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**Scenario Analysis on the Influence of Improving the RMB  
Exchange Rate Regimes Forming Mechanism on China's  
Macro Economy-A General Equilibrium Analysis**

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# Scenario Analysis on the Influence of Improving the RMB Exchange Rate Regimes Forming Mechanism on the China's Macro Economy-General Equilibrium Analysis\*

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**Abstract:** This paper applies Social Accounting Matrix (SAM), from the angle of general equilibrium analysis, having the China's SAM of 2005 as the shock object, resting on the assumption that the Chinese Yuan (RMB) Exchange Rate Regimes forms on the basis of the real effective exchange rate, makes a scenario analysis on the influence on the China's macro economy. The main conclusions are as follows: Firstly, the appreciation of the RMB shall not change the trade surplus of China, meanwhile, is to improve the deterioration of China's foreign trade since 1999. Secondly, the FDI takes on a characteristic of indifference to the RMB appreciation; however, the appreciation of the RMB will abstract the international idle money. Thirdly, the appreciation of the RMB will be favorable of the structure upgrading of the citizens' consuming level, meanwhile, this appreciation maybe going to widen the gap between the rich and the poor, and maybe made the current austere state of employment worse and worse. Fourthly, the appreciation of the RMB will increase the fiscal revenue of the government and do favor to the aggregate economy stock. Finally, the appreciation of the RMB will make little influence on the GDP applying either approach of expenditure or that of income.

**Keywords:** exchange rate of RMB; exchange rate system; real effective exchange rate; SAM; scenario analysis.

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## 1. Introduction

In the recent years, with the swift progress of Chinese economy, seeing from trend in the metaphase and the long term, the appreciation of the Chinese Yuan (RMB) is practically required. The foreign trade surplus and the foreign exchange reserve have been increasing gradually, which makes it an inevitable trend that the RMB will appreciate. The *Standard and Poor* released on the 10<sup>th</sup>, March, 2004, that in the year of 2003, China had abstracted as much as 40-50 billion dollars partially as a result of the expectation of RMB revaluing exchange rate. Therefore, the current feasible policy will not be the contrived appreciation of the RMB, which may, on the one hand, be unfavorable of the regimes forming mechanism of the RMB, and on the other hand, be to make the further accession of the international idle money that will spur up the domestic normal financial order. Under the practical background that the initiative growing mechanism of domestic demand has not been improved, the pressures of appreciation will make negative influence on the export, investment, employment and foreign debts and further prick up the economic growth gap and the unbalance between the exterior and the inner part unless they are performed appropriately. That will be a catastrophe not to China, but also to the whole world economy.

In the aspect of China's foreign trade, people usually take account of the great increase of the value and the ratio of dependence on foreign trade, and the favorable side of them to China's GDP, they ignore the deteriorating side of China's foreign trade in the recent years. As shown in the Fig. 1, ever since 1999, despite the existence of trade surplus, the increasing rate of import had been bigger than that of export except for 2002. While in the Jan. and Feb. of 2004, even deficit emerged in China's foreign trade. As to this phenomenon, seeing from the facade, it came from the realization of China's commitments made when accessing to the WTO in 2002 and was especially the direct results of fully abrogation of the drawback. However, whether there are some deep economic reasons, we should illustrate it from the angle of general equilibrium.

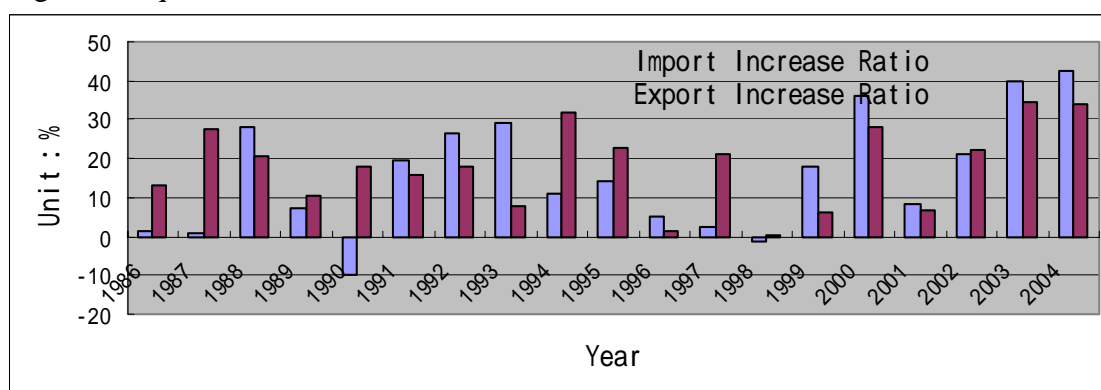


Fig 1. Time Series of China's Import and Export Growth Rate

Resources: National Statistic Bureau of PRC, China Statistic Yearbook, China Statistics Press; Data of 2004 include only the first three months, from the website of the Ministry of Commerce of the PRC. <http://www.moftec.gov.cn/tjzl.shtml>.

In the second part of this paper, we will make literature review, and mathematical model will be presented in the third part, and scenario analysis is showed on the on

the influence of exchange rate adjustment on the macro economy in the fourth part, scenario analysis on the influence of exchange rate adjustment on China's sectors economy in the fifth part. Finally, we draw conclusions.

## 2. Literature Review

As to the classification of exchange rate system, in accordance with the criterion of IMF (1981-1998), before 1999, the exchange rate system over the world mainly included fixed and floating, namely, peg exchange rate (including peg single currency and peg combined currency), limited flexibility exchange rate system (including single and combined currency) and more flexible exchange rate (including adjusting according to a set of indexes, managed floating and independent floating), which had been formally released by the *Annual Report on Exchange Arrangements and Exchange Restrictions* published by the IMF in accordance with the official reports from the member countries. This norm is called "de jure" exchange rate system. Ghost et al. (2003) offered 15 sub-classifications for this norm. However, the first and foremost problem of the "de jure" exchange rate system lies in the fact that the "de facto" exchange rate system of quite a few countries differs with the advocated in a large degree. Aiming at this kind of situation, Ghost et al. (1997) made research and classification called "de jure" on the basis of real exchange rate changes information. Later, Ghost et al. (2003), through the technology of hybrid, tested the macro economic performance of "de jure"/"de facto". Since 1999, IMF has changed the "de jure" exchange rate system to "de facto" exchange rate system. The newly-classified exchange rate system includes: exchange rate arrangement without independent statutory currency, currency bureau system, other traditional fixed peg system, parallel (1% upper or lower) adjusted peg, crawling peg, float within the crawling band, intervened managed float without reveal in advance, independent float. Recently, Reinhart and Rogoff (2004) put forward "Natural" classification, with the basic idea that we should first differentiate those significant macro economic factors before we combine to form "dual/parallel" market exchange rate. When the "dual/parallel" market exchange rate differs too much with the official "de jure" exchange rate, we should apply the "dual/parallel" market exchange rate to make exchange rate classification. Meanwhile, "natural" classification applies 5 years to compute and judge the exchange rate system and avoiding the influence of chanciness on the computation result. At present, the built data base includes all the data from the member countries and most of them can be traced back to 1946. "Natural" classified the "de facto" into 5 dominant categories and 15 fine ones. In the five categories, there include fixed exchange rate system, limited flexible exchange rate system, managed floating exchange rate system, free floating exchange rate system and free falling exchange rate system. In the 15 fine categories, there include unified rate, dual/multiple or parallel rates, "de jure" exchange rate, "de facto" rate, freely falling rate, hyperfloat exchange rate system, crawling peg system, crawling band system, moving band rate, managed float, freely floating, no legal tender, currency boarder rate, peg system and band system.

As to the choice of the exchange rate system, Zhang and Wang (2003) believed

that the issue of the RMB appreciation is an issue of the RMB exchange rate system choice. That paper discussed the long-term factors of determining the choice of the RMB exchange rate system as a whole, including optimal exchange rate zone factor, capital opening factor, macroeconomic factor and the historical and the institutional factors. They, taking account of the evolvement of the exchange rate system over the world in 1990s, presented a BBC principle of the current exchange rate system choice and some exchange rate systems that can be applied in China: pegging on a pack of currency, wide band floating, crawling, reference rate, soft exchange rate band, censorial/supervising exchange rate band, etc. In accordance of the definition of Fan (2000), 2-7 exchange rate systems within the “de facto” belong to “intermediate exchange rate system”. Yi et al concluded from the statistics that the number of those applying Corner Point (CP) exchange rate system is more than 50%. After comparison, Yi(2000) maintained that the key of choosing the exchange rate system is a trade-off between effectiveness and stability. In the former time before the international game rules of the money system changed, in the circumstances of capital account opening, it was very disastrous to implement intermediate exchange rate system and only the completed marketing exchange rate was effective and secure. However, in quite a few developing countries, there is still a long distance from the objective and a even longer way to go by virtue of that fact that before the developing countries can be fully exchangeable of the money, it is impossible that the real market exchange rate comes out. And meanwhile, as to a developing countries that hasn’t opened its capital account, the really elastic, complete floating and flexibly adjustable market exchange rate is absolutely one kind of “luxury”. Rogoff et al. (2003) drew conclusions by applying “natural classification” as follows: firstly, there exist distinctions between the practical performance and the government alleged exchange rate system in nearly half of the countries in the history, and the phenomenon of “cowardly-floating” is widely presented. Secondly, it is the most prevalent to apply intermediate exchange rate system, especially in the developing countries, and nearly half of them. It is extremely limited for them to perform freely floating system. Thirdly, the frequency of one country changing its exchange rate system is dramatically similar with the circumstance of 50 years ago. Since 1940, it is about 7% of all the countries that change their exchange rate system. Furthermore, in light of statistics by Shen (2002), seen from the practical maintenance time of every sort of exchange rate system, rigidly pegging system is the most endurable one, the mean value is 14.9 years; the single money peg and currency pack peg rank the second, mean value is 9-10 years; the floating system the last with mean value of 5-6 years. Therefore, judging from the period of exchange rate system, the limited endurance of certain exchange rate system is turned out. In other words, with the magisterial factors of determining the exchange rate system changes, the former existing exchange rate system had to be confronted with re-choosing, namely, in accordance with the multi-factor distinction and mobility of different countries. Zhang (2004) believes that the pack currency peg system is not available at the present time; it would be hard to introduce interregional floating in a short period of time, one-off appreciation with the drastic infrastructural system construction of floating exchange rate forming regimes mechanism and steady

introduction of the interregional floating mechanism would be the orientation of China's exchange rate system reform.

For the research of factors that impact the choice of exchange rate system, such statistical tests approaches as the differentiation test, OSL test, and two-stage test are most prevalent empirical methods. Heller (1978) did research on 86 national samples and drew conclusions as follows: the opening degree, economy scale, inflation, convergence degree of the geographical trade and integration degree of international finance are the dominant factors. Honkapohja and Pikkarainen (1994) made research on 125 national samples and drew conclusions as follows: degree of opening, economic development, economic scale, integration degree of international finance and the flexibility of the trade item are the dominant factors. Cuddington and Otoo (1990, 1991) conducted research on 66 national samples and drew conclusions as follows: degree of opening, economy scale, inflation, currency shock and the abroad price shock are the dominant factors. Holden et al. (1979) researched 76 national samples and concluded that the degree of opening, economy development, capital fluidity and convergence degree of the geographical trade are the dominant factors. Melvin (1985) researched 64 national samples and concluded that the economy scale, inflation, convergence degree of geographic trade, currency shock and abroad price shock are the dominant factors. Poirson (2001) researched 93 national samples and concluded that the degree of opening, economy development, economy scale, convergence degree of geographic trade, inflation, capital control degree, foreign currency reserve, distinction degree of products and the stability of the politics are the main factors. Dreyer (1978) researched 88 developing countries samples and concluded that degree of opening, economy and distinctions of products are the main factors. Savvides (1990) researched 39 developing countries and concluded that degree of opening, economic development, capital fluidity, convergence degree of geographic trade, real effective exchange rate and the distinctions of products are the main factors. What is need to mention particularly is the conclusions of Dreyer (1978) and Savvides (1990) of the developing countries account much of meaning for reference, especially to China. Their researches both released that the distinctions of products possessed high significance in the statistical tests to the exchange rate system choice and opposite signs means higher products distinctions and further stronger trend to choose the fixed exchange rate system and otherwise to choose floating system. However as for the influence of convergence degree of geographic trade on the system choice, Dreyer (1978) and Savvides (1990) drew entirely opposite conclusions. Furthermore, as far as this paper is concerned, we should discussed the exchange rate forming regimes mechanism that suit the China's practice from the angles of economy growth and real effective exchange rate respectively and research and analyze from macro and sector aspects. Meanwhile, by virtue of the former literatures related are all under the frame of partial equilibrium, it would be convictive to analyze from the angle of general equilibrium.

On the influence of RMB exchange rate adjustment on China's economy, Mundell (2003) pointed out that the appreciation of RMB would make at least six dominant effects on China's economy: firstly, influence China's export which would

bring great disaster on China; secondly, make China's deflation be confronted with more pressure; thirdly, lessen China's ability of attracting overseas capital and decrease FDI of overseas investor; fourthly, reduce the profit rate of China's enterprise and aggrandize the employment pressure; fifthly, the fiscal surplus and bank bad debts would increase with the appreciation of the RMB; sixthly, for further, the stability of China's monetary policy would be impacted. Mackinnon and Schnabl (2003) mentioned that at present, it would be not suitable to implement floating exchange rate system which would deduce the RMB to appreciate ceaselessly and therefore made the entire domestic market plunged into severe deflation. Krugman (2003) referred that it would make no difference unless the RMB appreciate to a notable degree, however, which would be unacceptable for the Chinese government. Li and Yu(2003) believed that the appreciation of the effective exchange rate of RMB to a notable degree would perform a gigantic negative impact on China's economic growth. They utilized the quarterly data of Jan. in 1995 to Jun, in 2003, with two-stage OLS, made regressive analysis on the relationship between the real effective exchange rate of RMB and the foreign trade and FDI. Their conclusion revealed that the real effective exchange rate of RMB was the significant factor that affected the foreign trade and FDI of China and the depreciation of the real effective exchange rate would stimulate the increase of export and decrease of import and reduce the growth rate of utilizing foreign investment. They also applied the Econometric Analyzing Model for China's Monthly Economic Conditions built by the Macroeconomic Research Division of the Development Research Center of the State Council to analyze the comprehensive influence of notable appreciation of RMB nominal effective exchange rate in the Asian Financial Crisis. The conclusions showed that the RMB didn't depreciation or the notable appreciation of the nominal effective exchange rate, which made disastrous impact on China's economy growth and was the significant reason for the deep decline and serious deflation in China.

However, some scholars, through testing on the real data, detected that there was no significant relationship between the exchange rate and the foreign trade. Cerra and Saxna (2003), with the quarterly data of 1985-2001, made research on sensitivity degree of China's export to price signals such as exchange rate. Seeing from the collective, the relationship between export and exchange rate is a bit weak, among which despite the significance between the exports of manufacturing products and exchange rate, the value of export will grow with the appreciation of the RMB and is opposite to the general theories. Wang (2003) believed, on the basis of experiential analysis, seeing from the long term, the relationship between the exchange rate of RMB and the trade balance was insignificant, the preminent reasons for the continuous surplus of China's foreign trade were as follows: the decreased supporting rate for the elderly people, the increase of national saving accounts and the withered domestic consumption stimulating the growth of export, the increasing population of young and youth enhancing the advantages of China's low-price labor force and further the export competition. Xie and Chen (2002), by analyzing the relationship between the exchange rate of the RMB and China's trade balance from 1978 to 2000, enclosed that the change of exchange rate could only explain 3% of the changes of



trade balance and the other non exchange rate factors account more than 90% for the influence on trade balance, including abroad demand and domestic demand. Hu, Z. L. of the Goldman Sachs Bank maintained that the export elasticity of the RMB exchange rate was awfully small and the adjustments of the exchange rate would not deduce notable changes. (Zhu and You, 2003)

Seeing from the above, in the analysis on the relationship between exchange rate and foreign trade and FDI, different period of data will bring about totally different conclusions in despite of basically same econometric analyzing approaches. Therefore, we believe that the partial equilibrium approach can not offer us the true facet of the relationship between the exchange rate and economic variable. And hereafter, we should apply the general equilibrium approach to make illustration, which eases the assumption of “other conditions remain constant”, and takes account of multi markets. This approach discusses all the commodities market and their mutual influence with the idea of universal connection rather than having a single market as the research object. Resultantly, the general equilibrium theory has long been interested and regarded by the economists (Starr, 2003). Zhang (2003) classified the research of the method of general equilibrium into three dominant fragments: one is the non-linear equilibrium theory by Marshall and Walras et al., another is the static and dynamic input-output model by Leontief et al., and the third one is macro economic orientation that built on the basis of Debreu (1959). In order to expand the general equilibrium theory from the existence, uniqueness, stability, effectiveness and bargaining to computable and measurable empirical analysis, economists devoted much of basic work, among which the Social Accounting Matrix (SAM) is one of the most effective approaches. Since the first SAM built as one part of the Cambridge Growth Project under the leadership of Prof. R. Stone, the theory of SAM has been researched and expanded all-round, such as the theory basis, frame structure, multiplier decomposition, interdependence analysis, data process, dynamic analysis, test on reliability (Pyatt, 1988, 1991a, 1991b, 2001; Defourny and Thorbecke, 1984; Pyatt and Round, 1979; Round, 1991, 2003; Robinson et al., 2001; Golan and Vogel, 2000; Adelman et al., 1991; Stone, 1981; Roland-Holst and Sancho, 1995; Byron, 1996; Kim, 2002; Arndt et al., 2000). Meanwhile, with the great impel of the World Bank, more than 70 countries and regions have built their SAM, which has been widely used into research of economic development strategy, income distribution and redistribution, fiscal policy making of one country or region, taxation analysis, economic structure analysis, regional development analysis, calamity analysis and the welfare degree comparison research and so on and so forth (Pyatt and Round, 1985; Robinson, 1988; Santos, 2003; Pyatt and Roe, 1977; Adelman and Robinson, 1978; Roland-Holst and Sancho, 1992; Whalley and St. Hillarie, 1983, 1987; King, 1985; Thorbecke, 1985; Iqbal and Siddiqui, 1996; Kilkenny, 1999). For the reason that SAM satisfies not only the numerical relationship between commodity and activity inside the social economic system, but also consider the balance of row and column, at the same time reflects a non-linear system, Keuning (1991) even proposed that the SAM be the basis of the national account system. SESAME accounting system brought out by Keuning and Verbruggen (2003) on the basis of SAM has been

implemented in Europe. Robinson et al. (2001) presented cross-entropy technology to balance and update the SAM. Factually, from the angle of information theory, the approach of cross-entropy can be applied to shock analysis.

In China, some textbooks such as *National Economy Statistics or National Economy Accounting Principle* introduced some knowledge about SAM, such as Qian (2000). Li (1996) compiled the first national SAM on the basis of the National Input-Output Table of 1987 and made comparably detailed introduction of the compilation. Later, Zhai(1998) compiled the SAM of 1995. In the present years, with the good endeavor of the economists at home and abroad, the CGE model of China has been the commonly used instrument of researchers to make research on the China's economy and made some achievements (Zheng and Fan, 1999; Li etc., 2000; Zhai etc., 1997; Wang and Zhou, 2000; Feng etc. 1996; Zhou and Deng, 1998; Li, 2001; Garbaccio, 1994; Fisher-Vanden, Jorgenson, 2001; Zhang, 1996). The above models all achieved good depict and policy simulation on the analysis of the influence of the policies and measures such as China's accession to the WTO, environment, tax, finance, endowment insurance, enterprise reform, trade liberty and the "three linkages" across the Taiwan strait. While those models did not study the China's economy and Social problem from the angle of shock and renovation, therefore, research of the scenario analysis of improving the exchange rate forming regimes mechanism on China's economy from the angel of SAM is awfully practically valuable.

### 3. Mathematical Analysis Frame

#### 3.1 Social Accounting Matrix (SAM)

SAM applies the form of matrix with row and column crossed, there are eight sectors in the row and as well as in the column: commodities, activities, factors, enterprises, households, government, capitals and the rest of world (ROW), at last there is a summation. In the matrix, it is demanded that the purchase, expenditure or money flow from every account must have the corresponding sale, revenue or money flow in the other account. Every non-zero factor in the matrix shares a double meaning, which means income in the row and expenditure in the column. In light of the basic principle that any income or revenue should have a corresponding payment or cost, the income expressed in the row in the matrix should equal to the payment in the column.

SAM can be expressed with a matrix:

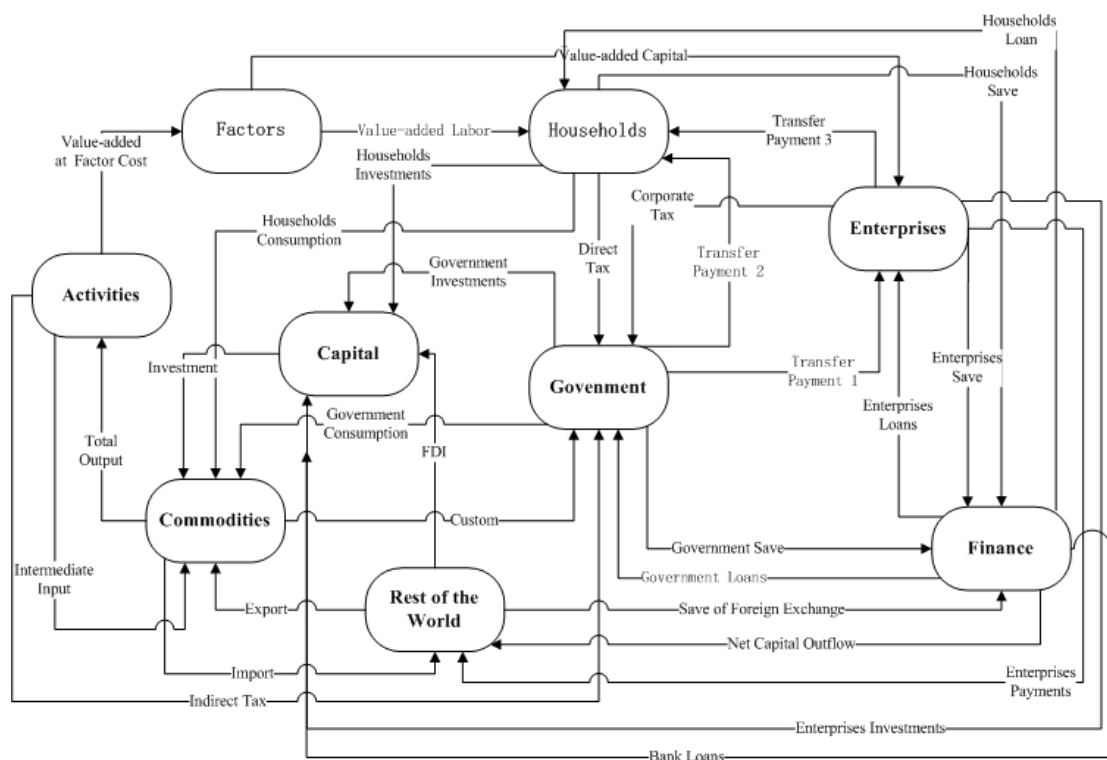
$$X = \{x_{ij}\} \quad (1)$$

where  $x_{ij}$  denotes the income that the account  $i$  got from the account  $j$ , correspondingly means the expenditure of  $j$

The treat of commodity and service flows from the row to the column, while the capital from the column to the row. The value in the row must equal to the column, namely:

$$\sum_j x_{kj} = \sum_i x_{ik} \quad (2)$$

Equation (2) indicates SAM satisfies the Walras Law: if all the accounts except one are balanced, the last account is balanced too. The relationship among accounts in SAM can be expressed with one economic Income Circulation Table (as shown in Fig.2).



**Fig.2 Cycle Figure of Social Accounting Matrix**

Commodities denote the combination of all kinds of products, and the income of it comes from the middle demand of manufacture sector, family's terminal consumption, governmental terminal consumption, investment and export; the expenditure is used for national output, tariff collected by the government and the import from abroad.

Activities refer to the production activity and the main bodies are manufacture sectors. The income comes from the domestic output of the product, and the expenditure is used for the middle demand of the manufacture process, the rewards paid to the manufacture factors and the indirect tax.

Factors mainly refer to the manufacture factors usually including capital and labor. The income is the rewards of factors and the expenditure includes the capital income of enterprise and the labor income of the family.

Income of enterprises refers to the capital income enterprises got in the process of manufacture and transfer payment from the government, the expenditure of enterprise includes the transfer payment of enterprise to the families, enterprise tax and deposit.

Income of households comes from the labor income, transfer payment from the

government and from the enterprise and the remittance from the abroad; the expenditure is used for the consumption of family, direct tax, deposit and purchase from abroad.

Income of government mainly includes all kinds of tax, including tariff, indirect tax from manufacture sector, enterprise tax and direct tax; the expenditure of government is used for the terminal consummation of government, transfer payment to enterprises and families and the deposit of government.

Income of capitals comes from the enterprise deposit, family deposit, government deposit and the net capital inflow; the expenditure of capital is used for investment.

Income of the ROW comes from import, abroad purchase of family; the expenditure of the ROW is used for export, abroad remittance and net capital inflow.

Any system is dynamic and developing, therefore, the SAM must be made updated to the initial SAM with the acquisition of basic knowledge so as to get the latest, instantaneous and all-round information of national economic account. Fan and Zheng (2003b), on the basis of Robinson et al. (2001), in light of the practical situation of China, presented that when innovating the SAM of China we must take four kinds of information into consideration: basic SAM information, initial row and information, macro economic gross information and accessional macro economic information. And they presented the following innovation cross-entropy optimizing equation.

### 3.3 Shock Analysis of Exchange Rate Change on the SAM

The initiate shock of exchange rate change on the macro SAM is processed following two steps:

Firstly, the exchange rate change will influence the import, export, FDI, abroad remittance and tariff, all together five accounts in the SAM shown in Table 1. While the direct shock on FDI and abroad remittance is shown that the amount in terms of home currency will change by the same ratio as the exchange rate, and can be expressed as follows:

We assume  $\lambda$  is the exchange rate of foreign currency to home currency, then the changing ratios of them after the RMB appreciated are  $-\frac{\lambda}{d\lambda}$ ,  $-\frac{\lambda}{d\lambda}$ ,  $\frac{\lambda}{d\lambda}$ ;

Secondly, in the aspect of import, export and tariff, in accordance with the purchasing power par value theory, the exchange rate is the ratio of the prices between two countries, namely,

$$P = \frac{P_w}{\lambda} \quad (3)$$

where  $P$  is the home price,  $P_w$  is the abroad price, hence  $\frac{dp}{p} = \frac{P_w}{\lambda^2}$ , through which,

we can deduce:

$$\frac{dp/p}{d\lambda/\lambda} = -1 \quad (4)$$

The above equation shows that the ratio of price change is the same as that of

exchange rate change, but in the opposite direction and the gist of exchange rate change is one kind of price changes. The appreciation of RMB will deduce the price of exporting goods increasing, and that of importing goods decreasing, and with the effect of elasticity of demand for import and export, the above two changes will determine the changes of the total value of import and export. Assuming that  $TR$  is the total value of import and export,  $Q$  is the total volume of import and export,  $\varepsilon$  is the

price elasticity of demand, and then,  $\frac{dTR}{dp} = Q + p * \frac{dQ}{dp} = Q(1 + \frac{p}{Q} * \frac{dQ}{dp}) = Q(1 - |\varepsilon|)$  ,

hence,  $\frac{dTR}{TR} = \frac{dp * Q(1 - |\varepsilon|)}{p * Q} = \frac{dp}{p}(1 - |\varepsilon|) = -\frac{d\lambda}{\lambda}(1 - |\varepsilon|)$  , and for further, we can

achieve the determinate formula of exchange rate change and demand elasticity to the import and export value change. Therefore, the change rate of total export value  $\eta_E$  and import value  $\eta_I$  after the RMB appreciation are respectively.

$$\eta_E = -\frac{d\lambda}{\lambda}(1 - |\varepsilon_E|) \quad (5)$$

$$\eta_I = -\frac{d\lambda}{\lambda}(1 - |\varepsilon_I|) \quad (6)$$

By virtue of the shock of exchange rate change to the macro SAM, this will deduce that the income and expense of the related sector are unequal, and for the time lag effect of “J-curve” effect, the macro SAM cannot but experience a course from non-equilibrium to equilibrium. Therefore, if we apply cross-entropy technology, having the initial change of the above five accounts as newly supplying information, the equilibrium solve of the equilibrium state can be achieved.

#### 4. Scenario Analysis on the Impact of Exchange Rate Adjustment on China’s macro Economy

##### 4.1 Estimation of China’s Macro SAM in the year 2005

Estimate all the factors in SAM in the time series, and we gain the conclusion of estimation. Bring all the factors mentioned above into Table 1, and we gain the initiate macro SAM of China in the year of 2005. We apply the cross-entropy technology by Robinson et al. (2001) to make balance and use the test method by Byron (1996) to process statistical test, considering the following reasons: on the one hand, there are some errors in the estimators, and on the other hand, the sum of the row and column in the initiate table are not equal exactly. The result is certified and we gain the balanced macro SAM of China. See Table 1 (see Appendix A).

##### 4.2 Bases of Exchange Rate Adjustment

There are many factors that influence the exchange rate forming regimes mechanism in China, such as degree of opening, economic development, economic scale, degree of inflation, capital fluidity, convergence degree of geographical trade, integration degree of international finance, economic growth, foreign currency reserve,

trade flexibility, real effective exchange rate, products distinctions, cash account, foreign loans scale, domestic credit scale, money shock, international market price, political stability, independence of the central bank and even the degree of multiparty cooperation under the leadership of CPC. In accordance of Dreyer (1978) and Savvides (1990), the statistical tests all revealed that the real effective exchange rate was significant to the exchange rate system choice, on which argument Yi et al.(2000) think alike.

While on the choice of exchange rate system, Yi et al (2000) believed that under the arrangement of intermediate exchange rate, as the equilibrium exchange rate adjusted with the outside shock, at one certain time point, the government controlled exchange rate must be different from this one. If some “international financial gaviel” can anticipate this rationally (especially, under the conditions that the government would intervene in advance), they would launch attack at this time point. The system with scant caution money provided effective magnifying lever for those speculators, meanwhile, dispersed market gossips deduced magnitude speculators follow. At this time, the market noise produced systematical great variance and the equilibrium exchange rate under the market mechanism would “super-adjust” (esp. when the sensitivity of market response was high). Thus, the exchange rate controlled by the government would be distinct remarkably with the equilibrium exchange rate and when the ammunition of the government for the counter market operation (foreign currency reserve) consumed, the intermediate exchange rate system was to collapse. This conclusion is somewhat inconsistent with the statistical result by Rogoff et al. (2003): “the intermediate exchange rate system was the most prevalent, esp. in the developing countries, nearly half of them.”

The real effective exchange rate (REER for shot) is the effective exchange rate that took off the price factor. Yi et al. (2000), applying the quarterly data of 1990-1997, estimated the REER of the past years and the conclusions revealed that from 1995 to 1997, despite the depreciation of the nominal effective exchange rate, but the REER had been remaining trend of appreciation and the range of appreciation was from 1% to 24%.

Dong and Yang (2004) computed the REER from 1994 to 2002 and concluded that if by CPI, the index of REER of the RMB in the year 2002 was 85.17 (1995 as the basic stage), the RMB in 2002 should appreciate by 14.83%  $[(85.17-100)/100]$ , if by export price index (EPI), the REER of the RMB in the year 2002 was 58.33 (1995 as the basic stage), and the RMB should appreciate by 41.67%  $[(58.33-100)/100]$ . Therefore, either by CPI or by EPI, the REER of the RMB reflected that the RMB had been underestimated by 14% to 41% and namely, the appreciation range should stand between 14% and 41%.

Yi and Fan (1999) estimated the weighed RMB REER of 9 countries' bilateral trade and concluded that the RMB REER took on a “V-shape” in the 1990s and from then on a increasing trend. The REER in the end of 1997 appreciated by 24% compared with the beginning of 1990s and by 50% with the middle of 1993. if we had the combined exchange rate of 1994 as the basic criterion, the REER of the bottom of 1997 was 6.07 RMB per US \$.

In addition, Zhang (1999), Zhang (2001), Wang (2004), Lin (2002), Zhang (2003), Li and Yu (2003) all made estimation on the exchange rate or REER of the RMB. However, no matter what system we choose, “intermediate” or “extreme” system, the REER or the equilibrium exchange rate should be the bases of improving China’s exchange rate forming regimes mechanism. As to the above mentioned estimation or computations, the RMB REER or equilibrium exchange rate had been underestimated by 3% to 50%. Hence, we, in this paper, will make scenario analysis resting on the assumption the RMB appreciated by 3%, 5%, 10%, 20% and 30% respectively.

#### 4.3 Scenario Analysis on the Influence on China’s Macro Economy

In order to research the sound exchange rate forming regimes mechanism of the RMB, we will have the SAM of the year 2005 as the shock object and make analysis. The influence of the RMB (by REER) appreciation on China’s macro economy is shown in the international part in 4.1 and some of the family and the government. We put the elasticity of China’s import and export (Fan, Wang, and Liang, 2004) and the above mentioned appreciation range into the five accounts in Table 2: import, export, FDI, abroad remittance and tariff, and then carry out shock by the equations (13)-(16) in 3.3. We gained the shocked macro SAM of China’s (unbalanced). Applying the renovation principle of 3.2, we got a new balanced one. Compared with Table 1, we could see clearly the shock results by different schemes (see Fig. 2). The initiate changes of the RMB appreciation were only reflected in import and export, FDI, net capital outflow and foreign currency saving that were closely connected with abroad, but the balanced result revealed that the shock of appreciation, by way of income flow and expenditure flow amongst economic sectors, would be transferred to the domestic economic sectors such as production, investment and consumption. In the following parts, we would analyze, from five angles, these impacts on the national economy and further make judgment on the comprehensive effects.

##### 4.3.1 Influence of the RMB Appreciation on the International Trade

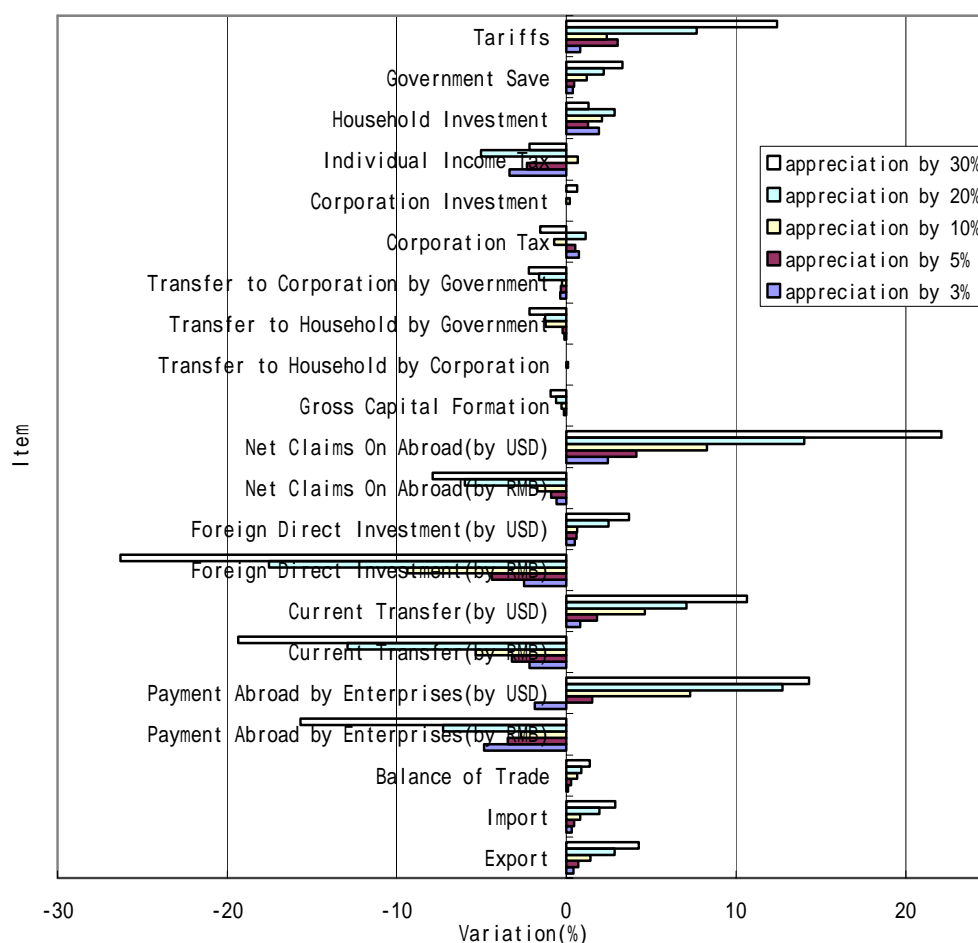
The computation based on the SAM technology reveals that the exchange rate will do affect the import and export, while the direction is different from the general conclusion. We, after computation, conclude that the appreciation will deduce increase in import and export rather than the generally idea that the appreciation of RMB will decrease the export and increase the import. For the application of SAM on basis of general equilibrium theory, the terminal changes of import and export after the appreciation reflect changes in all the other sectors and should be sound and all-around.

Seeing from the Fig.3, the RMB appreciates by 3%, the export will increase by 0.43% and the range of increase will rise. When the RMB appreciation by 30%, the export will increase by 4.26%, which indicates that either mildly or shrewdly, the RMB appreciation will not deteriorate China’s export, it will be favorable instead. The idea that the appreciation of RMB will do badly to China’s export are superficial and from intuition for the reasons as follows:

Firstly, it results from being affected by the elasticity. Fan, et al. (2004) worked out the elasticity of export in the long term is -0.8579. Owing to the elasticity (in

absolute value) less than 1, the increase of the export will increase the sum value of export rather than decrease.

Secondly, it comes from being connected with the particular trade structure. At present, the trade of processing and assembling materials supplied and of products with import materials account 55% in the export of China, meanwhile, trade of processing and assembling materials supplied and of products with import materials and the machinery import of foreign businessman account nearly 60% of the total import. If we take consideration of the import of raw materials and investing products in the general trade, there exists much space for increase in the former proportion. Processing and assembling materials supplied only earn fixed processing fees and have hardly anything to do with the changes of exchange rate. Trade of products with import materials maybe a bit complicated, which is determined by the proportion of the intermediate products to the raw materials. After the RMB appreciated, for most of the raw materials are imported and the import price decrease, the cost of the enterprises will be taken down, the export will not decrease.



**Fig.3 Shocked Scenario of China's Economy in Different Appreciation Level**

Thirdly, the low-price labor force of China will not be completely counteracted as a result of the increase export price; therefore, the increase of export price will not bring the export value down. In accordance of the computation in *Report of Trade*



*and Development* at the UN trade and development conference in the year 2002, amongst all the 17 sample countries, the wage of per labor force was the least and that of other countries were 2.5-47.8 times of China. Even taking account of the production efficiency of per labor force, there were 10 in 17 countries whose cost were higher than that of China. Therefore, despite the appreciation of the RMB, on condition of appropriate range, the China's labor force features comparative advantages.

Fourthly, export of China would be impacted by not only price, but also by exporting policy. Seeing from the history, since the year 1994, the RMB had been keeping an appreciation trend, and the trade surplus keeping a trend of growth instead, which indicated that the exchange rate was not the key factor that affected China's export. The innovation and incentives measures in the 1990s in foreign trade system such as tax, foreign currency portion-remaining, export allowance, trade credit, which were the most significant factors that stimulated the export. Especially, since 1998, the related departments increased the drawback rate for several times, which ensured that stable increase of export.

The experience informed us that the appreciation of the RMB would impel the export. As shown in the Fig.3, if the RMB appreciated by 3%, the import will increase by 0.32% and the range increased with the appreciation range increased, but at a lower speed than that of the appreciation. When the RMB appreciated by 30%, the import will increase 2.32%, which indicate that the appreciation of the RMB would do favor to and be positive to the world economy, esp. to those that had close connection with China in trade, and would impel their export to China increase.

Firstly, because the price elasticity of demand for import of China in the metaphase and long term is -1.0774, being elastic, after the RMB appreciated, the increase of import volume would remedy the decrease of import price, and further the import value would increase. Secondly, Ren (2003), making regressive analysis on the import and export of China, showed that the elasticity of import to export was 0.8182, which indicated that once we import one unit, 0.8182 of it would be exported, in other words, 81.82% in our import had been remanufactured before being re-exported. It showed that import was the reason for export, namely, in the short term; import would drive export, or most goods we import for the reason that we need to export, resulting from the manufacturing trade the suborder enterprises operated. This result indicated that appreciation would be favorable to import and further to re-export, which re-proved that the appreciation of the RMB exchange rate would be favorable to the increase of export. Chen (2003) pointed out that by virtue of the great proportion of manufacturing trade, China's import took on rigidity, namely, exchange rate made little meaning to import.

As far as the current item is concerned, after the RMB appreciated by 3%, 5%, 10%, 20%, and 30%, the abroad payment of enterprises, in terms of US \$, would decrease by 2.17% on condition of appreciation by 3%, and increase by 1.53%, 7.31%, 12.73% and 14.33% respectively. Compared with current transfer, under the conditions of appreciation by 3% and 5%, the current item ranges a small deficit, while appreciation by more than 10%, it ranges a small surplus. We should be

dialectical to analyze the results: on the one hand, the appreciation of the RMB would impel the improvement of operation efficiency and make them more profitable, which made it favorable for China to attract more investment. On the other hand, the RMB appreciated in a large range would deduce the speedier outflow of the current item, which indicated that the large-range appreciation of the RMB would be inadvisable. Seeing from the capital item, after the RMB appreciated by 3%, 5%, 10%, 20%, 30%, the abroad creditors' rights in terms of US \$, would increase by 2.43%, 4.12%, 8.30%, 14.02%, 22.11% respectively. In accordance with the above mentioned definition, the abroad creditors' rights include the net increase of foreign currency reserve and the foreign investment of Chinese enterprises. As shown in Fig.3, with range of RMB appreciation increase, the surplus range of China's capital item will increase, which is completely opposite to the prevalent proverbs. However, the abroad direct investment is, undoubtedly, one feasible scheme to decrease the surplus of the capital item in China.

In summary, the appreciation of the RMB will improve the foreign trade of China. Specializing mention is that the RMB appreciated by 3%-30%, the increasing rate of export will be larger than that of import first midst and last. On the one hand, it implies that the appreciation of RMB would not change the state of surplus of China's foreign trade; on the other hand, it would improve the deteriorating current of China's foreign since 1999. Furthermore, it abided by the policy objective of China on the international balance all through the ages: "Basic Balance, Some Surplus".

#### 4.3.2 Influence of the Appreciation on the Foreign Investment

As shown in the Fig.3, the FDI decrease by 2.5%, 4.45%, 9.36%, 17.53% and 26.29% on conditions that the RMB is expressed in terms of RMB appreciated by 3%, 5%, 10%, 20% and 30% whereas in terms of US \$, they will increase by 0.5%, 0.6%, 0.64%, 2.47% and 3.71% respectively, and they can be treated as litmus less. Searching for the reasons, we believed that the inflow motivation of FDI differed. Since the middle of 1990s, more FDI had been from the multinational cooperation and their aim for investing into China had been bound to the domestic market rather than to have China as the manufacture platform like those South-east medium and small enterprises (UNCTAD, 2002). The appreciation of the exchange rate heightens the investment cost of the newly-built items, however, the sales revenue in terms of US \$ of the foreign investing enterprises in the local market. The appreciation of the exchange rate will hinder the inflow of the FDI that aims to utilize the cost advantage of China's labor force and earth and meanwhile, encourage a passel of FDI that intend to enter Chinese market to inflow. Therefore, the exchange rate factor attributes limit to the FDI inflow, which is determined more by the domestic investing environment. Zhang, and He (2003) think alike.

Seeing from the current transfer, when the RMB appreciate by 3%, 5%, 10%, 20% and 30%, the value in terms of US \$ increased by 0.83%, 1.80%, 4.63%, 7.09% and 10.64 respectively, which is the direct reflection of the anticipation of the international idle money to RMB. However the change range cannot as terrible as people thought. With the level of China's track and supervision to the international "Hot Money" increasing, we believed that the ability and level of China government

management can besiege and stem the “Hot Money” effectively. The tragedy of Asian Financial Crisis in the year 1997 will not replay in China.

In a word, the appreciation of the RMB will make little influence on FDI, but attract the international idle money.

#### 4.3.3 Influence of Appreciation on the Domestic Consumption and Income Distribution

As shown in Fig.3, after the RMB appreciated by 3%, 5%, 10%, 20% and 30%, the import will increase by 0.32%, 0.44%, 0.8%, 1.95% and 2.88% and the tariff will increase by 0.8%, 3.02%, 2.39%, 7.68% and 12.43% respectively. In other words, seeing from the import variety, the commodities with high tariff will be exported more. From the angle of consumption, we can deduce that with the appreciation of RMB, the “Wealth Effect” of the citizens will be unpacked and the proportion of high-tariff luxury such as tobacco and liquor, imported food, jewelry, automobiles will increase.

Seeing from the family investment, the appreciation of the RMB will deduce the increase of family investment, when the appreciation ranges by 20%, the increase will be the greatest by 2.85%, while by 30%, the increase range will be only 1.30%. This reflects from one facet that the appreciation will be positive to the house consumption and the “Wealth Effect” is reflected.

However, we discover that no matter by any range the RMB appreciate, the total factor income of the citizens remain constant. Meanwhile, we notice that the personal income tax (PIT) will increase by 0.67% when the RMB appreciate by 10%, while decrease under any other condition. When the RMB appreciate by 20%, the PIT decreases the most by 5.02%. If considering the “Wealth Effect” above reflected, then one possible explanation is that the appreciation of RMB will further bring pressure to the domestic employment and worsen the income gap. In addition, as shown in Fig.3 the transfer payment from the government to the family, will decrease by 0.12%, 0.21%, 1.23%, 1.26% and 2.18% along with the RMB appreciates by 3%, 5%, 10%, 20% and 30%. In accordance with the former definition, the transfer payment from the government to the family include mainly policy price subsidy and the payment of the national fiscal reserve for pension and social welfare alms. From this angle, the appreciation of RMB will be negative to the low-income family.

Therefore, the influence of appreciation of RMB on the domestic consumption and income distribution features dualism: on the one hand, the appreciation of the RMB will be favorable to the structure upgrading of citizen consumption level; on the other hand, the appreciation of RMB may widen the gap between the rich and the poor and make the employment state worse and worse.

#### 4.3.4 Influence of the Appreciation on the Government Revenue and Expenditure

As shown in the Fig.3, when the RMB appreciates by 3%, 5%, 10%, 20% and 30%, the tariff will increase by 0.8%, 3.02%, 2.39%, 7.68% and 12.43% respectively, which indicates that the appreciation of the RMB will be beneficial to the tariff. But, as far as the PIT is concerned, as is mentioned in the above, by virtue of the austere employment state, except for the little increase in condition of the RMB appreciation by 10%, it will decrease in other conditions. From the angle of tax or employment, the range of appreciation of 10% one-off will be ideal. As to the abroad creditors’ rights,

after the appreciation of the RMB, the national treasure level will be taken up. After the RMB appreciation by 3%, 5%, 10%, 20% and 30%, the net increase of the abroad creditors' rights in terms of US \$ will increase by 2.43%, 4.12%, 8.30%, 14.02% and 22.11% respectively, obviously, which will strength the overall national strength, and further be beneficial to enhance the economic and political status on the international stage. Running back over the development history of Japan, the economic level of ours now is very similar to that of Japan in the year 1960 including many social and economic indexes such as life expectation, infant mortality rate, and agriculture proportion in the entire national economy. As for the Engle Coefficient, we are now 0.39 and the Japanese were 0.38 then similarly. From 1960 to 1988, the Japanese spent 28 years to catch the US in the income per capita and we have reasons to believe that up to 2030, the income per capita of China will be at least half of that of the US. Why did the Japanese catch? One is for the economic growth, another for the appreciation of the Japanese Yen (Lin, 2004). As shown in Fig.3, it is for the appreciation of the RMB that the government saving increases by 0.39%, 0.45%, 1.20%, 2.21% and 3.32%.

As far as the transfer payment from the government to the enterprises, with the appreciation of the RMB, this payment will decrease. After the RMB appreciates by 3%, 5%, 10%, 20% and 30%, this payment will decrease by 0.37%, 0.33%, 0.27%, 1.62% and 2.18% respectively in accordance with the above mentioned definition, the transfer payment from the government to the enterprises includes the increased appropriation flow capital from the national finance main expenditure items to enterprises, the capital for reform for potential capability and technology. With the appreciation of the RMB, the enterprises will import cheaper products and technology to raise the competition ability. From this angle, the appreciation of the RMB will be efficient to the technology advance of the enterprises, as the saying goes "getting twice the results with half the effort".

All in all, the appreciation of the RMB will be beneficial to the increase of the government revenue and China's aggregate economic stock.

#### 4.3.5 Influence of the Appreciation on the Macro Economy

In light of the definition of the GDP, the GDP in terms of expenditure equals to family consumption plus government consumption plus fixed capital investment plus export minus import and in terms of income equals to indirect tax plus factors payments. As shown in Fig.3, the appreciation of the RMB will make little influence on the GDP applying either approach of expenditure or that of income. From the angle of expenditure, though the appreciation of the RMB will deduce the increase of both import and export, the little marginal increase of trade balance will be counteracted by the decrease of capital forming sum of enterprises. From the angle of income, the appreciation of the RMB will make difference on the indirect tax and the factor payments. For this paper is only comparative static analysis, meanwhile, the SAM built in this paper is on the basis of China's input-output table, and the non-competitive input-output table hasn't been compiled (Chen 2002; Liang, 2002), in order to make further analysis on the influence of the appreciation of the RMB on China's macro economy, the complication of the *China Non-competitive*

*Input-Output Table* and dynamic SAM analysis will be the next step for research.

## 5. Conclusions

Firstly, from the angle of development, the current RMB exchange rate forming regimes mechanism should be consummated and be based on the REER or the equilibrium exchange rate.

Secondly, as to the action that the RMB exchange rate forming regimes mechanism changes the current “pegging on the US dollar”, whether it is an “intermediate” exchange rate system or an “extreme” one, it still need further study from the existing research achievements at home and abroad and the international experiences.

Thirdly, in accordance with the REER or the equilibrium exchange rate, the RMB had been underestimated by 14%-40%.

We made scenario analysis on the SAM of the year 2005 gained by estimation through appreciation by 3%, 5%, 10%, 20% and 30%, and from the five dominant façades of international trade, foreign capital, domestic consumption and income distribution, government revenue and expenditure and the macro economy, we made conclusions as follows:

Firstly, the appreciation of the RMB will improve the foreign trade of China. Specializing mention is that the RMB appreciated by 3%-30%, the increasing rate of export will larger than that of import first midst and last. On the one hand, it implied that the appreciation of RMB would not change the state of surplus of China’s foreign trade; on the other hand, it would improve the deteriorating current of China’s foreign since 1999. Furthermore, it abided by the policy objective of China on the international balance all through the ages, “Basic Balance, Some Surplus”

Secondly, all in all, the appreciation of the RMB will make little influence on the FDI for since the middle of 1990s, more FDI had been from the multinational cooperation and their aim for investing into China had been bound to the domestic market rather than to have China as the manufacture platform like those South-east medium and small enterprises (UNCTAD, 2002). But the appreciation will attract the international idle money, and with the level of China’s track and supervision to the international “Hot Money” increasing, we believed that the ability and level of China government management can besiege and stem the “Hot Money” effectively. The tragedy of Asian Financial Crisis in the year 1997 will not replay in China.

Thirdly, the influence of appreciation of RMB on the domestic consumption and income distribution features dualism: on the one hand, the appreciation of the RMB will be favorable to the structure upgrading of citizen consumption level; on the other hand, the appreciation of RMB may widen the gap between the rich and the poor and make the employment state worse and worse.

Fourthly, the appreciation of the RMB will be beneficial to the increase of the government revenue and China’s aggregate economic stock.

Finally, the appreciation of the RMB will make little influence on the GDP applying either approach of expenditure or that of income.

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## APPENDIX A

**Table 1. China Social Accounting Matrix (2005)**

	Commodities	Activities	Factors	Enterprises	Households	Government	Finances	Total Sum of Capital Formation	ROW	Total
Commodities		2564388000			683182500	193431000		559590800	457578100	4458171000
Activities	4002321000									4002321000
Factors		1236125000								1236125000
Enterprises			503893300			12617830	101741600			618252800
Households			732232100	124883600		14902690	56332260			928350600
Government	9899229.725	201807300		48660190	25433650					285800400
Finances				101103800	176129600	22304990			18257610	317796000
Total Sum of Capital Formation				335123400	43604790	42543870	104859000		33459730	559590800
ROW	445950600			8481764.96			54863160			509295500
Total	4458171000	4002321000	1236125000	618252800	928350600	285800400	317796000	559590800	509295500	