

# Real Exchange Rate, Capital Account, and Current Account\*

## —An Positive Analysis-Based on China's Data

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**Abstract:** On the basis of probing into the mechanism about how the capital account affects the current account and by the means of time series analysis, this paper empirically tests the relationship between the capital account and the current account in China within a 4-variables system. It discovers that, there is a long term co-integration among the current account, the capital account, the real exchange rate and GDP in China. There is an unidirectional causality from the capital account, the real exchange rate and GDP to the current account. The increasing capital account surplus and the devaluating real exchange rate improve the current account; the increasing GDP deteriorates the current account. The policy implication is that, the current account could be effectively adjusted by controlling some key macro-variables including capital account.

**Keywords:** Real Exchange Rate; Capital Account; Current Account; Co-integration Analysis

## 1 Introduction

Since the reform and opening up, China's capital accounts were always in surplus for several years. Meanwhile, except certain years, current accounts also remain in surplus for many years. What is the relationship between capital account and current account? What are the influences of capital account on current account and how does the capital account do? These questions undoubtedly are the main issues to consider in the opening up of Chinese capital account.

According to the standard of the Mundell-Fleming model, with a fixed exchange rate, if the dumping interrupting is applied to the large capital investment in the process of the opening up of capital account, the increase of basic currency provide is offset, which would lead to the increase of real exchange rate and deterioration of current account. However, if Central Bank does not adopt the dumping interrupting or does not completely interrupt, the increase of basic currency will lead to the decline in domestic interest rates and the raise of consumption and investment. And then, current account deteriorates. In a floating exchange rate system, capital influx causes the raise of nominal exchange rate. On the

one hand, it might cause the reduce of overall demand and the falling of prices; on the other hand, the raise of the nominal exchange rate might cause the raise of the real exchange rate, which leads to the deterioration of current account. Wong&Carranza (1999) tested the relationship between capital account and current account in Argentina, Mexico, Philippines and Thailand. They found during the period of 1989-1994 the massive capital influx led to the raise of real exchange rate and the deterioration of current account.

From the saving-investment point of view, Calvo&Leiderman (1996) analyzed the influence of foreign capital inflows on the current account in Brazil and Chile. The results showed that capital influx led to the increased consumption and investment, and at last led to the increasement of deficit in current account. However, Chinn&Prasad (2003), and Ho-Don Yan (2005) proposed that the impact of the capital flows on current account in developed countries was different from that in developing countries. Meng Xiaohong (2004) tested dynamic relationship between current accounts and capital accounts in China. They found that although the positive impact of capital accounts would deteriorate the current accounts in the short term, in a longer period of time, it would improve the current accounts. These researches only considered the two variables, capital accounts and current accounts, but they neglected the influence of

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other factors on the current accounts. Therefore, with the data collected in the 1982-2004 in China, based on the mechanism of impact of capital accounts on current accounts, the present research would test the mechanism.

## 2 Theoretical analysis

According to Figure 1, overall, the change of Chinese capital accounts and current accounts has a certain similarity of cyclical fluctuations. In the four years of 1983, 1984, 1992 and 1998, there were deficit in capital accounts and surplus in current accounts in China. In the five years of 1985, 1986, 1988, 1989 and 1993, there were deficit in current accounts and surplus in capital accounts. Except for these 9 years, both current accounts and capital accounts were in surplus. This figure also showed that in the most years before 1994, deficit and surplus in current accounts and capital accounts co-existed, that is, they were complementing each other. While in the most of the years after 1994, only surplus in capital accounts and current accounts co-existed. How to understand what influence of China's capital account on current accounts is?

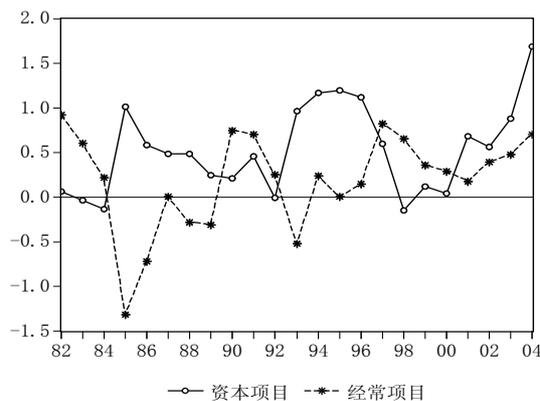


Figure 1 Capital Account and Current Account

The movement of China's nominal exchange rate is relatively simple. 1982 to 1994, devaluation was the main tone. From 1994 to 1997, a slight raise was shown. While in the years of 1998-2004 the movement was almost stable, which showed that China's exchange rate has not been large-scale raised with massive capital influx. Therefore, the mechanism, like the surplus of capital account → the raise of currency → the deterioration of

current accounts, is not established in China. The movement of the nominal interest rate showed that the increases in the 1982-1989 and 1992-1995, and the declines in the 1989-1992 and 1995-2004. Overall, increase of interest rates did not correspondingly with the raise of RMB. Therefore, the mechanism, like increase of capital flow → decrease of interest rates → the raise of currency → increase of current accounts deficit, is not established in China.

According to Figure 2, from 1982 to 2004, a great consistency existed in the trends of China's national savings-investment gap changes and the trends of current accounts changes, which confirmed that the national savings-investment gaps reflected actually the movement of current accounts. Capital accounts and changes of savings - investment gap were not synchronized, but their movements were basically the same. On the whole, before 1990, both volatility of the savings-investment gap and volatility of capital accounts were small; Since 1990, the volatility of them have increased, and in the most of the years, the surplus of capital accounts and surplus of domestic savings coexisted. Above all, the impact of the Chinese capital accounts on current accounts is closely linked to the changes of saving-investment.

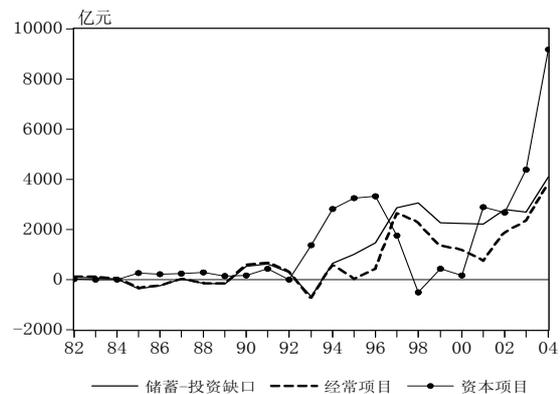


Figure 2 Saving-Investment Gap, Current Account and Capital Account

According to Figure 3, in the whole, there was a significant consistency of the trend in the changes of foreign direct investment (FDI)(major composition of China's capital accounts), trade items and revenue items(major composition of current accounts). Before

1990, fluctuations in FDI, trade items and income projects were relatively small. FDI has been in surplus, and in most of the years, trade projects were mainly in deficit, while revenue items were in surplus. It reflected, during this period, FDI inflows at a small scale, and the trade balance effect is not very obvious, thus, the trade projects were in deficit and the investment income of FDI were few. After 1990, with the sharp increase of FDI inflows, trade items were in considerable surplus in other years except in 1993, foreign investment income is also rising rapidly, which made deficit in the current accounts. Above all, the change of China's capital accounts closely related to the size of trade projects and revenue projects.

In summary, the impact of the Chinese capital accounts on current accounts can not be explained by the changes of nominal exchange rate and nominal interest rate. It is closely linked to the savings-investment gap, import-export and foreign investment income.

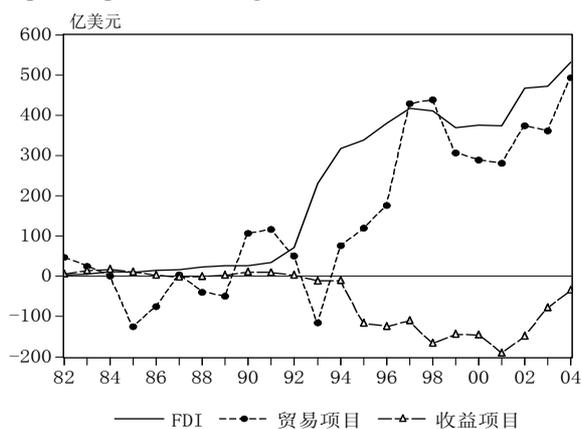


Figure 3 FDI, Trade Imbalance and Investment & Profits

### 3 Empirical Analysis

#### 3.1 The model setup, sample description and method

The main purpose of this paper is to test the impact of changes in the Chinese capital accounts on current accounts. At the same time, considering capital accounts might influence a country's savings-investment decisions, import, export and foreign investment through influencing the real effective exchange rate, GDP and other macroeconomic variables, in turn affect current accounts. Thus, to prevent the effect caused by the neglect of rele-

vant variables, the four-variable system, including the actual exchange rate and the GDP variables, was setup.

The formulation  $X_t=[CA_t,FA_t,REER_t,Y_t]$  was setup.  $CA_t$  stands for variable of current accounts, which shows the proportion of net value of current accounts (excluding common transfers) in nominal GDP calculated with PPP (Purchasing Power Parity).  $FA_t$  stands for variable of capital accounts, which shows the proportion of net value of capital accounts in nominal GDP calculated with PPP.  $REER_t$  stands for the real effective exchange rate of RMB, which are index values of the effective exchange rate weighted by trade shares with the base year of 2000.  $Y_t$  stands for the natural logarithm of nominal GDP calculated in PPP terms.

In the above original data, the unit of current accounts, capital accounts and nominal GDP calculated with PPP is U.S. dollars. Among them, the data of current accounts and capital accounts were from China's State Administration of Foreign Exchange Data website ([www.safe.gov.cn](http://www.safe.gov.cn)), the RMB real effective exchange rate were from the IMF IFS database ([www.IMF.org](http://www.IMF.org)), and data of nominal GDP calculated with PPP were from World Bank statistics. The sample period is the years of 1982-2004. All tests used software Eviews5.0.

In this paper, Integration of each variable was tested with ADF method firstly. If each variable belongs to integration with same order, the long-term relationship was examined with Johansen cointegration test. If the cointegration existed in the system variables, the error correction model would be established to explore short-term causal relationship among the variables and short-term dynamic adjustment mechanism. And then, with the generalized response functions curve obtained with the error correction model, the short-term dynamic response to impulse of variables or new disturbance was identified.

#### 3.2 Unit root test

Integration with order of time series was tested with the ADF unit root test method. Results in Table 1 showed that after the first order difference stationary,  $CA_t$ ,  $FA_t$ ,  $REER_t$  and  $Y_t$  were all in the  $I(1)$  process.

Table 1 Unit Root Test for Variables about Capital Account

Variables	Test for unit root in level			Test for unit root in 1st difference		
	Test type (C,T,L)	ADF Value	P-Value	Test type (C,T,L)	ADF Value	P-Value
CA <sub>t</sub>	(C,0,0)	-2.5841	0.1111	(C,0,1)	-4.2030	0.0043***
FA <sub>t</sub>	(C,T,3)	-3.2428	0.1060	(C,0,0)	-4.8255	0.0010***
REER <sub>t</sub>	(C,T,0)	-1.4981	0.7990	(C,0,0)	-2.5670	0.0130**
Y <sub>t</sub>	(C,T,1)	-1.9694	0.5835	(C,0,0)	-2.8554	0.0678*

Note: in the (C,T,L), C, T, and L denote intercept, time trend, and lag length. \*\*\*, \*\*, and \* represent the 1%, 5%, and 10% significance levels, respectively.

### 3.3 Co-integration

Johanson co-integration test is a testing method based on vector autoregressive (VAR) model. Before carrying out co-integration test, the optimal lag k of VAR model was identified with the values of LR, FPE, AIC, SC and HQ. Considering the constraints of sample interval, we began from the maximum lag of k = 3, and chosen the optimal lag k of VAR model of 3 according to values of FPE, AIC, SC and HQ, as shown in Table 2.

Table 2 Lags Test for Level VAR

Lag length	LR Value	FPE Value	AIC Value	SC Value	HQ Value
0	NA	0.0005	3.7578	3.9569	3.7967
1	119.5144**	9.03E-07	-2.6098	-1.6140	-2.4154
2	20.1831	9.02E-07	-2.8446	-1.0523	-2.4947
3	21.2899	4.41E-07**	-4.2860**	-1.6971**	-3.7806**

Note: \*\* denote optimal lag length.

Table 3 Cointegration Vectors Test

Cointegration order	Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	1 percent Critical Value	P-Value
(1, 2)	none***	0.9629	65.8965	33.7329	0.0000
	at most 1 个***	0.7542	28.0664	27.0678	0.0070
	at most 2 个	0.4986	13.8073	20.1612	0.1034
	at most 3 个	0.1753	3.8537	12.7608	0.4343

Note: \*\*\* represents that Hypothesized No. of CE(s) is refused in the 1% significance levels.

Because lag length of co-integration model is 1st difference of the VAR model in Level (Wang Shaoping, 2003), so the lag of co-integration VAR model was identified as 2.

Supposing co-integration equation with intercept rather than with the time trend term,  $Z_t = (CA_t, FA_t, REER_t, Y_t)$  was tested with Johansen co-integration of the characteristic roots, and the test results were shown in Table 3.

According to the co-integration test results shown in Table 3, there were two co-integration (r = 2) between the tested variables at the significant level of 1%. This paper selected the first co-integration and used ECT as error sequence of co-integration equation, thus the corresponding co-integration equation (the value in brackets is the standard deviation) was:

$$EC_t = CA_t - 1.0700 * FA_t + 0.4112 * REER_t + 0.1339 * Y_t + C$$

(0.1075)      (0.0886)      (0.0472)

From the view of long-term trend, cointegration relationship existed among the four variables, and there was a positive correlation effect between the capital accounts and current accounts. But the correlation effect of real exchange rate, GDP on current accounts was negative, which showed that in the long term, the increase of capital accounts would increase the current accounts surplus, while the raise of RMB and GDP would worsen the current accounts.

### 3.4 Variance Error Correction Model (VECM) and the diagnostic test

In this paper, impact of capital accounts changes on current accounts was tested, thus, we only provided the error correction model about  $\Delta CA_t$ , and estimated results were shown as the formulation below.

$$\Delta CA_t = -1.0663 EC_t - 0.1889 \Delta CA_{t-1} - 0.2012 \Delta CA_{t-2}$$

(0.2026)      (0.1267)      (0.1300)

$$- 0.8051 \Delta FA_{t-1} - 0.4238 \Delta FA_{t-2} - 0.3393 \Delta REER_{t-1}$$

(0.2564)      (0.2009)      (0.6295)

$$- 1.5417 \Delta REER_{t-2} - 9.7250 \Delta Y_{t-1} - 6.3971 \Delta Y_{t-2} + C$$

(0.6842)      (1.3007)      (2.8232)

where,  $\Delta$  represents 1st difference, the value in brackets is standard deviation. The estimated coefficients of error correction term on the error correction model  $\Delta CA_t$  are significantly negative, and the direction adjustment was consistent with the error correction mechanism. The long-term equilibrium relationship among current ac-

counts, capital accounts, real exchange rate and GDP can be maintained and adjusted automatically.

### 3.5 Granger causality test and impulse response function

Table 4 Granger Causality Test for Capital Account Model

Null Hypothesis	$\chi^2$ -Value	P-Value	
$FA_t$ does not Granger Cause $CA_t$	10.0992	0.0064***	Refuse
$CA_t$ does not Granger Cause $FA_t$	0.5251	0.7691	Accept
$REER_t$ does not Granger Cause $CA_t$	7.2052	0.0273**	Refuse
$CA_t$ does not Granger Cause $REER_t$	1.8994	0.3869	Accept
$Y_t$ does not Granger Cause $CA_t$	61.9160	0.0000***	Refuse
$CA_t$ does not Granger Cause $Y_t$	1.8313	0.4003	Accept

Note: \*\*\*,\*\*,and\*represent the 1%,5%,and 10% significance levels,respectively.

Granger causality test results based on VECM model were shown in Table 4. At the significant level of 1%, the capital account and GDP is Granger cause of current accounts, and at the significant level of 5%, the real exchange rate is Granger cause of current accounts.

Figure 4 shows the impact of current accounts. The impact of capital accounts deteriorated current accounts in the first period, after this period, it improved the current accounts, and the impact of real exchange rate improved the current accounts, while the impact of GDP would worsen current accounts

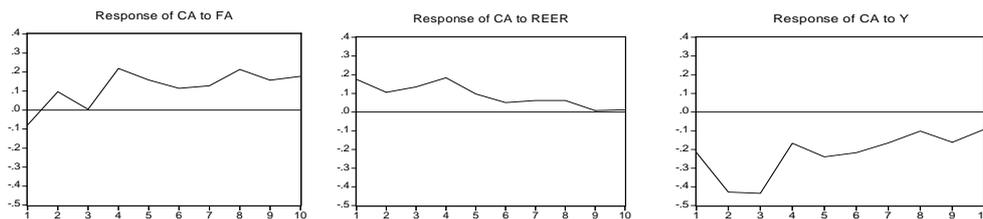


Figure 4 General Impulse Responses for Current Account to Other Variables

## 4 The interpretation of empirical results

Capital accounts are Granger cause of current accounts. At the beginning, the capital inflow will lead to deterioration of current accounts, but it improves the balance of current accounts in the long term. The main reasons are as following: (1) From the view of import and export. Initially, in the process of foreign investment, large quantities of raw materials and intermediate products were required. Thus, in the short-term, current accounts would show the deterioration. While in the long-term, the effect of foreign-funded enterprises on the import substitution and export promotion in China was generated gradually, and then the balance of current accounts was improved. (2) From the view of foreign investment income. In fact, most of the foreign investment earnings were reinvested rather than repatriated to their countries. Thus, deterioration of current accounts caused by some of the investment income was reduced. (3)

From the view of investment – saving. Foreign investment with super-national treatment reduce or replace the domestic enterprise market space because of the cost advantages and its technical management, thereby deepen the overplus of domestic savings. At the same time, foreign capital inflows speed up the Chinese adjustment of industrial structure, which led a large amount of unemployed people, thus the expected population's income was reduced, which caused the residents to save rather than to consume. Therefore, the capital accounts surplus did not change China's population tendencies of high savings and low consumption, which expanded surplus in current accounts.

Real exchange rate is Granger cause of current accounts, and the depreciation of the RMB can improve current accounts. From opening up to 1993, China implemented the multiple exchange rate system, which was objectively beneficial to China's foreign trade. In 1994, when the RMB exchange rates were introduced, the

Chinese government implemented the single managed floating exchange rate system. However, the Chinese government did not actually change the exchange rate system of RMB and dollar's; During this period, with sterilization policies, The People's Bank of China make the growth of base money caused by the capital accounts surplus to be offset, and the real exchange rate of RMB remained basically unchanged, which is conducive to sustained increase of current accounts surplus.

GDP is Granger cause of current account, and the increase of GDP will worsen the current account, the main reason is as following: On the one hand, the increase of a country's national income would lead to the increase in domestic demand, which further increased imports, and would worsen the current accounts accordingly. On the other hand, the higher a country's GDP growth rate was, the stronger investment activity was, and market capacity was also larger, and thus the demand for imported goods increased. Therefore, since opening up, GDP growth rates with high level in China has been reduced current accounts surplus.

## 5 Conclusions and Implications

In this paper, the impact of changes in the Chinese capital account on the current account was studied within the framework of four variables: the current account, capital account, the real exchange rate and GDP. The results showed that in the short-term, the increase of capital accounts surplus would deteriorate the current account, but in the long-term, it helped to improve current accounts. The depreciation of real exchange rate of RMB would help to improve the current account, while growth of GDP would reduce current account surplus.

First, with the development of China's opening up, reasonable adjustments of opening the capital account should make in accordance with the needs of domestic economic development, and selective preferential policies to attract FDI should be setup. Preferential policies

for foreign investment into competitive industries should be cancelled, and the foreign investment, which can be effectively regulated savings - consumption - investment relations and promote conversion of savings to investment, was used positively at the same time.

Second, the stability of RMB real exchange rate is conducive to increasing current account surplus. Therefore, in the process of promoting the RMB exchange rate formation mechanism, The Central Bank of China should make a good exchange rate flexibility and stability.

Third, some policies regulating current account are necessary, such as public expenditure was increased to speed up the reform of unemployment, pension and health Guarantee and education system; the basic construction of the social security system should be increased; and people's consumption ability should be released to increase domestic consumption, especially domestic consumer demand.

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