China_QEM:

A Quarterly Macro-econometric Model of China*

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Abstract This paper reports the first quarterly macro-econometric model of China, China_QEM, which is different from other published China models because it is demand-oriented and it emphasizes on the policy simulation. A brief discussion on econometric method chosen, economic theory used, and China macro-economic situations traced during the modeling process is given first. Simulations on monetary policy are discussed thereafter. It is found that China_QEM is very helpful in analyzing both internal and external shocks. Some high lights of extending China_QEM are given finally.

Key words Macro-econometric model, Quarterly model, Cointegration, Policy simulation

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I. Introduction

Many economists have tried to econometrically model the Chinese economy. However, it is still a very challengeable work for econometricians, because China is a transitional economy while the national accounting system has been converted from Material Product System (MPS) to System of National Accounts (SNA) system.

For data shortage, most published China models are annual ones established in traditional econometric techniques (see, for example, Shen 1999, Zhu and Liang 1999)[1]. Many economic variables, however, well respond to policies implemented, and their adjustments to policy shocks complete in a very short time. Therefore, quarterly model is more suitable for policy analysis. In addition, as the non-stationarity of economic time series has been realized since the 1980s, the traditional modeling techniques have been abandoned gradually because they easily result in spurious regressions[2]. Dynamic modeling technique overcomes many problems inherent in the traditional ones and becomes widely adopted and applied in econometric research fields. Apparently, China is in need of a quarterly macro-econometric model using dynamic modeling

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[1]The Institute of Quantitative and Technical Economics, Chinese Academy of Social Sciences, has developed the first macro-econometric model of China in ECM form in the 1990s by collaborating with Oxford Economic Forecast (see Zhu and Zhang 1999 and Wang and Shen 2001). However this model has been given up since 1997.

[2] Hendry (2001) pointed out, when two time series y and z are I(1) and not causally related, testing the hypothesis of no relationship from a regression of y on z produces an excess number of rejections, namely 60 per cent to 80 per cent rather than the anticipated 5 per cent.

technique. Therefore, the statistics department of Institute of World Economics and Politics, Chinese Academy of Social Sciences, has developed a quarterly macro-econometric model of China - the China_QEM, which can well satisfy the criterions above.

This paper is organized as follows. Section II characterizes China_QEM. Section III gives brief discussions on econometric and economic theories used, as well as the data sources and limitations. Section IV outlines all the behavior equations. Section V presents monetary policy simulations. Section VI highlights further implementations desired. Section VII summarizes the main points.

II. The Characteristics of China_QEM

China_QEM differs from other published China macro-econometric models in the following aspects:

(1) China_QEM is a demand-oriented macro-econometric model. Almost all published China macro-econometric models are supply-oriented ones. Because Chinese economy has been constrained by the lack of effective demand since the late 1990s, a demand-oriented model is preferred to supply-oriented ones. Considering macro-econometric models developed in other countries are usually demand-oriented ones, it is more convenient for comparing China_QEM with those models and the characteristics of Chinese economy are more easily observed.

(2) Dynamic modeling technique is adopted during the China_QEM modeling. Almost all published China macro-econometric models are developed by traditional modeling techniques. For the traditional modeling techniques have many disadvantages[1], they have been abandoned gradually. According to dynamic econometrics, modeling does not simply follow the standard economic theory but takes useful information from data generating process as well. By alternatively applying economic theories and using data information, it is easier to find the disciplinarian of the real economy. Therefore, we adopt the dynamic econometrics advocated by the Oxford professor, Dr. D.F. Hendry. We follow the guidelines of modern economics, and pay more attention to transitional characteristics of Chinese economy in the mean time. By starting from the most broadly influential variables, following the principles of "test, test, and test" and "general to specific" during the reduction process, the modeling process is explicit and manageable, and variables remain in the equations are no more arbitrary.

(3) Error Correction Method and Co-integration technique are applied in China_QEM modeling. By using Error Correction Model (ECM), the long-run equilibrium behaviors and the short-run dynamics of Chinese economy are well distinguished. ECM has become one of the mainstreams in econometric modeling[2]. By using ECM, the coefficient in front of the long-run

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[1]There are many inherent limitations in traditional modeling techniques, for example, which considers the economic theories as the gospel truth, choose explanatory and exogenous variables arbitrarily, have no constrains on the properties of error terms, have no regular rules on testing, etc.. (See Zhao, 1997; Hendry and Qin, 1998)

[2] For instance, FRB_USA and FRB_WORLD developed by the Federal Reserve Board of USA, MM model of Bank of England, etc..

equilibrium (setting by the economic theory) will well describe the driving force of the economic system to adjust any disequilibrium in the long run of the explained variable. And for the short-run dynamics are usually independent of the long-run equilibrium, one can easily explain the short run and the long run separately (Hendry and Qin, 1998). Because, as long as the explanatory variables and explained variable are co-integrated, there will be a unique Granger causality (Hendry and Qin, 1998), via adopting ECM, it is seldom result in "spurious regressions" like what happen quite often in traditional modeling process. In China_QEM modeling, we do not simply consider ECM as a modeling tool but emphase on its property of describing the Chinese economy, which makes the behavior equations in China_QEM embody more characteristics of the real Chinese economy.

(4) The sample period of China_QEM is mainly after China began to pursue the so-called socialist market economic system. The sample period is from the first quarter of 1992 to the fourth quarter of 2001. During this period, China started to establish the so-called socialist market economic system, and every component of the economy has already begun to enter the role of market economy. Unlike other China models which made their sample starting from 1978, when China adopted the opening-up policy, the behaviors of various component of the economy were more stable. What's more, quarterly national accounting under SNA system in China has started since 1992 and most of the data used in China_QEM can be found in the publications. It could avoid many troubles coming from manual composed data as it was in the modeling process in the past.

(5) China_QEM is modeled for policy simulation. Almost all published China macro-econometric models has not claimed the criteria of their use. Engle *et al* (1983) pointed out that one should use his/her model for different purposes according to different exogeneities of the exogenous variables. That is, a model can be used for statistical inference if its exogenous variables are weak exogenous, a model can be used for forecast if its exogenous variables are strong exogenous, and a model can be used for policy analysis if its exogenous variables are super exogenous. Because we create China_QEM for policy analysis, we have paid much attention to super exogeneity of our exogenous variables during the modeling process, which makes China_QEM quite different from the previous China macro-econometric models.

(6) A few dummy variables are used in China_QEM. There are always many dummy variables used in China macro-econometric models, because, being a transitional economy, it is very hard to estimate the economic behavior equations in China. In order to get a relative stable equation, the modelers have to use many dummies in their models. This kind of practice not only decreased estimated equations' degree of freedom but also made the modeling process more arbitrary and "artistic". In China_QEM, however, only two dummies are used except seasonal dummies. One is D2000II, which stands for the shock on ex-factory price index of industrial products in the second quarter of 2000, when the government abandoned the control of domestic oil price. The other one is D2001II, which accounts for changes in statistical methods on

household saving deposits.

III. An Overview of China_QEM

3.1 Economic theories adopted and the characteristics of Chinese economy considered

Since the concept of rational expectation adopted by economists in the 1970s, macro-economic research has concentrated more on dynamic adjustments. However, for the studies always mix together the static state and the dynamics, and different economist inspects different time and space spans, there are more and more theories to explain the same economic phenomena.

For instance, the orthodox consumption theories, Freedman's permanent income hypothesis and Modigliani's life cycle hypothesis, both state the consumer's behavior that wants to maximize the utility without considering any uncertainties. By introducing uncertainties, Hall concluded that the behavior of a rational consumer is unpredictable (the Random-Walk hypothesis). However, when a different utility function (Hall used quadratic utility function) was introduced, precautionary saving was concluded. By adding liquidity constraints, one can find that the liquidity constraints will depress the current consumptions even the utility function is the same as Hall's. It is also found that consumption is excessively sensitive to expected income changes but excessively smooth to unexpected income changes, when studying dynamic adjustments of income and saving simultaneously[1].

As another example, the orthodox investment theory, the Jorgensen's neo-classical investment theory, states the relationship between desired capital stock and production as well as user cost of capital with no consideration on adjustment costs and adjustment process. By adding adjustment costs, Hayashi (1982) proposed marginal q, which is the same as Tobin's Q, and average q. Hayashi pointed out that marginal q is unobservable, but can be replaced by average q in some particular circumstances, which makes Tobin's Q hypothesis become a real Q theory. However, it is found from firm level studies that the adjustment cost does not have the convex function form given by Hayashi. In general, there is a fixed adjustment cost, which does not depend on the amount of investment. But considering the fact that investment is irreversible, there will be no relationship between investment and average q in this situation. In the mean time, the relationship between investment and marginal q will only hold when q is big enough[2]. Oliner *et al* (1995) shows, from an empirical point of view, the investment equations by adding rational expectation and using Euler equation are not better than the orthodox ones.

Hendry (2001，Chapter 7) points out an autoregressive distributed lag (ADL) model is the most generalized one. It is the most suitable model when variables are non-stationary time series.

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[1] See Romer (2001) for detailed discussion on development of consumption theories.

[2] See He (2003) for detailed discussion on development of investment theories.

Because, as long as there are enough lags included in the model, all the unit roots will be eliminated. And most importantly, ECM model is a special form of ADL when there is a co-integration. In fact, Hayashi (1982) has noticed that, in Jorgensen's neo-classical investment theory, "there is a kind of adjustment costs introduced by adding lags". What Hayashi did is introducing adjustment costs explicitly and in a particular form. Like Caballero (1999) has written "many of the problems with investment equations have to do with the presence of complex and not well understood dynamic issues." Similar problems are also found in consumption studies. The excess smoothness and excess sensitivity are two sides of the same problem, which are impossible to be separated in empirical studies.

By linking studies of non-stationarities in econometrics, one can easily find that, by adding rational expectations to the orthodox theory, the long-run and short-run relationships among economic variables are studied simultaneously. Because the model used is only a special case of ADL, the results may not be a complete description of the real economy. For example, Hall's random walk only considers consumption has a unit root, but income does not. When examining unit root properties of both variables, however, the co-integration between these two variables is in fact described by the Freedman's permanent income hypothesis. While disequilibrium occurs, different combinations of the adjustment processes and the coefficients of short-run dynamics can explain many of the modern consumption theories.

In conclusion, we can form ADL models by choosing variables according to the orthodox economic theories, find co-integrations by considering both theoretical and data information, and then follow the "general to specific" reduction principle to obtain the short-run dynamics. In this way, we can develop a better model to describe the Chinese economy.

In brief, we adopt permanent income hypothesis in behavior equation of consumption. Two consumption equations, urban and rural, are created to reflect the Chinese characteristics. Because the data on consumption are from sample surveys conducted by the State Statistics Bureau, we have to estimate the equations in the form of per capita. Per capita cash income of rural households is used to explain per capita living expenditure of rural households in cash, and per capita disposable income of urban households is chosen as the explanatory variable for per capita living expenditure of urban households in cash.

According to different behaviors of investment, total fixed investment in China is categorized into three types, foreign direct investment in China, government investment and domestic non-government fixed investment. We consider effects of economic growth and changes of real exchange rate on foreign direct investment in China[1]. In the equation of government investment, government budgetary revenue (as a proxy of ensuring the needs of State key projects), unemployment rate, and the departure of actual GDP from potential GDP (as a proxy of keeping a

[1] See discussion in He, Wu and Liu (2003).

steady economic growth)[1] are included. For the domestic non-government investment, the standard capital demand theory is adopted and the effect of government investment is also considered[2].

The import and export equations are derived from the comparative advantage and demand side. The total GDP of Chinese major trade partners and relative price of export are chosen as the main explanatory variables for export equation. In import equation, both GDP and relative price of import are included. In addition, we included imports and exports to be mutual explanatory variables to reflect the importance of processing trade in China.

Government budgetary revenue is the only variable chosen as the explanatory variable in government consumption[3], because one of the main purposes of government budgetary revenue is to finance government general expenditure, i.e., the government consumption. Government budgetary revenue depends on economic growth, therefore, GDP is used to explain government budgetary revenue[4]. In the long run, government budgetary revenue should grow along economic growth.

We notice that income behaviors are different between rural and urban households. Because data on income are also from the sample surveys conducted by the State Statistics Bureau, income behavior equations are in per capita forms too. Average earnings of urban Employees are explained by per capita value added from secondary and tertiary industries. Average earnings of urban Employees and unemployment rate are explanatory variables for urban per capita income. Per capita value added from the primary, secondary and tertiary industries are used to estimate per capita cash income of rural households[5].

We focus our attention on all price indexes used in the model when we build up our price equations. Consumer’s price index is explained by ex-factory price index of industrial products, import price index, and the relative growth of money supply (M1) to GDP. Ex-factory price index of industrial products is explained by price index of investment in fixed assets, import price index, and average earnings of urban Employees over per capita value added from secondary and tertiary industries. Export price index is explained by import price index and ex-factory price index of industrial products.

Finally, we model financial sector from money demand side. There are three equations, i.e., money supply (M1), household saving deposits, and quasi-money (M2-M1). M1 is explained by GDP and interest rate of lending. Household saving deposits is explained by potential household saving deposits and interest rate of deposits. Quasi-money is explained by household saving

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1 See discussion in He and Qin (2003).

2 See discussion in He and Qin (2003).

3 It would be better to use total government revenue, which is the sum of government budgetary revenue and government non-budgetary revenue, as the explanatory variable. But quarterly data on non-budgetary revenue are not available in China yet.

4 Obviously, it is better to estimate various taxes independently, but we cannot find such detailed data at present.

5 Along with gradual establishment of market system in China, income from agriculture is no more the main part of cash income of rural households. Cash income from secondary and tertiary industries plays more and more important role in cash income of rural households.

deposits.

3.3 The data

According to Xu (2000), China has adopted SNA since 1985, and only production accounting was in practice at the beginning. Experiments on expenditure accounting and formal expenditure accounting have started since 1989 and 1993 respectively.

Quarterly national accounting began in 1992 in China. Because of various constraints, these time series are not seasonally adjusted. In the mean time, in order to be consistent with the annual data, quarterly data will usually be adjusted after yearly accounting (see Department of National Accounting, National Statistics Bureau of China, 1997).

Because national accounting is based on sample surveys from Rural Social-Economic Survey Organizations and Urban Social-Economic Survey Organizations, we can only choose variables available. Sometimes, these variables only close to theoretical ones, and may not equal in definitions. Sources and definitions of all variables used in the model are listed in Appendix II.

IV. Behavior Equations of China_QEM

Although China_QEM is very small in scale, it covers the main aspects of macro-economic analysis. China_QEM can be roughly divided into seven parts: consumption, investment, imports and exports, government finance, income, price, and financing. China_QEM includes 18 behavior equations, 3 technical equations and 49 identities. There are 70 endogenous variables and 18 exogenous variables in total (see Appendix I and II).

The long-run equilibriums in China_QEM behavior equations are constrained by three criterions, *i.e.* economic theories, economic situations and statistical criterions, and the short-run dynamics are those leftovers after the standard reduction process. A brief description of the 18 behavior equations is given below.

Average earnings of urban employees (Equation B1) have a long-run elasticity of 1 with respect to per capita value added of secondary and tertiary industries. In the short-run, an increment of per capita value added of secondary and tertiary industries will lead to a decrease in average earnings of urban employees (-0.3718). Average earnings of urban employees have statistical significant seasonalities. This equation tells that although inflation causes average earnings to rise in the short run, the ratio of average earnings over value added will be constant in the long run. The adjustment factor is only –0.1124 (the one in front of the long-run equilibrium), which shows that the adjustment to the disequilibrium will be very sluggish (1/0.1124=8.9).

Per capita income of urban households (Equation B2) is mainly determined by average earnings of urban employees in the long run, with an elasticity of 1. Unemployment rate has some effects on per capita income of urban households in the long run as well, with a semi-elasticity of 0.1, which means one percentage point increase in unemployment rate will lead to 10% drop in per capita income of urban households. In the short-run, per capita income of urban households is explained by average earnings of urban employees. Since there are so many people work in tertiary industries, per capita income of urban households has statistically significant seasonalities. The estimated adjustment factor is –0.7822, which states that any disequilibrium in the long run can be fully adjusted in about one quarter (1/0.7822=1.28).

Per capita cash income of rural households (Equation B3) no longer exclusively depends on earnings from farming, but more on per capita value added from secondary and tertiary industries instead. Because a large number of peasants from rural areas are now working in construction and processing trade, per capita value added from secondary industry has a much bigger effect on per capita cash income of rural households than per capita value added from tertiary industry (an elasticity of 0.65 versus 0.35). In the short run, however, per capita value added from primary industry still has some influence on per capita cash income of rural households, though the effects are much less than that of per capita value added from secondary and tertiary industries. Per capita cash income of rural households has statistically significant seasonalities too. The estimated adjustment factor of –0.9252 means any disequilibrium in the long run will be fully adjusted in about one quarter (1/0.9252=1.08). This equation shows that, in order to increase rural households cash income in the long run, having more employees from rural area by urbanization and tertiarization is better than cutting down taxes on rural households, which only have a short-run effect on increasing rural households cash income.

Per capita living expenditure of urban households in cash (Equation B4) is fully determined by per capita disposable income of urban households in the long run (the elasticity is 1). In the short run, it is affected by both per capita disposable income of urban households and price, and the price plays a more important role than that of disposable income. It is noticed that urban households buy more when price goes up. By taking equation B2 into account, one can easily find that the lack of effective demands recently in China is caused by both disinflation and expectation of any decrease in permanent income due to increase of unemployment rate. Therefore, policies emphasized on luxurious consumptions, for example, encouraging private car and house purchases by reducing mortgage interest rate will not work. Artificially raising the prices of daily necessities will only have short-run effects as well. Only creating more jobs and increasing wage rate can turn over the depression of urban consumption. The adjustment factor of –0.314 shows that any disequilibrium in the long run will be fully adjusted in about one year (1/0.314=3.18). In other words, we need to wait for a year to observe the full effects of a policy of raising urban consumption.

Per capita living expenditure of rural households in cash (Equation B5) is fully determined by per capita cash income of rural households (the elasticity is 1) in the long run. In the short run, per capita living expenditure of rural households in cash is determined by both per capita cash income of rural households and price. Like the behavior of urban households, rural households also spend more when prices go up. But unlike urban households, an increase in per capita cash income of rural households will bring much more increase in living expenditure in the short run. So that, in order to increase rural consumption, policies on enhancing per capita cash income of rural households in the short run will be effective too. The adjustment factor of –0.4589 indicates that any disequilibrium in the long run will be fully adjusted in about two quarters (1/0.4589=2.18).

Domestic non-government fixed investment (Equation B6) is determined by the level of production, the elasticity is 1, and user cost of capital, the elasticity is –1, which reflects the behavior is very much like market-oriented now. Both changes of user cost of capital and total products have statistically significant short run effects on non-government fixed investment, with estimated coefficients of –0.2788 and 0.2272 respectively. Government investment affects non-government fixed investment in the short-run too (0.1345). It shows quite big seasonalities in non-government fixed investment. The adjustment factor of –0.3259 illustrates that any disequilibrium in the long run will be fully adjusted in about three quarters (1/0.3259=3.07). The policy implications of this behavior equation are that expansionary fiscal policy emphasized on expanding government investment will only have limited short-run effects on non-government investment. Notice that user cost of capital appears both in long-run equilibrium and in short-run dynamics, therefore, fiscal and monetary policies affecting user cost of capital will have both long-run and short-run effects on non-government fixed investment. As user cost of capital is composed of interest rate of lending, price index of investment in fixed assets, GDP deflator, depreciation rate of fixed assets and tax rate, any changes of these variables will influence user cost of capital. It is obvious that expansionary fiscal policy (act on tax rate reductions or discount loans), or monetary policy (for instance, reducing interest rate of lending) will all lead to a lower user cost of capital. Considering the interest rate of lending is already quite low in China, the bad loans in state-owned commercial banks are still very high, and the government finance is facing quite large deficits, both policies on reducing interest rate of lending and reducing tax rate are not preferred policies, whereas financial discount loans will be the best choice. On one hand, government investment will only have short-run effects on non-government fixed investment, while financial discount loans will have effects on non-government fixed investment in both long run and short run. On the other hand, financial discount loans will expand commercial loans, enhance enterprise financial liquidity, and provide a chance to reduce bad loans of state owned commercial banks. Therefore, financial discount loans is much better than issuing government bonds in reinforcing the owner’s capital of state-owned commercial banks.

In the long run, government investment (Equation B7) is partly constrained by its budgetary revenue, the elasticity is only 0.5, which clearly indicates that the government has gradually withdrawn from ordinary investment business during the economic reform. Government investment responds strongly to changes in unemployment rate, with a semi-elasticity of 0.7, which means government investment will increase by 70% for every increased percentage point of unemployment rate in the long run. In other words, ensuring full employment is the key issue of the government. The adjustment factor of –0.4838 shows that any disequilibrium will be fully adjusted in about two quarters (1/0.4838=2.07). The departure of GDP from its long-run trend will only affect government investment in the short run, but government is very serious about the disparities (the coefficient is –0.3759) and responds very quickly (only one lag behind).

Foreign direct investment in China (Equation B8) is fully determined by real exchange rate in the long run, with an elasticity of –1. Foreign direct investment in China will increase with RMB revaluation, which gives a clear picture that foreign direct investment in China has become mainly market driven instead of labor driven, as it usually does in developing countries. In the short run, foreign direct investment in China also goes up with RMB revaluation, but the coefficient estimated is only –0.3834. Economic growth is attractive to foreign direct investment in China. There are statistically significant seasonalities on foreign direct investment in China too. The adjustment factor of –0.2734 indicates when the real exchange rate changes, foreign direct investment will reach the new level within a year (1/0.2734=3.66).

Government budgetary revenue (Equation B9) is fully determined by the economic growth in the long run, with an elasticity of 1. Only seasonalities are statistically significant in the short run. The adjustment factor of –0.3858 explains it will take more than half a year for government budgetary revenue to catch up with the economic growth (1/0.3858=2.59).

Government consumption (Equation B10) grows slowly than government budgetary revenue in the long run (the elasticity is only 0.8). One of the possible reasons would be much of the increments of government budgetary revenue has been used as government transfers recently. In addition, reducing the staff members in both central and local governments during the government reform may decrease the level of government consumption. In the short run, government consumption synchronizes with government budgetary revenue but the amplitude is only less than half of the government budgetary revenue's (0.4314). Government consumption not only has its inertia but also presents statistically significant seasonalities. The adjustment factor of 0.8476 reflects that government consumption and government budgetary revenue are almost synchronized in adjustment (1/0.8476=1.18).

Export (Equation B11) has an elasticity of –1 with respect to the relative price of export, and a very small elasticity (0.1) with respect to the economic scale of the main traders (USA, Japan, Germany, Korea, UK, the Netherlands, France, Italy, Canada and Australia[1]), and an elasticity of 0.9 with respect to import in the long run. It shows that export mainly depends on the relative price in the long run, and export and import have a very close relationship. In the short run, the relative price also has a significant effect on export (-0.5746). As processing trade plays a very important role in China export, import also affects export in the short run. There are statistically

[1]In 2000, the total imports from China to these countries are 55.77% of China total exports, and the exports of China via Hong Kong to these countries are 14.21% of China total exports. So that the total exports to these countries are over 70% of China total exports.

significant seasonalities in export. The adjustment factor of –0.2399 illustrates any disequilibrium will need more than one year to be fully adjusted (1/0.2399=4.17). Since the demand elasticity of export is small and it only affects export in the long run, one can easily find from this behavior equation that the only way to increase China export is to depress the relative price. By definition, relative price of export = export price / exchange rate / world export price. As China adopted a de facto fixed exchange rate regime and China has a very limited influence on world export price (China export accounts for only a small share of the whole world export), the only way to reduce relative price of export is to depress the export price, *i.e.*, *via* tax discounts, tax drawbacks, export subsidies, *etc*.

From the perspective of long run, the income elasticity of import (Equation B12) is 0.4 and elasticity of import with respect to export is 0.6, which indicates that an increment of import is not only caused by domestic demand, but also by the processing trade, with the latter has a stronger effect on import. In the short run, a decrease of relative price of import will lead to a significant increase in import (-0.4852). Export has a very strong effect on import in the short run too (0.9276). Import also has statistically significant seasonalities. The adjustment factor of –0.4043 means any disequilibrium will be fully adjusted in about half a year (1/0.4043=2.47).

From export and import equations, one can easily see there are not so many choices except improving qualities of export products in order to increase or maintain a trade surplus.

Consumer’s price index (Equation B13) is determined by ex-factory price index of industrial products, with an elasticity of 0.8, and import price index, with an elasticity of 0.2, in the long run. In the short run, ex-factory price index of industrial products has a dominant effect on consumer’s price index (the coefficient is 0.9653). The difference between growth of money supply (M1) and GDP only has a slightly short run effect on consumer’s price index (0.006859). The adjustment factor of –0.02311 shows that the adjustment is very sluggish (1/0.02311=43.27).

From the point view of long run, ex-factory price index of industrial products (Equation B14) has an elasticity of 0.3 with respect to import price index, an elasticity of 0.55 with respect to price index of investment in fixed assets, and an elasticity of 0.15 with respect to average earnings of urban employees over per capita value added from secondary and tertiary industries. The dominant determinant in the short run comes from price index of investment in fixed assets (the coefficient is 0.8499). The adjustment factor of –0.1354 indicates that any disequilibrium in the long run will take about two years to be fully adjusted (1/0.1354=7.39).

Export price index (Equation B15) has an elasticity of 0.5 with respect to both import price index and ex-factory price index of industrial products in the long run, which reflects the characteristics of processing trade. The third lag of ex-factory price index of industrial products has a dominant effect on export price index in the short run, which means that it will take some time to complete the contract. Import price index has a short-run effect on export price index too, with a coefficient of 0.5592. The adjustment factor of –0.6 reflects that any disequilibrium in the long run will be fully adjusted within two quarters (1/0.6=1.7).

Money supply, M1, (Equation B16) has an elasticity of 1 with respect to GDP, and a semi-elasticity of –0.1 with respect to one-year interest rate of lending in the long run. In other words, in the long run, M1 will grow synchronously with GDP, and rise 10% for one percentage point increase of real interest rate of lending. In the short run, the dominant effect on M1 comes from the level of price and the reaction is very quick (the coefficients are –0.8029 and –0.1056 respectively). The adjustment factor of –0.07816 states that the adjustment to equilibrium will be very sluggish (1/0.07816=12.79).

Seen from long run perspective, an increment of household saving deposits (Equation B17) is less than that of potential saving deposits (the elasticity is 0.9). Changes of one-year interest rate of deposits have a small effect on increment of household saving deposits, with a semi-elasticity of –0.008. In the short run, increments of household saving deposits are affected mainly by potential saving deposits too (0.3784). The adjustment factor of –0.362 presents that any disequilibrium in the long run will be fully adjusted within three quarters (1/0.362=2.76). This equation indicates quite clearly that deposits in the banks are no more the only choice for Chinese residents, changes of interest rate of deposits have a little effect both in the long run and short run. This equation explains a lot of why policies of trying to reduce deposits have failed. Household savings still keep a high level without any decreasing signs after so many reductions on interest rates of deposits and imposing tax on interest of deposits.

The increment of quasi-money (Equation B18) synchronizes with increment of household saving deposits, with an elasticity of 1 in the long run. In the short run, the increment of household saving deposits has dominant effects on increment of quasi-money supply too (the coefficient is 0.7707). The adjustment factor of –0.9363 manifests that the adjustment to equilibrium is very quick (1/0.9363=1.07).

V. Simulations on monetary policy

China_QEM has been successfully used in the studies of the effects of RMB revaluation, world price fluctuation, and economic growth of the major trade partners on the Chinese economy (see He and Wu and Liu, 2003; He, 2003). It presents more reliable conclusions than other studies on this topic, because of the quantitative analysis given by the model.

To save space, we will only report the simulations of interest rate adjustment here (base line is the same as He and Wu and Liu (2003)).

5.1 Scenario 1

One-year interest rate of deposits, ceteris paribus, were raised by 1 percentage point starting from the first quarter of 2004 (see Table 1 in the Appendix III).

Per capita disposable income of urban households would rise because of the assert effect. Per capita living expenditure of urban household would rise consequently, as a result, GDP would rise too, which would further act on and decrease average wage of urban employees in the short run. Therefore, per capita disposable income may turn to a slightly decline. But, as the assert effect is higher than that of income, per capita disposable income would increase anyway.

The effect on rural households is much smaller than that of urban households. Because consumption of rural households depends heavily on cash income, per capita of living expenditure of rural households in cash varies only after changes occurred on per capita cash income of rural households. However, in the long run, the increment of rural households' consumption is only 1/3 of their urban counterparts'.

Hence, in the long run, raising 1 percentage point of one-year interest rate of deposits would result in 0.33% increase of nominal GDP, whereas the year-on-year growth rate of GDP in constant price would increase by 0.1 percentage point only. In the mean time, it hardly has any effects on price indexes, and its effects on per capita income of urban households can be neglected as well.

Although, in the short run, the increment of one-year interest rate of deposits would result in a little increase in households saving deposits and enable an increase in quasi-money, which would further lead to an increase in money supply (M2), in the long run, quasi-money would decrease, so does money supply (M2). But money supply of M1 would slightly increase in the long run.

In conclusion, increasing one-year interest rate of deposits benefits economic growth. But, in this scenario, we assume only raising the interest rate of deposits, it would put the commercial banks, with so many bad loans, into a more difficult situation.

5.2 Scenario 2

One-year interest rate of lending, ceteris paribus, were raised by 1 percentage point starting from the first quarter of 2004 (see Table 2 in the Appendix III).

By comparing with the base line, the increment of one-year interest rate of lending would firstly lead to a drop of domestic non-government fixed investment formation. Because user cost of capital would increase with that of interest rate of lending (See equation I21), domestic non-government fixed investment formation would decrease in both long run and short run. Consequently, total domestic demand, i.e. GDP, would decline. Private consumption, government consumption, as well as import and export would be less than the base line in various degrees.

At the same time, money supply of M1 will grow slowly than that of the base line, along with the increment of one-year interest rate of lending. However, for the decrease is less than that of GDP, consumer's price index would go up slightly.

In summary, an increase of one-year interest rate of lending would have a higher effect on the macro-economy than that of one-year interest rate of deposits. By comparing with the base line, three years later, nominal GDP would drop about 3% and growth rate of GDP would drop about one percentage point. And almost all the macro-economic variables would be affected.

Of course, there was no such practice of raising lending rate alone in the past.

5.3 Scenario 3

Both one-year interest rate of lending and one-year interest rate of deposits, ceteris paribus, were raised by 1 percentage point starting from the first quarter of 2004 simultaneously (see Table 3 in the Appendix).

From the above two scenarios one can see, that raising interest rate of deposits benefits economic growth while raising interest rate of lending does the opposite. Adjusting both interest rates of deposits and lending simultaneously, which is a normal practice of the central bank of China, will give a scenario with more reality.

After both interest rates were raised one percentage point, it is very clear that it would not benefit the economic growth. In the first quarter following this shock, domestic non-government fixed investment would decline by 2.4%. Although disposable income of urban households would rise because of asset effect and it would further raise consumption, nominal GDP would drop in a considerable size, so does GDP growth rate due to the decline in total demand leading by decrease in investment. Apparently, this tightening monetary policy has negative effects on economic growth.

Recently, along with the rapid growth in foreign reserves, money supply grows faster. Though the central bank has implemented many offset policies, such as, open market operations and issuing the central bank's notes, in order to prevent over supply of money, it is still hardly to control.

In September 21, 2003, the central bank raised required reserve ratio from 6% to 7%, but it seems had a little effect on money supply. From China_QEM we can see, that money supply of M1 and M2 are all endogenous variables, but the required reserve ratio has not appeared in the model, so that any adjustment on required reserve ratio would have seldom effects on money supply. In fact, in a circumstance that the commercial bank had a quite large amount excess reserves, one percentage increase in required reserve ratio would only result in equal amount of increase in required reserves and decrease in excess reserves. There would be no apparent changes on the total reserves, which means money supply would not change under the assumption that money multiplier does not change. Therefore, if the demand of liquidity remains unchanged, raising required reserve ratio would have a very limited effect on total amount of credits of the commercial banks in China now.

More importantly, in order to maintain a stable exchange rate, the central bank has to increase its foreign reserves when there are trade surplus and foreign direct investment inflows. However, the ability to offset is very limited, resulting in a rapid growth in the base money uncontrolled.

One the other hand, while the central bank could make changes on interest rates of commercial banks, there is a very limited space to change interest, because adequate economic growth must be ensured. Direct adjustments on money demand are also very limited, because under no adjustments on interest rates the money demand would not change much, so does the behaviors of the commercial banks.

VI. Some highlights of extending China_QEM

Because of data shortage, China_QEM is still in its infant stage. If more data are available in the future, the model should be extended in the following aspects. (1) The effects of financial market on investment should be included. (2) Detailed trade components, the effects of both tariff and export tax rebated should be added. (3) Behavior equations of both the central bank and commercial banks should be further tested in financial sector, in order to have a better analysis on monetary policies. (4) Government transfers, non-budgetary revenues, debt revenue and expenditure should be considered in the model. (5) The demand of labor force in different industries should be endogenised, in order to study the industrial structure adjustments and labor force transfers among different industries. (6) More detailed price indexes should be studied, particularly, the price index of investment in fixed assets should be endogenised; (7) More equations on balance of payment should be included; ……. In conclusion, there are still many works remained in China_QEM construction.

VII. Summary

China_QEM is a small demand-oriented quarterly macro-econometric model of China. The application of dynamic modeling technique and cointegration theory makes it distinguished from any other published China models. It gives a better picture of the Chinese economy in transition since 1992. This paper presents only a brief introduction of the model, and outlines some applications of China_QEM. More revisions are needed if more data are available in the future.

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APPENDIX I. Equations

All variables are named by their English abbreviation. The letters following a "_" are stated as follows. D means US$. C means at constant price. P means per capita. U means urban. R means rural. When the variable name is Y, ln(Y) means the logarithm of Y, Y_1 means the first lag of Y, ΔY means the first difference of Y, *i.e.* ΔY=Y-Y_1, Δln(Y) means first take the logarithm and then take the first difference, *i.e.* Δln(Y)=ln(Y)-ln(Y_1); YECM means the long run equilibrium in the behavior equation, where Y is the explained variable. Seasonal, Seasonal_1, and Seasonal_2 are seasonal dummies. In the equations, (SE) stands for standard error of the parameter estimate, which is below each parameter estimate. There are three types of equations: behavioral or structural equations, technical or linking equations and identities. In the equation numbering system, B is used for behavioral equations, T is used for technical equations and I is used for identities.

(T 1) PGDP=exp(-2.3056+0.85*ln(K)+0.15*ln(Emp))

PGDP= Potential GDP (T 1)

K= Stock of Fixed Investment Assets (I 22)

Emp= Total Number of Employees (I 49)

(B 1) Δln(Wage_UP) =- 0.4398* Δln(Wage_UP_1) + 0.299 - 0.4118*Seasonal

(SE) (0.144) (0.0357) (0.0797)

- 0.3689*Seasonal_1 - 0.3347*Seasonal_2

(0.0754) (0.024)

- 0.1124*Wage_UPECM_1 - 0.3718* $\Delta_2$ln(Val23_PC_2)

(0.0359) (0.13)

sigma	0.0420072	
R^2	0.978743	
No autocorrelation	F(3,26) =	0.23626 [0.8703]
No ARCH	F(3,23) =	0.33284 [0.8017]
Normality	Chi^2(2) =	5.9656 [0.0506]
Homoscedasticity	F(9,19) =	0.51499 [0.8458]
Sample period	1993 (2) to 2001 (4)	

Wage_UPECM=ln(Wage_UP)-ln(Val23_PC)

Wage_UP= Average Earnings of Urban Employees (B 1)

Val23_PC= Per Capita Value Added from Secondary and Tertiary Industries (I 15)

(B 2) Δln(Inc_UP) = - 0.1519+0.4555* Δln(Wage_UP)+0.2295* Δln(Wage_UP_3)

(SE) (0.0126) (0.0748) (0.0449)

+ 0.1401*Seasonal - 0.7822*Inc_UPECM_1

(0.0655) (0.0852)

sigma	0.0338478	
R^2	0.957588	
No autocorrelation	F(3,27) =	1.5242 [0.2308]
No ARCH	F(3,24) =	0.65803 [0.5859]
Normality	Chi^2(2) =	5.0740 [0.0791]
Homoscedasticity	F(7,22) =	4.1225 [0.0049]**
Sample period	1993 (1) to 2001 (3)	

Inc_UPECM=ln(Inc_UP)-ln(Wage_UP)+0.1*UEmpR

Inc_UP= Per Capita Income, Urban (B 2)

Wage_UP= Average Earnings of Urban Employees (B 1)

UEmpR= Unemployment Rate Exogenous

(B 3) $\Delta \ln(CInc\_RP) = - 0.2228* \Delta \ln(CInc\_RP\_3) + 0.1849 - 0.2417*Seasonal$

(SE) (0.0789) (0.0417) (0.0878)

$- 0.5883*Seasonal\_1 + 0.158* \Delta \ln(ValAgr\_P\_3) + 0.6467* \Delta \ln(ValInd\_P\_2)$

(0.0938) (0.0538) (0.189)

$- 0.8698* \Delta \ln(ValInd\_P\_3) + 0.265* \Delta \ln(ValOth\_P\_2) - 0.9252*CInc\_RPECM\_1$

(0.205) (0.0769) (0.103)

sigma		0.0603953
R^2		0.966078
No autocorrelation	F(3,24) =	0.68547 [0.5697]
No ARCH	F(3,21) =	0.16856 [0.9164]
Normality	Chi^2(2) =	1.8110 [0.4043]
Homoscedasticity	F(14,12) =	0.77107 [0.6821]
Sample period		1993 (1) to 2001 (4)

CInc_RPECM=ln(CInc_RP)-0.65*ln(ValInd_P)-0.35*ln(ValOth_P)

CInc_RP= Per Capita Income in Cash of Rural Household (B 3)

ValAgr_P= Per Capita Value Added from Primary Industry (I 12)

ValInd_P= Per Capita Value Added from Industry (I 13)

ValOth_P= Per Capita Value Added from Construction and Tertiary Industry (I 14)

(B 4) $\Delta \ln(ConsL\_UP) = - 0.02662 - 0.1054*Seasonal\_1 + 0.06125*Seasonal\_2 - 0.4148* \Delta_3 \ln(ConsL\_UP\_1)$

(SE) (0.0293) (0.0317) (0.0121) (0.104)

$+ 0.08127* \Delta_3 \ln(DInc\_UP) + 0.9786* \Delta_2 \ln(CPI) - 0.314*ConsL\_UPECM\_1$

(0.0348) (0.186) (0.154)

sigma		0.0249394
R^2		0.94621
No autocorrelation	F(3,26) =	0.18733 [0.9041]
No ARCH	F(3,23) =	0.33344 [0.8012]
Normality	Chi^2(2) =	4.2089 [0.1219]
Homoscedasticity	F(10,18) =	0.43012 [0.9127]
Sample period		1993 (1) to 2001 (4)

ConsL_UPECM=ln(ConsL_UP)-ln(DInc_UP)

ConsL_UP= Per Capita Living Expenditure of Urban Household in Cash (B 4)

DInc_UP= Per Capita Disposable Income of Urban Households (I 8)

CPI= Consumer's Price Index (B 13)

(B 5) $\Delta \ln(ConsL\_RP) = - 0.2552* \Delta \ln(ConsL\_RP\_1) - 0.2329+ 0.1327*Seasonal- 0.1911*Seasonal\_1$

(SE) (0.095) (0.119) (0.0335) (0.0647)

$- 0.1024*Seasonal\_2 + 0.5216* \Delta \ln(CInc\_RP)+ 0.6356* \Delta \ln(CPI)$

(0.0638) (0.0777) (0.298)

$- 0.4589*ConsL\_RPECM\_1$

(0.158)

sigma		0.0418262
R^2		0.980067
No autocorrelation	F(3,27) =	0.70657 [0.5565]

No ARCH F(3,24) = 2.4427 [0.0888]
Normality Chi^2(2) = 2.0344 [0.3616]
Homoscedasticity F(11,18) = 0.49877 [0.8799]
Sample period 1992 (3) to 2001 (4)

ConsL_RPECM=ln(ConsL_RP)-ln(CInc_RP)

ConsL_RP= Per Capita Living Expenditure of Rural Household in Cash (B 5)
CInc_RP= Per Capita Income in Cash of Rural Household (B 3)
CPI= Consumer's Price Index (B 13)

(B 6) Δ ln(PrivI_C) =+ 0.005433 + 0.2272* Δ ln(GDP_C_2) + 0.1345* Δ ln(GovI_C_1)
(SE) (0.0347) (0.104) (0.0515)
- 0.922* $\Delta_3$ln(PrivI_C_1)- 0.3259*PrivIECM_1- 0.2788* $\Delta_3$ln(Cost)
(0.0174) (0.0848) (0.0864)

sigma 0.0716866
R^2 0.997033
No autocorrelation F(3,20) = 0.20735 [0.8901]
No ARCH F(3,17) = 1.9712 [0.1566]
Normality Chi^2(2) = 1.3371 [0.5125]
Homoscedasticity F(10,12) = 0.82227 [0.6164]
Sample period 1994 (4) to 2001 (4)

PrivIECM=ln(PrivI_C)-ln(GDP_C)+ln(Cost)

PrivI_C= Domestic Non-government Fixed Investment Formation (B 6)
GDP_C= Gross Domestic Product (I 4)
Cost= User Cost of Capital (I 21)
GovI_C= Government Investment (B 7)

(B 7) Δ ln(GovI_C) =+ 1.096 - 2.07*Seasonal - 0.3103*Seasonal_1 - 0.7429*Seasonal_2
(SE) (0.109) (0.111) (0.144) (0.0626)
- 0.4838*GovIECM_1 - 0.3759*ln(GDP_1/PGDP_1)
(0.143) (0.177)

sigma 0.123718
R^2 0.123718
No autocorrelation F(3,23) = 0.28111 [0.8385]
No ARCH F(3,20) = 0.86879 [0.4736]
Normality Chi^2(2) = 0.30267 [0.8596]
Homoscedasticity F(7,18) = 0.65625 [0.7052]
Sample period 1994 (1) to 2001 (4)

GovIECM=ln(GovI_C)-0.5*ln(GovR_C)-0.7*UEmpR

GovI_C= Government Investment (B 7)
GovR_C= Government Budgetary Revenue (I 27)
UEmpR= Unemployment Rate Exogenous
GDP= Gross Domestic Product (I 3)
PGDP= Potential GDP (T 1)

(B 8) Δ ln(FDI_D) = - 0.4316* Δ ln(FDI_D_1) + 3.16 - 0.6344*Seasonal - 0.1722*Seasonal_2
(SE) (0.0871) (0.482) (0.0571) (0.067)
- 0.3834* Δ ln(EER) - 0.2734*FDI_DECM_1 + 0.2395* Δ ln(GDP_D_1)

(0.18) (0.0458) (0.0884)

sigma	0.0729851	
R^2	0.975846	
No autocorrelation	F(3,24) =	0.12544 [0.9441]
No ARCH	F(3,21) =	0.11840 [0.9483]
Normality	Chi^2(2) =	2.6854 [0.2611]
Homoscedasticity	F(10,16) =	0.49804 [0.8673]
Sample period	1993 (1) to 2001 (2)	

FDI_DECM=ln(FDI_D)+ln(EER)

FDI_D= Foreign Direct Investment in China (B 8)

EER= Real Exchange Rate (I 42)

GDP_D= Gross Domestic Product (I 6)

(T 2) Δ(InvtR) = - 0.09923 + 0.1246*Seasonal + 0.1795*Seasonal_1 + 0.09916*Seasonal_2

(SE) (0.0266) (0.0434) (0.0379) (0.0406)

- 0.9657*InvtECM_1

(0.196)

sigma	0.0751929	
R^2	0.72516	
No autocorrelation	F(3,23) =	3.2191 [0.0415]
No ARCH	F(3,20) =	3.1104 [0.0494]
Normality	Chi^2(2) =	5.1354 [0.0767]
Homoscedasticity	F(5,20) =	0.96636 [0.4617]
Sample period	1993 (2) to 2000 (4)	

InvtECM=InvtR-0.03*(1-0.005*T)

InvtR= Changes in Inventories Over Effective Domestic Demand (T 2)

(T 3) Δ(Invt_CR) = + 0.3617*Δ(Invt_CR_4) - 0.04857 + 0.09994*Seasonal + 0.09104*Seasonal_1

(SE) (0.149) (0.0259) (0.0445) (0.0408)

+ 0.05345*Seasonal_2- 0.3681*Invt_CECM_1

(0.0273) (0.139)

sigma	0.047513	
R^2	0.831744	
No autocorrelation	F(3,22) =	0.56888 [0.6414]
No ARCH	F(3,19) =	1.4216 [0.2675]
Normality	Chi^2(2) =	0.75106 [0.6869]
Homoscedasticity	F(7,17) =	0.62085 [0.7320]
Sample period	1993 (2) to 2000 (4)	

Invt_CECM=Invt_CR-0.03 *(1-0.005*T)

Invt_CR= Changes in Inventories (in 1992Q1 price) Over Effective Domestic Demand (in 1992Q1 price) (T 3)

(B 9) Δln(GovR) =- 0.4332 - 0.3015*Seasonal - 0.256*Seasonal_1 - 0.5435*Seasonal_2

(SE) (0.234) (0.124) (0.0795) (0.113)

+ 0.4955*Δln(GDP) - 0.3858*GovRECM_1 - 0.7788*$\Delta_2$ln(GDP_1)

(0.184) (0.107) (0.186)

sigma 0.105638

R^2 0.916013

No autocorrelation F(3,26) = 4.2375 [0.0145]

No ARCH F(3,23) = 1.1877 [0.3363]

Normality Chi^2(2) = 10.144 [0.0063]

Homoscedasticity F(9,19) = 0.71367 [0.6905]

Sample period 1993 (1) to 2001 (4)

GovRECM=ln(GovR)-ln(GDP)

GovR= Government Budgetary Revenue (B 9)

GDP= Gross Domestic Product (I 3)

(B 10) Δ ln(GovC) =+ 1.379 - 0.4407*Seasonal + 0.4314* Δ ln(GovR) - 0.8476*GovCECM_1

(SE) (0.243) (0.0887) (0.0916) (0.166)

+ 0.3489* $\Delta_2$ln(GovC_1)

(0.0917)

sigma 0.0952038

R^2 0.915001

No autocorrelation F(3,26) = 2.0864 [0.1265]

No ARCH F(3,23) = 2.2494 [0.1096]

Normality Chi^2(2) = 2.3019 [0.3163]

Homoscedasticity F(7,21) = 4.8157 [0.0023]

Sample period 1993 (3) to 2001 (4)

GovCECM=ln(GovC)-0.8*ln(GovR)

GovC= Government Consumption (B 10)

GovR= Government Budgetary Revenue (B 9)

(B 11) Δ ln(Ex_CD) = + 0.00178 - 0.2017* Δ ln(Ex_CD_1) - 0.5746* Δ ln(ExRP_D) - 0.3107*Seasonal

(SE) (0.0407) (0.0531) (0.231) (0.0578)

- 0.2399*Ex_CDECM_1 + 0.293* Δ ln(Im_CD)

(0.077) (0.132)

sigma 0.0724449

R^2 ————

No autocorrelation F(3,23) = 0.92523 [0.4443]

No ARCH F(3,23) = 0.11728 [0.9491]

Normality Chi^2(2) = 2.1949 [0.3337]

Homoscedasticity F(13,15) = 1.8373 [0.1298]

Sample period 1993 (1) to 2001 (2)

Ex_CDECM=ln(Ex_CD)-0.9*ln(Im_CD)-0.1*ln(GDP10_CD)+ln(ExRP_D)

Ex_CD= Export (B 11)

Im_CD= Import (B 12)

ExRP_D= Relative Price of Export (I 30)

GDP10_CD= Total GDP of the 10 Countries Exogenous

(B 12) Δ ln(Im_CD) =- 0.2024 - 0.1393* Δ ln(Im_CD_3) + 0.9276* Δ ln(Ex_CD) - 0.4852* Δ ln(ImRP_D)

(SE) (0.0563) (0.0444) (0.0575) (0.113)

- 0.4043*Im_CDECM_1

(0.109)

sigma 0.0680287

R^2 ——————

No autocorrelation	F(3,23) =	0.31464 [0.8146]
No ARCH	F(3,23) =	0.33909 [0.7972]
Normality	Chi^2(2) =	3.8226 [0.1479]
Homoscedasticity	F(13,15) =	2.0635 [0.0905]
Sample period	1993 (1) to 2001 (2)	

Im_CDECM=ln(Im_CD)-0.6*ln(Ex_CD)-0.4*ln(GDP_CD)

Im_CD= Import (B 12)

Ex_CD= Export (B 11)

ImRP_D= Relative price Index of Import (I 31)

GDP_CD= Gross Domestic Product (I 5)

(B 13) $\Delta \ln(CPI) = + \underset{(0.00244)}{0.007239} + \underset{(0.00166)}{0.0063}*Seasonal\_2 - \underset{(0.0063)}{0.1326}*D2000II + \underset{(0.0356)}{0.9653}*\Delta \ln(IndPI) + \underset{(0.00328)}{0.006859}*\Delta \ln(RM1GDP) - \underset{(0.015)}{0.02311}*CPIECM\_1$

(SE) shown beneath coefficients.

sigma	0.00443292	
R^2	0.98226	
No autocorrelation	F(3,29) =	0.17603 [0.9118]
No ARCH	F(3,26) =	0.16193 [0.9210]
Normality	Chi^2(2) =	12.287 [0.0021]
Homoscedasticity	F(8,23) =	1.1718 [0.3571]
Sample period	1992 (3) to 2001 (4)	

CPIECM=ln(CPI)-0.8*ln(IndPI)-0.2*ln(ImPI)

CPI= Consumer's Price Index (B 13)

IndPI= Ex-factory Price Index of Industrial Products (B 14)

ImPI= Import Price Index (I 37)

RM1GDP =M1 to GDP ratio (I 40)

(B 14) $\Delta \ln(IndPI) = + \underset{(0.0874)}{0.2191}*\Delta \ln(IndPI\_1) + \underset{(0.0112)}{0.02063} + \underset{(0.146)}{0.8499}*\Delta \ln(IPI\_1) - \underset{(0.0349)}{0.04582}*\Delta \ln(PP\_2) + \underset{(0.00722)}{0.01894}*Seasonal - \underset{(0.0118)}{0.01342}*Seasonal\_1 + \underset{(0.00753)}{0.01495}*Seasonal\_2 - \underset{(0.0452)}{0.1354}*IndPIECM\_1 + \underset{(0.0146)}{0.107}*D2000II$

(SE) shown beneath coefficients.

sigma	0.0118986	
R^2	0.898648	
No autocorrelation	F(3,24) =	0.98235 [0.4176]
No ARCH	F(3,21) =	0.39381 [0.7587]
Normality	Chi^2(2) =	3.6921 [0.1579]
Homoscedasticity	F(12,14) =	3.2445 [0.0195]
Sample period	1993 (1) to 2001 (4)	

IndPIECM=ln(IndPI)-0.3*ln(ImPI_1)-0.55*ln(IPI)-0.15*ln(PP)

IndPI= Ex-factory Price Index of Industrial Products (B 14)

ImPI= Import Price Index (I 37)

IPI= Price Index of Investment in Fixed Assets Exogenous

PP= Average Earnings of Urban Employees Over Per Capita Value Added from Secondary and Tertiary Industries in 19992Q1 price (I 41)

(B 15) $\Delta \ln(ExPI) = - 0.107 + 0.1011*Seasonal + 0.5592*\Delta \ln(ImPI) + 1.439*\Delta \ln(IndPI\_3)$

(SE) (0.0211) (0.0208) (0.0981) (0.347)

$- 0.6*ExPIECM\_1$

(0.136)

sigma		0.0429518
R^2		0.778358
No autocorrelation	F(3,24) =	2.7316 [0.0661]
No ARCH	F(3,21) =	0.52855 [0.6676]
Normality	Chi^2(2) =	1.4085 [0.4945]
Homoscedasticity	F(7,19) =	1.0452 [0.4338]
Sample period		1993 (1) to 2000 (4)

ExPIECM=ln(ExPI)-0.5*ln(ImPI)-0.5*ln(IndPI)

ExPI= Export Price Index (B 15)

ImPI= Import Price Index (I 37)

IndPI= Ex-factory Price Index of Industrial Products (B 14)

(B 16) $\Delta \ln(M1) = - 0.2821*\Delta \ln(M1\_2) + 0.1365 - 0.07816*M1ECM\_1 - 0.103*Seasonal$

(SE) (0.0765) (0.0237) (0.027) (0.0133)

$- 0.8029*\Delta \ln(Defl\_1) - 0.1056*\Delta \ln(Defl\_2) + 0.05554*\Delta_2 \ln(GDP\_1)$

(0.28) (0.0329) (0.0201)

sigma		0.0198133
R^2		0.763239
No autocorrelation	F(3,25) =	0.24326 [0.8653]
No ARCH	F(3,22) =	0.50100 [0.6855]
Normality	Chi^2(2) =	0.61795 [0.7342]
Homoscedasticity	F(11,16) =	0.81026 [0.6314]
Sample period		1993 (2) to 2001 (4)

M1ECM=ln(M1)-ln(GDP)+0.1*RateL_Cs

M1= Money (M1) (B 16)

GDP= Gross Domestic Product (I 3)

Defl= GDP Deflator (I 36)

RateL_Cs= One Year Real Interest Rate of Lending (I 45)

(B 17) $\Delta^2 \ln(Sav) = - 0.4212*\Delta^2 \ln(Sav\_1) - 0.005032 + 0.0241*Seasonal + 0.002201*\Delta (RateD\_Cs\_1)$

(SE) (0.0944) (0.00305) (0.00796) (0.00112)

$+ 0.3784*\Delta_2 \ln(PSav) - 0.362*SavECM\_1$

(0.0834) (0.12)

sigma		0.0125008
R^2		0.870706
No autocorrelation	F(3,26) =	0.17179 [0.9145]
No ARCH	F(3,23) =	0.43619 [0.7292]
Normality	Chi^2(2) =	1.6856 [0.4305]
Homoscedasticity	F(9,19) =	0.96505 [0.4968]

Sample period 1993 (2) to 2001 (4)

SavECM=Δ ln(Sav)-0.9*Δ ln(PSav)+0.008*RateD_Cs

Sav= Household Saving Deposit (B 17)

PSav= Potential Saving Deposit (I 43)

RateD_Cs= One Year Real Interest Rate of Deposit (I 44)

(B 18) $\Delta^2 \ln(M2\_M1) = + 0.0003451 + 0.7707*\Delta^2 \ln(Sav) - 0.9363*M2\_M1ECM\_1 + 0.04978*D2001II$

(SE) (0.00112) (0.0359) (0.0766) (0.0066)

sigma 0.00631395

R^2 0.944317

No autocorrelation F(3,28) = 0.43787 [0.7277]

No ARCH F(3,25) = 0.30506 [0.8215]

Normality Chi^2(2) = 4.9318 [0.0849]

Homoscedasticity F(5,25) = 0.58492 [0.7113]

Sample period 1993 (2) to 2001 (4)

M2_M1ECM=Δ ln(M2_M1)-Δ ln(Sav)

M2_M1= Quasi-Money (M2-M1) (B 18)

Sav= Household Saving Deposit (B 17)

(I 1) GDPe=Cons+I+GovC+(Ex_D-Im_D)*ER/100

GDPe= Effective Domestic Demand (I 1)

Cons= Household Consumption Expenditure (I 18)

I= Gorss Fixed Capital Formation (I 20)

GovC= Government Consumption (B 10)

Ex_D= Export (I 32)

Im_D= Import (I 33)

ER= Exchange Rate Exogenous

(I 2) GDPe_C=Cons/CPI+I/IPI+GovC/CPI+(Ex_D/ExPI_D-Im_D/ImPI_D)*ER/100

GDPe_C= Effective Domestic Demand (I 2)

Cons= Household Consumption Expenditure (I 18)

CPI= Consumer's Price Index (B 13)

I= Gorss Fixed Capital Formation (I 20)

IPI= Price Index of Investment in Fixed Assets Exogenous

GovC= Government Consumption (B 10)

Ex_D= Export (I 32)

ExPI_D= Export Price Index in US$ (I 28)

Im_D= Import (I 33)

ImPI_D= Import Price Index in US$ Exogenous

ER = Exchange Rate Exogenous

(I 3) GDP=GDPe+Invt

GDP= Gross Domestic Product (I 3)

GDPe= Effective Domestic Demand (I 1)

Invt= Changes in Inventories (I 26)

(I 4) GDP_C=GDPe_C+Invt_C

GDP_C= Gross Domestic Product (I 4)

GDPe_C= Effective Domestic Demand (I 2)

	Invt_C= Changes in Inventories	(I 25)
(I 5)	**GDP_CD=GDP_C/ER*100**	
	GDP_CD= Gross Domestic Product	(I 5)
	GDP_C= Gross Domestic Product	(I 4)
	ER= Exchange Rate	Exogenous
(I 6)	**GDP_D=GDP/ER*100**	
	GDP_D= Gross Domestic Product	(I 6)
	GDP= Gross Domestic Product	(I 3)
	ER= Exchange Rate	Exogenous
(I 7)	**GDP_P=GDP/Pop*10000**	
	GDP_P= Per Capita Gross Domestic Product	(I 7)
	GDP= Gross Domestic Product	(I 3)
	Pop= Total Population	Exogenous
(I 8)	**DInc_UP=Inc_UP+RateD/100/4*Sav_P**	
	DInc_UP= Per Capita Disposable Income of Urban Households	(I 8)
	Inc_UP = Per Capita Income, Urban	(B 2)
	RateD= One Year Interest Rate of Deposit	Exogenous
	Sav_P= Per Capita Household Saving Deposit	(I 19)
(I 9)	**ValAgr=GDP*W1/100**	
	ValAgr= Value Added from Primary Industry	(I 9)
	GDP= Gross Domestic Product	(I 3)
	W1= Value Added from Primary Industry Over GDP	Exogenous
(I 10)	**ValOth=GDP*W3/100**	
	ValOth= Value Added from Construction and Tertiary Industry	(I 10)
	GDP= Gross Domestic Product	(I 3)
	W3= Value Added from Tertiary Industry Over GDP	Exogenous
(I 11)	**ValInd=GDP-ValAgr-ValOth**	
	ValInd= Value Added from Industry	(I 11)
	GDP= Gross Domestic Product	(I 3)
	ValAgr= Value Added from Primary Industry	(I 9)
	ValOth= Value Added from Construction and Tertiary Industry	(I 10)
(I 12)	**ValAgr_P=ValAgr/Pop_R*10000**	
	ValAgr_P= Per Capita Value Added from Primary Industry	(I 12)
	ValAgr= Value Added from Primary Industry	(I 9)
	Pop_R= Population, Rural	(I 48)
(I 13)	**ValInd_P=ValInd/Pop*10000**	
	ValInd_P= Per Capita Value Added from Industry	(I 13)
	ValInd= Value Added from Industry	(I 11)
	Pop= Total Population	Exogenous
(I 14)	**ValOth_P=ValOth/Pop*10000**	
	ValOth_P= Per Capita Value Added from Construction and Tertiary Industry	(I 14)
	ValOth= Value Added from Construction and Tertiary Industry	(I 10)
	Pop= Total Population	Exogenous
(I 15)	**Val23_PC=(GDP-ValAgr)/Defl/(Emp*Emp23R)*10000**	

	Val23_PC= Per Capita Value Added from Secondary and Tertiary Industries	(I 15)
	GDP= Gross Domestic Product	(I 3)
	ValAgr= Value Added from Primary Industry	(I 9)
	Defl= GDP Deflator	(I 36)
	Emp= Total Number of Employees	(I 49)
	Emp23R= Number of Employees in Secondary and Tertiary Industries Over Total Number of Employees	Exogenous
(I 16)	**Cons_U=ConsL_UP/0.92*Pop_U/10000**	
	Cons_U= Urban Household Consumption Expenditure	(I 16)
	ConsL_UP= Per Capita Living Expenditure of Urban Household in Cash	(B 4)
	Pop_U= Population, Urban	(I 47)
(I 17)	**Cons_R=ConsL_RP/0.54*Pop_R/10000**	
	Cons_R= Rural Household Consumption Expenditure	(I 17)
	ConsL_RP= Per Capita Living Expenditure of Rural Household in Cash	(B 5)
	Pop_R= Population, Rural	(I 48)
(I 18)	**Cons=Cons_U+Cons_R**	
	Cons= Household Consumption Expenditure	(I 18)
	Cons_U= Urban Household Consumption Expenditure	(I 16)
	Cons_R= Rural Household Consumption Expenditure	(I 17)
(I 19)	**Sav_P=Sav/Pop*10000**	
	Sav_P= Per Capita Household Saving Deposit	(I 19)
	Sav= Household Saving Deposit	(B 17)
	Pop= Total Population	Exogenous
(I 20)	**I=PrivI+GovI+FDI*ER**	
	I= Gorss Fixed Capital Formation	(I 20)
	PrivI= Domestic Non-government Fixed Investment Formation	(I 24)
	GovI= Government Investment	(I 23)
	FDI= Foreign Direct Investment in China	(B 8)
	ER= Exchange Rate	Exogenous
(I 21)	**Cost=(RateL/4-(IPI/IPI(-1)-1)*100+Dr/4)*IPI/Defl/(1-TaxR/100)**	
	Cost= User Cost of Capital	(I 21)
	RateL= One Year Interest Rate of Lending	Exogenous
	IPI= Price Index of Investment in Fixed Assets	Exogenous
	Dr= Depreciation Rate of Fixed Assets	Exogenous
	Defl= GDP Deflator	(I 36)
	TaxR= Tax Rate	Exogenous
(I 22)	**K=K(-1)*(1-Dr/400)+I**	
	K= Stock of Fixed Investment Assets	(I 22)
	Dr= Depreciation Rate of Fixed Assets	Exogenous
	I= Gorss Fixed Capital Formation	(I 20)
(I 23)	**GovI=GovI_C*IPI**	
	GovI= Government Investment	(I 23)
	GovI_C= Government Investment	(B 7)
	IPI= Price Index of Investment in Fixed Assets	Exogenous

(I 24)	**PrivI=PrivI_C*IPI**	
	PrivI= Domestic Non-government Fixed Investment Formation	(I 24)
	PrivI_C= Domestic Non-government Fixed Investment Formation	(B 6)
	IPI= Price Index of Investment in Fixed Assets	Exogenous
(I 25)	**Invt_C=Invt_CR*GDPe_C**	
	Invt_C= Changes in Inventories	(I 25)
	Invt_CR= Changes in Inventories (in 1992Q1 price) Over Effective Domestic Demand (in 1992Q1 price)	(T 3)
	GDPe_C= Effective Domestic Demand	(I 2)
(I 26)	**Invt=InvtR*GDPe**	
	Invt= Changes in Inventories	(I 26)
	InvtR= Changes in Inventories Over Effective Domestic Demand	(T 2)
	GDPe= Effective Domestic Demand	(I 1)
(I 27)	**GovR_C=GovR/Defl**	
	GovR_C= Government Budgetary Revenue	(I 27)
	GovR= Government Budgetary Revenue	(B 9)
	Defl= GDP Deflator	(I 36)
(I 28)	**ExPI_D=ExPI/ER*100*5.461667**	
	ExPI_D= Export Price Index in US$	(I 28)
	ExPI= Export Price Index	(B 15)
	ER= Exchange Rate	Exogenous
(I 29)	**IndPI_D=IndPI/ER*100*5.461667**	
	IndPI_D= Ex-factory Price Index of Industrial Products in US$	(I 29)
	IndPI= Ex-factory Price Index of Industrial Products	(B 14)
	ER= Exchange Rate	Exogenous
(I 30)	**ExRP_D=ExPI_D/WExPI_D**	
	ExRP_D= Relative Price of Export	(I 30)
	ExPI_D= Export Price Index in US$	(I 28)
	WExPI_D= World Export Price Index	Exogenous
(I 31)	**ImRP_D=ImPI_D/IndPI_D**	
	ImRP_D= Relative price Index of Import	(I 31)
	ImPI_D= Import Price Index in US$	Exogenous
	IndPI_D= Ex-factory Price Index of Industrial Products in US$	(I 29)
(I 32)	**Ex_D=Ex_CD*ExPI_D**	
	Ex_D= Export	(I 32)
	Ex_CD= Export	(B 11)
	ExPI_D= Export Price Index in US$	(I 28)
(I 33)	**Im_D=Im_CD*ImPI_D**	
	Im_D= Import	(I 33)
	Im_CD= Import	(B 12)
	ImPI_D= Import Price Index in US$	Exogenous
(I 34)	**Ex=Ex_D*ER/100**	
	Ex= Export	(I 34)
	Ex_D= Export	(I 32)

	ER= Exchange Rate	Exogenous
(I 35)	**Im=Im_D*ER/100**	
	Im= Import	(I 35)
	Im_D= Import	(I 33)
	ER= Exchange Rate	Exogenous
(I 36)	**Defl=GDP/GDP_C**	
	Defl= GDP Deflator	(I 36)
	GDP= Gross Domestic Product	(I 3)
	GDP_C= Gross Domestic Product	(I 4)
(I 37)	**ImPI=ImPI_D*ER/100/5.461667**	
	ImPI= Import Price Index	(I 37)
	ImPI_D= Import Price Index in US$	Exogenous
	ER= Exchange Rate	Exogenous
(I 38)	**InflCPI=(CPI-CPI(-1))/CPI(-1)*100**	
	InflCPI= Inflation Rate Based on CPI	(I 38)
	CPI= Consumer's Price Index	(B 13)
(I 39)	**InflIPI=(IPI-IPI(-1))/IPI(-1)*100**	
	InflIPI= Inflation Rate Based on IPI	(I 39)
	IPI= Price Index of Investment in Fixed Assets	Exogenous
(I 40)	**RM1GDP=M1/GDP**	
	RM1GDP= M1 Over GDP	(I 40)
	M1= Money (M1)	(B 16)
	GDP= Gross Domestic Product	(I 3)
(I 41)	**PP=Wage_UP/Val23_PC**	
	PP= Average Earnings of Urban Employees Over Per Capita Value Added from Secondary and Tertiary Industries in 19992Q1 price	(I 41)
	Wage_UP= Average Earnings of Urban Employees	(B 1)
	Val23_PC= Per Capita Value Added from Secondary and Tertiary Industries	(I 15)
(I 42)	**EER=ER*WExPI_D/IPI**	
	EER= Real Exchange Rate	(I 42)
	ER= Exchange Rate	Exogenous
	WExPI_D= World Export Price Index	Exogenous
	IPI= Price Index of Investment in Fixed Assets	Exogenous
(I 43)	**PSav= PSav(-1)+DInc_UP*Pop_U/10000+CInc_RP*Pop_R/10000 -(ConsL_UP*Pop_U/10000+ConsL_RP*Pop_R/10000)-DebtI**	
	PSav= Potential Saving Deposit	(I 43)
	DInc_UP= Per Capita Disposable Income of Urban Households	(I 8)
	Pop_U= Population, Urban	(I 47)
	CInc_RP= Per Capita Income in Cash of Rural Household	(B 3)
	Pop_R= Population, Rural	(I 48)
	ConsL_UP= Per Capita Living Expenditure of Urban Household in Cash	(B 4)
	ConsL_RP= Per Capita Living Expenditure of Rural Household in Cash	(B 5)
	DebtI= Government Debt Revenue	Exogenous
(I 44)	**RateD_Cs=RateD/4-InflCPI**	

	RateD_Cs= One Year Real Interest Rate of Deposit	(I 44)
	RateD= One Year Interest Rate of Deposit	Exogenous
	InflCPI= Inflation Rate Based on CPI	(I 38)
(I 45)	**RateL_Cs=RateL/4-(Defl/lag(Defl,1)-1)*100**	
	RateL_Cs= One Year Real Interest Rate of Lending	(I 45)
	RateL= One Year Interest Rate of Lending	Exogenous
	Defl= GDP Deflator	(I 36)
(I 46)	**M2= M2_M1+M1**	
	M2= Money and Quasi-Money (M2)	(I 46)
	M2_M1= Quasi-Money (M2-M1)	(B 18)
	M1= Money (M1)	(B 16)
(I 47)	**Pop_U=UPopR*Pop/100**	
	Pop_U= Population, Urban	(I 47)
	UPopR= Urban Population Over Total Population	Exogenous
	Pop= Total Population	Exogenous
(I 48)	**Pop_R=Pop-Pop_U**	
	Pop_R= Population, Rural	(I 48)
	Pop= Total Population	Exogenous
	Pop_U= Population, Urban	(I 47)
(I 49)	**Emp=ActPop*(1-UEmpR/100)**	
	Emp= Total Number of Employees	(I 49)
	ActPop= Economically Active Population	Exogenous
	UEmpR= Unemployment Rate	Exogenous

APPENDIX II. Variable List[1]

Variable Name	Definition	How to Generate	Data Sources
ActPop	Economically Active Population (10 thousand)	Exogenous	Computed from CSY
CInc_RP	Per Capita Income in Cash of Rural Household (yuan)	Behavior Equation	Per capita income in cash of rural household minus savings and loans (from CMEI)
Cons	Household Consumption Expenditure (100 million yuan)	Identity	Computed by identity
Cons_R	Rural Household Consumption Expenditure (100 million yuan)	Identity	Separate annual data in CSY by seasonality observed from CMEI
Cons_U	Urban Household Consumption Expenditure (100 million yuan)	Identity	Separate annual data in CSY by seasonality observed from CMEI
ConsL_RP	Per Capita Living Expenditure of Rural Household in Cash (100 million yuan)	Behavior Equation	CMEI
ConsL_UP	Per Capita Living Expenditure of Urban Household in Cash (100 million yuan)	Behavior Equation	Computed from CMEI
Cost	User Cost of Capital (%)	Identity	Computed by identity
CPI	Consumer's Price Index (1992Q1=1)	Behavior Equation	Computed from CMEI
D2001II	Dummy (2001Q2=1)		
D2000II	Dummy (2000Q2=1)		
DebtI	Government Debt Revenue (100 million yuan)	Exogenous	Computed from CMEI
DebtO	Government Expenditure on Debt (100 million yuan)	Exogenous	Computed from CMEI
Defl	GDP Deflator (1992Q1=1)	Identity	Computed from CMEI
DInc_UP	Per Capita Disposable Income of Urban Households (yuan)	Identity	Computed from CMEI
Dr	Depreciation Rate of Fixed Assets (%)	Exogenous	IWEP
EER	Real Exchange Rate (RMB/100US$)	Identity	Computed by identity
Emp	Total Number of Employees (10 thousand)	Identity	Computed from CSY
Emp23R	Number of Employees in Secondary and Tertiary Industries Over Total Number of Employees	Exogenous	Computed from CSY
ER	Exchange Rate (RMB/100US$, quarterly average)	Exogenous	Computed from CMEI

[1] China Monthly Economic Indicators is abbreviated to CMEI. China Statistics Yearbook is abbreviated to CSY. International Financial Statistics is abbreviated IFS. The People's Bank of China Quarterly Statistical Bulletin is abbreviated to PBCQSB.

Variable Name	Definition	How to Generate	Data Sources
Ex	Export (100 million yuan)	Identity	Computed by identity
Ex_CD	Export (100 million yuan, at 1992Q1 price)	Behavior Equation	Computed by identity
Ex_D	Export (100 million US$)	Identity	Computed from CMEI
ExPI	Export Price Index (1992Q1=1)	Behavior Equation	Computed by identity
ExPI_D	Export Price Index in US$ (1992Q1=1)	Identity	Computed from CMEI
ExRP_D	Relative Price of Export	Identity	Computed by identity
FDI_D	Foreign Direct Investment in China (Actually Utilized, 100 million US$)	Behavior Equation	Computed from CMEI
GDP	Gross Domestic Product (100 million yuan)	Identity	Computed from CMEI
GDP_C	Gross Domestic Product (100 million yuan, in 1992Q1 price)	Identity	Computed from CMEI
GDP_CD	Gross Domestic Product (100 million US$, in 1992Q1 price)	Identity	Computed by identity
GDP_D	Gross Domestic Product (100 million US$)	Identity	Computed by identity
GDP_P	Per Capita Gross Domestic Product (yuan)	Identity	Computed by identity
GDP10_CD	Total GDP of the 10 Countries (100 million US$, in 1992Q1 price)	Exogenous	Computed from IFS
GDPe	Effective Domestic Demand (100 million yuan)	Identity	Computed by identity
GDPe_C	Effective Domestic Demand (100 million yuan, in 1992Q1 price)	Identity	Computed by identity
GovC	Government Consumption (100 million yuan)	Behavior Equation	Separate annual data in CSY by seasonality directly from National Statistics Bureau of China
GovI	Government Investment (100 million yuan)	Identity	Separate annual data in CSY by seasonality directly from National Statistics Bureau of China
GovI_C	Government Investment (100 million yuan, in 1992Q1 price)	Behavior Equation	Computed by identity
GovR	Government Budgetary Revenue (100 million yuan)	Behavior Equation	Computed from CMEI
GovR_C	Government Budgetary Revenue (100 million yuan, in 1992Q1 price)	Identity	Computed by identity
I	Gorss Fixed Capital Formation (100 million yuan)	Identity	Separate annual data in CSY by seasonality observed from CMEI

Variable Name	Definition	How to Generate	Data Sources
Im	Import (100 million yuan)	Identity	Computed by identity
Im_CD	Import (100 million US$, in 1992Q1 price)	Behavior Equation	Computed by identity
Im_D	Import (100 million US$)	Identity	Computed from CMEI
ImPI	Import Price Index (1992Q1=1)	Identity	Computed by identity
ImPI_D	Import Price Index in US$ (1992Q1=1)	Exogenous	Computed from CMEI
ImRP_D	Relative price Index of Import	Identity	Computed by identity
Inc_UP	Per Capita Income, Urban (yuan)	Behavior Equation	Computed by identity
IndPI	Ex-factory Price Index of Industrial Products (1992Q1=1)	Behavior Equation	Computed from CMEI
IndPI_D	Ex-factory Price Index of Industrial Products in US$ (1992Q1=1)	Identity	Computed by identity
InflCPI	Inflation Rate Based on CPI (%)	Identity	Computed by identity
InflIPI	Inflation Rate Based on IPI (%)	Identity	Computed by identity
Invt	Changes in Inventories (100 million yuan)	Identity	Computed by identity
Invt_C	Changes in Inventories (100 million yuan, in 1992Q1 price)	Identity	Computed by identity
Invt_CR	Changes in Inventories (in 1992Q1 price) Over Effective Domestic Demand (in 1992Q1 price)	Technical Equation	Computed by identity
InvtR	Changes in Inventories Over Effective Domestic Demand	Technical Equation	Computed by identity
IPI	Price Index of Investment in Fixed Assets (1992Q1=1)	Exogenous	Computed from CMEI
K	Stock of Fixed Investment Assets (100 million yuan)	Identity	Computed by identity
M1	Money (M1) (100 million yuan)	Behavior Equation	Computed from PBCQSB
M2	Money and Quasi-Money (M2) (100 million yuan)	Identity	Computed from PBCQSB
M2_M1	Quasi-Money (M2-M1) (100 million yuan)	Behavior Equation	Computed by identity
PGDP	Potential GDP (100 million yuan)	Technical Equation	Computed by identity
Pop	Total Population (10 thousand)	Exogenous	Computed from CSY
Pop_R	Population, Rural (10 thousand)	Identity	Computed from CSY
Pop_U	Population, Urban (10 thousand)	Identity	Computed from CSY
PP	Average Earnings of Urban Employees Over Per Capita Value Added from Secondary and Tertiary Industries in 19992Q1 price	Identity	Computed by identity

Variable Name	**Definition**	**How to Generate**	**Data Sources**
PrivI	Domestic Non-government Fixed Investment Formation (100 million yuan)	Identity	Computed by identity
PrivI_C	Domestic Non-government Fixed Investment Formation (100 million yuan, in 1992Q1 price)	Behavior Equation	Computed by identity
PSav	Potential Saving Deposit (100 million yuan)	Identity	Computed by identity
RateD	One Year Interest Rate of Deposit (%, daily average)	Exogenous	Computed from PBCQSB
RateD_Cs	One Year Real Interest Rate of Deposit (%, daily average)	Identity	Computed by identity
RateL	One Year Interest Rate of Lending (%, daily average)	Exogenous	Computed from PBCQSB
RateL_Cs	One Year Real Interest Rate of Lending (%, daily average)	Identity	Computed by identity
RM1GDP	M1 Over GDP	Identity	Computed by identity
Sav	Household Saving Deposit (100 million yuan)	Behavior Equation	Computed from PBCQSB
Sav_P	Per Capita Household Saving Deposit (yuan)	Identity	Computed by identity
Seasonal_1	Dummy (Q1=1)		
Seasonal_2	Dummy (Q2=1)		
Seasonal_3	Dummy (Q3=1)		
T	Trend Variable(1992Q1=1，1992Q2=2，……)		
TaxR	Tax Rate (%)	Exogenous	From National Statistics Bureau of China
UEmpR	Unemployment Rate (%)	Exogenous	=(ActPop-Emp)/ActPop*100
UPopR	Urban Population Over Total Population (%)	Exogenous	Computed by identity
Val23_PC	Per Capita Value Added from Secondary and Tertiary Industries (yuan, in 1992Q1 price)	Identity	Computed by identity
ValAgr	Value Added from Primary Industry (100 million yuan)	Identity	Computed from CMEI
ValAgr_P	Per Capita Value Added from Primary Industry (yuan)	Identity	Computed by identity
ValInd	Value Added from Industry (100 million yuan)	Identity	Computed from CMEI
ValInd_P	Per Capita Value Added from Industry (yuan)	Identity	Computed by identity
ValOth	Value Added from Construction and Tertiary Industry (100 million yuan)	Identity	Computed from CMEI
ValOth_P	Per Capita Value Added from Construction and Tertiary Industry (yuan)	Identity	Computed by identity

Variable Name	Definition	How to Generate	Data Sources
W1	Value Added from Primary Industry Over GDP (%)	Exogenous	Computed by identity
W3	Value Added from Tertiary Industry Over GDP (%)	Exogenous	Computed by identity
Wage_UP	Average Earnings of Urban Employees (yuan)	Behavior Equation	Computed from CMEI
WExPI_D	World Export Price Index (1992Q1=1)	Exogenous	Computed from IFS

APPENDIX III. Simulations

Table 1. **Scenario 1**

时间	GDP	GDP_C[1]	Cons	Cons_C	GovC	I	Ex	Im	Defl	CPI	IndPI	ExPI	ImPI	Wage_UP	InflCPI[2]	ExRP	ImRP
2004Q1	0.02	0.03	0.04	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004Q2	0.12	0.12	0.23	0.23	0.02	0.01	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004Q3	0.16	0.17	0.33	0.33	0.02	0.04	0.01	0.03	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004Q4	0.14	0.14	0.32	0.33	-0.01	0.04	0.02	0.05	0.01	0.00	0.00	0.00	0.00	-0.02	0.00	0.00	0.00
2005Q1	0.18	0.17	0.29	0.29	-0.02	0.02	0.03	0.06	0.01	0.00	0.00	0.00	0.00	-0.04	0.00	0.00	0.00
2005Q2	0.20	0.07	0.38	0.38	0.02	0.03	0.03	0.08	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01
2005Q3	0.25	0.09	0.47	0.48	0.08	0.08	0.04	0.09	0.02	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01
2005Q4	0.25	0.11	0.50	0.51	0.12	0.08	0.06	0.11	0.01	-0.01	-0.01	0.00	0.00	-0.01	0.00	0.00	0.01
2006Q1	0.32	0.16	0.46	0.48	0.15	0.07	0.07	0.13	0.01	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	0.01
2006Q2	0.31	0.12	0.52	0.54	0.15	0.08	0.08	0.16	0.01	-0.02	-0.02	-0.01	0.00	0.01	0.00	-0.01	0.02
2006Q3	0.34	0.10	0.60	0.62	0.16	0.15	0.10	0.18	0.02	-0.02	-0.02	-0.02	0.00	0.01	0.00	-0.02	0.02
2006Q4	0.33	0.09	0.62	0.65	0.17	0.12	0.12	0.20	0.01	-0.03	-0.03	-0.02	0.00	0.02	-0.01	-0.02	0.03
时间	GDPe	Cons_R	Cons_U	PrivI	GovI	FDI_D	Inc_UP	DInc_UP	CInc_RP	ValAgr_P	ValInd_P	ValOth_P	Val23_PC	M1	M2-M1	EER	Sav
2004Q1	0.02	0.00	0.06	0.00	0.00	0.00	0.00	0.79	0.00	0.02	0.02	0.02	0.02	0.00	0.02	0.00	0.03
2004Q2	0.12	0.01	0.34	0.01	-0.01	0.01	0.00	0.98	0.02	0.12	0.12	0.12	0.11	0.00	0.05	0.00	0.06
2004Q3	0.16	0.07	0.48	0.04	-0.04	0.02	0.00	0.96	0.13	0.16	0.16	0.16	0.15	0.02	0.03	0.00	0.02
2004Q4	0.14	0.13	0.44	0.06	-0.08	0.02	-0.01	0.93	0.23	0.14	0.14	0.14	0.13	0.04	-0.02	0.00	-0.04
2005Q1	0.18	0.10	0.42	0.04	-0.11	0.01	-0.03	0.78	0.12	0.18	0.18	0.18	0.17	0.04	-0.10	0.00	-0.13
2005Q2	0.20	0.11	0.50	0.05	-0.12	0.02	-0.02	0.98	0.10	0.20	0.20	0.20	0.18	0.05	-0.20	0.00	-0.23
2005Q3	0.25	0.17	0.64	0.10	-0.12	0.01	-0.02	0.95	0.23	0.25	0.25	0.25	0.24	0.06	-0.32	0.00	-0.35
2005Q4	0.25	0.19	0.66	0.12	-0.13	0.03	-0.02	0.94	0.25	0.25	0.25	0.25	0.23	0.08	-0.45	0.00	-0.48
2006Q1	0.32	0.23	0.63	0.09	-0.13	0.01	0.00	0.82	0.29	0.32	0.32	0.32	0.31	0.09	-0.59	0.00	-0.63
2006Q2	0.31	0.22	0.63	0.13	-0.15	0.03	0.00	1.03	0.25	0.31	0.31	0.31	0.29	0.11	-0.74	0.00	-0.78
2006Q3	0.34	0.30	0.76	0.18	-0.15	0.01	0.01	0.99	0.37	0.34	0.34	0.34	0.32	0.12	-0.89	0.00	-0.93
2006Q4	0.33	0.25	0.80	0.17	-0.16	0.03	0.01	0.99	0.26	0.33	0.33	0.33	0.32	0.14	-1.05	0.00	-1.09

Notes: 1.Year-on-year growth rate net that of the base line. 2.Inflation based on CPI net that of the base line. 3.Percentage changes relative to the base line.

Table 2. **Scenario 2**

时间	GDP	GDP_C[1]	Cons	Cons_C	GovC	I	Ex	Im	Defl	CPI	IndPI	ExPI	ImPI	Wage_UP	InflCPI[2]	ExRP	ImRP
2004Q1	-0.41	-0.51	0.00	0.00	-0.09	-1.93	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004Q2	-1.31	-1.44	-0.06	-0.07	-0.27	-3.72	-0.03	-0.10	0.03	0.02	0.01	0.00	0.00	-0.05	0.01	0.00	-0.01
2004Q3	-1.78	-2.03	-0.30	-0.33	-0.23	-4.11	-0.11	-0.36	0.00	0.02	0.02	0.00	0.00	-0.01	0.01	0.00	-0.02
2004Q4	-1.12	-1.18	-0.53	-0.54	0.24	-2.15	-0.23	-0.64	-0.03	0.01	0.01	0.01	0.00	0.28	-0.01	0.01	-0.01
2005Q1	-1.00	-0.64	-0.37	-0.39	0.37	-3.84	-0.29	-0.67	0.02	0.01	0.02	0.02	0.00	0.50	0.00	0.02	-0.02
2005Q2	-1.51	-0.21	0.00	-0.06	-0.32	-4.62	-0.33	-0.62	0.03	0.06	0.06	0.02	0.00	0.13	0.05	0.02	-0.06
2005Q3	-2.53	-0.92	-0.26	-0.36	-1.25	-5.48	-0.41	-0.72	0.06	0.10	0.09	0.02	0.00	-0.19	0.03	0.02	-0.09
2005Q4	-2.21	-1.19	-0.64	-0.77	-1.40	-4.05	-0.55	-1.08	0.03	0.13	0.13	0.04	0.00	-0.15	0.03	0.04	-0.13
2006Q1	-1.93	-1.16	-0.96	-1.08	-0.96	-5.72	-0.66	-1.34	0.11	0.12	0.13	0.13	0.00	0.19	-0.01	0.13	-0.13
2006Q2	-1.79	-0.38	-0.29	-0.46	-0.81	-5.37	-0.76	-1.38	0.11	0.16	0.17	0.13	0.00	0.05	0.04	0.13	-0.17
2006Q3	-3.12	-0.84	-0.43	-0.62	-1.40	-6.61	-0.85	-1.39	0.18	0.19	0.19	0.15	0.00	-0.31	0.03	0.15	-0.19
2006Q4	-2.85	-0.82	-0.68	-0.91	-1.75	-5.58	-1.02	-1.67	0.17	0.24	0.24	0.12	0.00	-0.62	0.05	0.12	-0.24
时间	GDPe	Cons_R	Cons_U	PrivI	GovI	FDI_D	Inc_UP	DInc_UP	CInc_RP	ValAgr_P	ValInd_P	ValOth_P	Val23_PC	M1	M2-M1	EER	Sav
2004Q1	-0.41	0.00	0.00	-2.40	0.00	0.00	0.00	0.00	0.00	-0.41	-0.41	-0.41	-0.46	0.00	0.00	0.00	0.00
2004Q2	-1.31	-0.19	0.01	-4.89	0.08	-0.10	-0.02	-0.02	-0.38	-1.31	-1.31	-1.31	-1.34	-0.25	-0.01	0.00	-0.01
2004Q3	-1.78	-0.87	0.01	-4.86	0.38	-0.25	-0.02	-0.02	-1.61	-1.78	-1.78	-1.78	-1.78	-0.60	-0.04	0.00	-0.04
2004Q4	-1.12	-1.40	0.00	-2.75	0.77	-0.23	0.12	0.11	-2.29	-1.12	-1.12	-1.12	-1.08	-0.89	-0.08	0.00	-0.09
2005Q1	-1.00	-0.96	0.06	-4.74	0.86	-0.01	0.33	0.32	-0.92	-1.00	-1.00	-1.00	-1.01	-0.99	-0.13	0.00	-0.15
2005Q2	-1.51	-0.42	0.20	-6.22	0.63	-0.07	0.31	0.29	0.24	-1.51	-1.51	-1.51	-1.54	-1.05	-0.20	0.00	-0.22
2005Q3	-2.53	-1.19	0.23	-6.35	0.36	-0.15	0.09	0.08	-1.59	-2.53	-2.53	-2.53	-2.59	-1.28	-0.29	0.00	-0.32
2005Q4	-2.21	-2.06	0.12	-5.06	0.46	-0.33	-0.06	-0.07	-3.30	-2.21	-2.21	-2.21	-2.24	-1.64	-0.42	0.00	-0.45
2006Q1	-1.93	-2.31	0.03	-6.78	0.58	-0.08	-0.06	-0.07	-3.11	-1.93	-1.93	-1.93	-2.04	-1.86	-0.55	0.00	-0.59
2006Q2	-1.79	-1.28	0.10	-7.28	0.50	-0.10	0.00	-0.01	-0.59	-1.79	-1.79	-1.79	-1.90	-1.91	-0.67	0.00	-0.69
2006Q3	-3.12	-1.58	0.18	-7.47	0.14	-0.03	-0.12	-0.13	-1.30	-3.12	-3.12	-3.12	-3.29	-2.02	-0.77	0.00	-0.80
2006Q4	-2.85	-2.28	0.11	-6.90	0.08	-0.38	-0.33	-0.34	-3.10	-2.85	-2.85	-2.85	-3.02	-2.35	-0.91	0.00	-0.95

Notes: 1.Year-on-year growth rate net that of the base line. 2.Inflation based on CPI net that of the base line. 3.Percentage changes relative to the base line.

Table 3.

Scenario 3

时间	GDP	GDP_C[1]	Cons	Cons_C	GovC	I	Ex	Im	Defl	CPI	IndPI	ExPI	ImPI	Wage_UP	InflCPI[2]	ExRP	ImRP
2004Q1	-0.39	-0.48	0.04	0.04	-0.08	-1.93	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2004Q2	-1.19	-1.32	0.18	0.16	-0.25	-3.72	-0.03	-0.09	0.04	0.01	0.01	0.00	0.00	-0.05	0.01	0.00	-0.01
2004Q3	-1.62	-1.86	0.03	0.01	-0.20	-4.08	-0.10	-0.33	0.01	0.02	0.01	0.00	0.00	0.00	0.01	0.00	-0.01
2004Q4	-0.98	-1.05	-0.20	-0.22	0.23	-2.11	-0.21	-0.59	-0.02	0.01	0.01	0.01	0.00	0.25	-0.01	0.01	-0.01
2005Q1	-0.81	-0.47	-0.09	-0.10	0.35	-3.82	-0.26	-0.61	0.03	0.01	0.01	0.02	0.00	0.46	0.00	0.02	-0.01
2005Q2	-1.31	-0.13	0.38	0.32	-0.30	-4.60	-0.30	-0.54	0.04	0.06	0.06	0.02	0.00	0.12	0.04	0.02	-0.06
2005Q3	-2.28	-0.82	0.21	0.12	-1.17	-5.40	-0.36	-0.63	0.08	0.09	0.09	0.02	0.00	-0.20	0.03	0.02	-0.09
2005Q4	-1.96	-1.08	-0.15	-0.26	-1.28	-3.97	-0.49	-0.97	0.05	0.11	0.12	0.04	0.00	-0.15	0.02	0.04	-0.12
2006Q1	-1.61	-1.00	-0.50	-0.60	-0.82	-5.66	-0.59	-1.20	0.12	0.11	0.11	0.11	0.00	0.19	-0.01	0.11	-0.11
2006Q2	-1.49	-0.27	0.22	0.08	-0.66	-5.29	-0.68	-1.22	0.12	0.14	0.15	0.12	0.00	0.07	0.03	0.12	-0.15
2006Q3	-2.79	-0.74	0.17	0.00	-1.25	-6.47	-0.75	-1.21	0.19	0.17	0.17	0.14	0.00	-0.31	0.03	0.14	-0.17
2006Q4	-2.53	-0.74	-0.06	-0.27	-1.58	-5.47	-0.91	-1.48	0.19	0.21	0.22	0.10	0.00	-0.60	0.04	0.10	-0.22
时间	GDPe	Cons_R	Cons_U	PrivI	GovI	FDI_D	Inc_UP	DInc_UP	CInc_RP	ValAgr_P	ValInd_P	ValOth_P	Val23_PC	M1	M2-M1	EER	Sav
2004Q1	-0.39	0.00	0.07	-2.40	0.00	0.00	0.00	0.79	0.00	-0.39	-0.39	-0.39	-0.43	0.00	0.02	0.00	0.03
2004Q2	-1.19	-0.18	0.36	-4.88	0.08	-0.09	-0.02	0.96	-0.36	-1.19	-1.19	-1.19	-1.23	-0.25	0.04	0.00	0.05
2004Q3	-1.62	-0.80	0.49	-4.82	0.34	-0.22	-0.02	0.93	-1.48	-1.62	-1.62	-1.62	-1.63	-0.59	-0.01	0.00	-0.02
2004Q4	-0.98	-1.27	0.44	-2.69	0.69	-0.21	0.11	1.04	-2.06	-0.98	-0.98	-0.98	-0.96	-0.86	-0.10	0.00	-0.13
2005Q1	-0.81	-0.85	0.48	-4.71	0.75	0.00	0.30	1.10	-0.80	-0.81	-0.81	-0.81	-0.84	-0.95	-0.24	0.00	-0.27
2005Q2	-1.31	-0.31	0.70	-6.17	0.51	-0.05	0.28	1.28	0.34	-1.31	-1.31	-1.31	-1.36	-1.01	-0.41	0.00	-0.45
2005Q3	-2.28	-1.02	0.87	-6.25	0.24	-0.14	0.07	1.03	-1.37	-2.28	-2.28	-2.28	-2.36	-1.22	-0.61	0.00	-0.66
2005Q4	-1.96	-1.87	0.78	-4.95	0.33	-0.30	-0.07	0.87	-3.05	-1.96	-1.96	-1.96	-2.01	-1.57	-0.87	0.00	-0.93
2006Q1	-1.61	-2.08	0.66	-6.69	0.44	-0.07	-0.06	0.75	-2.82	-1.61	-1.61	-1.61	-1.73	-1.77	-1.14	0.00	-1.21
2006Q2	-1.49	-1.05	0.73	-7.16	0.34	-0.06	0.01	1.01	-0.34	-1.49	-1.49	-1.49	-1.61	-1.81	-1.40	0.00	-1.46
2006Q3	-2.79	-1.28	0.93	-7.30	-0.02	-0.02	-0.11	0.85	-0.92	-2.79	-2.79	-2.79	-2.98	-1.90	-1.65	0.00	-1.72
2006Q4	-2.53	-2.04	0.90	-6.74	-0.08	-0.35	-0.32	0.64	-2.84	-2.53	-2.53	-2.53	-2.71	-2.22	-1.95	0.00	-2.03

Notes: 1.Year-on-year growth rate net that of the base line. 2.Inflation based on CPI net that of the base line. 3.Percentage changes relative to the base line.