Effective Exchange Rate and International Trade
——Evidence from Zhejiang province

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***ABSTRACT*—In 2005 China began to implement a managed floating exchange rate system on the basis of market supply and demand with reference to a basket of currencies. since 2010, the RMB exchange rate began to appreciate sharply, till now, the pressure of RMB appreciation is still huge, and has great impact on foreign trade. This paper made a empirical reasearch on the impact of effective exchange rate on Zhejiang international trade. We employed the general export model, exports of ordinal trade model, processing export model, results show that the real effective exchange rate of RMB devaluation will not only promote Zhejiang international trade, but also decrease international trade.**

Keywords-Exchange rate, Foreign trade, real effective exchange rate

I. INTRODUCTION

Exchange rate is an important variable of macroscopical economy and has has significant influence on the international trade balance. it is also as a means of regulating a country's international balance of payments and international trade, directly affects a country on the international market commodity prices, and ultimately affect the country's international competitiveness of commodities. In general, the currency exchange rate (decline), namely the currency's value rise (fall), it will result in the increase of import (reduced), export decrease (increase). In recent years, Chinese international balance of payments continued to face the "double surplus", this also caused the expected continuously appreciation of RMB. Since 2005 to 2008 , the RMB exchange rate of $1 to $6.80, gained a total of 18.07%. Zhejiang Province ranked first in foreign trade surplus in recent years in China. So study on RMB exchange and Zhejiang foreign has stimulate interest in both academic and practical field. Scholars had done a large amount of research, but most focus on nominal exchange rate and real exchange rate changes on the impact of international trade balance, and views from effective exchange rate perspective is few. While Chinese scorlars are mainly from national point of view, views from a specifical area is few. This artivle is focusing on the impact of real exchange rate on Zhejiang international trade. We set up the general trade export t model, ordinal trademodel, and process export model, empirical results show that the real effective exchange rate of RMB devaluation will not only promote Zhejiang international trade, but also decrease the it.

The following of the paper is arranged as follows: section two is literature review, secontion three introduces theorietic background, Section four reviews the evidence, and section four is general conclusion.

II. LITERATURE REVIEW

Since the disintegration of Bretton Woods system, the world's major industrial countries have imployed a floating exchange rate system, the impact of exchange rate changeson international trade has been a focus in the field of Economics, Marshall (1923) was the first scorlar put forward a theory of elasticity, and it has become complete system till now. There are mainly two views, one is that Marshall - Lerner condition can not hold, and the exchange rate had no significant effect on international trade, for instance, the earliest research was done by Houthakker and Magee (1969), Groenewold and He (2007), Wilson (2001), Eckaus（2004） Klaassen(2004) et al. The other view is that the exchange rate had no significant effect on international trade, while Marshall Lerner condition is still hold. Evidence are shown by Oskooee (1998), Cerra and Gulati (1999), Chou (2000) , Bin (2010), Byme (2008), Thorbecke (2006), et al.

Domestic scolars also have such above introduced two views, and there are many research done on the impact of exchange rate and Zhejiang international trade. Most from the perspective of nominal exchange rate and real exchange rate changes on the impact of international trade balance, and research from effective exchange rate perspective is very few.

III. Empirical evidence.

A Establishing models

We employed the Bickerdike -Robinson -Metzler incomplete replacement model. The model assumes that the traded goods cannot completely replace the import commodity, rather trade commodity subject to many factors such as the prices of imported goods, domestic income, domestic commodity prices and others.

In the process of setting up models, we take into account real exchange rate, and add joined GDP and other influencing factors as economic growth both domestic and abroad will also affect international trade. In Zhejiang Province, non-governmental enterprises accounts for more than proportion of 30% every year, so we add factor of foreign direct investment (FDI) . Then we usE multiple linear regression model and cointegration model to estimate the correlation between the RMB exchange rate and international trade, add we take the natural logarithm on relevant variables.

Assume general trade model is:

$$lnEX = \beta_0 + \beta_1 lnGDPF_t + \beta_2 lnREER_t + \beta_3 lnFDIS_{t-1} + \beta_4 lnWTO + \varepsilon_t$$

$$lnIM = \gamma_0 + \gamma_1 lnGDP_t + \gamma_2 lnREER_t + \gamma_3 lnFDIS_{t-1} + \gamma_4 lnWTO + \mu_t$$
(1)

In similar way, we set up model of ordinal trade model ：

$$lnEXOR = \beta_0 + \beta_1 lnGDPF_t + \beta_2 lnREER_t + \beta_3 lnFDIS_{t-1} + \beta_4 lnWTO + \varepsilon_t$$

$$lnIMOR = \gamma_0 + \gamma_1 lnGDP_t + \gamma_2 lnREER_t + \gamma_3 lnFDIS_{t-1} + \gamma_4 lnWTO + \mu_t$$

(2)

Then, processing trade model is：

$$lnEXPR = \beta_0 + \beta_1 lnGDPF_t + \beta_2 lnREER_t + \beta_3 lnFDIS_{t-1} + \beta_4 lnWTO + \varepsilon_t$$

$$lnIMPR = \gamma_0 + \gamma_1 lnGDP_t + \gamma_2 lnREER_t + \gamma_3 lnFDIS_{t-1} + \gamma_4 lnWTO + \mu_t (3)$$

Where EX is total export, IM is total import、 EXPR is process export、IMPR is process import, in similar way, we set up general trade model (EXOR and IMOR）and process model EXPR and IMPR.

We also set up real effective exchange rate (effective real exchange rate)

Real effective exchange rate is on the basis of nominal effective exchange rate basis, eliminating inflation to monetary purchasing influence can be obtained. Therefore, the real

$$REER = \sum_{i=0}^{n} w_i \times NER_i \times \frac{P_d}{P_i} \quad (4)$$

Where REER represents a real effective exchange rate index, wi is the weight each year according to international trade amount of each partner country, Pd is the domestic price level represented by CPI index, PI is price level represented by CPI index; NERi is nominal exchange rate index that is got from a with a fixed year as base year.

B Data collection

This paper uses an nual data from 1985 to 2010 rate, 1985 is regarded as base year, namely 1985=100. partner countries we selected US, Germany, Japan, France, UK, Italy, Hongkong, Taiwan, Korea, Australia, totally ten countries, which rank top ten in dealing business with Zhejiang enterprises. Sources of data are from "statistical yearbook of Zhejiang", "International Statistical Yearbook" and "China Statistical Yearbook" and official websites of Chinese State Administration of foreign exchange, China Daily National Statistical Bureau and Zhejiang chamber of commerce.

C Empirical Results

Empirical results showed in the general trade 1 export model, export model, processing trade exports export model, the real effective exchange rate elasticity are -0.371395, -0.04686, -3.85749 respectively. meaning real effective exchange rate of RMB appreciated by one percentage point, total exports, exports in general trade, processing trade exports will decrease by 0.371395, 0.04686, 3.85749 percentage respectively. The three elastic are negative, i.e. the devaluation of real effective exchange rate of RMB will promote Zhejiang Province export, which is in the coincide with traditional theory. Among the three processing trade exports has the largest absolute value of real effective exchange rate elasticity, showing that exchange rate changes on the export of processing trade has the greatest effect. imported real effective exchange rate elasticity of total import model, general trade import model, processing trade import models are -0.848948, -1.511114, -0.546121 respectively. Meaning real effective exchange rate of RMB appreciation by one percent, total imports, imports of general trade, processing trade imports will decrease by 0.848948, 1.511114, 0.546121 percent respectively. This is in contradicat with the traditional theory. considering Marshall - Lerner condition, only the import and export of processing trade model in line with the conditions, namely the real effective exchange rate of RMB devaluation can improve the balance of payments. Total import and export model and general trade import and export models are not eligible.

Concerning the impact of income elasticity, income elasticity for the three models are are 0.089294, 0.127326, 0.082651 respectively; domestic income elasticity of importing : are 0.424135, 0.45807, 0.039556 respectively, positive number means foreign income increases will lead to the increase in exports, domestic income increases will lead to the increase of imports of foreign income, influence coefficient less than domestic income effect.Foreign direct investment stock (FDIS) of Zhejiang Province Import and export influence, three export model coefficients were 1.463467, 1.426052, 1.640945; three imports of the coefficient of the model were 0.900001, 2.214886, 0.968180, that foreign direct investment have a significant role in Zhejiang international trade. In addition, influence of China’s joining into WTO to import and export trade of Zhejiang province's is huge, three export model coefficients were: 0.422837, 0.392991, 0.984021; three import model coefficients 1.166069, 0.039168: -0.009642. respectively. In order to conserve space, here only list table of cointergratoin estimation result.

Table 1 cointergration estimation result of (t statistics in brackets)

Y \ X	REER	GDPF	GDP	FDIS	WTO
EX	-0.371395 (0.04230)	0.089294 (0.03716)	___	1.463467 (0.01656)	0.422837 (0.01936)
IM	-0.848948 (0.08284)	___	0.424135 (0.05772)	0.900001 (0.04866)	-0.009642 (0.03197)
EXOR	-0.046860 (0.02037)	0.127326 (0.01781)	___	1.426052 (0.00829)	0.392991 (0.00986)
IMOR	-1.511114 (0.16548)	___	0.458070 (0.10738)	2.214886 (0.08999)	1.166069 (0.05970)
EXPR	-3.857491 (0.14776)	0.082651 (0.11822)	___	1.640945 (0.05686)	0.984021 (0.06754)
IMPR	-0.546121 (0.02763)	___	0.039556 (0.01956)	0.968180 (0.01654)	0.039168 (0.01073)

IV. CONCLUSION

On the basis of elasticity theory, we employed general export model, order trade model and processing trade model, we concluded that the devaluation real effective exchange rate of RMB will not only increase the amount of Zhejiang international trade, but also decrease it. Moreover, only the import and export of processing trade is in line with Marshall - Lerner condition, the general export mondel and ordinary trade model are not consistent with the theory. We suggest that the government take steady steps to promote the formation mechanism of RMB exchange rate, prevent excessive exchange change, take effective ways in attracting foreign direct investment and accelerate the adjustment of industrial structure

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