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THE RELATIVE IMPORTANCE OF INTERNATIONAL AND DOMESTIC SHOCKS ON THE MALAYSIAN ECONOMY

MOHD AZLAN SHAH ZAIDI

ABSTRACT

Following its rapid transformation from an agricultural-dependent economy into a manufacturing-based and export-oriented economy industry, it might be expected that Malaysia has become more susceptible to external shocks. If this is the case, then formulation of macroeconomic policy will need to take into account not only the domestic disturbances, but also their foreign counterparts. This paper investigates the relative importance of international and domestic shocks in affecting the Malaysian economy. Three different specifications are used to represent the external sector for Malaysia. The first model combines US and Japanese variables to represent the world economy. As a comparison, the other two models use US and Japanese variables by themselves, to capture the external sector. Using structural vector autoregressive analysis with non-recursive identification framework in each model, the main findings suggest that domestic shocks play the major role in determining short-run variation in real and financial variables in Malaysia. In the medium to longer term is where foreign shocks play a more important role. The only exceptions are for inflation and the exchange rate where foreign factors are dominant both in the short and long term. Relative to the use of a weighted average of US and Japanese variables, the use of US or Japanese variables alone to represent foreign sector, frequently produces quite different estimates of the influence of foreign (and domestic) shocks on the Malaysian economy.

INTRODUCTION

The relative importance of foreign and domestic factors in affecting the behaviour of an economy has been examined by a number of empirical studies: see Genberg, Salemi and Swoboda (1987) for Switzerland; Dungey and Pagan (2000), Dungey and Fry (2003) and Buncic and Melecky (2007) for Australia; Buckle, Kim, Kirkman, McLellan and Sharma (2007) for New Zealand, and Horvath and Rusnak (2009) for Slovakia. Such studies have been undertaken for economies with either a fixed and/or flexible exchange rate regime, since neither type of regime is able to fully insulate an economy from the external disturbances[1].

In macroeconomic models of Malaysia, the United States (US) has been commonly used to represent the external (or world) economy (see Chua, Dibooglu & Sharma, 1999; Ibrahim, 2003, 2004; Tang, 2006 and Mackowiak, 2007). This choice reflects the fact that the US is one of Malaysia's major trading partners and source of foreign direct investment (FDI). However the studies by Chua et al. and Ibrahim (2004) also consider the effects of the Japanese economy on Malaysia. Japan has increasingly become one of Malaysia's major trading partners. From 1980 to 2007, Malaysian exported more to the US (about 18 percent of total Malaysian exports) than to Japan (about 15 percent of total exports). On the other hand, Malaysia imported more from Japan (22 percent of total imports) than from the US (16 percent of total imports). In terms of total trade, Japan is marginally more important than the US – Japan accounted for about 18 percent of total Malaysian trade compared to 17 percent for the US[2].

Despite its significant trade links with Malaysia, the effects of Japanese shocks have not been extensively analysed in macroeconomic studies of Malaysia. Chua et al. (1999) and Ibrahim (2004) allow a somewhat limited role for Japanese factors in their studies. Chua et al. include Japanese output and a

[1] Studies that explicitly examine the effects of foreign shocks on domestic variables under different exchange rate regimes include Batten and Ott (1985), Burbidge and Harrison (1985), Genberg et al (1987), Genberg and Salemi (1987), Kuszczak and Murray (1987) and Burdekin (1989) and Lastrapes and Koray (1990)

[2] Calculations are based on annual export and import data from various issues of the Quarterly Bulletin of the Bank Negara Malaysia.

Japanese monetary aggregate, while Ibrahim only considers Japanese output. Both include US variables in their studies. As Malaysia has become more integrated with international financial markets, it seems likely that foreign financial variables may need to be included in Malaysian macroeconomic models[3]. It is possible that shocks to monetary policy or to other financial variables in foreign countries have a substantial effect on real and financial activity in Malaysia.

This paper examines the relative importance of foreign versus domestic shocks (both real and financial) in affecting the behaviour of macroeconomic variables in Malaysia. Using a SVAR model with a non-recursive identification scheme, it investigates the interrelationship between five international variables (commodity prices, real output, inflation, interest rates and asset prices) and six domestic variables (real output, inflation, the interest rate, credit, asset prices and the exchange rate). Three fundamental models are developed. The first model looks at the relative importance of shocks when the US and the Japanese variables are combined and treated as representing the world economy. Specifically, each US variable is combined with the corresponding Japanese variable using a trade weighted approach to produce an international variable. Then as a comparison, the second model only uses the US variables, while the third model uses only the Japanese variables in the external sector. The models are analysed using variance decompositions and impulse response functions.

To identify the SVAR model, an informal approach based on standard theory and information availability is used. This follows the approach of previous studies on Malaysia, particularly Ibrahim (2003) and Tang (2006). An alternative strategy involves imposing the restrictions implied from a fully-specified dynamic stochastic general equilibrium (DSGE) model. This is left to future research.

This paper is organised as follows. Next section discusses some previous empirical studies on the role of external shocks. The following two sections describe the data and outline the methodological framework respectively. The next section that follows presents the results while the last section concludes with some policy implications.

LITERATURE REVIEW

Studies on the relative importance of domestic versus foreign shocks on a small open economy are relatively common. In most studies the US economy is used to represent the external sector: see Genberg et al. (1987) for Switzerland; Lastrapes and Koray (1990) for UK, France and Germany; Cushman and Zha (1997) for Canada; Selover (1997), Dungey and Pagan (2000) and Buncic and Melecky (2007), all for the Australian case.

For Malaysia, Ibrahim (2003), Tang (2006) and Mackowiak (2007) are examples. Ibrahim (2003) employs eight variables (three of which are US variables) in his VAR model. Using a recursive structure, he finds that shocks to US real activity and monetary policy have relatively large impacts on the Malaysian economy. Specifically, Malaysian output responds immediately to a shock to US real activity but only after a lag to a shock to US monetary policy. In addition, shocks to US prices and real activity also influence the exchange rate for Malaysia, which is itself found to have a significant impact on domestic variables.

While employing more US variables than Ibrahim (2003), Tang (2006) emphasizes the relative importance of the transmission mechanisms for a domestic monetary policy shock. Using a recursive SVAR and a channel-shutdown methodology, he finds that the interest rate channel is important in influencing output and inflation over a horizon of about two years, while the influence of the credit channel extends beyond that horizon. The asset price channel is also relevant at shorter horizons (more so than the exchange rate channel); particularly in influencing output. For inflation, the exchange rate channel is more important than the asset price channel.

Mackowiak (2007) studies the effect of US monetary policy shocks on macroeconomic fluctuations in eight emerging markets; Korea, Malaysia, Philippines, Thailand, Hong Kong, Singapore, Chile and Mexico. Using a SVAR model, he finds that a US monetary policy shock rapidly affects the short-term interest rate and the exchange rate in a typical emerging economy. In addition, US monetary shocks explain a larger portion of variance in the aggregate price level and real aggregate output in these emerging markets than they do in the US itself.

There are studies which use more complicated proxies for the external sector: see Moon and Jain (1995) for Korea; Dungey and Fry (2003) for Australia; Buckle et al. (2007) for New Zealand and Horvath

[3] Chinn and Frankel (1995) provide evidence that Malaysian interest rates are linked with both US and Japanese interest rates.

and Rusnak (2009) for Slovakia. Moon and Jain employ a geometrically weighted average of variables from Korea's two main trading partners (Japan and the US) to represent foreign shocks in their study. Using a cointegration technique, they find that foreign factors have a strong influence on the Korean economy. In particular a shock in the foreign interest rate leads to a fairly rapid adjustment of Korean variables - to their new long-run levels.

Dungey and Fry (2003) investigate the effects of Japanese (and US) shocks on the Australian economy. They find that even though the effects of the US shocks are still dominant in explaining Australian fluctuations, the responses are moderated, compared with a model incorporating only a US external shock. They argue that ignoring the Japanese influences on the Australian model tend to overstate the impact of US shocks on Australia.

Horvath and Rusnak (2009) assess the relative importance of foreign and domestic shocks on the Slovakia economy. Estimating a VAR model with a domestic block and a foreign block (the Euro area), they find the monetary policy shocks of the European Central Bank (ECB) have a larger effect on Slovak prices compared to the corresponding National Bank of Slovakia monetary policy shocks. With regards to Slovak output, domestic factors play a bigger role. However the domestic monetary policy shock explains only a small part of the variation in Slovak output. It appears that the Slovak monetary authority responds quite closely to changes in ECB monetary policy.

Buckle et al. (2007) develop a large four block SVAR model of the New Zealand economy in an effort to capture the effects of its exposure to a volatile climate, relatively volatile international trade prices and to international financial markets. In total, 13 variables are included in the model, with five representing world variables.[4] The model is successful in eliminating the price and exchange rate puzzles, and suggests that shocks to climate and international trade prices have been a more important source of business cycle fluctuations in New Zealand than international and domestic financial shocks.

In the case of Malaysia, Chua et al. (1999) and Ibrahim (2004) are relevant studies. Chua et al. examine the effect of US and Japanese macroeconomic shocks (to aggregate output and money supply) on output variability in Korea and Malaysia, before and after, the Plaza accord of 1985. They find that foreign shocks explain a high proportion of output variability of Korea and Malaysia. In addition, they show that US influence on Korea and Malaysia has declined, while the Japanese influence has increased. Ibrahim mainly investigates the effect of US and Japanese output on the aggregate and sectoral outputs of Malaysia. He finds that while both domestic and foreign disturbances produce aggregate and sectoral output fluctuations, domestic shocks are generally more important. However some sectors are particularly susceptible to external shocks. Forestry and fishing; manufacturing; electricity, gas and water; and finance, insurance, real estates and business services are affected by Japanese output shocks, while US output shocks affect mining and quarrying; construction; wholesale and retail trade and hotels and restaurants.

Thus, while there has been some previous work, the use of foreign variables in Malaysian studies is somewhat limited. The model in this paper includes a number of foreign variables and aims to provide a more comprehensive analysis than previous studies.

DATA

Following previous studies (e.g. Tang, 2006) the variables that enter the SVAR model are separated into; an external block and a domestic block. The external block consists of real commodity prices, real aggregate output, inflation, an interest rate and real asset prices; while the domestic block comprises real output, inflation, the interest rate, real credit, real asset prices and the real effective exchange rate. The international block is assumed to be block-exogenous to Malaysian macroeconomic variables; see Cushman and Zha (1997) and Zha (1999). In other words, there are no contemporaneous or lagged effects from the domestic variables to the international variables. According to Zha, failing to impose these restrictions in the small open economy model is not only economically unappealing but may result in biased results. Ibrahim (2003) and Tang (2006) do not impose block-exogeniety.[5]

Commodity prices are included in the model for two reasons. First it may serve as a proxy for inflationary expectations (to policy-makers) and may help solve the empirical anomaly of a price puzzle

[4] Foreign real output is represented by the log of trade weighted industrial production of Australia, US, UK, Japan, Germany , Hong Kong, Taiwan and South Korea, while foreign nominal interest rates are represented by a weighted average of Australia, US, UK, Japan and German 90-day interest rates.

[5] In Tang's (2006) model imposing complete block-exogeniety produces an unstable model in which not all of the roots (of the characteristic polynomials) lie outside the unit circle.

(see Sims, 1992; Christiano et al., 1996). Secondly they are relevant to the model as Malaysia is also commodity exporting country. Ibrahim (2003) does not employ this variable but Tang (2006) does. Kim and Roubini (2000) use oil prices rather than commodity prices in their SVAR analysis of the non-US G7 countries. The study opt not to use this indicator as Malaysia is also an oil producer and the oil price in the domestic market is heavily regulated[6].

Foreign output is a trade-weighted aggregate of gross domestic product (GDP) for the US and Japan. A similar approach is employed by Dungey and Fry (2003), Buckle et al. (2007) in their models. To construct this measure both GDPs are converted to a common currency. In this case, Japanese GDP is converted to US dollars.

For other foreign variables; inflation, the interest rate and asset prices, a similar trade- weighted approach is employed. Inflation is calculated as quarterly changes in the consumer price indices for each country. Foreign interest rates are measured by the Federal Funds rate for the US and the call money rate for Japan. The share price indices for the two countries (NYSE composite index for the US and Nikkei Stock average for Japan) are treated as an indicator of external asset prices.

The domestic variables are similar to those for the international sector except that real credit and the exchange rate are included. Specifically, the variables are: real aggregate output (Malaysian real GDP), inflation (quarter-on-quarter percentage change in the consumer price index (CPI)), the interest rate (3-month interbank rate), real credit (corresponds to total loans and outstanding from banking institutions, deflated by the CPI), real asset price (Malaysian share price index deflated by the CPI) and the exchange rate (the real effective exchange rate).

All variables are transformed into natural logs except for foreign and domestic inflation and both foreign and domestic policy interest rates. The sample period runs from 1982:2 until 2008:1, covering the two major recessions of 1985/86 and 1997/98. To capture the effects of the economic recession, two dummies are used, a 1985/86 economic recession dummy (DER) and a dummy for the 1997/98 Asian crisis (DAC). DER is set to equal to one from 1985:2 to 1986:2 and zero otherwise. DAC is one from 1997:4 to 1998:4 and zero otherwise. Data are taken from International Financial Statistics database, DataStream and various publications of Monthly Bulletin of Bank Negara Malaysia (BNM).

With the possible exception of both domestic and foreign inflations, all of the variables in used in the study are potentially non-stationary due to the presence of either deterministic or stochastic trends. This raises the question as to whether the SVAR model should be specified in first-differences rather than in levels. Ramaswamy and Slok (1998) discuss the trade-off between the loss of efficiency (when the VAR is estimated in levels, but without imposing any cointegrating relationships) and the loss of information (when the VAR is estimated in first-differences). In essence, they recommend that in cases where there is no prior economic theory that can suggest either the number of long-run relationships or how they should be interpreted, it is reasonable not to impose cointegration restrictions on the VAR model. Their recommendation is followed in this paper; the SVAR model is specified in levels.

SVAR METHODOLOGY

This section outlines the SVAR model that is to capture the interrelationships between the foreign and domestic macroeconomic variables. The SVAR model is given below;

$$BY_t = C + (\Gamma_1 L + \Gamma_2 L^2 + ... + \Gamma_k L^k)Y_t + \varepsilon_t \qquad [1]$$

where B is a square matrix consisting of the contemporaneous structural parameters of the model, Y_t is n x 1 matrix of macroeconomics variables, C is a vector of deterministic variables, $\Gamma(L)$ is a k'th order matrix polynomial in the lag operator L and ε_t is the structural innovation which satisfies the conditions that $E(\varepsilon_t) = 0$, $E(\varepsilon_t \varepsilon_s^{'}) = \Sigma_\varepsilon = I$ for all $t = s$ and $E(\varepsilon_t \varepsilon_s^{'}) = 0$ otherwise.

Multiplying equation [1] with B^{-1}, gives the following reduced-form VAR equation;

$$Y_t = B^{-1}C + B^{-1}(\Gamma_1 L + \Gamma_2 L^2 + ... + \Gamma_k L^k)Y_t + B^{-1}\varepsilon_t \qquad [2]$$

[6] Recently the Malaysian government has reduced the oil price subsidy, thus making the domestic oil price more closely related to the world oil price.

where $e_t = B^{-1}\varepsilon_t$ is a reduced-form residual which satisfies the conditions that $E(e_t)=0$, $E(e_t e_s^{'}) = \Sigma_e$ for all $t = s$ and $E(e_t e_s^{'}) = 0$ otherwise. Σ_e is a (nxn) symmetric, positive definite matrix that can be estimated from the data. The relationship between the variance-covariance matrix of the estimated residuals, Σ_e and the variance-covariance matrix of the pure innovations, Σ_ε is such that

$$\begin{aligned} \Sigma_\varepsilon &= E(\varepsilon_t \varepsilon_t^{'}) \\ &= E(Be_t e_t^{'} B^{'}) = BE(e_t e_t^{'})B^{'} \\ &= B\Sigma_e B' \end{aligned} \qquad [3]$$

In order for the system to be identified, a sufficient number of restrictions must be imposed on *B* so that all of the structural innovations can be recovered from the reduced-form VAR residuals, e_t. Thus for the (nxn) symmetric matrix Σ_e, there are $(n^2+n)/2$ unknowns and hence $(n^2-n)/2$ additional restrictions need to be imposed to exactly identify the system.

Equation [4] shows the restrictions that are imposed on the matrix of contemporaneous parameters *B*. The coefficients β_{ij} indicate how variable j affects variable i contemporaneously. To exactly identify the system 55 coefficients must be restricted. Firstly the coefficients on the diagonal are normalized to one.

The basic order of the variables follows the standard setting in the previous VAR studies for small open economies. The foreign variables are placed above the domestic ones to reflect the transmission process from the foreign sectors to the domestic sectors. The foreign sector is block-exogenous to the Malaysian economy; under the assumption Malaysian shocks will have no significant affect on external variables.

The order of the foreign variables follows that used by of Dungey and Fry (2003), where the commodity price is placed at the top of the order, followed by foreign real GDP, inflation, and the interest rate. Finally real asset prices come after the interest rate (see Dungey & Pagan, 2000). In the domestic block, real credit, real asset prices and the exchange rate are ordered after the policy interest rate, to allow for their role in the transmission of monetary policy.

Strictly speaking the order of the variables is not of first-order importance with a non-recursive identification structure, since contemporaneous relationships can be accounted for by including non-zero elements above the diagonal of the *B* matrix. However for ease of interpretation and comparison with other standard VAR studies it is useful to begin with a recursive structure.

$$BY_t \equiv \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \beta_{21} & 1 & 0 & \beta_{24} & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \beta_{31} & 0 & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \beta_{41} & 0 & \beta_{43} & 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ \beta_{51} & \beta_{52} & \beta_{53} & \beta_{54} & 1 & 0 & 0 & 0 & 0 & 0 & 0 \\ \beta_{61} & \beta_{62} & \beta_{63} & \beta_{64} & \beta_{65} & 1 & 0 & \beta_{68} & \beta_{69} & 0 & 0 \\ \beta_{71} & 0 & 0 & 0 & 0 & 0 & 1 & 0 & 0 & 0 & 0 \\ \beta_{81} & 0 & \beta_{83} & \beta_{84} & \beta_{85} & 0 & \beta_{87} & 1 & \beta_{89} & 0 & \beta_{811} \\ \beta_{91} & \beta_{92} & \beta_{93} & \beta_{94} & \beta_{95} & \beta_{96} & \beta_{97} & \beta_{98} & 1 & 0 & 0 \\ \beta_{101} & \beta_{102} & \beta_{103} & \beta_{104} & \beta_{105} & \beta_{106} & \beta_{107} & \beta_{108} & \beta_{109} & 1 & 0 \\ \beta_{111} & \beta_{112} & \beta_{113} & \beta_{114} & \beta_{115} & \beta_{116} & \beta_{117} & \beta_{118} & \beta_{119} & \beta_{1110} & 1 \end{bmatrix} \begin{bmatrix} LCP_t \\ LFY_t \\ FINF_t \\ FINT_t \\ LFAP_t \\ LMY_t \\ INF_t \\ INT_t \\ LCR_t \\ LAP_t \\ LER_t \end{bmatrix} \qquad [4]$$

The key identifying restrictions are as follows. Commodity prices are allowed to affect all other variables contemporaneously. Foreign output is assumed to have an immediate effect on all variables ordered below it, except for foreign and domestic inflation and foreign and domestic interest rates. Imposing the zero restrictions for the two inflation variables reflects the assumption of short-run price rigidity. Following the same logic domestic inflation is also assumed not to respond contemporaneously to any other variable, except for commodity prices – which potentially acts as a proxy for anticipated inflation. The exclusion of foreign output from (contemporaneously) affecting the domestic policy rate reflects the information lag faced by policy-makers. A zero restriction is also imposed on domestic output.

There are five non-zero restrictions above of the diagonal elements of the *B* matrix. Both foreign and domestic real outputs are assumed to respond contemporaneously to their respective policy rates.[7] This assumption is plausible due to the fact that with quarterly data the real output would have enough time to react (within the same period) to a change interest rates; see Walsh (2003). Domestic output is also allowed to respond contemporaneously to real credit shocks (see Berkelmans, 2006 and Safaei & Cameron, 2003). In theory economic agents can draw on loans provided by the banking system.

In the domestic interest rate equation, policy-makers are assumed to react contemporaneously to all variables except foreign and domestic output, and real asset prices[8]. In the latter case it is assumed that Malaysian policy-makers (in setting the policy rate) give more weight on information from foreign asset markets – which are more developed and liquid – compared to the less developed domestic asset market. Finally as in Cushman and Zha (1997), Kim and Roubini (2000), and Brischetto and Voss (1999), the real exchange rate is allowed to have contemporaneous effect on the domestic interest rate. Since there are a total of 62 restrictions in equation [4], the SVAR model is over- identified.

Estimation

Since the domestic and foreign sectors are block-exogenous, not all equations in the reduced-form VAR have identical right-hand side variables. Thus seemingly unrelated regression (SUR) is used to estimate equation [2] and Σ_e. Maximum likelihood estimation is used to estimate the structural parameters in ***B*.** The log likelihood function is

$$-\frac{T}{2}\ln\left|B^{-1}\Sigma_{\varepsilon}(B')^{-1}\right|-\frac{1}{2}\sum_{t=1}^{T}(\hat{e}_t^{'}B'\Sigma_{\varepsilon}^{-1}B\hat{e}_t) \qquad [5]$$

If there are more than $(n^2-n)/2$ additional restrictions, the system is over-identified. In this case the χ^2 test statistic

$$\chi^2 = \left|\Sigma_e^R\right| - \left|\Sigma_e\right| \qquad [6]$$

with R (number of restrictions exceeding $(n^2-n)/2$) degrees of freedom can be used to test the restricted system. Σ_e^R is the restricted variance-covariance matrix while Σ_e is the unrestricted variance-covariance matrix.

In choosing a lag length for the reduced-form model the individual equations are tested for evidence of first and fourth-order serial correlations, (AR(1) and AR(4)). In addition, two model selection criteria – Akaike (1973) Information Criterion (AIC) and Schwarz (1978) Bayesian Criterion (SBC) – are computed for various numbers of lags. Finally the stability of the model is examined by calculating the eigenvalues of the companion matrix of the VAR model. If all the values are inside the unit circle, the model is stable. This implies that the system process is stationary (see Lutkepohl, 1993).

From the estimated SVAR model variance decomposition and impulse response functions are generated. The variance decomposition computes how much of the forecast error variance of each of the variable in the system can be explained by exogenous shocks to the other variables. Impulse response functions, on the other hand describe how a variable reacts to a shock to other variables in the system.

EMPIRICAL RESULTS

This section discusses the key findings from the SVAR model especially the variance decompositions and impulse response functions.[9] Based on AIC, the lag length of two is chosen for the model. In addition, two lags seem to be sufficient to capture the dynamics of the macroeconomic variables and do not involve the loss of too many degrees of freedom. As for the estimates of the coefficients in *B*, there are only 12 coefficients that are significant at the 5 percent level. Most of the signs of the estimated coefficients are as

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[7] Some SVAR studies do not impose this restriction on their foreign sector. We also test the restrictions in equation [4] without B_{24} assumption and find no significant difference in the results.

[8] Allowing for a contemporaneous effect of foreign interest rates on domestic interest rates has also been found important by Brischetto and Voss (1999).

9 The results of the lag length test and the *B* estimates are not shown in order to conserve space.

expected. The negative sign of B_{68} implies that the policy interest rate has an immediate negative impact on domestic output. Similarly the positive sign of B_{69} indicates that credit has an immediate and positive effect on domestic output. Furthermore, as captured in B_{111}, the exchange rate has a significantly negative impact on the domestic interest rate. The significance of these three variables provides some support for the use of a non-recursive structure in the SVAR model.

Variance decompositions

Tables 1 to 3 summarize the variance decomposition for domestic variables for a 6 year period. Each table corresponds to a different measure for the foreign variables. The final two columns of each table indicate the relative importance of the domestic vis-a-vis the foreign sector in contributing to the forecast error variance of each domestic variable. FF corresponds to a foreign factor and is the sum of the proportions of forecast error variance of the given domestic variable explained by the five foreign variables (LCP, LFY, FINF, FINT and LFAP). DF corresponds to a domestic factor which is the sum of the proportion of forecast error variance of a given domestic variables explained by all the (other) domestic variables. Thus when evaluating the variance decomposition of LCR, DF would refer to the sum of the proportion of forecast error variance explained by LMY, INF, INT, LAP and LER.

As indicated in Table 1 – where the foreign sector is an aggregate of the US and Japanese variables – the forecast error variance of LMY at one quarter is explained largely by its own shocks. At this short-run horizon, the second most important variable is domestic credit shocks, which account for about 12 percent of the domestic output variance. At a two year horizon, foreign shocks (mainly commodity prices) account for about 40 percent of the variation in Malaysian GDP. The remainder of the variation in domestic output is split equally between its own shocks and shocks to other domestic variables. At longer horizons the index of foreign GDP becomes the dominant source of variation in LMY. More generally, over the long-run, the contribution of foreign variables to Malaysian GDP is more important than domestic variables.

Interestingly when US variables alone are used to represent the foreign sector there is a marked decline in the contribution of foreign shocks in explaining Malaysian output. In addition, the short-run contribution of (other) domestic variables also falls, see Table 2. Up to 2 years, most of the variance in domestic output is due to its own shocks. In the longer term the role of foreign (US) shocks and (other) domestic shocks increases, but compared to Table 1, the contribution of foreign shocks is lower, while the contribution of domestic factors is higher. The findings are broadly consistent with those of Ibrahim (2003). He finds that domestic variables (the price level, a monetary aggregate and the Treasury bill rate) are not important in explaining Malaysian output in the short run, however US monetary policy (Federal Fund rate) explains a significant portion of its variation at longer horizons. In Table 2 US monetary shocks make the largest individual contribution to Malaysian GDP at a six year horizon. In contrast Mackowiak (2007) finds no important role for US monetary policy in explaining Malaysian output, in either the short run or the long run.

When only Japanese variables are used to represent the foreign sector the results of the variance decomposition are largely the opposite from those for the US case. As shown in Table 3, foreign shocks now contribute about 60 percent of the variation of Malaysian GDP at a two year horizon, with the contribution coming from real commodity prices. Use of only Japanese variables to represent the external sector, implies that foreign factors explain almost 90 percent of the Malaysian output in the long-run.

Turning to the variance decomposition for domestic inflation (INF), a broadly similar pattern is evident in Tables 1 to 3. Own shocks to Malaysian inflation tend to dominate in both the short and the long run. As the horizon increases, foreign factors tend to become more important, and they are also more important than (other) domestic factors in explaining INF. An interesting result is the fact that neither domestic monetary policy nor credit shocks appear to explain much of the variance in inflation.

The variance decompositions for LMY and INF in Tables 1 to 3 provide some evidence that using only US variables (or Japanese variables) to represent the foreign sector for the Malaysian economy (as in Ibrahim, 2003; Tang, 2006 and Mackowiak, 2007) may lead to some problems. Use of the US or Japanese variables on their own can yield quite different results for the variance decomposition – relative to the use of a weighted average – particularly for domestic output. Similar findings have been obtained by Dungey and Fry (2003) for Australia.

In discussing the variance decompositions for other domestic variables the study focuses on the results from Table 1. A number of notable results emerge. The forecast error variance of the policy rate for Malaysia (INT) is, in the short-run, largely explained by its own innovations and by innovations in (other) domestic variables. Foreign factors play a modest role at a one quarter horizon. Over time the relative contribution of foreign factors (particularly commodity prices and foreign output) increases and dominates at a four year horizon. The variance decomposition for real credit is similar to that for INT. Domestic factors are more important than the foreign ones up to four years, but the reverse is true after that period. INF accounts for more than 20 percent of the variation in LCR at the first quarter horizon but its effect gradually subsides.

In the case of real asset prices in Malaysia, foreign factors are very important by 8 quarters (about 51 percent). The contribution of foreign output increases as the forecast horizon expands. Finally, for all horizons, foreign shocks make a significant contribution to the variation in Malaysia's real exchange rate (LER). LFY accounts for 22 percent of the forecast error variance of LER in the first quarter horizon. This percentage increase to 32 percent after 3 quarters and gradually subsides after that. Over time commodity prices becomes more important and account for about 24 percent of exchange rate fluctuations after four years. Among the domestic variables interest rates and asset prices make the largest contributions (aside from own shocks to LER).

Impulses response functions

Key impulse response functions for the SVAR model (for the weighted foreign sector) are shown in Figures 1 to 11. Figure 1 to 5 show the impulse responses of domestic variables to the foreign real and financial shocks, while Figures 6 to 11 depict the impulse responses of domestic variables to the domestic real and financial shocks. These figures provide a clear picture of the how a shock to the foreign variable (e.g. foreign real aggregate output) and its domestic counterpart (domestic real aggregate output) affect domestic variables of interest.

In Figure 1 a shock to commodity prices produces a significant increase in domestic output and inflation. As Malaysia is also a commodity exporter country, such an increase in output and inflation is not unexpected. An increase in real commodity prices raises the income of exporters and thus Malaysian output as a whole. The increase in the inflation rate confirms the importance of commodity prices as an indicator of inflationary expectations in Malaysia. In response to the positive commodity price shock the domestic policy rate increases after about a year, suggesting to somewhat lagged response by policy-makers.

Figure 2 shows that domestic output and inflation also react positively and significantly to a foreign output shock. In this case the domestic interest rate responds quite immediately and significant. Similar positive and significant responses of domestic output and inflation are also observed following a shock to foreign inflation; see Figure 3. The domestic interest rate also rises but the effect is not statistically significant. These results support the previous results from variance decomposition that foreign factors (e.g. foreign output and inflation) play large roles in influencing domestic output and inflation.

Figure 4 implies that a rise in the foreign interest rate has a negative and significant impact on domestic output; but only after several quarters. The negative effect on domestic inflation is much more immediate (and also significant). As a result of the foreign interest rate shock, the domestic interest rate also rises immediately; but only for one quarter. It then falls until 3 quarters later.

As indicated by Figure 5 there is a negative effect on aggregate output and inflation following a shock in foreign asset prices. The domestic interest rate also falls, while the domestic asset price rises. This rise in the domestic asset prices, points to a strong and positive linkage between the asset markets/equity markets of Malaysia and the rest of the world. Finally the real exchange rate appreciates.

There is an unexpected (although insignificant) fall in domestic inflation after a shock to the domestic output, see Figure 6. The domestic interest rate also falls, possibly reflecting the decrease in inflation. Real credit significantly decreases in the short-run, while asset prices increase. A shock to domestic output also causes the exchange rate to depreciate in the short-run.

Figure 7 shows there is a negative response of real domestic output to an inflation shock. This would make sense if the shock to inflation reflected a negative aggregate supply or cost shock. The domestic interest rate rises significantly; presumably to help offset the inflationary pressure.

The effects of an innovation in the domestic interest rate are depicted in Figure 8. The contractionary monetary policy leads to a significant fall in domestic output. Output falls to its lowest level after third quarter. In addition, inflation declines significantly while the exchange rate significantly appreciates in response to the shock – pointing to the absence of either price or exchange rate puzzles. The policy shock also brings about significant declines in real credit and in asset prices, although credit only declines after some time. The delayed negative effect on credit following a monetary policy shock has also been documented in Tang (2006).

Comparing the impulse responses of the domestic variables to foreign monetary policy shocks with the impulse responses of the same variables to domestic monetary policy shock reveals the following. First, a shock to domestic monetary policy affects domestic output faster than does a shock to foreign monetary policy; but the response to the later shock is more persistent. Second, the negative response of domestic inflation to the foreign monetary policy shock is much longer than response to the domestic monetary shock. Third, a shock to foreign monetary policy has a much longer negative effect on domestic asset prices than does a shock to domestic monetary policy. These findings, to a large extent, are consistent with the previous finding that the foreign sector plays an important role in influencing the longer term behaviour of the Malaysian economy.

Following a shock to domestic credit (Figure 9) all domestic variables show significant rises, except for the exchange rate, which depreciates. A shock to domestic asset prices (Figure 10) leads to positive and significant response in all domestic variables. Finally an appreciation of the real exchange rate (Figure 11) is associated with positive responses in domestic output and real credit, but declines in all other domestic variables.

CONCLUSION

This paper investigates the effects of foreign and domestic macroeconomic disturbances on the Malaysian economy. Using a non-recursive SVAR model, the interrelationship between five foreign variables (commodity prices, real output, inflation, the interest rate and asset prices) and six domestic ones (real output, inflation, the interest rate, credit, asset prices and the exchange rate) is examined. Three different measures of foreign sector variables are considered. The first model looks at the relative importance of the shocks when both the US and the Japanese variables are combined and are regarded as representing the world economy. As a comparison, only the US variables are used in the second model and only Japanese variables in third model (to represent the foreign sector). The results of the three models are compared and discussed in terms of variance decompositions and the impulse response functions. Furthermore a shutdown approach is also employed to examine the relative importance of the interest rate channel in relation to the exchange rate channel in transmitting a foreign monetary policy shock.

Overall, the results of the variance decomposition for the first model suggest that the domestic shocks explain more of the variation in the domestic output and financial variables in the short term, but the foreign variables become increasingly important in the long term. Relying only on the US (or Japanese) variables to represent foreign sector for Malaysia can produce quite different results for some types of shocks. A similar point is made by Dungey and Fry (2003).

Moreover, preliminary examination of the results of the impulse responses in the three models indicate that the price and the exchange rate puzzle do not appear as a result of a domestic monetary policy shock. A shock in the foreign monetary policy however, produces short term price puzzle in the foreign sector.[10] Examining the impulse responses in great detail reveal the importance of foreign variables shocks on the domestic variables. Shocks to the foreign variables particularly the foreign output, inflation and the interest rate leads to significant responses of the domestic output, inflation and the interest rate more so than do shocks to the domestic variables. These findings, to a great extent support our variance decomposition results in that the foreign sector does play a significant role in affecting most of the domestic variables in the long term.

Furthermore, the results of the impulse responses in the second and the third model reveal some varying responses of the domestic variables to the respective foreign shocks. Analysing the impulse response functions in the first model with that of the other two, unveils that some domestic variables are more susceptible to the US shocks and some are prone to the Japanese disturbances. This information would be useful in the formulation of a monetary policy. Knowing which foreign country's effect is more dominant to which domestic variable, a policy maker, for instance can undertake an appropriate strategy to absorb any unwanted influence caused by the foreign country policy or vice versa.

With the shutdown methodology, the relative important of the domestic interest rate channel and the exchange rate channel in transmitting the foreign policy shock to the domestic output and inflation is tested. The results suggest that none of the channels is important in affecting the domestic output. Nevertheless, the exchange rate channel does play a significant role in transmitting the foreign policy shock

[10] Dungey and Fry (2003) find a brief price puzzle in domestic sector as a result of a shock in domestic monetary policy. Their model incorporates both US variables and Japanese variables in the same model.

on the domestic inflation. The importance of the exchange rate in affecting domestic inflation has also been documented by Ibrahim (2003) and Tang (2006). Thus, the policy makers have to take the exchange rate stability into account when stabilizing the inflation.

In short, relying only on the US to represent the foreign sector in an economic model would undeniably lead to a biased policy advice. In the long run, this strategy would be harmful for the Malaysian economy as a whole.

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FIGURE 1: Responses of Domestic Variables to Commodity Price Shock

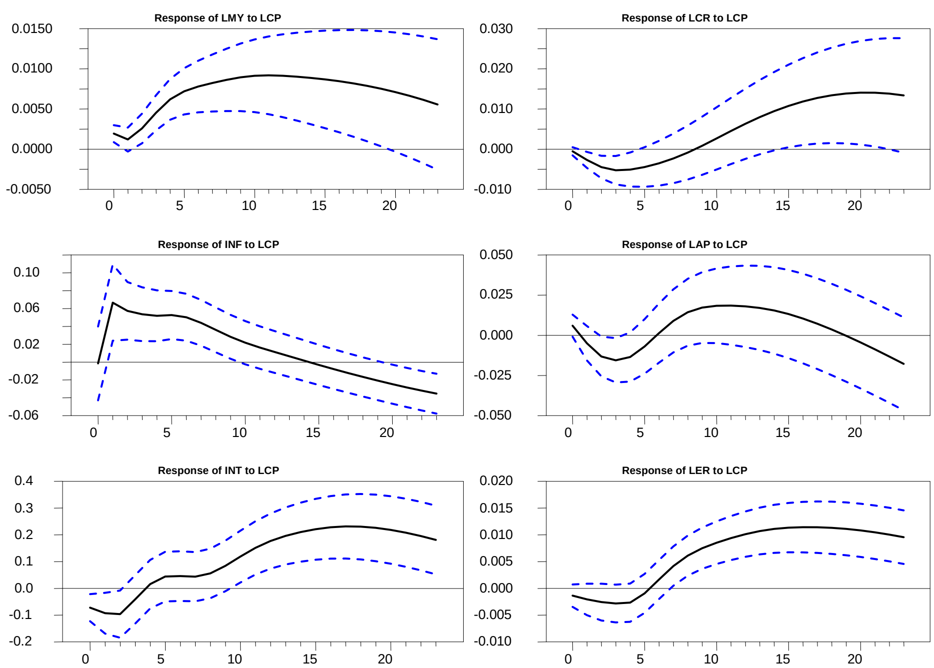

FIGURE 2: Responses of Domestic Variables to Foreign Output Shock

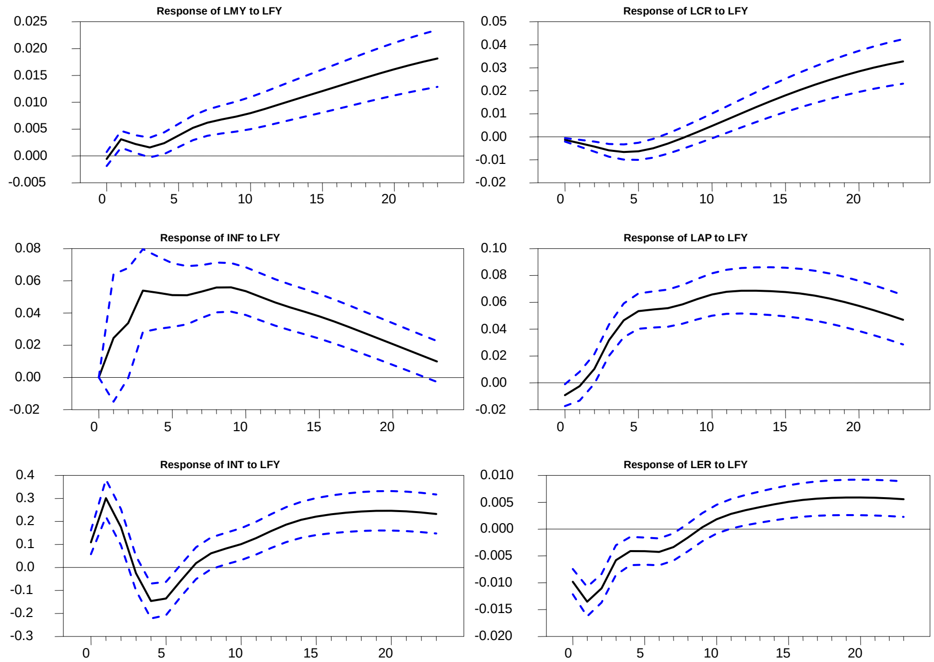

FIGURE 3: Responses of Domestic Variables to Foreign Inflation Shock

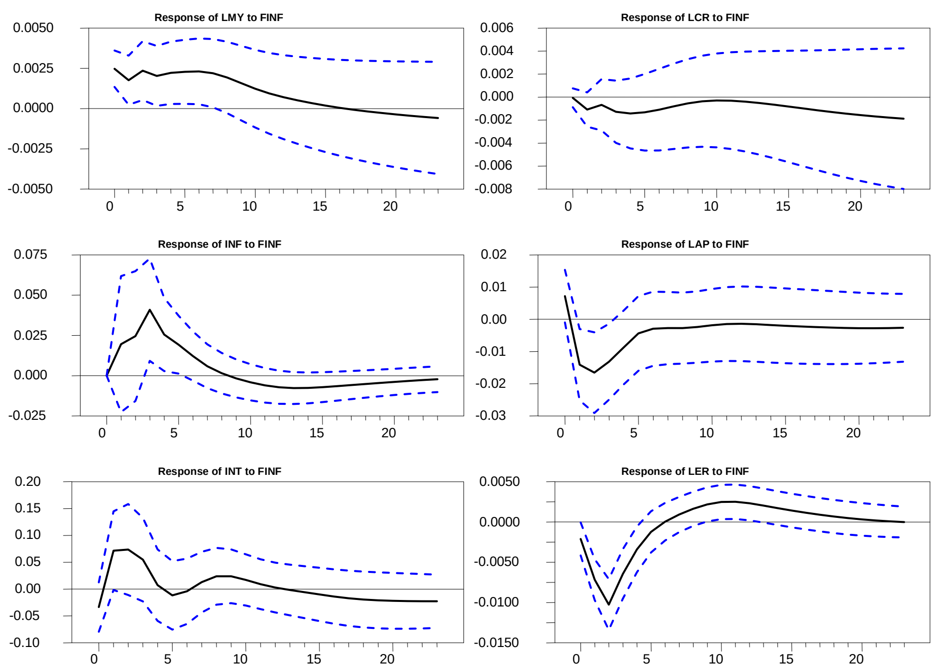

FIGURE 4: Responses of Domestic Variables to Foreign Interest Rate Shock

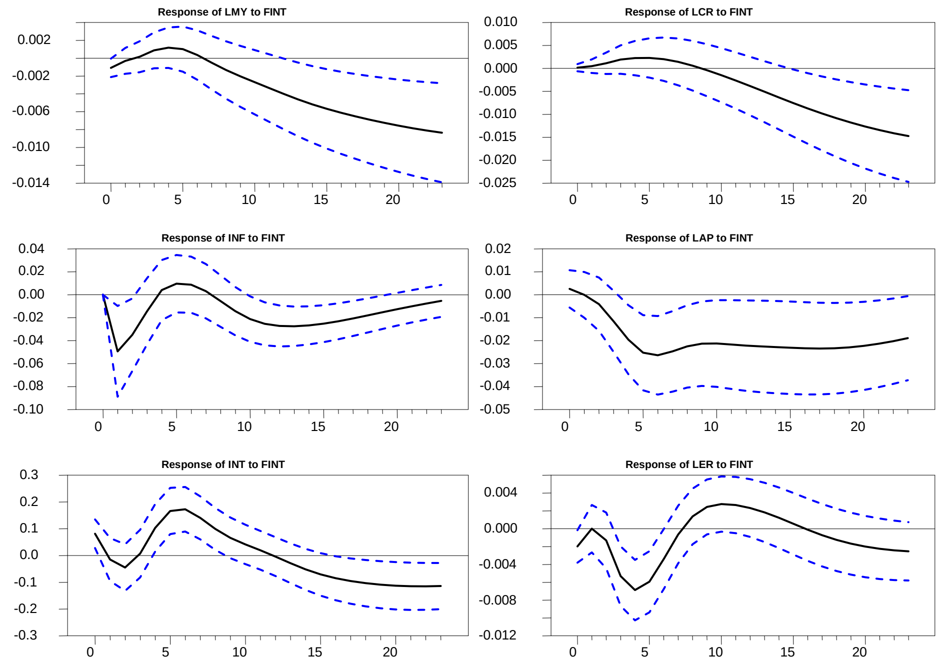

FIGURE 5: Responses of Domestic Variables to Foreign Asset Price Shock

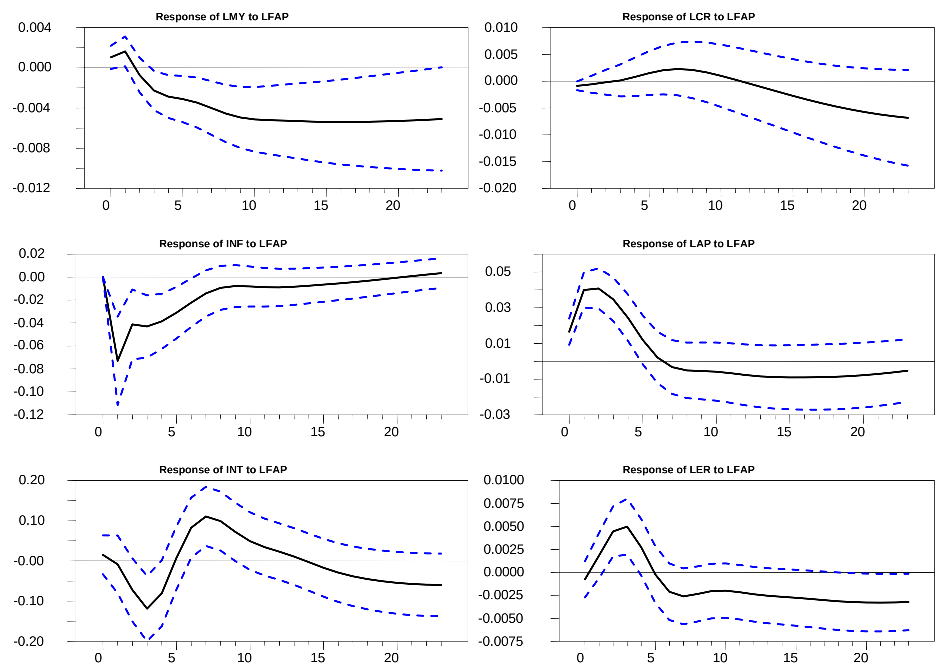

FIGURE 6: Responses of Domestic Variables to Domestic Output Shock

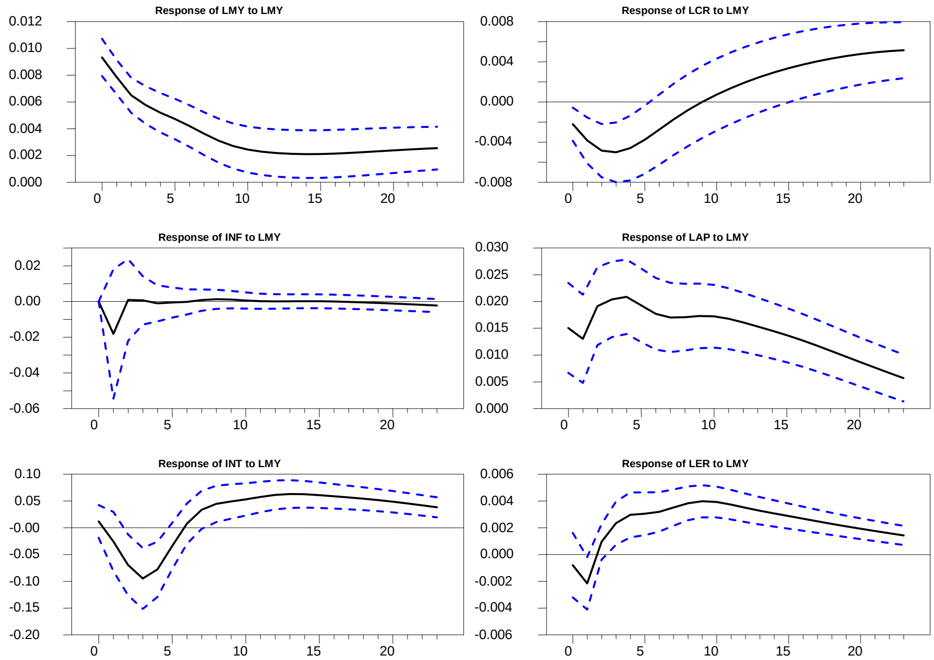

FIGURE 7: Responses of Domestic Variables to Domestic Inflation Shock

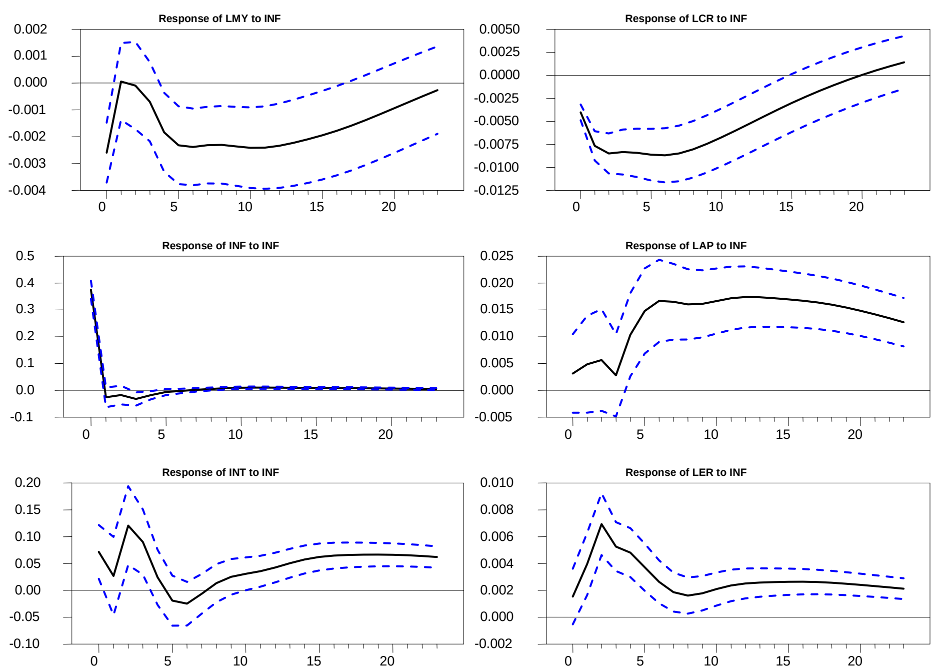

FIGURE 8: Responses of Domestic Variables to Domestic Interest Rate Shock

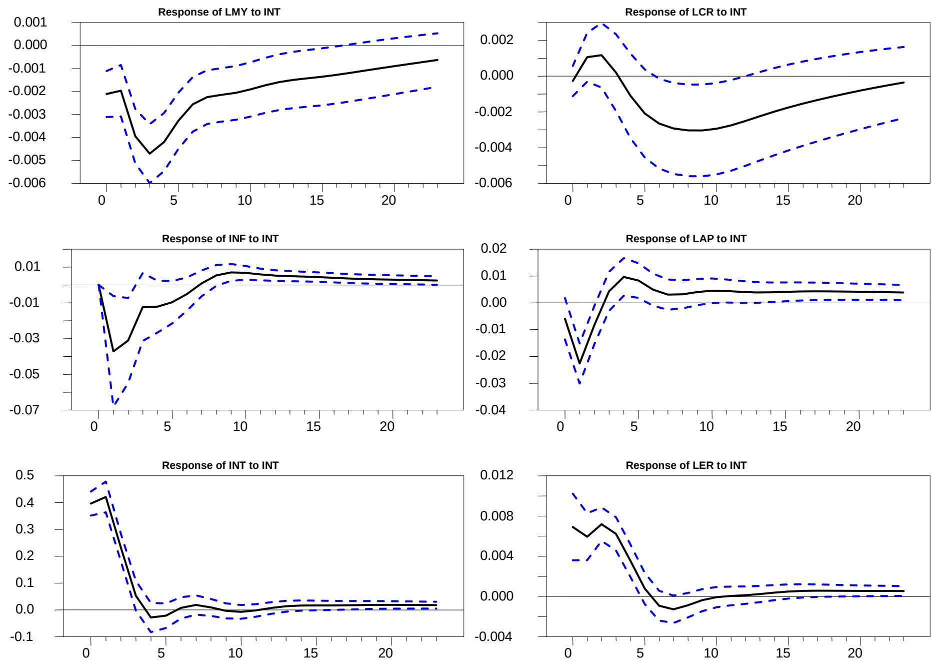

FIGURE 9: Responses of Domestic Variables to Domestic Credit Shock

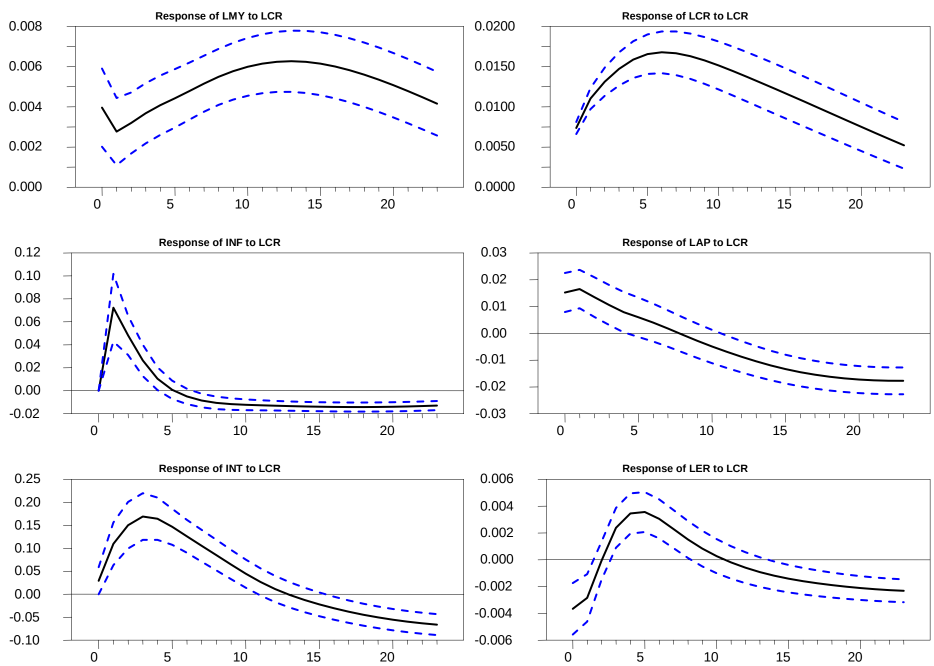

FIGURE 10: Responses of Domestic Variables to Domestic Asset Price Shock

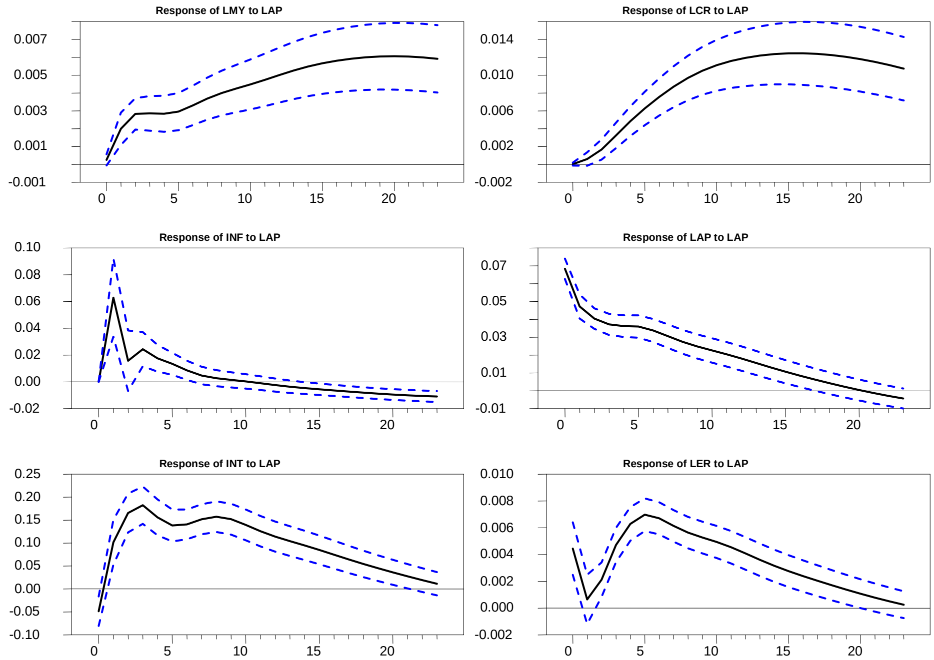

FIGURE 11: Responses of Domestic Variables to Exchange Rate Shock

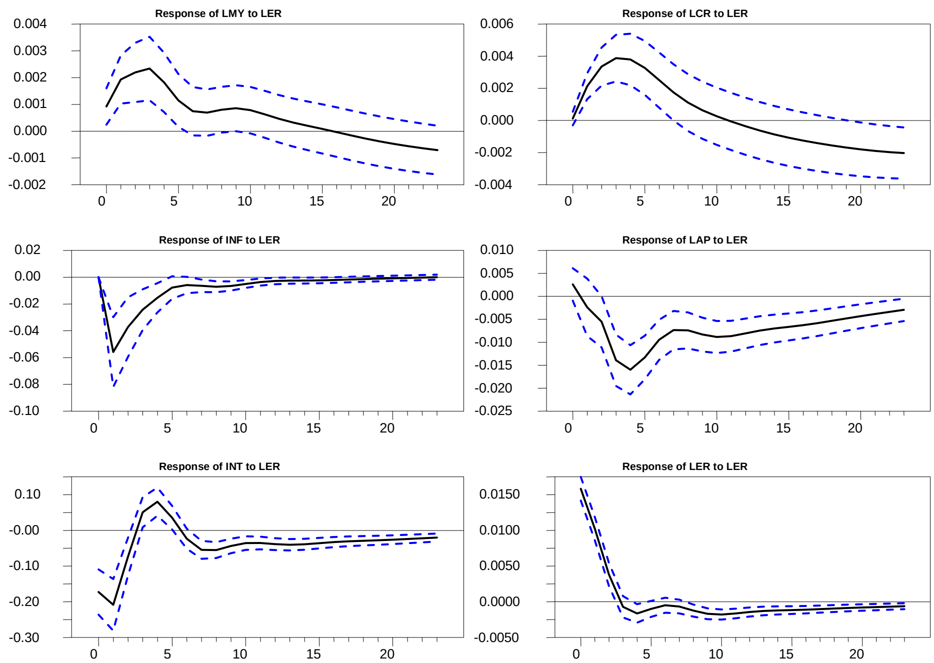

TABLE 1: Variance Decomposition: Domestic and Foreign Trade Weighted Variables

Decomposition of Variance for Series LMY													
Step	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	2.94	0.25	4.80	0.93	0.84	68.41	5.29	3.51	12.31	0.05	0.67	9.76	**21.83**
8	23.13	9.51	3.60	0.45	5.10	28.05	2.49	7.91	12.20	5.67	1.89	**41.79**	30.16
16	26.38	24.19	1.44	3.72	7.92	10.38	2.01	3.26	12.55	7.47	0.69	**63.65**	25.98
24	18.70	40.02	0.71	8.00	7.00	5.63	1.12	1.68	9.12	7.66	0.36	**74.43**	19.94
Decomposition of Variance for Series INF													
Steps	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.00	0.00	0.00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00	**0.00**	0.00
8	9.26	6.99	1.75	1.83	5.45	0.15	64.59	1.25	3.82	2.43	2.47	**25.28**	10.13
16	9.39	13.67	1.66	3.28	5.04	0.13	57.31	1.21	3.89	2.18	2.25	**33.03**	9.66
24	10.64	14.67	1.63	3.82	4.80	0.13	54.42	1.17	4.26	2.32	2.13	**35.56**	10.02
Decomposition of Variance for Series INT													
Steps	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	2.35	5.38	0.51	3.00	0.10	0.06	2.33	71.29	0.39	1.07	13.52	11.34	**17.37**
8	2.57	14.70	1.25	8.04	3.76	1.91	2.50	32.70	11.59	13.28	7.70	30.32	**36.98**
16	13.07	19.82	0.91	6.61	3.52	2.65	2.43	21.44	8.39	15.40	5.77	**43.93**	34.64
24	21.19	28.55	0.69	7.37	2.95	2.38	2.73	13.75	6.11	10.41	3.88	**60.75**	25.50
Decomposition of Variance for Series LCR													
Steps	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.36	2.26	0.01	0.03	0.96	6.28	20.67	0.10	69.32	0.00	0.02	3.62	**27.06**
8	4.07	6.17	0.31	0.73	0.46	3.92	17.48	0.82	56.63	7.18	2.24	11.74	**31.64**
16	6.20	14.90	0.15	2.30	0.47	2.00	10.64	1.05	44.06	17.27	0.94	24.03	**31.91**
24	10.45	39.31	0.16	7.50	1.51	1.75	4.39	0.47	20.79	13.15	0.51	**58.94**	20.27
Decomposition of Variance for Series LAP													
Steps	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.64	1.52	0.92	0.12	4.85	4.03	0.18	0.63	4.11	82.88	0.12	8.05	**9.06**
8	1.86	28.88	1.90	5.85	12.89	6.09	2.23	1.95	2.15	34.28	1.92	**51.38**	14.34
16	3.24	50.85	0.91	6.94	6.38	5.02	3.48	1.03	1.62	19.12	1.41	**68.31**	12.57
24	2.89	57.03	0.69	7.92	4.91	4.13	3.86	0.84	2.87	13.72	1.14	**73.43**	12.85
Decomposition of Variance for Series LER													
Steps	LCP	LFY	FINF	FINT	LFSP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.42	21.80	1.01	0.89	0.13	0.14	0.54	10.83	3.03	4.47	56.73	**24.26**	19.01
8	2.44	24.88	10.83	6.43	3.37	2.61	7.06	9.48	3.31	10.88	18.71	**47.94**	33.35
16	23.80	18.10	7.73	4.97	3.46	4.70	5.66	5.88	2.28	11.38	12.04	**58.06**	29.90
24	36.35	18.13	5.41	4.00	4.10	3.98	4.93	4.12	2.28	8.23	8.45	**68.00**	23.55

TABLE 2: Variance Decomposition: Domestic and the US Variables

Decomposition of Variance for Series LMY

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.59	0.35	0.03	5.17	0.03	87.91	1.29	1.95	2.52	0.01	0.15	**6.17**	5.92
8	0.23	4.87	6.59	4.38	3.51	55.31	1.22	12.02	3.03	7.88	0.97	19.57	**25.12**
16	0.21	3.70	9.65	15.07	4.44	33.63	0.93	8.36	3.73	17.26	3.04	33.07	**33.30**
24	1.35	5.07	11.97	24.06	4.82	21.16	0.70	5.23	2.81	18.85	3.97	**47.27**	31.57

Decomposition of Variance for Series INF

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.02	0.00	0.00	0.00	0.00	0.00	99.98	0.00	0.00	0.00	0.00	**0.02**	0.00
8	4.43	3.93	2.89	4.36	1.53	2.76	67.25	3.37	2.88	1.19	5.41	**17.14**	15.61
16	6.23	3.65	2.84	8.79	2.09	2.56	60.75	3.19	2.61	1.92	5.39	**23.59**	15.66
24	7.33	3.78	2.70	10.74	2.68	2.49	57.48	3.06	2.48	2.06	5.19	**27.22**	15.29

Decomposition of Variance for Series INT

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.13	0.14	2.35	0.73	5.76	0.26	3.24	80.56	0.29	0.53	6.02	9.11	**10.34**
8	7.00	1.04	14.99	4.59	9.44	1.04	2.77	38.34	8.19	2.14	10.47	**37.06**	24.59
16	17.48	2.22	11.68	3.86	12.33	4.71	2.42	26.49	7.79	4.18	6.84	**47.57**	25.94
24	21.35	2.14	8.65	7.26	15.37	5.39	2.06	18.95	6.60	7.10	5.12	**54.77**	26.27

Decomposition of Variance for Series LCR

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.39	1.13	3.03	0.59	0.01	1.07	20.02	0.10	73.65	0.00	0.01	5.15	**21.20**
8	1.21	4.37	7.14	4.71	0.50	5.00	15.41	5.60	43.28	5.56	7.22	17.93	**38.79**
16	3.16	3.68	3.52	3.35	0.21	14.22	11.59	10.35	33.21	13.36	3.33	13.93	**52.86**
24	7.24	2.32	2.21	6.75	0.16	15.58	8.36	9.45	24.22	21.12	2.59	18.68	**57.10**

Decomposition of Variance for Series LAP

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.11	0.19	1.13	0.74	20.34	4.12	0.02	2.19	0.62	70.37	0.16	**22.51**	7.12
8	3.26	0.10	17.22	8.10	23.96	5.36	0.48	2.46	0.38	31.04	7.65	**52.64**	16.32
16	2.06	1.51	19.45	18.75	20.06	3.22	0.82	1.83	1.41	22.13	8.78	**61.82**	16.05
24	1.77	4.97	19.63	21.44	17.29	3.77	1.38	2.76	3.30	16.17	7.51	**65.10**	18.72

Decomposition of Variance for Series LER

Steps	LCP	LYUS	INFUS	RUS	LSPUS	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.04	5.32	0.55	0.00	0.08	3.14	0.03	0.51	1.60	7.20	81.54	5.98	**12.48**
8	3.46	2.75	0.85	2.11	4.25	8.86	10.46	10.38	0.70	5.99	50.19	13.42	**36.40**
16	12.87	3.93	1.29	3.09	5.47	17.60	7.53	9.89	0.52	4.62	33.18	26.65	**40.17**
24	16.05	4.11	1.25	7.37	10.22	15.80	5.34	7.91	0.74	6.91	24.30	**38.99**	36.70

TABLE 3: Variance Decomposition: Domestic and the Japanese Variables

Decomposition of Variance for Series LMY

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	6.34	0.03	0.35	0.04	0.95	71.74	4.07	0.95	13.24	0.47	1.82	7.70	**20.56**
8	44.28	8.96	2.90	1.26	3.66	23.42	2.47	2.04	4.50	5.05	1.45	**61.07**	15.51
16	60.12	15.62	1.28	0.69	5.12	7.16	1.32	0.63	3.85	3.68	0.53	**82.82**	10.02
24	64.32	19.48	0.62	1.85	3.66	3.53	0.72	0.31	2.58	2.69	0.26	**89.92**	6.55

Decomposition of Variance for Series INF

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.04	0.00	0.00	0.00	0.00	0.00	99.96	0.00	0.00	0.00	0.00	**0.04**	0.00
8	13.38	6.51	4.05	1.33	1.99	0.70	63.09	4.45	2.37	1.09	1.03	**27.27**	9.64
16	17.67	7.53	4.18	1.38	2.13	0.67	56.77	4.01	2.96	1.66	1.03	**32.89**	10.34
24	17.40	7.41	4.34	1.41	3.58	0.72	55.47	3.92	2.93	1.79	1.03	**34.14**	10.39

Decomposition of Variance for Series INT

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	1.63	5.00	3.82	0.77	0.31	0.08	4.40	21.90	9.50	10.69	41.90	11.52	**66.58**
8	10.31	2.85	2.50	11.75	4.45	3.18	3.89	11.72	14.67	10.88	23.78	31.87	**56.41**
16	33.38	6.12	2.47	8.01	2.92	2.64	2.96	7.30	9.75	8.40	16.04	**52.91**	39.79
24	47.00	6.57	1.82	5.81	2.59	2.13	2.58	5.32	8.00	6.26	11.91	**63.79**	30.89

Decomposition of Variance for Series LCR

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.38	1.23	4.74	0.06	0.10	7.74	15.87	2.49	61.42	1.22	4.76	6.51	**32.07**
8	2.01	5.26	0.67	0.71	2.44	4.97	10.74	0.41	52.15	13.40	7.24	11.09	**36.76**
16	24.12	17.60	0.32	6.87	3.03	1.83	4.92	0.21	26.00	12.52	2.59	**51.94**	22.07
24	42.35	24.04	0.15	6.97	2.95	1.08	2.27	0.10	12.15	6.63	1.32	**76.46**	11.39

Decomposition of Variance for Series LAP

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	1.07	5.31	1.25	0.58	0.26	2.72	0.05	0.39	2.52	85.07	0.76	**8.48**	6.45
8	3.41	10.29	1.18	10.56	13.33	5.52	2.19	2.19	1.32	40.26	9.74	**38.78**	20.96
16	22.64	17.68	1.06	7.10	7.97	4.73	3.21	1.58	2.37	24.17	7.50	**56.45**	19.39
24	28.71	19.50	1.02	5.72	7.83	4.01	3.07	1.30	3.02	19.62	6.21	**62.78**	17.60

Decomposition of Variance for Series LER

Steps	LCP	LYJP	INFJP	RJP	LSPJP	LMY	INF	INT	LCR	LAP	LER	FF	DF
1	0.71	1.69	0.66	0.20	6.19	0.05	0.83	57.90	0.94	6.26	24.55	9.46	**65.99**
8	4.64	3.99	11.13	7.09	2.98	0.65	11.85	31.52	7.56	9.63	8.96	29.84	**61.20**
16	21.97	3.74	8.75	5.04	7.28	3.54	8.74	18.88	6.23	7.66	8.18	**46.78**	45.04
24	30.86	3.78	8.37	6.69	7.03	3.15	7.25	13.98	6.39	6.04	6.48	**56.73**	36.80