The impact of export growth to stock market in a managed floating exchange rate regime: A VAR Analysis

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Abstract

This paper examines the dynamic effects of export growth to the stock market index (DGEN[2]) in a managed-floating exchange rate regime in Bangladesh during the period 2004:M06-2013:M07. Using vector autoregressive (VAR) model, the impulse responses of the exchange rate and stock index (as well as prices, import and money market rate) to the export shock is studied. The result shows that exchange rate reacts negatively against a positive export shock. On the contrary, the response of stock index to one standard deviation positive innovation on export is positive, at least after certain period.

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[2] Dhaka Stock Exchange General Index: Index of one of the two stock exchanges in Bangladesh.

1. Introduction:

Stock market is a significant driver for a well-functioning financial system and sustaining economic growth. The performance of stock market depends on the decision of investors' based on number of economic factors such as export, import, exchange rate[3], interest rate and inflation. Empirical literature on the relationship between stock prices and mentioned variables is extensive and generally inconclusive. For example, early work to find the relationship between exchange rate and stock market using US data such as that by Franck and Young (1972), Aggarwal (1981), and Soenen and Hennigar (1988) produce different signs for different periods and methods. Subsequent analysis such as that by Ma and Kao (1990) extends the data set, including information on six industrialised economies and finds evidence in favour of the flow approach although the sign of the stock-price effect depends on whether the country is export or import-dominated. Besides, the interaction between stock market and exchange rate through changes in foreign investment is well known. Foreign investors convert rates of return on investment (ROI) from one currency to another currency through spot exchange rate. Hence, foreign investors always considers the timing on the conversion of their return based on exchange rate movement.

In general, from a monetary policy perspective in developing nations, such movement in exchange rate is supervised through practicing different exchange rate regimes. As we know, there are three types of exchange rate regimes: floating, fixed and managed floating regimes. As a sequence of growing application of "managed floating" exchange rate regime in the Asian emerging markets during late 1990s, Bangladesh adopted this system in the 3rd quarter of 2003. The key implication of this type of exchange rate mechanism is to intervene through the central bank in the foreign exchange market so that it behaves in a favourable direction. For instance, central bank may sometimes deliberately take policy to keep the currency a little bit undervalued in the expectation of boosting export. While analysing the Asian emerging economies, Lin (2012) finds that trade from export-oriented industries has stronger to non-significant effect to exchange rate and the stock market depending on the period of consideration (crisis period or tranquil period).

The purpose of this study is to analyse the impact of export shock to the targeted macroeconomic variables: such as to the stock market index in the controlled exchanged rate regime in Bangladesh including other significant variables of interest such as import, consumer

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[3] Here, exchange rate means the nominal exchange rate (NER) of BDT/USD.
  For example, 1USD (US Dollar) = 80 BDT(Bangladeshi Taka)

price index, and money market rate (as a proxy of policy rate). The main motivation is to deal with the interesting question whether growth of export influence stock market index in Bangladesh and if it does how? To the best of my knowledge, there are not many specific literatures that studied that issue in Bangladesh context.

VAR (Vector Autoregressive) models are the widely recognized tool in the literature of studying the dynamic relationship of different macro-economic variables to identify the contemporaneous relationship among the variables by using the Choleski decomposition for impulse response analysis. In this perspective, this analysis opens up the new avenues to employ the identification of unrestricted VAR method to study the different macroeconomic variables of interest in Bangladesh.

The estimated results initially show one unusual relationship which is not common in the standard analysis. For example, the increase in export results in reduction in exchange rate (i.e. depreciation of domestic currency) before it rises up to a certain level to stationary in negative level. This uncommon trend is probably because of pegging the exchange rate by central bank as a policy initiative to maintain export growth. Secondly, the accumulated response of stock market after the export shock is negative at the beginning but turns positive before it becomes stationary which implies that export growth tends to raise stock index though not immediately but after certain period of time.

The remainder of the essay is organized in the following way: 2) discusses data and making model with identification strategy 3) discusses the results and 4) conclusion and future research scope.

2. Data and the Model

Monthly data for six variables i) Export (X) ii) General Stock Index of Dhaka Stock Exchange (SI) iii) Exchange Rate (ER) iv) Import (IM) v) Money Market Rate (MMR) which is a proxy for policy rate [as policy rate was fixed during the reporting period] and vi) Consumer Price Index (CPI) are collected from IMF DOTS[4] and DSE[5] website for the period 2004:M06-2013:M07. The reason for choosing this data period is the following: a) Bangladesh entered into "(Managed) Floating Regime" of Exchange rate from "Fixed Exchange Rate Regime" in 2003 b) The general index in Dhaka Stock Exchange is converted to 3 indices in the late 2013. The reason why money market rate is considered while studying the impact of export growth

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[4] Direction of Trade Statistics
[5] Dhaka Stock Exchange, Bangladesh

to the stock market in a managed floating exchange rate regime is that the effect of interest rate to stock market is very significant through money market channel. Beside, empirical study suggests stronger relationship between the stock market and the other variables (such as CPI and import) analysed in this paper.

Performing the unit root test using EViews version-9 [*this software is used throughout the analysis*] confirms that money market rate is stationery at level. All other variables become stationary after transforming them to log difference (figure 5). It is important to note here that Dhaka Stock Exchange experienced the biggest collapse ever in December 2010 during the period of the then caretaker government regime (when the country's political turmoil was in peak) which is also known as "Bangladesh Share Market Scam". To adjust the structural break in data used, a dummy variable (*Dummy2010*) is introduced before estimating VAR to minimize the forecasting error.

Noticeably, as all roots have modulus less than 1 (i.e., lie inside the unit circle), it can be claimed that the estimated VAR is stable (Figure 3). From the various information criteria, this study uses lag 1 for estimating VAR according to **Akaike Information Criterion** and **Schwarz Information Criterion** because they have lower BIC and make the model parsimonious (Figure 4).

The recursive vector autoregressive (VAR) model is used to analyse the effect of export shock to the stock market through exchange rate channel. In line with the discussion, stock index can be expressed as a function of other variables in the following manner:

$SI = f(Export, Consumer\ Price\ Index, Import, Money\ Market\ Rate, Exchange\ Rate)$

Hence, the VAR (1) can be written in the following form;

$$SI_t = aSI_{t-1} + bCPI_{t-1} + cIM_{t-1} + dMMR_{t-1} + eER_{t-1} + fX_{t-1} + gD_{t-1} + U_t \qquad (1)$$

Where, *t* indicates current period and *(t-1)* refers lag 1 of the variables, U_t refers white noise with mean zero and constant variances, D_t refers dummy variable and *a, b, c, d, e, f* and *g* are the coefficients of lagged variables.

In the abridged form,

$$AY_t = BY_{t-1} + U_t \qquad\qquad\qquad\qquad (2)$$

Where vector Y_t is endogenous variables and Y_{t-1} is Vector of lagged variables. Suppose, *T* is the contemporaneous coefficient matrix of the endogenous variables. Hence,

$$T^{-1}U_t = \varepsilon_t$$

$$\Rightarrow \quad U_t = T\varepsilon_t \tag{3}$$

The fundamental reason why the study has considered analysing the export shock to the other major variables including stock index and exchange rate is mainly two fold. Firstly, the government of Bangladesh (GoB) has been relentlessly trying to increase its export volume since long to maintain its current account balance favourably against growing import. Few major policy initiatives to facilitate export are i) provide exporters with ample access to fund at minimized interest rate ii) provide export tax rebate iii) create special loan scheme such as "Export Development Fund". Secondly, as Bangladesh economy is emerging and growing bigger so is its capital and money market, the export channel supposed to have significant interaction with the variables of different market (per se goods market and money market) as mentioned.

2.1 Identification of the Export Shock

Following the work related to the impact of monetary policy shock, for example analysis by Erceg and Levin (2002), the identification for this study is determined. Imposing the short-run restriction, a recursive ordering VAR can be identified as follows:

$$\begin{bmatrix} u_X \\ u_{CPI} \\ u_{IM} \\ u_{MMR} \\ u_{ER} \\ u_{SI} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ t_{21} & 1 & 0 & 0 & 0 & 0 \\ t_{31} & t_{32} & 1 & 0 & 0 & 0 \\ t_{41} & t_{42} & t_{43} & 1 & 0 & 0 \\ t_{51} & t_{52} & t_{53} & t_{54} & 1 & 0 \\ t_{61} & t_{62} & t_{63} & t_{64} & t_{65} & 1 \end{bmatrix} \begin{bmatrix} \varepsilon_X \\ \varepsilon_{CPI} \\ \varepsilon_{IM} \\ \varepsilon_{MMR} \\ \varepsilon_{ER} \\ \varepsilon_{SI} \end{bmatrix} \tag{4}$$

Intuitively, the above identification assumes that export is not contemporaneously affected by shocks in any other variable, but the prices is affected contemporaneously only by export shock. Import is contemporaneously affected by export and price shocks. The exchange rate and the stock index are contemporaneously affected by export, price, import, and money market shocks. However, exchange rate is not immediately affected by stock index but stock index is contemporaneously affected by shocks in all other variables.

Now, about the justification of the Cholesky ordering, there is no specific study that focuses the idea of this paper. But, for the ordering of the variables such as price, import, interest rate (in this paper money market rate as proxy), and exchange rate (exactly in this order) is justified in many standard analysis. For example, Mehrotra (2006), Alam (2015) use the mentioned ordering while studying effectiveness of monetary policy. However, the ordering of the stock

index at the last and export at the beginning in the above equation is consistent with the subject matter of the study.

3. Results

Figure 1 shows the accumulated impulse responses of the variables after imposing one standard deviation positive innovation to the export. As an initial effect, the accumulated responses of prices is positive against that shock which is a reasonable result. However, the responses of import is not clear from the result i.e. it fluctuates before the accumulated response become stationary in about eighth month. As more export proceeds reduces the demand for money from the exporters, the overall demand for money from the money market fall so is money market rate. This finding is, in fact, consistent with the Central Bank's (*Here Bangladesh Bank*) stance by increasing CRR[6] and SLR[7] for several times to reduce excess liquidity during the reporting period.

On the other hand, the negative accumulated response of exchange rate after the export shock is not uniform to the standard findings but not unique as well. While studying the effect of different shocks on foreign trade in Finland's economy, for example, Sariola (2009) finds this sort of relationship. As the result suggests, in Bangladesh the immediate cumulative effect of export shock is negative before it moves up a bit in 3rd month and becomes stationary to -0.2% on average from fourth month and so on. Again, this pattern of exchange rate does make sense in the Bangladesh context. This is consistent with the relentless endeavour of the GoB[8] to maintain the export growth by managing the exchange rate through central bank when it requires. For example, after entering the managed-floating exchange rate regime in 2003, the central bank of Bangladesh kept the exchange rate almost in the same level (undervalued) during the period 2005-2010 with the target of not hurting exporter.

Moreover, the accumulated response of the stock index to the export shock becomes positive in 3rd month though immediate effect of the shock is negative. Though the effect is not quite significant (only 0.4%), the accumulated response remains stable on average on that level after it moves up. One possible explanation in favour of this response may be the tendency of the investors to move to alternative market (i.e., to the stock market) in the expectation of maximizing their return because money market rate falls due to excess liquidity. It is evident that, the growing investment to Bangladesh stock market by the general and institutional

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[6] Cash Reserve Ratio
[7] Statutory Liquidity Ratio
[8] Government of Bangladesh

investors (including the financial institutions) as well as foreign investors in the anticipation of higher return (because money market rate was low due to access liquidity) causes the stock market index to explode and breaks all of its past record before it collapsed in December 2010.

On the other hand, variance decomposition (Figure 2) shows that variances of three variables (export, exchange rate, and consumer price index) are mainly composed of their own innovation while variances of other three variables (import, stock index, and money market rate) are impacted moderately by remaining variables besides itself.

Robustness check:

To check the robustness of the results, the orders of the variables are changed to see whether that switching is sensitive to the resulted accumulated impulse responses. Figure 1a, for instance, exhibits that the result is intact even after the change of ordering of the variables.

4. Conclusion

This study investigates the impact of export shock to the stock market in the managed-floating exchange rate regime. The results from the analysis confirms the cumulative effect is positive after certain period (after 3 months on an average). Although the impact is not striking enough, it supports the empirical result find by many economists around the world. To the extent of the discussion in this study, it can be claimed that the ancillary policies to support export worked well during the period 2004-2010 before Bangladesh experience a crash in the stock market. One of the major visible impact, in this regard, is the escalation of money market rate after the collapse of stock market (figure 5). This conclusion indicates the requirement of coordination of several policies, at least by evaluating the interaction mechanism of the impact of different policy measures.

It is worthwhile to mention here that the interdependence among the macroeconomic variables requires the systematic analysis of the impact of certain policy initiatives to the total economic ecosystem. This is even more important for an emerging economy like Bangladesh. In line with this experiment, one can think of extending the study using non-recursive SVAR identification technique. Besides, there are standard tools like DSGE model to investigate the aggregate effects of monetary policy in the macroeconomic analysis.

References

Aggarwal, Raj. "Exchange rates and stock prices: A study of the US capital markets under floating exchange rates." (2003): 7-12.

Aghevli, Bijan B., Mohsin S. Khan, Prabhakar R. Narvekar, and Brock K. Short. "Monetary policy in selected Asian countries." *Staff Papers* 26, no. 4 (1979): 775-824.

Alam, Md Rafayet. "Effectiveness of monetary policy in Bangladesh." *The Journal of Developing Areas* 49, no. 2 (2015): 363-372.

Banerjee, P. K., and B. K. Adhikary. "Dynamic Effects of Changes in Interest Rates and Exchange Rates on the Stock Market Return in Bangladesh." *Ritsumeikan Journal of Asia Pacific Studies* 25 (2009): 119-133.

Christiano, Lawrence J., Martin Eichenbaum, and Charles L. Evans. *Monetary policy shocks: what have we learned and to what end?*. No. w6400. National bureau of economic research, 1998.

Erceg, Christopher J., and Andrew T. Levin. "Optimal monetary policy with durable and non-durable goods." *FRB International Finance Discussion Paper* 748 (2002).

Franck, Peter, and Allan Young. "Stock price reaction of multinational firms to exchange realignments." *Financial Management* (1972): 66-73.

Ivanov, Ventzislav, and Lutz Kilian. "A practitioner's guide to lag order selection for VAR impulse response analysis." *Studies in Nonlinear Dynamics & Econometrics* 9, no. 1 (2005).

Kim, Soyoung, and Nouriel Roubini. "Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach." *Journal of Monetary Economics* 45, no. 3 (2000): 561-586.

Lin, Chien-Hsiu. "The comovement between exchange rates and stock prices in the Asian emerging markets." *International Review of Economics & Finance* 22, no. 1 (2012): 161-172.

Ma, Christopher K., and G. Wenchi Kao. "On exchange rate changes and stock price reactions." *Journal of Business Finance & Accounting* 17, no. 3 (1990): 441-449.

Mehrotra, Aaron N. "Exchange and interest rate channels during a deflationary era—Evidence from Japan, Hong Kong and China." *Journal of Comparative Economics* 35, no. 1 (2007): 188-210.

Romer, David. *Advanced macroeconomics*. mcgraw-hill companies, 1996.

Sariola, Mikko. "Monetary policy and exchange rate shocks: effects on foreign trade in Finland." (2009).

Soenen, Luc A., and Elizabeth S. Hennigar. "An analysis of exchange-rates and stock-prices-the united-states experience between 1980 and 1986." *Akron Business and Economic Review* 19, no. 4 (1988): 7-16.
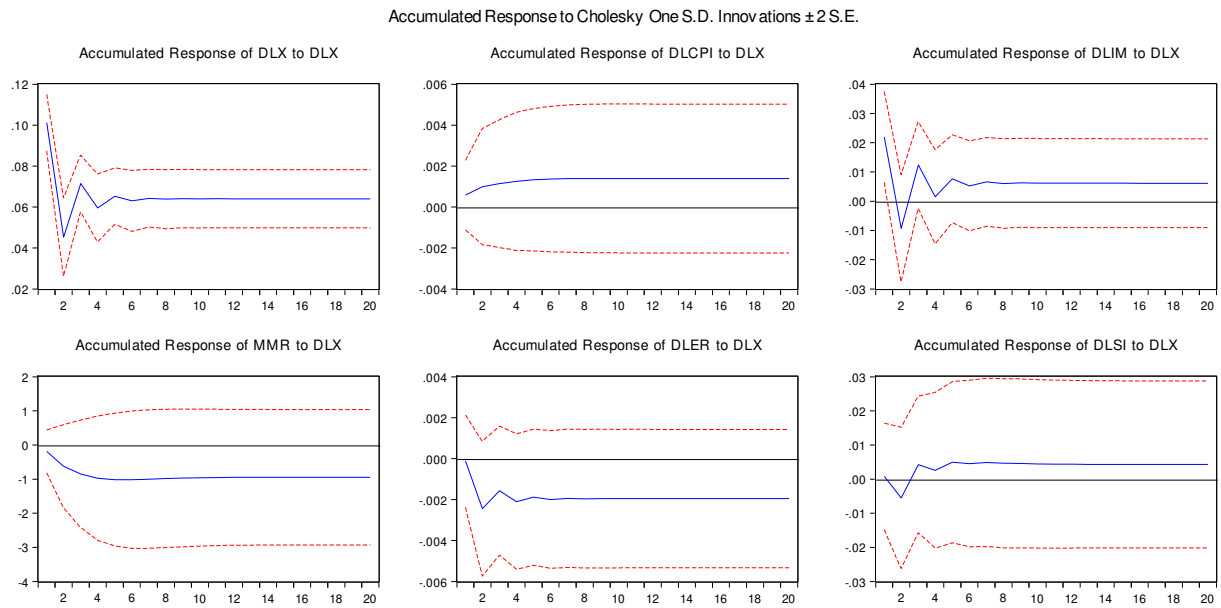
Appendix

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 1: Accumulated Impulse responses to Export Shock

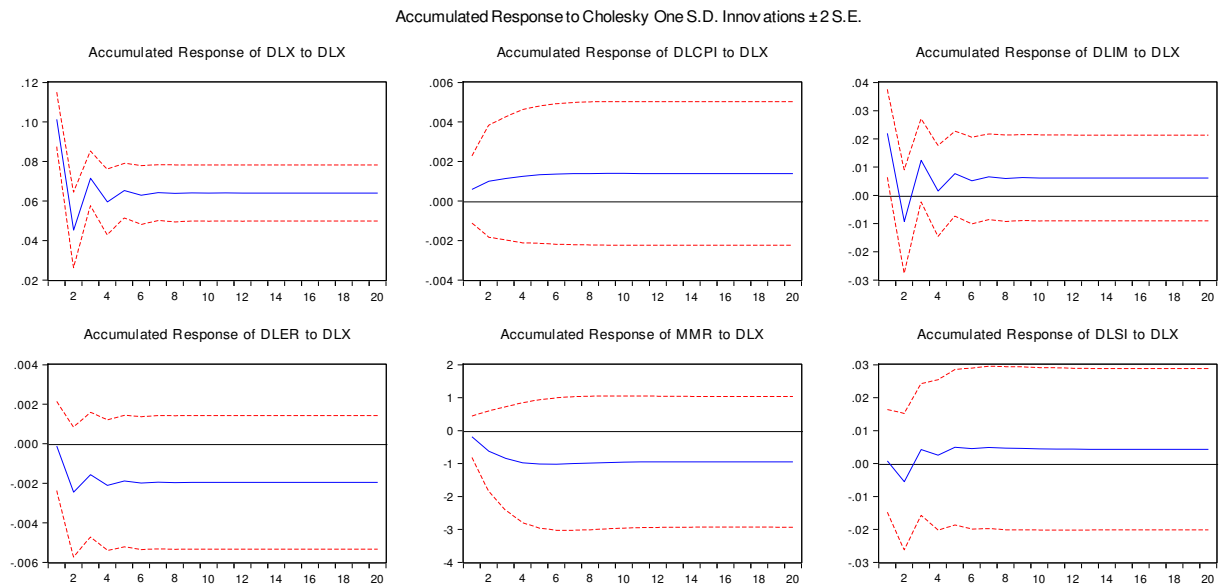Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

Figure 1a: Accumulated Impulse responses to Export Shock [Changing the order of variables]
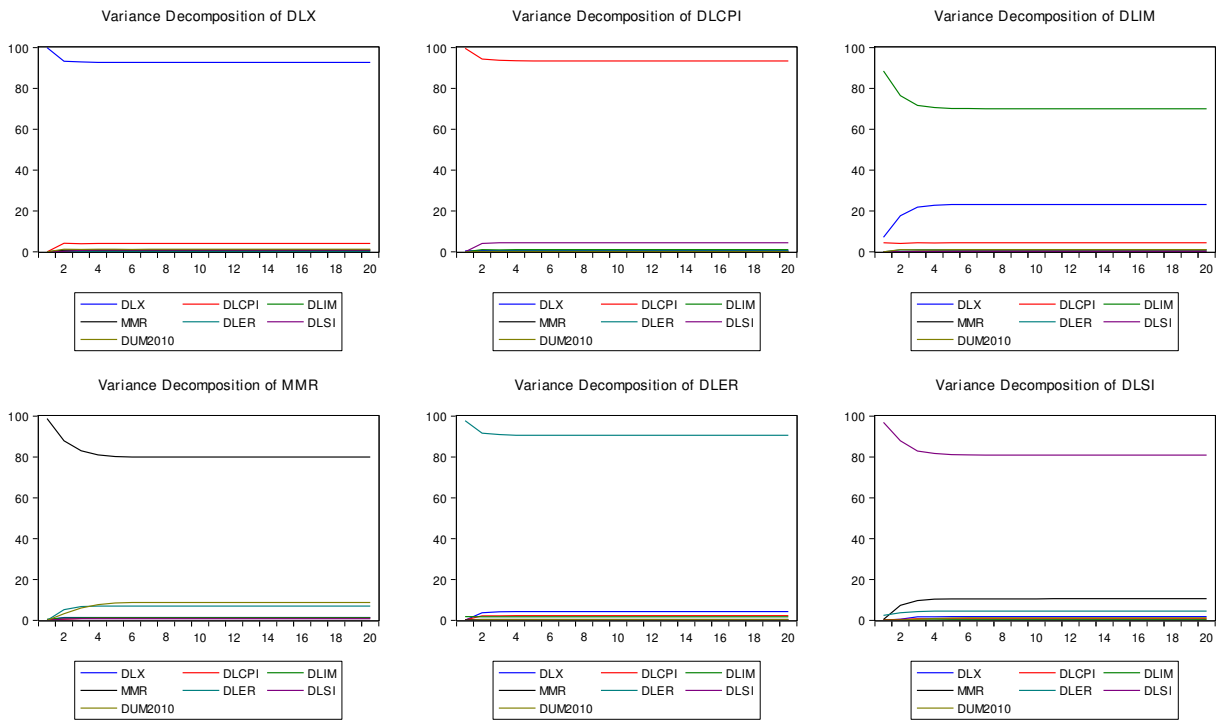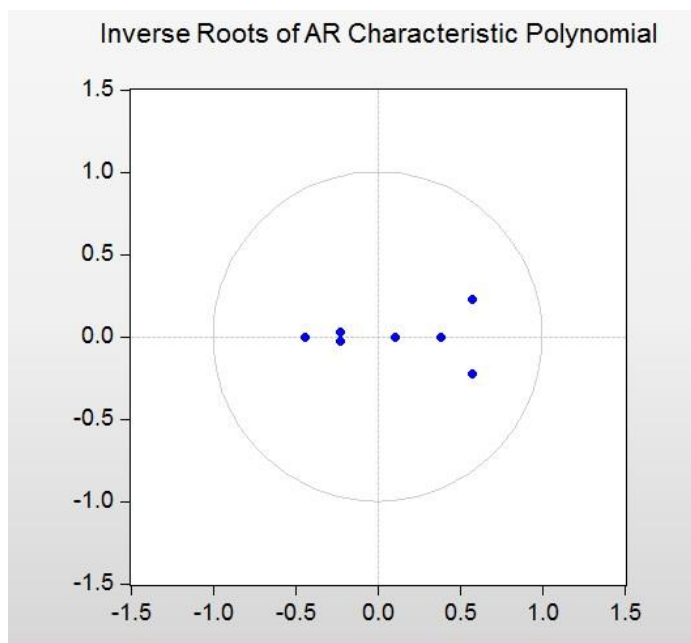
Figure 2: Variance Decomposition

Figure 3: AR Root Graph

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VAR Lag Order Selection Criteria
Endogenous variables: DLX DLCPI DLIM MMR DLER DLSI DUM2010
Exogenous variables: C
Date: 10/13/16   Time: 19:05
Sample: 2004M06 2013M07
Included observations: 105
```

Lag	LogL	LR	FPE	AIC	SC	HQ
0	726.3033	NA	2.64e-15	-13.70101	-13.52408	-13.62932
1	842.4302	214.5583	7.38e-16	-14.97962*	-13.56418*	-14.40606
2	922.9653	138.0602	4.09e-16*	-15.58029	-12.92633	-14.50485*
3	970.0963	74.51187*	4.37e-16	-15.54469	-11.65222	-13.96738
4	1009.233	56.65544	5.60e-16	-15.35682	-10.22583	-13.27765

```
* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion
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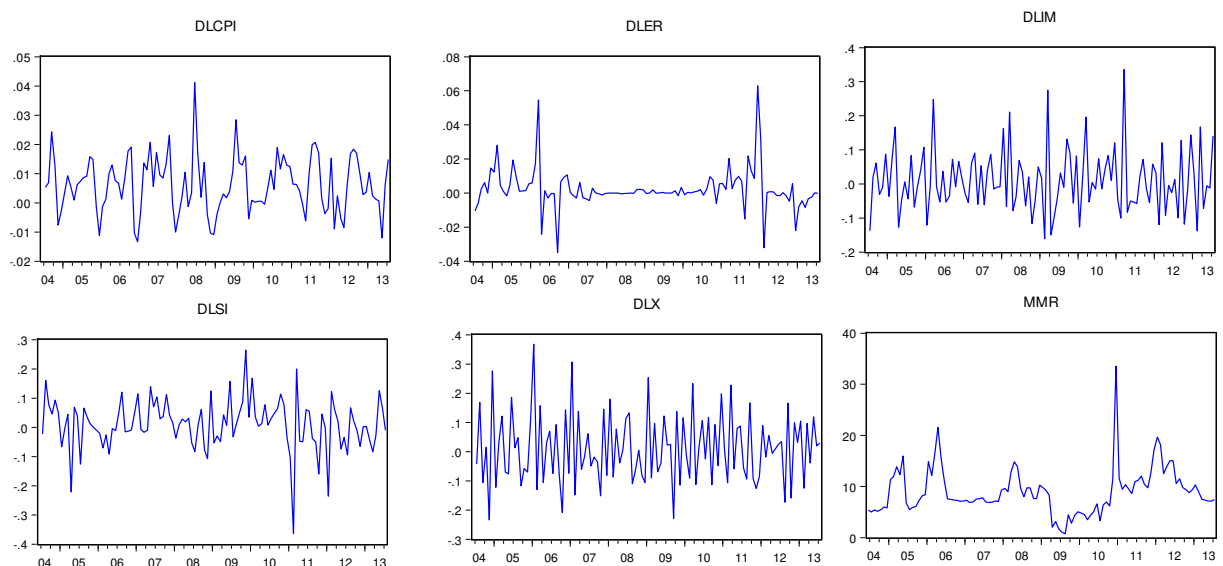
Figure 4: Lag Length Criteria

Figure 5: The transformed variables in log-difference [MMR in level]