The effects of the real exchange rate on the trade balance: Is there a J-curve for Vietnam? A VAR approach.

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15 May 2013

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Abstract

This study employs a reduced-form VAR model to estimate trade balance's responses to a positive shock to the real VND/USD exchange rate. For this purpose, we apply identification restrictions based on the conclusion by Krugman, Obstfeld and Melitz (2012), and on the theory of the AA-DD model to estimate the impulse response functions of the trade balance. We use a monthly data set of four endogenous variables and two exogenous variables from January 1995 to December 2012. Since the data of two endogenous variables is unavailable in monthly basis, we interpolate those series using Chow and Lin's (1971) annualized approach from their annual series. Overall, we find that there exists a J-curve for Vietnam, and its effect lasts for 11 months. Particularly, the worsening effect on the trade balance becomes most severe in the third and the fourth months.

Key words: J-curve; Trade balance; Real exchange rate, VAR, Vietnam.

JEL classification: F14, F32.

Introduction and brief literature review

Depreciation of a currency has great impacts on the trade balance, but the impact may vary across countries, probably due to different levels of economic development. The Marshall-Lerner condition states that real depreciation of the domestic currency improves the trade balance in the long run if the sum of the absolute values of elasticity of import and export demand is greater than one (Krugman, Obstfeld and Melitz, 2012). Real depreciation causes the trade balance to improve in two different ways. First, such real depreciation makes exported goods cheaper in terms of foreign currency and therefore more competitive. Consequently, this leads to an increase in the quantity of exports. Second, real depreciation causes the prices of imported goods to increase in terms of the domestic currency. Thus, the quantity of import demanded decreases in the long run. However, there is also a so-called J-curve effect on the trade balance in the short run, which states that the trade balance is immediately worsened due to real depreciation of the domestic currency, and that the J-curve usually lasts for several months. This is because the quantity effect is dominated by the price effect in the short run. In other words, since the prices of imports go up in terms of the domestic currency due to real depreciation, whereas the quantity of imports and exports cannot quickly adjust, the trade balance deteriorates.

Statistical data from the International Financial Statistics (IFS) shows that the Vietnamese dong (VND) has been depreciating in nominal term against the US dollar (USD). However, since Vietnam inflation is much higher than US inflation, the VND has actually appreciated in real term. In addition, data reported by the General Statistics Office of Vietnam (GSO) reveals that the trade balance of Vietnam has been persistently in deficit for many years (except 1992 and 2012). Thus, one may question on the linkage between the real VND/USD exchange rate and the Vietnam's trade balance. This study therefore tries to address the research questions: How might real depreciation of the VND affect the trade balance in the short run? Is there a J-curve for Vietnam? Since our objective is to estimate the responses of the trade balance to a positive shock to the real VND/USD exchange rate in the short run, and to examine whether a J-curve exists, this paper does not test the Marshall-Lerner condition, and assumes that it holds for Vietnam.

There have been many empirical studies on the existence of the J-curve for many countries. The results, however, differ across countries. Stučka (2004) used a reduced-form model approach to estimate the trade balance's response to permanent domestic currency depreciation, and found that the J-curve exists in Croatia. Petrović and Gligorić (2009) applied autoregressive distributed lag approach to estimate the impact of the real exchange rate on the trade balance of Serbia, and found the existence of the J-curve. Ahmad and Yang (2004) examined the hypothesis of J-curve on China's bilateral trade with the G-7 countries by utilizing the cointegration and causality tests and found no indication of a negative short-run response which characterizes the J-curve. Yuen-Ling, Wai-Mun, and Geoi-Mei (2008) employed the Vector Error Correction Model (VECM), and impulse response analyses to identify the relationship between the real exchange rate and the trade balance in Malaysia from 1955 to 2006. The study found no evidence of the existence of the J-curve for the Malaysia case.

Overview on Vietnam's trade

Since the Reformation in 1986, Vietnam has adopted market-oriented policies including trade policies. In the early 1990s, Vietnam gradually opened its economy and traded with many countries in the world. However, because of the starting point at a poor country which heavily depended on agriculture, the volume of trade in the early 1990s was fairly limited. Yet, Vietnam's trade volume has increased significantly since 1995 (13.6 billion US dollars)[1], when the Vietnamese government's development policies came into effect. It is notable that Vietnam's trade balance has been persistently in deficit since 1990, except 1992 and 2012 with small surpluses. Especially, 2008 was the year which exhibited the largest deficit, more than 18 billion US dollars[2]. (Figure 1, see Appendix)

[1] According to GSO
[2] GSO

In terms of trade partners, Vietnam has traded with almost all countries in the world since 1995, and the trade volume has therefore increased considerably since then. Japan and European Union (EU) have been major trade partners of Vietnam since the early 1990s. Before 2000, the trade volume (the sum of export and import) between Vietnam and the US, and China was smaller compared to that between Vietnam and Japan, and EU. Nevertheless, since the early 2000s, the US and China have also become major trade partners of Vietnam, who accounted for approximately 11.5% and 17.5%, respectively of Vietnam's total trade volume in 2012 (Figure 2, see Appendix). Regarding the export markets, the US has played a role as the biggest export market of Vietnam since 2003. EU, Japan and China are the second, the third and the fourth biggest markets, respectively (Figure 3, see Appendix).

Variables and data descriptions

Our VAR model uses four endogenous variables and two exogenous variables, which are adequate in explaining the trade policy framework of a small open economy like Vietnam. We choose endogenous variables based on the variables used by Yuen-Ling, Wai-Mun, and Geoi-Mei (2008). In their model, they used the real exchange rate expressed by Ringgit Malaysia (RM) against United States Dollar (USD), Malaysia's gross domestic product, gross domestic product (GDP) of the US, and the ratio of exports to imports. In our VAR model, we use the real exchange rate denominated by units of Vietnamese dong (VND) per one unit US dollar (USD), Vietnam's real GDP, the ratio of exports to imports, and the money supply (M1) as four endogenous variables. We include the money supply in the VAR model as a policy variable because the money supply has been used by the State Bank of Vietnam as a main instrument of the monetary policy as well as the exchange rate policy. In addition, we use the world oil price as a proxy for expected inflation, and the US real GDP as a proxy for foreign income. The reason we use the US real GDP as a proxy for foreign income is that the US is the biggest export market of Vietnam. Additionally, the US economy is large enough to affect other economies. Therefore, when the US GDP changes, it is likely that GDP of other trade partners of Vietnam also changes. We treat the world oil price and the US real GDP as exogenous variables in our VAR model.

In order to estimate the VAR model, we tried to acquire a monthly data set from January 1995 to December 2012 including 216 observations, but Vietnam's real GDP, exports and imports are unavailable in monthly basis. Thus, to obtain monthly data of those variables, we interpolate those series using Chow and Lin's (1971) annualized approach from their annual series. Once having monthly data of exports and imports, the ratio of export to import is computed. The real VND/USD exchange rate is calculated as follow:

$$q = \frac{E \times P^{us}}{P}$$

where q represents the real VND/USD exchange rate; E represents the VND/USD nominal exchange rate; P^{us} represents the US price level, and P represents the domestic price level. According to relative purchasing power parity (PPP), the percent change of the real exchange rate is given by:

$$\%\Delta q = \%\Delta E + \pi^{us} - \pi$$

where π^{us} denotes US inflation, and π represents domestic inflation.

The data set used to estimate our VAR model is obtained from several various sources. The data of the nominal exchange rate, Vietnam's consumer price index, Vietnam's real GDP and the money supply is obtained from the International Financial Statistics (IFS). The data of exports and imports is acquired from the General Statistics Office of Vietnam. The data of US real GDP and US consumer price index is obtained from the US Bureau of Economic Analysis (BEA). Finally, the data of world oil price is collected from the World Bank. All the variables in our model are expressed in the form of annualized growth rates except the ratio of export to import. Since the data was already seasonally adjusted by the statistics agencies, we do not apply the seasonal adjustment to the series. The definitions of variables used in our model and their data sources are summarized in Table 2 (see Appendix). Also, Figure 4 (see Appendix) shows their movements over time.

Model specification

Our VAR model is in the following form:

$$F_t = A_0 + A_1F_{t-1} + A_2F_{t-2} + \cdots + A_pF_{t-p} + B_0X_t + B_1X_{t-1} + \cdots + B_pX_{t-p} + e_t$$

where F_t={Y, RER, EM, M1_PC}' is a 4x1 vector of endogenous variables; A_0 is a 4x1 vector of intercept terms; A_1, …, A_p are 4x4 matrices of coefficients; X_t={Y_US, WOP}' is a 2x1 vector of exogenous variables; B_0, …, B_p are 4x2 matrices of coefficients; and e_t is a 4x1 vector of error terms.

Identification strategy

The error term e_t is the so-called reduced-form (or observed) residuals in the reduced-form VAR, which are usually correlated. Let's denote u_t as the unobserved structural innovations, which are uncorrelated. It is insightful to express e_t in terms of u_t as follow:

$$e_t=Cu_t$$

where $E(e_te_t')=\Sigma$, $E(u_tu_t')=I$, and C is a 4x4 matrix. Thus,

$$\Sigma=CC'$$

By imposing restrictions on the matrix C, we could identify the model.

According to Krugman, Obstfeld and Melitz (2012), when the domestic currency depreciates in real term, the trade balance is immediately affected. Thus, it is reasonable to impose a restriction such that the real exchange rate has a contemporaneous impact on the trade balance. In addition, consistent with the AA-DD model, an increase in the real income will increase the real money demand, which in turn causes the interest rate to rise. In an open economy, such an increase in the real interest rate appreciates the domestic currency in the short run. Hence, real GDP is supposed to contemporaneously affect the real exchange rate. Ultimately, since the money supply has been used as a main instrument of the monetary policy of the State Bank of Vietnam, it is feasible to assume that the money supply is contemporaneously affected by all of other endogenous variables.

Thus, the restrictions displayed in terms of reduced-form residuals and structural innovations are as follow.

$$\begin{bmatrix} e_Y \\ e_{RER} \\ e_{EM} \\ e_{M1\_PC} \end{bmatrix} = \begin{bmatrix} c_{11} & 0 & 0 & 0 \\ c_{21} & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix} \begin{bmatrix} u_Y \\ u_{RER} \\ u_{EM} \\ u_{M1\_PC} \end{bmatrix}$$

These restrictions are equivalent to imposing the Cholesky ordering: Y, RER, EM, M1_PC when we perform the impulse response functions.

Results of the unit root tests and the optimal lag

We basically employ the Augmented Dickey-Fuller (ADF) test to examine whether the time series have a unit root. The null hypothesis is that the series has a unit root. In this paper, 5% is chosen to be the significance level. Thus, if the p-value reported by the ADF test is lower than 0.05, the series is said to have no unit root; otherwise, it has a unit root. Accordingly, the ADF test[3] shows that all of the series have no unit root at 5% significance level since all the p-values reported are less than 0.05. This implies that the VAR model using these time series is stable.

Table 1: The summary of the ADF tests for a unit root

Variables	**ADF test statistic**	*Mackinnon critical values for rejection of hypothesis of a unit root*			**P-value**	**Decision**
		1%	**5%**	**10%**		
Y	*-9.853245*	-3.462253	*-2.875468*	-2.574271	0.0000	*I(0)*
RER	*-8.940610*	-3.461327	*-2.875062*	-2.574054	0.0000	*I(0)*
EM	*-3.100417*	-3.460739	*-2.874804*	-2.573917	0.0280	*I(0)*
M1_PC	*-4.631741*	-3.463067	*-2.875825*	-2.574462	0.0002	*I(0)*
Y_US	*-19.32672*	-3.460739	*-2.874804*	-2.573917	0.0000	*I(0)*
WOP	*-11.63695*	-3.460739	*-2.874804*	-2.573917	0.0000	*I(0)*

[3] We also used the Phillips-Perron and KPSS tests to check the stationarity of those time series. These two tests also give the same results as the ADF test does.

There are several criteria for choosing the optimal number of lags. However, we use the BIC to determine the optimal lag. It is nice that FPE, AIC, BIC, and HQ criteria select one lag as an optimal lag (Table 3, see Appendix). The LR criterion chooses 12 lags while the log likelihood ratio recommends longer lags. Thus, as suggested by the BIC, we choose one lag to estimate the VAR. To double check the optimal lag and stability of the VAR, we test for autocorrelation among the residuals, and examine the roots of characteristic polynomial. The autocorrelation LM test shows that there is no autocorrelation among residuals (Table 4, see Appendix). In addition, all the roots of characteristic polynomial are less than 1, which implies that the VAR satisfies the stability condition (Table 5, see Appendix). Thus, we are confident to estimate the VAR model with one lag. In the following parts, using the identification restrictions, we will discuss the impulse response functions of the ratio of export to import with respect to positive shocks of other endogenous variables, specially focusing on a positive shock of the real exchange rate to find whether there are J-curve effects on the trade balance of Vietnam.

Responses of the trade balance to a positive real exchange rate shock

Since the real exchange rate is denominated in terms of units of VND per USD, an increase in the real exchange rate means real depreciation of the domestic currency. Figure 5 (see Appendix) indicates that real depreciation of the domestic currency has negative impacts on the trade balance in a certain period of time. Specifically, the trade balance deteriorates significantly after 2 months. The negative effect of real depreciation on the trade balance becomes worst in the 3rd and the 4th months, and decreases since then. Such a negative effect on the trade balance is statistically significant until the 11th month, which implies that a positive shock to the real exchange rate worsens the trade balance for 11 months, at 5% significance level. Even though Vietnam is a developing country, this finding is highly consistent with the conclusion by Krugman, Obstfeld and Melitz (2012), which stated that for most industrial countries a J-curve lasts more than six months but less than a year. In addition, this result, together with Stučka's (2004) and

Petrović and Gligorić's (2009), positively contribute to literature in the sense that J-curve effects do exist in emerging countries where exchange rate policies are considered to be immature. Our result, however, is in contrast to Yuen-Ling, Wai-Mun, and Geoi-Mei's (2008), which revealed that there is no evidence of a J-curve for Malaysia. One possible reason this difference is that impulse response functions generated from the VECM are not robust since there are issues with standard errors.

Our finding, however, implies that the J-curve effect on the trade balance of Vietnam is quite long. It takes at least 11 months for the trade balance to recover after real depreciation of the domestic currency. This implies that the price effect is dominant over the quantity effect, and it could be explained by two main reasons. First, the export capacity of Vietnam is quite limited because of limited capital stock. Furthermore, the majority of exported goods is agricultural products, or is processed from agricultural products, which heavily depends on crops and climate changes. Thus, exporting firms cannot quickly adjust to take advantage of real depreciation of the domestic currency. Second, the demand for imports of the Vietnamese economy is quite high and persistent. Vietnam is a developing country, and has been in the phase of industrializing the economy whereas its domestic manufacturing is immature and unable to fulfill the demand for high-tech products that are essential for the industrialization. Therefore, real depreciation of the domestic currency, which makes the prices of imported goods in terms of domestic currency increase, necessarily causes the total value of import to rise.

Responses of the trade balance to a positive real income shock

An increase in real income is expected to increase the demand for imported goods, thereby worsening the trade balance. Figure 5 (see Appendix) shows that a positive shock to real income immediately worsens the trade balance. The negative effect on the trade balance becomes less severe and gradually declines since the second month. The worsening effect of a positive shock to real income on the trade balance is statistically significant at 5% significance level until the 20^{th} month, which implies that an increase in real income negatively affects the trade balance for 20 months. This persistent effect could be explained through the development policies of the Vietnamese government. As discussed earlier, Vietnam has been in the stage of modernizing the economy. Thus, a rise in real income in current period will stimulate the demand for import of modern machinery and equipment in the future periods. Moreover, many Vietnamese people are "foreign-goods-loving". Hence, when their income goes up, they tend to demand more imported goods, which are believed to have higher quality than domestically produced goods.

Responses of the trade balance to a positive money supply shock

Theoretically, how an increase in the money supply affects the trade balance depends on where the funds are used. If the funds are used to encourage the export sector, then the trade balance is improved. In contrast, if the funds are utilized to support import, then the trade balance deteriorates. Usually, central banks expand the money supply to stimulate exports, thereby improving the trade balance. Figure 5 (see Appendix) suggests that a positive shock to the money supply may have a positive effect on the trade balance. Accordingly, the effect might be strongest in the third month since the occurrence of the shock. However, such impacts are statistically insignificant at 5% significance level.

Impulse response functions of other endogenous variables

This section summarizes the impulse responses of other endogenous variables to structural shocks since this is not the main objective of this paper. Figure 6 (see Appendix) shows that real depreciation of the domestic currency has a positive effect on real GDP from the second to the fourth month. However, a positive shock to the money supply is unlikely to affect the real GDP growth rate since the effect is not statistically significant. Likewise, a positive shock to the trade balance is unlikely to have any effect on real GDP. The real exchange rate increases in the first month and then declines from the second to the fifth months due to a positive shock to real income. A rise in the money supply causes the real exchange rate to fall from the second to the fourth month while the impact of a positive shock to the trade balance on the real exchange rate is statistically insignificant. In terms of the monetary policy, a positive shock to the real exchange rate leads to a rise in the money supply for 5 months. A positive shock to real GDP immediately increases the money supply but the effect becomes statistically insignificant afterwards. The effect of a positive shock to the trade balance on the money supply is also statistically insignificant.

Variance decomposition of the trade balance

In this part, we only discuss the variance decomposition of the trade balance to determine how the variations in the trade balance depend on variations of other endogenous variables. The variance decomposition of other endogenous variables is not discussed since it is beyond the research territory of this paper[4].

Table 6 (see Appendix) presents the variance decomposition of the trade balance due to its own shocks, and variations of other endogenous variables. Accordingly, the variations in the trade balance in the 1st horizon is mainly explained by its own innovations (approximately 75.4%). Apart from its own shocks, real income also plays an important role in explaining the variations of the trade balance. It accounts for about 23.3% in the 1st horizon. The real exchange rate only comprises around 1.4% of the variations of the trade balance in the first horizon. The money supply is assumed to have no impact on the trade balance in the 1st horizon. The importance of real income in explaining the variations of the trade balance is decreasing over time while the proportions of the real exchange rate, the money supply and its own shocks become increasing. In the 24th horizon, 77.9% of the variations of the trade balance are explained by its own innovations while real income accounts for 15.1%. The real exchange rate and the money supply comprise 6.6% and 0.4%, respectively, of the variations in the trade balance. Overall, apart from its own shocks, the variations in the trade balance are mainly explained by variations of real income and the real exchange rate. The

[4] The variance decomposition of other endogenous variables could be provided upon request.

importance of the money supply in explaining the variations of the trade balance is trivial.

Robustness of the results

In order to ensure the robustness of the estimation of impulse response functions, we use various identification restrictions. First, we impose a restriction such that real income is contemporaneously affected by the real exchange rate, and the trade balance is contemporaneously influenced by real income. This means that we use the Cholesky ordering: RER, Y, EM, M1_PC. We express this restriction in terms of the reduced-form residuals and structural innovations as follow.

$$\begin{bmatrix} e_Y \\ e_{RER} \\ e_{EM} \\ e_{M1\_PC} \end{bmatrix} = \begin{bmatrix} c_{11} & c_{12} & 0 & 0 \\ 0 & c_{22} & 0 & 0 \\ c_{31} & c_{32} & c_{33} & 0 \\ c_{41} & c_{42} & c_{43} & c_{44} \end{bmatrix} \begin{bmatrix} u_Y \\ u_{RER} \\ u_{EM} \\ u_{M1\_PC} \end{bmatrix}$$

This identification restriction produces results (Figure 7, see Appendix) almost similar to our findings based on the identification restriction earlier. A slight difference is that the J-curve effect in this case lasts a bit longer. It lasts for 15 months instead of 11 months.

Second, we impose a restriction such that real income is contemporaneously affected by the real exchange rate and the trade balance. This is equivalent to using the Cholesky ordering: RER, EM, Y, M1_PC. This restriction is exhibited in terms of the reduced-form residuals and structural innovations as follow.

$$\begin{bmatrix} \mathrm{e_Y} \\ \mathrm{e_{RER}} \\ \mathrm{e_{EM}} \\ \mathrm{e_{M1\_PC}} \end{bmatrix} = \begin{bmatrix} \mathrm{c_{11}} & \mathrm{c_{12}} & \mathrm{c_{13}} & 0 \\ 0 & \mathrm{c_{22}} & 0 & 0 \\ 0 & \mathrm{c_{32}} & \mathrm{c_{33}} & 0 \\ \mathrm{c_{41}} & \mathrm{c_{42}} & \mathrm{c_{43}} & \mathrm{c_{44}} \end{bmatrix} \begin{bmatrix} \mathrm{u_Y} \\ \mathrm{u_{RER}} \\ \mathrm{u_{EM}} \\ \mathrm{u_{M1\_PC}} \end{bmatrix}$$

This identification restriction also generates almost similar results (Figure 8, see Appendix) to our major findings earlier. A minor difference is that the J-curve effect in this restriction lasts a bit longer (14 months). Another difference is that the effect of a positive shock to real income on the trade balance now becomes statistically insignificant. Nevertheless, this is unworthy to be worried since our finding on the J-curve is still consistent under various identification restrictions.

Concluding remarks

In this study, we employed a VAR framework to examine how the trade balance is affected by selected economic variables. Particularly, we investigated how real depreciation of the domestic currency (VND) influences the trade balance over time. Various identification restrictions were imposed to check the robustness of the results.

To sum up, our estimation results affirm that there exists a J-curve for Vietnam. The worsening effect on the trade balance due to a positive shock to the real exchange rate is strongest in the 3rd and the 4th months. More importantly, the J-curve effect lasts about 11 months, which implies that the trade balance needs at least 11 months to improve after real depreciation of the domestic currency. In the context of a changeable world nowadays, this finding suggests that the export sector needs to improve capacity, and be able to actively manage the production so as to quickly adjust to take advantage of real depreciation of the domestic currency.

This study, however, may have limitations. Although the US is the biggest export market as well as a major trade partner of Vietnam, and almost all the trade transactions are made in USD, it might be more adequate to use the real effective exchange rate instead of the real VND/USD exchange rate. This is because the real effective exchange rate also takes account of other strong currencies. Yet, this requires a lot of effort to acquire enough data, and needs appropriate calculation method. Thus, this could be a suggestion for further research. In spite of that, our findings in this study are significant and robust to some certain extent.

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Appendix

Table 2: Definitions of variables and their data sources

Variable		Abbreviation	Source
Endogenous variables	Growth rate of the real VND/USD exchange rate	RER	Computed by using available data from IFS and BEA.
	Real domestic GDP growth rate	Y	IFS
	Money supply growth rate	M1_PC	IFS
	The ratio of export to import	EM	Computed by using data from GSO
Exogenous variables	Growth rate of US real GDP	Y_US	BEA
	Growth rate of the world oil price	WOP	World Bank

Table 3: Lag length criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1421.484	NA	49.51843	15.25380	15.59685	15.39278
1	-1121.897	570.6428	2.463686*	12.25288*	12.87035*	12.50303*
2	-1110.224	21.74078	2.580609	12.29866	13.19057	12.66000
3	-1097.567	23.03653	2.676431	12.33404	13.50039	12.80656
4	-1092.641	8.756615	3.014424	12.45123	13.89201	13.03492
5	-1084.454	14.20844	3.282601	12.53391	14.24912	13.22878
6	-1078.064	10.81897	3.646852	12.63560	14.62524	13.44165
7	-1071.738	10.44411	4.058913	12.73796	15.00204	13.65520
8	-1066.335	8.689430	4.568022	12.85011	15.38862	13.87852
9	-1053.031	20.83637	4.735770	12.87863	15.69158	14.01823
10	-1028.424	37.49602	4.363692	12.78756	15.87494	14.03833
11	-1002.923	37.77906	3.990632	12.68702	16.04883	14.04897
12	-969.4862	48.12108*	3.362674	12.50250	16.13875	13.97563

Table 4: Autocorrelation LM test for the residuals

Lags	LM-Stat	Prob
1	16.00372	0.4527
2	22.53526	0.1267
3	11.72816	0.7625
4	13.57057	0.6307
5	13.51341	0.6349
6	11.17707	0.7984
7	8.221854	0.9420
8	10.58058	0.8346
9	18.35683	0.3034
10	25.68657	0.0586

Table 5: VAR stability condition check

Roots of Characteristic Polynomial
Endogenous variables: Y RER EM M1_PC
Exogenous variables: C WOP WOP(-1) Y_US Y_US(-1)
Lag specification: 1 1
Date: 07/29/13 Time: 15:04

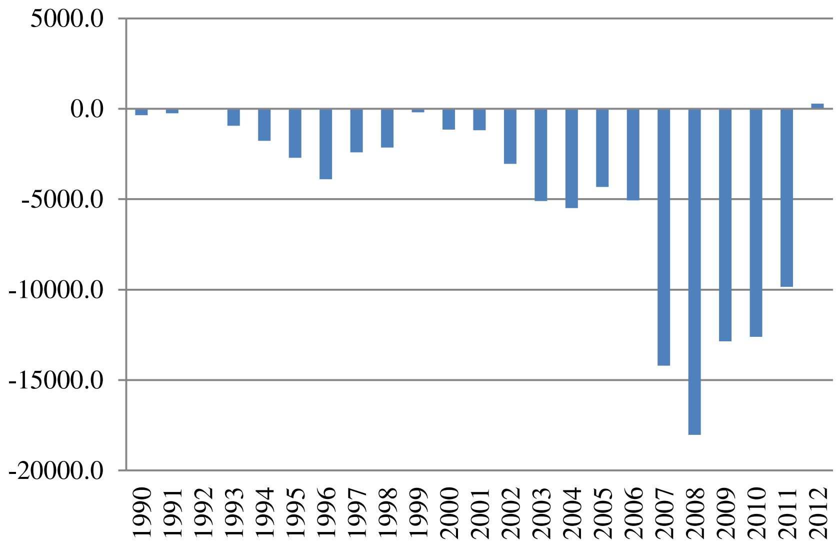
Root	Modulus
0.952143	0.952143
0.321940 - 0.156682i	0.358043
0.321940 + 0.156682i	0.358043
-0.139896	0.139896

No root lies outside the unit circle.
VAR satisfies the stability condition.

Table 6: Variance decomposition of the trade balance

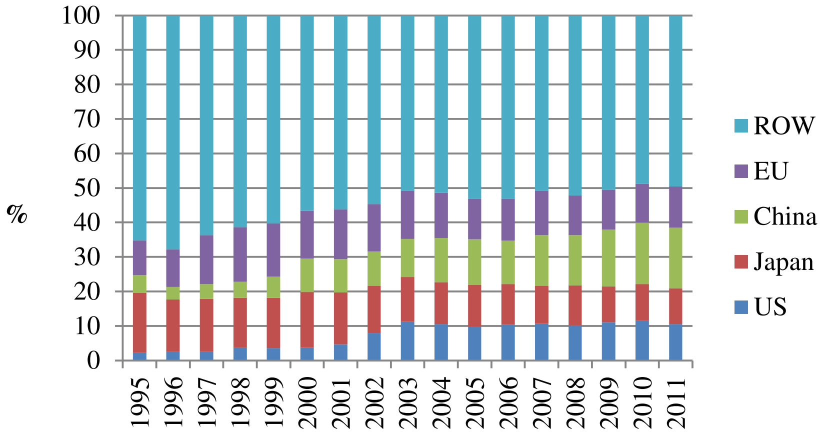
Period	S.E.	Y	RER	EM	M1_PC
1	**2.265785**	**23.25455**	**1.383280**	**75.36217**	**0.000000**
2	2.310089	20.24094	3.084389	76.65198	0.022686
3	2.315244	18.63941	4.210055	77.05029	0.100242
4	2.316752	17.63621	4.910330	77.28017	0.173292
5	2.317052	16.99006	5.351805	77.42927	0.228863
6	2.317163	16.55307	5.644632	77.53367	0.268628
8	2.317322	16.01391	6.001238	77.66629	0.318553
9	2.317389	15.83825	6.116894	77.71003	0.334824
10	2.317450	15.69991	6.207934	77.74454	0.347624
11	2.317506	15.58858	6.281192	77.77231	0.357917
12	**2.317556**	**15.49744**	**6.341170**	**77.79505**	**0.366342**
15	2.317680	15.30437	6.468232	77.84321	0.384186
20	2.317820	15.12836	6.584067	77.88712	0.400453
21	2.317841	15.10543	6.599158	77.89284	0.402572
22	2.317859	15.08523	6.612451	77.89788	0.404439
23	2.317876	15.06739	6.624195	77.90233	0.406088
24	**2.317892**	**15.05158**	**6.634600**	**77.90627**	**0.407549**

Figure 1: Vietnam's trade balance, 1990-2012 (million US dollars)



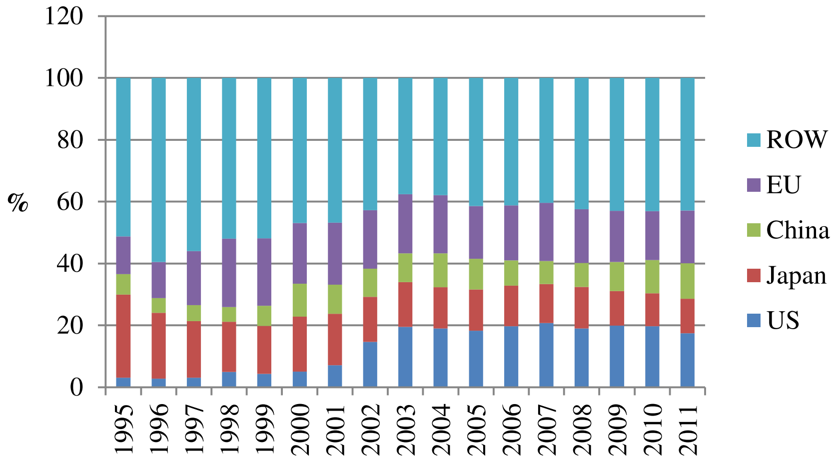
Source: GSO (2013)

Figure 2: Vietnam's trade directions, 1995-2011



Source: GSO (2013)

Figure 3: Major export markets



Source: GSO (2013)

Figure 4: Innovations of endoegenous and exogenous variables

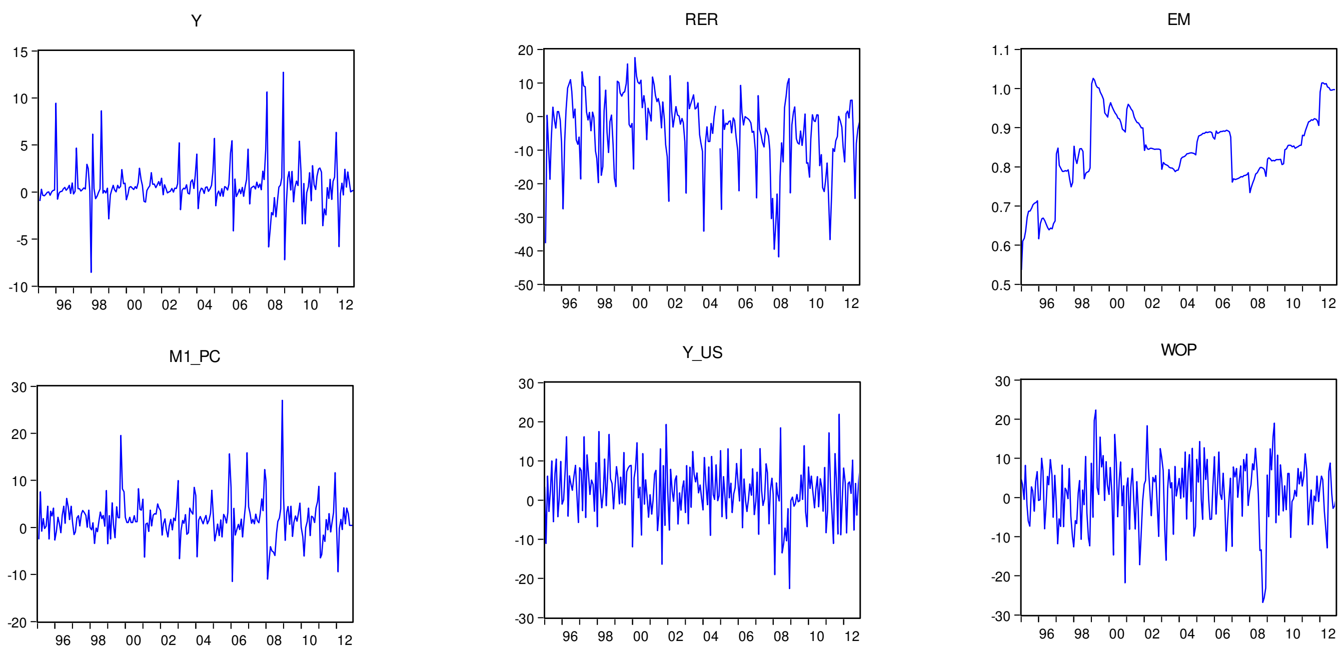


Figure 5: Impulse responses of the trade balance
(Cholesky ordering: Y, RER, EM, M1_PC)

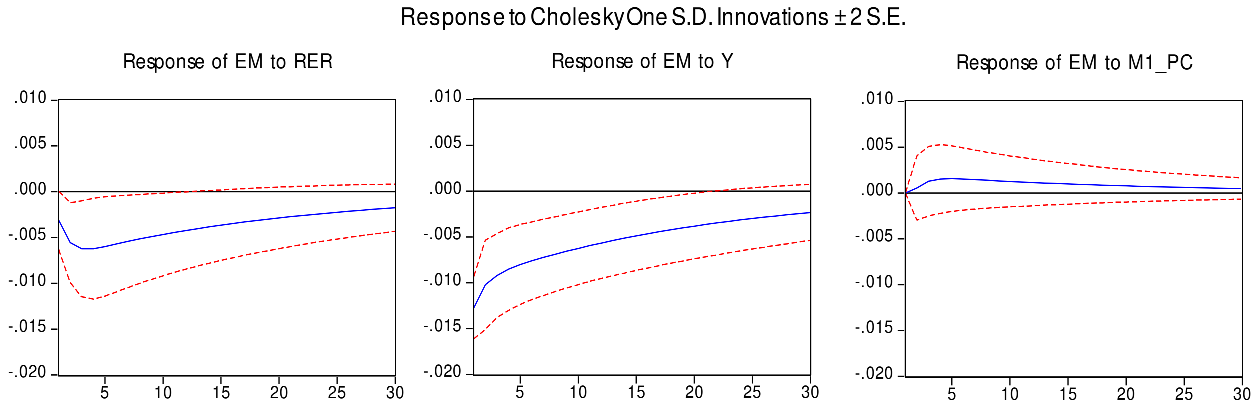


Figure 6: Impulse responses of other endogenous variables
(Cholesky ordering: Y, RER, EM, M1_PC)

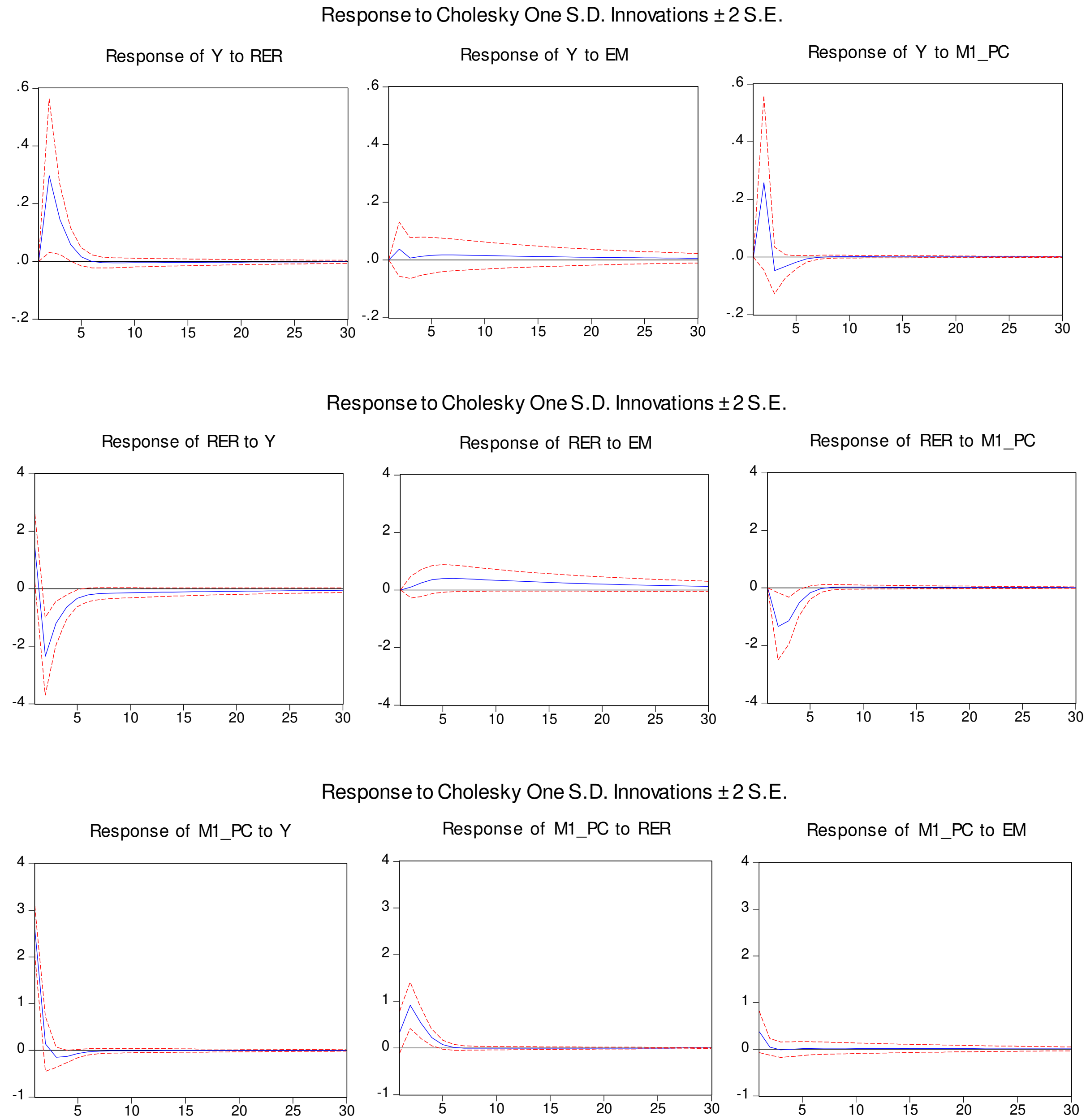


Figure 7: Robustness check, impulse responses of the trade balance (Cholesky ordering: RER, Y, EM, M1_PC)

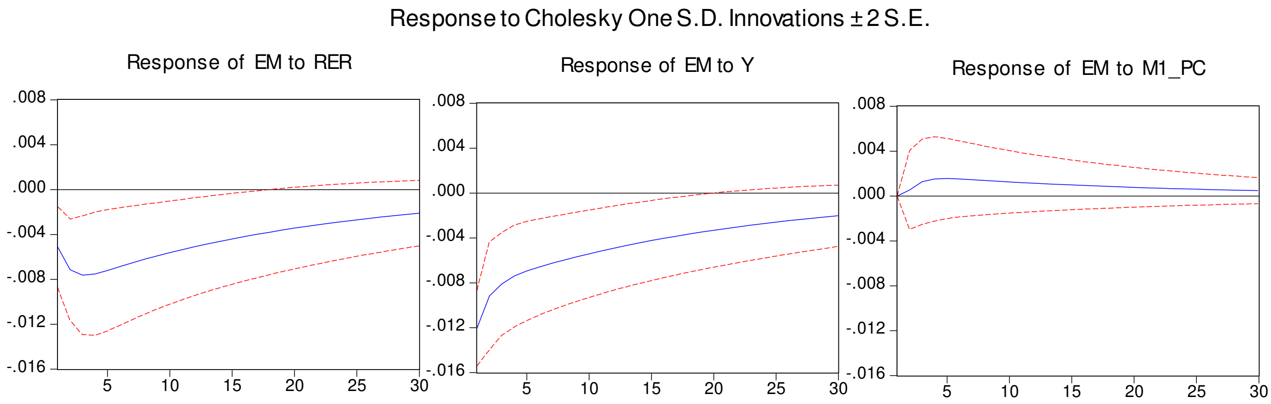


Figure 8: Robustness check, impulse responses of the trade balance (Cholesky ordering: RER, EM, Y, M1_PC)