

Exchange Rate Management in Vietnam for Sustaining Stable and Long-Term Economic Growth*

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Abstract. The purpose of this paper is to measure empirically the effects of currency depreciation on inflation and trade balance in the case of Vietnam. The author utilizes the quarterly data from 2000 to 2012 for the Vector Auto-Regression (VAR) model to build the impulse response functions and variance decompositions of inflation and trade balance. The obtained results are remarkably consistent with economic principles in the theory review. The impulse response functions indicate that currency depreciation has considerable negative impact on inflation while having fairly positive impacts on trade balance. However, variance decompositions of trade balance show that exchange rate itself can hardly explain much about the change in trade balance. Basing on these results, the author proposes (1) stabilization of exchange rate to restrain inflation and (2) enhancing the quality of exported goods to improve competitiveness.

Аннотация. Целью данной работы является эмпирическое измерение влияния обесценивания валюты на инфляцию и торговый баланс на примере Вьетнама. Автор использует квартальные данные с 2000 по 2012 год для построения модели вектора авторегрессии (VAR). Полученные результаты полностью соответствуют принципам экономической теории. Функции импульсных откликов показывают, что обесценивание валюты оказывает значительное негативное воздействие на инфляцию, имея при этом положительное влияние на сальдо торгового баланса. Основываясь на полученных результатах, автор предлагает: 1) использовать стабилизацию обменного курса для сдерживания инфляции; 2) повышать качество экспортных товаров для повышения конкурентоспособности.

Key words: Exchange rate, inflation, trade balance, Vietnam, VAR model.

1. INTRODUCTION

Exchange rate has long since been a controversial issue concerned by both macroeconomic policy makers and most of the population. By nature, exchange rate is simply the price of a currency denominated in another one; nonetheless, in a highly open economy like Vietnam, exchange rate exerts strong impacts on other macroeconomic variables, most significantly inflation and trade balance. In theory, the situation is even more complicated as the impacts of exchange rate on inflation and trade balance are mutually contradictory: an increase in exchange rate will help to improve the trade balance while affects inflation negatively, *vice versa*. Therefore, developing optimal exchange rate policy for satisfying both of the factors is critically impor-

tant to keep inflation under control while gradually improving trade balance. There have been quite a few researches in the world in this topic, namely those of Amit Ghosh (2008), Atish R. Ghosh (2006), Khim-Sen Liew (2005) and Michele Ca Zorzi (2007). These researches have provided both a general background in and deep insight to this issue of South East Asian nations in particular and emerging economies in general. Among these countries, the case of Vietnam is of special interest of Carmen Ulrich (2006), Vo Tri Thanh (2011), Nguyen Van Tien (2009), Nguyen Thi Hien (2011), Nhat Trung (2011), Nguyen Duc Thanh (2011) and Nguyen Thi Kim Thanh (2011). However, all of these researches have only focused on either the inflation aspect or trade balance aspect rather than taken the trade-off between them into consideration.

* Управление обменным курсом для поддержки стабильности экономического роста во Вьетнаме.

2. THEORY REVIEW OF EXCHANGE RATE'S EFFECTS ON INFLATION AND TRADE BALANCE

2.1. EFFECTS OF EXCHANGE RATE ON INFLATION

In 1990s, exchange rate was proved to have effects on inflation which was called exchange rate pass-through (ERPT). The strength of the effect depends on three fundamental passages, including the direct one, the indirect one and the behavioral one.

For the direct passage, an increase in the exchange rate will inflate the price of imported goods denominated in the domestic currency. This will, in turn, raise the domestic price level as much as the imported goods play their role in total domestic consumption. Besides the immediate consumption, some of the imports are also inputs for domestic production. The higher price of the inputs will be partly transferred to the final price of the products, which also contributes to the rise in national price level.

For the indirect passage, by the same manner, currency depreciation will push up the price of imported goods denominated in the domestic currency. This will, in turn, make the domestic goods become relatively cheaper, which encourages people to switch from the imported goods to the domestic ones (expenditure-switching effect). In addition, an increase in the exchange rate will reduce the price of exported goods denominated in the foreign currency. Then the exported goods would be more competitive in term of price, which will boost the foreign demand

of these goods (expenditure-changing effect). Both of these spur the demand for domestic goods, fueling the demand-pull inflation. Moreover, in the specific case of Vietnam, the depreciated currency and the trend of economic openness have attracted foreign investment, increased labor demand, and then raised the domestic wage level. This occurrence causes both cost-push and demand-pull inflation.

For the behavioral passage, in most developing countries with economic instability and high and persistent inflation, their people have the tendency to lose confidence in the domestic currency. Especially, in these countries, most of the population is of low educational level; therefore, there is much room for the speculators to manipulate the exchange rate. In case the domestic currency is devalued, the magnitude of the devaluation will be greater with the phenomenon of speculation, intensifying the ERPT effect. Further, the act of devaluation is a clear signal that the government is losing its control over inflation. This provides a sound basis for the people to expect higher inflation in the future, and expected inflation also plays a notable part in the increase of the real inflation.

2.2. EFFECTS OF EXCHANGE RATE ON TRADE BALANCE

Three economic theories have approached the effects of exchange rate on trade in various ways. These approaches have complemented each other and helped to understand more deeply the effects in particular situations.

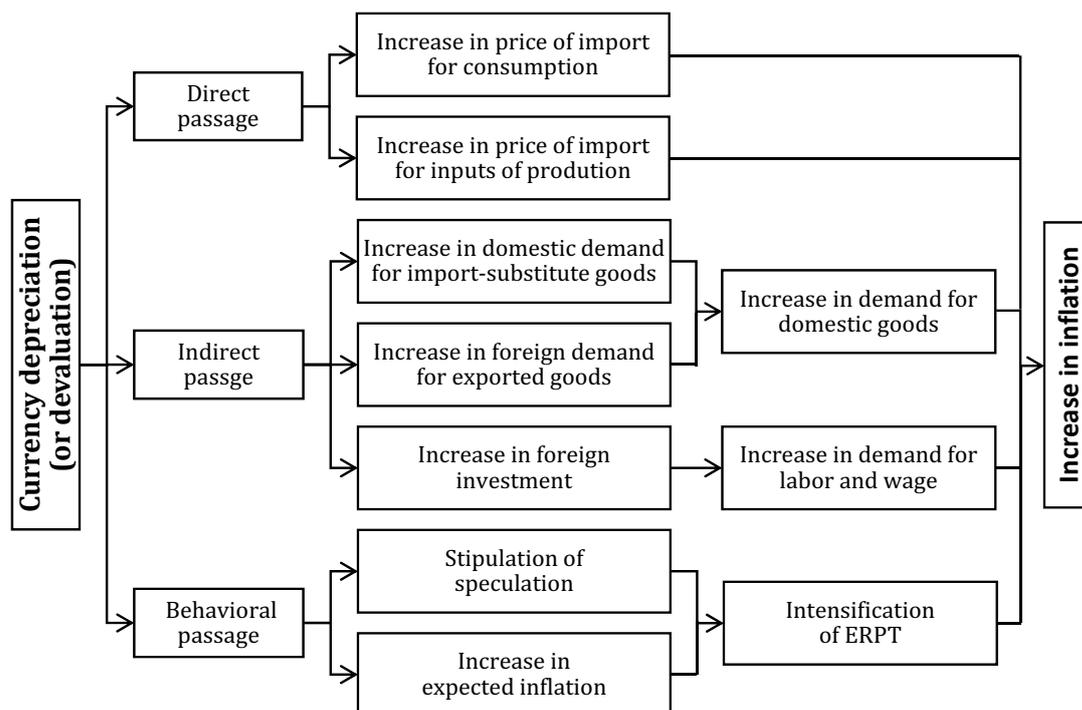


Figure 1. Three passages of exchange rate pass-through effect.

For the theory of price elasticity of demand, nominal devaluation would be able to improve the trade balance as long as foreign demand for the exported goods is price elastic. Given that the price of exported goods denominated in foreign currency is unchanged, the revenue of the exporter will go up. This will, in turn, increase the volume of export and the opposite will happen to the volume of import and *vice versa*. The power of exchange rate over trade balance depends on the price elasticity of demand of the goods. The more elastic the demand is, the stronger the effect is.

For the theory of aggregate expenditure, only if the national income exceeds its aggregate expenditure could trade balance be improved by currency devaluation. This theory emphasizes on the power of exchange rate over national income, aggregate expenditure, and ultimately trade balance. When the government conducts devaluation of the domestic currency, the value of export will rise and the opposite will happen to import, which eventually stimulates aggregate demand. In case the economy is not producing at its potential level, it will have enough unemployed resources to increase the output to meet the higher aggregate demand. On the contrary, in case the economy is producing at its potential level already, it cannot produce more outputs. Then the increase in aggregate demand will push up wage and price level speedily, which erodes the country's international competitiveness and drives the trade balance back to the initial level. When the wage and price level increase by the same proportion that the currency has been devalued by, the country's international competitiveness will also come back to its initial level.

For the monetary theory, trade balance is of monetary nature; thus, it needs to be systematically analyzed through the supply and demand of money. The imbalance of trade balance is the manifestation of the imbalance in the money market. Devaluation of a currency, at first, may raise the domestic price level, which makes the country's residents cut back on spending. And then the trade balance would be improved swiftly but the new equilibrium is only maintained in short term. Due to the higher price level, there is an increase in money demand which gradually drives the trade balance back to the original level with a lower price level, however, still higher than the initial one. Even though this overshooting effect happens in a short amount of time, it is widely considered favorable by the authority, especially in developing countries, as it allows the foreign-exchange reserve to be built up without worsening the trade balance. Nevertheless, in case the devaluation is expected precisely by the population, the process will happen in no time and the devaluation will be ineffective even in the short-term.

3. QUANTITATIVE ANALYSIS OF EXCHANGE RATE'S EFFECTS ON INFLATION AND TRADE BALANCE

3.1. METHODOLOGY AND DATA

In this section, the modern quantitative method, econometrics, is utilized to analyze the effects of exchange rate on inflation and trade balance in the case of Vietnam in the period from 2000 to 2012. Year 2000 is chosen to be the starting year as Vietnam has been taking actions to liberate the foreign exchange market since 1999. The liberation movement starting with Resolution No. 65/1999/QĐ-NHNN7 of State Bank of Vietnam (SBV) is highly crucial as it is the indispensable prerequisite for economic laws to be applied in any econometric model. The data for the model is collected quarterly, including 52 observations and meeting the large-sample-size requirement (more than 30 observations).

As all of the variables in the model are time series ones and some of them have the manifestation of autocorrelation; Vector Autoregression (VAR) model is employed to handle the two issues effectively. The VAR model is the transformation of the Autoregression model into vectors of economic variables. VAR model is especially useful for forecasting as the relationships between economic variables are not always one-way ones (independent variables influence dependent ones), but in many cases, dependent variables could have influence back on independent ones. Besides, VAR model also has several advantages including rather easy implementation, conventional inference, lag length criteria, impulse response function and variance decomposition. The equations of the VAR model used in this paper are the following:

$$CPI_t = \alpha + \sum_{j=1}^k \beta_j * CPI_{t-j} + \sum_{j=1}^k \gamma_j * MS2_{t-j} + \sum_{j=1}^k \delta_j * LEN_{t-j} + \sum_{j=1}^k \theta_j * EXR_{t-j} + \sum_{j=1}^k \omega_j * TBR_{t-j} + \varepsilon_t$$

$$TBR_t = \alpha' + \sum_{j=1}^k \beta_j' * TBR_{t-j} + \sum_{j=1}^k \gamma_j' * MS2_{t-j} + \sum_{j=1}^k \delta_j' * LEN_{t-j} + \sum_{j=1}^k \theta_j' * EXR_{t-j} + \sum_{j=1}^k \omega_j' * CPI_{t-j} + \varepsilon_t'$$

Where:

CPI stands for Consumer Price Index and acts as the inflation index. Its index reference period is year 2000.

TBR stands for Trade Balance Ratio, and it is calculated by dividing the total export turnover of Vietnam in one year by its total import turnover. Increase in trade balance ratio means trade balance is improved. It has also been mathematically proved that the percentage change in trade balance ratio is approximately equal the percentage change in trade balance itself.

EXR stands for exchange rate of Vietnamese Dong (VND) to US Dollar (USD). The data on exchange rate is announced by SBV daily then consolidated quarterly by computing the average.

MS2 stands for money supply of type M2 including all cash, transactional accounts and time deposits in the economy. Even though change in money supply may not exert any impact on inflation immediately, excessive increase in money supply has been proved to be the most fundamental cause of inflation in the mid-term and the long-term.

LEN stands for the average short-term lending rate of commercial banks. The rate is usually for three month loans and announced by SBV. It wields great and direct influence upon the import condition as most of the firms in the import business have to borrow to imported goods. Increase in short-term lending rate will reduce the profit of the business and drive down the amount of import.

The data is collected quarterly from the first quarter of year 2000 to the fourth quarter of year 2012. The sources of data for exchange rate and lending rate are obtained from SBV; those for inflation and total import-export turnover is collected from General Statistics Office of Vietnam; those for money supply and others indicators are attained from International Financial Statistics, Databank of World Bank and Annual Reports of Asian Development Bank. All of the seasonal component of the data are removed

by X-12-ARIMA Seasonal Adjustment Program of US Census Bureau. First difference of common logarithm of some variables is calculated to measure the growth rate of these variables quarterly.

3.2. TEST FOR STATIONARITY AND LAG LENGTH SELECTION

To avoid the phenomena of spurious regression in the equations, Augmented Dickey-Fuller test is used for all variables in the model (Table 1). The tested lag length is selected according to Schwarz Information Criterion with the maximum lag length of 12 quarters.

Sequential modified Likelihood-Ratio test (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz information Criterion (SC) and Hannan-Quinn information criterion (HQ) are utilized to determine the optimal lag length for the variables in the model (Table 2). According to these criteria, one quarter and three quarters are the optimal lag length. Nonetheless, one quarter lag length seems not to be of common economic sense. Moreover, many quantitative researches (Khim-Sen Liew, 2004) have proved that AIC and FPE criteria are preferable for time series data with less than 120 observations. In addition, AIC and FPE criteria are also least likely to be confronted with the underestimate issue. LR criterion is often employed to test the stability of AIC and SC criteria. Hence, the lag length of three quarters is selected due to LR, FPE and AIC criteria which are more creditable.

4. FINDINGS ABOUT ECONOMETRIC MODEL

4.1. FINDINGS ABOUT EFFECTS OF EXCHANGE RATE ON INFLATION

Analyses of impulse response function of inflation to exchange rate are reasonably consistent with economic theories and estimation for the case of Vietnam (Appendix 2). Response of inflation to a

Table 1: Test for stationarity of variables in model.

Variable	ADF test	Stationarity	Variable	ADF test	Stationarity
CPI	4.480050	Non-stationary	dlogCPI	-4.238069***	Stationary
TBR	-3.582007***	Stationary			
EXR	0.113497	Non-stationary	dlogEXR	-1.640168**	Stationary
MS2	1.985719	Non-stationary	dlogMS2	-4.281709***	Stationary
LEN	-1.351350**	Stationary			

***, **: statistically significant at 1% and 5% level, respectively.

Table 2. Selection of optimal lag length for model.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	657.0107	NA	1.09e-18	-27.16711	-26.97220	-27.09345
1	749.4069	161.6934	6.64e-20	-29.97529	-28.80579*	-29.53333*
2	771.4099	33.92126	7.79e-20	-29.85041	-27.70633	-29.04016
3	804.6235	44.28476*	6.06e-20*	-30.19265*	-27.07398	-29.01410
4	821.8628	19.39426	1.01e-19	-29.86928	-25.77603	-28.32244

*: the optimal lag lengths selected by the criterion.

positive exchange rate shock is negligible in the first three quarters. Somehow, in the period, increase in exchange rate discourages import and then reduces aggregate demand, bringing down the inflation, which is a minimal effect. Inflation is not affected immediately due to price stickiness. For example, contracts signed previously are carried out with the price in the past, which makes the price level to be rigid in the short term. After the third quarter, inflation starts to rise quickly, reaches the peak in the sixth quarter, then gradually lowers until the eighth quarter and becomes stable. The reason why inflation cannot achieve the state of equilibrium in the first six quarters is that inflation may overreact to the change in exchange rate (overshooting effect) and it takes time to reconcile the expected inflation with the actual one. Quantitatively, the accumulated response of inflation to an exchange rate shock is 0.338, which means that a 1% increase in exchange rate will be translated into a 0.338% increase in inflation in eight quarters. According to a research by IMF (2007), the ERPT of Taiwan, China, Korea and Thailand are 0.02%, 0.07%, 0.12%, and 0.28%, respectively. That ERPT of Vietnam is relatively high in comparison with other nations in the region, which could be attributed to high and persistent inflation, import as a large proportion of consumption and inputs of domestic industries, rampant speculation among the population, etc.

The variance decomposition of inflation (Appendix 3) indicates the substantial influence of exchange rate over inflation. In the first two quarters, when a change in exchange rate has not yet exerted considerable impact upon inflation, it only accounts for about 8% of the change in inflation. From the third quarter, exchange rate explains more and more variation in inflation. In the long term, up to 19% of fluctuation in inflation could be attributed to an exchange rate shock. Besides exchange rate, inflation in the past (causing expected inflation) and trade balance are also major factors behind changes in inflation. Contrary to exchange

rate, expected inflation has the greatest impact on inflation in the first two quarters; it accounts for 100% and 88% in the first and second quarter, respectively. Then the impact is gradually alleviated and becomes stable at 52% in the long term. For the influence of trade balance on inflation, as it demonstrates strong correlation with GDP, improvement of trade balance could increase GDP, causing the demand-pull inflation.

4.2. FINDINGS ABOUT EFFECTS OF EXCHANGE RATE ON TRADE BALANCE

Analyses of impulse response function of trade balance to exchange rate are also reasonably consistent with economic theories and estimation in the case of Vietnam (Appendix 2). To a positive exchange rate shock, trade balance is improved insignificantly in the first two quarters. An increase in exchange rate will immediately encourage available extra export (marginal export) and discourage easy-to-substitute export (marginal import). This effect has no impact on the structure of import and export. After the second quarter, the trade balance ratio worsens continuously for three quarters. The reason for this worsening is the overwhelming of price effect over volume effect: (1) lower revenue from export turnover, (2) higher cost for import in total. From the fifth quarter, trade balance is improved again due to the growing stronger volume effect and the adapting structure of import and export for more export and less import. After nine quarters, the effects of exchange rate on trade balance diminish completely. Quantitatively, the accumulated response of trade balance ratio to an exchange rate shock is 0.00255, which means that a 1% increase in exchange rate will be translated into a 0.255% improvement in trade balance in nine quarters. The impulse response function of trade balance ratio exhibits the tendency to closely resemble the J curve effect. If Vietnamese Dong is devalued by 1%, the economy will endure a four quarter period of trade balance worsening with the accumulated effect equal to 0.138% of the total import and ex-

port turnover in a quarter. In 2012, the total import and import turnover was about 28.448 billion USD, then the possible amount of trade balance worsening is approximately 39.144 million USD, as much as 0.098% of the foreign reserve of Vietnam by the end of the first quarter in 2013. However, the net accumulated improvement of trade balance ratio which is only 0.224% (equal to merely 63,946 million USD) could be considered fairly modest.

The variance decomposition of inflation (Appendix 3) shows that the influence of exchange rate over trade balance is not as much as conventionally expected. In the first four quarters, exchange rate only accounts for up to 10.64% of the variation in trade balance. From the fifth quarter, exchange rate explains a little bit more change in trade balance, from 13.44% to 17.03%. In the long term, from 13% to 15% of fluctuation in trade balance could be attributed to an exchange rate shock. Meanwhile, trade balance ratio is affected mostly by the value of itself in the past, not by the exchange rate as the conventional belief. Up to 85% of the variation in trade balance is explained by the value of itself in the past for the first quarter. The rate gradually slows down to 61% in the second quarter and 50% in the third quarter. This phenomenon could be interpreted as follows. How well the goods are exported depends largely on their quality: if a kind of goods has been exported well in the past they will continue to be exported well in the future, and *vice versa*. Specifically, if the quality of goods meets the requirements widely accepted all over the world, the market for the goods is potentially huge. This means the demand for the goods is rather price-elastic and a relative reduction in price would encourage exporting more goods. However, the opposite happens in the case of Vietnam. As most of the country's exported goods are low quality ones, raw materials, or unprocessed produce, their price elasticity is quite low. In brief, the quality of exported goods is the decisive factor in how much Vietnam could export.

5. CONCLUSIONS AND POLICY PROPOSALS

Two conclusions could be derived from this paper: Firstly, in the case of Vietnam, an increase in exchange rate could affect inflation negatively and the influence is relatively profound in comparison with other nations in the region. This could be attributed to some specific factors of the country that maintain ERPT at high level. They consist of, mainly but not exclusively, high and persistent inflation, import as a large propor-

tion of consumption and inputs of domestic industries, rampant speculation among the population.

Secondly, a positive exchange rate shock could improve Vietnam's trade balance slightly; however, compared with other factors, it just plays a lesser role in explaining the variation in trade balance. This could be due to the fact that Vietnam has not achieved enough prerequisites for a successful currency devaluation which can substantially improve the trade balance. For Vietnam, the most essential condition among these ones is that its exported goods have not met the criteria to be internationally tradable ones.

Quantitatively, an 1% increase in exchange rate will be translated into a 0.224% improvement in trade balance but with a 0.338% increase in inflation. Thus, at the moment, as the first priority is stabilizing the macro economic conditions, the author proposes maintaining the exchange rate as a powerful tool to keep inflation under control. Besides, the author also proposes raising the quality of the exported goods to enhance the competitiveness as it is the decisive factor in improving trade balance which accounts for up to 85% of variation in trade balance ratio. Currency devaluation for the purpose of trade balance improvement must be taken into careful consideration, as its contribution to the improvement is relatively minor (about 15% of variation in trade balance).

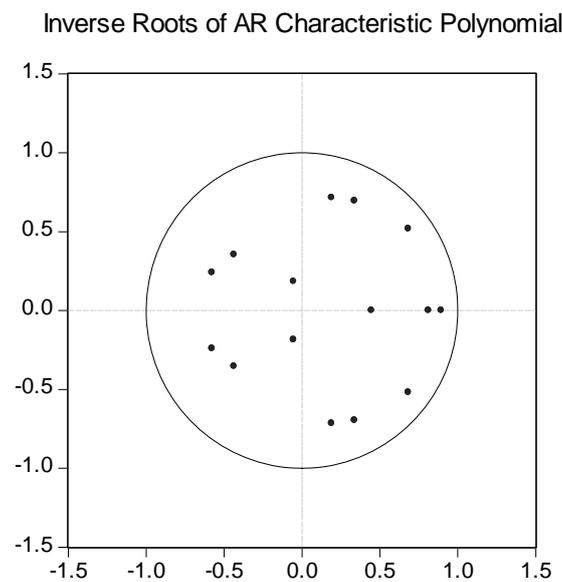
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APPENDIX 1. Testing the model.

Unit root test yields the result that all the roots are smaller than one. It can be concluded that the model is statistically stable. Unit root test is an indispensable test to confirm the stationarity of variables, then to avoid the phenomenon of spurious regression. In case of spurious regression, the estimators of the coefficients are still statistically significant and have high R^2 , but the genuine cause is that there exists at least one non-stationary independent variable and it has an increasing (decreasing) trend rather than the variables have economic relations.

Autocorrelation test shows that there exists no correlation among the variables after twelve quarters. All of the value of LM-Stat has the probability higher than 0.05, which fails to reject the null hypothesis that there is no serial correlation among the variables. The results of this test are highly important as in case correlation exists among the variables, (1) variances of coefficients' estimators are biased, (2) confidence intervals is unreliable, and (3) statistical hypothesis of coefficients is unreliable.



VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Sample: 2000Q1 2012Q4

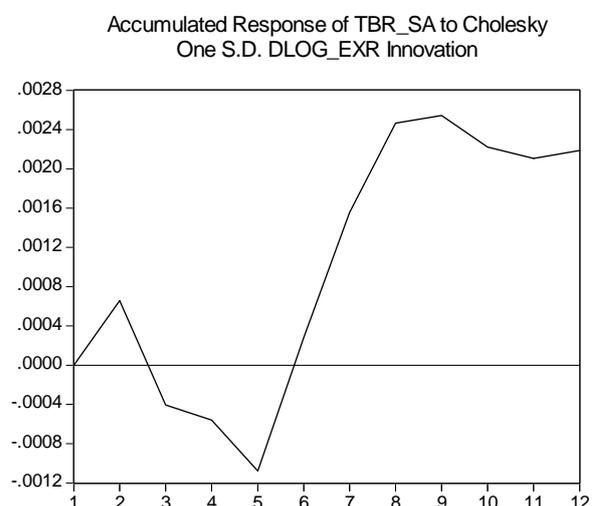
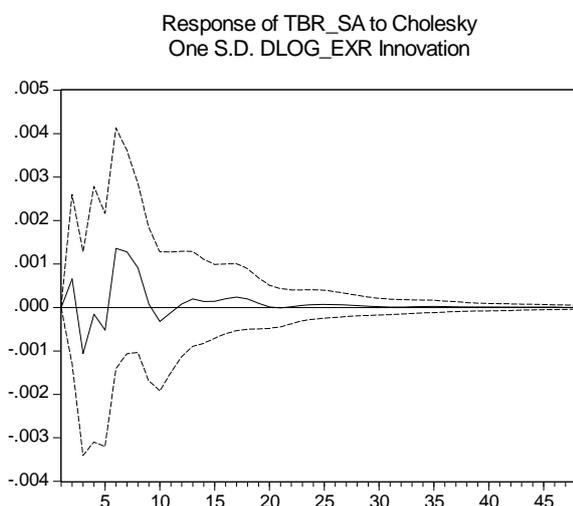
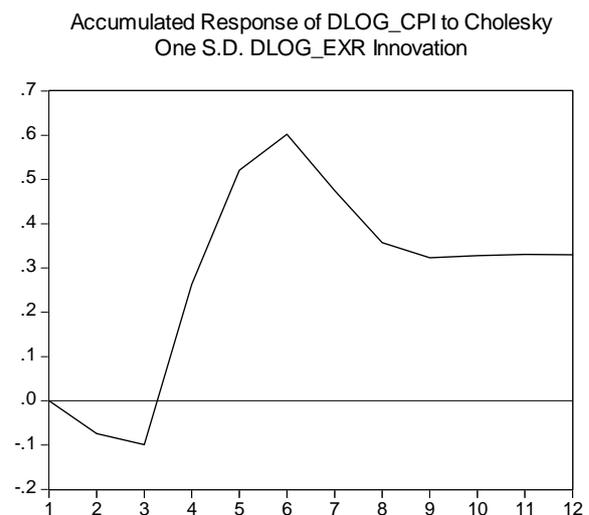
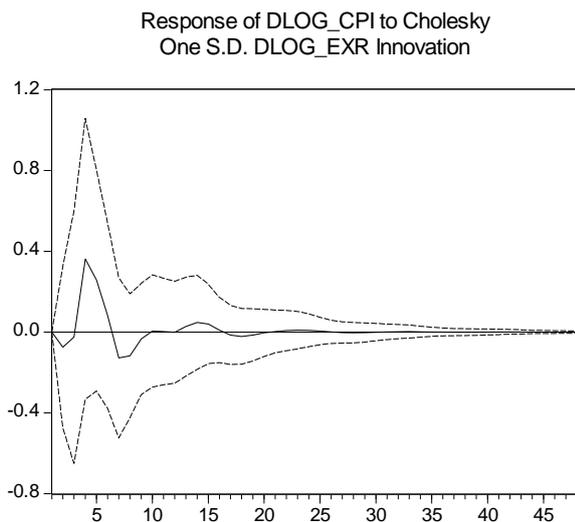
Included observations: 52

Lags	LM-Stat	Prob
1	27.98470	0.3086
2	24.94875	0.4652
Lags	LM-Stat	Prob
3	12.81941	0.9786
4	31.05690	0.1871
5	16.04437	0.9135
6	17.26466	0.8720
7	21.61754	0.6577
8	29.35058	0.2495
9	16.60964	0.8955
10	19.19823	0.7875
11	25.15489	0.4537
12	37.13798	0.0560

Residual Heteroskedasticity Tests fail to reject the null hypothesis that the error term has a constant variance. This is also a crucial test as the consequences of an inconstant variance of the error term are especially severe, including (1) estimators of coefficients are unreliable, and (2) confidence intervals and statistical hypothesis of coefficients are worthless.

VAR Residual Heteroscedasticity Tests: No Cross Terms (only levels and squares)		
Sample: 2000Q1 2012Q4		
Included observations: 52		
Joint test:		
Chi-sq	df	Prob.
466.1351	450	0.2899

APPENDIX 2. Impulse response functions and accumulated responses functions of inflation and trade balance ratio to exchange rate.



APPENDIX 3. Variance decomposition of inflation and trade balance ratio.**Variance decomposition of inflation**

Variance Decomposition of DLOG_CPI:						
Period	S.E.	DLOG_CPI	TBR_SA	DLOG_MS2	LEN_SA	DLOG_EXR
1	0.010533	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.015915	88.29226	1.713742	1.789966	0.092683	8.111351
3	0.020370	69.91496	8.171073	6.082558	1.337083	14.49433
4	0.022083	64.04432	11.87168	6.977521	3.187235	13.91924
5	0.023319	57.66264	15.03356	6.458203	3.985253	16.86034
6	0.024146	53.78640	18.30095	6.106606	3.790631	18.01541
7	0.024431	52.81520	19.06944	6.254073	3.811607	18.04968
8	0.024661	52.30823	19.18863	6.159269	3.750372	18.59350
9	0.024926	52.20429	18.80862	6.028836	4.006227	18.95203
10	0.024997	52.02956	18.87739	6.009689	4.236674	18.84668

Variance decomposition of trade balance ratio

Variance Decomposition of TRBR_SA:						
Period	S.E.	DLOG_CPI	TBR_SA	DLOG_MS2	LEN_SA	DLOG_EXR
1	0.005930	15.19949	84.80051	0.000000	0.000000	0.000000
2	0.008107	24.31917	60.85745	5.328275	0.021810	9.473299
3	0.009947	27.18014	50.00318	3.767649	11.38391	7.665128
4	0.011059	22.30037	45.19291	3.322363	18.54690	10.63746
5	0.011566	20.46056	41.63579	4.571206	18.83397	14.49848
6	0.012065	24.92267	38.91863	5.073787	17.64353	13.44139
7	0.012158	24.54320	38.35485	5.234014	17.67861	14.18933
8	0.012396	25.01608	37.68825	5.035425	17.06537	15.19488
9	0.012610	24.56021	36.56387	5.059118	16.97743	16.83936
10	0.012682	24.28771	36.15923	5.187837	17.33902	17.02620