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Appreciation of Chinese Yuan and International Trade: The Case of Liaoning, China

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Abstract

The paper analyzes the relationship between RMB exchange rate and international trade using the data of 1999-2011 of Liaoning, China. The finding shows appreciation of Chinese Yuan has a long run effect on international trade. It can increase the export and decrease the import. And there is unidirectional causal relationship between them. But it has no significant influence on improving surplus in balance of payment, which is maybe related with the processing trade. It is hope to be beneficial to improve development of Liaoning foreign trade.

Keywords: appreciation, Chinese Yuan, import, export

1. Introduction

The issue of exchange rate and trade is the very important in international economics research. Marshall-Lerner condition is the main theory research in related fields, that is, whether depreciation of a nation's currency would improve its balance of payment depended on demand and supply elasticity of trade commodity. This theory stimulates some empirical analysis with different nation sample. There are two conclusions, one view is that exchange rate fluctuation has no significant effect on foreign trade, the other is the opposite. Houthakker and Magee (1969) put forward "Elasticity Pessimism". They believed that the exchange rate fluctuation resulting in relative prices changes would cause trade elasticity decrease. Rose and Yellen (1989) thought that the real exchange rate had no significant effect on trade testing with the trade data between United States and the G-7 countries from 1960 to 1988. Rahman and Mustafa (1996) maintained that there was no long run significant relationship between the real effective exchange rate of dollar and United States trade balance using quarterly data of 1973-1992. Wilson (2000) thought that the actual exchange rate changes had no impact both on U.S.-S. Korea and .Korea-Japan trade based on their multilateral trade data. However, Boyd et al (2001) stated that exchange rate changes had significant effect on import and export trade analyzing with developed nations samples. This view is supported by Thailand evidence of Brahmasrene and Jiranyaku (2002). Singh (2002) also agreed this argument, but he further studies the difference between nominal exchange rate and real effective exchange rate utilizing 35 years data of 1960-1995 of India, and argued only real effective exchange rate had a significant effect on international trade. Other studies such as Thorbecke and Smith (2010).

In China, the researches focus on empirical test whether Marshall-Lerner condition is applicable so as to analyze the effect of exchange rate on trade. There are also two views. The first is that Marshall-Lerner condition is not applicable in China, and there is little or even no effect of exchange rate fluctuation on trade, e.g. LI Yining et al (1991), Chen Biaoru(1992), Xie Jianguo, Chen Ligao (2002), Shen Guobing and Yang Yi (2005) etc. On the opposite, some arguments support that appreciation of Chinese yuan will improve trade balance, and Marshall-Lerner condition is applicable in China. e.g. Dai Zuxiang (1997), Xie Zhangyong etc.(1999), Lu Xiangqian and Dai Guoqiang (2005), Li Hongbin etc(2011).In those studies, it is OLS and Var methods that usually used to analyze the relationship between exchange rate and international trade with the national sample. There is little regional research. So it is significant to study with regional data.

In China, since exchange rate regime reform in 1994, RMB exchange rate regime was been reformed in 2005. Until now Chinese Yuan is appreciating, which will exactly affect international trade of China. And Meanwhile, as one coastal areas of China, Liaoning province speed up the openness pace. The international trade value has been increased from 13.73 billion dollars in 1999 to 95.96 billion dollars in 2011. With the international trade growth, the trade balance has enlarged from 2.67 billion dollars in 1999 to 6.12 billion dollars. So what's relationship between Chinese Yuan appreciation and international trade on earth? The paper analyzes the effect with data of 1999-2011 of Liaoning, China

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utilizing OLS method. Section 2 is model and data resource for empirical test. Section 3 shows empirical analysis results. Section 4 gives some discussion and conclusions. The international trade surplus in Liaoning is difficult to improve depending on Chinese Yuan appreciation because process trade is the main trade method in Liaoning, China.

2. Model and data

In order to analyze the effect of Chinese yuan appreciation on international trade, The export demand function and import demand function are established, shown in Eq. 1 and 2.

$$ex=b+\alpha\times e+\beta\times y^{*}+\varepsilon \quad (1)$$

$$im=c+\gamma\times e+\delta\times y+\mu \quad (2)$$

Wherein, ex and im indicates the export and import demand for each, b and c are constant items. e is nominal effective exchange rate(here is the direct quotation and Chinese yuan is domestic currency). α and γ are the exchange rate flexibility of export and import. y is national income of Liaoning, China and y* is the national income of its trading partners. can be calculated by per capita gross regional product. ε and μ are the error term. e is calculate according to Eq. 3.

$$e_i=\sum_{i=1}^{n}E_iW_i \quad (3)$$

E is the nominal exchange rate of foreign exchange rate in term of Chinese yuan. i indicates different trade partners. W is the weight of foreign currency, if EX and IM represent export value and import value, W can be calculated as Eq.4.

$$W_i=\frac{EX_i+IM_i}{\sum EX_i+IM_i} \quad (4)$$

According to the international economic theory, in export demand function the national income of its trading partners can be seen as exogenous variable, so the estimated model can be simplified as,

$$ex=b+\alpha\times e+\varepsilon \quad (5)$$

$$im=c+\gamma\times e+\delta\times y+\mu \quad (6)$$

All variables are logarithmic value in order to eliminate heteroscedasticity of time-series data. The sample data are from China Statistical Yearbook. Then unit root test is conduct to determine the stable data, and co-integration test is done to demonstrate its long-term equilibrium relationship, at last Granger test is done to verify the cause and effect relationship between variables. EViews6.0 software is used.

Table 1. ADF Test result

	e	d (e)	ex	d(ex)	im	d(im)	y	d(y)
t-Statistic	-3.4271	-2.6909	-2.0474	-2.1861	3.0794	-3.9983	-2.1763	-3.6704
Prob.	0.0991	0.0122	0.5203	0.0335	0.1584	0.0574	0.4510	0.0018

*d indicated the variable is first-order differential

3. Empirical Results

Most time-series data are not stationary, so before co-integration test, ADF test should be done to test whether unit root is in the variables. The results shown in Table 1.

From Table 1 we know that except e, the variables of ex, im and y are not stable but their first order differentials are stable. So co-integration and regression analysis can be tested. The followings are estimation of export and import demand function with co-integration test and Granger non-causality test.

3.1 Estimation of Export Demand Function

3.1.1 Co-integration Test

The long run relationship between Chinese Yuan appreciation and international trade can be estimated by co-integration test when the variables are stationary. The co-integration test is shown in table 2. From Table 2, there is positive relationship between exchange rate iof Chinses Yuan and export trades, that is, variation of Chinese Yuan appreciation can explain 0.2556 of export trade increasing.

Table 2. Co-integration test result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
e	0.2556	0.0439	10.3860	0.0000
b	7.0267	0.2375	29.5818	0.0000
R-squared	0.9075	Adjusted R-squared		0.899
S.E. of regression	0.0931	F-statistic		107.8699
Durbin-Watson stat	1.8725	Prob(F-statistic)		0.000001

In order to test model stationary fatherly, residual series is tested with unit root test. The test value showed in Table 3.

Table 3. Unit root test on residual series

	ADF	DF-GLS	PP	KPSS
Residual Series	-3.5512*	-3.9145***	-3.8182*	0.4146*

*, *** indicates 10% and 1% significant level.

Residual Series is stationary at 10% significant level. That means the model is stationary. And there is co-integration relationship between exchange rate and export trade.

3.1.2 Granger Non-Causality Test

Here we make Granger non-causality test by Eviews 6.0. Table 4 shows the test result of lagging 2 periods for sample volume restricted.

Table 4. Granger non-causality test

Null Hypothesis	Obs.	F-Statistic	Prob.
e does not Granger Cause ex	11	0.0108	0.9893
ex does not Granger Cause e	11	4.7877	0.0572

From Table 4, we know that there is unidirectional causal relationship between Chinese Yuan apprection and export trade.

3.2 Estimation of Import Demand Function

We estimate import demand function reusing co-integration test and Granger non-causality test. The co-integration test result is shown in Table 5. And unit root test is also done with its residual series, shown in Table 6.

Table 5. Co-integration test result

Variable	Coefficient	Std. Error	t-Statistic	Prob.
e	-1.7648	0.3014	-5.8556	0.0002
y	0.3947	0.2609	1.5131	0.1612
c	9.3609	3.6989	2.5307	0.0298
R-squared	0.9232	Adjusted R-squared		0.9078
S.E. of regression	0.1076	F-statistic		60.06501
Durbin-Watson stat	1.8330	Prob(F-statistic)		0.000003

Table 6. Unit root test on residual series

	ADF	DF-GLS	pp	kpss
Residual Series	-2.587469**	-2.520788**	-2.431815**	0.082660***

, * indicates 5% and 1% significant level.

From Table 5 and Table 6, there is negative relationship between exchange rate of Chinese Yuan and import trades, that is, variation of Chinese Yuan appreciation can explain 1.7648 of import trade decreasing. And income level will enlarge the import with 0.3909. And there is co-integration relationship between exchange rate and import trade in long run.

And now we have know the long run relationship between Chinese Yuan and import trade, but it is not the causal relationship, so Granger non-causality test should still done. The result is shown in Table 7.

Table 7. Granger non-causality test

Null Hypothesis	Obs.	F-Statistic	Prob.
e does not Granger Cause im	11	1.49732	0.2968
im does not Granger Cause e	11	9.27209	0.0146

From Table 7, we know that there is unidirectional causal relationship between Chinese Yuan apprection and import trade.

4. Discussion and Conclusion

It is long run relationship between exchange rate and international trade using the data of 1999-2011 of Liaon, Dalian. There is co-integration relationship between exchange rate and international trade in the long run. Appreciation of Chinese yuan will increase the import trade value while decrease export value. The exchange rate elasticity of export trade is 0.2556 and exchange rate elasticity of import is 1.7648. There is only unidirectional causal relationship between Chinese Yuan apperception and import and export trade.

With the empirical test, there is no significant effect of Chinese Yuan appreciation on improving trade balance surplus. That is because that the processing trade is the main trade method in Liaoning, China. The effect of exchange rate on processing trade shows in price change of raw materials imported and final product exported. The import profit will somewhat offset export losses. So that it may be a little difficult to improve the trade surplus depending on the appreciation of Chinese Yuan.

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