarity of the variables. For estimation of the VAR, two lag are chosen, based on Akaike Information Criterion (AIC).

For Granger Causality test, the short-term interest rates of ASEAN 5 countries are measured by the call money rate and money market rate respectively. ADF unit root check at first difference is done for the stated variables with four lags. The test result shows that all data series t-statistic values are smaller than the 5% and 10% test critical values. Therefore, first differences of these variables are used for the estimation.

## RESULTS & ANALYSIS

### Correlation analysis, VAR estimation and Impulse Response Function Results

We first look at some preliminary results on the correlation of surplus/deficit and liability of Indonesia. Figure 1a and Figure 1b shows the level and first differences correlation of the two variables. Figure 1a indicates significant negative correlation between the surplus/deficit and liability with correlation coefficient being -0.8087. This suggests that the net borrowing decreases when the surplus/deficit increases. This seems to indicate that some kind of Ricardian fiscal policy is at work. From figure 1b, similar result is obtained. The correlation coefficient of the first differences of the two variables is -0.7839.

The VAR estimation for Indonesia is as below:

$$\Delta S_t = 0.000640 - 0.312 \Delta S_{t-1} - 0.108 \Delta S_{t-2} + 0.124 \Delta B_{t-1} + 0.324 \Delta B_{t-2} \quad (6)$$

$$\Delta B_t = -0.000435 - 0.232 \Delta B_{t-1} - 0.182 \Delta B_{t-2} - 0.502 \Delta S_{t-1} - 0.262 \Delta S_{t-2} \quad (7)$$

$\Delta S_t$  and  $\Delta B_t$  denote the first difference of surplus/deficit and liability respectively. From the estimation, there is a case that there exists a negative correlation between the two variables.

Figure 7a and 7b show the impulse response function for the two variables with different ordering. The figures indicate that one S.D. innovation in  $\Delta S_t$  causes a positive but decreasing response of  $\Delta S_t$ . From the figure also, one S.D. innovation of  $\Delta S_t$  induces a negative response of  $\Delta B_t$  from period 1 to 2. Beyond period 2 the positive response turns to be insignificant. This is reflecting some signs of a Ricardian fiscal regime in the period covered.

Next we analyze the case of Malaysia. The correlation of surplus/deficit and liability at level and first differences are shown in figure 2a and 2b. In the figures, we observe a significant negative correlation between the surplus/deficit and liability with the correlation coefficient calculated as -0.6279 for the level, and -0.6787 for the first difference case.

$$\Delta S_t = 0.00846 + 0.621 \Delta S_{t-1} + 0.238 \Delta S_{t-2} + 0.626 \Delta B_{t-1} + 0.609 \Delta B_{t-2} \quad (8)$$

$$\Delta B_t = 0.0000984 - 0.455 \Delta B_{t-1} - 0.0598 \Delta B_{t-2} - 0.375 \Delta S_{t-1} - 0.228 \Delta S_{t-2} \quad (9)$$

From the VAR estimation, it indicates strong negative correlation between  $\Delta S_t$  and  $\Delta B_t$ . The impulse response function is reflected in figure 8a and 8b with different ordering. From figure 8a, it is significant that one S.D. innovation of  $\Delta S_t$  induces a strong positive response of  $\Delta S_t$ , for both ordering. This is similar to the case of Indonesia. The response of  $\Delta B_t$  to  $\Delta S_t$ , are also negative up to 4 period before turning to become insignificant. Therefore, for Malaysia too, the test results seem to indicate fiscal regime has been a Ricardian rather than a non Ricardian.

The analysis on Philippines has been split to 2 portions, due to reason as previously stated. Referring to figure 3a and 3b, correlation coefficient are -0.8219 and -0.7658 respectively at level and first difference for surplus/deficit over domestic liability, while from figure 4a and 4b, the coefficient are -0.7561 and -0.4421 respectively at level and first difference for surplus/deficit over foreign liability.

$$\Delta S_t = 0.000351 - 0.110 \Delta S_{t-1} - 0.466 \Delta S_{t-2} + 0.0730 \Delta B_{t-1} - 0.573 \Delta B_{t-2} \quad (10a)$$

$$\Delta B_t = -0.000936 + 0.0376 \Delta B_{t-1} - 0.0671 \Delta B_{t-2} - 0.490 \Delta S_{t-1} - 0.164 \Delta S_{t-2} \quad (10b)$$

$$\Delta S_t = 0.000351 - 0.183 \Delta S_{t-1} + 0.106 \Delta S_{t-2} - 0.0730 \Delta B_{t-1} + 0.573 \Delta B_{t-2} \quad (11a)$$

$$\Delta B_t = 0.000585 - 0.345 \Delta B_{t-1} - 0.203 \Delta B_{t-2} - 0.417 \Delta S_{t-1} - 0.737 \Delta S_{t-2} \quad (11b)$$

The VAR estimation from equation 10a to 11b indicates some negative correlation between  $\Delta S_t$  and  $\Delta B_t$ . Further analysis on impulse response function from figure 9a and 9b with first ordering imply that one S.D. innovation of  $\Delta S_t$  induces a positive but declining response of  $\Delta S_t$  for the first 2 period. Also from figure 9a, one S.D. innovation of  $\Delta S_t$  also induces a negative response of  $\Delta B_t$  for the first 2 periods. However, the response of  $\Delta B_t$  to  $\Delta S_t$  is not significant in figure 9b.

Figure 9c and 9d indicate some same results, that is one S.D. innovation of  $\Delta S_t$  induces a positive and declining response of  $\Delta S_t$  for the first 2 periods. Looking at the same figure, the response of  $\Delta B_t$  to  $\Delta S_t$  is significant for both figures. Therefore, analysis on Philippines indicate that the fiscal regime may be of Ricardian.

Controversially, Singapore exhibits non similar result compare to other ASEAN nations. The correlation coefficient between surplus/deficit and liability of level and first differences ( as shown in figure 5a and 5b ) are 0.002134 and 0.4800 respectively. This weak positive correlation hints that a Non Ricardian regime may be present. On top of that, the VAR estimation indicates some positive correlation between  $\Delta S_t$  and  $\Delta B_t$ .

$$\Delta S_t = 0.00184 - 0.355 \Delta S_{t-1} + 0.111 \Delta S_{t-2} - 0.0536 \Delta B_{t-1} - 0.0216 \Delta B_{t-2} \quad (12)$$

$$\Delta B_t = 0.00133 - 1.369 \Delta B_{t-1} - 0.520 \Delta B_{t-2} - 0.510 \Delta S_{t-1} - 0.397 \Delta S_{t-2} \quad (13)$$

The impulse responses in figure 10a and 10b with different ordering indicates that one S.D. innovation of  $\Delta S_t$  induces some positive response of  $\Delta S_t$ . However, the response of  $\Delta B_t$  to  $\Delta S_t$  are positive in figure 10a. On the contrary, figure 10b indicates negative response of  $\Delta B_t$  to  $\Delta S_t$ . Therefore, although not clearly indicative yet, the overall tests point Singapore's to be of Non Ricardian regime.

Finally, Thailand's correlation results resembles Indonesia and Malaysia. Figure 6a and 6b's correlation coefficients are -0.9154 and -0.7435 at level and first difference respectively. The result of the VAR estimation in equation (14) and (15) indicates also moderate negative correlation between  $\Delta S_t$  and  $\Delta B_t$ .

$$\Delta S_t = 0.00215 + 0.582 \Delta S_{t-1} - 0.124 \Delta S_{t-2} + 0.365 \Delta B_{t-1} - 0.221 \Delta B_{t-2} \quad (14)$$

$$\Delta B_t = -0.00264 - 0.368 \Delta B_{t-1} - 0.312 \Delta B_{t-2} - 0.509 \Delta S_{t-1} - 0.344 \Delta S_{t-2} \quad (15)$$

From the impulse response function reflected in figures 11a and 11b, one S.D. innovation of  $\Delta S_t$  induces a positive response of  $\Delta S_t$  up to 4 periods before the response becomes insignificant regardless of ordering. From another view in figure 11b, it indicate one S.D. innovation of  $\Delta S_t$  induces also a negative response of  $\Delta B_t$  up to 5 periods. Therefore, Thailand can be categorized as a country that practice Ricardian regime.

In general, the correlation analysis, VAR estimation and impulse response functions favors the conclusion that ASEAN 5 except Singapore are prone to have implemented a Ricardian rather than Non Ricardian regime in the past decades.

### **Fiscal and Monetary Policy Interactions Test Results**

From table 1, all 5 countries reflect changes in surplus/deficit does not Granger-cause changes in the short-term interest rate, and  $\Delta S$  does not Granger-cause  $\Delta \pi$  either, except for Singapore and Thailand. The change in the short-term interest rate does not Granger-cause the surplus/deficit change except for Indonesia and Thailand. Results of change in inflation rate Granger-causes  $\Delta S$  are different among the 5 countries.  $\Delta \pi$  does Granger-cause  $\Delta S$  in the case of Indonesia for both 2 and 4 lags. For Singapore and Thailand,  $\Delta S$  Granger-causes  $\Delta \pi$  when 4 lags is used for estimation. It should be noted that the results may be sensitive to the periods covered.

In general, the Granger-Causality tests indicate that the causality between the surplus/deficit, interest rate and inflation rate is asymmetric: The surplus/deficit does not Granger-cause the interest, while the interest rate and inflation may, to some extent, Granger-cause the surplus/deficit. This suggests that fiscal policy is to some degree, affected by monetary policy. These findings, to some extend, resembles Semmler and Zhang (2004) observation on Germany, France and Italy, as per in table 2.

## CONCLUSION

This paper explores whether ASEAN 5 have been practicing Ricardian or Non Ricardian regime. We first present the correlation coefficients between surplus/deficit and liability, in level and first difference. Next, we undertake estimation using VAR and obtained the regression model. Finally, impulse response functions were generated to study the effect of first difference of surplus/deficit on the first difference of liability and vice versa for ASEAN 5. This three tests of fiscal regimes indicate that the four countries of Indonesia, Malaysia, Philippines and Thailand have implemented Ricardian fiscal policy in the covered period. Singapore, however, has shown signs of practicing Non Ricardian regime for the past two decades.

We also undertake Granger-Causality tests to examine monetary and fiscal policy interactions. All ASEAN 5 countries indicate change in the surplus/deficit does not Granger-cause the change in the short-term interest rate, and change in surplus/deficit does not Granger-cause change in inflation rate either, except for Singapore and Thailand. Although surplus/deficit does not Granger-cause interest rate, interest rate and inflation may, to some extent, Granger-cause the surplus/deficit. In short, the Granger-Causality tests indicate that the causality between the surplus/deficit, interest rate and inflation rate is asymmetric.

Both results above have reveal some useful information for ASEAN 5 countries prior to monetary union consideration and possible implementation in the future. Although preliminary analysis has shown that Singapore was not part of the group that practice Ricardian regime, further analysis have to be made to detail out the rational and embedded elements behind.

EMU, so far, has been successful and one major reason of it is strong political commitment from member governments. ASEAN 5 will have to reference this as the foundation for future economic integration, despitess on the fact that symmetrical of monetary shocks and similarity in fiscal regime are important. If political drive to move forward from each of the member country is not propulsive enough, this shall be the major stumbling block of monetary union.

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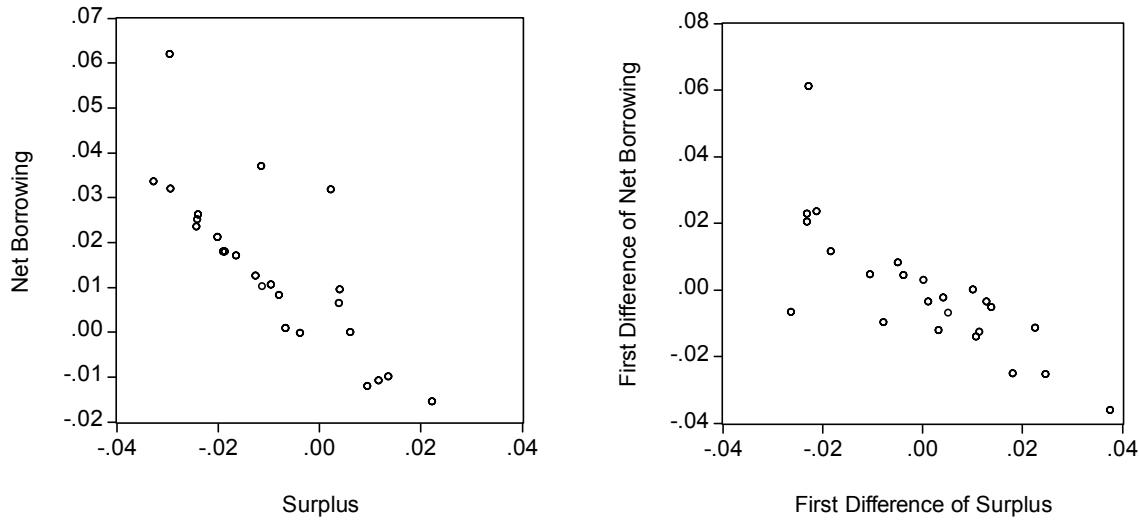
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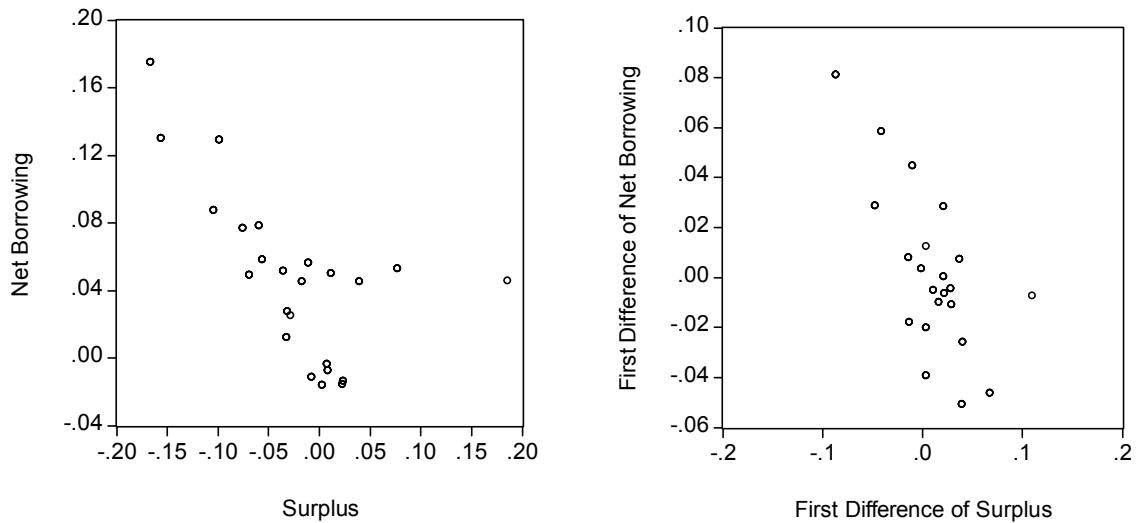
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## APPENDIXES



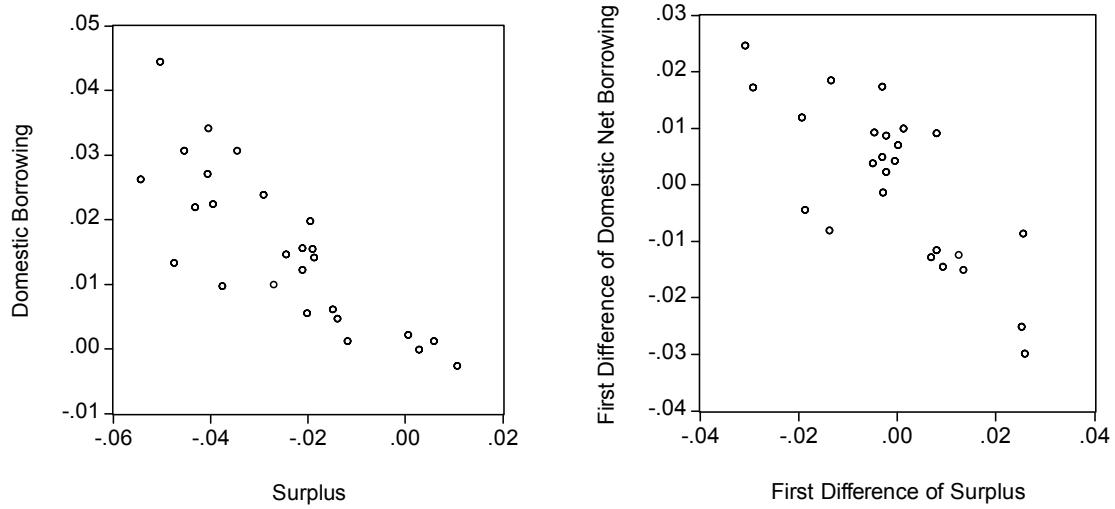
Correlation coefficient are -0.8087 and -0.7839 respectively

**Figure 1a & 1b: Surplus/deficit and liability ( net borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Indonesia**



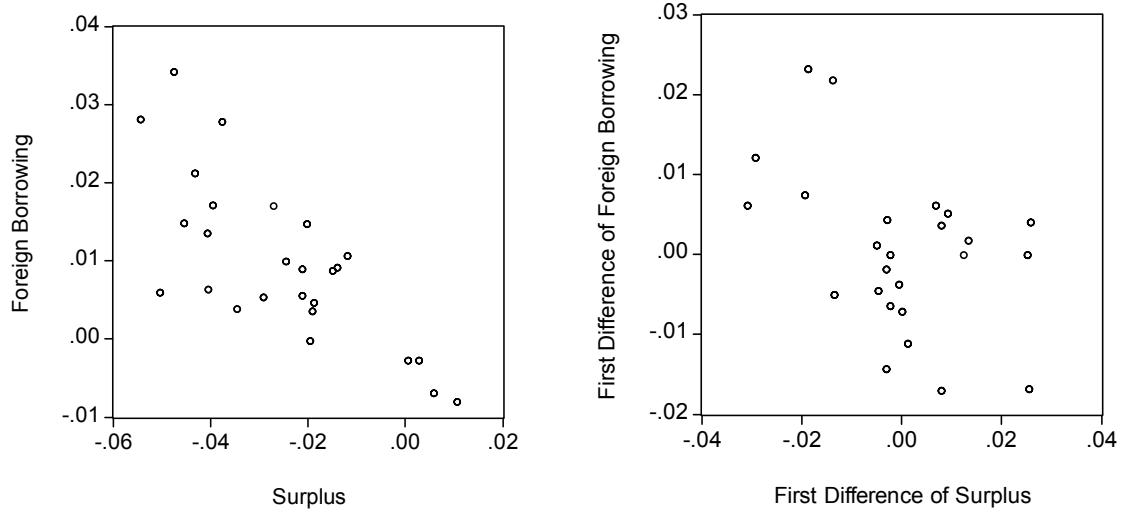
Correlation coefficient are -0.6279 and -0.6787 respectively

**Figure 2a & 2b: Surplus/deficit and liability ( net borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Malaysia**



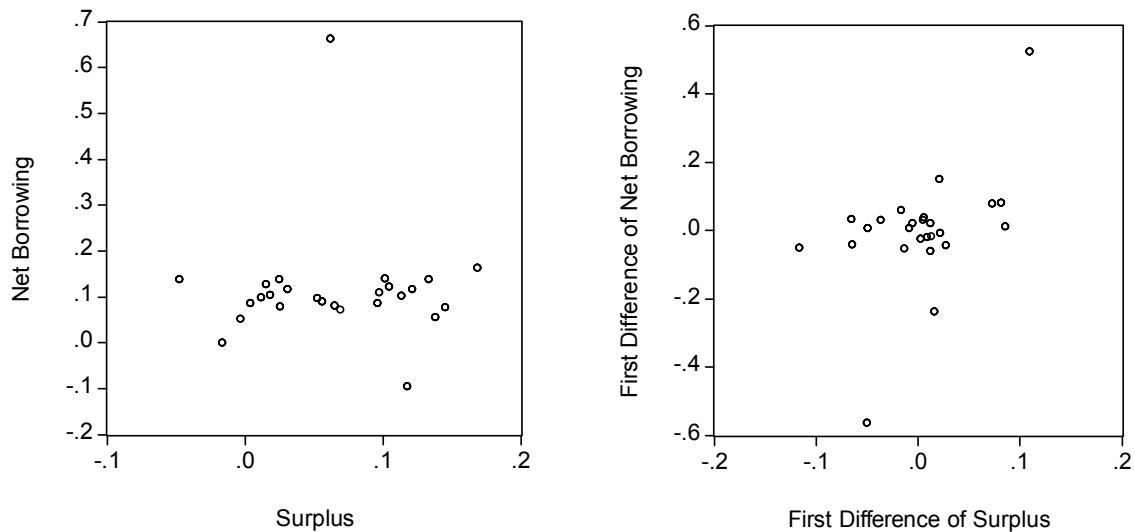
Correlation coefficient are -0.8219 and -0.7658 respectively

**Figure 3a & 3b: Surplus/deficit and liability ( domestic borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Philippines**



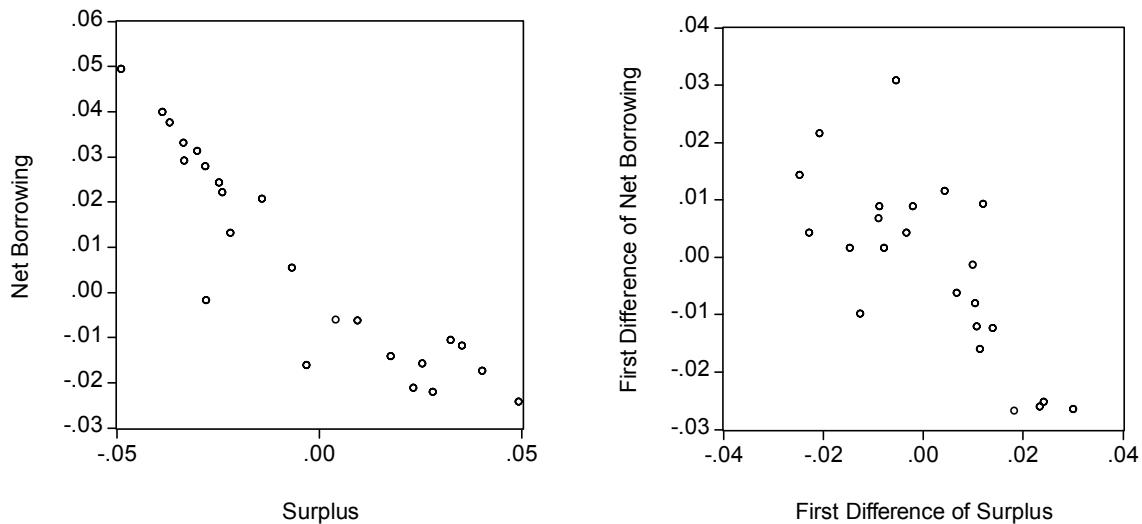
Correlation coefficient are -0.7561 and -0.4421 respectively

**Figure 4a & 4b: Surplus/deficit and liability ( foreign borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Philippines**



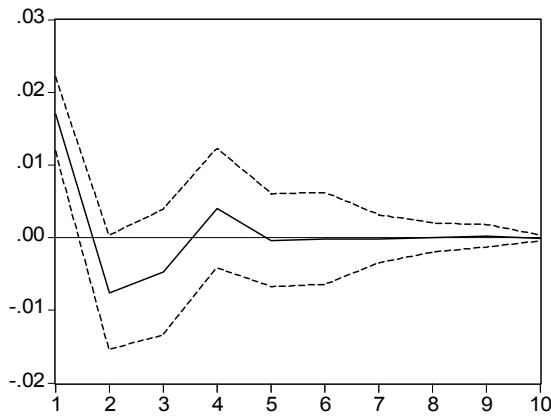
Correlation coefficient are 0.002134 and 0.4800 respectively

**Figure 5a & 5b: Surplus/deficit and liability ( net borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Singapore**

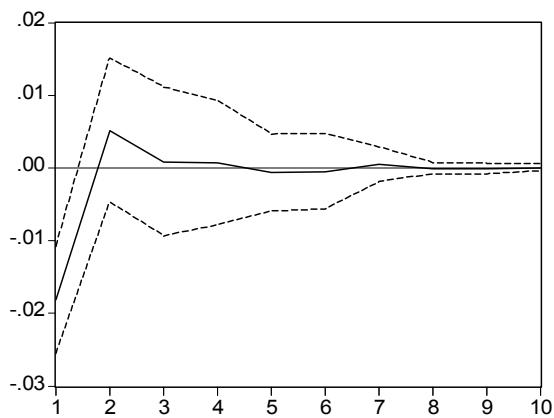


Correlation coefficient are -0.9154 and -0.7435 respectively

**Figure 6a & 6b: Surplus/deficit and liability ( net borrowing ) and first difference of surplus/deficit and liability ( net borrowing ) of Thailand**

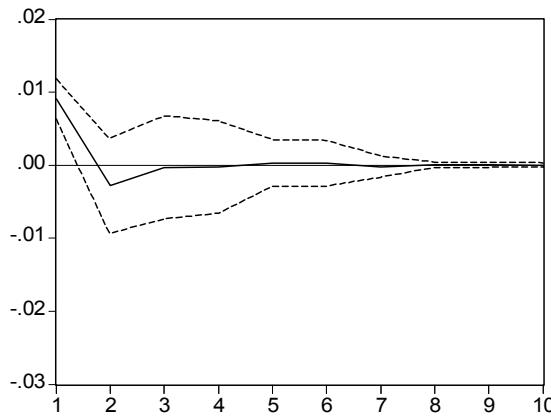


Response of  $\Delta S$  to  $\Delta S$

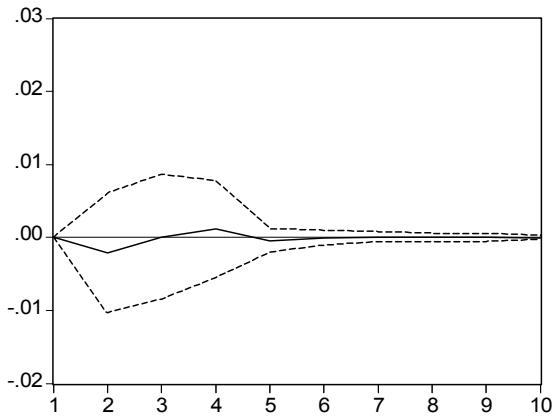


Response of  $\Delta B$  to  $\Delta S$

**Figure 7a: Response to one S.D. innovation (Indonesia) with ordering  $\Delta S_t, \Delta B_t$**

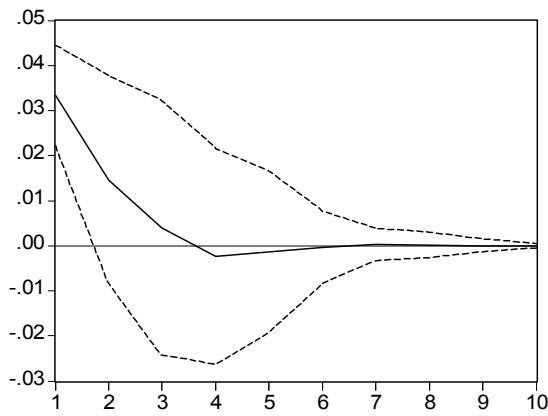


Response of  $\Delta S$  to  $\Delta S$

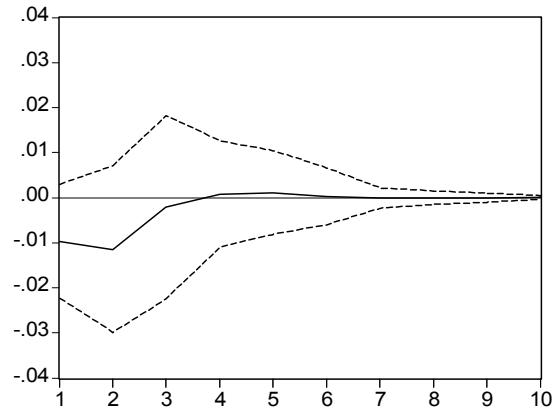


Response of  $\Delta B$  to  $\Delta S$

**Figure 7b: Response to one S.D. innovation (Indonesia) with ordering  $\Delta B_t, \Delta S_t$**

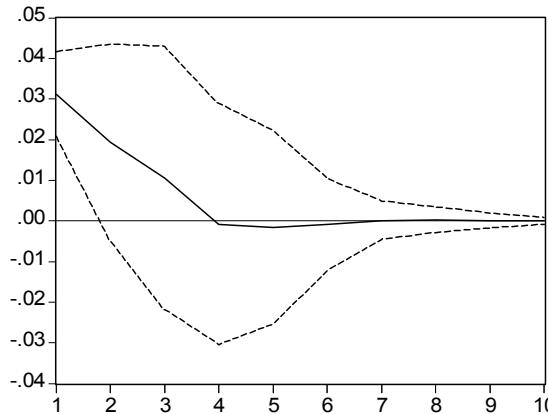


Response of  $\Delta S$  to  $\Delta S$

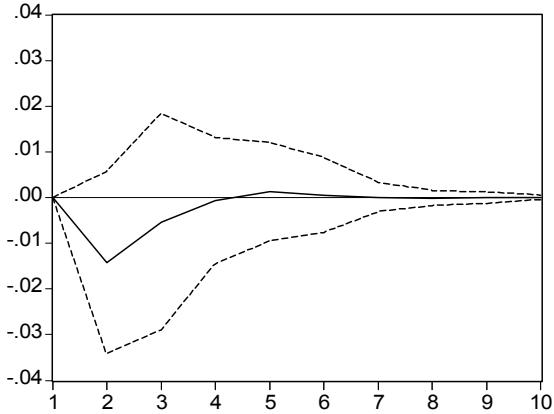


Response of  $\Delta B$  to  $\Delta S$

**Figure 8a: Response to one S.D. innovation (Malaysia) with ordering  $\Delta S_t, \Delta B_t$**

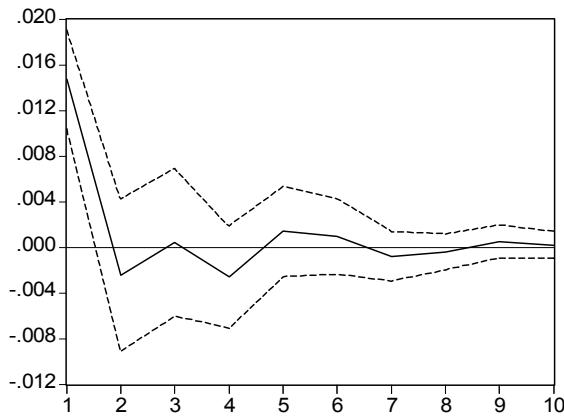


Response of  $\Delta S$  to  $\Delta S$

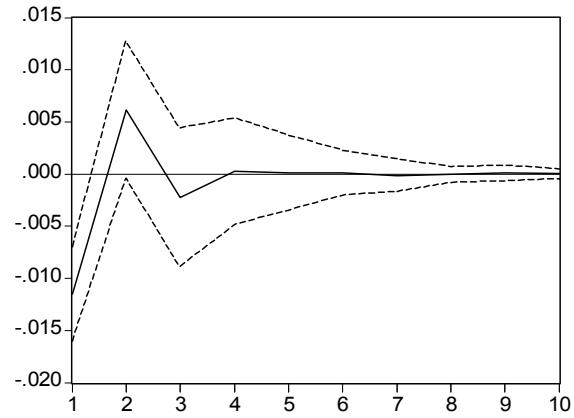


Response of  $\Delta B$  to  $\Delta S$

**Figure 8b: Response to one S.D. innovation (Malaysia) with ordering  $\Delta B_t, \Delta S_t$**

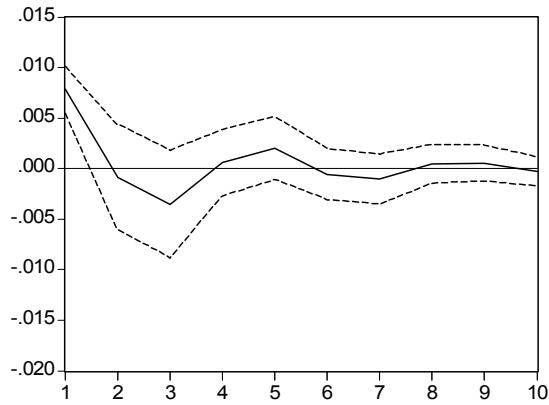


Response of  $\Delta S$  to  $\Delta S$

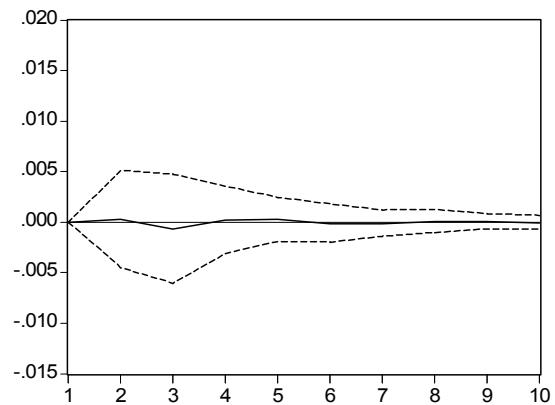


Response of  $\Delta B$  to  $\Delta S$

**Figure 9a: Response to one S.D. innovation (Philippines) with ordering  $\Delta S_t, \Delta B_t$  (domestic borrowing)**

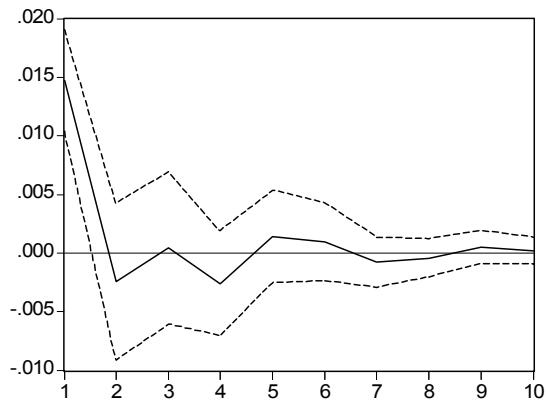


Response of  $\Delta S$  to  $\Delta S$

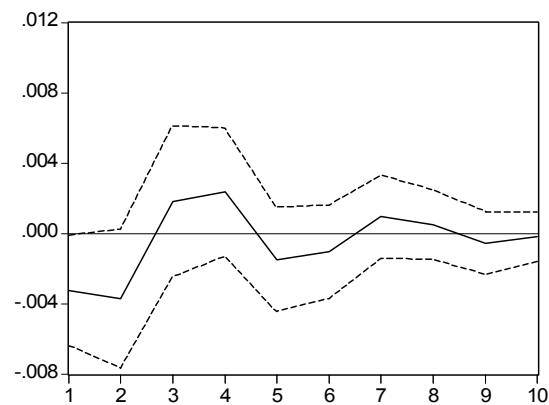


Response of  $\Delta B$  to  $\Delta S$

**Figure 9b: Response to one S.D. innovation (Philippines) with ordering  $\Delta B_t, \Delta S_t$  (domestic borrowing)**

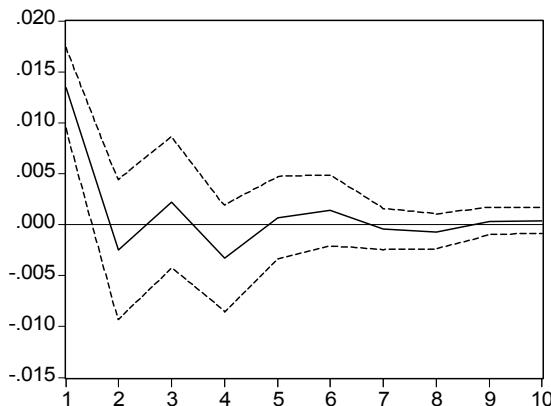


Response of  $\Delta S$  to  $\Delta S$

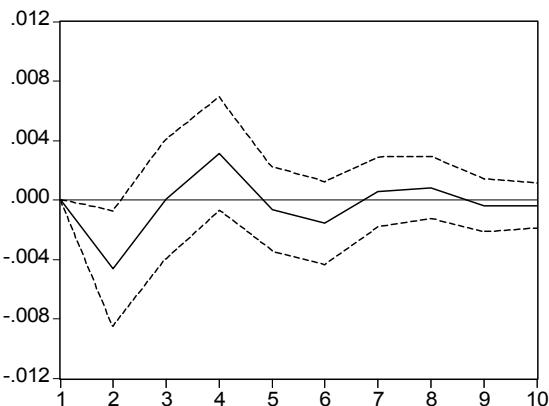


Response of  $\Delta B$  to  $\Delta S$

**Figure 9c: Response to one S.D. innovation (Philippines) with ordering  $\Delta S_t, \Delta B_t$  (foreign borrowing)**

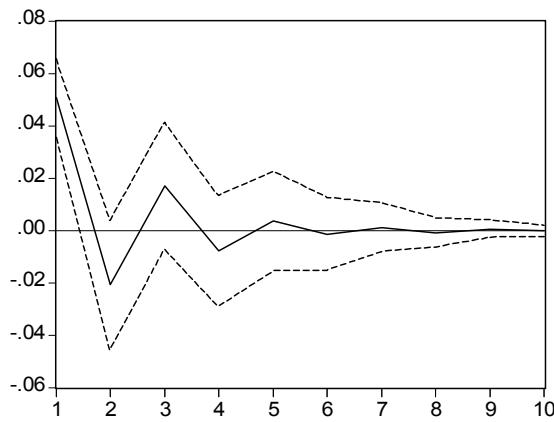


Response of  $\Delta S$  to  $\Delta S$

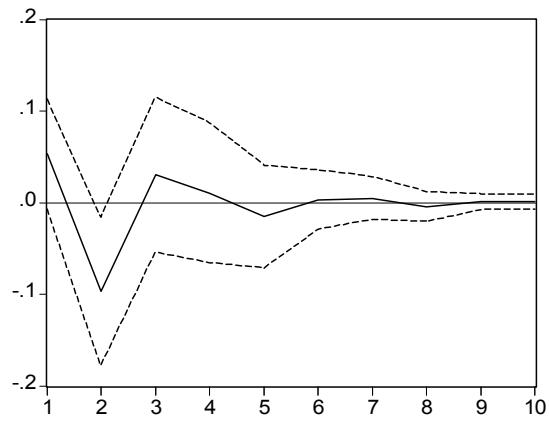


Response of  $\Delta B$  to  $\Delta S$

**Figure 9d: Response to one S.D. innovation (Philippines) with ordering  $\Delta B_t, \Delta S_t$  (foreign borrowing)**

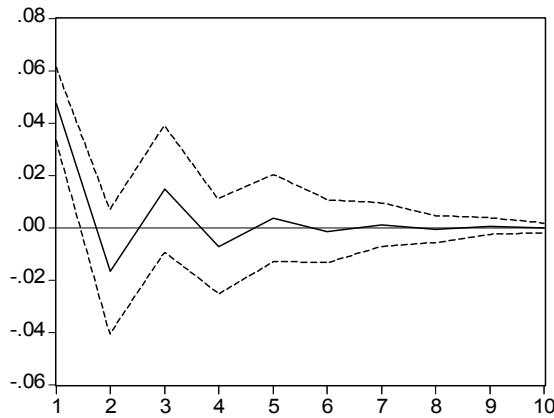


Response of  $\Delta S$  to  $\Delta S$

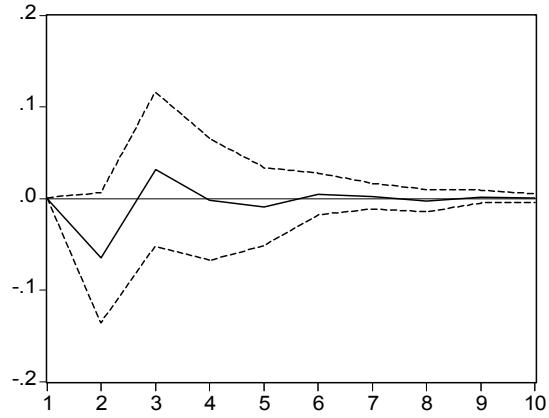


Response of  $\Delta B$  to  $\Delta S$

**Figure 10a: Response to one S.D. innovation (Singapore) with ordering  $\Delta S_t, \Delta B_t$**

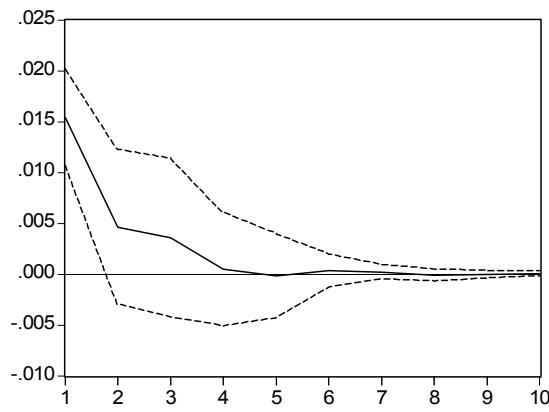


Response of  $\Delta S$  to  $\Delta S$

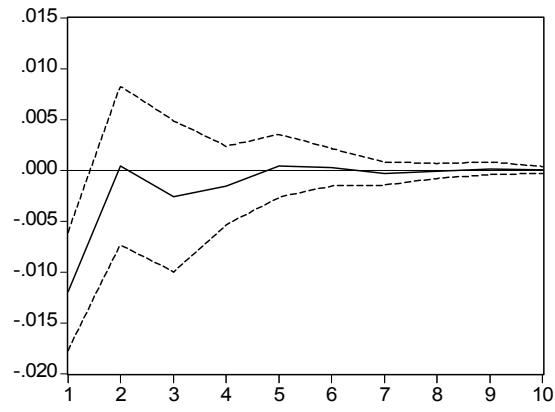


Response of  $\Delta B$  to  $\Delta S$

**Figure 10b: Response to one S.D. innovation (Singapore) with ordering  $\Delta B_t, \Delta S_t$**

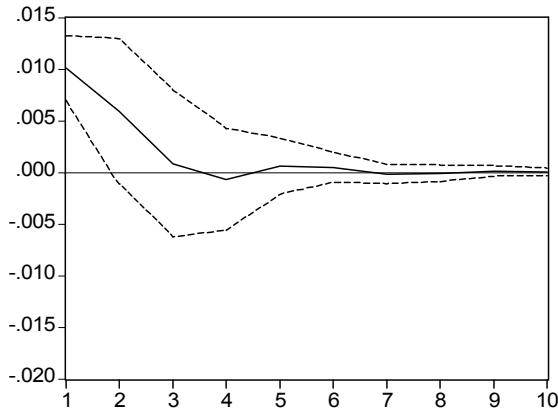


Response of  $\Delta S$  to  $\Delta S$

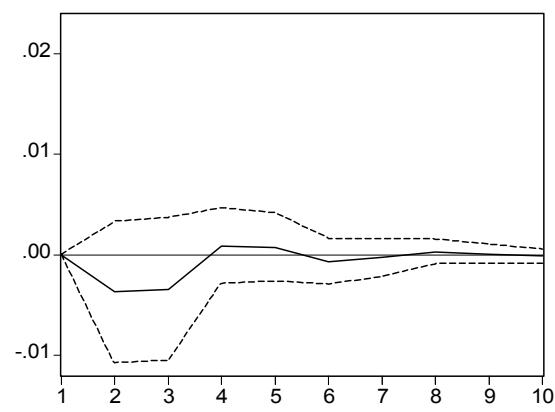


Response of  $\Delta B$  to  $\Delta S$

**Figure 11a: Response to one S.D. innovation (Thailand) with ordering  $\Delta S_t, \Delta B_t$**

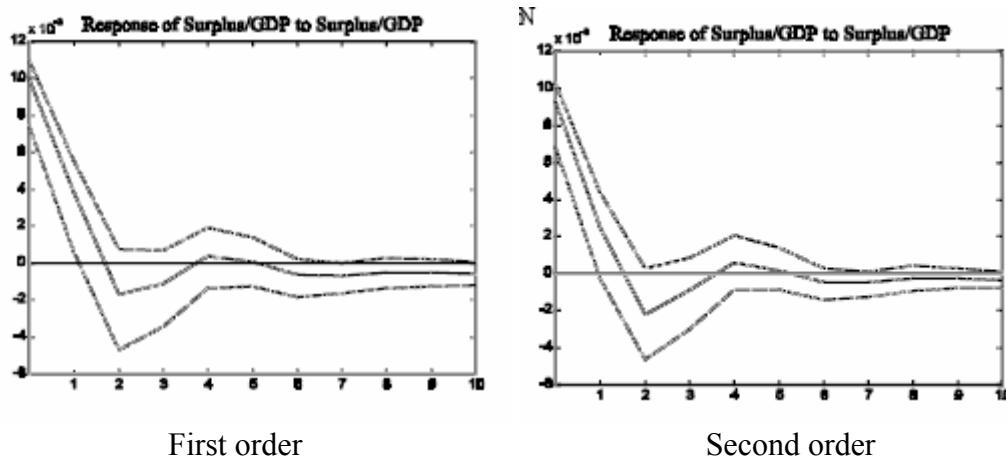


Response of  $\Delta S$  to  $\Delta S$



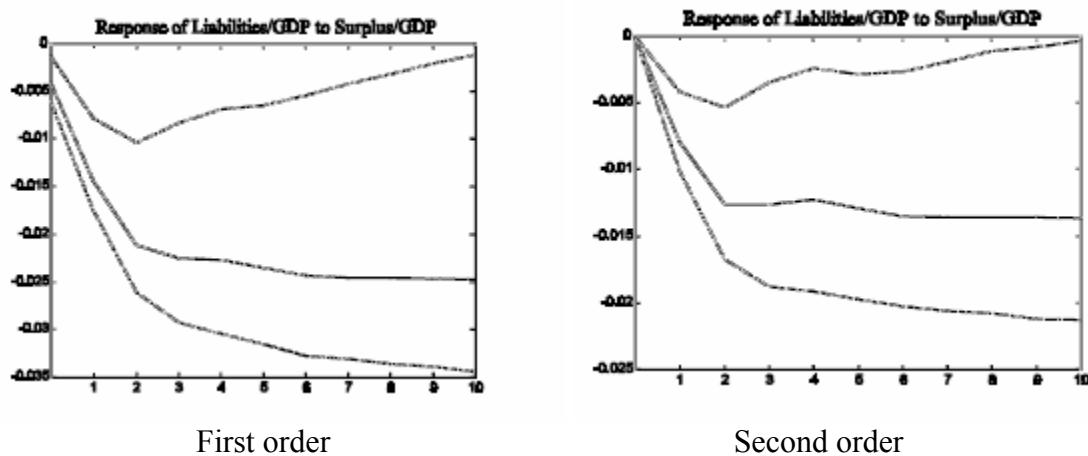
Response of  $\Delta B$  to  $\Delta S$

**Figure 11b: Response to one S.D. innovation (Thailand) with ordering  $\Delta B_t, \Delta S_t$**



**Figure 12: Response of (surplus/deficit)/GDP to (surplus/deficit)/GDP in first order and second order**

Source: Canzoneri, Matthew B, et.al (2001)



**Figure 13: Response of liabilities/GDP to (surplus/deficit)/GDP in first order and second order**

Source: Canzoneri, Matthew B, et.al (2001)

**Table 1: Granger-Causality test results for ASEAN 5.**

Country	$\Delta S \rightarrow \Delta R$	$\Delta R \rightarrow \Delta S$	$\Delta S \rightarrow \Delta \pi$	$\Delta \pi \rightarrow \Delta S$
Indonesia	No* No**	Yes* Yes**	No* Yes**	Yes* Yes**
Malaysia	No* No**	No* No**	No* No**	No* No**
Philippines	No* No**	No* No**	No* No**	No* No**
Singapore	No* No**	No* No**	No* Yes**	No* No**
Thailand	No* No**	Yes* Yes**	Yes* Yes**	No* No**

\* means 2 lags is used and \*\* means 4 lags is used for test

**Table 2 : Granger-Causality test results for Germany, France and Italy.**

Country	$\Delta S \rightarrow \Delta R$	$\Delta R \rightarrow \Delta S$	$\Delta S \rightarrow \Delta \pi$	$\Delta \pi \rightarrow \Delta S$
Germany	No* No**	No* Yes**	Yes* No**	No* No**
France	Yes* Yes**	No* Yes**	Yes* No**	Yes* No**
Italy	No* No**	Yes* Yes**	No* No**	No* Yes**

\* means 4 lags is used and \*\* means 8 lags is used for test

Source: Semmler and Zhang (2004)