What Happened in China's External Flow of Funds?

－Global-Flow-of-Funds Analysis in a Theoretical Model–

(Discussion paper)

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Abstract

Building a model of global-flow-of-funds is the main focus of this paper. This goal is achieved first by presenting the general idea of global-flow-of-funds, and then explaining the outlines of theoretical analysis. The model infers both the factors of the structure of fund flows and the recycling in China's oversea flow of funds, raising important policy proposals. It is based on a macro-monetary analysis.

Key Words：Flow of Funds; Balance of Payment; International Capital Flows

1. The Framework for the Analysis of Global Flows of Funds

Global flows of funds are flow of funds that relates to domestic flows and international capital flows. The analysis of global flows of funds includes the analysis of the relationship between domestic financial flows and international capital flows. It is an analysis of the characteristics and the structure of the flows of funds including the balance of investment-savings, and current balance. Financial markets indicate the debts and credits of funds as a whole plus the total process of financial liquidity. Investigated more carefully, items of financial markets include inflows of domestic funds, overseas funds by domestic savings and credit loans of banks on the side of fund-sources (funds inflow). On the other hand, funds split into fund supply to the domestic economy and funds outflow overseas in fund uses (funds outflow). When the flow of funds in financial markets is tied up with the international balance of payments, the overseas sector will become fund outflow excess (net capital outflows) if the current account is in surplus. Conversely, the domestic sector will become fund inflow excess. Therefore, when the real economy side of the domestic economy and overseas is analyzed under an open economic system, the balance of savings-investment of the domestic economy corresponds to the current account balance. However, national net capital outflows correspond with the capital account balance, when the relationship between

domestic and overseas on the financial side is examined. Therefore, relations between the domestic savings-investment balance, the financial surplus or deficit, the current account, and the overseas net fund outflow will be expressed in the following structural formulae.

Savings-Investment and Current Account Balance

$$S - I = \Delta FA - \Delta FL = EX - IM \quad (1)$$

The Overseas Income and Expenditures Balance

$$EX - IM = (FO_d - FI_d) + \Delta FER \quad (2)$$

The Financial-Markets Balance

$$FO_d + FO_o + \Delta FER = FI_d + FI_o \quad (3)$$

The upper formula is transformed as follows:

$$FO_o - FI_o + \Delta FER = FI_d - FO_d \quad (4)$$

Net fund supply to overseas balance

$$NFO_o + FER = NFI_d \quad (5)$$

The constitution of the net overseas fund flows

$$(FO_o - FI_o) = DI + PI + OI + CaA \quad (6)$$

Notes: ΔFA : financial assets increase, ΔFL : financial liabilities increase,
EX : exports, IM: imports, ΔFER : Foreign exchanges reserves,
FO_d : domestic funds outflow, FO_o : overseas funds outflow,
FI_d : domestic funds inflow, FI_o : oversea funds inflow,
$NFO_o = FO_o - FI_o$ (net outflow of overseas funds),
$NFI_d = FI_d - FO_d$ (net inflow of domestic funds), *CaA*: Capital account,
DI: Direct investment, *PI*: Portfolio investment, *OI*: Other investment

It is apparent that the net overseas flow of funds $(FO_o - FI_o)$ correspond with the Capital & Financial Account in Balance of Payment by (4) and Capital & Financial Account is constituted of Financial Account and Capital Account, so the net overseas flow of funds as (6). All the items on the right of the formula made into net value, and indicate course, composition, and scale the global flow of fund. From (1) to (6) we build the framework of global flows of funds. The changes of the global flows of funds are determined by foreign direct investment, portfolio investment, and other investment. This is how to obtain the analysis framework of global flow of funds from the above structural formula, and using the formula we examine the characteristics of the flows of funds in China and specify the theoretic model of the global flows of funds.

This paper uses the theoretic model to review some of the key factors behind into and out of China transformation of the structural the flow of funds, and the challenges China faces to follow the rapid pace of globalization.

2. The Characteristics of the flows of funds and out of China

The global flows of funds and out China have been changed dramatically since the 1990s, which not

only did inflows increased, but also outflows increased as well. We will observe the changes in overseas flows of funds in China as follows.

First, we investigate the causes of the growth of the domestic flow of funds. While Chinese domestic investment had increased from 1992 to 2008, national savings have increased faster. The investment rate in China has been high and it has risen approximately 36 percent of GDP in 1992 to 42 percent of GDP in 2008 as shown in Chart 1. However, the saving rate has risen even faster to about 51 percent of GDP in 2008. From 1992 to 2008, the balance of saving and investment (net lending) was grown by 266.7 billion[1] a year on average and Chinese current account surplus has increased considerably. Looking at the side of external economy, we also notice except for 1993, the current balance serves as a continuous current account surplus. The current account surplus of the annual average amounts to US$31.6 billion during the period[2]. China's foreign exchange reserves also increased to US$1.2 trillion dollars in the first quarter of 2008 after from US$19.4 billion in 1992[3]. However, the Chinese outflows of funds increased with foreign exchange reserves and capital flight after 1997. The capital inflows in the form of hot money were also conspicuous, because of an expected evaluation of Yuan. Since the 1990s, the patterns of oversea flow of funds have changed significantly especially during the periods 1994-1997 and 2001-2008 The average saving rate, capital inflows and foreign exchange reserves have all increased. How to reduce the unbalance of savings and investment, prevent future crises, and create international and regional safety nets for large and volatile capital flows? It is a key challenge for China's economy.

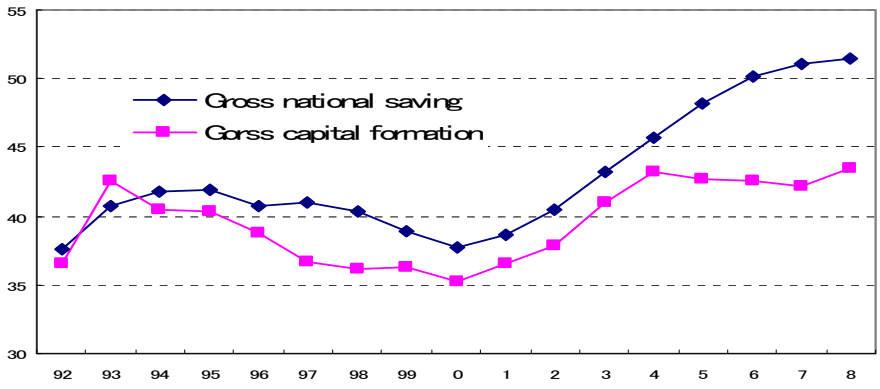

Chart 1 Savings and investment in China, percent of GDP

Source: China Statistics Press, *China Statistical Yearbook-2009*.

Developing countries' economic stage is always shown in the double restriction of the domestic financial deficit and shortage of foreign reserves. In China, both investment and savings have extensively raised since 1990s as chart 1 shows. China has been over savings except for 1993, and the amount of

1 China Statistics Press, *China Statistical Yearbook-2009*.
2 The People's Bank of China, *The People's Bank of China Quarterly Statistical Bulletin*
3 http://www.pbc.gov.cn/

excess savings increased from RMB1.04 trillion in 1992 to RMB15.8 trillion in 2008[4]. On the other hand, although domestic savings have become an excess since 1990s, financing from overseas mainly through FDI has remained significant. The amount of FDI in China has surpassed that in the United States. Inflow of foreign capital increased from RMB121.2 billion in 1992 to RMB1.04 trillion in 2008. It has increased from 4.4 percent of GDP in 1992 to 3.4 percent in 2008 (see Chart 2). Moreover, from 92 to 2008 capital outflows of funds have also gradually increased. The domestic outflow of funds amounted to RMB4.18 trillion in 2008 and they have increased from 5.7 percent of GDP in 1992 to 13.7 percent of GDP in 2008 as shown in chart 2.

Even though the excess of domestic savings has been increasing, capital inflows and outflows have been rising since 2001 (see chart 2). The result has been a net outflow except in 1993. The net outflow was RMB247 billion in 1997 during the Asian financial crisis, and reached a maximum of RMB3.13 trillion in 2008. Accordingly, the current account surplus has increased considerably, and foreign exchange reserves have reached US$2.4 trillion in the end of 2009.

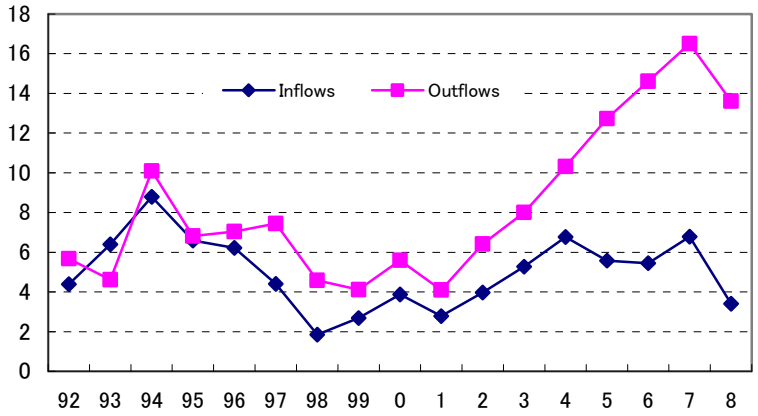

Chart 2 overseas inflows and Outflows in China, percent of GDP

Source: *The People's Bank of China Quarterly Statistical Bulletin, 1998-2009.*

Table 1 was made by the sector of the rest-of-world in Flow-of-Funds-Accounts in China, and it shows the structural change of external flow of funds in China. The total overseas inflow of funds to China was amounted to RMB11.4 trillion from 1992 to 2008. On the other hand, although the outflows of funds from China to overseas have gone up from RMB168.1 billion in 1992 to RMB1.26 trillion in 2008, it was amounted to RMB7.1 trillion during the analysis period. However, when the balance of fund inflows and fund outflows was observed, net inflows to China were positive except for 1998, and in these 17 years, net capital inflow was RMB255.4 billion a year on average. This means 'double-black' in China, that is, which the current account in the black and financial account in the black. But, even China have been kept a huge net savings since 1992, the net capital inflow also have been increased, so over the past few years, foreign exchange reserves have risen sharply. About such an unusual problem, we should

[4] China Statistics Press, China Statistical Yearbook-2006.

examine what happened in Chinese external flow of funds, and if any structural problems arose in the China economy?

Table 1: Changes in Overseas Fund Flows in China (100 million RMB)

		1992～96	1997-2002	2003	2004	2005	2006	2007	2008
Inflows	(A)	4295	3484	5807	8712	11883	13095	16689	12270
Outflows	(B)	2163	2708	1224	-551	7078	12677	10806	12633
Net inflows	(A-B)	2132	776.2	4583	9263	4805	418	5884	-363
Foreign E.R	(C)	-1425	-2540	-9686	-17080	-16958	-19692	-32618	-29119
Errors & O.	(D)	-927	-849	1377	2135	-1373	-1027	1159	-1814
S or D	(E)	-220	-2612	-3726	-5682	-13526	-20301	-25575	-31296

Note: E = (A - B) + C + D; FER (- = increase); E.O: Errors & omissions; S or D: Financial surplus or deficit

The data of 1992-96 is the average value in this period.

Sources: The People's Bank of China. *The People's Bank of China Quarterly Statistical Bulletin*.

However, when we verify the changes of the Financial Surplus and Deficit that puts foreign exchange reserves in net inflows situation and adding Errors and Omissions, we can get the actual situation. That is, the overseas sector was always in financial deficit except for 1993. In other words, the financial surpluses in the domestic sector also became net outflows of funds from China. And the flows of the funds are like the "return of capital" which means to flow to the advanced countries and other areas. Those returns of capital, however, increased rapidly after 1997, and due especially to the Asian currency crises, outflows of funds from China increased markedly. This appeared in the last row of Table 1.

Over the past decade, the large-scale capital inflows are increasing and the large-scale capital outflows have also appeared by foreign reserves increased during the same period. It will be able to say the main characteristic of overseas flows of funds in China after 1997. In the next parts, we will use the empirical model to try to explain the structural change of flow of funds in China.

3. Building the Model of Global-Flow-of-Funds

The economies of countries are connected by merchandise trade and financial transaction. The change of merchandise trade and financial transaction is reflected in global-flow-of-funds. In this way, it is necessary to investigate the influences of the fiscal and monetary policies on global flow of funds. In this part, I attempt to exploit the data to create the theoretical model for global-flow-of-funds based on the framework of the analysis, and describe the change of China's economy from the perspective of the financial structure reflected in the flow of funds.

3.1. Basic structure of the model

The balance of global-flow-of-funds is an adjustment process that always tends toward an equilibrium state, but sometimes the flows of funds creates macroeconomics imbalances. Moreover, even if the aggregate flows of funds are in equilibrium, sometimes sectorial imbalance many arise. So our model of

the global-flow-of-funds doe not necessary produce equilibrium for every period, and it doesn't reflect the equilibrium state of the flows of funds in a country.

The model uses the principle of Applied General Equilibrium model. It allows for risk and the formation of expectation, and with a lag structure of economic variables. It explains the flows of funds using continuous adjustment process to the balance from imbalance, and in a medium-to-long period of time. It also belongs to a kind of dynamic model. A system of simultaneous equations is a model of financial market equilibrium, consisting of the follows. The following system of structural equilibriums makes up the basic structural of the model.

Structural Equations

(1) Savings[5] $S_t = b_{11} + b_{12}DI_t + b_{13}C_{t-1} + b_{14}R_t + \varepsilon_{t1}$

(2) Investment $I_t = b_{21} + b_{22}Y2 + b_{23}G_t + b_{24}R_t + \varepsilon_{t2}$

(3) Import $IM_t = b_{31} + b_{32}CPI_t + b_{33}Y_t + \varepsilon_{t3}$

(4) Export $EX_t = b_{41} + b_{42}REER_t + b_{43}WGDY_t + \varepsilon_{t4}$

(5) Capital inflow $FI_t = b_{51} + b_{52}YR_{t-1} + b_{53}PER_t + b_{54}FDI_t + b_{55}R_t + b_{56}D_t + \varepsilon_{t5}$

(6) Foreign direct investment $FDI_t = b_{61} + b_{62}Y_{t-1} + b_{63}PI_t + b_{64}REER_t + \varepsilon_{t6}$

(7) International-portfolio-investment $OPI_t = b_{71} + b_{72}rbond_t^{US} + b_{73}risk_t + b_{74}R_t + \varepsilon_{t7}$

(8) External debt $OIO_t = b_{81} + b_{82}RFL_{t-1} + b_{83}CA_t + b_{84}R_t + \varepsilon_{t8}$

(9) Expected stock profit $PER_t = b_{91} + b_{92}R_t + b_{93}YR_{t-1} + b_{94}REX_t + b_{95}risk + \varepsilon_{t9}$

(10) Market interest $R_t = b_{101} + b_{102}MR_t + b_{103}RCB_t + b_{104}YR_{t-1} + \varepsilon_{t10}$

(11) Exchange rate $REX_t = b_{111} + b_{112}R_t + b_{113}PER_t + b_{114}NFI_t + b_{115}EX_t + \varepsilon_{t11}$

(12) Reserve assets $CRA_t = b_{121} + b_{122}CA_t + b_{123}FI_t + b_{124}REX_t + b_{125}FFR_t + \varepsilon_{t12}$

(13) Capital outflow $FO_t = b_{131} + b_{132}CRA_t + b_{133}PI_t + b_{134}RCB_t + b_{135}FFR_t + b_{136}D_t + \varepsilon_{t13}$

Identities Equation

(14) Net Fund flow definition $NFI_t = FO_t - FI_t$

(15) Current balance definition $CA_t = NFI_t + CRA_t$

(16) GDP identical equation $Y_t = C_t + I_t + NFI_t$

The Model of the Global-Flows-of-Funds is created from three viewpoints, that is, investments-savings balance, current balance flow, and international capital flow. First, savings-investment equation is formed in the Chinese flow of funds model from the side of domestic savings-investment balance. Moreover, we built Import and Export equation that connected with savings-investment equation from the side of trade flow, because Chinese flow of funds is becoming current account surplus-fund export type and the leading

[5] S**:** refer to the total disposable income minus the final consumption, including the gross capital formation and net foreign financial assets; C**:** final consumption expenditure; I: gross capital formation, including the total fixed capital formation and the increase in inventory; DI: total national disposable income (=S+C).

cause of current account surplus serves as an excess of exports. And we are trying to show this feature, when assembling a structural equation. In order to follow the continuous adjustment process of the global-flow-of-funds the international side, we build the international capital inflow equation and domestic capital outflow equation of the gross base are formed.

The model contains thirteen behavioral equations, two equilibrium conditions and an accounting identity. GDP_{t-1}, the price earnings ratio (*PER*), the money market rates (*R*), and foreign direct investment (*FDI*) are explanatory variables of the international capital inflow equation. We set up the *FDI* equation, the international-portfolio-investment equation, and the external debt equation to examine the main influential factors that determine large-scale international capital inflows. Furthermore, we built the expected-PER equation, the market-rate-of-interest equation, the exchange rate equation, and the foreign change reserve equation. According to the mechanism of international capital movement, we want to observe the ripple effects of the financial and monetary policy of each country. Moreover, we used changes in reserve assets *(CRA*), profit from investment (*PI*), rates of central bank *(RCB*) and the U.S. federal funds rate (*FFR*), to set up the capital outflow equation.

Through our simultaneous-equations model, we want to study the structural factors and cyclic factors in the flow-of-funds; how the profit factor and the risk factor affect international capital flows, and how changes of the pattern of the flow of funds affect domestic economy growth. In order to perform prediction of a future flow-of-funds trend, and the simulation of the policy effect at the end of the model, three definitional equations called Net Flow of Funds, Current Account Balance, National Income identical equation are formed.

3.2. System Methods of Estimation and Construction of the Data

We try to use 3SLS method to estimate the change of Chinese external flow of funds. Three techniques are generally used for joint estimation of the entire system of equations: Three-Stage Least Squares (3SLS), Generalized Method of Moments (GMM), and Maximum Likelihood. The model of Global-Flow-of-Funds was built by 3SLS method. When Two-Stage Least Squares (2SLS) was used for joint estimation of the entire system of equation, 2SLS assumed no correlation between error terms ε_1 and ε_2 in simultaneous equations. On the other hand, 3SLS is presuming that exist correlation between error terms ε_1 and ε_2 of simultaneous equations.

As the presumed method, 2SLS is how to solve the equation of each of structural equations separately. But compared with this method, 3SLS is the methods for presuming simultaneous equations that take into consideration all directions of a simultaneous-equations system using the variance-covariance matrix of the error term between equations. Intuition would surely suggest that systems method, 3SLS is to be preferred to single-equation methods 2SLS. The estimator of presumption that was by 3SLS is a consistent estimator, and when the disturbance terms of each structural equation have correlation, it becomes the estimator of effective presumption more asymptotically than 2SLS (William H. Greene, 2000).

Since the variance-covariance matrix of the disturbance term by 2SLS was not zero when we estimated the model of Chinese external flow of fund, each structural equation of simultaneous equations is estimated by 3SLS method. The estimation of the model uses annual data for the years 1992-2005 taken from the China statistical yearbook, International Financial Statistics (*IFS*) and Flow of Funds Accounts.

GDP in the world（described *WGDP*）is the sum of the U.S, Japan, EU and East Asia.

4. A Presumed Result and Econometric Analysis

4.1. Estimation Result

The table 2 presumed the estimation results (the definition of each variable is referred to the paper end appended table 3). As shown in Table 1, the system's weighted MSE (mean squared error) is 0.8726. We realize the presumed model will be evaluated, because the value of MSE is not large. Moreover, the degrees of freedom (DF) is 84, it means that the sample size is small, because the motel only used the year data from 1992 to 2008. System's weighted R-Square that showed the explanation power or goodness of fit of the whole model of simultaneous equations is 0.9821. So we know the explanation power of the estimated model will be wholly accepted to be good.

Table 2 Evaluation of estimated model

System Weighted MSE	0.8726
Degrees of freedom	84
System Weighted R-Square	0.9821

As the weight of System Weighted R-Square, the ratio of each endogenous variable to the total variation of all the endogenous variables is used[6].

4.2. Econometric Analysis

In order to consider the change of Chinese external flow of funds from savings and investment balance, we estimate saving and investment functions. According to presumption of the savings function (*S*), if *DI* increases by RMB100 million, savings will rise about 68 percent of *DI*. Since t value is 15.29, it can be said that the significance with savings have high change of *DI*. Moreover, the elasticity of money market rates (*R*) with respect to saving is 2397. If interest rates go up 1 percent, savings will rise about RMB239.7 billion. Chinese savings was considered to have been very flexible to interest rate fluctuation during this period (1992-2008). We also wanted to use final consumption expenditure in the previous period (C_{t-1}) to observe the influence on savings, but it was not significant, since t value was low.

Let us show the presumed result of an investment function (*I*). $Y2_t$ is the difference of *GDP* in the previous period$(Y_{t-1} - Y_{t-2})$, and if *GDP* in the previous period increased by RMB100 million, the investment would increased by about RMB84 million when we presumed the investment function. That is, investment of one or less unit is only produced for the change of the final demand of one unit. The effect of the investment stimulus by the increase in Chinese *GDP* will not be large.

Moreover, the parameter of government expenditure (*G*) is 1.6. If government expenditure increased by RMB100 million, the investment would be increased by 1.6 times. It will be able to say that Chinese fiscal expenditure has the strong elasticity to investment. In addition, according to the theoretical

[6] William H. Greene (2000), *Econometric Analysis*, 692-699.

assumption that domestic investment of a loanable funds market and the interest rate in large open economy, investment will rise if interest rate (*R*) increases (Mankiw, 1992). When the presumption result is -330, it means the investment will drop by about RMB33 billion when the rate of funds market goes up by 1 percent, and the presumption of the elasticity of the interest rate with respect to investment has brought the identical result with a theoretical hypothesis. But we cannot accept this estimated result because this t value is -0.75 which is not significant estimation.

When the change of the import and export of goods and services which brought about the change of the international capital flow was analyzed, we divided it into the demand factor (gross domestic demand) and the price factor (import relative price), and estimated the import function and export function. First, in view of the demand factor, the Chinese import propensity in the analysis period differs significantly compared with the Chinese export propensity. The elasticity of import with respect to Chinese *GDP* was estimated by 5.1 percent, but the elasticity of export with respect to *WGDP* was 6.6 percent. It means that the import of China will rise 5.1 percent if Chinese *GDP* grows up by one point, and the export of China will rise 6.6 percent if the world economy that does not include China grows up by one point. Since the difference between the elasticity of import with respect to Chinese *GDP* and the elasticity of export with respect to *WGDP* is 1.5 percent during this analysis period, it has suggested that the structural problem of the import and export existed in the Chinese economy.

Moreover, when we will see the price fluctuation which is another factor of import change, we can get the measurement result, that is, import will increase by US$6.5 billion if the consumer price index (*CPI*) goes up by one percent. On the other hand, we used the real effective exchange rate (*REER*), and estimated the change of an exchange rate influence on export. We got measurement result, that is, Chinese export decrease by US$7.6 billion, if the *REER* goes up one percent. The corresponding estimated coefficient is significant at the *EX*, the corresponding t value is -5.48.

As explanatory variables of an international capital inflow function, we used *GDP* growth rate in the previous period(YR_{t-1}), price earnings ratio (*PER*), *FDI, R,* and a Dummy variable (*D*). YR_{t-1} was estimated by 1286. It means the overseas capital inflow would be brought RMB128.6 billion, if the *GDP* growth rate in the previous year increases by one percent. The corresponding coefficient is significant, because its t value was 5.85. On the other hand, the elasticity of the international capital inflows with respect to *PER* is -0.37, but its t value is -0.22. It means the earnings of Chinese portfolio investment are not major factor in overseas capital inflows.

The elasticity of international capital inflows with respect to *FDI* turned in China is 1.43 and its t value is 4.8. We also used money market rate (*R*) as a determinant of international capital inflows, but it against economic theories. In an open economy, a higher domestic interest reduces domestic capital outflows, and promotes foreign capital inflows. Although Chinese capital flows have been liberated in the global flow of funds since the 1990s, the market mechanism has not worked well, because the domestic capital market has not been opened enough. So the interest rate in China hasn't been serving to the influence on foreign capital inflows during the period.

The speculation of foreign direct investment (*FDI*) into China uses *GDP* in the previous year, profit from investment (*PI*), and *REER* as explaining variables. All the estimates coefficients of equation are significant except that of *PI*. We can show the presumption that *FDI* would increase by RMB2 million if *GDP* in the previous period increased by100 million, that is, China economy high growth has continually

absorbed foreign direct investment positively.

The *PI* is the income earned by direct-investment in a foreign country. We show the change of this index, and know how much *PI* was used for reinvestment, and how much *PI* was brought back to home country. In this estimation, about 0.5 percent of *PI* in China was reinvested in China. But its t value is 1.18, we cannot accept this estimation. We also have checked the influence of the change in exchange rate on *FDI*. Since the cost of *FDI* decreases if *ERRE* depreciates, we have got the result of presumption, that is, if *ERRE* is depreciates by one percent, *FDI* to China will increases by about 2.6 billion Yuan.

When we try to analyze the factor of international capital inflows with the estimation of foreign direct investment to China, we know the feature, that is, overseas capital flows in China will attach greater importance to long-term economic growth than short-term speculations, and pursue long-term profitability including direct investment.

In order to appreciate the effect of market forces on international capital flows to China, we included the money-market-rates (*R)*, *GDP* growth rate in the previous period (YR_{t-1}) and liability ratio (*risk*)[7] as explanatory variables in the price earning ratio function (*PER*). Since the Chinese capital market had not been opened yet, the estimation result of this equation didn't fit so well, but we can find the trending influence of *R* and YR_{t-1} on *PER*. That is, the *PER* decreases by about 34 point, when the money market rate *R* increase by one percent. If YR_{t-1} increases by one percent, *PER* will rise by about 22.8 points. But the estimated coefficient of the risk of market (*risk*) was not significant.

In the equation of money-market-rate (*R*), we used the real money supply (*MR*), the rate of central bank (*RCB*), and YR_{t-1} as explanatory variables. We know *MR* has the elasticity with respect to *R* is minus, it means the increase in money supply will reduce interest rates. It not only stimulates economy growth, but also makes the domestic capital outflow. The estimation value is -0.0005, if *MR* raise one unit, interest rates will fall by 0.0005 point. *RCB* is being interlocked with money market rates, if rate of central bank goes up by 1 percent, money market rates will also rise by 0.45 point, and the t value is 6.78, it is considered to be a significant guess result. This will be considered that the financial policy of central bank has the strong influence on the financial market of China. Moreover, the YR_{t-1} also has big elasticity to with respect to *R*, and if YR_{t-1} is extended by 1 percent, *R* will rise by about 0.33 point.

Although the system of Chinese exchange has been taken the managed-floating since 1994, it couldn't show a fluctuating rate, because the width of exchange rate change was restricted to less than 0.05 percent until 2005. Chinese exchange rate just change from 8.64 Yuan per USD in 1994 to 8.19 Yuan per USD in 2005, but People's Bank of China revalued the Renmin Yuan exchange rate to 2% on July 21, 2005, and had declared reform of the Renmin Yuan exchange system (now the exchange rate is 7.72 in April 2007). In the explanatory variables of the exchange rate (*REX*), we used the interest rate (*R*), net financial investment (*NFI*), and export (*EX*). According to an economic theories (Mundell, 1968), a rise of the domestic interest rate will decreases net foreign investment, and it leads to appreciation of the domestic currency. That is, the interest rate and the exchange rate are positively correlated.

However, the result of presumption was not so good. According to the result of estimation, we can know that the exchange rate will depreciate 0.02 point if the interest rate *R* rises to 1 percent. It will be against economic theories as above-mentioned. And the results with significant estimation of *NFI* and *EX*

[7] Liability ratio refers to the ratio of the balance of foreign debts to the GDP of the current year.

were not obtained. When we saw the estimated value of *NFI* and *EX*, we know they all have small elasticity, and the influence on nominal exchange rate is very weak. This means that the Chinese exchange rate has not ridden on market change yet, and will be considered to have reflected the current condition of the China exchange quotation under a period of transition to the market economy.

Since Chinese foreign-reserves assets were increasing rapidly in this analysis period, in addition to current account (*CA*) and inflow of funds (*FI*), we also used exchange rate (*REX*) and U.S. federal funds rate (*FFR*) as an explaining variable to estimate the change of foreign-reserves assets. We know the cause of foreign-reserves assets rapid increase in China through this estimation. That is, *CRA* increases by 36 million USD if current account surplus rises in 100 million USD. And when *FI* increases by 100 million Yuan, *CRA* will increase by about 16 million dollar. Another factor affecting to *CRA* of China is American interest rate changes. According to the statistical data, about 43 percent of Chinese foreign-reserves have invested in U.S. government bonds and national bond[8], so we used *FFR* to estimate the changes of *CRA*. But, the elasticity of *FFR* has become minus; this result hasn't fit with economic theories. That is, we consider that factors other than economy have affected the change of Chinese foreign reserves. A lot not only depended on the market economy, but also on political factor; it has more changed by Chinese domestic factor than the factor that from the U.S.

As a part of analysis of capital outflows, we will examine estimated results of domestic outflow of funds (*FO*). We have presumed the change of domestic outflow of funds which using changes in reserve assets (*CRA*), profit from investment (*PI*), rates of central bank (*RCB*), and U.S. federal fund interest rates (*FFR*), and each estimated value of explanatory variable has brought significant results.

The elasticity of the increase of *CRA* with respect to capital outflow is 9.73, and t value was set by 19.84. It means capital outflows will rise about 973 million Yuan when *CRA* increased by 100 million USD, and the rapid increase of foreign reserves showed the cyclic factor in the external flow of funds.

We also were known that the capital outflow will change by 14.1 million Yuan, when *PI* was made by 100 million USD, since the t value of *PI* is put by 6.48, we can accept this estimation. This shows that the profit from investment returned back to overseas is still 14.1 percent or less. *PI* is classified into "direct-investment profit", "securities investment profit", and "other investment profit". The amount of capital outflow by *PI* is not large now; it means during the analysis period that the amount of stocks of the undistributed *PI* is large.

We also can show the effects of monetary policy on capital outflows. The elasticity of the increase of *RCB* with respect to capital outflow is -423.5, and t value was set by -3.45. The capital outflows will decrease 42.35 billion Yuan when *RCB* was got up 1 percent. So we are considered that the monetary policy has important influence on capital flows.

Moreover, since the Chinese capital outflow mainly flow into the U.S., the elasticity to the foreign capital outflow was presumed using U.S. federal fund rates (*FFR*). The elasticity of the increase of *FFR* with respect to capital outflow is 1357.5, and t value was set by 13.72. That is, if U.S. *FFR* goes up 1 percent, the Chinese capital outflows will increase about 135.7 billion Yuan. This estimation result will be accepted because the t value was very high, and since China have had large-scale U.S. treasury bonds that

[8] U.S. Treasury Department, http:/www.ustreas.gov/tic

from 583 million USD in 1992 rise to 45.6 billion USD in 2006[9]. Chinese funds is flowing into the U.S., the change of the U.S. financial market shows the huge influence on the Chinese foreign capital flows.

5. Conclusions

Although the Chinese capital market has not currently been opened, due to the liberation of the export and import of goods and services, the Chinese foreign capital flow has already linked on the loop of global flow of funds. Its quantity of foreign capital flow and the direction of flows are influenced by U.S. capital flow. Although there are some differences among East Asian countries which belong to the same emerging market in the real economy and current balance, they tend to have same net outflow of funds at global flow of funds. The capital movement of amount far exceeds the scale of an existing current balance. I have built the Structural Equation Modeling and want to clarify the features and structural problems in overseas flow of funds in China since the 1990s. This is a very important issue for the stable growth of Chinese economy and the world economy. The following conclusions from the above-mentioned econometric analysis have been obtained.

First, since Chinese savings and GDP in the previous period were very high, and interest rate fluctuation is set very flexibly for Chinese savings, we have discovered the cause for a rise in national savings which contributes to current account surplus. However, monetary authority hoped to raise interest rate to control the scale of investment, but this financial policy couldn't take an effect on tightening investment. As a result the gap of savings and investment was expanded (towards savings glut), leading to an imbalanced current account.

Second, the difference in the elasticity of import with respect to Chinese GDP and the elasticity of export with respect to WGDP is 1.6%. According to measured result, if real effective exchange rate goes up by 1 percent, Chinese export will decrease by about 7.6 billion USD, suggesting that a structural problem exists in the Chinese economy. The results of presumption have showed two main factors related to huge current account surplus. If large excess savings existed, and exchange rate wasn't adjusted to flexible appreciation, the huge current account surplus will continue, because the current balance equals the balance of savings-investment. Therefore, it will be necessary to perform a structural conversion of domestic economy growth, and adjustment of policy which will shift the viewpoints of foreign trades from the current balance.

Third, some important points are seen when we analyze the change of international capital inflow in China. That is, the overseas capital inflow in China is more inclined toward longer-term economic growth and longer-term profitability including foreign direct investment rather than short-term investment. Through good economic fundamentals and the restrictively liberalized policy of capital market, directly invested large-scaled foreign capital has flown into the China market. However, in the analysis period, both Chinese capital marginal productivity and the effective use of foreign funding have also fallen.

The elasticity of the change of foreign-reserves with respect to capital outflows is 9.7 and the increase in profit from foreign investment has accounted for about 14.1 percent at the domestic outflows

[9] http://www.ustreas.gov/tiv/

of capital. These results indicate the cyclic factor of the overseas capital flows. Now, effective possession of foreign reserves and the risk of the capital flows containing capital flight exist in Chinese economic development. For developing countries, "flowing back" of international capital flows including capital flight may arise in the stage of economic development. Although international capital from advanced country flows into a developing country which is at the stage of low income level, international capital then flow out of developing country when those developing countries reach the middle income level. While carrying out change of global flow of funds, capital flight arises from the developing country due to financial repression; following that a developing country suffers from a painful setback as a financial crisis, and the gap of the income between developing countries and advanced countries expands again.

Fourth, in this estimation, the elasticity of market change factors is small, and that influence is very weak on the Money Market Rates, Price Earning Ratio, Exchange Rate, Real Effective Exchange Rate, etc. It means that capital markets in China still remain closed, and the mechanisms of financial market are not effective enough. This should be considered when reflecting the current condition of the China economy in the transition stage of economic reform. Therefore, in order to make market mechanisms more functional and to ripen the market in China more, China needs to refer to an international financial transaction system, so that it can improve further the Chinese securities market system and the international-capital-transactions system. In addition, China needs to further strengthen its financial system and enhance a sound macroeconomic framework, including appropriate monetary and fiscal policies, to protect against financial imbalance relevant for the future.

At the end of 2009, Chinese foreign reserves amounted to 2.4 trillion; more observation should be made for the future change in foreign reserves. According to the method of geometric mean, the average growth rate of current account surplus has been 26 percent, and the average growth rate of overseas capital inflow has been 18 percent since 1997. If I put growth rate of current account surplus stands at 6 percent, and growth rate of overseas capital inflow stands as 5 percent from 2010 to 2015, and even the exchange rate of Yuan per US dollar is revalued from 6.8 of 2010 to 6.0 of 2015. According to my estimate, which used the model of global-flows-of-funds, the foreign reserves in China will amount to about 3.14 trillion dollars in 2015.

This means current account imbalances will expand further, and that the operation management of foreign reserves faces a larger risk. So the monetary authority should adjust its monetary policy to make the increase of foreign reserves zero from now on for a period of time. For that purpose, China has to adjust the pattern of global-flow-of-funds from "twins-surplus" (current account surplus and financial account surplus) to maintain balanced global-flow-of-funds. Due to the big income gap between the urban-rural and the coast-inland area, in order to reduce large-scaled excess savings, China will need to stimulate a more long-lasting increase in consumption and sustain a more balanced economic growth over the medium term. It needs to expand domestic consumption and fix specifically the infrastructure of the stable growth, such as medical treatment, education, social security, and environment. Consequently, it is important to maintain investments-savings balance, foreign trade balance and the consistency of a macroeconomic policy, and to adjust synthetically the exchange rate which reflects economic ability. For the future, the Chinese economy should aim at a new platform for improving conventional quantitative growth qualitatively, with its growth in a more sustainable footing.

Table 2 the presumed result of Chinese-external-fund-flows

Model		Savings			
Dependent Variable		S			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-39678.3	6005.266	-6.61	0.0002
DI	1	0.684525	0.044764	15.29	0.0001
C(-1)	1	-0.04992	0.122164	-0.41	0.6935
R	1	2397.476	441.7047	5.43	0.0006

Model		Investment			
Dependent Variable		I			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8102.955	4594.269	1.76	0.1158
Y2	1	0.841873	0.078765	10.69	0.0001
G	1	1.590931	0.126897	12.54	0.0001
R	1	-330.043	440.1862	-0.75	0.4749

Model		Import			
Dependent Variable		IM			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-9457.30	350.8762	-26.95	0.0001
CPI	1	65.02454	2.987221	21.77	0.0001
Y	1	0.050912	0.000745	68.35	0.0001

Model		Export			
Dependent Variable		EX			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-2992.12	1459.268	-2.05	0.0706
REER	1	-75.6568	13.80496	-5.48	0.0004
WGDP	1	0.066022	0.005055	13.06	0.0001

Model		Inflow of funds			
Dependent Variable		FI			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-4234.56	2163.863	-1.96	0.0981
YR(-1)	1	1285.977	219.8531	5.85	0.0011
PER	1	-0.37675	1.749510	-0.22	0.8366
FDI	1	1.434211	0.298763	4.80	0.0030
R	1	-1132.64	200.5609	-5.65	0.0013
D	1	-1124.10	488.5198	-2.30	0.0610

Model		Foreign Direct Investment			
Dependent Variable		FDI			
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	4072.675	1187.196	3.43	0.0089
Y(-1)	1	0.023661	0.003641	6.50	0.0002

PI	1	0.004663	0.003964	1.18	0.2733
REER	1	-25.6644	13.09397	-1.96	0.0857

Model **Price Earning Ratio**
Dependent Variable **PER**

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	451.3261	171.0698	2.64	0.0298
R	1	-34.3607	11.59153	-2.96	0.0180
YR(-1)	1	22.84622	10.58425	2.16	0.0629
risk	1	-18.5484	13.48587	-1.38	0.2063

Model **Interest Rates**
Dependent Variable **R**

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	2.261971	0.575889	3.93	0.0044
MR	1	-0.00054	0.000210	-2.59	0.0322
RCB	1	0.448404	0.066156	6.78	0.0001
YR(-1)	1	0.327401	0.050930	6.43	0.0002

Model **Exchange Rate**
Dependent Variable **REX**

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8.129095	0.068538	118.61	0.0001
R	1	0.019851	0.006630	2.99	0.0172
NFI	1	0.000007	0.000003	-1.93	0.0902
EX	1	0.000011	0.00001	1.01	0.3428

Model **Changes in Reserve Assets**
Dependent Variable **CRA**

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	6268.267	4036.552	1.55	0.1644
CA	1	0.359760	0.066787	5.39	0.0010
FI	1	0.162563	0.010522	15.45	0.0001
REX	1	-757.913	482.8754	-1.57	0.1605
FFR	1	-68.1098	12.58693	-5.41	0.0010

Model **Outflow of duns**
Dependent Variable **FO**

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	-925.714	898.9708	-1.03	0.3428
CRA	1	9.732598	0.490594	19.84	0.0001
PI	1	0.141047	0.021774	6.48	0.0006
RCB	1	-423.528	122.6598	-3.45	0.0136
FFR	1	1357.547	98.94701	13.72	0.0001
D	1	-221.134	371.2313	-0.60	0.5732

Table 3 The list of Variable and definition

Variable	Variable name	Unit	Classification	Source
Y	Chinese GDP	100millionsRMB	Endogenous	China statistical yearbook
Y2	Dif2 of lag of GDP	100millionsRMB	Exogenous	Processing
S	Gross Savings	100millionsRMB	Endogenous	Processing
DI	Disposable Income	100millionsRMB	Exogenous	China statistical yearbook
I	Gross Investment	100millionsRMB	Endogenous	Chinese FOF
C	Final Consumption	100millionsRMB	Exogenous	China statistical yearbook
K(-1)	lag of the capital stock	100millionsRMB	Exogenous	Processing
EX	Export	100millionsUSD	Endogenous	PBCQSB
IM	Import	100millionsUSD	Endogenous	PBCQSB
CA	Current account	100millionsUSD	Endogenous	IMF, IFS
REER	Real Effective Exchange Rate	%	Exogenous	IMF, IFS
REX	Exchange rates	RMB/USD	Endogenous	IMF, IFS
R	One-year loans interest	%	Endogenous	PBCQSB
CPI	Consumer Price Index	%	Exogenous	PBCQSB
PER	Shenzhen B share	%	Exogenous	PBCQSB
CRA	Changes in Reserve Assets	100millionsRMB	Exogenous	PBCQSB
CF	Errors & omissions	100millionsRMB	Exogenous	PBCQSB
FO	Fund outflows	100millionsRMB	Endogenous	Chinese FOF
FI	Fund inflows	100millionsRMB	Endogenous	Chinese FOF
NFI	Net financial investment	100millionsRMB	Endogenous	Chinese FOF
YR	Economic growth rate	%	Exogenous	China statistical yearbook
FDI	Foreign direct investment	100millionsRMB	Endogenous	PBCQSB
OPI	Portfolio investment	100millionsUSD	Endogenous	IMF, IFS
OIO	Other investment(liabilities)	100millionsUSD	Endogenous	IMF, IFS
RFL	Interest payment	100millionsUSD	Exogenous	PBCQSB
Risk	Liability ratio	%	Exogenous	China statistical yearbook
RCB	Interest rates of central bank	%	Exogenous	PBCQSB
MR	Real money supply	100millionsRMB	Exogenous	PBCQSB
G	Government expenditure	100millionsRMB	Exogenous	China statistical yearbook
PI	Profit from Investment	100Millions USD	Exogenous	China statistical yearbook
FFR	Federal Funds Rate	%	Exogenous	IMF, IFS
WGDP	Total of Japan ,U S and Euro	100millionsUSD	Exogenous	IMF, WEO

Note: PBCQSB is The People's Bank of China Quarterly Statistical Bulletin

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