Should Chinese Renminbi Be Cursed for Its Trade Surplus: An VAR Approach*

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Abstract:

During the recent years, the Renminbi (RMB) exchange rate issue has been at the centre of ongoing debate over the source of global current account imbalance, especially with the United States. Critics say that, by undervaluing its currency, China gains unfair trade advantage and has seriously injured the manufacturing sector in the United States, and some even attribute the recent East Asian financial crisis to the 50% devaluation of the Chinese currency in 1994. The objective of this study is to contribute to the current discussion on the Renminbi (RMB) exchange rate by providing new evidence on China's exchange rate policy and the impacts of RMB devaluation/revaluation on China's output and trade balance using a structural VAR approach. The results indicate that, the dynamic effect of exchange rate on China's trade balance is still very limited, and China's balance of trade is mainly determined by the world demand and its trade performance, with the latter being a result of its successfully maintained comparative advantage.

Keywords: Chinese Exchange Rate Policy; Trade Balance; Structural Vector Autoregression; Variance Decompositions; East Asia

JEL classification: F14; F31; P21

1. INTRODUCTION

China's path-breaking initiatives of reforms have successfully transformed itself from a poor, closed nation to an important trading nation and manufacturing centre in the world (see Lardy, 1998; Naughton, 1996). The rapid rise of the Chinese economy is creating opportunities for many but also causing increasingly trade disputes with its major trading partners. During the recent years, the Renminbi (RMB) exchange rate issue has been at the centre of ongoing debate over the source of global current account imbalance, especially with the United States. The US and other countries have expressed, with considerable concern, the view that China's national currency was seriously undervalued.[1] Some analysts also indicate that the RMB needs to rise by as much as 40% in order to reflect its true value (see Zhang and Pan, 2004; Chang and Shao, 2004; and Cheung et al., 2009) and others argue that further revaluation of the RMB will serve China's own interest (see Tung and Baker, 2004)[2]. Critics say that, by undervaluing its currency, China gains unfair trade advantage and has seriously injured the manufacturing sector in the United States. Moreover, some even attribute the 1997 East Asian financial crisis to the 50% devaluation of the Chinese currency in 1994. By far not many OECD countries have recognized China's market economy status when dealing with trade issues after its three decades long market-oriented economic reforms.

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[1] According to U.S. Census Bureau, China has surpassed Japan and become the largest contributor to the US trade deficit since 2001. Out of its record-high trade deficits of $816 billion in 2008, China accounted for 33%, and this share rose again to 45% in 2009 before fell to about 36% by April 2010. This has led to calls for political action against China and criticizing China for manipulating its exchange rate. The US Treasury Department has urged China strongly in recent years to adopt procedures that would allow the RMB to rise in value. US Congress has even been considering legislation that would place a 27.5% tariff on Chinese imports to the United States if the RMB is not revalued.

[2] Cline and Williamson (2008) provide a literature review of the recent studies on the equilibrium exchange rate of the Chinese currency, and find that most of the studies report an average undervaluation of 19% to 40% for the Chinese currency measured either in the real effective exchange rate (REER) or by the bilateral real exchange rate against the US dollar.

Throughout recent decades, especially since 1994, China has endeavoured to reform its exchange rate regime towards a market-based unified floating exchange regime and RMB convertibility. Early experiments include the introduction of the dual exchange rate system first in 1979-1985 and re-emerged in 1986 when the foreign exchange adjustment centres (FEACs) or swap centres were set up.[3] Since 1986, the official RMB exchange rate was in effect crawling pegged to the US dollar. The year 1994 marked a significant change in China's exchange rate policy, as China unified the various exchange rates still in use, and devalued the official rate by 50% to 8.7 yuan to the US dollar, a rate quite close to that in the black market. Since the unification the exchange value of the RMB has been remained stable.[4] From 1994 to July 2005, the official rate of the renminbi against the US dollar was kept very stable, despite of the pressures caused by the 1997 Asian financial crisis. On 21 July 2005 China adopted a managed floating exchange rate regime based on market supply and demand with reference to a basket of currencies. The Chinese authority also announced that it would allow the RMB to trade within a band of 0.3% per business day for the first time. The RMB/USD rate was adjusted to 8.11 on 21 July 2005. According to the Bank for International Settlements, over the past two years, the

[3] To accommodate reforms in the foreign trade sectors, China introduced a dual exchange rate system in 1981: one is the official rate fixed at RMB1.5/USD for non-trade transactions; and another rate for the internal settlement of trade transactions at RMB2.8/USD. The rationale for adopting a dual rate system was to set prices of imported goods via the internal settlement rate at the same (similar) level as comparable domestically produced goods, implying the traditional import substitution character of China's foreign trade regime. Under the dual exchange rate system since 1986, in-plan trade and out-plan trade could be conducted at two different exchange rates, i.e., the administered official exchange rate and the market-determined swap rates. By 1988, the swap markets had come to dominate China's foreign-currency transactions, representing an estimated 80-85 percent of all such activities at over 100 swap locations. See Zhang (1997, 1999), Lardy (1992), Roberts and Tyers (2001), and more recently Goldstein and Lardy (2007) for an extensive overview of the debate on China's current exchange rate policy.

[4] The new exchange rate system has contributed to the rapid increase of China's international reserves, rising from US$22 billion at the end of 1993 to over US$53 billion by the end of 1994, and further to US$107 billion in 1996. Since then China's foreign exchange reserves rose rapidly, exceeded US$1 trillion for the first time in October 2006, and US$2 trillion by June 2009. By the end of September 2010, China's foreign-exchange reserves surged by a record to USS2.65 trillion. Data were adapted from the State Administration of Foreign Exchange, China.

RMB has appreciated by 9.4% against the U.S. dollar, and the real effective exchange rate of the RMB has appreciated by 6.3%. Recently, China has decided to proceed further with reform of the RMB exchange rate regime and to enhance the RMB exchange rate flexibility.

China's trade surpluses are viewed by many, notably the US authorities, as a major contributor to global imbalances, and attributed to its undervalued Renminbi. Corden (2009) argues that exchange rate regimes are not really connected with global current account imbalances. As a matter of fact, global current account imbalances have been associated with all kinds of exchange rate regimes. Figure 1 presents the evolution of the RMB exchange rates and China's trade account balance against the US during the period in 1994-2010. One may easily find that there is a diverse relation between the change of the exchange rate and China's trade balance both with the US and the rest of the world.[5] Given China's "socialist market economy" today, how to determine if the Chinese currency has been undervalued or overvalued? To what extent has the Chinese economy been transformed to a market economy? How sensitive is the Chinese economic system to the market signals and how is China's balance of payments related to the exchange values of the RMB? And how would the changes in the exchange rates affect the economy and what implications to the other countries, especially the East Asian countries, should the Chinese government revalue its currency? These remain important issues but are not yet resolved satisfactorily.

[Please insert Figure 1about here]

[5] In 2009 China surpassed Germany and became the world's No 1 exporter, and was the second largest importer in the world. Because of the global economic turmoil and weakness, China's trade surplus in 2010 is expected to shrank to US$180 billion, down from US$196 billion in 2009 and the historic peak of US$300 billion in 2008.

There are a number of existing studies on the effect of the Chinese RMB devaluation on its trade balance, but the results are mixed. Stiglitz (2005) has argued that revaluation and eliminating China's trade surplus will have little effect on the more important problem of global trade imbalances, and particularly on the US trade deficit. Mann and Plück (2005), using a dynamic panel specification and disaggregated trade flows, report that price elasticities for US imports from China are wrong-signed and that price elasticities for US exports to China are not statistically significant. Thorbecke (2006), employing Johansen MLE and dynamic OLS techniques, finds that the long-run real exchange rate coefficients for exports and imports between China and the US equal approximately unity. Cheung et al. (2007), using dynamic OLS methods, find that an appreciation of the RMB increases US exports to China but does not affect China's exports to the US. Marquez and Schindler (2007), using an autoregressive distributed lag model and China's shares in world trade, report that a 10% appreciation of the RMB would reduce China's share of world exports by half a percentage point and China's share of world imports by a tenth of a percentage point.

The objective of this study is to construct a vector autoregression (VAR) model and employ the most recent econometric techniques to identify if the Chinese economic system has become responsive to the changes in the exchange rates after about three decades reform. In particular, we construct a structural VAR model to estimate the impulse response functions and variance decompositions for China's output and trade balance, and to determine how the fundamental macroeconomic shocks contribute to the fluctuations in the real exchange rates, and how output and trade account respond to the identified various shocks. Thus, this study will contribute to the current discussion on the RMB exchange rates by providing new evidence on

China's exchange rate policy and the impacts of RMB devaluation/revaluation on China's output and trade balance. This would also help explain why China was immune to the recent financial crisis in 1997 and how China could keep its currency value unchanged during the crisis. Apparently this would have important policy implications for the rest of the East Asian economies. This study implies three major contributions. First, it applies a VAR model to the transition economy of China to determine the exchange value of the RMB and how the system responds to changes in the market signals. It contributes to our better understanding of how far and how fast China's reforms have transformed the economy to a market-oriented. It also contributes to the recent discussion on China's exchange rate policy. Then, it provides policy-makers both within and outside China with robust empirical evidence towards how effective the RMB devaluation/revaluation would be on the economy and its trade balance, and what policy implications to others. Finally, it helps explain why China could be immune to the recent East Asian financial crisis in 1997 and if China's RMB devaluation in 1994 is one of the causes to the crisis in 1997.

The remainder of this paper is organized as follows. In section 2, we discuss the analytical framework and methodology employed in the paper. Section 3 discusses the data issue and presents the results of empirical estimation. Section 4 provides some concluding remarks.

2. METHODOLOGY AND MODEL

To study if the Chinese economic system has become responsive to the changes in the exchange rates since reform, we extend the Lee and Chinn (2006) and Blanchard and Quah (1989) models to construct a 3-variable VAR model, including real output, real exchange rates, and trade balance. We use the US real GDP and world real GDP respectively to proxy for the income effect of the rest of the world that will possibly affect the trade balance. The structural model can be specified as follows:

$$X_t = \left(\Delta y_t^*, \Delta rer_t, (TB/y)_t\right)', \qquad \varepsilon_t = \left(\varepsilon_{y,t}, \varepsilon_{e,t}, \varepsilon_{b,t}\right)',$$

and

$$X_t = A(L)\cdot\varepsilon_t = \begin{pmatrix} A_{11}(L) & A_{12}(L) & A_{13}(L) \\ A_{21}(L) & A_{22}(L) & A_{23}(L) \\ A_{31}(L) & A_{32}(L) & A_{33}(L) \end{pmatrix}\cdot\varepsilon_t, \qquad (1)$$

where $A_{ij}(L) = a_{ij}^0 + a_{ij}^1 L + a_{ij}^2 L^2 + \cdots$, and it is assumed that the structural shocks, ε_t, are serially uncorrelated and the covariance matrix are normalized to the identity matrix. y^* denotes US or world real GDP; rer the bilateral real exchange rate of Chinese yuan vis-à-vis the US dollar or the yuan's real effective exchange rate; *TB* the (nominal) trade balance against the United States or the world; and y the China's nominal GDP. Δ is the first-difference operator. ε_y is the US or world output shock, ε_e the real (effective) exchange rate shock, and ε_b the transitory (trade balance) shock.

In order to identify the structural A_i matrices, we follow the method developed by Blanchard and Quah (1989) and impose the following long-run restrictions. First, we assume that Δy^* is affected only by the US or the world output shock (ε_y) in the long-run. Second, Δrer is affected by both the US or world output shocks and the real (effective) exchange rate shock (ε_e) in the long-run, but not affected by the transitory (trade balance) shock (ε_b). Finally, (TB/y) is influenced by all the three shocks in the long-run. Thus, the long-run restrictions require $A_{12}(1) = A_{13}(1) = A_{23}(1) = 0$ that is sufficient to identify the structural A_i matrices and the time series of structural shocks, $\varepsilon_t = \left(\varepsilon_{y,t}, \varepsilon_{e,t}, \varepsilon_{b,t}\right)'$. We estimate a reduced-form VAR as:

$$\Delta x_t = B(L)\Delta x_{t-1} + u_t, \qquad (2)$$

where u_t is a vector reduced form disturbance and $B(L)$ is a 3×3 matrix of lag polynomials. An MA representation of equation (2) is given as:

$$\Delta x_t = C(L)u_t, \qquad (3)$$

where $C(L) = (1 - B(L)L)^{-1}$ and the lead matrix of $C(L)$ is, by construction, $C_0 = I$. By comparing equations (1) and (3), we obtain the relationship between the structural and reduced form disturbances: $u_t = A_0\varepsilon_t$. As the shocks are mutually orthogonal and each shock has unit variance, $C(1)\Sigma C(1)' = A(1)A(1)'$ where $\Sigma = Eu_t u_t' = EA_0\varepsilon_t\varepsilon_t' A_0' = A_0 A_0'$. Letting H denote the lower triangular Choleski decomposition of $C(1)\Sigma C(1)'$, we obtain $A(1) = H$ since our long-run restrictions imply that $A(1)$ is also lower triangular. Consequently, we obtain $A_0 = C(1)^{-1}A(1) = C(1)^{-1}H$. Given an estimate of A_0, we can recover the time series of structural shocks.

3. EMPIRICAL ANALYSIS

3.1 Data Description

We use the quarterly series of data spanning from 1987Q1 to 2007Q3 except for the real GDP series of OECD countries that ranges from 1995Q1 to 2007Q1 (we are revising and extending the data series to 2010). To assess the changing sensitivity of the economic system to the market signal during the reform period, we divide the whole sample period into three in our estimations. The first period covers the prior-exchange rate unification years, the second spans from 1994 through 2007, and finally the whole sample period. The purpose is to reflect the dynamics and comparatively investigates if the Chinese economic system has become more sensitive to market signal changes over the entire reform period. As China's dual exchange rate system was abandoned in January 1994, we chose the sample starting from 1994Q2. In addition, as China's trade surplus began to grow in the latter half of 1990s, our sample period seems quite reasonable to catch the most recent trend and to determine the effect of the exchange rate policy changes on China's trade balance.

As a proxy for the world real GDP variable, we use the real GDP series of either the United States or OECD countries. The bilateral real exchange rate of Chinese yuan vis-à-vis the US dollar and the real effective exchange rate (REER) of the yuan are used in this study. Bilateral real exchange rate is constructed based on relative consumer price index (CPI) between China and the US. China's bilateral trade surplus with both the United States and the rest of the world is denominated in US dollars. China's nominal GDP is constructed using the real GDP and CPI and also converted into US dollar terms. All data are obtained from the Chinese State Bureau of Statistics, IMF: International Financial Statistics, CD-ROM; CEIC Global Database; and the NUS Databank. Figures 2 and 3 present these series.

[Please insert Figures 2 and 3 about here]

We choose to use the first-difference model to ensure the stationarity of endogenous variables. We have checked the time-series properties of the endogenous variables and the results of unit-root test show that both y^* and rer are nonstationary in level but stationary in first-differences, while there is a conflict in the results of stationarity in (TB / y). To be consistent with the existing studies as well as due to the low power problem of unit-root tests, we chose to include the level of (TB / y) in a VAR model. As we attempt to analyse the results for sub-samples where the sample size is small, we do not conduct cointegration tests.

3.2 Empirical Results

The estimation results of our VAR model are reported in Table 1. We use two lags in each estimation based on Schwartz information criterion (SIC) and Akaike information criterion (AIC). In general the model estimation performs fairly well. The adjusted R^2 values for China's trade balance respectively with the rest of the world and the US vary from 0.53 to 0.99 with different sample periods, while those for the output and exchange rate equations take on values from 0.01 to 0.27. In particular, the adjusted R^2 values for the trade balance with the US ranges from 0.81 for the prior-unification period to 0.986 for the post-unification period. It is interesting to note that the first differences of real exchange rates exhibit some serial correlation with the highest coefficient exceeding 0.40 in the cases of real exchange rates with the US dollar prior-unification and REER. All the coefficients are statistically significant. Similar pattern can be observed for the output. As we are interested of how China's trade balance responds to shocks, we will focus our discussion on the results of trade balance equations only.

[Please insert Table 1 about here]

As it can be seen from Table 1, the coefficients relating China's trade balance to the once lagged changes in the real exchange rates are negative and not statistically significant in all cases. The coefficients relating the bilateral trade balance against the US to changes in the real exchange rates with two lags for the entire sample period and prior-unification period show positive but insignificant, taking on values from 0.0088 to 0.0383. Hence, one might speculate upon the dynamic effect of exchange rate on China's trade balance. The results seem not lend much support to the view that the Chinese economic system has become responsive to changes in the exchange rate after about three decades reform.

The response of China's trade balance to the once lagged US and world output is positive, taking on values from 0.15 to 1.21, even though not statistically significant. The coefficient relating the trade balance to the once lagged change in the trade balance is positive and also statistically significant, taking on values from 0.67 to 0.97. These results inspire one's expectation that China's balance of trade is mainly determined by the world demand and its trade performance, with the latter being a result of its successfully maintained comparative advantage.

[Please insert Figure 4 about here]

Figure 4 reports the results of impulse responses of each endogenous variable to structural shocks. The black line indicates the impulse response, while the blue line shows the 16 percent and 84 percent fractiles that correspond to one standard deviation if symmetrical error bands were set based on estimates of the variance.[6] In Figure 4, there are 4 panels displayed, representing China's trade balance with either the US or the rest of the world during different sample periods. Each panel, from the left to the right, reports the response of each variable to the vertically specified shocks. It is interesting to note that in general China's balance of trade situation is

[6] This follows Sims and Zha (1999) and conducts the Monte Carlo integration of 2,500 replications.

affected largely by the world demand shock and trade balance shock, while the exchange rate shock affects the trade balance with an undetermined pattern. When the exchange rate shock occurs, the effect on the trade balance becomes either positive or negative. It is not conclusively clear if the depreciation of the RMB will firmly improve China's balance of trade. However, the results do indicate the trend of increasing sensitivity of China's trade balance to the exchange rate shock since the dual rate unification. Moreover, the response of the exchange rates to all the three structural shocks is short-lived, mostly lasting for only one quarter and then immediately back to a zero-level effect. One may interpret this response pattern as the rigidity of China's exchange rate regime even though efforts have been given in the recent years to let the market play a bigger role in determining the RMB exchange rates.

To identify the contribution of each shock to the three variables, we conducted Variance Decomposition (VD) analysis to decompose variation in the percentage change of the forecast error variance of changes in the world output, exchange rates and trade balance that are due to each shock at the 1 through 20 quarter horizons. Table 2 reports the forecast error variances of each endogenous variable to respective shocks. As it can be seen from Table 2, the movement of the US output is attributed largely to its own shocks during the entire sample period, while China's trade balance and the exchange rates are found to be the predominant shocks accounting for the variability of the US output during the period 1994-2007. The movement of the world output is attributed largely to the world output shocks, however, China's exchange rate shock is found to be increasingly effective on the fluctuation of the world output. The finding is consistent with our casual observation that the emerging Chinese economy as the world's manufacturing centre will inevitably generate increasing effects on the rest of the world through the channels of international trade and direct investment.

[Please insert Table 2 about here]

Fluctuations in real exchange rates were predominantly caused by China's trade balance and exchange rate shocks at all horizons except during the prior-unification period. The trade balance shock accounts for over 51 percent of the variability at all horizons for the whole sample period, and over 73 percent in the post-unification period. Trade balance shock increases pressure on the exchange rate, inducing appreciation. The finding also reflects China's recent move towards the market-determined exchange rates.

It is also found that the movement of China's trade balance against the US is attributed largely to the US output shock during the post unification period and even before, while the exchange rate effect does not contribute much. When we look at the whole sample period and also the trade balance with the rest of the world, the exchange rate effect becomes obvious, taking a percentage of 30 to 40 through the horizons. This finding seems to suggest that, after about three-decade reform, the Chinese economic system has been gradually transformed towards a market-originated system under which economic agents have become responsive to market signals to allow changes in exchange rates to influence the trade balance. However, the exchange rate effect on China's balance of trade is still limited.

4. CONCLUDING REMARKS

In this paper we have briefly reviewed the evolution of the Chinese exchange rate system and constructed a vector autoregression (VAR) model to assess if the Chinese economic system has become more responsive to the changes in the exchange rates after about three decades reform. The results from the VAR estimations indicate that the coefficients relating China's trade balance to the once lagged changes in the real exchange rate are negative and not statistically significant in all cases, while those with two lags for the whole sample and also the prior-unification period show positive but insignificant, taking on values from 0.0088 to 0.0383 in the case of trade balance with the US. The response of China's trade balance to the once lagged US and world output is positive, taking on values from 0.15 to 1.21 even though not statistically significant, and to the once lagged change in the trade balance is positive and also statistically significant, taking on values from 0.67 to 0.97. These results inspire one's expectation that, the dynamic effect of exchange rate on China's trade balance is still very limited, and China's balance of trade is mainly determined by the world demand and its trade performance, with the latter being a result of its successfully maintained comparative advantage. The findings are supported by the results from the impulse analysis, that China's trade balance is found to be affected largely by the world demand shock and trade balance shock, while the exchange rate shock affects the trade balance with an undetermined pattern. The results from the variance decomposition analysis further confirm that the movement of China's trade balance against the US is attributed largely to the US output shock during the post unification period and even before, while the exchange rate effect does not contribute much. The exchange rate effect has becomes observable only when we look at the whole sample period with the US and also the trade balance with the rest of the world. The movement of the US output is attributed largely to its own shocks during the entire sample period, while China's trade balance and the exchange rates are found to be the predominant shocks accounting for the variability of the US output during the period

1994-2007. The movement of the world output is attributed largely to the world output shocks, but China's exchange rate shock is found to be increasingly effective on the fluctuation of the world output. The findings seems to suggest that, after about three-decade reform, the Chinese economic system has been gradually transformed towards a market-originated system under which economic agents have become responsive to market signals to allow changes in exchange rates to influence the trade balance. However, the exchange rate effect on China's balance of trade is still limited.

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Table 1: Results of Vector Autoregression

	Bilateral Trade with US 1987Q2-2007Q3			Bilateral Trade with US 1987Q2-1993Q4			Bilateral Trade with US 1994Q2-2007Q3			Trade with World 1995Q2-2007Q1		
	DY	DEXR	TB	DY	DEXR	TB	DY	DEXR	TB	DY	DEXR	TB
DY(-1)	0.15	-0.14	0.15	0.22	-1.81	0.29	0.09	-0.22	0.17	0.52	0.72	1.21
	0.11	1.14	0.16	0.26	2.02	0.39	0.14	0.51	0.16	0.16	1.08	1.65
DY(-2)	0.31	-1.43	0.18	0.14	-0.34	0.13	0.30	0.03	0.12	0.01	-1.84	-1.49
	0.11	1.15	0.16	0.26	2.02	0.39	0.14	0.50	0.16	0.16	1.07	1.63
DEXR(-1)	0.00	0.18	0.00	-0.01	0.47	-0.01	0.01	0.06	-0.01	0.01	0.40	-0.14
	0.01	0.12	0.02	0.03	0.21	0.04	0.02	0.06	0.02	0.02	0.14	0.21
DEXR(-2)	-0.02	-0.07	0.01	-0.02	-0.06	0.04	-0.01	-0.09	0.00	0.00	-0.06	-0.02
	0.01	0.11	0.02	0.03	0.21	0.04	0.01	0.05	0.02	0.02	0.14	0.22
TB(-1)	-0.01	1.81	0.88	0.08	2.49	0.74	-0.05	1.05	0.97	0.01	0.14	0.67
	0.09	0.88	0.12	0.16	1.23	0.24	0.13	0.45	0.14	0.02	0.11	0.16
TB(-2)	0.01	-1.86	0.12	-0.09	-2.41	0.19	0.04	-0.99	0.03	-0.02	-0.21	0.18
	0.09	0.90	0.12	0.16	1.24	0.24	0.13	0.46	0.15	0.02	0.13	0.19
C	0.42	1.37	-0.09	0.45	0.64	0.31	0.56	-1.23	0.03	0.33	0.87	1.14
	0.17	1.75	0.24	0.49	3.80	0.74	0.27	0.95	0.31	0.12	0.83	1.26
Adj.R^2	0.10	0.01	0.98	0.01	0.27	0.81	0.04	0.10	0.99	0.18	0.14	0.53

Note: DY denotes either 1st-difference of log of US real GDP or world (OECD) real GDP; DEXR refers to either 1st-differnce of log of bilateral real exchange rate of Chinese yuan vis-à-vis the US dollar or real effective exchange rate of Chinese yuan; TB either the ratio of China's bilateral trade surplus against the United States to China's nominal GDP or the corresponding ratio of China's total trade surplus against world. Standard errors (in red font) are reported just below the estimates (in black font).

Table 2: Results of the Variance Decomposition Test

a) VAR Model of Bilateral Trade with US (1987Q2-2007Q3; Lag order is 2)

Horizon	Std Error	DYUS	DRER	TB_US
Decomposition of Variance for Series DYUS				
1	0.46	89.83	0.05	10.12
4	0.50	89.36	1.45	9.19
8	0.50	89.32	1.66	9.02
12	0.50	89.31	1.67	9.02
16	0.50	89.30	1.67	9.03
20	0.50	89.30	1.67	9.03
Decomposition of Variance for Series DRER				
1	4.74	5.55	40.61	53.85
4	4.94	6.07	43.22	50.71
8	4.95	6.22	43.16	50.63
12	4.95	6.23	43.15	50.62
16	4.95	6.23	43.15	50.62
20	4.95	6.23	43.15	50.62
Decomposition of Variance for Series TB				
1	0.66	1.76	29.80	68.44
4	1.21	9.72	29.98	60.29
8	1.72	17.16	28.03	54.82
12	2.14	20.85	26.73	52.42
16	2.50	22.87	25.99	51.14
20	2.83	24.10	25.54	50.37

b) VAR Model of Bilateral Trade with US (1987Q2-1993Q4; Lag order is 2)

Horizon	Std Error	DYUS	DRER	TB_US
Decomposition of Variance for Series DYUS				
1	0.48	77.69	20.77	1.54
4	0.55	79.80	17.18	3.02
8	0.56	80.03	17.00	2.97
12	0.56	79.98	17.00	3.01
16	0.56	79.97	17.00	3.03
20	0.56	79.96	17.00	3.04
Decomposition of Variance for Series DRER				
1	3.75	27.50	69.88	2.62
4	5.03	48.93	44.83	6.25
8	5.10	49.76	44.11	6.13
12	5.10	49.79	44.08	6.14
16	5.10	49.78	44.07	6.15
20	5.10	49.78	44.07	6.16
Decomposition of Variance for Series TB				
1	0.73	32.06	0.00	67.94
4	1.15	19.85	4.37	75.78
8	1.44	15.24	6.35	78.42
12	1.58	13.45	6.84	79.71
16	1.65	12.62	7.01	80.36
20	1.69	12.21	7.09	80.70

Table 2: Results of the Variance Decomposition Test (cont'd)

c) VAR Model of Bilateral Trade with US (1994Q2-2007Q3; Lag order is 2)

Horizon	Std Error	DYUS	DRER	TB_US
Decomposition of Variance for Series DYUS				
1	0.44	4.81	78.25	16.93
4	0.46	4.85	77.84	17.32
8	0.46	4.85	77.80	17.35
12	0.46	4.91	77.75	17.34
16	0.46	4.97	77.70	17.33
20	0.46	5.04	77.65	17.31
Decomposition of Variance for Series DRER				
1	1.58	0.51	18.03	81.45
4	1.68	9.81	16.43	73.76
8	1.68	9.93	16.43	73.64
12	1.68	10.03	16.42	73.55
16	1.68	10.14	16.41	73.46
20	1.68	10.24	16.39	73.37
Decomposition of Variance for Series TB				
1	0.51	97.40	1.68	0.92
4	1.01	98.55	1.08	0.37
8	1.45	97.30	2.16	0.53
12	1.78	96.64	2.72	0.63
16	2.06	96.30	3.01	0.69
20	2.30	96.09	3.19	0.72

d) VAR Model of Trade with World (1995Q2-2007Q3; Lag order is 2)

Horizon	Std Error	DYWOR	DREER	TB_WOR
Decomposition of Variance for Series DYWOR				
1	0.26	83.36	13.73	2.92
4	0.31	80.14	13.53	6.33
8	0.31	79.47	13.97	6.56
12	0.32	78.92	14.27	6.81
16	0.32	78.69	14.39	6.92
20	0.32	78.58	14.45	6.97
Decomposition of Variance for Series DREER				
1	1.81	5.10	60.99	33.91
4	2.08	6.83	52.82	40.34
8	2.15	6.92	52.39	40.70
12	2.16	6.98	52.34	40.68
16	2.16	7.01	52.32	40.66
20	2.16	7.02	52.32	40.66
Decomposition of Variance for Series TB				
1	2.75	10.99	33.26	55.75
4	4.10	10.60	41.78	47.62
8	4.76	11.71	43.46	44.82
12	5.03	11.94	44.03	44.04
16	5.15	12.02	44.24	43.74
20	5.20	12.06	44.33	43.61

Figures:

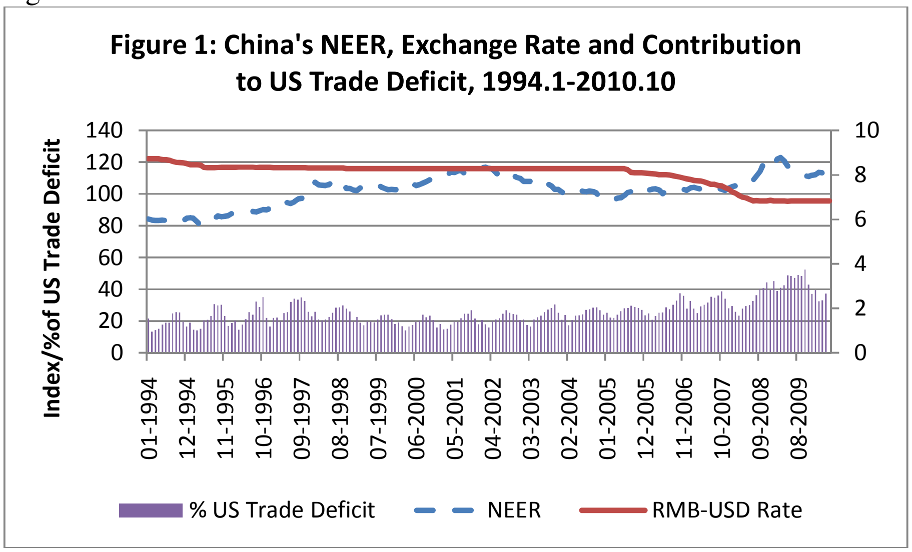
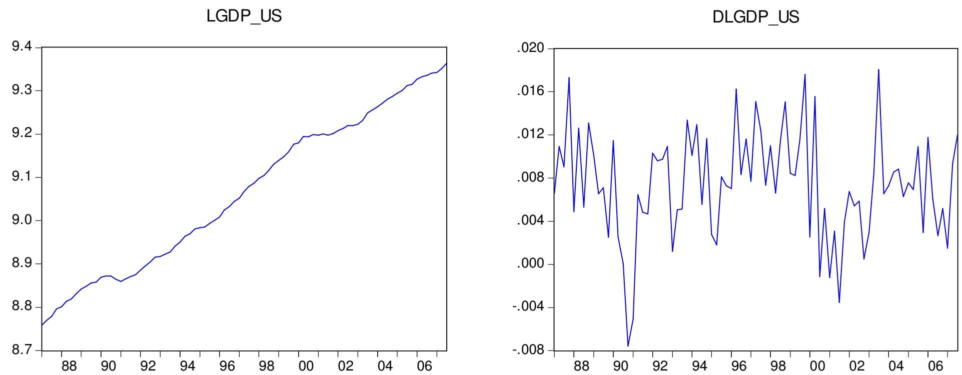


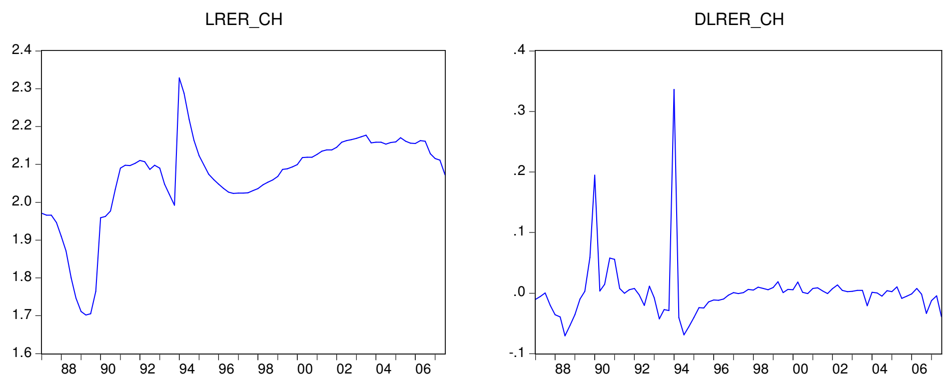
Figure 1: China's NEER, Exchange Rate and Contribution to US Trade Deficit, 1994.1-2010.10
Index/%of US Trade Deficit
140
120
100
80
60
40
20
0
10
8
6
4
2
0
01-1994
12-1994
11-1995
10-1996
09-1997
08-1998
07-1999
06-2000
05-2001
04-2002
03-2003
02-2004
01-2005
12-2005
11-2006
10-2007
09-2008
08-2009
% US Trade Deficit
NEER
RMB-USD Rate

Figure 2: Graphical Analysis of Data (1987Q1-2007Q3)

(a) US GDP (real) in log level and the first-difference:



(b) Bilateral Real Exchange Rate of Chinese Yuan vis-à-vis the US Dollar (level and 1st-diff)



(c) Bilateral Trade Balance with US to China's GDP (level and 1st-difference)

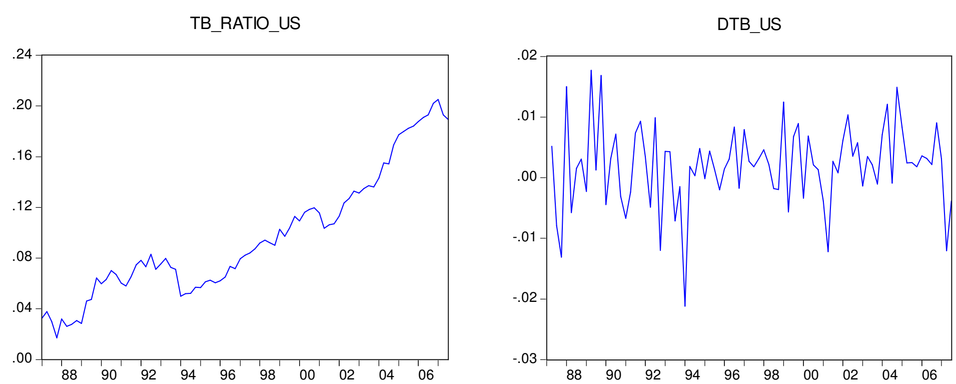
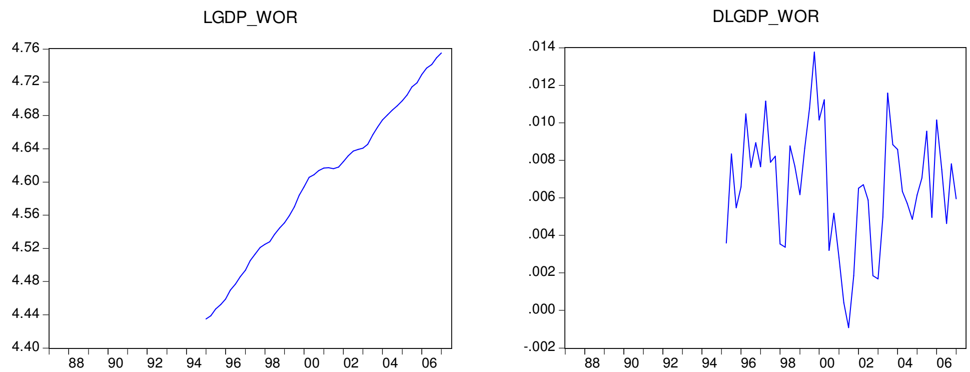
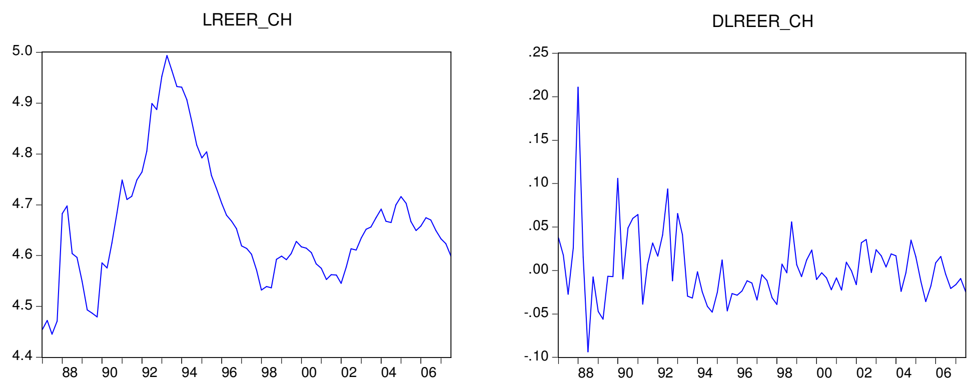


Figure 3: Graphical Analysis (1987Q1-2007Q3)

(a) World (OECD) GDP (real) in log level and the first-difference:



(b) Real Effective Exchange Rate of Chinese Yuan (level and 1st-diff)



(c) Trade Balance with World to China's GDP (level and 1st-difference)

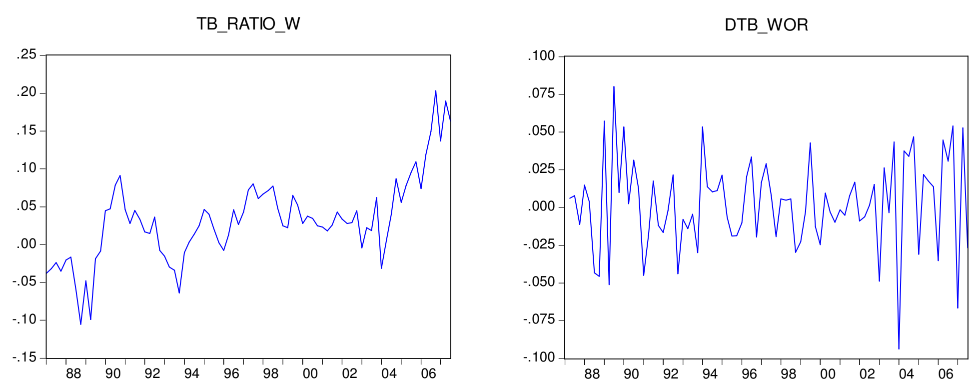
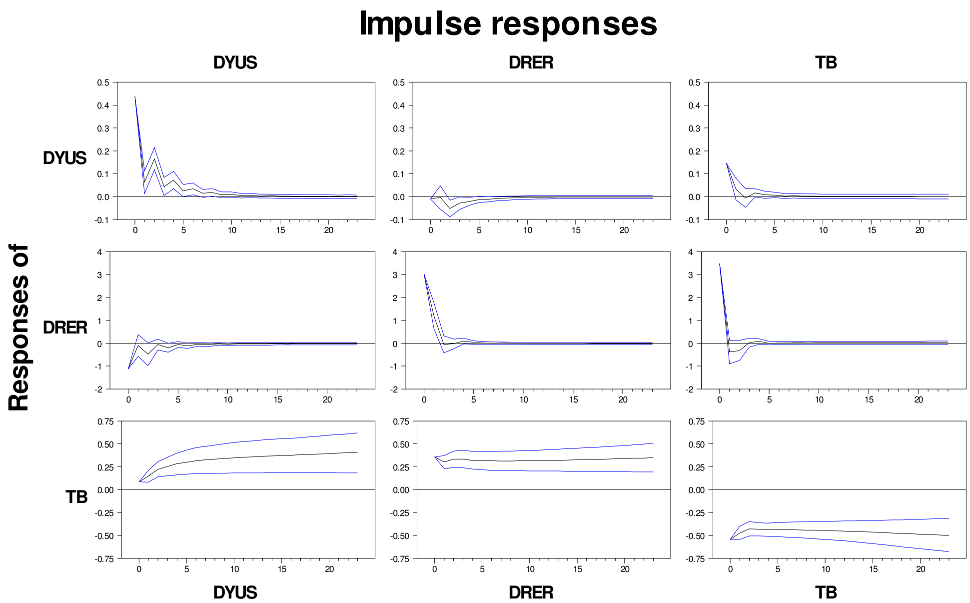


Figure 4: Impulse Response Function Analysis

a) VAR Model of Bilateral Trade with US (1987Q2-2007Q3; Lag order is 2)



b) VAR Model of Bilateral Trade with US (1987Q2-1993Q4; Lag order is 2)

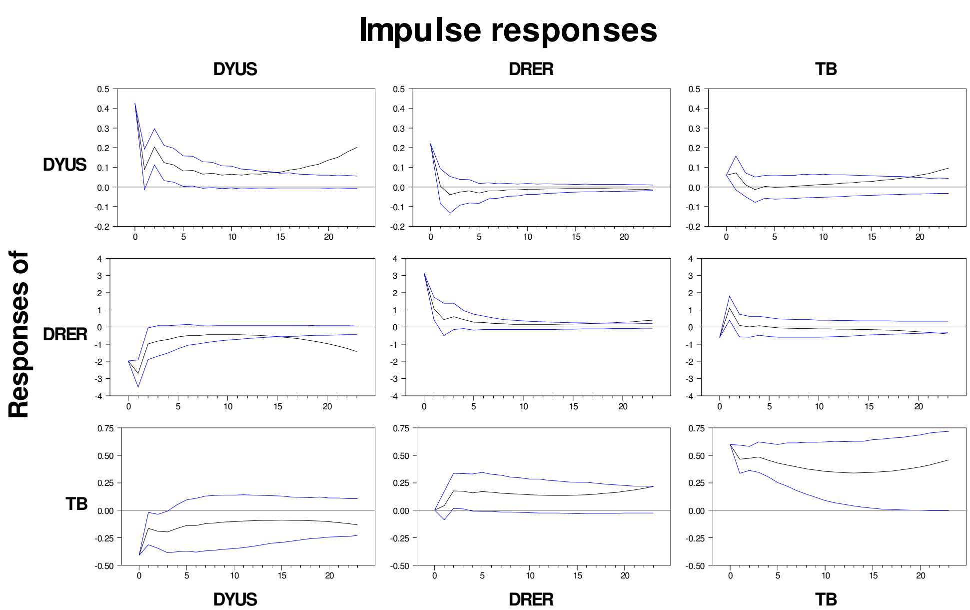
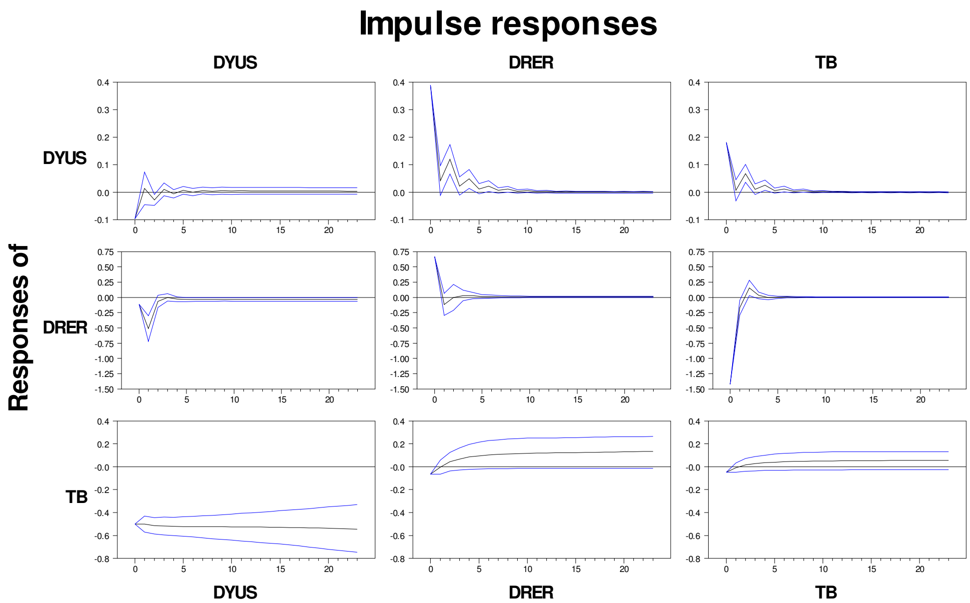


Figure 4: Impulse Response Function Analysis (cont'd)

c) VAR Model of Bilateral Trade with US (1994Q2-2007Q3; Lag order is 2)



d) VAR Model of Trade with World (1995Q2-2007Q3; Lag order is 2)