Chinese currency appreciation & depreciation: Effects of exchange rate changes on trade balance with the European Union

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International Business
2018

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FIGURE

ABBREVIATIONS

Abbreviations	**Full Name/Definition**
CGE	Computer General Equilibrium
CNY	Chinese Yuan Renminbi
GTAP	Global Trade Analysis Project
IRP	Interest Rate Parity
EU	European Union
EUR	The European euro
USD	The United States dollar
JPY	The Japanese yen
GBP	The Great British pound
GDP	Gross Domestic Production
CIP	Covered Interest Parity
CPI	Consumer Price Index
FX	Foreign exchange
NER	Nominal exchange rate
REX	Real exchange rate
PPP	Purchasing Power Parity
RMB	Renminbi

DEGREE THESIS	
Arcada	
Degree Programme:	International Business
Identification number:	
Author:	Huong Tran
Title:	Chinese currency appreciation & depreciation: Effects of exchange rate changes on trade balance with the European Union
Supervisor (Arcada):	Andreas Stenius
Commissioned by:	

Abstract:

Today, China is the second largest economy in the world. During the last decade, it witnessed an increasing surplus in the trade balance. The more goods and services China exports to the world, its currency becomes more potent in the international market. The main aims of this research are to study the Chinese currency exchange rate vis-à-vis other currencies, namely U.S dollar, euro, and U.K. pound; and how the respective exchange rate changes affect the trade balance with the European Union. To fulfill these aims, the research is approached quantitatively, and secondary data is collected to demonstrate the currency trends. Four multiple regression models (for four periods) are applied for examining the effect of exchange rate changes on the trade balance. Results show that the yuan mostly appreciated over other currencies during four periods and model 1, 2, 4 indicate independent variables explain to some extent of the variance in the trade balance. However, in model 3, independent variables do not make any unique contribution to the prediction of the trade balance. In conclusion, these exchange rate changes affect the trade balance, but the effect is still limited. Moreover, the multiple regression model may not be the best model to examine the exchange rate changes and the trade balance, the autoregressive model might be an optimal model for this research area.

Keywords:	Appreciation, Depreciation, Chinese Currency, Purchasing Power Parity, Multiple Regression
Number of pages:	40
Language:	English
Date of acceptance:	

ACKNOWLEDGMENT

I would like to thank professor Andreas Stenius, my supervisor for giving me many comments to improve this paper; and a special thank should be given to Prof. Dr. Minna Stenius, my statistical professor for her professional guidance and enthusiastic encouragement.
I would also like to extend my thanks to Arcada UAS and Frankfurt UAS for giving me a free education, from there I could dedicate my whole self on this topic.

1 INTRODUCTION

Today, China is the second largest economy in the world and its currency is among the top five most used currencies in the world, according to the Society for Worldwide Interbank Financial Telecommunication SWIFT. (2016)

Chinese currency or Yuan or Renminbi has emerged to become a significant Asian currency due to its effect and importance to global reach. Moreover, on October 1, 2016, the Chinese Renminbi (RMB) was allowed to be a freely usable currency and included in the SDR- Special Drawing Right basket as a fifth currency, along with the U.S. dollar (USD), the euro (EUR), the Japanese yen (JPY) and the Great British pound (GBP). It seems evident that the Chinese yuan will indeed be playing a pivotal role in global payments banking and will challenge the Japanese yen as the principle Asian currency to stand alongside the euro and the U.S. dollar. Several ongoing matters concerning the Chinese exchange rate have been raised as particularly significant from the global perspective. Especially in the trade area, within the global demand, both developed and developing countries are seeking a share in the global trade volume. Therefore, the Chinese yuan manipulation may hurt many emerging markets and developed markets trade balance such as the United States and the European Union.

The internationalization of the Chinese currency is one of the most crucial aspects of the debate in the global economic and political forum. Since 2015, the executive board of the International Monetary Fund discussed Renminbi potential as a reserve currency. Even though the renminbi has a big step as a tradable currency and meets the IMF's requirement for exports, the central debate is still ongoing that whether the currency is "freely usable" (Platt, 2015). Furthermore, there is another discussion about the prospects of China's currency. According to Prasad (2013) RMB is on the threshold of becoming the leading global reserve currency. However, the issue is complicated, as the growth of the Chinese economy and its currency is related to the global macroeconomic and financial stability. Though the economy has neither a flexible exchange rate nor an open capital account, the Chinese government has recently improved the international use of renminbi.

As one of the largest exporting countries in the world, China has witnessed a large amount of trade surplus for the past decade. There was an increasing discussion about the manipulation of the government on the Chinese currency exchange rate. In July 2005, the Chinese government executed the exchange rate reform policy, which raised the question of whether the currency is

still undervalued. The short-run J-curve hypothesis and long-run trade balance were tested by Wang, Lin, and Yang (2012) if the effect on the real exchange rate between China and its main trading partners by using a set of data over the 2005-2009 period. The result was that a real appreciation of Chinese currency decreased the long-term effect on China's trade balance with only three of eighteen trading partners and increased its impact in five of the eighteen trading partners. Due to the mixed finding of the empirical evidence the real appreciation of RMN has not affected China's trade balance over the long-term. (Wang, Lin & Yang, 2012)

1.1 Research aim

The research aims to focus on the study of China's Renminbi exchange rate vis-à-vis Other currencies, namely U.S. dollar, euro, and U.K. pound. While China has transformed from a manufacturing-based economy to a consumer-driven one, it has become the second largest economy and the biggest exporter worldwide. In 2011 Chinese merchandise exports share accounted for 10.43 percent maintaining its top position since 2009. China is a country that keeps a continuous surplus of current account balance with a peak in 2007 (10.2 percent of GDP) and a declining trend in recent time, reaching 2.8 percent of GDP in 2011. Nonetheless, this surplus is substantial, and there was a question raised about the role of exchange rates (Orastean, 2013). Thus, the author wants to conduct a research on how the currency could play a role in this process as well as its impact on the trade balance.

1.2 Research Questions

To fulfill the aims, there are two main questions and seven sub-questions in this thesis:

1. How did the Chinese currency appreciate or depreciate over other currencies from 2000 to 2016?
    - 1.1 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2000 to 2004?
    - 1.2 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2005 to 2007?
    - 1.3 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2008 to 2011?
    - 1.4 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2012 to 2016?

2. How did the exchange rate (CNY/USD, CNY/GBP, and CNY/EUR) changes affect the trade balance between China and the European Union?

2.1 How well do the three variables (CNY/EUR, CNY/USD, and CNY/GBP) predict trade balance?

2.2 How much variance in trade balance can be explained by those three variables?

2.3 Which is the best predictor of trade balance?

1.3 Demarcation

Due to the scope of this bachelor thesis, the author just wants to focus on the leading theory. The secondary data collected relates to China's trade with one of its main trading partners, the European Union.

There are many theories applicable to the depreciation of RMB and its relation to trade balance. For the theoretical framework, only Purchasing Power Parity is used to support the research. Nonetheless, for the analyses in this research, the author collected the exchange rate between the yuan and the U.S. dollar, euro and the U.K. pound and trade balance with the European Union for analysing.

1.4 Thesis structure

In general, the structure of this thesis paper is divided into two main parts: the theoretical framework and the empirical part.

The thesis starts with a background and a concise review of the current research related to the topic, aims of the study, research questions are addressed in the introduction part.

Later, the theoretical framework is in Chapter 2, in which an earlier study about the Purchasing Power Parity has reviewed as well as the theory of exchange rate.

The next Chapter 3 is empirical research. The author uses multiple regression analysis for examining the beta coefficients of the independent variables (CNY/EUR, CNY/USD, and CNY/GBP) with dependent variable trade balance. A quantitative method was used, and the author collected the secondary data via a reliable source. (see Chapter 3)

Lastly, after having the results from the previous chapter, the research questions will be discussed.

2 THEORETICAL FRAMEWORK

2.1 Purchasing Power Parity

The first theory is the Purchasing Power Parity (PPP) theory which states that exchange rates between two currencies adjust based on the movement of the consumer price index (CPI) between two different countries. For example, if the price of a hamburger is EUR 4.50 in Germany and USD 4.00 in the United States, the PPP for hamburgers between the two economies is USD 0.88 (4.00/4.50) to the EUR from the German perspective and EUR 1.125 (4.50/4.00) to the dollar from the U.S. perspective. Especially, for every euro spent on hamburgers in Germany, 0.88 dollars would have to pay in the United States to obtain the same quantity and quality that is the same volume of hamburgers. Vice versa, for every dollar spent on hamburgers in the United States, EUR 1.125 would have to be paid in Germany to receive the same volume of hamburgers. To compare the amounts of hamburgers purchased in two countries, the hamburger consumption in Germany can be indicated in dollars by dividing by EUR 1.125 or the hamburger consumption in the United States can be stated in euros by dividing by USD 0.88. (The World Bank, 2014)

In the context of the global economy, trade and capital account disparity mainly come from the exchange rate misalignment. These disparities can increase strains for both individual economies and the global system. The PPP condition defines the relationship between exchange rates and national price levels, and it is regularly used as a measure for estimating rate misalignment. (Cheung, 2009)

2.1.1 Absolute Purchasing Power Parity

Absolute Purchasing Power Parity relates the exchange rate between two countries by considering the ratio of the price level for those two countries. This approach is based on the law of one price, which shows that the set of goods values must be the same across all countries (Investopedia, a). To demonstrate this statement clearly, let's suppose that beans tagged at 3 dollars per kilogram in the U.S., that beans are tagged at EUR 3.5 per kilogram in Europe, leading to the exchange rate is EUR 1.16 per USD. After one month, the price of beans in Europe increases 10 percent which now is EUR 3.85, meanwhile the beans price in the U.S. is only increase 5 percent USD 3.15. If there is no depreciation in the euro currency to balance the 5 percent difference, the European beans will lose their competitiveness in the international market, which means the trade of beans will increase from the U.S. market to European market.

If all the goods within the economy are weighted for average price, absolute purchasing power parity reflects the currency exchange rate between two countries as reflected in two countries' price levels. (Investopedia)

The relationship can be given by the following formula:

$$S = \frac{P}{P*}$$

Where S is the spot exchange rate between two countries expressed as the domestic price of the foreign currency.

P is the domestic price index.

P* is the corresponding foreign price index.

In order to hold this relationship, the following condition should be met:

- All of the goods of each country are traded freely on the international market.
- The price index for each of the two countries must be created from the same basket of goods.
- The price index should be collected in the same year. (Investopedia)

2.2 J-Curve phenomenon

The J curve reveals the trade balance after a depreciation or appreciation. The time path of the trade balance shows a J curve if the elasticities of demand for imports and supply of exports are smaller in the short run than the long term. (Levi, 2005)

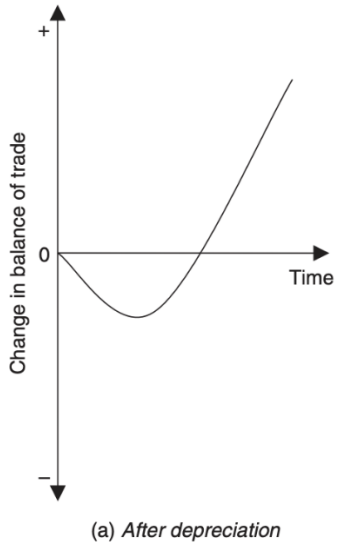

Figure 2-1 The J-Curve (Levi, 2005)

According to the theory base, in the short run after the currency depreciation, which means the domestic currency is weaker than the foreign currency, the domestic importers have to deal with increases in import prices. Thus, the net imports decrease. Besides, the domestic exporters face lower export prices because, in the short run, the demand for exports and imports is slightly inelastic. Thus, domestic consumer temporarily spends more on imports because the domestic substitution products could not replace the import products immediately after the depreciation;

and exports do not sufficiently increase due to the initially slowly reaction from the international consumer, the trade balance worsens immediately after the depreciation.
Afterward, when domestic consumer changes their preference to the substitution products instead of import products, and the domestic suppliers could provide more substitution products in line with the international demand, the trade balance will ultimately improve in the long run.

Ali, Johari, and Alias (2014) reviewed four approaches following the chronological order: The Standard Theory of International Trade, the Elasticity approaches, the Keynesian Absorption Approach, and the Monetary Approach. The study shows that the J-curve is known for the most persuasive dynamic approach in this field.
However, according to Wang, Lin, and Yang (2012) empirical study, the J-curve does not reflect the results for all Chinese eighteen trading partners.

2.3 Fixed exchange rate systems

A fixed exchange rate is a type of exchange rate that governments try to force currency values on market participants. These systems help companies trading cross-border lower exposure to currency risk. For example, under a fixed exchange rate system, when a domestic exporter and a foreign importer have agreement on trading products for an amount of foreign currency payable in three months, the exporter knows precisely how much of the foreign currency will be worth in three months straightaway when they made the contract.
In the fixed rate system, a decrease in currency value is called devaluation and an increase in currency value is called revaluation. (Butler, 2008, pp 25-28)

2.4 Floating rate systems

In floating exchange rate systems, currency values can be fluctuated to market supply and demand without direct interference by government authorities. However, government intervention in the foreign exchange market does affect currency values in the short term. Exchange rate changes in the floating regime are called appreciation when one currency rises in relation to another currency and depreciation when that currency falls in value. (Butler, 2008, pp 25-28)

2.5 Chinese exchange rate system

Chinese current exchange rate regime is a hybrid of fixed and floating. It was a purely fixed regime from 1994 to 2005, when the yuan was pegged to the U.S. dollar at 8.28 yuan to the

dollar (Morrison, Wayne, Labonte, 2008). In 2005, Beijing announced it would revalue the yuan and peg it to a basket of currencies. The Chinese expert Wayne Morrison calls the reforms as "a managed float". This type of regime is a fusion of a fixed and floating currency. It is similar to a floating regime because market forces determine the direction of the currency's trend. In China's case, the yuan is expected to appreciate. However, it is similar to a fixed regime in that Beijing is still acting to reduce how fast the currency rises in value. (Pittaluga, Seghezza, 2012)

2.6 Changes in foreign exchange rates

Foreign exchange changes are close to a random walk. If the exchange rate follows the random walk, then exchange rate changes at a particular point in time are independent of previous changes and are equally likely to rise or fall. That is, there is no memory in a random walk, so once a rate is established there is again an equal probability of an appreciation or a depreciation. Because of this behaviour, the best guess of tomorrow's exchange rate is just today's exchange rate. However, the empirical studies of exchange rates reject the purest form of the random walk model. A time series displaying this exchange rate changes over time is frequently modelled as a GARCH process. (Butler, 2008, p. 65)

2.7 Currency appreciation/depreciation

Exchange rate changes in a floating rate system are called an appreciation when one currency rises in relation to another currency and depreciation when that currency falls in value to another currency. (Butler, 2008, pp 25-28)

Calculation of the value of the currency in the denominator of an exchange rate quote changes according to the formula:

Percentage change in a foreign currency value = $(S_1^{\frac{d}{f}} - S_0^{\frac{d}{f}})/S_0^{\frac{d}{f}}$ (*)

Where:

$S^{\frac{d}{f}}$ is a spot exchange rate between domestic and foreign currency

(Butler, 2008, p. 63).

For example, during January 2008 and December 2011, the exchange rate CNY/EUR changed from $S_0^{\frac{€}{¥}}$ = €0.093259/¥ to $S_1^{\frac{€}{¥}}$ = €0.1207939¥ over three years (see Appendix C). The percentage change in the euro is calculated:

(€0.1207939/¥ - €0.093259/¥)/€0.093259/¥ = +0.2252422

Therefore, the yuan in the denominator appreciated 22.5 percent over three years; however, besides the yuan value rises the euro value must fall. In order to calculate the euro depreciation, the exchange rate should be converted the other way around. The beginning of the spot rate now is 1/(€0.093259/¥) = ¥10.72282/€, and the ending rate is 1/(€0.1207939/¥) = ¥ 8.278625/€. The percentage fall in the yuan is calculated:

(¥8.278625/€ - ¥10.72282/€)/¥10.72282/€ = -0.2279436

So, the euro depreciated 22.79 percent over the yuan.

2.8 Statements of Hypotheses

Hypotheses for the model:

H0: There is no relation between exchange rate changes and trade balance with the European Union from 2002 to 2016.

H1: There is a relation between exchange rate changes and trade balance with the European Union from 2002 to 2016.

Hypotheses for variable CNY/EUR:

H0: Independent variable CNY/EUR does not make a unique contribution to the prediction of trade balance between China and the European Union.

H2: Independent variable CNY/EUR make a unique contribution to the prediction of trade balance between China and the European Union.

Hypotheses for variable CNY/USD:

H0: Independent variable CNY/USD does not make a unique contribution to the prediction of trade balance between China and the European Union.

H3: Independent variable CNY/USD make a unique contribution to the prediction of trade balance between China and the European Union.

Hypotheses for variable CNY/GBP:

H0: Independent variable CNY/GBP does not make a unique contribution to the prediction of trade balance between China and the European Union.

H4: Independent variable CNY/GBP make a unique contribution to the prediction of trade balance between China and the European Union.

3 Methodology

The research is approached quantitatively, and the secondary data is used to demonstrate the currency trends in an empirical test. Secondary data is the type collected by other researchers and has already been published (Bryman, Bell, 2015). The author uses this data because of its high-quality resources and cost time effective. Moreover, using secondary data resources could help the author utilize currency trends in the market and make the analysis is more precise. However, secondary data has some limitations as it lacks familiar with data, Carlson and Morrison (2009).

A quantitative method was defined as entailing the collection of numerical data and as showing a view of the relationship between theory and research as deductive, a predilection for a natural science approach and an objectivist conception of social reality (Bryman, Bell, 2015). In other words, Denyin and Lincoln (1998) mentioned quantitative research as an emphasizing measurement and examine a causal relationship between variables. Although quantitative research is more commonly associated with deductive theory development based on hypothesis testing, there is always an exception. As Fernandez, Taylor, and Bell (2005) conducted their research and proved that quantitative analysis is not always hypothesis-driven, especially when handling secondary analysis. New ideal or development could be developed while observing the set of data.

3.1 Research design

Firstly, the reader is provided with general information about how the yuan appreciated or depreciated over other currencies, after that, four multiple regression models are used to examine the relationship between the exchange rate CNY/EUR, CNY/USD, CNY/GBP and the trade balance between China and the European Union.

This thesis aim is to explore the effects of exchange rate changes on the trade balance between China and the European Union; precisely, to examine how much a single independent variable (CNY/EUR, CNY/USD, and CNY/GBP) could explain variance in the dependent variable trade balance. Thus, standard multiple regression is applied here. The multiple regression equation is written:

$$Y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + \varepsilon$$

In which,

Y is the dependent variable

β_0 is the intercept

Each of the β_i's for i = 1 to k is the slope of the regression surface with respect to the variable x_i, and ε is the error term. This error term is generally recognized as the residual. (Richardson, Ronny, 2015, p 62)

Test of significance: Richardson and Ronny (2015) suggested that when building multiple regression, each independent variable should be examined regarding the test of significance using the following hypotheses:

$$H_0: \beta_k = 0$$

$$H_1: \beta_k \neq 0$$

(Richardson, Ronny, 2015, p 93)

Apply the equation to this research:

$$Y_{i,t} = \beta_0 + \beta_{\frac{CNY}{EUR}} \frac{CNY}{EUR}_{i,t} + \beta_{\frac{CNY}{USD}} \frac{CNY}{USD}_{i,t} + \beta_{\frac{CNY}{GBP}} \frac{CNY}{GBP}_{i,t} + \varepsilon$$

Where: $Y_{i,t}$ is the dependent variable trade balance from time i to t

- $\frac{CNY}{EUR}_{i,t}$ is the exchange rate between the yuan and the euro
- $\frac{CNY}{USD}_{i,t}$ is the exchange rate between the yuan and the U.S. dollar
- $\frac{CNY}{GBP}_{i,t}$ is the exchange rate between he yuan and the U.K. pound

From i = 2002 to t = 2016

3.2 Data collection

Online sources were used in order to collect the secondary data. According to Bryman and Bell (2015), secondary data brings many benefits for students to conduct a research project. It offers the opportunity of approaching reliable quality data. Many datasets have been collected by highly professional researchers; some research organizations gathered the data, developed structures and handling procedures to scrutinize the quality of the emerging data. For instance, in this thesis, the author collected data from OANDA Corporation and Eurostat.

OANDA Corporation was established in 1996 by Dr. Michael Stumm, a professor of Computer Engineering at the University of Toronto, and Dr. Richard Olsen of Olsen Ltd, a leading econometric research and development company. The firm provides foreign exchange trading and currency information service to individuals, corporations, portfolio managers, and financial institutions worldwide. (OANDA, 2018)

Eurostat is the statistical office of the European Union located in Luxemburg; the office was founded in 1953. It offers an entire range of critical and impressive data that government,

businesses, the education sector, journalists and the public can use for their work and daily life. Eurostat's mission is to contribute high-quality statistics for Europe. (Eurostat, 2018)

In order to examine the effects of exchange rate changes on trade balance between China and the European Union, the research is conducted by collecting exchange rate weekly between Chinese currency yuan and euro, U.S. dollar, and U.K. pound from 2000 to 2016 through OANDA; and trade balance indexes were obtained monthly from 2002 to 2016 via Eurostat.

The exchange rate dataset is divided into four periods such as period 1 (2000-2004), period 2 (2005-2007), period 3 (2008-2011), period 4 (2012-2016) for evaluating. The reason for this subdivision is that exchange rates can be very volatile, and when we examine in short-term, the exchange rate could respond to a change in market fundamentals better than in long-term. Dataset 1 (2000-2004_EXR_W) contains 260 dates, which is gathered weekly from 2000 to 2004, in each date, the exchange rate CNY/EUR, CNY/USD, CNY/GBP is exhibited in column B, C, D respectively. Dataset 2 (2005-2007_EXR_W) displays 156 dates, which is collected weekly from 2005 to 2007. Dataset 3 (2008-2011_EXR_W) shows the exchange rate CNY/EUR, CNY/USD, CNY/GBP weekly from 2008 to 2011. Dataset 4 (2012-2016_EXR_W) displays those exchange rates weekly from 2012 to 2016. (See Appendix A, B, C, D)
The exchange rate data is imported to excel for evaluating the depreciation or appreciation of Chinese currency during each period.

The trade balance is collected from Eurostat by using a keyword (ext_st_eu27_2019sitc). The data was updated on 16th October 2018 by professional researchers, and the author extracted it on the second of November 2018. Trade value is calculated in a million ECU/EURO, and all the product category (SITC06) of 27 countries in the European Union is included to examine. Besides, United Kingdom trade amount is not considered in this thesis due to the complication of Brexit negotiation at the moment. Furthermore, the trade amount from Hong Kong is also excluded because of the different currency with mainland China.

The purpose of the second question is to examine the effects on trade balance between China and the EU. However, the author could not find any reliable resource from Chinese government due to the lack of transparency. She decided to collect the import and export between the EU and China via Eurostat and changed "EU's import from China" into "China's export to EU", and vice versa. For the reason that the definition of import and export from one domestic

country to a foreign country is equivalent to export and import from the foreign country to that domestic country. Moreover, the data provided by OANDA is weekly while Eurostat offers data monthly, in order to make these data compatible and accessible through the SPSS program, she took mean from exchange rates monthly. The results could be founded in Appendix E.
In order to answer the second research question, data is imported to SPSS program for evaluating the multiple regression.

4 Results

This chapter shows the results of those following research questions:

1. How did the Chinese currency appreciate or depreciate over other currencies from 2000 to 2016?
   1.1 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2000 to 2004?
   1.2 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2005 to 2007?
   1.3 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2008 to 2011?
   1.4 How did CNY/EUR, CNY/USD, CNY/GBP fluctuate from 2012 to 2016?

2. How did the foreign exchange rate (CNY/USD, CNY/GBP, and CNY/EUR) changes affect the trade balance between China and the European Union?
   2.1 How well do the three variables (CNY/EUR, CNY/USD, and CNY/GBP) predict trade balance?
   2.2 How much variance in trade balance can be explained by those three variables?
   2.3 Which is the best predictor of the trade balance?

4.1 Checking for multicollinearity between independent variables

Table 4.1-1 Correlation

	Trade balance	CNY/EUR	CNY/USD
Trade balance			
CNY/EUR	.19**		
CNY/USD	.59***	.56***	
CNY/GBP	.43***	**.80***	**.86***

**p<.01, ***p<.001

Multicollinearity is a condition when the independent variables are related to each other (Richardson, Ronny, 2015, p. 93). Pallant also advises (citing in Tabachnick and Fidell, 2001, p. 84) “think carefully before including two variables with a bivariate correlation of, say, .7 or

more in the same analysis". Table 4.1-1 shows that the correlation between CNY/GBP and the other two variables CNY/EUR (0.80) and CNY/USD (0.86) are above 0.7. Thus, the variable CNY/GBP is omitted from this model. The author has to rerun this model without variable CNY/GBP.

4.2 Period 1 from 2000 to 2004 (P1)

Preliminary analyses

The dataset for the period 1 could be seen in Appendix A

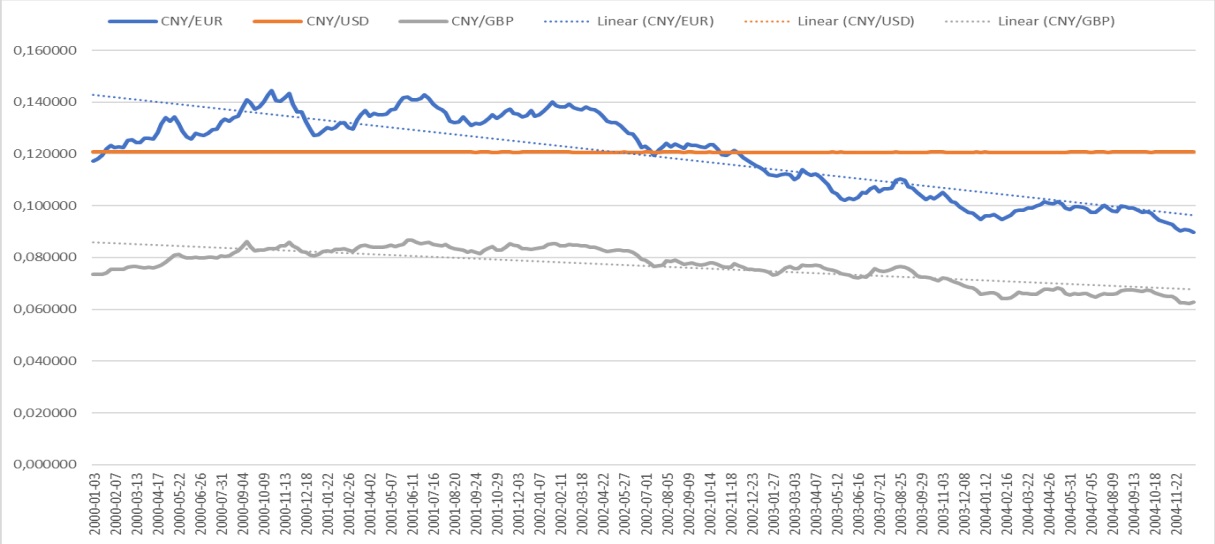

Figure 4-1 Fluctuation of exchange rates from 2000 to 2004

The graph indicates the fluctuation of exchange rate CNY/EUR, CNY/USD, CNY/GBP from 2005 to 2007. During this period, the CNY/USD remained fairly unchanged while the CNY/EUR and CNY/GBP experienced a downward trend in general.

As can be seen from figure 4-1, the CNY/USD slightly changed, and its figure stranded around value 0.12 because the yuan was pegged to the dollar during this period.

Although the CNY/EUR and CNY/GBP had a similar trend, the CNY/EUR went up and down widely at the beginning of the period and continued to fluctuate sharply while the CNY/GBP gently fluctuated during the whole period.

There was a significant downward trend of CNY/EUR, CNY/GBP during this period.

Table 4.2-1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP during period 1

Time	CNY/EUR	CNY/USD	CNY/GBP
2000-01-03	0.117234	0.120766	0.073628
2004-12-20	0.089602	0.120678	0.062653

Between 2000 and 2004, the CNY/EUR and the CNY/GBP decreased dramatically from 0.117234 to 0.089602 and from 0.073628 to 0.062653, respectively.

Combine the exchange rates in table 4.2-1 with the formula (*) from chapter 2.7, the table below shows the results:

Table 4.2-2 The yuan ppreciation/depreciation over other currencies (P1)

	EUR to CNY	USD to CNY	GBP to CNY
Change in FX rate	-0.2357	-0.0007	-0.1490
In percentage	**-23.57**	**-0.07**	**-14.91**

The yuan depreciated over the euro and the U.K. pound respectively 23.57 percent and 14.91 percent while it remained fairly unchanged over the U.S. dollar for 0.07 percent.

Main analyses

Table 4.2-3 Model summary (P1)

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate
.71[a]	.51	**.48**	797.24

a. Predictors: (Constant), CNY/USD, CNY/EUR

b. Dependent Variable: Trade Balance

Table 4.2-4 Coefficient (P1)

Coefficient[a]

Model 1	Standardized Coefficients Beta	Sig.	Part Correlations	Tolerance value	VIF value
(Constant)		.622			
CNY/EUR	**-.72**	.000	-.71	.98	1.02
CNY/USD	**.06**	.619	.06	.98	1.02

a. Dependent Variable: Trade Balance

Table 4.2-5 Squared part correlation value (P1)

	Part. value	Squared part	In percentage
CNY/EUR	-.71	.50	**50.41**
CNY/USD	.06	.00	**.36**

Table 4.2-6 Correlation (P1)

	Trade balance	CNY/EUR
Trade balance		
CNY/EUR	**-.71*****	
CNY/USD	**-.04***	.15*

*p<.5, **p<.01, ***p<.001

As could be seen in table 4.2-3, model 1 explains 48 percent of the variance in trade balance with the European Union. Table 4.2-4 shows the independent variable CNY/EUR has the largest beta coefficient (-.72), this means CNY/EUR makes the strongest unique contribution to explaining trade balance with the European Union while variable CNY/USD makes no contribution to the model 1 (-.04). Table 4.2-5 indicates variable CNY/EUR uniquely explains approximately 50 percent of the variance in trade balance whereas CNY/USD merely contributes 0.36 percent.

It is precisely in table 4.2-6, two independent variables CNY/EUR, CNY/USD have a weak positive correlation (r = .15), the VIF value and Tolerance value also support this in table 4.2-4. Pallant (2005) suggests that tolerance value of less than .10, or a VIF value of above 10 indicate multicollinearity (Pallant, 2005, p. 150). Thus, in this case, model 1 was not violated the multicollinearity assumption.

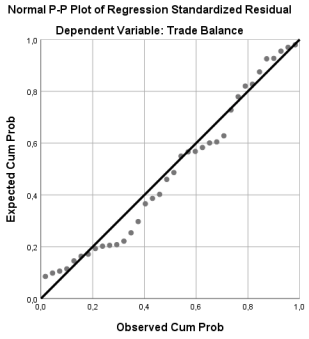

Figure 4-2 Normal Probability Plot

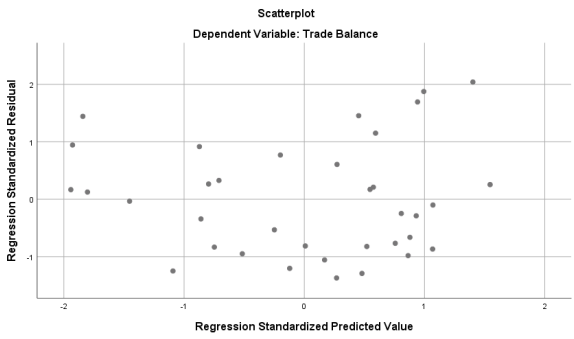

Figure 4-3 Residuals Scatterplot

Pallant (2005) suggests checking the assumptions is a part of the analysis, this conducted by observing the residuals scatterplot and the Normal Probability Plot of the regression standardized residuals. As shown in Figure 4-2, those points lean on a reasonably straight diagonal line from bottom left to top right; this would suggest no significant deviations from normality. Figure 4-3 shows the Scatterplot of the standardized residuals, most of the points distributed inside the rectangular, among the origin coordinate within the radius of approximately 2.

4.3 Period 2 from 2005 to 2007 (P2)

Preliminary analyses

The dataset for period 2 could be founded in Appendix B

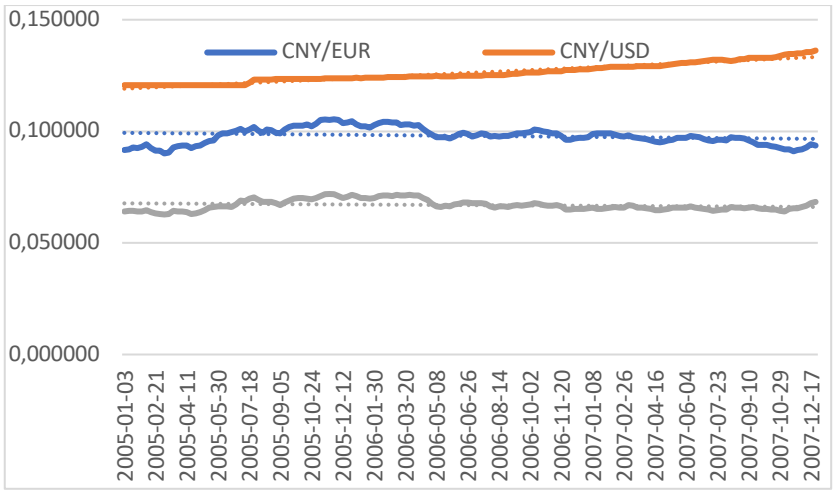

Figure 4-4 Fluctuation of exchange rates from 2005 to 2007

The graph indicates the fluctuation of exchange rate CNY/EUR, CNY/USD, CNY/GBP from 2005 to 2007. In general, the CNY/EUR and the CNY/GBP went up and down widely while the CNY/USD climbed significantly during this period.

In 2005, the exchange rate CNY/USD remained relatively steady between 0.120678 and 0.123825. In this period, the yuan was no longer pegged to the U.S. dollar allows it to freely fluctuate. The rating figure began to rise more significant afterward, and by the end of the period, it reached 0.136204. (Appendix B)

From the beginning of the period to the middle of 2006, there was a dramatic growth trend of the exchange rate CNY/EUR, and then it fairly fluctuated.

During the period, the exchange rate CNY/GBP also fluctuated.

Table 4.3-1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP during period 2

Time	CNY/EUR	CNY/USD	CNY/GBP
2005-01-03	0.091486	0.120678	0.064214
2007-12-24	0.093602	0.136204	0.068500

Table 4.3-2 The yuan appreciation/depreciation over other currencies (P2)

	EUR to CNY	USD to CNY	GBP to CNY
Change in FX rate	0.0231	0.1286	0.0667
In percentage	**2.31**	**12.87**	**6.67**

After applying formula (*) to the table 4.3-1, Table 4.3-2 shows the yuan appreciated over the euro (2.31%), the U.S. dollar (12.87%), and the U.K. pound (6.67%). The percentage change in the foreign U.S. dollar currency value is approximately five times compares to the percentage change in euro currency value and double the percentage change in U.K. pound value.

Main analyses

Table 4.3-3 Model summary (P2)

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate
.84[a]	.70	**.69**	1171.02

a. Predictors: (Constant), CNY/USD, CNY/EUR

b. Dependent Variable: Trade Balance

Table 4.3-4 Coefficient (P2)

Coefficient[a]

Model 2	Standardized Coefficients Beta	Sig.	Part Correlations	Tolerance value	VIF value
CNY/EUR	**.14**	.160	.14	.91	1.1
CNY/USD	**.87**	.000	.83	.91	1.1

a. Dependent Variable: Trade Balance

Table 4.3-5 The squared part value (P2)

	Part. value	Squared part	In percentage
CNY/EUR	.14	.02	**1.96**
CNY/USD	.83	.69	**68.89**

Table 4.3-6 Correlation (P2)

	Trade balance	CNY/EUR
Trade balance		
CNY/EUR	**-.12***	
CNY/USD	**.83*****	-.30*

*p<.5, **p<.01, ***p<.001

As could be seen in table 4.3-3, model 2 explains 69 percent of the variance in trade balance with the European Union. Table 4.3-4 shows the independent variable CNY/USD has the largest beta coefficient (.87), this means CNY/USD makes a strongest unique contribution to

explaining trade balance with the European Union while variable CNY/EUR makes a little contribution to the model 2 (.14). Table 4.3-5 indicates variable CNY/USD uniquely explains approximately 68.9 percent of the variance in trade balance whereas CNY/EUR only contributes 1.96 percent.

It is precisely in table 4.3-6, two independent variables CNY/EUR, CNY/USD have a weak negative correlation (r = -.30), this is also supported by the VIF and Tolerance values in table 4.3-4. As shown in that table, the tolerance value for each variable is high compared to the number Pallant (2005) suggested (.91>.10), and VIF value for both of them is 1.1 (well below 10). Therefore, model 2, in this case, was not violated the multicollinearity assumption.

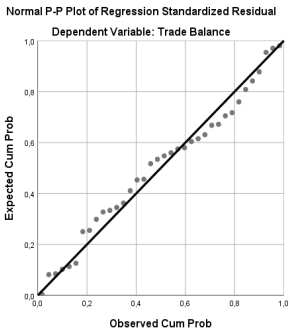

Figure 4-5 Normal Probability Plot

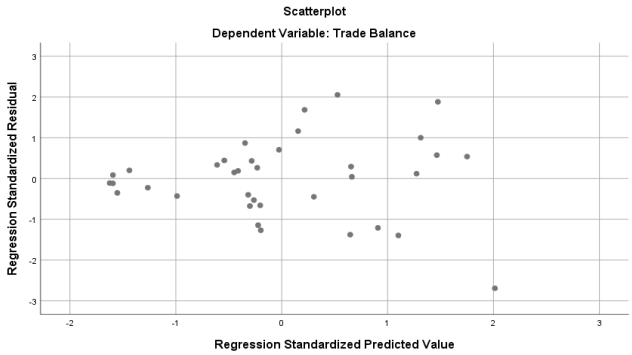

Figure 4-6 Residuals Scatterplot

As shown in Figure 4-5, those points lean on a reasonably straight diagonal line from bottom left to top right; this would suggest the normality assumption seems to be satisfied. Figure 4-6 shows the Scatterplot of the standardized residuals, most of the points distributed inside the rectangular, among the origin coordinate within the radius of approximately 2.

4.4 Period 3 from 2008 to 2011 (P3)

Preliminary analyses

The dataset for period 3 could be seen in Appendix C

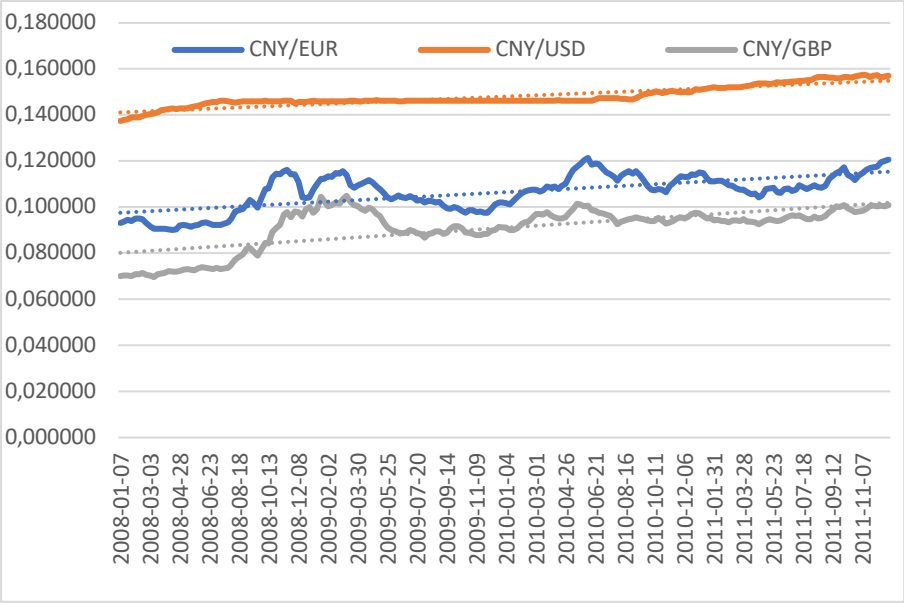

Figure 4-7 Fluctuation of exchange rates from 2008 to 2011

The graph shows the fluctuation of the exchange rate CNY/EUR, CNY/USD, CNY/GBP from 2008 to 2011. Generally, the exchange rate CNY/EUR, CNY/USD, and CNY/GBP went up during this period.

The CNY/USD experienced a steady increase while the CNY/EUR, and the CNY/GBP has a similar fluctuated trend. Both of them went up at the beginning of the period and fell gradually. After that, they experienced a sharp increase for the second time and then remained an upward trend until the end of the period.

Table 4.4-1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP during period 3

Time	CNY/EUR	CNY/USD	CNY/GBP
2008-01-07	0.093259	0.137456	0.070007
2011-12-26	0.120793	0.156982	0.100949

Table 4.4-2 The yuan appreciation/depreciation over other currencies (P3)

	EUR to CNY	USD to CNY	GBP to CNY
Change in FX rate	0.2952	0.1420	0.4419
In percentage	**29.52**	**14.20**	**44.20**

After applying formula (*) to the table 4.4-1, it can be seen in the table 4.4-2, the yuan appreciated over the euro (29.52%), the U.S. dollar (14.20%), and the U.K. pound (44.20%). The percentage change in the foreign U.S. dollar currency value is less than a half percentage change in the euro currency value and nearly one-third of a percentage change in the U.K. pound value.

Main analyses

Table 4.4-3 Model summary (P3)

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate
.20[a]	.04	**.00**	2314.52

a. Predictors: (Constant), CNY/-USD, CNY/EUR

b. Dependent Variable: Trade balance

Table 4.4-4 Coefficient (P3)

Coefficients[a]

Model 3	Standardized Coefficients Beta	Sig.	Part Correlations	Tolerance value	VIF value
(Constant)		.398			
CNY/EUR	**.24**	.196	.19	.65	1.53
CNY/USD	**-.08**	.650	-.06	.65	1.53

a. Dependent Variable: Trade Balance

Table 4.4-5 The squared part correlation values (P3)

	Part. value	Squared part	In percentage
CNY/EUR	.19	.04	**3.61**
CNY/USD	.06	.00	**.36**

Table 4.4-6 Correlation (P3)

	Trade balance	CNY/EUR
Trade balance		
CNY/EUR	**.19***	
CNY/USD	**.06***	.59***

*p<.5, **p<.01, ***p<.001

As could be seen in table 4.4-3, two independent variables CNY/EUR and CNY/USD together in model 3 do not make any contribution to the prediction of trade balance between China and the European Union. Table 4.4-4 shows the beta values for both two independent variables CNY/EUR and CNY/USD is slightly low (.24, .08 respectively), indicating that they make a barely small contribution to explain model 3. This is also supported by table 4.4-5, in this case, the squared part correlation values of variables CNY/EUR and CNY/USD are 3.61 percent and .36 percent respectively, which means CNY/EUR and CNY/USD uniquely explain only 3.61

percent and .36 percent corresponding of the variance in the trade balance. Table 4.4-6 indicates the weak correlations between trade balance and two independent variables; moreover, this finding is not statistical significance because p-value is smaller than .5, which could be one reason for model 3 is not able to predict any variation on the trade balance.

4.5 Period 4 from 2012 to 2016 (P4)

Preliminary analyses

The dataset for period 4 could be founded in Appendix D

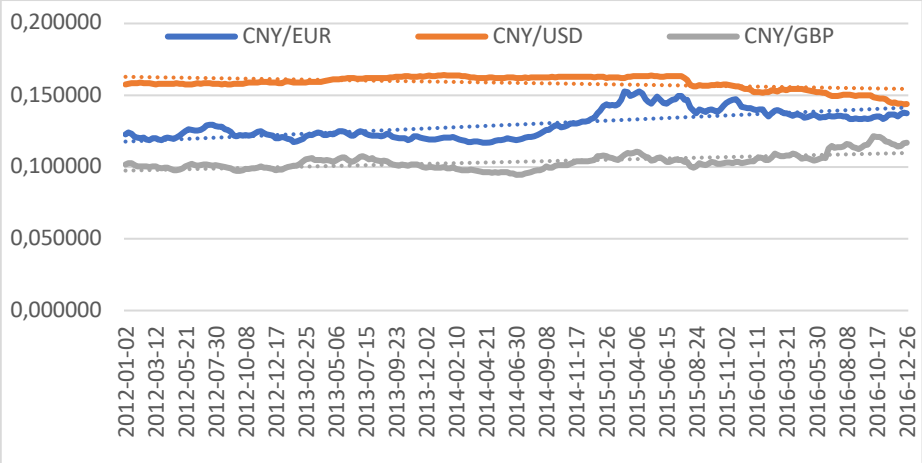

Figure 4-8 Fluctuation of exchange rates from 2012 to 2016

The graph shows the fluctuation of the exchange rate CNY/EUR, CNY/USD, CNY/GBP from 2012 to 2016. Above all, the exchange rate CNY/EUR and CNY/GBP continued the upward trend while there was a significant fall of the CNY/USD during the end of this period.
The exchange rate CNY/USD remained relatively constant to the end of 2015 then it rapidly decreased until it reached its lowest point in December 2016.

Between 2012 and the middle 2014, there were relatively stable trends of CNY/EUR and CNY/GBP. After that, the exchange rate CNY/EUR shot up dramatically and remained fairly steady upward direction while the CNY/GBP slightly fluctuate until the end of this period.

Table 4.5-1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP during period 4

Time	CNY/EUR	CNY/USD	CNY/GBP
2012-01-02	0.122616	0.157701	0.101635
2016-12-26	0.137235	0.143879	0.117030

Table 4.5-2 The yuan appreciation/depreciation over other currencies (P4)

	CNY to EUR	CNY to USD	CNY to GBP
Change in FX rate	0.1192	-0.0876	0.1515
In percentage	**11.92**	**-8.76**	**15.15**

After applying formula (*) to the table 4.5-1, it can be clearly seen in the table 4.5-2, the yuan appreciated over the euro (11.92%) and the U.K. pound (15.15%) while it depreciated over the U.S. dollar (8.76%).

Main analyses

Table 4.5-3 Model summary (P4)

Model Summary[b]

R	R Square	Adjusted R Square	Std. Error of the Estimate
.61[a]	.37	**.35**	1931.95

a. Predictors: (Constant), CNY/-USD, CNY/EUR

b. Dependent Variable: Trade balance

Table 4.5-4 Coefficient (P4)

Coefficient[a]

Model 4	Standardized Coefficients Beta	Sig.	Part Correlations	Tolerance value	VIF value
(Constant)		.331			
CNY/EUR	**.52**	.000	.50	.92	1.09
CNY/USD	**-.20**	.069	-.20	.92	1.09

a. Dependent variable: Trade balance

Table 4.5-5 The squared part correlation values (P4)

	Part. value	Squared part	In percentage
CNY/EUR	.50	.25	**25.00**
CNY/USD	.20	.04	**4.00**

Table 4.5-6 Correlation (P4)

	Trade balance	CNY/EUR
Trade balance		
CNY/EUR	**.58*****	
CNY/USD	**-.35****	-.29*

*p<.5, **p<.01, ***p<.001

As could be seen in table 4.5-3, model 2 explains 35 per cent of the variance in trade balance with the European Union. Table 4.5-4 shows the independent variable CNY/EUR has the largest beta coefficient (.52), this means CNY/EUR makes a strongest unique contribution to explaining trade balance with the European Union in this period while variable CNY/USD makes less contribution to the model 4 (.20). Table 4.5-5 indicates variable CNY/EUR uniquely explains 25 percent of the variance in trade balance whereas CNY/USD only contributes 4 percent.

It is clearly in table 4.5-6, two independent variables CNY/EUR, CNY/USD have a weak negative correlation (r = -.29), the VIF value and Tolerance value also support this in table 4.5-4. As shown in that table, the tolerance value for each variable is high compared to the number Pallant (2005) suggested (.92 >.10), and VIF value for both of them is 1.09 (well below 10). Therefore, model 4, in this case, was not violated the multicollinearity assumption.

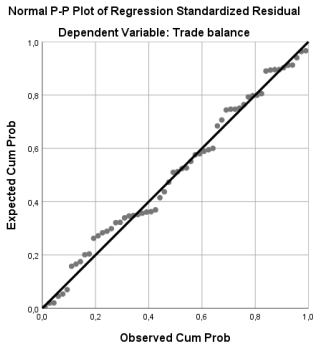

Figure 4-9 Normal Probability Plot

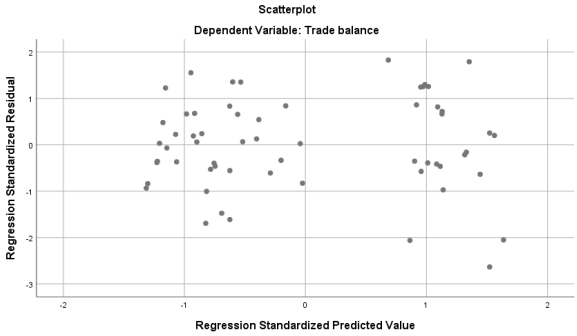

Figure 4-10 Residuals Scatterplot

As shown in Figure 4.9, those points lean on a reasonably straight diagonal line from bottom left to top right; this would suggest the normality assumption seems to be satisfied. Figure 4-10 shows the Scatterplot of the standardized residuals, most of the points distributed inside the rectangular, among the origin coordinate within the radius of approximately 1.8.

5 DISCUSSION

5.1 Findings

During the past decades, China has been successfully transformed from a poor, developing country to a crucial trading state and showing the world an industrialization process of the most massive scale in human history (Fang, 2010). There are many ongoing discussions whether the yuan depreciation or appreciation over other currencies. According to Zhang and Sate's research result (cited Zhang and Pan, 2004; Chang and Shao, 2004; Cheng et al., 2009; Goldstein and Lardy, 2009), the Chinese currency was significantly undervalued and need to rise nearly 40 percent in order to reflect the true value.

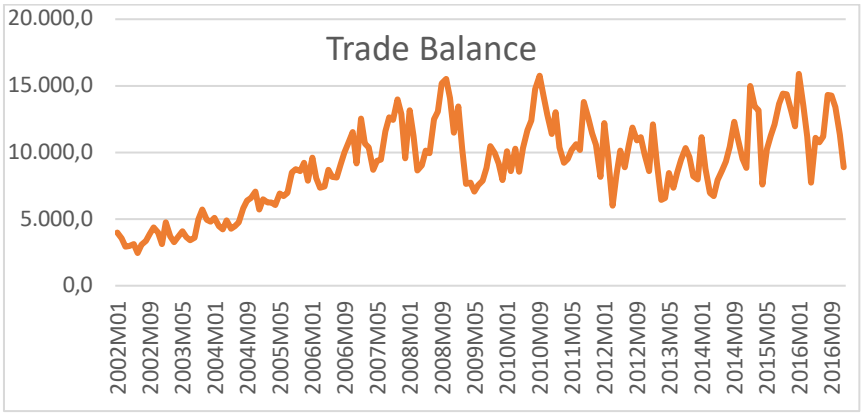

Figure 5-1 Trade balance between China and the EU

Table 5.1-1 Summary of model 1, 2, 3, and 4

Period	Adjusted R Square	CNY/EUR (%)	CNY/USD (%)	EUR to CNY	r^a	USD to CNY	r^b
P1(2000-2004)	**.48*****	**50.41*****	0.36*	**-23.57**	**-.71*****	0.07	-.04*
P2 (2005-2007)	**.69*****	1.96*	**68.89*****	2.31	-.12*	**12.87**	**.83*****
P3 (2008-2011)	.00*	3.61*	0.36*	29.52	.19*	14.21	.06*
P4(2012-2016)	**.35*****	**25.00*****	4.00*	**11.92**	**.58*****	-8.76	-.35**

*p<.5, **p<.01, ***p<.001
a. Coefficient value between CNY/EUR and the trade balance
b. Coefficient value between CNY/USD and the trade balance
Source Author's computation result

Table 5.1-1 reveals how Chinese currency appreciated or depreciated over other currencies namely the euro, the U.S. dollar, and the U.K. pound during four periods. It is worth notable how yuan remained constant to the U.S. dollar in the first period, and it appreciated in period 2, 3 then depreciated in period 4.

Firstly, during period 1, from the beginning of 2000 to the end of 2004, the CNY/USD barely changed around value 0.12, which could be explained by the fixed exchange rate system. Until 2005, the Chinese government still maintained its currency's value at a fixed exchange rate to the U.S. dollar (Ogawa, Sakane, 2006). The country central bank set a fixed amount of its currency in return for the U.S. dollar. While the U.S. dollar's value changes regularly, if the currency falls below the peg, the country's central bank will monitor its currency exchange rate relative to the dollar's value (Amadeo, 2018).
The CNY/USD started to increase slightly, and the yuan appreciated approximately (12.87-14.21) percent over the U.S. dollar in period 2 and 3. At the beginning of period 2, China announced a new exchange rate regime which seems to be a fusion of a fixed and floating rate system. Frankel and Wei (2014) suggested: "the exchange rate would be at with reference to a basket of other currencies, with numerical weights unannounced, allowing a movement of up to +- 0.3 % within any given day". However, according to Salitan's study (2010), even though Chinese currency appreciated 17.5 percent against the U.S. dollar from 2005 to 2010, the yuan is still undervalued than its 17.5 percent appreciation. Politician Senator Charles Schumer estimated the highest degree of the yuan undervaluation is 40 percent, Morgan Stanley estimated 7 percent, Goldman Sachs 10 percent, and the Institute for International Economics 15-25 percent. Salitan argued that the yuan should be appreciated more than 17.5 percent and suspected about "Beijing is still acting to reduce how fast the currency rises in value". In this research, the empirical study after the reform, period 2, 3, and 4 shows Chinese currency true value is difficult to examine because its movement threshold is vast, especially how the yuan reacted with the euro and the U.K. pound.

Secondly, as a suggestion from Chin (1998) R squared values for endogenous latent variables of 0.67, 0.33, and 0.19 be respectively described as substantial, moderate and weak. Table 5.1-1 under "Adjusted R Square" value, shows model 2 (.69) explains substantially of the variance in trade balance while model 1 (.48) and 4 (.35) explain it moderately. Except for period 3, multiple regression analyses illustrate partly the effects of the exchange rate changes to the trade balance with the European Union with the level of statistical significance at $p < .001$.
As can be seen from 5.1-1, the independent variable CNY/EUR is the best predictor in model 1 (50.41 percent) and 4 (25 percent) whereas in model 2 the CNY/USD (68.89 percent) is the better predictor.

Thirdly, Table 5.1-1 also shows that when Chinese currency depreciated, there is a negative correlation between the exchange rate and the trade balance, and vice versa.

Indeed, in the period 1, the yuan depreciated 23.57 percent over the euro and the exchange rate CNY/EUR experiences a strong negative correlation (-.71) with the trade balance, which means when the exchange rate CNY/EUR decreases, the trade balance increases. In this time period, the yuan is pegged to the U.S. dollar, which implies the independent variable CNY/USD does not fluctuate and has no effect on the regression equation. Thus, the regression equation only shows the relationship between CNY/EUR and the dependent variable trade balance. Due to the depreciation, the yuan now is weaker than the euro, leads to a decrease in the exchange rate, the Chinese export products might gain the competitiveness in the EU market and boost the trade balance with the EU in this period. Therefore, model 1 explains pretty well the relation between exchange rate changes and the trade balance, that when the exchange rate goes down (Figure 4.1), the trade balance goes up (Figure 5.1).

In period 2, the yuan appreciated 12.87 percent over the U.S. dollar and the exchange rate CNY/USD correlate positively (.83) with the trade balance, which means when the exchange rate CNY/USD increases, the trade balance between China and the European Union increases. In this period, we will examine the equation regardless of the independent variable CNY/EUR due to its little contribution (1.96 percent) to the prediction of the trade balance. The yuan experienced an appreciation over the U.S. dollar, and the exchange rate CNY/USD climbed slightly after the reform in 2005 (Figure 4-4), so its value is stronger than the U.S. dollar, leads to an increase in the export price to the United States. The Chinese export products may lose their competitiveness in the US market, so the trade flows into the US slows down, and it may turn into the European market, which makes the CNY/USD seems to explain pretty well the trade balance between China and the European Union in the period 2. (Figure 5.1)

In period 3, both two independent variables CNY/EUR and CNY/USD make little contribution to the regression equation, and the correlation between trade balance and two variables is actually weak. Therefore model 3 does not reveal any results.

In period 4, the yuan appreciated 11.92 percent over the euro, and the CNY/EUR has a strong positive (.58) correlation with trade balance; at the same time, the yuan depreciated 8.76 percent over the dollar and experienced a negative relationship with the trade balance. In this model 4, both two independent variables contribute to explaining the variance in the trade balance.

However, the trade balance fluctuated heavily (Figure 5.1), so it is quite hard to interpret the results.

Last but not least, there are several models, each one has its limitations and its strengths; thus, the results may be different depending on the methodology the researcher uses. Zhang and Sato used a structural Vector Autoregression (VAR) approach, and their result shows that the effect of exchange rate on the Chinese trade balance is still limited because the variance of Chinese trade balance is mainly determined by the world demand and its trade performance. (Zhang, Sato, The RMB exchange rate and its impact on the trade balance). Besides, Cardoso (2017) used Vector Error Correction (VEC) model shows the result "Over the past few years, Chinese exports have benefited from an "unfair" competitive advantage resulting from the manipulation of its currency value" (Cardoso, 2017). Although in this research, the author used a different model compared to other researchers, its results are reasonable and supportive. In line with the J-Curve theory, the trade balance between China and the European Union after the currency appreciation supposes to be ultimately improved in the short run and worsen in the long run. However, the trade balance experiences a significant increase during the period 1, 2, and fluctuated strongly in period 3, 4 (Figure 5.1), which does not show any evidence of the J-curve phenomenon.

5.2 Validity and reliability

In order to ensure the quantitative research is useful and trustworthy, validity and reliability must be considered and addressed during the experiment design and analysis. (Key issue in quantitative research). For the reason of omitting variable CNY/GBP out of this model, the author does not examine the null hypothesis for that variable in this chapter.

Validity

Golafshani (2003) (cited in Joppe, 2000) added the explanation of what validity is in quantitative research:

> "*Validity determines whether the research truly measures that which it was intended to measure or how truthful the research results are. In other words, does the research instrument allow you to hit "the bull's eye" of your research object? Researchers generally determine validity by asking a series of questions and will often look for the answers in the research of others. (p.1)"*

To assess the statistical significance of the model Null hypothesis is tested.

Table 5.2-1 Hypothesis test

	Model		CNY/EUR		CNY/USD	
	H_0	H_1	H_0	H_2	H_0	H_3
P1	reject	accept	reject	accept	accept	reject
P2	reject	accept	accept	reject	reject	accept
P3	accept	reject	accept	reject	accept	reject
P4	reject	accept	reject	accept	accept	reject

As can be seen from table 5.2-1, p-value for model 1, 2, 4 is less than .001, which is very low. The null hypothesis can be rejected, which means there is a significant relationship between exchange rate change and trade balance at any significant level. Similarly, we reject H2 in period 2, 3 and reject H3 in period 1, 3, 4. It very clear in table 6-1 H1, H2, H3 are rejected in period 3.

Reliability

Golafshani (2003) (cited in Joppe, 2000) explained reliability as:

> *"The extent to which results are consistent over time and an accurate representation of the total population under study is referred to as reliability and if the results of a study can be reproduced under a similar methodology, then the research instrument is considered to be reliable. (p. 1)"*

In this research, data collection is conducted from credible resources and the same analysis methods were used for all variables; thus, there is no reason that the results would be less reliable.

5.3 Limitation and further research

Exchange rate and trade balance are typically distributed at each point in time; multiple regression model maybe not the suitable model to examine the exchange rate changes and the trade balance because it cannot analyse variables within a time-varying process. The autoregression might be the optimal model for this research area. Moreover, the data could be reflected better if it is divided into two periods before and after the reform in 2005 instead of four periods as it is conducted in this research. This is because 2005 was a remarkable stage when China changed into the new exchange rate regime; thus, the analysis could be more precise. In additional, China and the United States are recently engaged in a trade war; the author would recommend having further research on the same topic using the autoregression model.

6 Conclusion

In this paper, the author conducted the research by using currency exchange rates and multiple regression analysis to assess how the yuan reacted to other currencies and whether the exchange rate changes could affect the trade balance or not. The main findings of this research are that Chinese currency mostly appreciated over other currencies during four periods, and the effect of the exchange rate changes on the trade balance with the European Union is quite limited. In particular, the results from examining currency exchange rates shows that during period 1, the yuan depreciated over the euro, the U.S. dollar and the U.K. pound. While, in period 2, 3, and 4 it appreciated over the euro and the U.K. pound. The results further confirm the true value of the Chinese currency is difficult to predict due to the wide movement threshold. Furthermore, the results from the multiple regression analysis revealed that the exchange rate changes explain to some extent of the variance in the trade balance. However, due to the mix results between four periods, the effects of these exchange rate to the trade balance with the European Union still limited.

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APPENDIX A

Table A 1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP weekly from 2000 to 2004

Time	CNY/EUR	CNY/USD	CNY/GBP
2000-01-03	0,117234	0,120766	0,073628
2000-01-10	0,118081	0,120766	0,073589
2000-01-17	0,119344	0,120769	0,073388
2000-01-24	0,122006	0,120785	0,073939
2000-01-31	0,123233	0,120786	0,075402
2000-02-07	0,122373	0,120780	0,075357
2000-02-14	0,122659	0,120798	0,075438
2000-02-21	0,122341	0,120789	0,075468
2000-02-28	0,125177	0,120779	0,076367
2000-03-06	0,125485	0,120782	0,076512
2000-03-13	0,124517	0,120788	0,076629
2000-03-20	0,124263	0,120781	0,076204
2000-03-27	0,126041	0,120777	0,075853
2000-04-03	0,126029	0,120771	0,076164
2000-04-10	0,125806	0,120769	0,076075
2000-04-17	0,128133	0,120777	0,076433
2000-04-24	0,131513	0,120769	0,077086
2000-05-01	0,134104	0,120762	0,078233
2000-05-08	0,132661	0,120784	0,079461
2000-05-15	0,134318	0,120804	0,080979
2000-05-22	0,131486	0,120804	0,081322
2000-05-29	0,128834	0,120803	0,080429
2000-06-05	0,126535	0,120801	0,079702
2000-06-12	0,125808	0,120807	0,079902
2000-06-19	0,127991	0,120805	0,080100
2000-06-26	0,127383	0,120792	0,079864
2000-07-03	0,127108	0,120775	0,079845
2000-07-10	0,128045	0,120769	0,080187
2000-07-17	0,129428	0,120768	0,080065
2000-07-24	0,129692	0,120768	0,079952
2000-07-31	0,132411	0,120769	0,080530
2000-08-07	0,133568	0,120764	0,080333
2000-08-14	0,132653	0,120767	0,080667
2000-08-21	0,133967	0,120763	0,081664
2000-08-28	0,134644	0,120775	0,082635
2000-09-04	0,137781	0,120773	0,084214
2000-09-11	0,140761	0,120795	0,086088
2000-09-18	0,139904	0,120789	0,084306
2000-09-25	0,137175	0,120770	0,082476

2000-10-02	0,138033	0,120774	0,082851
2000-10-09	0,139955	0,120781	0,082908
2000-10-16	0,142899	0,120790	0,083332
2000-10-23	0,144478	0,120782	0,083403
2000-10-30	0,140582	0,120802	0,083321
2000-11-06	0,140270	0,120804	0,084540
2000-11-13	0,141598	0,120805	0,084625
2000-11-20	0,143443	0,120794	0,085849
2000-11-27	0,139168	0,120795	0,084501
2000-12-04	0,136217	0,120805	0,083545
2000-12-11	0,136110	0,120806	0,082426
2000-12-18	0,132408	0,120800	0,081909
2000-12-25	0,129208	0,120800	0,081023
2001-01-01	0,127271	0,120796	0,080541
2001-01-08	0,127343	0,120805	0,081241
2001-01-15	0,128723	0,120813	0,082216
2001-01-22	0,130142	0,120782	0,082570
2001-01-29	0,129476	0,120793	0,082303
2001-02-05	0,130221	0,120812	0,083150
2001-02-12	0,131707	0,120806	0,083256
2001-02-19	0,131952	0,120803	0,083316
2001-02-26	0,130283	0,120789	0,082871
2001-03-05	0,129566	0,120798	0,082307
2001-03-12	0,133237	0,120795	0,083743
2001-03-19	0,134993	0,120802	0,084628
2001-03-26	0,136652	0,120796	0,084701
2001-04-02	0,134602	0,120805	0,084292
2001-04-09	0,135723	0,120805	0,084004
2001-04-16	0,135103	0,120799	0,083962
2001-04-23	0,134990	0,120802	0,083952
2001-04-30	0,135394	0,120799	0,084105
2001-05-07	0,137043	0,120799	0,084837
2001-05-14	0,137196	0,120807	0,084343
2001-05-21	0,140046	0,120801	0,084861
2001-05-28	0,141802	0,120800	0,085005
2001-06-04	0,142084	0,120807	0,086698
2001-06-11	0,140902	0,120803	0,086711
2001-06-18	0,140984	0,120805	0,085762
2001-06-25	0,141462	0,120808	0,085395
2001-07-02	0,142769	0,120808	0,085692
2001-07-09	0,141364	0,120808	0,085843
2001-07-16	0,139234	0,120807	0,085091
2001-07-23	0,137815	0,120804	0,084783

2001-07-30	0,137100	0,120807	0,084498
2001-08-06	0,136062	0,120804	0,084939
2001-08-13	0,132579	0,120805	0,083933
2001-08-20	0,132052	0,120804	0,083524
2001-08-27	0,132427	0,120807	0,083153
2001-09-03	0,134207	0,120808	0,082932
2001-09-10	0,132342	0,120816	0,082127
2001-09-17	0,131009	0,120717	0,082527
2001-09-24	0,131787	0,120672	0,081951
2001-10-01	0,131509	0,120674	0,081585
2001-10-08	0,132423	0,120676	0,082935
2001-10-15	0,133609	0,120674	0,083714
2001-10-22	0,135188	0,120672	0,084306
2001-10-29	0,133625	0,120672	0,082736
2001-11-05	0,134744	0,120676	0,082769
2001-11-12	0,136353	0,120673	0,084024
2001-11-19	0,137277	0,120693	0,085423
2001-11-26	0,135574	0,120668	0,084858
2001-12-03	0,135424	0,120669	0,084522
2001-12-10	0,134395	0,120674	0,083439
2001-12-17	0,134756	0,120675	0,083348
2001-12-24	0,136721	0,120675	0,083237
2001-12-31	0,134690	0,120677	0,083350
2002-01-07	0,135200	0,120676	0,083614
2002-01-14	0,136359	0,120675	0,083836
2002-01-21	0,138022	0,120677	0,084971
2002-01-28	0,140005	0,120677	0,085321
2002-02-04	0,138561	0,120676	0,085217
2002-02-11	0,138062	0,120674	0,084376
2002-02-18	0,138148	0,120676	0,084372
2002-02-25	0,139288	0,120677	0,084996
2002-03-04	0,137899	0,120672	0,084749
2002-03-11	0,137194	0,120668	0,084906
2002-03-18	0,137025	0,120668	0,084608
2002-03-25	0,138161	0,120667	0,084616
2002-04-01	0,137192	0,120669	0,084070
2002-04-08	0,137158	0,120669	0,083927
2002-04-15	0,135810	0,120666	0,083505
2002-04-22	0,134598	0,120667	0,082970
2002-04-29	0,132672	0,120668	0,082370
2002-05-06	0,132196	0,120666	0,082453
2002-05-13	0,131950	0,120672	0,082806
2002-05-20	0,130946	0,120670	0,082767

2002-05-27	0,129494	0,120677	0,082697
2002-06-03	0,127993	0,120672	0,082614
2002-06-10	0,127616	0,120672	0,081922
2002-06-17	0,125474	0,120667	0,080800
2002-06-24	0,122511	0,120669	0,079205
2002-07-01	0,123112	0,120674	0,079011
2002-07-08	0,121758	0,120675	0,077795
2002-07-15	0,119452	0,120672	0,076619
2002-07-22	0,121402	0,120672	0,076823
2002-07-29	0,122632	0,120675	0,076979
2002-08-05	0,124210	0,120675	0,078626
2002-08-12	0,122798	0,120675	0,078514
2002-08-19	0,123777	0,120675	0,079141
2002-08-26	0,123034	0,120675	0,078289
2002-09-02	0,122221	0,120670	0,077348
2002-09-09	0,123795	0,120673	0,077611
2002-09-16	0,123264	0,120714	0,077852
2002-09-23	0,123322	0,120668	0,077427
2002-09-30	0,122680	0,120665	0,076975
2002-10-07	0,122388	0,120669	0,077235
2002-10-14	0,123509	0,120674	0,077819
2002-10-21	0,123556	0,120669	0,077917
2002-10-28	0,121829	0,120668	0,077250
2002-11-04	0,119763	0,120668	0,076519
2002-11-11	0,119572	0,120669	0,076214
2002-11-18	0,120567	0,120669	0,076378
2002-11-25	0,121470	0,120669	0,077568
2002-12-02	0,120226	0,120669	0,076783
2002-12-09	0,118696	0,120669	0,076234
2002-12-16	0,117517	0,120669	0,075394
2002-12-23	0,116392	0,120669	0,075435
2002-12-30	0,115523	0,120669	0,075091
2003-01-06	0,114777	0,120669	0,075022
2003-01-13	0,113724	0,120664	0,075001
2003-01-20	0,112009	0,120671	0,074277
2003-01-27	0,111641	0,120667	0,073312
2003-02-03	0,111456	0,120634	0,073616
2003-02-10	0,112041	0,120664	0,074603
2003-02-17	0,112230	0,120664	0,075979
2003-02-24	0,111874	0,120664	0,076453
2003-03-03	0,110076	0,120664	0,075586
2003-03-10	0,110910	0,120669	0,075571
2003-03-17	0,113996	0,120667	0,077051

2003-03-24	0,112570	0,120668	0,076719
2003-03-31	0,111764	0,120668	0,076887
2003-04-07	0,112272	0,120667	0,077053
2003-04-14	0,111153	0,120668	0,076721
2003-04-21	0,109740	0,120670	0,076100
2003-04-28	0,108039	0,120670	0,075371
2003-05-05	0,105448	0,120673	0,075170
2003-05-12	0,104622	0,120672	0,074575
2003-05-19	0,102742	0,120673	0,073755
2003-05-26	0,102212	0,120672	0,073578
2003-06-02	0,102914	0,120672	0,073199
2003-06-09	0,102343	0,120672	0,072497
2003-06-16	0,103220	0,120671	0,072125
2003-06-23	0,105133	0,120665	0,072699
2003-06-30	0,104824	0,120663	0,072452
2003-07-07	0,106582	0,120666	0,073744
2003-07-14	0,107336	0,120670	0,075586
2003-07-21	0,105335	0,120667	0,074871
2003-07-28	0,106425	0,120666	0,074672
2003-08-04	0,106403	0,120666	0,074958
2003-08-11	0,106918	0,120671	0,075329
2003-08-18	0,109747	0,120676	0,076246
2003-08-25	0,110459	0,120670	0,076626
2003-09-01	0,109878	0,120671	0,076368
2003-09-08	0,107448	0,120669	0,075611
2003-09-15	0,106695	0,120666	0,074561
2003-09-22	0,105144	0,120668	0,072823
2003-09-29	0,103763	0,120669	0,072356
2003-10-06	0,102452	0,120670	0,072456
2003-10-13	0,103403	0,120676	0,072104
2003-10-20	0,102748	0,120676	0,071470
2003-10-27	0,103651	0,120676	0,071116
2003-11-03	0,105115	0,120673	0,072055
2003-11-10	0,103364	0,120671	0,071828
2003-11-17	0,101518	0,120672	0,070917
2003-11-24	0,101323	0,120670	0,070473
2003-12-01	0,099685	0,120670	0,069877
2003-12-08	0,098497	0,120669	0,069195
2003-12-15	0,097507	0,120671	0,068440
2003-12-22	0,097083	0,120672	0,068150
2003-12-29	0,096058	0,120673	0,067567
2004-01-05	0,094590	0,120670	0,065849
2004-01-12	0,096146	0,120674	0,066169

2004-01-19	0,095941	0,120670	0,066219
2004-01-26	0,096612	0,120670	0,066348
2004-02-02	0,095904	0,120668	0,065668
2004-02-09	0,094648	0,120669	0,064152
2004-02-16	0,095385	0,120669	0,064205
2004-02-23	0,096363	0,120671	0,064503
2004-03-01	0,098012	0,120671	0,065478
2004-03-08	0,098222	0,120669	0,066507
2004-03-15	0,098198	0,120668	0,066169
2004-03-22	0,099013	0,120669	0,066126
2004-03-29	0,098955	0,120671	0,065832
2004-04-05	0,099795	0,120672	0,065811
2004-04-12	0,100584	0,120671	0,066865
2004-04-19	0,101588	0,120652	0,067792
2004-04-26	0,100994	0,120630	0,067761
2004-05-03	0,100647	0,120669	0,067480
2004-05-10	0,101638	0,120668	0,068396
2004-05-17	0,100679	0,120670	0,067790
2004-05-24	0,099181	0,120672	0,066209
2004-05-31	0,098541	0,120674	0,065658
2004-06-07	0,099589	0,120675	0,065980
2004-06-14	0,099701	0,120677	0,065861
2004-06-21	0,099408	0,120676	0,066147
2004-06-28	0,098705	0,120677	0,066109
2004-07-05	0,097531	0,120631	0,065164
2004-07-12	0,097297	0,120676	0,064738
2004-07-19	0,098709	0,120677	0,065471
2004-07-26	0,100074	0,120673	0,066159
2004-08-02	0,099103	0,120485	0,065748
2004-08-09	0,098099	0,120673	0,065748
2004-08-16	0,097793	0,120675	0,066091
2004-08-23	0,099994	0,120676	0,067229
2004-08-30	0,099652	0,120676	0,067532
2004-09-06	0,098966	0,120676	0,067474
2004-09-13	0,098951	0,120675	0,067374
2004-09-20	0,098381	0,120677	0,067103
2004-09-27	0,097561	0,120677	0,066893
2004-10-04	0,097748	0,120676	0,067535
2004-10-11	0,097194	0,120637	0,067061
2004-10-18	0,095693	0,120678	0,066341
2004-10-25	0,094469	0,120678	0,065715
2004-11-01	0,093798	0,120678	0,065306
2004-11-08	0,093269	0,120678	0,065105

2004-11-15	0,092804	0,120678	0,065056
2004-11-22	0,091389	0,120678	0,064098
2004-11-29	0,090315	0,120678	0,062606
2004-12-06	0,090699	0,120678	0,062635
2004-12-13	0,090633	0,120678	0,062312
2004-12-20	0,089602	0,120678	0,062653

APPENDIX B

Table B 1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP weekly from 2005 to 2007

Time	CNY/EUR	CNY/USD	CNY/GBP
2005-01-03	0,091486	0,120678	0,064214
2005-01-10	0,091820	0,120678	0,064291
2005-01-17	0,092652	0,120678	0,064450
2005-01-24	0,092550	0,120678	0,064094
2005-01-31	0,093166	0,120678	0,064180
2005-02-07	0,094064	0,120678	0,064753
2005-02-14	0,092526	0,120678	0,063758
2005-02-21	0,091345	0,120678	0,063108
2005-02-28	0,091408	0,120678	0,062877
2005-03-07	0,090091	0,120678	0,062739
2005-03-14	0,090404	0,120678	0,062853
2005-03-21	0,092765	0,120678	0,064322
2005-03-28	0,093455	0,120678	0,064226
2005-04-04	0,093610	0,120678	0,064164
2005-04-11	0,093529	0,120678	0,063816
2005-04-18	0,092372	0,120678	0,063051
2005-04-25	0,093428	0,120678	0,063259
2005-05-02	0,093723	0,120678	0,063667
2005-05-09	0,094832	0,120678	0,064703
2005-05-16	0,095752	0,120678	0,065868
2005-05-23	0,095976	0,120678	0,066090
2005-05-30	0,098306	0,120678	0,066476
2005-06-06	0,098969	0,120678	0,066302
2005-06-13	0,099108	0,120678	0,066257
2005-06-20	0,099639	0,120678	0,066187
2005-06-27	0,100277	0,120678	0,067344
2005-07-04	0,101043	0,120678	0,069077
2005-07-11	0,099839	0,120678	0,068611
2005-07-18	0,100688	0,121731	0,069848
2005-07-25	0,101818	0,123176	0,070319
2005-08-01	0,100129	0,123247	0,069379
2005-08-08	0,099300	0,123269	0,068369
2005-08-15	0,100737	0,123279	0,068428
2005-08-22	0,100485	0,123311	0,068446
2005-08-29	0,099389	0,123374	0,067747
2005-09-05	0,099163	0,123354	0,067047
2005-09-12	0,100692	0,123395	0,068031
2005-09-19	0,101894	0,123415	0,068952
2005-09-26	0,102475	0,123349	0,069803

2005-10-03	0,102381	0,123364	0,069979
2005-10-10	0,102427	0,123457	0,070146
2005-10-17	0,103020	0,123415	0,069950
2005-10-24	0,102289	0,123457	0,069515
2005-10-31	0,103508	0,123542	0,070095
2005-11-07	0,105198	0,123591	0,070909
2005-11-14	0,105294	0,123612	0,071727
2005-11-21	0,105117	0,123690	0,071924
2005-11-28	0,105283	0,123726	0,071760
2005-12-05	0,105148	0,123727	0,071040
2005-12-12	0,103615	0,123769	0,070020
2005-12-19	0,103822	0,123757	0,070618
2005-12-26	0,104437	0,123825	0,071641
2006-01-02	0,103146	0,123911	0,070921
2006-01-09	0,102327	0,123875	0,070024
2006-01-16	0,102295	0,123923	0,070171
2006-01-23	0,101564	0,123967	0,069687
2006-01-30	0,102683	0,123989	0,070032
2006-02-06	0,103777	0,124101	0,071058
2006-02-13	0,104268	0,124169	0,071388
2006-02-20	0,104307	0,124225	0,071151
2006-02-27	0,103953	0,124336	0,071031
2006-03-06	0,104076	0,124240	0,071523
2006-03-13	0,102887	0,124331	0,071172
2006-03-20	0,103069	0,124436	0,071286
2006-03-27	0,103100	0,124517	0,071500
2006-04-03	0,102420	0,124638	0,071394
2006-04-10	0,102850	0,124616	0,071225
2006-04-17	0,101196	0,124579	0,070036
2006-04-24	0,099701	0,124608	0,069176
2006-05-01	0,098387	0,124628	0,067554
2006-05-08	0,097348	0,124755	0,066515
2006-05-15	0,097307	0,124659	0,066147
2006-05-22	0,097402	0,124488	0,066543
2006-05-29	0,096903	0,124472	0,066444
2006-06-05	0,097678	0,124604	0,067173
2006-06-12	0,098886	0,124768	0,067582
2006-06-19	0,099292	0,124824	0,068107
2006-06-26	0,098728	0,124903	0,068231
2006-07-03	0,097717	0,124973	0,067751
2006-07-10	0,098337	0,124952	0,067871
2006-07-17	0,099081	0,124970	0,067817
2006-07-24	0,098651	0,125179	0,067458

2006-07-31	0,097730	0,125235	0,066410
2006-08-07	0,097836	0,125241	0,065941
2006-08-14	0,097721	0,125120	0,066256
2006-08-21	0,097871	0,125278	0,066302
2006-08-28	0,097882	0,125499	0,065994
2006-09-04	0,098483	0,125703	0,066766
2006-09-11	0,099042	0,125674	0,066958
2006-09-18	0,098942	0,126002	0,066599
2006-09-25	0,099382	0,126297	0,067010
2006-10-02	0,099657	0,126306	0,067235
2006-10-09	0,100684	0,126327	0,067946
2006-10-16	0,100454	0,126317	0,067431
2006-10-23	0,099999	0,126498	0,067090
2006-10-30	0,099569	0,126840	0,066624
2006-11-06	0,099180	0,126923	0,066562
2006-11-13	0,098983	0,126912	0,066946
2006-11-20	0,098052	0,127031	0,066340
2006-11-27	0,096353	0,127455	0,065036
2006-12-04	0,096109	0,127615	0,064900
2006-12-11	0,096874	0,127597	0,065130
2006-12-18	0,097131	0,127748	0,065164
2006-12-25	0,097141	0,127830	0,065240
2007-01-01	0,097365	0,127846	0,065620
2007-01-08	0,098772	0,128005	0,065803
2007-01-15	0,099130	0,128372	0,065180
2007-01-22	0,099160	0,128457	0,065237
2007-01-29	0,099142	0,128625	0,065491
2007-02-05	0,099173	0,128834	0,065748
2007-02-12	0,098412	0,128791	0,065997
2007-02-19	0,098003	0,128863	0,065854
2007-02-26	0,097736	0,128974	0,065936
2007-03-05	0,098230	0,128980	0,066818
2007-03-12	0,097416	0,129012	0,066610
2007-03-19	0,097012	0,129142	0,065929
2007-03-26	0,096861	0,129178	0,065725
2007-04-02	0,096601	0,129219	0,065545
2007-04-09	0,096017	0,129275	0,065374
2007-04-16	0,095208	0,129332	0,064634
2007-04-23	0,094925	0,129323	0,064685
2007-04-30	0,095288	0,129610	0,065010
2007-05-07	0,095904	0,129889	0,065347
2007-05-14	0,096153	0,130099	0,065767
2007-05-21	0,096971	0,130472	0,065874

2007-05-28	0,097087	0,130585	0,065910
2007-06-04	0,097107	0,130564	0,065878
2007-06-11	0,098012	0,130807	0,066306
2007-06-18	0,097569	0,131016	0,065771
2007-06-25	0,097244	0,131133	0,065480
2007-07-02	0,096537	0,131415	0,065267
2007-07-09	0,095976	0,131844	0,065022
2007-07-16	0,095597	0,131982	0,064408
2007-07-23	0,096193	0,132081	0,064592
2007-07-30	0,096236	0,131955	0,064887
2007-08-06	0,095988	0,131913	0,065058
2007-08-13	0,097379	0,131572	0,066050
2007-08-20	0,097098	0,131732	0,065922
2007-08-27	0,096971	0,132283	0,065692
2007-09-03	0,096775	0,132400	0,065496
2007-09-10	0,095876	0,132842	0,065717
2007-09-17	0,094966	0,132952	0,066170
2007-09-24	0,093826	0,132975	0,065539
2007-10-01	0,093962	0,133048	0,065204
2007-10-08	0,094024	0,132998	0,065301
2007-10-15	0,093311	0,132919	0,065046
2007-10-22	0,093149	0,133272	0,065059
2007-10-29	0,092542	0,133809	0,064445
2007-11-05	0,091934	0,134417	0,064200
2007-11-12	0,091906	0,134521	0,065305
2007-11-19	0,091064	0,134771	0,065396
2007-11-26	0,091502	0,135070	0,065431
2007-12-03	0,092015	0,134921	0,066114
2007-12-10	0,092755	0,135384	0,066559
2007-12-17	0,094173	0,135464	0,067784
2007-12-24	0,093602	0,136204	0,068500

APPENDIX C

Table C 1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP weekly from 2008 to 2011

Time	CNY/EUR	CNY/USD	CNY/GBP
2008-01-07	0,093259	0,137456	0,070007
2008-01-14	0,093648	0,137863	0,070308
2008-01-21	0,094520	0,138229	0,070316
2008-01-28	0,093865	0,138924	0,070151
2008-02-04	0,095056	0,138909	0,071000
2008-02-11	0,095112	0,138959	0,070911
2008-02-18	0,094681	0,139706	0,071372
2008-02-25	0,093045	0,140087	0,070669
2008-03-03	0,091883	0,140483	0,070276
2008-03-10	0,090634	0,140704	0,069649
2008-03-17	0,090732	0,141355	0,070925
2008-03-24	0,090615	0,142131	0,071184
2008-03-31	0,090603	0,142313	0,071551
2008-04-07	0,090417	0,142619	0,072203
2008-04-14	0,090137	0,142784	0,072004
2008-04-21	0,090446	0,142690	0,071891
2008-04-28	0,092007	0,142846	0,072216
2008-05-05	0,092393	0,142850	0,072863
2008-05-12	0,092070	0,142797	0,073176
2008-05-19	0,091447	0,143584	0,072846
2008-05-26	0,092011	0,143839	0,072671
2008-06-02	0,092395	0,144078	0,073354
2008-06-09	0,093282	0,144476	0,073878
2008-06-16	0,093322	0,145026	0,073752
2008-06-23	0,092774	0,145435	0,073428
2008-06-30	0,092383	0,145607	0,073238
2008-07-07	0,092365	0,145811	0,073639
2008-07-14	0,092196	0,146368	0,073240
2008-07-21	0,092843	0,146320	0,073383
2008-07-28	0,093559	0,146067	0,073735
2008-08-04	0,095150	0,145634	0,074955
2008-08-11	0,098095	0,145457	0,077295
2008-08-18	0,098703	0,145807	0,078308
2008-08-25	0,099261	0,145998	0,079608
2008-09-01	0,101275	0,146014	0,082150
2008-09-08	0,103212	0,145988	0,082391
2008-09-15	0,101795	0,145887	0,080565
2008-09-22	0,099712	0,146058	0,079060
2008-09-29	0,104092	0,145877	0,081857

2008-10-06	0,107904	0,146178	0,084659
2008-10-13	0,108138	0,146099	0,084309
2008-10-20	0,113018	0,145876	0,089178
2008-10-27	0,114663	0,145854	0,091047
2008-11-03	0,114221	0,146053	0,092296
2008-11-10	0,115658	0,146276	0,096811
2008-11-17	0,116151	0,146181	0,097980
2008-11-24	0,114135	0,146264	0,095644
2008-12-01	0,114338	0,145154	0,098020
2008-12-08	0,110896	0,145622	0,097938
2008-12-15	0,104379	0,145711	0,096045
2008-12-22	0,104061	0,145794	0,099011
2008-12-29	0,104203	0,145997	0,100235
2009-01-05	0,107597	0,146102	0,097523
2009-01-12	0,110148	0,146066	0,099157
2009-01-19	0,112250	0,146010	0,104450
2009-01-26	0,112287	0,145992	0,102505
2009-02-02	0,113411	0,146063	0,100466
2009-02-09	0,113247	0,146081	0,100806
2009-02-16	0,114956	0,146080	0,102074
2009-02-23	0,114618	0,146026	0,101605
2009-03-02	0,115735	0,145948	0,103381
2009-03-09	0,114015	0,145998	0,104942
2009-03-16	0,109646	0,146174	0,102427
2009-03-23	0,108460	0,146163	0,100874
2009-03-30	0,109416	0,146087	0,100366
2009-04-06	0,110169	0,146082	0,099320
2009-04-13	0,111001	0,146141	0,098433
2009-04-20	0,111751	0,146226	0,099926
2009-04-27	0,110764	0,146358	0,099043
2009-05-04	0,108940	0,146386	0,096962
2009-05-11	0,107766	0,146340	0,096340
2009-05-18	0,106126	0,146307	0,093384
2009-05-25	0,104307	0,146241	0,091225
2009-06-01	0,103505	0,146175	0,090060
2009-06-08	0,104301	0,146102	0,089487
2009-06-15	0,105018	0,146063	0,089033
2009-06-22	0,104351	0,146098	0,088817
2009-06-29	0,104120	0,146144	0,088958
2009-07-06	0,104821	0,146153	0,090221
2009-07-13	0,103973	0,146154	0,089503
2009-07-20	0,102878	0,146152	0,088822
2009-07-27	0,103032	0,146183	0,088357

2009-08-03	0,102120	0,146154	0,086877
2009-08-10	0,102893	0,146137	0,088349
2009-08-17	0,102737	0,146131	0,088660
2009-08-24	0,102178	0,146168	0,089579
2009-08-31	0,102313	0,146129	0,089609
2009-09-07	0,100785	0,146258	0,088290
2009-09-14	0,099626	0,146243	0,089002
2009-09-21	0,099382	0,146240	0,090578
2009-09-28	0,100223	0,146265	0,091752
2009-10-05	0,099412	0,146282	0,091824
2009-10-12	0,098361	0,146282	0,090800
2009-10-19	0,097653	0,146306	0,089101
2009-10-26	0,098785	0,146257	0,089095
2009-11-02	0,098758	0,146295	0,088553
2009-11-09	0,097948	0,146328	0,087777
2009-11-16	0,098148	0,146280	0,087805
2009-11-23	0,097571	0,146258	0,088374
2009-11-30	0,097546	0,146289	0,088434
2009-12-07	0,099368	0,146272	0,089702
2009-12-14	0,101122	0,146221	0,090156
2009-12-21	0,102014	0,146364	0,091453
2009-12-28	0,101926	0,146344	0,091078
2010-01-04	0,101733	0,146305	0,091288
2010-01-11	0,101196	0,146320	0,090160
2010-01-18	0,103013	0,146288	0,090119
2010-01-25	0,104504	0,146292	0,090799
2010-02-01	0,105911	0,146286	0,092465
2010-02-08	0,106866	0,146230	0,093398
2010-02-15	0,107339	0,146193	0,093786
2010-02-22	0,107676	0,146299	0,095378
2010-03-01	0,107470	0,146271	0,097106
2010-03-08	0,106891	0,146308	0,096953
2010-03-15	0,107243	0,146273	0,096653
2010-03-22	0,108999	0,146261	0,097902
2010-03-29	0,108391	0,146307	0,096510
2010-04-05	0,108982	0,146363	0,095718
2010-04-12	0,107988	0,146471	0,095054
2010-04-19	0,109221	0,146289	0,095211
2010-04-26	0,110141	0,146279	0,095567
2010-05-03	0,113530	0,146283	0,097651
2010-05-10	0,116289	0,146263	0,099334
2010-05-17	0,117624	0,146288	0,101452
2010-05-24	0,118844	0,146256	0,101244

2010-05-31	0,120391	0,146216	0,100442
2010-06-07	0,121399	0,146184	0,100542
2010-06-14	0,118566	0,146183	0,098838
2010-06-21	0,119039	0,146838	0,098295
2010-06-28	0,118704	0,147236	0,097461
2010-07-05	0,116758	0,147370	0,097413
2010-07-12	0,115197	0,147408	0,096719
2010-07-19	0,114242	0,147325	0,096172
2010-07-26	0,113145	0,147362	0,094405
2010-08-02	0,111596	0,147469	0,092690
2010-08-09	0,113794	0,147207	0,093789
2010-08-16	0,114903	0,147000	0,094344
2010-08-23	0,115556	0,146871	0,094726
2010-08-30	0,114609	0,146754	0,095053
2010-09-06	0,115635	0,147270	0,095631
2010-09-13	0,114024	0,148236	0,095207
2010-09-20	0,111701	0,148934	0,094849
2010-09-27	0,109387	0,149265	0,094373
2010-10-04	0,107718	0,149452	0,093964
2010-10-11	0,107360	0,150032	0,094073
2010-10-18	0,107819	0,150131	0,095295
2010-10-25	0,107595	0,149698	0,094154
2010-11-01	0,106579	0,149737	0,092799
2010-11-08	0,109145	0,150304	0,093299
2010-11-15	0,110399	0,150394	0,094042
2010-11-22	0,112067	0,150019	0,095176
2010-11-29	0,113320	0,149858	0,095764
2010-12-06	0,113142	0,150088	0,095129
2010-12-13	0,113044	0,149957	0,095796
2010-12-20	0,114400	0,150183	0,097146
2010-12-27	0,113955	0,151129	0,097529
2011-01-03	0,115113	0,150984	0,097230
2011-01-10	0,114816	0,151235	0,096108
2011-01-17	0,112518	0,151655	0,095020
2011-01-24	0,111128	0,151716	0,095469
2011-01-31	0,111115	0,151975	0,094398
2011-02-07	0,111560	0,151708	0,094432
2011-02-14	0,111627	0,151697	0,093918
2011-02-21	0,110614	0,151873	0,093956
2011-02-28	0,109418	0,151994	0,093457
2011-03-07	0,109351	0,152037	0,094196
2011-03-14	0,108226	0,151961	0,094148
2011-03-21	0,107612	0,152206	0,094050

2011-03-28	0,107621	0,152328	0,094861
2011-04-04	0,106490	0,152687	0,093669
2011-04-11	0,105743	0,152820	0,093633
2011-04-18	0,105956	0,153340	0,093365
2011-04-25	0,104263	0,153618	0,092478
2011-05-02	0,105183	0,153830	0,093340
2011-05-09	0,107978	0,153839	0,094375
2011-05-16	0,108139	0,153586	0,094709
2011-05-23	0,108535	0,153834	0,094214
2011-05-30	0,106551	0,154163	0,093867
2011-06-06	0,106162	0,154133	0,094334
2011-06-13	0,107797	0,154212	0,094963
2011-06-20	0,108197	0,154390	0,096066
2011-06-27	0,107164	0,154536	0,096394
2011-07-04	0,107583	0,154539	0,096342
2011-07-11	0,109687	0,154876	0,096458
2011-07-18	0,108585	0,154810	0,095528
2011-07-25	0,107782	0,155148	0,094763
2011-08-01	0,108834	0,155252	0,094925
2011-08-08	0,109447	0,155975	0,095834
2011-08-15	0,108825	0,156557	0,095173
2011-08-22	0,108331	0,156408	0,095334
2011-08-29	0,109165	0,156531	0,096210
2011-09-05	0,112278	0,156206	0,097747
2011-09-12	0,113814	0,156377	0,098958
2011-09-19	0,114820	0,155914	0,100265
2011-09-26	0,115613	0,156079	0,100110
2011-10-03	0,117253	0,156464	0,100997
2011-10-10	0,113865	0,156517	0,099527
2011-10-17	0,113176	0,156328	0,098754
2011-10-24	0,111830	0,156908	0,097768
2011-10-31	0,113812	0,157129	0,098121
2011-11-07	0,114849	0,157509	0,098304
2011-11-14	0,116084	0,157252	0,099344
2011-11-21	0,117086	0,156518	0,100675
2011-11-28	0,117196	0,156954	0,100535
2011-12-05	0,117486	0,157333	0,100510
2011-12-12	0,119440	0,156283	0,100565
2011-12-19	0,120149	0,156826	0,100426
2011-12-26	0,120793	0,156982	0,100949

APPENDIX D

Table D 1 Exchange rate CNY/EUR, CNY/USD, CNY/GBP weekly from 2012 to 2016

Time	CNY/EUR	CNY/USD	CNY/GBP
2012-01-02	0,122616	0,157701	0,101635
2012-01-09	0,124152	0,158099	0,102825
2012-01-16	0,123324	0,158338	0,102499
2012-01-23	0,121068	0,158557	0,101292
2012-01-30	0,120622	0,158594	0,100457
2012-02-06	0,120159	0,158651	0,100373
2012-02-13	0,120615	0,158546	0,100531
2012-02-20	0,118934	0,158536	0,100283
2012-02-27	0,118927	0,158494	0,099800
2012-03-05	0,120089	0,158134	0,100372
2012-03-12	0,120212	0,157694	0,100225
2012-03-19	0,119319	0,157898	0,099548
2012-03-26	0,118514	0,157956	0,098975
2012-04-02	0,119996	0,158076	0,099343
2012-04-09	0,120602	0,158062	0,099488
2012-04-16	0,120246	0,158086	0,098696
2012-04-23	0,119675	0,158148	0,097695
2012-04-30	0,120306	0,158321	0,097759
2012-05-07	0,122001	0,158146	0,098097
2012-05-14	0,123556	0,157777	0,099135
2012-05-21	0,124909	0,157663	0,100298
2012-05-28	0,126391	0,157355	0,101522
2012-06-04	0,126021	0,157644	0,102056
2012-06-11	0,125489	0,157944	0,101291
2012-06-18	0,125395	0,158201	0,101078
2012-06-25	0,125910	0,158051	0,101159
2012-07-02	0,127115	0,158302	0,101586
2012-07-09	0,129156	0,158254	0,101959
2012-07-16	0,129520	0,158405	0,101291
2012-07-23	0,129313	0,157888	0,101079
2012-07-30	0,128535	0,158116	0,101146
2012-08-06	0,128003	0,157955	0,100954
2012-08-13	0,127898	0,157664	0,100455
2012-08-20	0,126472	0,157789	0,099867
2012-08-27	0,125700	0,157708	0,099623
2012-09-03	0,124476	0,157692	0,098952
2012-09-10	0,121846	0,157887	0,097915
2012-09-17	0,121180	0,157850	0,097237
2012-09-24	0,122407	0,157816	0,097447

2012-10-01	0,121887	0,158010	0,097900
2012-10-08	0,122344	0,158262	0,098620
2012-10-15	0,121743	0,158714	0,098773
2012-10-22	0,122435	0,158859	0,098925
2012-10-29	0,123096	0,158878	0,098862
2012-11-05	0,124535	0,158921	0,099578
2012-11-12	0,124997	0,159173	0,100266
2012-11-19	0,123688	0,159201	0,099742
2012-11-26	0,122900	0,159409	0,099500
2012-12-03	0,122279	0,159034	0,098969
2012-12-10	0,121714	0,158943	0,098566
2012-12-17	0,120246	0,158746	0,097882
2012-12-24	0,119900	0,158416	0,098109
2012-12-31	0,120725	0,158574	0,098127
2013-01-07	0,120647	0,159130	0,098870
2013-01-14	0,119777	0,159711	0,099901
2013-01-21	0,118950	0,159109	0,100545
2013-01-28	0,117184	0,158897	0,100877
2013-02-04	0,117902	0,158825	0,100922
2013-02-11	0,118677	0,158906	0,101991
2013-02-18	0,119754	0,158929	0,103840
2013-02-25	0,121544	0,158994	0,105207
2013-03-04	0,122160	0,159139	0,105950
2013-03-11	0,122412	0,159486	0,106265
2013-03-18	0,122992	0,159211	0,105009
2013-03-25	0,123998	0,159259	0,104874
2013-04-01	0,123676	0,159510	0,104745
2013-04-08	0,122216	0,159847	0,104225
2013-04-15	0,122498	0,160199	0,104836
2013-04-22	0,123153	0,160466	0,104433
2013-04-29	0,122678	0,160947	0,103526
2013-05-06	0,123415	0,161224	0,104238
2013-05-13	0,124927	0,161113	0,105728
2013-05-20	0,125126	0,161486	0,106681
2013-05-27	0,124695	0,161632	0,106673
2013-06-03	0,123166	0,161880	0,104849
2013-06-10	0,121773	0,162104	0,103549
2013-06-17	0,122051	0,161769	0,104088
2013-06-24	0,123709	0,161460	0,105456
2013-07-01	0,124952	0,161654	0,107177
2013-07-08	0,124718	0,161732	0,107624
2013-07-15	0,123364	0,161811	0,106481
2013-07-22	0,122329	0,161898	0,105388

2013-07-29	0,121972	0,161814	0,106019
2013-08-05	0,121660	0,162116	0,104954
2013-08-12	0,121882	0,162184	0,104271
2013-08-19	0,121299	0,162184	0,103862
2013-08-26	0,121965	0,162162	0,104440
2013-09-02	0,122968	0,162038	0,103862
2013-09-09	0,122280	0,162340	0,102787
2013-09-16	0,120842	0,162616	0,101688
2013-09-23	0,120400	0,162653	0,101204
2013-09-30	0,120063	0,162808	0,100928
2013-10-07	0,120228	0,162913	0,101812
2013-10-14	0,119860	0,163146	0,101510
2013-10-21	0,118586	0,163256	0,100920
2013-10-28	0,119530	0,163062	0,101738
2013-11-04	0,121190	0,162951	0,101649
2013-11-11	0,121225	0,163047	0,101675
2013-11-18	0,120700	0,163122	0,100936
2013-11-25	0,120115	0,163074	0,100098
2013-12-02	0,119744	0,163232	0,099733
2013-12-09	0,118950	0,163565	0,099966
2013-12-16	0,119230	0,163452	0,100058
2013-12-23	0,119146	0,163417	0,099534
2013-12-30	0,119519	0,163705	0,099306
2014-01-06	0,120238	0,163856	0,099638
2014-01-13	0,120583	0,164085	0,100004
2014-01-20	0,120349	0,163853	0,099264
2014-01-27	0,120479	0,163725	0,099159
2014-02-03	0,120741	0,163779	0,100128
2014-02-10	0,119942	0,163855	0,098750
2014-02-17	0,119102	0,163547	0,098090
2014-02-24	0,118641	0,163136	0,097708
2014-03-03	0,118163	0,163150	0,097613
2014-03-10	0,117161	0,162769	0,097786
2014-03-17	0,117337	0,162466	0,098153
2014-03-24	0,117840	0,162358	0,097933
2014-03-31	0,117831	0,161957	0,097472
2014-04-07	0,117177	0,162073	0,096935
2014-04-14	0,117101	0,161866	0,096498
2014-04-21	0,117107	0,161878	0,096323
2014-04-28	0,117033	0,162199	0,096214
2014-05-05	0,117250	0,162375	0,096048
2014-05-12	0,118180	0,162093	0,096357
2014-05-19	0,118547	0,162046	0,096179

2014-05-26	0,118836	0,161947	0,096538
2014-06-02	0,118938	0,162079	0,096608
2014-06-09	0,119906	0,162584	0,096371
2014-06-16	0,119449	0,162249	0,095444
2014-06-23	0,119113	0,162277	0,095349
2014-06-30	0,118801	0,161988	0,094518
2014-07-07	0,119046	0,162030	0,094589
2014-07-14	0,119446	0,161879	0,094624
2014-07-21	0,120453	0,162218	0,095292
2014-07-28	0,120810	0,162104	0,095931
2014-08-04	0,121088	0,162215	0,096419
2014-08-11	0,121390	0,162462	0,097113
2014-08-18	0,122145	0,162362	0,097686
2014-08-25	0,123180	0,162258	0,097835
2014-09-01	0,124372	0,162264	0,098747
2014-09-08	0,125661	0,162557	0,100333
2014-09-15	0,126046	0,162539	0,099748
2014-09-22	0,127420	0,162720	0,099726
2014-09-29	0,128936	0,162514	0,100797
2014-10-06	0,128822	0,162890	0,101293
2014-10-13	0,127810	0,162825	0,101491
2014-10-20	0,128226	0,162835	0,101199
2014-10-27	0,129036	0,162894	0,101491
2014-11-03	0,130445	0,162709	0,102174
2014-11-10	0,130443	0,162756	0,103201
2014-11-17	0,130464	0,162807	0,103937
2014-11-24	0,130785	0,162895	0,103772
2014-12-01	0,131721	0,162803	0,104032
2014-12-08	0,131448	0,163032	0,103924
2014-12-15	0,131952	0,162928	0,104032
2014-12-22	0,133303	0,162647	0,104476
2014-12-29	0,134406	0,162515	0,104966
2015-01-05	0,137301	0,162866	0,107399
2015-01-12	0,139389	0,163070	0,107475
2015-01-19	0,142357	0,162683	0,107908
2015-01-26	0,143528	0,162122	0,107398
2015-02-02	0,142712	0,162306	0,106831
2015-02-09	0,143123	0,162569	0,106122
2015-02-16	0,142700	0,162441	0,105470
2015-02-23	0,143830	0,162246	0,105008
2015-03-02	0,146997	0,162151	0,106465
2015-03-09	0,152461	0,162058	0,108601
2015-03-16	0,152156	0,162729	0,109611

2015-03-23	0,149377	0,162982	0,109435
2015-03-30	0,150240	0,163301	0,109899
2015-04-06	0,151875	0,163329	0,110531
2015-04-13	0,152656	0,163405	0,110097
2015-04-20	0,151354	0,163405	0,108580
2015-04-27	0,147471	0,163455	0,107129
2015-05-04	0,145655	0,163422	0,106848
2015-05-11	0,144344	0,163572	0,104294
2015-05-18	0,146704	0,163453	0,104961
2015-05-25	0,149059	0,163250	0,106293
2015-06-01	0,146667	0,163084	0,106638
2015-06-08	0,144743	0,162965	0,105407
2015-06-15	0,144221	0,163150	0,103471
2015-06-22	0,145464	0,163224	0,103552
2015-06-29	0,146842	0,163205	0,104341
2015-07-06	0,147217	0,163144	0,105370
2015-07-13	0,149277	0,163198	0,104661
2015-07-20	0,149308	0,163273	0,104972
2015-07-27	0,147007	0,161847	0,103742
2015-08-03	0,146973	0,160780	0,103380
2015-08-10	0,141614	0,157015	0,100625
2015-08-17	0,139403	0,156184	0,099653
2015-08-24	0,137597	0,156000	0,100436
2015-08-31	0,140160	0,156950	0,102754
2015-09-07	0,139308	0,156659	0,101864
2015-09-14	0,138538	0,156821	0,101235
2015-09-21	0,139851	0,156589	0,102327
2015-09-28	0,140070	0,157007	0,103490
2015-10-05	0,139316	0,157239	0,102895
2015-10-12	0,138274	0,157395	0,102202
2015-10-19	0,140329	0,157208	0,102063
2015-10-26	0,142913	0,157395	0,102513
2015-11-02	0,144734	0,157394	0,103027
2015-11-09	0,145797	0,156856	0,103301
2015-11-16	0,146595	0,156498	0,102815
2015-11-23	0,147202	0,156274	0,103563
2015-11-30	0,145359	0,156023	0,103545
2015-12-07	0,142104	0,155461	0,102676
2015-12-14	0,141652	0,154475	0,102994
2015-12-21	0,141198	0,154470	0,103673
2015-12-28	0,141111	0,153975	0,104017
2016-01-04	0,140308	0,152313	0,104199
2016-01-11	0,139657	0,152089	0,105654

2016-01-18	0,139950	0,151989	0,106761
2016-01-25	0,139904	0,151915	0,106396
2016-02-01	0,137543	0,152032	0,105030
2016-02-08	0,135247	0,152184	0,105067
2016-02-15	0,137563	0,153288	0,106633
2016-02-22	0,139192	0,153132	0,109475
2016-02-29	0,139758	0,152782	0,108519
2016-03-07	0,138967	0,153807	0,107709
2016-03-14	0,137502	0,154106	0,107351
2016-03-21	0,137237	0,153658	0,108190
2016-03-28	0,136353	0,154347	0,108055
2016-04-04	0,135649	0,154499	0,109206
2016-04-11	0,136407	0,154454	0,108738
2016-04-18	0,136626	0,154242	0,107483
2016-04-25	0,135770	0,154180	0,105809
2016-05-02	0,134449	0,154030	0,106097
2016-05-09	0,134967	0,153387	0,106432
2016-05-16	0,135848	0,152924	0,105443
2016-05-23	0,136577	0,152440	0,104307
2016-05-30	0,135457	0,152006	0,104713
2016-06-06	0,134506	0,152294	0,105653
2016-06-13	0,134821	0,151762	0,106557
2016-06-20	0,134922	0,151603	0,106104
2016-06-27	0,135505	0,150371	0,112818
2016-07-04	0,135013	0,149648	0,114871
2016-07-11	0,135010	0,149485	0,113384
2016-07-18	0,135781	0,149582	0,113592
2016-07-25	0,135545	0,150124	0,113937
2016-08-01	0,135062	0,150500	0,114138
2016-08-08	0,135056	0,150471	0,115888
2016-08-15	0,133442	0,150590	0,115499
2016-08-22	0,133225	0,150099	0,114007
2016-08-29	0,134048	0,149691	0,113406
2016-09-05	0,133401	0,149750	0,112430
2016-09-12	0,133602	0,149784	0,113757
2016-09-19	0,133830	0,149864	0,115211
2016-09-26	0,133475	0,149911	0,115441
2016-10-03	0,133850	0,149862	0,118658
2016-10-10	0,134735	0,148783	0,121496
2016-10-17	0,135389	0,148158	0,121025
2016-10-24	0,135032	0,147533	0,120932
2016-10-31	0,133439	0,147814	0,119468
2016-11-07	0,134269	0,147088	0,117668

2016-11-14	0,136356	0,145568	0,117162
2016-11-21	0,136538	0,144682	0,116236
2016-11-28	0,136396	0,145124	0,115376
2016-12-05	0,135352	0,144180	0,114112
2016-12-12	0,137070	0,144241	0,114875
2016-12-19	0,137855	0,143883	0,116592
2016-12-26	0,137235	0,143879	0,117030

APPENDIX E

Table E 1 Trade balance between China and EU, [ext_st_eu27_2019sitc], exchange rate CNY/EUR, CNY/USD, CNY/GBP monthly from 2002 to 2016.

Time	Export	Import	Trade Balance	CNY/EUR	CNY/USD	CNY/GBP
2002M01	6.215,2	2.207,2	4.008,0	0,137397	0,120676	0,084436
2002M02	5.645,6	2.102,7	3.542,9	0,138515	0,120676	0,084740
2002M03	5.446,3	2.533,8	2.912,5	0,137570	0,120669	0,084720
2002M04	5.656,1	2.668,1	2.988,0	0,135486	0,120668	0,083368
2002M05	5.728,4	2.590,5	3.137,9	0,131147	0,120671	0,082681
2002M06	5.287,4	2.833,1	2.454,3	0,125899	0,120670	0,081135
2002M07	6.095,1	3.038,2	3.056,9	0,121671	0,120674	0,077445
2002M08	6.057,4	2.697,0	3.360,4	0,123455	0,120675	0,078643
2002M09	6.739,7	2.844,6	3.895,1	0,123056	0,120678	0,077443
2002M10	7.435,8	3.082,1	4.353,7	0,122821	0,120670	0,077555
2002M11	7.055,0	3.042,3	4.012,7	0,120343	0,120669	0,076670
2002M12	6.246,9	3.098,4	3.148,5	0,117671	0,120669	0,075787
2003M01	7.637,7	2.869,4	4.768,3	0,113038	0,120668	0,074403
2003M02	6.550,5	2.859,1	3.691,4	0,111900	0,120657	0,075163
2003M03	6.372,1	3.114,9	3.257,2	0,111863	0,120667	0,076363
2003M04	6.882,9	3.212,6	3.670,3	0,110301	0,120669	0,076311
2003M05	7.154,7	3.087,6	4.067,1	0,103756	0,120673	0,074270
2003M06	6.785,8	3.124,4	3.661,4	0,103687	0,120669	0,072594
2003M07	7.054,4	3.622,7	3.431,7	0,106420	0,120667	0,074718
2003M08	6.747,6	3.144,1	3.603,5	0,108382	0,120671	0,075790
2003M09	8.390,9	3.380,8	5.010,1	0,106586	0,120669	0,074344
2003M10	9.188,8	3.492,2	5.696,6	0,103064	0,120675	0,071787
2003M11	8.262,3	3.329,6	4.932,7	0,102830	0,120672	0,071318
2003M12	8.270,3	3.453,2	4.817,1	0,097766	0,120671	0,068646
2004M01	8.198,5	3.122,0	5.076,5	0,095822	0,120671	0,066146
2004M02	7.722,5	3.259,1	4.463,4	0,095575	0,120669	0,064632
2004M03	8.100,1	3.888,5	4.211,6	0,098480	0,120670	0,066022
2004M04	8.932,2	4.052,2	4.880,0	0,100740	0,120656	0,067057
2004M05	8.153,2	3.855,2	4.298,0	0,100137	0,120671	0,067107
2004M06	8.821,9	4.344,6	4.477,3	0,099351	0,120676	0,066024
2004M07	8.872,2	4.120,8	4.751,4	0,098403	0,120664	0,065383
2004M08	9.069,7	3.241,6	5.828,1	0,098928	0,120637	0,066470
2004M09	10.102,1	3.696,8	6.405,3	0,098465	0,120676	0,067211
2004M10	10.322,0	3.730,7	6.591,3	0,096276	0,120667	0,066663
2004M11	10.672,3	3.627,4	7.044,9	0,092315	0,120678	0,064434
2004M12	9.696,1	3.960,9	5.735,2	0,090311	0,120678	0,062533
2005M01	9.721,3	3.213,5	6.507,8	0,092335	0,120678	0,064246
2005M02	9.612,2	3.342,6	6.269,6	0,092336	0,120678	0,063624
2005M03	10.085,8	3.861,7	6.224,1	0,091679	0,120678	0,063535
2005M04	9.866,0	3.798,7	6.067,3	0,093235	0,120678	0,063573
2005M05	10.587,3	3.672,9	6.914,4	0,095718	0,120678	0,065361
2005M06	10.731,1	4.011,2	6.719,9	0,099498	0,120678	0,066523

2005M07	11.304,2	4.342,0	6.962,2	0,100847	0,121566	0,069464
2005M08	12.483,4	3.964,8	8.518,6	0,100008	0,123296	0,068474
2005M09	13.192,0	4.425,8	8.766,2	0,101056	0,123378	0,068458
2005M10	12.591,1	4.006,1	8.585,0	0,102725	0,123447	0,069937
2005M11	13.443,6	4.238,3	9.205,3	0,105223	0,123655	0,071580
2005M12	12.764,1	4.885,7	7.878,4	0,104256	0,123770	0,070830
2006M01	13.579,4	3.970,8	9.608,6	0,102403	0,123933	0,070167
2006M02	12.300,2	4.232,6	8.067,6	0,104076	0,124208	0,071157
2006M03	12.511,2	5.149,4	7.361,8	0,103283	0,124381	0,071370
2006M04	11.810,9	4.348,0	7.462,9	0,101542	0,124610	0,070458
2006M05	13.303,4	4.610,2	8.693,2	0,097469	0,124600	0,066641
2006M06	13.079,4	4.906,2	8.173,2	0,098646	0,124775	0,067773
2006M07	13.050,7	4.936,0	8.114,7	0,098303	0,125062	0,067461
2006M08	13.824,1	4.725,9	9.098,2	0,097828	0,125285	0,066123
2006M09	15.415,4	5.441,7	9.973,7	0,098962	0,125919	0,066833
2006M10	16.258,4	5.431,7	10.826,7	0,100073	0,126458	0,067265
2006M11	17.318,9	5.773,5	11.545,4	0,098142	0,127080	0,066221
2006M12	14.658,3	5.458,0	9.200,3	0,096814	0,127698	0,065109
2007M01	17.025,6	4.507,0	12.518,6	0,098714	0,128261	0,065466
2007M02	15.597,4	4.916,3	10.681,1	0,098331	0,128866	0,065884
2007M03	15.810,5	5.409,7	10.400,8	0,097380	0,129078	0,066271
2007M04	13.814,8	5.103,3	8.711,5	0,095608	0,129352	0,065050
2007M05	15.016,4	5.652,1	9.364,3	0,096529	0,130261	0,065725
2007M06	15.131,0	5.647,0	9.484,0	0,097483	0,130880	0,065859
2007M07	17.524,7	5.966,0	11.558,7	0,096108	0,131855	0,064835
2007M08	18.153,8	5.492,7	12.661,1	0,096859	0,131875	0,065681
2007M09	18.233,1	5.807,1	12.426,0	0,095361	0,132792	0,065731
2007M10	20.166,9	6.192,4	13.974,5	0,093398	0,133209	0,065011
2007M11	18.745,7	5.862,9	12.882,8	0,091602	0,134695	0,065083
2007M12	15.479,9	5.920,7	9.559,2	0,093136	0,135493	0,067239
2008M01	19.018,2	5.835,3	13.182,9	0,093823	0,138118	0,070196
2008M02	16.874,6	5.651,6	11.223,0	0,094474	0,139415	0,070988
2008M03	14.567,4	5.898,5	8.668,9	0,090893	0,141397	0,070717
2008M04	15.586,2	6.540,6	9.045,6	0,090752	0,142735	0,072079
2008M05	16.142,0	5.995,5	10.146,5	0,091980	0,143268	0,072889
2008M06	16.412,2	6.444,2	9.968,0	0,092831	0,144924	0,073530
2008M07	19.450,3	6.972,6	12.477,7	0,092741	0,146142	0,073499
2008M08	18.227,2	5.141,6	13.085,6	0,097802	0,145724	0,077542
2008M09	21.178,3	5.981,6	15.196,7	0,102017	0,145965	0,081205
2008M10	21.966,1	6.424,7	15.541,4	0,110931	0,146002	0,087298
2008M11	19.836,6	5.761,3	14.075,3	0,115041	0,146194	0,095683
2008M12	17.213,4	5.711,9	11.501,5	0,107575	0,145656	0,098250
2009M01	17.811,0	4.364,3	13.446,7	0,110571	0,146043	0,100909
2009M02	15.558,9	5.254,0	10.304,9	0,114058	0,146063	0,101238
2009M03	13.865,3	6.219,5	7.645,8	0,111454	0,146074	0,102398
2009M04	14.177,6	6.418,1	7.759,5	0,110921	0,146202	0,099181
2009M05	13.319,2	6.270,7	7.048,5	0,106785	0,146319	0,094478

2009M06	14.350,6	6.799,9	7.550,7	0,104259	0,146116	0,089271
2009M07	15.244,4	7.371,6	7.872,8	0,103676	0,146161	0,089226
2009M08	14.771,3	5.952,2	8.819,1	0,102448	0,146144	0,088615
2009M09	17.152,6	6.684,5	10.468,1	0,100004	0,146252	0,089906
2009M10	16.807,1	6.869,8	9.937,3	0,098553	0,146282	0,090205
2009M11	16.395,3	7.199,0	9.196,3	0,097994	0,146290	0,088189
2009M12	15.344,1	7.423,2	7.920,9	0,101108	0,146300	0,090597
2010M01	16.519,1	6.423,4	10.095,7	0,102612	0,146301	0,090592
2010M02	16.015,3	7.407,5	8.607,8	0,106948	0,146252	0,093757
2010M03	19.490,6	9.230,6	10.260,0	0,107799	0,146284	0,097025
2010M04	16.814,4	8.268,6	8.545,8	0,109083	0,146351	0,095388
2010M05	18.978,8	8.663,0	10.315,8	0,117336	0,146261	0,100025
2010M06	21.243,1	9.574,8	11.668,3	0,119427	0,146610	0,098784
2010M07	22.051,0	9.672,0	12.379,0	0,114836	0,147366	0,096177
2010M08	22.794,6	8.025,1	14.769,5	0,114092	0,147060	0,094120
2010M09	24.808,0	9.050,3	15.757,7	0,112687	0,148426	0,095015
2010M10	23.343,4	9.081,5	14.261,9	0,107623	0,149828	0,094372
2010M11	22.582,9	9.733,9	12.849,0	0,110302	0,150062	0,094216
2010M12	21.382,0	10.003,6	11.378,4	0,113635	0,150339	0,096400
2011M01	21.847,1	8.832,3	13.014,8	0,112938	0,151513	0,095645
2011M02	20.097,3	9.704,3	10.393,0	0,110805	0,151818	0,093941
2011M03	20.978,4	11.768,8	9.209,6	0,108203	0,152133	0,094314
2011M04	19.309,3	9.772,6	9.536,7	0,105613	0,153116	0,093286
2011M05	21.097,8	10.911,5	10.186,3	0,107277	0,153850	0,094101
2011M06	20.913,3	10.310,9	10.602,4	0,107330	0,154318	0,095439
2011M07	21.001,8	10.796,7	10.205,1	0,108409	0,154843	0,095773
2011M08	23.979,9	10.184,4	13.795,5	0,108920	0,156145	0,095495
2011M09	23.132,0	10.528,9	12.603,1	0,114131	0,156144	0,099270
2011M10	22.563,5	11.142,4	11.421,1	0,113987	0,156669	0,099033
2011M11	21.904,9	11.350,6	10.554,3	0,116304	0,157058	0,099715
2011M12	19.442,9	11.267,9	8.175,0	0,119467	0,156856	0,100613
2012M01	22.352,6	10.143,5	12.209,1	0,122356	0,158258	0,101742
2012M02	20.946,6	11.264,7	9.681,9	0,119659	0,158557	0,100247
2012M03	17.808,2	11.812,4	5.995,8	0,119534	0,157921	0,099780
2012M04	18.850,5	10.546,0	8.304,5	0,120165	0,158139	0,098596
2012M05	21.478,9	11.353,5	10.125,4	0,124214	0,157735	0,099763
2012M06	21.057,5	12.187,5	8.870,0	0,125704	0,157960	0,101396
2012M07	22.222,9	11.770,7	10.452,2	0,128728	0,158193	0,101412
2012M08	22.417,9	10.567,3	11.850,6	0,127018	0,157779	0,100225
2012M09	21.089,1	10.171,7	10.917,4	0,122477	0,157811	0,097888
2012M10	22.444,5	11.279,9	11.164,6	0,122301	0,158545	0,098616
2012M11	20.990,0	11.151,4	9.838,6	0,124030	0,159176	0,099772
2012M12	18.601,2	9.999,0	8.602,2	0,120973	0,158743	0,098331
2013M01	22.209,2	10.120,0	12.089,2	0,119140	0,159212	0,100048
2013M02	19.066,7	9.790,3	9.276,4	0,119469	0,158914	0,102990
2013M03	17.783,2	11.342,0	6.441,2	0,122891	0,159274	0,105525
2013M04	18.163,0	11.555,7	6.607,3	0,122844	0,160194	0,104353

2013M05	19.675,9	11.195,3	8.480,6	0,124541	0,161364	0,105830
2013M06	18.497,1	11.161,7	7.335,4	0,122675	0,161803	0,104486
2013M07	20.913,0	12.425,4	8.487,6	0,123467	0,161782	0,106538
2013M08	20.473,2	10.986,7	9.486,5	0,121702	0,162162	0,104382
2013M09	21.240,4	10.921,3	10.319,1	0,121311	0,162491	0,102094
2013M10	21.895,0	12.217,5	9.677,5	0,119551	0,163094	0,101495
2013M11	20.023,3	11.819,2	8.204,1	0,120808	0,163049	0,101090
2013M12	19.197,4	11.200,8	7.996,6	0,119318	0,163474	0,099719
2014M01	22.113,7	10.962,3	11.151,4	0,120412	0,163880	0,099516
2014M02	19.808,3	11.036,9	8.771,4	0,119607	0,163579	0,098669
2014M03	18.722,6	11.774,4	6.948,2	0,117666	0,162540	0,097791
2014M04	18.598,6	11.854,6	6.744,0	0,117105	0,162004	0,096493
2014M05	19.949,9	12.008,6	7.941,3	0,118203	0,162115	0,096281
2014M06	20.760,5	12.093,9	8.666,6	0,119241	0,162235	0,095658
2014M07	22.980,3	13.641,0	9.339,3	0,119939	0,162058	0,095109
2014M08	21.059,8	10.617,6	10.442,2	0,121951	0,162324	0,097263
2014M09	24.931,5	12.631,3	12.300,2	0,126487	0,162519	0,099870
2014M10	24.397,2	13.444,2	10.953,0	0,128474	0,162861	0,101369
2014M11	21.623,5	12.096,9	9.526,6	0,130534	0,162792	0,103271
2014M12	21.770,7	12.940,3	8.830,4	0,132566	0,162785	0,104286
2015M01	25.794,2	10.800,4	14.993,8	0,140644	0,162685	0,107545
2015M02	24.339,8	10.874,3	13.465,5	0,143091	0,162391	0,105858
2015M03	26.005,8	12.833,1	13.172,7	0,150246	0,162644	0,108802
2015M04	20.382,0	12.787,7	7.594,3	0,150839	0,163399	0,109084
2015M05	21.993,8	11.747,8	10.246,0	0,146441	0,163424	0,105599
2015M06	24.112,4	12.868,7	11.243,7	0,145587	0,163126	0,104682
2015M07	25.643,7	13.548,8	12.094,9	0,148202	0,162866	0,104686
2015M08	24.017,1	10.382,6	13.634,5	0,141149	0,157386	0,101370
2015M09	26.958,3	12.549,3	14.409,0	0,139442	0,156769	0,102229
2015M10	26.764,9	12.391,9	14.373,0	0,140208	0,157309	0,102418
2015M11	25.495,5	12.365,7	13.129,8	0,145937	0,156609	0,103250
2015M12	24.378,7	12.412,6	11.966,1	0,141516	0,154595	0,103340
2016M01	26.392,7	10.495,4	15.897,3	0,139955	0,152077	0,105753
2016M02	24.970,4	11.469,7	13.500,7	0,137861	0,152684	0,106945
2016M03	23.946,7	12.763,9	11.182,8	0,137515	0,153980	0,107826
2016M04	20.989,0	13.249,1	7.739,9	0,136113	0,154344	0,107809
2016M05	22.869,7	11.771,1	11.098,6	0,135460	0,152957	0,105398
2016M06	24.358,3	13.608,3	10.750,0	0,134939	0,151508	0,107783
2016M07	24.038,0	12.847,7	11.190,3	0,135337	0,149710	0,113946
2016M08	26.115,6	11.805,4	14.310,2	0,134167	0,150270	0,114588
2016M09	26.934,5	12.672,9	14.261,6	0,133577	0,149827	0,114210
2016M10	26.212,5	12.819,5	13.393,0	0,134489	0,148430	0,120316
2016M11	25.761,1	14.421,5	11.339,6	0,135890	0,145616	0,116611
2016M12	24.426,3	15.538,3	8.888,0	0,136878	0,144046	0,115652