Using the OLS Method to Analyze Indian Currency Fluctuations

Anna Nie

The School of Economics, Shanghai University, Shanghai, China

Email address:
m18800200686@163.com

Abstract: This article mainly uses the OLS method to analyze Indian currency fluctuations in 2014. We choose the exchange rate fluctuation of the Indian rupee against the Swiss franc as our research object. In order to analyze the influence of the Indian rupee against the Swiss franc, here this article mainly considers two factors: the exchange rate of dollar against the Swiss franc and exchange rate of the euro against the Swiss franc. This article use binary regression model considering two factors affect rupees/Swiss franc. By contrast, we found that the results of 2006 in the original model are better than the 2014.

Keywords: OLS, Exchange Rate, India

1. Introduction

The exchange rate always plays an important role in the economic life. It is closely related with the national macroeconomic regulation and control, economic policy, and the rate of inflation, even the nation's internal and external economy and international economy. It also plays an important role in the macroeconomic regulation and control, and economic stability. Meanwhile, it also concerns with the economic development trend, and has a significant and profound impact on the economy. Because the exchange rate system structure of India and China have some similarities, so in this paper, we study the Indian currency fluctuations and it should has the some enlightenment on China's exchange rate system. India is one of the fastest growing countries in the world, and has remarkable economic growth. If measured in the same purchasing power, India's gross domestic product is $4.457 million in 2011, with Japan tied for third in the world, second only to the United States, China. But if we use the dollar assessment, India's gross domestic product is only $1.676 million, ranked 11th in the world, and is nearly the same as the developed countries with just 23 million people in Australia. India's annual growth rate is 5.8%, and 6.1% in 2011 to 2012.Social wealth in a developing country like India is extreme imbalance, because 10% of the country's population control 33% of the nation's income. Because of India's population, the average gross national product (GNP) is very low, in 2011, India's average GDP (PPP) of $3694, 129th in the world. The dollar exchange rate is $1389, for the 140th in the world. Before 1991, influenced by the socialist planned economy, economic policy adopted trade protectionism, the Indian government interference labor and financial markets and regulatory business activities, because of India's economic crisis of 1991, with the collapse of the Soviet union, the new congress government made India begin to implement economic liberalization, by foreign trade and direct investment, gradually transition to the free market, India's economy obtained faster growth.

The Indian economy mainly depends on farming, modern agriculture, handicraft industry, modern industry and its supporting industries primarily. The country still has a population of a quarter could not get enough food and clothing. India has enough foreign exchange reserves, exchange rate stability, and the future official will exchange controls, which is decided by market value. India's manufacturing exports have begun to decline; power supply across large parts of the country is still insufficient. The population of India has a lot of people who is proficient in English, and now is the main, in the 21st century, information service industry of the world's main producers, computer software exporter and numerous software engineer of the motherland.

2. Econometric Analysis Method and Data

2.1. Variable Selection

The choice of samples in this article is based on research needs and data quality.

2.2. The Selection of Model Indicators

In order to analyze the influence of the Indian rupee against the Swiss franc, here this article mainly considers two factors: the exchange rate of dollar against the Swiss franc and exchange rate of the euro against the Swiss franc. This article use binary regression model considering two factors affect rupees/Swiss franc.

2.2.1. Explained Variable Selection

From the perspective of international literature, the measure of exchange rate fluctuation need choose one of the countries' currencies as a comparison. In this paper, we select Swiss Franc as a comparison of exchange rate fluctuation, because The Swiss Franc is a relatively stable currency.

2.2.2. Explanatory Variables Selection

The exchange rate fluctuation of Indian rupee against the Swiss franc is influenced by many factors. Here we consider two main factors: the dollar exchange rate against the Swiss franc, and the euro exchange rate against the Swiss franc. The dollar in the global financial system and the trading system is the primary reserve currency, so he's exchange rate fluctuation has certain impact on the exchange rate fluctuations of other countries around the world, including India. The euro, as another second only to a strong dollar, the currency exchange rate volatility also has a certain impact on Indian rupee against the Swiss franc Through these indicators, the exchange rate fluctuation of Indian rupee against the Swiss franc can be observed through the exchange rate of dollar against the Swiss franc and exchange rate of the euro against the Swiss franc.

2.2.3. The Selection of Control Variable

The main content of this article is to study the influence factors of the Indian currency fluctuations over the past few years. In order to eliminate the influence of other factors on the explanatory variables, this article selects the two control variables related to the exchange rate fluctuation to ensure the accuracy of the results.

The fluctuations of Indian exchange rate is influenced by the exchange rate of dollar against the Swiss franc and the exchange rate of the euro against the Swiss franc. Generally, the fluctuations of Indian rupee against Swiss francs are more vulnerable to the influence of the international strong currency.

The exchange rate fluctuations of Indian rupee against the Swiss franc and the exchange rate of dollar against the Swiss franc and exchange rate of the euro against the Swiss franc have close relationship.

3. The Construction of Regression Model

3.1. The Construction of Regression Model of Indian
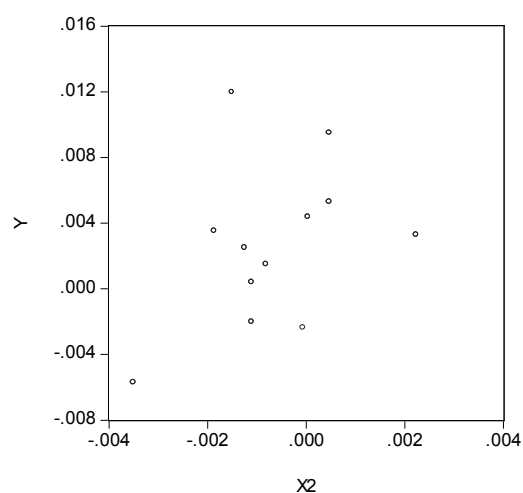
$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + U_i$$

3.2. Data Sampling

Table 1. *The exchange rate of rupee against the Swiss franc, the euro, the dollar.*

Year	INR/SF(Y)	USD/SF(X$_1$)	EUR/SF(X$_2$)
2013-12	0.01444	0.8942	1.2249
2014-1	0.01455	0.9035	1.2312
2014-2	0.01436	0.8942	1.2213
2014-3	0.01445	0.8811	1.2178
2014-4	0.01462	0.8826	1.2191
2014-5	0.01495	0.888	1.2204
2014-6	0.015	0.896	1.2181
2014-7	0.01493	0.8969	1.215
2014-8	0.01495	0.9098	1.2219
2014-9	0.01536	0.9354	1.2077
2014-10	0.01552	0.9526	1.2078
2014-11	0.01565	0.9646	1.2026
2014-12	0.01556	0.9759	1.2024
2013-12	0.01444	0.8942	1.2249
2014-1	0.01455	0.9035	1.2312
2014-2	0.01436	0.8942	1.2213
2014-3	0.01445	0.8811	1.2178

Table 2. *The difference of exchange rate.*

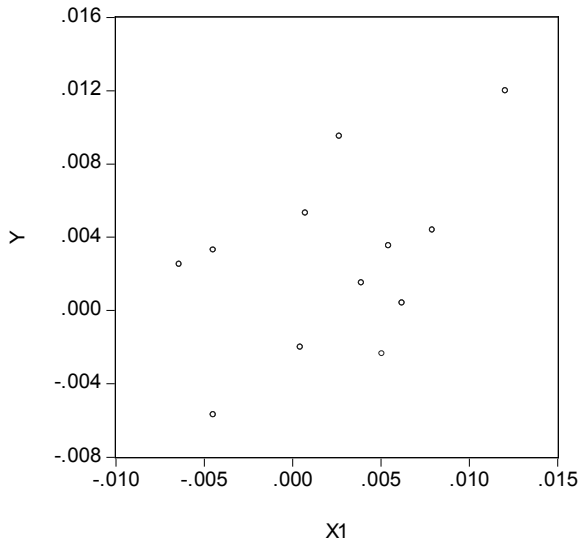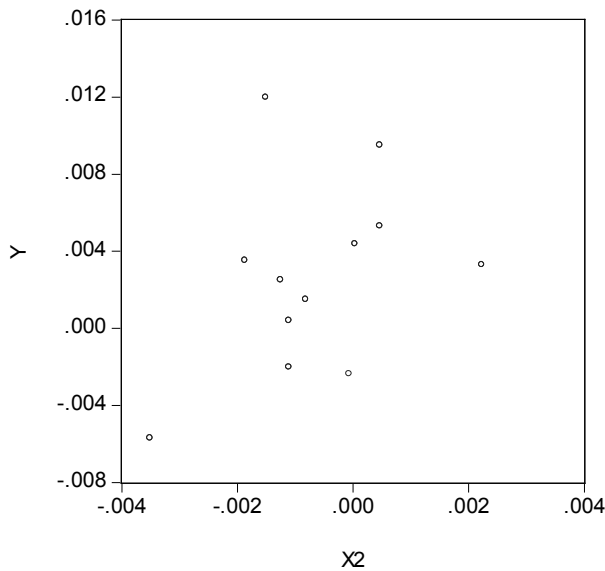| Year	Y	X$_1$	X$_2$
2014-1	0.003301	-0.00449	0.002228
2014-2	-0.00569	-0.00449	-0.00351
2014-3	0.002517	-0.00641	-0.00125
2014-4	0.005314	0.000739	0.000463
2014-5	0.009506	0.002649	0.000463
2014-6	0.001509	0.003895	-0.00082
2014-7	-0.00201	0.000436	-0.00111
2014-8	0.000413	0.006202	-0.00111
2014-9	0.011984	0.012051	-0.00151
2014-10	0.004385	0.007913	3.6E-05
2014-11	0.003538	0.005437	-0.00187
2014-12	-0.00236	0.005058	-7.2E-05
Average Value	0.002701	0.002415	-0.00067

Figure 1. The scatter plot of the correlation between X_1 and Y.

Figure 2. The scatter plot of the correlation between X_2 and Y.

Table 3. Main index regression results.

$\overset{\bullet}{Y}$	$\overset{\bullet}{X}_1$	$\overset{\bullet}{X}_2$
0.0006	-0.00691	0.002899
-0.00839	-0.00691	-0.00284
-0.00018	-0.00882	-0.00058
0.002613	-0.00168	0.001134
0.006805	0.000234	0.001134
-0.00119	0.00148	-0.00015
-0.00471	-0.00198	-0.00044
-0.00229	0.003787	-0.00044
0.009283	0.009636	-0.00084
0.001684	0.005498	0.000707
0.000837	0.003021	-0.0012
-0.00506	0.002643	0.000599

Table 4. Main index regression results.

$\overset{\bullet}{Y}{}^{2}$	$\overset{\bullet}{X}_1^2$	$\overset{\bullet}{X}_2^2$
3.605E-07	4.77295E-05	8.40337E-06
7.04019E-05	4.77295E-05	8.03877E-06
3.37028E-08	7.78767E-05	3.31166E-07
6.82995E-06	2.81152E-06	1.2863E-06
4.63137E-05	5.45782E-08	1.28531E-06
1.41987E-06	2.18963E-06	2.20264E-08
2.21896E-05	3.91837E-06	1.8982E-07
5.23304E-06	1.43388E-05	1.92103E-07
8.61818E-05	9.28547E-05	7.00359E-07
2.83726E-06	3.02277E-05	4.99919E-07
7.01267E-07	9.12848E-06	1.44641E-06
2.56095E-05	6.98487E-06	3.58688E-07

Table 5. Main index regression results.

$\overset{\bullet}{X}_1 * \overset{\bullet}{X}_2$	$\overset{\bullet}{X}_1 * \overset{\bullet}{Y}$	$\overset{\bullet}{X}_2 * \overset{\bullet}{Y}$
-2.00272E-05	-4.14807E-06	1.74052E-06
1.95879E-05	5.79677E-05	2.37896E-05
5.0784E-06	1.62008E-06	1.05647E-07
-1.9017E-06	-4.38207E-06	2.96401E-06
2.64858E-07	1.58988E-06	7.71541E-06
-2.19613E-07	-1.76323E-06	1.76846E-07
8.6243E-07	9.32453E-06	2.05232E-06
-1.65968E-06	-8.66231E-06	1.00264E-06
-8.06422E-06	8.9456E-05	-7.76906E-06
3.88734E-06	9.26088E-06	1.19097E-06
-3.63367E-06	2.53012E-06	-1.00714E-06
1.58284E-06	-1.33746E-05	-3.03081E-06

$$S_{yy} = \sum \overset{\bullet}{Y}{}^{2} = 0.00027 \tag{1}$$

$$S_{11} = \sum \overset{\bullet}{X}_1{}^{2} = 0.00036$$

$$S_{12} = \sum \overset{\bullet}{X}_1 \overset{\bullet}{X}_2 = -0.0000043$$

$$S_{22} = \sum \overset{\bullet}{X}_2^{2} = 0.000023$$

$$S_{12} = \sum \overset{\bullet}{X}_1 \overset{\bullet}{X}_2 = -0.0000043$$

$$S_{22} = \sum \overset{\bullet}{X}_2^{2} = 0.000023$$

$$S_{1y} = \sum \overset{\bullet}{X}_1 \overset{\bullet}{Y} = 0.000139$$

$$S_{2y} = \sum \overset{\bullet}{X}_2 \overset{\bullet}{Y} = 0.000029$$

$$D_0 = S_{11} * S - S * S_{12} = 0.000000007624 \tag{2}$$

$$D_1 = S_{1y} * S_{22} - S_{12} * S_{2y} = 0.0000000033$$

$$D_2 = S_{11} * S_{2y} - S_{12} * S_{1y} = 0.0000000103$$

$$\beta_1 = \frac{D_1}{D_0} = 0.4321 \tag{3}$$

$$\beta_2 = \frac{D_2}{D_0} = 1.3516$$

$$\beta_0 = 0.002564$$

3.3. Regression Results and Analysis

$$Y = 0.002564 + 0.4321 X_1 + 1.3516 X_2$$

4. Model Test

4.1. Significance Test

According the regression equation, we can see the Rupee/Swiss franc is influenced by dollar/Swiss franc, and the euro/Swiss franc. On the surface, the three have positive correlation.

4.2. Statistical Tests

4.2.1. Test of Goodness of Fit

$$R^2 = \frac{\hat{\beta}_1 S_{1y} + \hat{\beta}_2 S_{2y}}{S_{yy}} = 0.3706 \tag{4}$$

$$\bar{R}^2 = 1 - \frac{n-1}{n-k-1}(1-R^2) = 0.2308 \tag{5}$$

Conclusion: the goodness-of-fit is 0.3706, and the adjusted coefficient is 0.2308, which shows that the fitting degree of this model on the whole is very poor, explain variables cannot be explained well, simply because there may be a heteroscedasticity, multicollinearity, or the autocorrelation.

4.2.2. F Test

Table 6. F test.

$\hat{Y}_i$	$\hat{Y}_i - \bar{Y}$	$(\hat{Y}_i - \bar{Y})^2$	$Y_i - \bar{Y}$
0.003634	0.000933	8.69683E-07	0.0006
-0.00412	-0.00682	4.64812E-05	-0.00839
-0.00189	-0.00459	2.108E-05	-0.00018
0.00351	0.000809	6.53868E-07	0.002613
0.004335	0.001633	2.66828E-06	0.006805
0.00314	0.000439	1.92759E-07	-0.00119
0.001257	-0.00144	2.08576E-06	-0.00471
0.003745	0.001044	1.08923E-06	-0.00229
0.005734	0.003033	9.2007E-06	0.009283
0.006032	0.003331	1.1098E-05	0.001684
0.002381	-0.00032	1.02456E-07	0.000837
0.004652	0.001951	3.80757E-06	-0.00506

Table 7. F test.

$(Y_i - \bar{Y})^2$	$U_i = Y_i - \hat{Y}$	$U^2_i = (Y_i - \hat{Y})^2$
3.605E-07	-0.00033	1.10932E-07
7.04E-05	-0.00157	2.46908E-06
3.37E-08	0.004409	1.94349E-05
6.83E-06	0.001805	3.25661E-06
4.631E-05	0.005172	2.67446E-05
1.42E-06	-0.00163	2.65882E-06
2.219E-05	-0.00327	1.06673E-05
5.233E-06	-0.00333	1.11004E-05
8.618E-05	0.00625	3.90623E-05
2.837E-06	-0.00165	2.71562E-06
7.013E-07	0.001158	1.33983E-06
2.561E-05	-0.00701	4.91781E-05

$$ESS = \sum (\hat{Y}_i - \bar{Y})^2 = 0.00009933 \tag{6}$$

$$RSS = \sum (Y_i - \hat{Y}_i)^2 = 0.000168738 \tag{7}$$

$$F = \frac{ESS/K}{RSS/(N-K-1)} = 2.65 \tag{8}$$

Hypothesis:

$H_0: \beta_i = 0$

$H_1:$ not all the β_i is equal to 0

Statistical magnitude F=2.65 obey the F-distribute whose degrees of freedom is (2, 9), according to the table, the critical value is $F_{\alpha=0.01} = 3.01$, F<3.01, we cannot refuse the null hypothesis. This model is false under the significance level of 99%.

4.2.3. T Test

$$S^2 = \frac{\sum_{i=1}^n \hat{u}_i^2}{n-k-1} = 0.00001874 \tag{9}$$

$$S_{\hat{\partial}}^2 = \frac{S^2}{n} + \frac{\bar{X}_1 S_{22} + \bar{X}_2 S_{11} - 2\bar{X}_1 \bar{X}_2 S_{22}}{D_0} = 0.000002229 \tag{10}$$

$$S_{\hat{\beta}_1}^2 = \frac{S^2 S_{11}}{D_0} = 0.5598$$

$$S_{\hat{\beta}_2}^2 = \frac{S^2 S_{22}}{D_0} = 0.8250$$

$$S_{\hat{\alpha}} = 0.001493$$

$$S_{\hat{\beta}_1} = 0.2366$$

$$S_{\hat{\beta}_2} = 0.9083$$

$$t_{\hat{\alpha}} = \frac{\hat{\alpha}}{S_{\hat{\alpha}}} = 1.718041 \tag{11}$$

$$t_{\hat{\beta}_1} = \frac{\hat{\beta}_1}{S_{\hat{\beta}_1}} = 1.82$$

$$t_{\hat{\beta}_2} = \frac{\hat{\beta}_2}{S_{\hat{\beta}_2}} = 1.4873$$

Hypothesis:

$H_0:\ \beta_1 = \beta_2 = 0$

$H_1:$ not all the β_i is equal to 0

$\alpha = 0.01$

According to the table, $t_{0.01}(9) = 2.821$, $t_{\hat{\alpha}} < 2.821$, $t_{\hat{\beta}_1}$

< 2.821, $t_{\hat{\beta}_2} < 2.821$ we cannot reject the null hypothesis. This model is false under the significance level of 99%. The reason may be a heterosexuality, multidisciplinary, or the auto-correlation.

4.3. Economic Test

4.3.1. Auto-correlation Test

In this article, we choose D-W test to test auto-correlation, which is a regular way to test it.

(1) $H_0: d = 2$, $H_1: d \neq 2$

(2) $d = \dfrac{\sum\limits_{t=2}^{n}(u_t - u_{t-1})^2}{\sum\limits_{t=1}^{n} u_t^2} = 2.2658$, according to k=2, n=12 we

know $d_l = 0.569$, $d_u = 1.274$, meanwhile $d_u < d < 4-d_u$, so we accept the null hypothesis and firmly believe the disturbance is out of auto-correlation.

4.3.2. Test for Multi-collinearity

There are many ways to test the multi-collinearity, such as the correlation coefficient test and the variance inflation factor test. In this article, we adopt the first one to test the multi-collinearity. By calculating, we come into conclusion that there is no multi-collinearity. And the counting process is as follows:

$$\rho = \frac{\text{cov}(X_1, X_2)}{\sqrt{D(X_1)D(X_2)}} = -0.04793 < 1 \tag{12}$$

4.3.3. Test for Heterosexuality

In this test, we adopt Glejser test.

$$\text{Glejser Test:}\ \left| U_i \right| = \alpha_0 + \alpha_1 f(x_i) + \varepsilon_i \tag{13}$$

(1) Null hypothesis: $H_0: \alpha_1 = 0$, Alternate hypothesis: $H_1: \alpha_1 \neq 0$

(2) Select X_1 and use the OLS method to calculate their goodness of fit when $f(x) = x_1$, x_1^2, x_1^3, so the results are $R_1 = 0.12355$, $R_2 = 0.1518$, $R_3 = 0.6656$

(3) Select X_2 and use the OLS method to calculate their goodness of fit when $f(x) = x_2$, x_2^2, x_2^3, so the results are $R_1 = 0.2343$, $R_2 = 0.3555$, $R_3 = 0.01413$

(4) Choose the biggest number of the goodness of fit. We know the biggest number of R is $f(x) = x_1^3$, at the same time, α_1 is not equal te0, so there don't exist heterosexuality.

(5) Solution: In this article we use the weighted least square method and the weight is $W_i = \dfrac{1}{|u_i|}$

Table 8. Weighted data.

$W_i Y$	$W_i X_1$	$W_i X_2$
10.00167879	-13.61663939	6.751430303
-3.621180892	-2.862096178	-2.233280255
0.570860059	-1.45372284	-0.28269154
2.943916898	0.409264266	0.256710249
1.837907773	0.512189288	0.089494973
0.925608589	2.389597546	-0.502611043
-0.614763303	0.133337615	-0.338429664
0.124099099	1.862434835	-0.333180781
1.91738592	1.92822928	-0.24123504
2.657718788	4.795886061	0.021793333
3.054865285	4.694887737	-1.618157168
-0.336309272	0.721549215	-0.010271041

Table 9. Weighted data processing.

$\dot{Y}$	$\dot{X}_1$	$\dot{X}_2$	$\dot{Y}^2$
8.379863	-13.5762	6.621466	70.22211
-5.243	-2.82167	-2.36324	27.48901
-1.05096	-1.4133	-0.41266	1.104508
1.322101	0.449688	0.126746	1.747952
0.216092	0.552613	-0.04047	0.046696
-0.69621	2.430021	-0.63258	0.484704
-2.23658	0.173761	-0.46839	5.002285
-1.49772	1.902858	-0.46315	2.243155
0.29557	1.968653	-0.3712	0.087362
1.035903	4.83631	-0.10817	1.073095
1.43305	4.735311	-1.74812	2.053631
-1.95812	0.761973	-0.14024	3.834253

Table 10. *Weighted data processing.*

$\overset{\cdot}{X}_1^2$	$\overset{\cdot}{X}_1^2$	$\overset{\cdot}{Y}\ \overset{\cdot}{X}_1$	$\overset{\cdot}{Y}\ \overset{\cdot}{X}_2$	$\overset{\cdot}{X}_1\ \overset{\cdot}{X}_2$
184.3136	43.84381	-113.767	55.48698	-89.8945
7.961836	5.584925	14.79402	12.39048	6.668303
1.997415	0.170285	1.485315	0.433683	0.583206
0.202219	0.016065	0.594533	0.167571	0.056996
0.305381	0.001638	0.119415	-0.00875	-0.02236
5.905003	0.400152	-1.6918	0.440403	-1.53717
0.030193	0.219393	-0.38863	1.0476	-0.08139
3.62087	0.214503	-2.84994	0.69366	-0.8813
3.875594	0.137789	0.581875	-0.10972	-0.73076
23.38989	0.011701	5.009948	-0.11205	-0.52315
22.42317	3.055929	6.785936	-2.50514	-8.2779
0.580602	0.019666	-1.49204	0.274598	-0.10686

β_0=1.3927, β_1=0.3384, β_2=1.8679

So the adjusted model is: Y=1.3927+0.3384X$_1$+1.8679X$_2$.

5. Adjusted Model Test

5.1. Statistical Test

5.1.1. Test of Goodness of Fit

$$R^2 = \frac{\hat{\beta}_1 S_{1y} + \hat{\beta}_2 s_{2y}}{S_{yy}} = 0.8376$$

$$\bar{R}^2 = 1 - \frac{n-1}{n-k-1}(1-R^2) = 0.802$$

The goodness-of-fit rise sharply after adjustment, so the explain variables can well explained variable.

5.1.2. F Test

Table 11. *F test of adjusted data.*

$\hat{Y}_i$	$\hat{Y}_i$ - $\bar{Y}$	$(\hat{Y}_i$ - $\bar{Y})^2$	Y_i - $\bar{Y}$
9.395886786	7.774071141	60.43618211	8.379863144
-5.140232889	-6.762048533	45.72530037	-5.242996536
-1.020020485	-2.641836129	6.979298133	-1.050955585
0.61802354	-1.003792104	1.007598589	1.322101253
0.340506565	-1.281309079	1.641752957	0.216092128
-0.130162606	-1.75197825	3.06942779	-0.696207055
-0.5870437	-2.208859345	4.879059604	-2.236578947
0.007921455	-1.61389419	2.604654455	-1.497716545
0.201937116	-1.419878528	2.016055035	0.295570276
1.663730977	0.041915333	0.001756895	1.035903144
-1.433785096	-3.05560074	9.336695881	1.433049641
0.225000724	-1.396814921	1.951091922	-1.958124917

Table 12. *F test of adjusted data.*

$(Y_i$ - $\bar{Y})^2$	U_i = Y_i - $\hat{Y}$	U^2_i = $(Y_i$ - $\hat{Y})^2$
70.22210631	0.605792002	0.36698395
27.48901268	1.519051997	2.30751897
1.104507642	1.590880544	2.530900905
1.747951724	2.325893358	5.409779911
0.046695808	1.497401208	2.242210377
0.484704264	1.055771195	1.114652816
5.002285386	-0.027719602	0.000768376
2.24315485	0.116177644	0.013497245
0.087361788	1.715448804	2.9427646
1.073095323	0.993987811	0.988011769
2.053631273	4.48865038	20.14798224
3.834253189	-0.561309996	0.315068912

$$ESS = \sum(\hat{Y}_i - \bar{Y})^2 = 139.6489$$

$$TSS = \sum(Y_i - \hat{Y}_i)^2 = 38.389$$

$$F = \frac{ESS/K}{RSS/(N-K-1)} = 16.3736$$

Suppose: H$_0$: β_i=0。 H$_1$:not all the β_i is equal to 0,F> F$_{\alpha=0.01}$ =3.01,so we reject the null hypothesis，and failure to reject Alternate hypothesis, that is not all the β_i is equal to 0.We can accept the adjusted model on 99% level.

5.1.3. T Test

$$S^2 = \frac{\sum_{i=1}^{n} u_i^2}{n-k-1} = 4.2645$$

$$S_{\hat{\alpha}}^2 = \frac{S^2}{n} + \frac{\bar{X}_1 S_{22} + \bar{X}_2 S_{11} - 2\bar{X}_1 \bar{X}_2 S_{22}}{D_0} = 0.3621$$

$$S_{\hat{\beta}_1}^2 = \frac{S^2 S_{11}}{D_0} = 0.2315 \quad S_{\hat{\beta}_2}^2 = \frac{S^2 S_{22}}{D_0} = 0.0488$$

$$S_{\hat{\alpha}} = 0.6017 \quad S_{\hat{\beta}_1} = 0.4811$$

$$S_{\hat{\beta}_2} = 0.2193 \quad t_{\hat{\alpha}} = \frac{\hat{\alpha}}{S_{\hat{\alpha}}} = 3.8462$$

$$t_{\hat{\beta}_1} = \frac{\hat{\beta}_1}{S_{\hat{\beta}_1}} = 2.19 \quad t_{\hat{\beta}_2} = \frac{\hat{\beta}_2}{S_{\hat{\beta}_2}} = 8.52$$

Hypothesis: $H_0 : \beta_i =0$, H_1 :not all the β_i is equal to 0. $t_{0.05}$

(9)=1.833, $t_{\hat{\alpha}}$ >1.833, $t_{\hat{\beta}_1}$ >1.833, $t_{\hat{\beta}_2}$ >1.833, so we reject the null hypothesis，and failure to reject alternate hypothesis, that is not all the β_i is equal to 0.We can accept the adjusted model on 99% level.

5.2. Economic Test: Heteroscedasticity

There are many ways to test the heteroscedasticity of the model .In this article we choose White test, which is a regular way to test heteroscedasticity. And the detailed process are as follow:

(1) Hypothesis: $H_0 :$ $\alpha_1 =0$, $H_1 :$ $\alpha_1 \neq 0$

nR =3.645 and nR obey the $\chi(4)$. Suppose $\alpha = 0.05$, then we can get $\chi_{0.05}(4)=9.49$, $nR < \chi_{0.05}$, so we cannot reject the null hypothesis，There is no heterosexuality in the model.

(2) Auto-correlation test

d=1.3411, d_u <d<4- d_u, So it do not exist auto-correlation.

(3) Multicollinearity test

λ_1= 292.15328, λ_2= 17.84474, λ_3= 11.29742, $\sqrt{CN} = \sqrt{\dfrac{\lambda_1}{\lambda_3}}$ =5.085<10, So it do not exist multicollinearity.

5.3. Compare with the 2006's Data

Table 13. The exchange rate of the countries in 2006.

Month	INR/SF(Y)	USD/SF(X_1)	EUR/SF(X_2)
1	-1.53985	0.0244446	0.107346
2	-1.53121	0.0385407	0.115477
3	-1.53239	0.0359498	0.115877
4	-1.54409	0.0199882	0.108497
5	-1.57073	-0.019724	0.086182
6	-1.57219	-0.011129	0.090928
7	-1.57479	-0.01104	0.092194
8	-1.57757	-0.017277	0.090293
9	-1.56896	-0.009839	0.094855
10	-1.55721	-8.69E-05	0.100646
11	-1.55956	-0.017729	0.092229
12	-1.56719	-0.038389	0.082498

This time we got the results from Eviews: Y=-1.7408-0.2242X_1 +1.8626X_2 +U_i

5.3.1. Statistical test

(1) Test of goodness of fit: R^2 =0.8537

$\bar{R^2}$ =0.8212

Conclusion: adjusted goodness of fit is larder, which show that the explanatory variable can well explain the explained variable.

(2) F test: Null hypothesis: $H_0 : \alpha_1$ =0,Alternate hypothesis:

$H_1 : \alpha_1 \neq 0$. F=26.26, F(2,9)=10.11, F>10.11. The original assumption is false, so the original equation exists a good linear relationship

(3) T test: Null hypothesis: $H_0 :$ α_1 =0, Alternate hypothesis: $H_1 :$ $\alpha_1 \neq 0$, $t_{\hat{\alpha}}$ =-15.10, $t_{\hat{\beta}_1}$ =-0.4156, $t_{\hat{\beta}_2}$ =1.5889

They are all less than 2.262 when α =0.025.So we accept the null hypothesis, because there is no significant linear relationship, the reason may be that there is heteroscedasticity, multicollinearity, or the correlation.

5.3.2. Economic Test

(1) D-W test: d=1.1654, according to the table, we know that k=2, n=12 and then get d_l =0.569, d_u =1.274, d_l <d<d_u. So the conclusion is there is no autocorrelation.

(2) Test for multi-collinearity

λ_1 =1.2118e+01, λ_2 =3.5869e-02, λ_3 =9.4036e-04 $\sqrt{CN}$ >30. So the conclusion is there is serious multi-collinearity.

(3) White test: Hypothesis: $H_0 :$ α_1 =0, $H_1 :$ $\alpha_1 \neq 0$

nR =10.3179 and nR obey $\chi(5)$, if $\alpha = 0.05$，then $\chi_{0.1}(5)$ =9.24, $nR > \chi_{0.1}$, So the conclusion is there is heteroscedasticity on 90% level .Use the weighted least square method to adjust the original model, and the new model is Y=-1.6832+0.1133X_1 +1.2653X_2, the adjust goodness of fit is 97%, It pass the F、T、 D-W test, but it still exist serious multicollinearity, so we use stepwise regression method to get the final model:

Y=-1.6935+1.3819 X_1 + U_i.

6. Conclusion

Table 14. Contrast results in 2014 and 2016.

	2014	2006
Goodness of fit	Poor	Good
F Test	Don't pass	Pass
T Test	Don't pass	Don't pass
Heteroskedasticity	Exist	Exist
autocorrelation	Don't exist	Don't exist
Multicollinearity	Don't exist	Exist

By contrast, we can found that the results of 2006 in the original model are better than the 2014. We analyze the causes in the context of multicollinearity. Before the financial crisis in 2008, the dollar's influence in the world is big, the euro against the dollar dependence is stronger, so the multicollinearity exists. After the 2008 financial crisis, the dollar's influence in the world has shrunk, currencies against the dollar dependence is reduced, and as the Yuan and the yen currency internationalization, further weakening the dollar's influence. Similarly, the dollar and the euro have the similar influence on the influence of the RMB exchange rate.

References

[1] Lu Qianjing, Cai Tianyi. India's exchange rate system reform and the enlightenment to China [J]. International Finance Research, 2011, 05: 13-22.

[2] Ma Xianxian, Gong Jian. India's exchange rate regime reform effect and enlightenment [J]. South Asian Studies Quarterly, 2009, 02: 56-60+74+113.

[3] Wu Juan. The compare of China's exchange rate system reform with India and the enlightenment to China [D]. Dongbei University of Finance and Economics, 2012.

[4] Sajal Ghosh. Examining crude oil price – Exchange rate nexus for India during the period of extreme oil price volatility [J]. Applied Energy, 2010, 885.

[5] Natalie D. Hegwood, Hiranya K. Nath. Real exchange rate dynamics: Evidence from India [J]. Economic Analysis and Policy, 2014.

[6] Biswajit Mohanty, N. R. Bhanumurthy. Exchange Rate Regimes and Inflation: Evidence from India [J]. International Economic Journal, 2014, 282.

[7] Mohsen Bahmani-Oskooee, Rajarshi Mitra. Exchange Rate Risk and Commodity Trade Between the U.S. and India [J]. Open Economies Review, 2008, 191.

[8] Tony Cavoli, Ramkishen S. Rajan. Open economy inflation targeting arrangements and monetary policy rules: Application to India [J]. Indian Growth and Development Review, 2008, 12.

[9] Hung-Teng Chang. A study on the application of neural network to the interrelationship among Renminbi and foreign currencies [J]. Journal of Information and Optimization Sciences, 2008, 294.

[10] P. Norouzzadeh, B. Rahmani. A multifractal detrended fluctuation description of Iranian rial–US dollar exchange rate [J]. Physica A: Statistical Mechanics and its Applications, 2005, 367.

[11] Zuoquan Zhang, Qin Zhao. The Application of SVMs Method on Exchange Rates Fluctuation [J]. Discrete Dynamics in Nature and Society, 2009, 2009.