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Study of the impact of RMB real exchange rate on zhangzhou's trade balance

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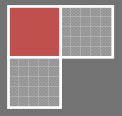
ABSTRACT

With the monthly data of RMB real effective exchange rate and Zhangzhou's trade balance from Aug,2006 to Sep,2011, we make empirical analysis of each economic variable relationship through establishing vector regression models. The result indicates that the RMB real effective exchange rate and Zhangzhou's trade balance has the long-term cointegration relationship, but the relationship is not very significant. In other words, the RMB real exchange rate is not the main factor to affect the Zhangzhou's trade balance. It's not obvious to improve the Zhangzhou's trade balance through exchange rate balance.

KEYWORDS

RMB real exchange rate; Zhangzhou; Trade balance.



INTRODUCTION

Zhangzhou City, located in the southeast of Fujian Province, its east is near the Taiwan Strait and in the opposite of Taiwan Province. Its northeast, Quanzhou and Xiamen are together and are known as the "Golden Triangle of South Fujian". Its northwest bordering with Longyan and its southern is next to Guangdong, Shantou and Chaozhou, it is famous as "the hometown of fish and goods". It is famous of overseas Chinese and the ancestral home. At present, Zhangzhou people are seizing the opportunity of reform and opening and are active in the construction of the West Coast Economic under the lead of government. It has carried out the development strategy that "industry setting up city" to accelerate the economic growth rate, to build ecological industry and trade port city and to enhance the ability to participate in the international competition. Under the call of the government policy, Zhangzhou has achieved huge development on economic. It has achieved a GDP of 176.82 billion yuan, which is 14.7% more than the previous year until 2011. In terms of the import and export, in the ten years from 2000 to 2011, the average growth rate of import and export is 24.62% every year in which 2003 is 69.09%, 2004 is 56.58 and 2010 is 54.19% and they are rapid particularly. Total imports and exports in 2010 reached up to 7399 million U.S dollars that is 54.19% more than 2009. According to the whole information, we can see generally that the improvement of foreign trade has promoted the rapid development of Zhangzhou's economy.

The foreign trade dependency of Zhangzhou is 32.77% in recent ten years. It can be seen that the impact of RMB exchange rate on Zhangzhou's foreign trade balance can not be ignored. It goes without saying that it's necessary and important to study on the relationship between RMB exchange rate and Zhangzhou's foreign trade balance.

LITERATURE REVIEW OF THE EMPIRICAL STUDY OF THE RMB EXCHANGE RATE AND CHINA'S TRADE BALANCE

For now, elastic analysis method has been widely used to analyze the relation between exchange rate changes and the international trade balance. Whether the Marshall-Lerner condition is established has been used in the study on the relation between the country's exchange rate and international trade balance by scholars from all over the world. There is a "elasticity pessimism debate" among theoretical cycle o12002n whether exchange rate changes have influence on international trade balance. In recent years, with the continued appreciation of RMB, many domestic scholars use whether the Marshall-Lerner condition that the import demand elasticity adds export demand elasticity equals one is established to analyze the impact of RMB exchange rate on Chinese international trade balance. At present, there is a big divergence between the research conclusions and ideas. There are three main ideas:

Idea 1. There is a serious shortage of the price elasticity of demand for imports and exports, the Marshall-Lerner condition is not established in China. As the analysis on the information 1970-1983 done by Li Yining (1991) shows, Chinese price elasticity of demand for imports and exports is only 0.7377 that was a serious shortage of price elasticity of demand. Xie Jianguo and Chen Ligao (2002)[1] used the cointegration analysis and impulse response method to study on the relation between RMB real exchange rate and international trade balance. It turned out that the influence of RMB real exchange rate on Chinese international trade balance was not significant. Zhou Hongshan and Li Qi (2007) used quarterly data 1993-2004 to examine the relation between RMB exchange rate and the Sino-US trade. As the result shew, exchange rate fluctuations had no significant effect on exports.

Idea 2. Chinese demand elasticity of imports and exports is the critical value. Using the exchange rate policy to adjust Chinese trade balance has just a little effect. Chen Biaoru (1992) made a conclusion using data 1980-1989 that Chinese price elasticity of demand for imports and exports is 1.0248, the depreciation of RMB had a limited effect on improving Chinese trade balance. Shen Guobin and Yang Yi (2005)[5] carried out a study using monthly data 1990.01-2004.12, which shew that it is a small mutual influence between RMB exchange rate and Chinese imports and exports in short -term and it is not a stable cointegration relation in long-term. Zhao Xi and Li Bingyang (2006) made a study using data 1984-2004 on Guangdong Province's imports and exports, which shew that the influence of the fluctuation of RMB real exchange rate on Guangdong Province's imports and exports is very small.

Idea 3. The fluctuation of exchange rate has a long and obvious influence on Chinese trade balance. Lu xiangqian and Dai Guoqiang (2005)[2] used cointegration vector auto-regression analysis method to analyze the long-term relationship between RMB and the world's major currencies weighted real exchange rate fluctuation from1994 to 2003 and Chinese imports and exports. As the result shew, RMB real exchange rate fluctuation had an obvious influence on Chinese imports and exports. What's more, it exists the J-curve effect between them. Liu Xinxin (2005)[7] did a study using annual data about RMB real exchange rate and Chinese trade balance from1979 to 2003, through which she made a conclusion that the main reason that influence Chinese trade balance is RMB real exchange rate. Li Bohai (2003)[8] used cointegration analysis and other analytical methods to made a research on data 1973-2001. The result shew that there is a long-term stable equilibrium relationship between RMB real exchange rate and Chinese foreign trade.

However, there are still relatively little relevant research literature specific to Fujian Province. According to the available information, Lin Youwen, Huang Jie and Song Baoding hold the view that there is no long-term equilibrium relationship between RMB real exchange rate fluctuation and Chinese foreign trade; Han Ping and Ren Chunmei think that RMB real exchange rate fluctuation has a tiny influence on Fujian province's imports and exports. There is no relevant research specific to Zhangzhou's.

Based on the current different academic point of view and take into account the real effective exchange rare is more representative compared to the norminal effective exchange rate, the article intends to use monthly data about RMB real

exchange rate from August, 2006 to September, 2011 and relative data to build econometric model and use Eviews 6.0 to do empirical analysis. The article aims to do the research on the influence of the RMB real exchange rate fluctuation on Zhangzhou's trade balance.

EMPIRICAL ANALYSIS OF THE IMPACT OF RMB REAL EXCHANGE RATE FLUCTUATION ON ZHANGZHOU'S TRADE BALANCE

(1) Characteristics of real exchange rate movements and trade balance of Zhangzhou

Since the reform and opening up, Chinese exchange rate system had mainly gone through two reformation. The first is the unification of RMB exchange rate in 1994 that adopt a unified managed floating exchange rate system. The second is the floating exchange rate system in July, 2005 which is a managed floating exchange rate regime based on market demand and supply with reference to a basket of currencies. In order to observe the relationship between RMB real exchange rate and Zhangzhou's trade balance from the surface of data, the article adopt some annual datum from 1994 to 2010 about RMB nominal effective exchange rate index, RMB real exchange rate index and Zhangzhou's trade balance (Trade balance is exports minus imports). The annual exchange rate index can be calculated by adding the monthly datum published by Bank for International Settlements about RMB nominal effective exchange rate index and the RMB real exchange rate index and get the average of them. What's more, it is the result of normalization of 2005=100.

Among the samples, with the depreciation of RMB, the scale of trade surplus became larger in some years which accorded with the traditional theory. However, with the appreciation of RMB, the scale of trade surplus became larger in some years. For this paradox, this article is going to analyze whether there is a significant correlation between RMB real exchange rate and Zhangzhou's trade balance and find the reason for these phenomenon above.

(2)Empirical Analysis of the impact of RMB Real Exchange Rate Fluctuation on Zhangzhou's Trade Balance

(a). Econometric model

International trade theory indicates that a country's or a region's international trade balance are mainly influenced by the country's or the region's relative prices of import and export goods, the real income levels of consumers at home and abroad and other economic variable. With this basis, the article refers to many scholars at home and abroad such as Xie Jianguo, Chen Ligao,Bhamani,Rose and others analysis methods in order to analyze whether there is a long-run equilibrium relationship between RMB real exchange rate and Zhangzhou's trade balance.

The specific functional form can be represented as:

$$TB = f(RER, Y, Y_f)$$

TB represents a country or a region's international trade balance; *RER* represents real exchange rate; *Y* represents the country's real income; *Yf* represents foreign country's real income.

As the real effective exchange rate is more representative, the article chose the REER instead of the RER when establishing econometric model. At the same time, all these datum series are seasonally adjusted and are converted to exponential form. What's more, in order to eliminate the effect of possible heteroscedasticity in the time series, the article takes natural logarithm index of every variable sequence respectively. Trade balance measurement equation can be represented as:

$$\ln TB_t = \alpha + \beta \ln Y_t + \delta \ln Y_{ft} + \varphi \ln REER_t + \varepsilon_t$$

TB_t represents the trade balance between Zhangzhou and main trading partner countries or regions in time t. Y_t represents the actual output. Y_{ft} represents the output of its main trading countries or regions. *REER* represents the RMB real exchange rate.

(b)Sample data selection and processing

Chinese floating exchange rate system is managed which is based on the market supply and demand with reference to a basket of currencies in 2005 after the exchange rate reform. Price changes can influence trade through market mechanism theoretically. So it should use the data after July 2005 as the research object. However, because of the lack of monthly data, I must extend the upper limit of the sample time interval to August 2006. The specific interval is the monthly data from August 2006 to September 2011 which are 62 samples totally.

RMB Real Effective Exchange Rate Index

Select the RMB real effective exchange rate instead of the real exchange rate and used the real effective exchange rate index as indicator variables in this econometric model. The RMB real effective exchange rate datum from August 2006 to September 2011 were released by the Bank for International Settlements. The statistics are adjusted as the corresponding national CPI. What's more, it is the result of indexation processing of 2005=100.

Selection of trading partners and determination of trade weights

The article selects 20 representative countries or regions as trading partners of Zhangzhou. They are America, Taiwan, Japan, Korea, Hongkong, Germany, India, Malaysia, Australia, Thailand, Philippines, England, Canada, Singapore, Italy, France, Spain, Finland, Denmark and Sweden. The reason why I choose these countries is that the Zhangzhou's total trade

volume with the 20 countries and regions accounted for about 80% of the total annual trade volume which is representative relatively. Zhangzhou's import and export trade with each trading partner can be got through calculating the total trad volume with its trading partners. The formula to calculate trade weight is

$$W_{it} = \frac{X_{it} + M_{it}}{\sum (X_{it} + M_{it})}$$

W_{it} represents the trade weight with sample trading partners in year t; X_{it} represents Zhangzhou's exports of sample trading partner i in year t; M_{it} represents Zhangzhou's imports of sample trading partner i in year t. Each trade weight is calculated by author. On account of the lack of data of year 2011, I filled it through tracing method.

Zhangzhou's Trade Balance

Zhangzhou's trade balance is the margin between its monthly total exports and monthly total imports. For the reason that the trading data released by Zhangzhou Customs Net has not adjusted seasonally, I use seasonally adjusted tool --X12 to adjust total imports and exports each month when doing econometric analysis. Then I get the trade balance --TB through indexation processing of 2005=100.

Real income of Zhangzhou and its trading partner

In general, I choose a country or a region's GDP as trading partner. Because the GDP only according to annual statistics, the article chooses the added value of industrial monthly instead of GDP as the real income. Zhangzhou's added value of industrial data comes from Zhangzhou's Statistics Net and it is also adjusted by the seasonally adjusted tool --X12. And then do the indexation processing of 2005=100. On account of the lack of data of monthly data, I filled it through tracing method.

Similarly, we choose the foreign industrial added value instead of the real income. In the 20 trading partners except for Hongkong, Singapore, Thailand and Philippines, the datum of the others sample trading partners monthly industrial added value all come from the OECD. They are all adjusted seasonally and based on 2205=100. Among them, the data which referred to Australia in the OECD is monthly data. So in this article these datum are adjusted to the monthly datum according to the tendency of time variation. However, the monthly industrial added value datum of the four countries or regions above can only be transformed through the GDP released by IMF data bank into monthly datum and do the seasonal adjustment and indexation treatment.

Just as mentioned above, the comprehensive index of industrial added value is the sum of each country or region's monthly industrial added value index multiplied by the trade-weight $W_{it.}$ And we use it to replace the foreign real income $Y_{ft.}$

(3)Econometric Regression

Stationary Test

TABLE 1 : The stationarity test results of variable time series

Variate	Examination form (C,T,L)	ADF Statistics	1% critical value	5% critical value	10% critical value	stationarity
lnTB	(C,T,0)	-4.499890	-4.115684	-3.485218	-3.170793	stationary***
△lnTB	(0,0,2)	-7.330499	-2.605442	-1.946549	-1.613181	stationary***
lnY	(C,T,1)	-1.381842	-4.118444	-3.486509	-3.171541	nonstationary
△lnY	(C,0,0)	-10.36003	-3.544063	-2.910860	-2.593090	stationary***
$\ln Y_f$	(C,T,0)	-5.815308	-4.115684	-3.485218	-3.170793	stationary***
∆lnYf	(0,0,0)	-13.20453	-2.604073	-1.946348	-1.613293	stationary***
lnREER	(C,0,0)	-1.584281	-3.542097	-2.910019	-2.592645	nonstationary
△lnREER	(C,0,0)	-7.959907	-3.544063	-2.91086	-2.59309	stationary***

Note : △represents first order defference form; The C and T in the examination form represent the constant and time trend. L represents the Lag Intervals for Endogenous, the selection of it is according to the rule of the AIC information criterion; * represents that the data is significant on the 1% significant level. ** represents that the data is significantly on the 5% significant level.**

We can see from TABLE1 that, Zhangzhou's trade balance index TB, Zhangzhou's real income index Y, foreign real income index Yf and real effective exchange rate index REER are all transformed into stationary sequence after first order

difference. That to say, they are all first- order single sequence I (1). So we can do long-term cointegration integration analysis on the four variables.

Cointegration Test

There are two methods to do the cointegration test. They are the Engle-Granger and the Johansen Cointegration Test. What's more, I establish the VAR (3) model to do the cointegration of ln*TB*、ln*REER*、ln*Y* and lnY_f. The result of it is shown as Tan2 and TABLE 3.

TABLE 2 : The cointegration test results of Johansen

Valid subjects：lnTB lnY lnYf lnREER；Lag Intervals for Endogenous2				
Null hypothesis (cointegration vector)	Eigenvalues	Trace statistic	5% critical value	Probability
None*	0.522320	43.59002	27.58434	0.000200
At most 1 *	0.404491	30.58200	21.13162	0.001800
At most 2	0.062518	3.808878	14.26460	0.879000
At most 3	9.69E-07	5.72E-05	3.841466	0.996300

Note: * represents that it rejects the null hypothesis at the 5% significance level; The Johansen Cointegration Test is very sensitive to the choice of Lag Intervals for Endogenous. Data in this article is chose according to the AIC information criterion.

TABLE 3 : The long-term cointegrating relationship estimate of real effective exchange rate and Zhangzhou's trade balance after standardization

lnTB	**lnY**	**lnYf**	**lnREER**
1.000000	0.829567	-8.033245	-2.600736
	(0.35431)	(1.01209)	(1.57838)

Note: The number in parentheses is the statistic t of estimated coefficients.

The result of cointegration test in TABLE 2 shows that Zhangzhou's trade balance, RMB real effective exchange rate, Zhangzhou's real income and foreign real income exist two cointegration at the 5% significance level. It illustrates the existence of long-term equilibrium relationship among each economic variables in Zhangzhou's trade balance equation. TABLE 3 is the standardized cointegration, it can be presented as the follow equation:

$$\ln TB = -0.829567\ln Y + 8.033245\ln Y_f + 2.600736\ln REER$$

From the point of view of the elastic coefficient, the result of cointegration test shows that the real effective exchange rate elasticity of Zhangzhou's trade balance is 2.600736. It indicates that when the RMB real effective exchange rate increased by 1% or RMB depreciated by 1%, Zhangzhou's trade balance would increase 2.600736% which is the same as the traditional theory that devaluation can expand trade exports. That's to say the depreciation of RMB can expand the trade exports of Zhangzhou. But on account of *t* is only 1.57838 which indicates that the long-term relationship between real effective exchange rate and Zhangzhou's trade balance is not significant and we can not adjust Zhangzhou's trade balance through exchange rate policy.

According to the Keynesian theory of international trade, there may be two kinds of circumstances between a country's income increase and its imports. The first is that with the increase of the country's real income, the country's real purchasing power will also improve. So that the imports of this country will also increase. The other is that if the increase of the country's domestic income is the result of the increase of the output of domestic import substitution products, the country's imports would decrease. The result of cointegration test shows that Zhangzhou's real income elasticity of trade balance is -0.829567 and its foreign real income elasticity is 8.033245. In other words, if Zhangzhou's real income increased by 1%, its trade balance would decrease by 0.829567. And if its foreign real income increase by 1%, its trade balance would increase by 8.033245%. The empirical results indicate that Zhangzhou is now in the first circumstance of Keynesian theory. Actually, the result above matches the circumstance Zhangzhou's trade export faced with now. With the development of Zhangzhou's economy, the increase of income improves the city's real purchasing power so that it will improve the imports of trade partners. Especially in 1998 and 1999, the deficit appeared in trade balance. So there is a negative relationship between Zhangzhou's real income and trade balance and a positive relationship between foreign real income and trade balance. To make a conclusion, whatever Zhangzhou's real income or foreign real income is not the main reason that influence its trade balance in long term.

MAIN CONCLUSION

We can get the following conclusion through the long-term cointegration analysis on Zhangzhou's trade balance and RMB real effective exchange rate and other variables that:

There is a long-term cointegration relationship between Zhangzhou's trade balance and RMB real effective exchange rate and the influence of RMB real effective exchange rate on Zhangzhou's trade balance is positive. That's to say, the depreciation of RMB can expand Zhangzhou's trade that matches the traditional theory. However, since the statistic is not significant, the RMB real exchange rate is not the main reason to influence its trade balance and the effect of the change in exchange rate policy on Zhangzhou's trade balance is very small.

There is a long-term equilibrium relationship between Zhangzhou's trade balance and its real income. With the development of Zhangzhou's economy that its increase in income improve the actual purchasing power, Zhangzhou's imports from its trade partners increase. However, since the statistic is not significant, the effect on Zhangzhou's exports is very small.

There is a long-term stable relationship between Zhangzhou's trade balance and foreign real income. There are so many primary products in Zhangzhou's export products. Foreign domestic industry's demand for Zhangzhou's primary products is strong which improves the exports of Zhangzhou. So Zhangzhou's trade balance has a positive influence on foreign real income. Similarly, since the statistic is not significant, the effect on Zhangzhou's exports is very small.

The empirical results shows that the slight appreciation of the RMB only has a little influence on Zhangzhou's economy. Although the relationship is no so significant, the slight depreciation would improve Zhangzhou's exports.

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