

Real Effect of Exchange Rate in RMB and Trade Surplus in China

EFFET RÉEL DU TAUX DE CHANGE SUR RMB ET SURPLUS COMMERCIAL EN CHINE

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Abstract: The relationship between real effective exchange rate (REER) of RMB from 1997 to 2006 and trade surplus between China and other trade partners was discussed using cointegration vector autoregression in the paper. The study shows that there exists a long-standing and stable relationship between REER of RMB and trade balance; the fall of the real effective exchange rate of RMB is one of the reasons of the increasing trade surplus, however, the influences it brings are less than domestic GDP and trade partner's GDP do. So, increasing the flexibility of the exchange rate of RMB, broadening the exchange rate's float space between RMB and dollar are a necessary part of the package policies in solving the trade surplus.

Key words: RMB appreciation, real effective exchange rate, trade surplus, cointegration vector autoregression

Résumé: La relation entre le taux de change réel (TCR) de RMB de 1997 à 2006 et le surplus commercial de la Chine avec les autres partenaires commerciaux est discutée, en utilisant l'autoregression de vecteur de cointégration, dans l'article présent. L'étude montre qu'il existe un lien stable de longue date entre TCR de RMB et la balance commerciale, et que la baisse de TCR de RMB est une des raisons du surplus commercial croissant. Néanmoins, ses influences sont moins importantes que celles de PIB de notre pays et des partenaires. Ainsi, renforcer la flexibilité du taux de change de RMB, élargir l'espace de flottement du taux de change entre RMB et le dollar sont nécessaires pour résoudre le problème de surplus commercial.

Mots-Clés: appréciation de RMB, taux de change réel, surplus commercial, autoregression de vecteur de cointégration

Exchange rate (REER) of RMB shows a stable appreciation trend from 2005 when it began to reform. At the same time, trade surplus and foreign exchange reserve showed all-time upswing continually. The issue of exchange rate of RMB is a focus for USA up to the present. A new bill drafted out by Democrat conscript fathers Chars, which wanted RMB to appreciate faster. In 2007, trade surplus in the first quarter were 464 hundred million dollar that were 231 hundred million dollar more than in same term in China, so big financial organizations in the world considered that the trend will bring RMB appreciation more pressure. At the same time, center bank indicated that one of the work pivots is to enhance the flexibility of RMB, and to keep the exchange stable in a reasonable level. Zhou XiaoChuang, the president of People's Bank of China, thought that China will expand the flexibility of RMB according to go-aheadism, gradualness, and

controllable principle, and the exchange rate will be determined via supply and demand in the market. It is obvious that the market holds an important position more and more in case of creation of mechanism of RMB exchange rate; with the continual increment of foreign exchange reserve the pressure of RMB appreciation will keep. Whether RMB appreciation can settle trade surplus is the study subject in the paper, the long-term and short-term relationship between real effective exchange rate (REER) of RMB and trade surplus was investigated, and the effect and trend of RMB appreciation was appraised.

1. REFERENCE REVIEW

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Traditional income-expenses theories think, when M-L condition is met, it is that the sum between the demand elasticity of imported commodity and that of exported commodity is more than one, the money appreciation will bring the change of the relative price, which will lead to change of the quantity of the imported commodity, ultimately, it will bring the income and expenses of trade to change. At the same time, owing to the "J curve effect" in real economy, in initially, exchange rate appreciation can change the income and expenses of trade due to the hysteresis of exchange rate transfer; after a while, the income and expenses of trade will become deteriorate gradually.

Many scholars in the world analyzed instructively the relationship between the trade surplus and exchange rate in China. Xie J G and Chen L G (2002) found that depreciation of exchange rate of RMB from 1978 to 2000 did not bring the income and expenses of trade remarkable influence in China; at the same time, they also thought that the rate policies will not work if the change of the income and expenses of trade is brought by other factors. Zhang S G (2005) measured the FDI function in China, the function of import and export, and the flexibility of exchange rate; and he also estimated the cost of exchange rate appreciation with different level, which mainly included the amount of foreign capital and the decrease of export trade, and the GDP and decreasing employment scale they brought. The author also found that exchange rate appreciation will bring the amount of import and export prominent effect, which will decrease more than a half after three quarters, and almost disappear after seven quarters.

Lu X Q and Dai G Q (2005) tested the long-term relationship between fluctuations of weighted real exchange rate of RMB to main currency in the world and the import and export from 1994 to 2003 in China using cointegration vector autoregression technique, the result indicated that the fluctuations will bring the import and export trade remarkable effect when the M-L condition was met with the working "J curve" effect. At the same time, many scholars investigated the relationship between trade deficit between China and USA and exchange rate of RMB. Chou (2000) analyzed the relationship, and found that the fluctuation of real exchange rate of RMB to dollar will bring the export to USA in China a negative effect; it is that the export will decrease when the fluctuation is drastic. However, only the fluctuation of exchange rate was analyzed in the paper, the effect the real exchange rate and nominal exchange rate bring China-USA trade structure did not be discussed.

Yao Z Z (2003) thought that exchange rate is not only factor that effects trade deficit in USA, financial deficit policies, the large-scale securities capital influx caused by the status of dollar considered as an international settlements currency and a reserve currency, are the important causes brought large-scale trade deficit. As a result, only depending on change of exchange rate, the problem of trade surplus in USA

cannot be settled. Eckaus (2004) thought that the unbalance trade in the two countries indicated uncertainly that exchange rate is not in a problem, only emphasizing the trade and exchange rate in China is not right. Li and Li's (2006) result obtained by analyzing the data of China-USA trade from 1980-2004 showed that there is not any prominent relationship in statistics between the fluctuation of nominal exchange and practical exchange of RMB to dollar and the fluctuation of export of China to USA, and that of China imported commodity from USA, by contraries, a remarkable factor in statistics that effect the amount of exporting USA is the rate that FDI holds in Chinese economy.

So, the conclusions are that the scholars obtained must not be the same because of the selected methods, economy variables, and the chose samples. At present, most of references think that there exist not cointegration relationship between real effective exchange rate of RMB and income and expenses of trade; only few references admitted that there exists the relationship, and exchange rate is an important factor that affects income and expenses of trade. So, in the paper, the cointegration test of real effective exchange rate of RMB and income and expenses of trade was achieved by analyzing the data from 1997 to 2006, and then the VAR model was established to reflect the level of short-term fluctuation deviates long-term equilibrium; finally, the change of trade surplus shocked by exchange rate impact brings was explained using covariance decomposition technique.

2. SELECTION OF MODEL AND DATA

2.1 Model

Traditional methods assume that import demand is a function of domestic GDP Y_d , price of import commodity P_m (the price is denoted by foreign currency), the price of domestic commodity P_d , exchange rate S and so on:

$$M_d = M_d(Y_d, P_m, P_d, S) \quad (1)$$

Export demand X_d is a function of some variables such as income level in trade partners Y_f , the domestic price of export commodity P_x , price of commodity in trade partners P_f , exchange rate S and so on:

$$X_d = X_d(Y_f, P_x, P_f, S) \quad (2)$$

Presuming the real exchange rate is:

$$E = SP_m / P_d = SP_f / P_x \quad (3)$$

So, we can rewrite the above expression:

$$M_d = M_d(Y_d, E) \tag{4}$$

$$X_d = X_d(Y_f, E) \tag{5}$$

Defining the rate trade surplus $TB = X_d / M_d$ yields:

$$TB = TB(E, Y_f, Y_d) \tag{6}$$

Logarithm of the above formula, and do linear estimation yield the following equation:

$$\ln(TB_t) = C_0 + C_1 \ln(E_t) + C_2 \ln(Y_{ft}) + C_3 \ln(Y_{dt}) + e_1 \tag{7}$$

2. SELECTION OF DATA

In the paper, the selected data is a quarter data from 1997 to 2006, where:

(1) REER: the index of REER of RMB based on 1996 was chosen for the analysis. In a multi-currency international economy system, the NEER can be estimated in order to observe the total state of some currency and it holds station in international trade and competition of finance field, which can be obtained by weighting nominal bilateral exchange rate between the estimated country and some sample countries; in fact, the REER is obtained by eliminating the effect of price index from NEER.

(2) Domestic real income (Y_d): the GDP index based on 1996 in China is selected for the analysis.

(3) Real income of trade partners (Y_f): the real GDP index in the countries that there is a close trade relation with China is selected, which were obtained by weight according to the trade proportion. Except the

countries, Hong Kong SAR, Japan, USA, Korea, which have the most amount of trade with China, we also chose the GDP index of fifteen countries in EU with an increasing amount of trade with China; total amount of trade between the countries and China holds 80% of export amount in China. All above GDP index real GDP based on 1996.

(4) Income and expense of trade ($\ln(TB)$): it is a logarithm of the rate between the amount of import and that of export among China and trade partners each quarter in the selected sample term.

In the above index, the domestic real income data was obtained by computing according to statistics quarter report of People's Bank of China. Trade surplus data was obtained by computing according to the statistics from the web of ministry of commerce of the people's republic of China; the data of real income in trade partners and that of REER of RMB were from EIU calculation database.

3. TEST AND ANALYSIS OF RESULT

3.1 Stationarity test of time series

A basic condition to analysis of time series is that the considered sample must be a stationary unit root process, or it can lead to "spurious-regression" phenomenon. In the paper, we employed ADF method to test unit root, the optimal lag order of unit root was established via AIC criterion; the lag order is better when the AIC is smaller. The result of ADF test was showed in table 1. Analyzing the table, it is obvious that every time series is non-stationary, but one order difference of the data is stationary statistically significant at 5% level, it is that every variable is a I(1) process. So we can adopt cointegration theory to analyze the data.

Table 1 Stability test of correlative data (Stationarity Test)

Variables	ADF:T	1% critical value	5% critical value	10% critical value
lnREER	-1.352075	-3.6171	-2.9422	-2.6092
d(lnREER)	-3.931351	-3.6228	-2.9446	-2.6105
ln Y_d	-2.841542	-3.6171	-2.9422	-2.6092
d(ln Y_d)	-5.766460	-3.6228	-2.9446	-2.6105
ln Y_f	-0.265101	-3.6171	-2.9422	-2.6092
d(ln Y_f)	-3.134999	-3.6228	-2.9446	-2.6105
lnTB	-1.973304	-3.6171	-2.9422	-2.6092
d(lnTB)	-5.419435	-3.6228	-2.9446	-2.6105

3.2 Test of cointegration relationship

For the time series with the same unit root, we can employ Johansen test to discriminate whether exists a cointegration relationship among the tested data. The basic principle of Johansen is that vector autoregression model, which includes the one order difference lag item of the involved variables and one order lag item of horizontal quantity, is estimated using maximum likelihood estimation, at the same time, the eigenvalue of level estimation coefficient matrix is solved.

According to Johansen's proposition (1988), we can discriminate whether there exist a cointegration relationship among the considered data by the maximum statistics " $-T \ln(1 - \lambda)$ ", viz. λ_{max} , and trace statistics " $-T \sum \ln(1 - \lambda)$ ", namely, λ_{trace} . Osterwald-Lenium (1992) proposed the critical value of the two statistics corresponding to different error

modification model. Given null hypothesis of there exists not a cointegration relationship among the model variables, when the estimation value of the statistics exceeds the critical value; we refuse the null hypothesis and accept the alternative hypothesis. The rank number the eigenvalue corresponds is cointegration order among the variables (Qing D, 1998).

Because the considered time series is a I(1) process, we can do cointegration test by the logarithm of the rate of export to import between China and other trade partners (TB), the REER, the domestic income (Y_d), and foreign income(Y_f). We can ensure whether there is one or several cointegration relationship among the four variables on the basis of analyzing AIC and SBS criterion. Table 2 shows that there only is a cointegration relationship among the variables statistically significant at 5% level.

Table 2 Test of cointegration relationship

Eigen value	Max-Eigen	5% critical value	1% critical value	Null hypothesis
0.444617	45.21156	39.89	45.58	none *
0.339105	23.45193	24.31	29.75	No more than 1
0.144053	8.127978	12.53	16.31	No more than 2
0.062116	2.372759	3.84	6.51	No more than 3

*(**) Statistically significant at 5% (1%) level. Reject null hypothesis

We can express the cointegration relationship into the following model:

$$LNTB = -0.288701 LNREER + 0.811768 LN Y_f - 0.844992 LN Y_d + EC \quad (8)$$

(0.68038) (0.42993) (0.54320)

Formula (8) showed the long-term equilibrium relationship between trade surplus and the variables. The data in parentheses are asymptotic standard deviation of cointegration coefficient estimation value. When the REER of RMB increases by 1%, the trade deficit will decrease by 0.29%. When the GDP increases by 1% in trade partners, trade surplus will decrease by 0.84%. The above relationship showed that among the factors affect the trade surplus such as REER of RMB, GDP in trade partners, and the level of domestic income, the role of domestic GDP is the most important, in turn, are GDP in trade partners and REER of RMB.

3.3 Vector error modification model

Engle and Granger advised vector error modification model by combining cointegration theory and error modification model. Gao T M (2006) thought that the model could be deduced if there is a cointegration relationship in two variables. The model can directly describe the synthetical relationship between the

short-term fluctuation and long-term equilibrium. According to the above cointegration test, we can obtain the error modification item.

$$ecm_t = \ln TB_t - 0.288701 \ln REER_t + 0.811768 \ln Y_{ft} - 0.844992 \ln Y_{dt}$$

So, we can obtain the following VEC model:

$$\Delta \ln TB = -0.014123 ecm - 0.623813 \Delta \ln TB(-1) - 0.588394 \Delta \ln TB(-2) + 0.789612 LNREER(-1) - 7.404809 LN Y_f(-2) - 0.119619 LN Y_d(-1) - 0.090816 LN Y_d(-2) + 0.083127 \quad (9)$$

In equation (9), the t -statistics of different coefficient are: -3.31355, -4.06033, -3.62106, 1.75452, 1.73289, -2.26457, -1.91748, 2.56633 respectively. Besides, $R^2 = 0.607501$, $e = 0.062608$. The values of logarithm maximum like, AIC, SC respectively are 316.0433, -14.63105, -11.96474.

Bigger maximum like value, smaller AIC and SC

value indicate that the result is relatively perfect. From the result of regression, we can find that change of trade surplus will be influenced remarkably by the short-term change of real income with a 5% level in trade partners; the short-term change of REER of RMB with an above 5 percent of level will also bring the surplus remarkable influence.

3.4 Covariance decomposition

Covariance decomposition method can be employed to investigate the dynamic characteristic of the model considering the VAR model. Primary idea of the

method is that the fluctuation of endogenous variable in the system was decomposed into m components that associate with new information in different equations according to the cause, so we can understand the relative importance of the variables the new information brings (Yi D H, 2002). In the paper, covariance decomposition was implemented to after 20 terms. From table 3, we can find, in middle-term, the influence REER of RMB bring income and expenses of trade will gradually increase by 40% or so, however, the influence that long-term REER of RMB bring income and expenses of trade will be more than that of short-term REER of RMB.

Table 3 Covariance decomposition

period	S.E.	LNTB	LNREER	LNYSA	LNYP
1	0.062608	100.0000	0.000000	0.000000	0.000000
2	0.073110	86.51040	7.561525	0.006782	5.921296
3	0.085802	68.27688	7.491406	0.412295	23.81942
4	0.100420	54.42557	13.98220	1.041117	30.55111
5	0.111956	53.65601	17.84157	0.843070	27.65936
6	0.120834	50.27257	24.56714	0.732925	24.42737
7	0.127736	47.56721	29.29781	0.710622	22.42436
8	0.136540	44.75374	34.43772	0.852779	19.95576
9	0.144092	44.06292	36.97608	0.767053	18.19395
10	0.150650	43.09039	39.24786	0.718547	16.94320
11	0.156400	42.29902	40.85680	0.704521	16.13966
12	0.162716	41.54172	42.47765	0.707479	15.27315
13	0.168368	41.28708	43.33108	0.660817	14.72102
14	0.173508	41.00058	44.02428	0.640472	14.33466
15	0.178393	40.76727	44.61410	0.623456	13.99517
16	0.183562	40.47197	45.34310	0.608785	13.57614
17	0.188441	40.29042	45.81654	0.579200	13.31384
18	0.193035	40.12543	46.17867	0.561189	13.13471
19	0.197519	39.99301	46.54012	0.544886	12.92198
20	0.202151	39.79892	47.02870	0.527441	12.64494

4. CONCLUSIONS

We can obtain the following conclusions by analyzing the cointegration relationship between income and expenses of trade and REER.

(1) There exists a long-term stable relationship between income and expenses of trade and REER according to the result of the test. The fluctuation of REER of RMB will bring the income and expense of trade distinct change, but the effect it bring will is

smaller than that of the level of income at home, and real income level in trade participator countries.

(2) The result of error modification model shows that the fluctuation of REER will leads to distinct change of income and expense of trade in the short-term.

(3) The result of covariance decomposition indicates that the effect REER of RMB brings income and expense of trade is a gradual augment process in the middle-term.

The rank of factors that influence income and

expense of trade is the level of income at home, real income level in deal participator countries, and REER of RMB according to their importance. The level of REER in RMB is one of important factor to influence income and expense of trade, however, the force is smaller than the other two factors. We should rightly look on the function of exchange rate work on settling the trade deficit, RMB appreciation is a necessary component in package policy of settling the trade surplus.

Modifying exchange rate policy in China can alleviate the unbalanced trade. Under the background of economic globalization, bilateral trade balance mainly depends on economy structure and the division of work pattern of the world, though the change of exchange rate can affect trade balance. As a result, the answer cannot only be depending on the change of exchange rate, but it also cannot be avoided. Expending domestic demand and importing are efficient measures to modify international trade surplus, at the same time, the exchange rate policies that considered as an accessorial measure will work on some degree (Zhou X C, 2007).

As for trade surplus, the effect REER of RMB brings is more direct than that of nominal exchange rate does. Though RMB to dollar is appreciated in 2006, in whole, REER decreased in China. In 2006, the appreciation of RMB to dollar is by 3% or so, but the money such as EUR to dollar or KRW to dollar is appreciated more than YUAN. The cause of decrease of REER of RMB when the exchange rate of RMB to dollar arrives a summit is that the dollar is in a large depreciation in the world, the range of RMB appreciation lag the appreciation of other currencies to dollar, in fact, which lead to depreciation of RMB. The cause that trade unbalance did not be meliorated by the appreciation of RMB to dollar can be interpreted using REER. With the decrease of trade surplus gradually from 2006, in the year, the summation of trade surplus is 1774.7 hundred million dollar, which is over 700 hundred million dollar

more than 2005 with 1019 hundred million dollar, the range of augment is by 74.0%.In the end ,RMB has still in the pressure of appreciation.

There is an advantage and disadvantage to the change of RMB; when the value of RMB is underestimated, the advantage of the labor-intensive industry will be expended, and however, it is disadvantageous for the advanced technology industry to enhance their international competition power. On the opposite, the price of RMB will decrease with the increase of the import commodity, which can lead to the domestic commodity price decrease that will deteriorate deflation (Wang Z X, 2004). Rapid appreciation of RMB can bring more risk and instability to economy; similarly, we also will bear more cost if the speed of RMB appreciation is slow, in the long run, which is a disadvantageous to trade and economy stability. As what Lrens said, if the elapsed time of exchange regulation in China is longer, the cost will be higher. Slow regulation speed of exchange rate will bring the markets hidden troubles. At the same time, extremely cautious policies of the reform of RMB exchange rate will fosterage foreign protectionism, in the long run, which will be a disadvantage for export and maintaining the trade relationship between China and trade participator countries.

The reform of exchange rate generation mechanism, especially more flexibility in exchange rate of RMB, bigger exchange rate float space of RMB to dollar are more important than whether RMB will appreciate or not. We should give RMB more flexibility, exert the market mechanism on the form of RMB exchange rate, and let foreign exchange market seek the equilibrium level of RMB exchange rate spontaneously. At the same time, control of gamble capital is an important safeguard measure that accords with modification of the policy of RMB exchange rate, which can efficiently prevent the hot money from inputting market so as to give modification of RMB a looser circumstance.

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