

The Sustainability of China's Economic Performance at the Turn of the Century

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ABSTRACT

Reform of the Chinese economy, on a step-by-step basis began in 1978, and has proceeded remarkably well, except for some early threats of accelerating inflation and the disturbances at Tiananmen Square in 1989. The level of GDP approximately quadrupled between 1980 and 2000, but can such fast economic growth be sustained? The target of Chinese planners is to duplicate this performance between 2000 and 2020. Our high-frequency forecasting models that are in regular use on a semi-monthly basis, finds no indication at the present time, 2006, of significant deviations from the targeted path. Inflation and growth together are consistent with the sustainability goal at this time in the early 21st Century. Access to international capital has been provided through foreign direct investment, as well as more traditional channels and growth has become export-led, to an extent that contributes to large holdings of foreign exchange reserves.

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I. INTRODUCTION

In Adam Smith's *Wealth of Nations*, the wise Scotsman recognized that China was once a wealthy country on the scale of world-class economic comparisons. In late 13th century, Marco Polo documented remarkable economic achievement in China, but Smith noted that there were few significant or protracted gains since that time, as shown by Angus Maddison's flat graphs of the time series curve of China's GDP per capita. From late 20th Century, the pattern is remarkably different. It is well recognized at the present time, but I doubt that any respectable analysis during the cultural revolution or soon after could have foreseen the breathtaking magnitude of advance that has captured the imagination of economists, business leaders, political authorities; or almost any kind of intellectual.

When I led a team of economists on behalf of the Committee on Scholarly Communication with the People's Republic of China (CSCPRC) to China in autumn 1979, in order to establish intellectual interchange between economists East and West, we may have known that something exciting and significant was taking place, but no one in that group could have anticipated what is taking place today.

We talked with village and provincial statisticians at each of our stopovers and learned about livestock counts, grain harvests (from highway traffic running across cut stalks strewn over the road), archeological digs, battle stories, and other aspects totally unrelated to what could be seen ahead in a few years and (growing) today.

I and some of my colleagues came away from that 1979 visit impressed and interested in trying to improve the level of economic understanding in China through arranging basic classes, in China and in the United States, with the support coming from the Ford Foundation.

Many future developments were planned:

1. Professor Lawrence Lau and I proposed a full summer's seminar in econometrics, fundamentally introducing that branch of the subject from an expanded team of specialists, participating in what turned out to be an extremely successful program in 1980, at the Summer Palace in Beijing.
2. Our colleague, Irving Kravis, had collected nearly 100 basic price quotations while moving about the country in 1979. From this collection, he was able to include China in the PENN World Tables of more than 100 countries in valuations at Purchasing Power Parity prices (PPP) which have become the standard for large-scale cross-country comparisons. Professor Kravis' initial estimates placed China at 12.3% of US estimates of real GDP, per capita in 1975, approximately at the level of the Philippines, and double that of India.

Chinese economists complained that Kravis' estimates were too high, not wanting to appear so rich as to be denied access to international loans at preferential interest rates.

Economists, including some China specialists, have charged that China has exaggerated her estimates of GDP, but I deny that claim. Some of those who make it, now find themselves complaining that China is growing too fast, becoming too

prominent in the world economy, and absorbing too much of critical world supplies of basic materials.

Many astute Chinese economists also failed to see just how powerful China was to become in a short period of time. Pu Shan, who was an outstanding economics student at the University of Michigan and later was granted a Ph.D. at Harvard, returned to China in 1949 to devote his efforts to the development of the country, in which he had deep faith. When he came to see me, after econometrics lectures in the Summer Palace in 1980 and took me to his office as Dean of the Graduate School of the Chinese Academy of Social Sciences in a chauffeur-driven car, I remarked casually to him, "How long will we have to wait before ordinary citizens in China will have their own cars and drive them personally?" He smiled and replied, "Not in our lifetimes."

The outstanding Chinese economist, who helped to lead his cherished country into World Bank membership and was involved in many economic-diplomatic steps leading to reform, could not perceive the speed and magnitude of the transformation that was to occur soon after the start of reform. He wanted reform to succeed, but like so many of his fellow economists, could not foresee the order of magnitude of the change process.

In the present group of papers by Maddison, Chow, Perkins, and myself, we could see that China was moving forward, economically, but not at such unusual speed. It is undoubtedly true that no country in eras of recorded performance has reached such heights and kept the progress going, year-after-year, for almost three decades, with no end in sight. It is the idea of the present paper to examine key aspects of sustainability of China's march forward.

In a few words, Adam Smith recognized China's economic position through the findings of Marco Polo, which put us, as readers, near Angus Maddison's starting point, 1300. No significant improvement appears until the second half of the twentieth century. Irving Kravis' early estimate in numerical terms, was perhaps the first realization that something very large was just beginning. Many economists, including his close colleagues, Alan Heston and Robert Summers, leaned toward smaller, though still impressive valuations for China. Many Western or Westernized economists now think that the official figures, which are only slightly lower than those of Kravis, are overstated, but I am going to make two arguments in favor of the believability of the official numbers. The critics seem to ignore the well-established fact that every country in the world produces estimates that contain known errors since there are alternative ways of estimating a country's GDP, or other well-defined aggregate, that contain uncertainties amounting to as much as one, two, or three percent of the published figures. GDP, for example, may be defined and estimated as total

final purchases (the demand side)

value added (the supply side)

or factor payments (also the supply side)

Most respectable statistical offices publish estimates of a statistical discrepancy. For the United States, at times this error term has been as large as \$200 billion. Sometimes it is positive and sometimes negative. It fluctuates a great deal and is certainly not random or trivial.¹ A second error source arises from the fact that most

components of GDP are assembled in value terms that must be adjusted by price deflators in order to compile real GDP, the essential magnitude to be examined.

The United States, for example, has altered price deflators for specific changes in goods and services that make up the total GDP. Over the years this, has been done for such things as improved motor car features (optional equipment, at first like automatic transmissions), improved health care services, and most recently, improved electronic devices. The Boskin Committee added more than a full point to the growth rate of the US GDP by changing the price deflators – asserting that they overstated inflation.²

For corresponding treatment of China's GDP, I and Chinese visiting scholars at the University of Pennsylvania, estimated the "true cost-of-living", as a theoretical concept that is more inclusive than the piece-meal approach of the Boskin Committee.³

Anyway one looks at the issues associated with China's economic growth, the result has been overwhelming and raised fearful outcries by competitors in advanced countries. It is hardly likely to cease in the short run. This paper is about sustainability. How long is it likely to last?

II. FEATURES OF THE CHINESE ECONOMY, 1978-2005

It is useful to point out that two major socialist-planned economies made the transition from plan to market at about the same time. Although China started as early as 1978, Russia, as part of the Soviet Union, did not get involved on a large scale until the break up of the Soviet Union, starting in 1989; however, the Soviet policies known as Glasnost and Perestroika were started at about the same time as the Chinese reform process and had the option, even the active encouragement, of adopting the Chinese pattern, but gave in to the pressure of some Western economists who argued for "Shock Therapy", which sought early and widespread opening up of market systems, only to send Russia and many Soviet republics into unstructured reform. Russia, itself, went through a large scale recession, even deeper than the Great Depression of the United States during the 1930s. Many excuses were raised that Russia could not have adopted the Chinese approach, which became known as "step-by-step" gradualism towards a market system with Chinese characteristics. Instead of attempting to open markets, with very little guidance and without erection of some market institutions, in the manner of Chinese reforms, market-based processes were hastily urged on Russia at the time by the pure advocates of laissez-faire.

Some of the main steps in the gradual Chinese approach were:

- (i) land reform
- (ii) town and village enterprises (TVE)
- (iii) special economic zones (SEZ)
- (iv) population control
- (v) exchange control
- (vi) western economic education
- (vii) foreign direct investment (FDI)

(i) On China's coming out of the cultural revolution, it was evident to Western economists that agriculture was backward, subject to food shortages and in need of immediate reform in order that food supply should not be a fatal stumbling block in the whole reform program.

Land reform replaced the communal system with a farmer responsibility system over designated plots of land. The land was not given to the farmer, but the farmers were given the responsibility of using assigned land plots as though they were in complete control. They chose the planting, had the right to pass along control to their younger family members, and had to deliver fractions of the crop to public officials. It was deemed by our visiting team of American economists that if China could bring agriculture to a 3% annual growth path, the food problem could be manageable.

As we toured the countryside in 1979, we saw hopeless gangs of workers with shovels, hoes, rakes and other hand equipment, working in the fields. Soon after the introduction of land reform, we could see individual farmers working their plots in the evening dusk and keeping dangerous food shortages from developing. At first, agricultural output rose significantly above the 3% annual path and then settled down to a maintained path, somewhat above 3%.

The crude manual practices for harvesting and distributing products gradually vanished. Clean packages in supermarkets gradually displaced farmers with horse-drawn wagons ladling out milk in village squares, or curbside heaps of cabbages, potatoes, and other vegetables distributed in the wee hours on urban street corners.

Land reform has been successful and the food supply appears to be adequate.

(ii) TVEs were, at an early stage, constructed or placed in former commercial areas to do necessary machine work or "off season" small manufacturing work in towns and villages. Many of these establishments were quite small, but some grew to be establishments with scores of workers, adding significantly to national production. This provided work opportunity for otherwise redundant labor supply, particularly rural supply.

(iii) SEZs (special economic zones) have been important in other developing areas, particularly as export processing zones, that permit easy entry and exit of goods in raw, semi-finished, and finished form, with special tax treatment. This system of export promotion was especially important at an early stage of development in Taiwan, when the transformation taking place was from low value-added activity (sugar and pineapples, for example) to higher value added, in the form of manufactured exports.

The concept spread widely – to Mexico's Maquiladoras traffic along the southern border of the United States for widespread outsourcing of low, medium, and even high tech activity. The SEZ concept has been generalized in China, beyond export activities.⁴ They have become enterprise zones in China with large infrastructure investment, restricted dwelling areas for international business groups. There are restricted permits for city living; so Chinese people are not openly free to choose life in an SEZ, but foreigners in finance, manufacturing, and many other lines of economic or political activity can live in SEZs with most of the comforts of home from the outside

world. Many world corporations have offices and production facilities in SEZs. They have been quite successful in China, and are still expanding.

(iv) Population control was very much in evidence at the beginning of reform because a major population census was undertaken there in cooperation with the United Nations population office. A startling demographic result immediately became apparent to all the specialists involved, namely, that China's policy of one-child-per-family turned out to be a striking early success. China aimed for faster economic growth, without having a large part of the generated output consumed immediately by large families. Both total GDP expansion and GDP per capita expansion were kept within a band of slightly more than a one-percent differential. Large numbers of children were not on hand to consume "too" much of the early output expansion. This policy looked good at the time and got very favorable attention from world-class demographers, admiring Chinese restraint. There were some exceptions, but on the whole, the plan objectives were met. A few decades hence, a problem could arise for China, similar to the Japanese experience after World War II, if the dependency ratio turns highly unfavorable. Now, is the time for China to re-think its demographic policies. The pending problems will not arise soon, but as we eased into the 21st Century, many scholars realized that the problems of the future sometimes catch nations off guard.

(v) At the time of start-up reform, the official exchange rate between the US dollar and the yuan was fixed (pegged) and currency conversion was tightly controlled. Some items (fine arts, jewelry, imported retail goods, carpets) were available only for "hard" currency payment, often in special stores (Friendship Stores). Gradually more business transactions with foreigners allowed conversion at agreed upon rates. In January 1994, various exchange rates were consolidated to what was effectively an average 20 percent devaluation and the rate between the US dollar and the yuan was fixed at 8.277¥/\$. Persistent pressure by the United States, as a result of a large adverse dollar-trade deficit, has led to some small adjustments. The fixed rate vs. the US dollar was called a "manipulated" rate, but it is hard to justify such a description. A fixed rate is certainly not being manipulated. Hong Kong has had a fixed rate vs. the US dollar for a long time, but that rate is not being challenged or regarded as manipulated. Many smaller economies have chosen fixed pegs for their rates, in order to have an anchor (not manipulated) and it is hard to appreciate the US official attitude.

At the time of the financial crisis in East Asia (1997), China was being asked to hold rates steady and continue strong growth, in order to help stabilize Asia. China did just that, and it does not make sense to keep pressuring them to change their exchange rates simply because the US economy has deficits and poor US saving rates.

A primary objective of China, given their experience during the Cultural Revolution, is to maintain stability at all cost. They are understandably reluctant to allow wide swings in the key exchange rate; that would only invite destabilizing foreign currency markets, with speculators causing trouble as they did in Southeast Asian countries in 1997, and the years leading up to the Asian crisis.

(vi) In the early decades since 1949, the education establishment in China was influenced by that in the Soviet Union. This was pervasive, but economics became a particular target, because it followed Soviet-Marxist lines, even down to the definitions and concepts of macroeconomic measurement. In place of GDP, the focus was on NMP (net material product), which misses much of the important side of economic activity. On the other hand, the attention paid to input-output analysis has proved to be beneficial. To get the Chinese economy moving forward at a strong and steady pace, Marxist economics was not very helpful.

Project LINK, a cooperative research venture tying together models of nearly all the world's economies started to include Soviet, CMEA, and eventually Chinese economies and economists before 1978 liberalization, began to take place, but many macroeconomic concepts had to be adjusted to dovetail with Western accounting methodology. This was not entirely satisfactory, but it was better than to have omitted a significant share of the world economy from the mathematical-statistical system that was meant to be all inclusive. We developed within LINK, our own models of the socialist economies.

In our 1979 visit under the auspices of the CSCPRC, I asked a guide of our group, when we were bussed by Tiananmen Square whether we would see the same larger-than-life photographs in the Square of such personalities as Mao, Chou-en-lai, Marx, Engels when we might return for follow-up visits. He replied to me, unhesitatingly, "yes", using body language, too. But in 1980, for the econometric training seminars, and repeatedly in future years, we saw gradual replacement of the photographs, although Mao's was in view for some time.

Chinese scholars, hungry for education, after the cultural revolution, were enthusiastic participants in the daily lectures on Western econometrics. The social accounting systems were gradually changed to Western standards; foundations in the West supported Chinese scholars abroad and Western scholars in China. Within a decade or so, a large group of Chinese economists, trained in Anglo-American economics were qualified to take over much, if not most, of the training of future generations of Chinese economists in the traditions of modern Anglo-American economies. The educational barriers have come down, and Chinese economists are at work or study throughout the world and are presently in a strong growth phase.

Not only has the visible economy of China undergone enormous transformation in concept, in quantitative details, in targets for development, etc, but one striking accomplishment has been for China to succeed in achieving a very important objective – the gradual elimination of poverty. The task is not yet complete, but it is estimated that several million persons have been lifted above the international poverty line. This has been one of the most cherished targets of major multinational economic institutions, and China's contribution to this aspect of economic development, in our time, has been realized.

(vii) (FDI) Foreign direct investment has moved in very large amounts into China since reform. Some years ago, FDI was not thought to be the strategic international capital flow for promoting economic development. Now it is very high on the scale of preference, because it can be adapted for technology transfer if all parties are in

agreement, and it is less likely to be fickle, in a highly mobile way, when all aspects of complex projects are not moving in the appropriate direction.

In the China case, the periodic chronology of Beijing Jeep is a fine example of how not to have capital transfer. Some Jeeps were produced, after painstaking differences of opinion between Asian and US participants, but it was nothing like the success subsequently enjoyed by Volkswagen's Santana taxis in major urban areas. Later automotive ventures with GM, Honda, Toyota, Nissan and other major producers seem to have fared better.

China is a leader among developing economies in making progress through the use of FDI in large quantity. The reason why some countries do not like FDI inflows is that the recipients feel that undue control is transferred to institutions in the supplying economy, but now China seems to know how to deal with FDI flows and sticks to their own politico-economic principles in dealing with donors, especially those who now feel that they do not want to be left out of the China market.

III. 27 YEARS SINCE THE START OF REFORM – WILL IT LAST?

An important feature of Chinese trade since the start of reform was its ability to secure Most Favored Nation (MFN) status, especially with the United States. An awkward aspect of this was that MFN status was not automatically granted. China had to seek annual renewals, but eventually a dialogue developed with the United States for a Permanent Normal Trade Relationship, which, if granted, would make MFN automatic. In a bipartisan meeting in Washington, PNTR status was negotiated and approved by the Clinton Administration. In order to complete PNTR acceptance, China had to guarantee favorable treatment on many issues for US businesses in China. PNTR led to China's being accepted in the World Trade Organization, a move that was highly prized by the Chinese government. Membership in WTO, PNTR and MFN were important steps for carrying on China's thrust for export-led growth and represents one more reason for believing now that sustainability has some future, not an indefinite future, but a good prospective future for a few years at least.

However, even with textile quotas in force China prospered in world trade, but when the textile quotas were lifted at the beginning of 2005, China's net export bulge grew so fast; their foreign reserves increased so much; their holdings of US treasury securities became so large that US economic officials complained bitterly that China's export surplus was simply too large, even though US private enterprise, other than those directly affected by the textile influx, wanted to continue to do business as usual with China.

Ultimately, the US complaints, and some from Europe have become so strident that China has felt obligated to restore exogenous constraint on textile, apparel, and shoemaking activities. It is not the way competitive free trade should work, but China has acquiesced by imposing trade restraints and loosening the peg to the US dollar.

In order to keep the growth momentum intact, China is relying more on trade growth as a result of being the host country for the Olympiad of 2008. The infrastructure build-up for that event is well in place in Beijing. Just two years later, in 2010, China will host an international exposition in Shanghai. In the light of events

such as the Olympics followed by an expo should stretch sustainability to 2010 and even beyond. There will still have to be an effort to complete the targeted quadrupling of real GDP by 2020. At least, through 2010, this should keep the macroeconomy on track, setting new world development records all along the way.

The pressures on China to up-value the currency, beyond a fixed peg to the US dollar, are not by themselves important enough to provide the kind of relief that the United States are seeking. There is no assurance that the foreign trade elasticities are strong enough to throw away some export earnings and expect that they will accrue to the benefit of the United States. A much sharper and more important economic measure should be considered; in particular, the wage differential.

The World Development Indicators (2002) of the World Bank show relative labor costs per worker between China and the United States to have been 40:1 during 1995-2000. This ratio dropped in recent reports to 30:1 and is generally estimated to be near 20:1 at the present time. With these huge wage differentials, it is easy to see why China's exports are cost-effective vis-à-vis the United States. It is not exchange rate manipulation from the argumentative side of the United States that is likely to change the prevailing patterns of trade. Chinese workers are likely to demand relatively more as their shares in this ever changing, ever improving world manufacturing.

India is drawing the attention of the United States officials now, in the disputed practices of "offshoring", especially of software services, and their differential is closer to 4 or 5:1 for workers meeting the requirements for success in the particular "white-collar" jobs that are coveted now.

There will be steady streams of challenges against China's strong role. Both losses and gains will take place in the nation's malls, department stores, and other retail establishments. Gains will be distributed over many countries. What is clear, however, is that China stands to gain a good deal more than is yet apparent. Our forecasting models, that are being used in order to track China's sustained growth fortnight-by-fortnight, show, at the present time, what we see are continuing success stories in favor of China's ambitious goals, which are still in place – fortnight-by-fortnight.

IV. ADDENDUM WITH WENDY MAK

As far as a backward look at the developments since reform is concerned, we stand by the observation that critics and competitors would not be so disturbed about China's economic growth record, if it were not actually being seen or felt, year after year, if it were only a mirage and not really happening. The pessimists have yet to justify their appraisals.

A statistical modeling approach to the historical issue has been provided in an application of principal component analysis over the period, 1980-2000.⁵ Principal components constitute a canonical form of many interrelated variables, as mutually independent linear combinations of these variables that have the same overall variance as the original sample set. It is a method that has been used for a long time by social and psychological statisticians and has found many uses in economics, dating as far back as Richard Stone's insightful article.⁶

Briefly, linear combinations of economic time series that are, without any doubt, strongly indicative of a nation's economic development, are highly correlated in the Chinese case, with the annual movement of Chinese GDP in the first two decades of growth after reform. This correlation does not prove that China grew as the official GDP data suggest, but the burden of proof that the Chinese figures are exaggerated is passed on to the doubters.

The purpose of this section is to investigate, using a statistical model, the prospects for China's future. How long and how strong can one look forward to China's economic growth? Again, the method of principal component analysis, on a much larger and more refined scale, will be illustrated in this section.

A full investigation of China's future growth, or the sustainability of contemporary growth tendencies, should be based on a structural econometric model of China, such as those that have been built and used for decades in forecasting and policy analysis of many advanced industrial economies. The transition economies, especially China and Russia need some more time to build adequate databases. Usable monthly or quarterly data, in the form of well articulated social accounts are not yet available in China and Russia for the period before 1994 or 1995. Chinese data are available annually, but not in full detail, since the start of reform, in 1978. It has accordingly been decided to work intensively with monthly data and have a better business-cycle perspective for the period starting in 1994-95. This span (up to the present) allows us to use high-frequency types of data analysis, featuring some principal component analysis, for these two economies. The China case is presented in the following pages.

At the high-frequency (monthly) observation period, we are making forecasts of Chinese variables twice monthly for the following items:

- (1) Gross Domestic Product (GDP) as a function of 29 monthly indicators,
- (2) Consumer Price Index (CPI) as a function of 33 monthly indicators, and
- (3) Producer Price Index (PPI) as a function of 32 monthly indicators

The GDP forecasts are quarterly and the price indexes are monthly. All included indicators are monthly.

Two other systems are under construction for follow-on study. One estimates GDP from the supply side, by adding up results for primary, secondary, and tertiary activity separately, using appropriate indicators. This system is nearly ready for initial testing.

Another system is under construction from the demand side, to add up household consumption, capital formation, exports, imports, government demand, inventory changes, wages, profits, and financial market clearing variables (interest, exchange rate, profits).

Latest results from the overall system for quarterly GDP, monthly CPI, monthly PPI are shown below.

Chinese policy, at the present time, is to keep the system from overheating, say to lower GDP expansion to the range 7%-9% annually. Inflation is to be avoided by keeping the CPI near 2% and the PPI below its present 4% level.

Without a larger structural model, we cannot make medium-term extrapolations to monitor the success in meeting these targets, but our fortnightly forecasts of GDP, CPI and PPI do indicate some slight movement in a step-by-step fashion toward the desired values. Recent forecasts as of January 6, 2006 show reasonable interim success as follows:

GDP is expected to be at about 10% quarterly growth at an annual rate by early 2006, CPI growth at about 1.5% by March and April 2006, and PPI growth at 3.0% by March and April 2006. Both price indexes peaked in early 2004 and have been falling, on balance, since that period.

From the viewpoint of looking ahead, the graphs of GDP, CPI, and PPI seem to show that each series has peaked in 2002 or 2003 and followed, on balance, a declining trend in small steps. We conclude that our statistical models thus far show dynamic results on track, as we monitor developments every two weeks. In the past, there was reasonable response to the SARS outbreak, export quota changes, and presently, the fear of avian flu. These events are set against preparation for the Olympics (2008), and Expo (2010). The rest, thus far, follows empirical regularities that we continue to model.

Table 1
List of 29 monthly indicators used in forecasting GDP and their mnemonics

LOGALUMINUMIM	Imports - Aluminum (Tons)
LOGBENCHMARK	Central Bank Benchmark Interest Rate - Reserve Requirements (Percent per annum)
LOGCEMENTIP	Industrial Production - Cement (Millions of Tons)
LOGCOMBUILDUNDER	Commercial Buildings, Under Construction (Thousands of Square Meters)
LOGCOPPERIM	Imports - Copper (Tons)
LOGCOTTONX	Exports - Cotton Yarn (Tons)
LOGCRUDEIM	Imports - Crude Petroleum Oil (Thousands of Tons)
LOGENERGYIP	Industrial Production - Total Energy Production (Millions of Tons)
LOGFDIURATIO(-6)	Ratio of Utilized FDI to GDP, lagged by six months
LOGFERTILIZERIP	Industrial Production - Chemical Fertilizer (Thousands of Tons)
LOGGARMENTIP	Industrial Production - Garments (Millions of Pieces)
LOGGOVEXPRATIO(-6)	Ratio of Government Expenditure to GDP, lagged by six months
LOGINDSALESRATIO	Ratio of Industrial Sales to GDP
LOGIRONIP	Industrial Production - Iron Ore (Thousands of Tons)
LOGPIGX	Exports - Live Pigs (Thousands)
LOGPLASTICPIP	Industrial Production - Plastic Products (Thousands of Tons)
LOGPLASTICX	Exports - Plastic Articles (Tons)
LOGPOULTRYX	Exports - Live Poultry (Thousands)
LOGPOWERIP	Industrial Production - Power Generated (Billions of Kilowatt-hours)
LOGREALRETAILTOTAL	Real Retail Sales, Consumer Goods - Total (Billions of Yuan)
LOGREFPETROIM	Imports - Refined Petroleum Products (Thousands of Tons)
LOGSTATEINVRATIO(-3)	Ratio of Fixed Assets Investment (State Owned & Other Ownerships) to GDP, lagged by three months
LOGSTEELIM	Imports - Steel Products (Thousands of Tons)
LOGSTEELIP	Industrial Production - Steel (Thousands of Tons)
LOGSUGARX	Exports - Sugar (Tons)
LOGTEAX	Exports - Tea (Tons)
LOGVEGX	Exports - Vegetables (Thousands of Tons)
LOGRELWAGERMB	Relative Wage Rate between China (numerator) and US (Percent Change from a Year Earlier)
LOGVELOCITYM2	Velocity, based on M2 (Percent Change from a Year Earlier)

The units of measurement presented in the above list are the raw units as reported by the Chinese National Bureau of Statistics. In the principal component analysis, we transform the monthly indicators into the same format (year-over-year index) as GDP. Then we convert both monthly indicators and GDP into logarithm forms. The same approach is applied to the principal component analysis of monthly indicators used in estimating CPI and PPI.

Table 2
List of 33 monthly indicators used in forecasting CPI and their mnemonics

LOGALUMINUMMP	Import Price - Aluminum (US Dollars per Metric Ton)
LOGAQUATICXP	Export Price - Aquatic Products (US Dollars per Metric Ton)
LOGCARMP	Import Price - Motor Vehicles and Chassis (US Dollars per Unit)
LOGCOALXP	Export Price - Coal (US Dollars per Metric Ton)
LOGCOPPERMP	Import Price - Copper (US Dollars per Metric Ton)
LOGCOTTONXP	Export Price - Cotton Yarn (US Dollars per Metric Ton)
LOGCRUDEMP	Import Price - Petroleum Oil (US Dollars per Metric Ton)
LOGDEPDEMAND	Household Savings Deposits Rate - Demand (Percent per annum)
LOGFABRICMP	Import Price - Cotton Woven Fabrics (US Dollars per Meter)
LOGFDI	Signed FDI, year-to-date (Millions of US Dollars)
LOGFERTILIZERMP	Import Price - Fertilizers (US Dollars per Metric Ton)
LOGFIBREMP	Import Price - Synthetic Fibers for Spinning (US Dollars per Metric Ton)
LOGINCOME35	Urban Household Survey, Monthly Income per Capita - 35 Cities Average (Renminbi)
LOGINVSTATE	State-Owned Fixed Asset Investment (Millions of Renminbi)
LOGIRONMP	Import Price - Iron Ore and Concentrates (US Dollars per Metric Ton)
LOGM1	Money Supply M1 (Billions of Renminbi)
LOGPEAOILXP	Export Price - Edible Oil Seeds, Peanuts (US Dollars per Metric Ton)
LOGPETROMP	Import Price - Refined Petroleum Products (US Dollars per Metric Ton)
LOGPIGXP	Export Price - Live Pigs (US Dollars per Unit)
LOGPLASTICXP	Export Price - Plastic Articles (US Dollars per Metric Ton)
LOGPOULTRYXP	Export Price - Live Poultry (US Dollars per Unit)
LOGREPRICE	Real Estate Price Index
LOGRICEPRICE	Price Index of Rice
LOGRUBBERMP	Import Price - Synthetic Rubber (US Dollars per Metric Ton)
LOGSILKXP	Export Price - Raw Silk (US Dollars per Metric Ton)
LOGSOYOILXP	Export Price - Edible Oil Seeds, Soybean (US Dollars per Metric Ton)
LOGSTEELMP	Import Price - Steel Products (US Dollars per Metric Ton)
LOGSUGARXP	Export Price - Sugar (US Dollars per Metric Ton)
LOGTEAXP	Export Price - Tea (US Dollars per Metric Ton)
LOGTVMP	Import Price - TV Sets, Including CKD and SKD (US Dollars per Unit)
LOGVEGOILMP	Import Price - Edible Vegetable Oils, Including Palm Oil (US Dollars per Metric Ton)
LOGWHEATMP	Import Price - Cereals and Cereal Flour, Wheat (US Dollars per Metric Ton)
LOGYARNMP	Import Price - Woven Fabrics of Synthetic Filament Yarn (US Dollars per Meter)

In estimating CPI, we also introduce a dummy variable to account for the Chinese New Year dates, where DUMMY is equal to: +1 for the month when Chinese New Year occurs this year, but not in the same month of the previous year (to account for the spike-up in CPI); -1 for the month when Chinese New Year does not occur this year, but did occur in the same month of the past year (to account for the dip in CPI); and 0 for the month when the Chinese New Year occurs this year as in the same month of the prior year (to account for no New Year effect on CPI).

Table 3
List of 32 monthly indicators used in forecasting PPI and their mnemonics

LOGCEREALMP	Import Price - Cereals and Cereal Flour (including rice, wheat, and maize) (US Dollars per Ton)
LOGVEGOILMP	Import Price - Edible Vegetable Oils, Including Palm Oil (US Dollars per Ton)
LOGSUGARMP	Import Price - Sugar (US Dollars per Ton)
LOGRUBBERMP	Import Price - Synthetic Rubber (US Dollars per Ton)
LOGWOODMP	Import Price - Wood in the Rough (US Dollars per Cubic meter)
LOGFIBREMP	Import Price - Synthetic Fibers for Spinning (US Dollars per Ton)
LOGIRONMP	Import Price - Iron Ore and Concentrates (US Dollars per Ton)
LOGPETROMP	Import Price - Refined Petroleum Products (US Dollars per Ton)
LOGFERTILIZERMP	Import Price - Fertilizers (US Dollars per Ton)
LOGPLASTICMP	Import Price - Plastics in Primary Forms (US Dollars per Ton)
LOGCOTTONMP	Import Price - Cotton Woven Fabrics (US Dollars per Meter)
LOGSTEELMP	Import Price - Steel Products (US Dollars per Ton)
LOGPIGXP	Export Price - Live Pigs (US Dollars per Unit)
LOGPOULTRYXP	Export Price - Live Poultry (US Dollars per Unit)
LOGTEAXP	Export Price - Tea (US Dollars per Ton)
LOGCOALXP	Export Price - Coal (US Dollars per Ton)
LOGBUILDPUPI	Purchasing Price Index, Building Materials and Non Ferrous Metal Minerals (Past Year = 100)
LOGCHEMPUPI	Purchasing Price Index, Chemical Materials (Past Year = 100)
LOGFERMETPUPI	Purchasing Price Index, Ferrous Metal Materials (steel included) (Past Year = 100)
LOGFUELPUPI	Purchasing Price Index, Fuels and Power (Past Year = 100)
LOGNONFERPUPI	Purchasing Price Index, Non Ferrous Metal Materials & Electric Wire (Past Year = 100)
LOGTIMBERPUPI	Purchasing Price Index, Timber and Paper Pulp (Past Year = 100)
LOGVALUEADD	Value Added of Industry (Billions of Yuan)
LOGINDSALES	Industrial Sales (Billions of Yuan)

LOGGOVEXPCAP	Government Expenditure - Capital Construction (Billions of Yuan)
LOGREOFFICE	Real Estate Investment, year-to-date, Office Buildings (Millions of Yuan)
LOGRECOM	Real Estate Investment, year-to-date, Commercial Buildings (Millions of Yuan)
LOGCOMSALE	Commercial Buildings, Sales, year-to-date, Total (Millions of Yuan)
LOGINVSTATE	State-Owned Fixed Assets Investment (Millions of Yuan)
LOGFDI	Signed FDI, year-to-date (Millions of US Dollars)
Separate Independent Variables	
LOGBRENTSPOT(-1)	Brent Oil Spot Price (US Dollars per Barrel), lagged by one month
LOGBASEMETAL(-3)	Base Metal Price Index (1985=100, includes aluminum, copper, lead, nickel, tin and zinc), lagged by three months

Chart 1
GDP equation plot (1997Q2 – 2005Q4)

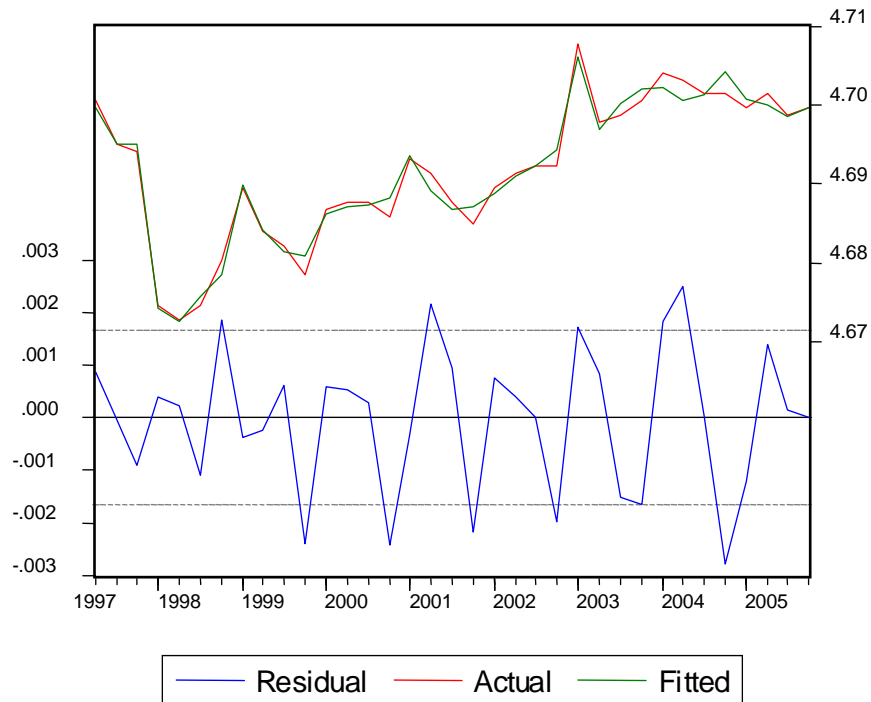


Table 4
GDP Regression Equation
 Sample period: 1997Q2 – 2005Q4
 Forecast period: 2006Q1 – 2006Q2

Dependent Variable: LOGGDP
 Method: Least Squares
 Date: 02/10/06 Time: 11:00
 Sample (adjusted): 1997Q2 2005Q4
 Included observations: 35 after adjustments
 Convergence achieved after 12 iterations
 Backcast: 1997Q1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.69154757	5.76E-05	81498.5563	8.31E-99
A1	0.00294774	4.21E-05	70.0472092	2.57E-28
A2	-0.0003376	6.17E-05	-5.4674788	1.47E-05
A3	-0.0009785	1.08E-04	-9.0248147	5.11E-09
A4	0.00064359	0.00010508	6.12447067	3.01E-06
A5	-0.0011121	0.00018644	-5.9650981	4.41E-06
A8	0.0016345	0.00021521	7.59487123	1.03E-07
A9	0.00184281	0.00037572	4.90478371	5.91E-05
A10	-0.0012883	0.0002773	-4.6458769	1.13E-04
A12	-0.0014245	5.09E-04	-2.7975973	1.02E-02
A14	0.00164326	0.00067633	2.42967439	2.33E-02
MA(1)	-0.9972907	0.16431174	-6.0695037	3.44E-06
R-squared	0.97737065	Mean dependent var		4.69E+00
Adjusted R-squared	0.96654792	S.D. dependent var		9.09E-03
S.E. of regression	1.66E-03	Akaike info criterion		-9.69E+00
Sum squared resid	6.36E-05	Schwarz criterion		-9.16E+00
Log likelihood	181.660513	F-statistic		9.03E+01
Durbin-Watson stat	2.14566722	Prob(F-statistic)		3.19E-16
Inverted MA Roots	1.00E+00			

$A_i = i^{\text{th}}$ principal component

MA = moving-average error transformation

Table 5
Partial elasticity of GDP with respect to monthly indicators

LOGALUMINUMIM	0.000822
LOGBENCHMARK	0.000629
LOGCEMENTIP	0.000343
LOGCOMBUILDUNDER	0.000794
LOGCOPPERIM	-0.001731
LOGCOTTONX	-0.000091
LOGCRUDEIM	0.001233
LOGENERGYIP	0.000519
LOGFDIURATIO(-6)	0.000430
LOGFERTILIZERIP	0.000681
LOGGARMENTIP	0.001972
LOGGOVEXPRATIO(-6)	-0.000457
LOGINDSALESRATIO	0.000626
LOGIRONIP	0.000492
LOGPIGX	-0.001280
LOGPLASTICPIP	0.000926
LOGPLASTICX	-0.000095
LOGPOULTRYX	0.000455
LOGPOWERIP	0.000663
LOGREALRETAILTOTAL	0.002438
LOGREFPETROIM	0.000610
LOGSTATEINVRATIO(-3)	-0.000062
LOGSTEELIM	-0.000185
LOGSTEELIP	0.000619
LOGSUGARX	-0.000046
LOGTEAX	-0.000188
LOGVEGX	-0.001093
LOGRELWAGERMB	0.000171
LOGVELOCITYM2	0.000851

Table 6
GDP forecast as of February 10, 2006
(Forecast period: 2006Q1 – 2006Q2)

	LOGGDP	GDP	
2005Q1	4.70	109.90	Actual
2005Q2	4.70	110.10	Actual
2005Q3	4.70	109.80	Actual
2005Q4	4.70	109.90	Actual
2006Q1	4.70	110.17	Forecast
2006Q2	4.70	110.03	Forecast

Note: The LOGGDP variable stands for the logarithm of year-over-year percent change in GDP (base = 100), while the GDP variable here stands for the year-over percent change in GDP (base = 100).

Chart2

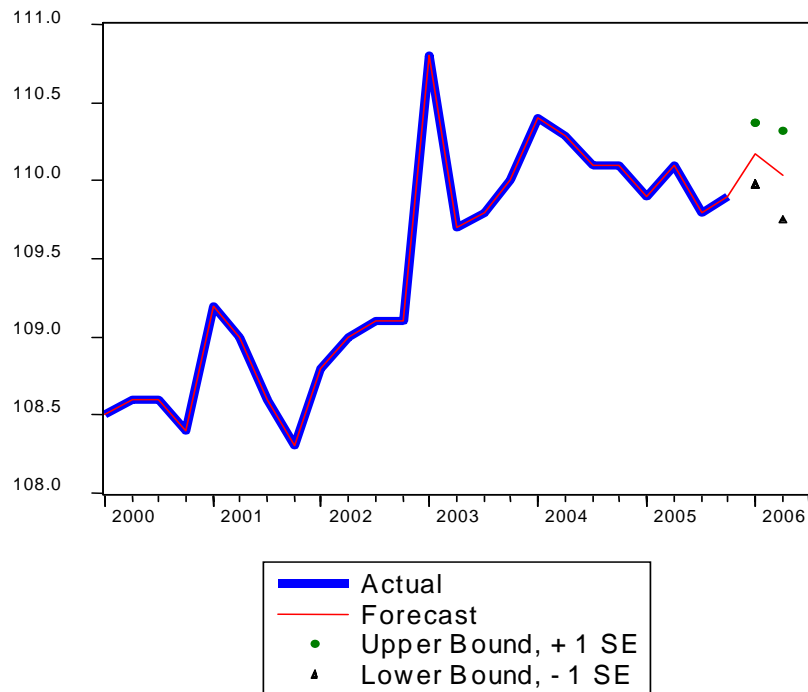


Table 7
 CPI monthly regression equation
 Sample period: February 1997 – December 2005
 Forecast period: January – June 2006

Dependent Variable: LOGCPI				
Method: Least Squares				
Date: 02/10/06 Time: 11:13				
Sample (adjusted): 1997M02 2005M12				
Included observations: 107 after adjustments				
Convergence achieved after 8 iterations				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.61085501	0.00236192	1952.16119	7.06E-231
A1	-0.0043606	0.00052281	-8.3406606	4.18E-13
A2	-0.0013519	0.00051105	-2.6453231	9.48E-03
A8	-0.00147	0.00049372	-2.9774746	3.65E-03
DUMMY	0.00288475	0.00072879	3.95828581	1.41E-04
AR(1)	0.98521045	0.10036772	9.8160088	2.51E-16
AR(2)	-0.1561172	0.08930589	-1.7481179	8.35E-02
R-squared	0.95318519	Mean dependent var		4.61319806
Adjusted R-squared	0.9503763	S.D. dependent var		0.01809412
S.E. of regression	0.00403071	Akaike info criterion		-8.1265643
Sum squared resid	0.00162466	Schwarz criterion		-7.9517063
Log likelihood	441.77119	F-statistic		339.346046
Durbin-Watson stat	1.94178781	Prob(F-statistic)		3.99E-64
Inverted AR Roots	0.79	0.2		

A_i = ith principal component

AR = autoregressive error transformation

Chart 3
CPI equation plot (February 1997 – December 2005)

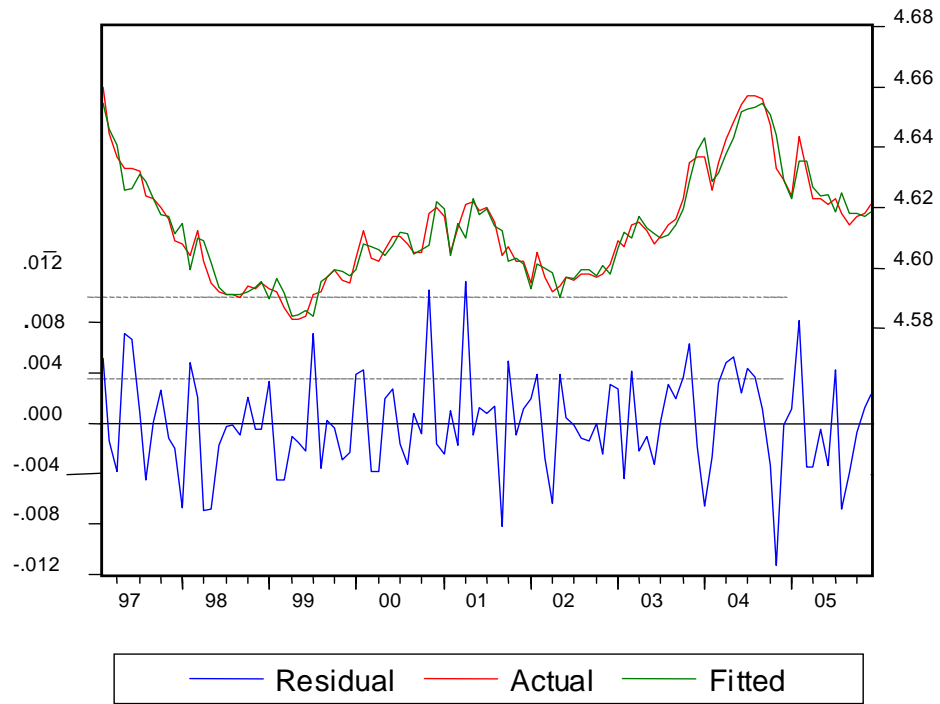


Table 8
Partial elasticity of CPI with respect to monthly indicators

LOGALUMINUMMP	0.000630
LOGAQUATICXP	0.000411
LOGCARMPI	0.000067
LOGCOALXP	0.001177
LOGCOPPERMP	0.001308
LOGCOTTONXP	0.001352
LOGCRUDEMP	0.000357
LOGDEPDEMAND	0.001148
LOGFABRICMP	0.000290
LOGFDI	0.000476
LOGFERTILIZERMP	0.001380
LOGFIBREMP	0.000616
LOGINCOME35	0.000655
LOGINVSTATE	-0.000877
LOGIRONMP	0.001452
LOGMI	-0.000271
LOGPEAOILXP	0.000022
LOGPETROMPI	0.000191
LOGPIGXP	0.000539
LOGPLASTICXP	0.000931
LOGPOULTRYXP	-0.000296
LOGREPRICE	0.000606
LOGRICEPRICE	0.001338
LOGRUBBERMP	0.001078
LOGSILKXP	0.001320
LOGSOYOILXP	-0.000164
LOGSTEELMP	0.000775
LOGSUGARXP	0.000797
LOGTEAXP	0.001124
LOGTVMP	0.000490
LOGVEGOILMP	-0.000101
LOGWHEATMP	0.000155
LOGYARNMP	0.000970

Table 9
 CPI forecast as of February 10, 2006
 (Forecast period: January – June 2006)

	LOGCPI	CPI	
2005M01	4.62	101.90	Actual
2005M02	4.64	103.90	Actual
2005M03	4.63	102.70	Actual
2005M04	4.62	101.80	Actual
2005M05	4.62	101.80	Actual
2005M06	4.62	101.60	Actual
2005M07	4.62	101.80	Actual
2005M08	4.62	101.30	Actual
2005M09	4.61	100.90	Actual
2005M10	4.62	101.20	Actual
2005M11	4.62	101.30	Actual
2005M12	4.62	101.60	Forecast
2006M01	4.62	101.90	Forecast
2006M02	4.62	101.16	Forecast
2006M03	4.62	101.47	Forecast
2006M04	4.62	101.53	Forecast
2006M05	4.62	101.37	Forecast
2006M06	4.62	101.27	Forecast

Note: The LOGCPI variable represents the logarithm of CPI year-over-year change (base = 100). The CPI variable represents the year-over-year change of consumer prices (base = 100).

Chart 4

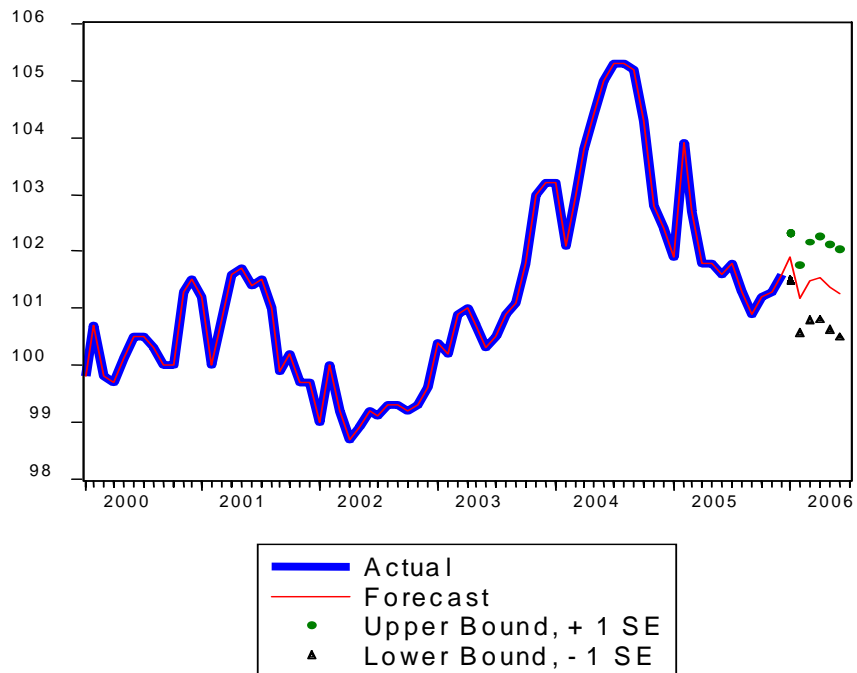


Table 10
 PPI monthly regression equation
 Sample period: February 1997 – December 2005
 Forecast period: January – June 2006

Dependent Variable: LOGPPI
 Method: Least Squares
 Date: 02/10/06 Time: 11:23
 Sample (adjusted): 1997M02 2005M12
 Included observations: 107 after adjustments
 Convergence achieved after 22 iterations
 Backcast: 1997M01

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.37983025	0.05704672	76.7761973	4.95E-90
A1	0.00450956	9.22E-04	4.89019767	3.90E-06
A9	-0.0018203	0.00070034	-2.5991407	1.08E-02
A11	-0.0016052	0.00057131	-2.8095964	5.98E-03
LOGBRENTSPOT(-1)	0.01834533	0.00403839	4.54273143	1.57E-05
LOGBASEMETAL(-3)	0.03107279	0.01151927	2.69746254	8.21E-03
AR(1)	0.92831715	0.0409536	22.6675367	5.64E-41
MA(1)	0.08723909	0.11208546	0.77832657	4.38E-01
R-squared	0.98205444	Mean dependent var		4.61E+00
Adjusted R-squared	0.98078556	S.D. dependent var		0.03664249
S.E. of regression	0.00507924	Akaike info criterion		-7.66E+00
Sum squared resid	0.00255407	Schwarz criterion		-7.4556486
Log likelihood	417.568516	F-statistic		7.74E+02
Durbin-Watson stat	1.98356206	Prob(F-statistic)		2.01E-83
Inverted AR Roots	0.93			
Inverted MA Roots	-0.090000			

A_i = ith principal component
 AR = autoregressive error transformation
 MA = moving-average error transformation

Chart 5
PPI equation plot (February 1997 – December 2005)

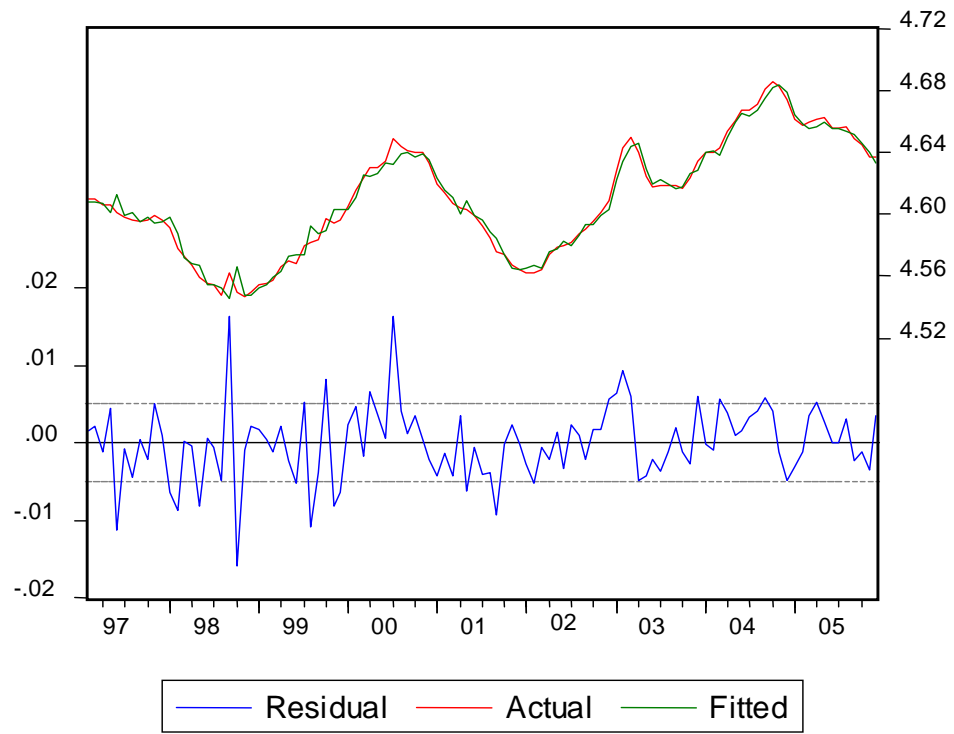


Table 11
 Partial elasticity of PPI with respect to monthly indicators

LOGCEREALMP	0.001369
LOGVEGOILMP	-0.000072
LOGSUGARMP	-0.000589
LOGRUBBERMP	0.000837
LOGWOODMP	-0.000355
LOGFIBREMP	0.001190
LOGIRONMP	0.000636
LOGPETROMP	0.000756
LOGFERTILIZERMP	0.000824
LOGPLASTICMP	0.001724
LOGCOTTONMP	-0.000120
LOGSTEELMP	0.001299
LOGPIGXP	0.001022
LOGPOULTRYXP	-0.000479
LOGTEAXP	0.000860
LOGCOALXP	0.001323
LOGBUILDPUPI	0.000601
LOGCHEMPUPI	0.001568
LOGFERMETPUPI	0.001147
LOGFUELPUPI	0.000839
LOGNONFERPUPI	0.001385
LOGTIMBERPUPI	0.000020
LOGVALUEADD	0.000900
LOGINDSALES	0.000549
LOGGOVEXPCAP	-0.000122
LOGREOFFICE	0.001012
LOGRECOM	0.001170
LOGCOMSALE	0.000146
LOGINVSTATE	-0.000824
LOGFDI	0.000831
Separate Independent Variables	
LOGBRENTSPOT(-1)	0.018345
LOGBASEMETAL(-3)	0.031073

Table 12
 PPI forecast as of February 10, 2006
 (Forecast period: January – June 2006)

	LOGPPI	PPI	
2005M01	4.66	105.80	Actual
2005M02	4.66	105.40	Actual
2005M03	4.66	105.60	Actual
2005M04	4.66	105.80	Actual
2005M05	4.66	105.90	Actual
2005M06	4.66	105.20	Actual
2005M07	4.66	105.20	Actual
2005M08	4.66	105.30	Actual
2005M09	4.65	104.50	Actual
2005M10	4.64	104.00	Actual
2005M11	4.64	103.20	Actual
2005M12	4.64	103.20	Forecast
2006M01	4.63	103.00	Forecast
2006M02	4.63	102.99	Forecast
2006M03	4.64	103.05	Forecast
2006M04	4.63	102.81	Forecast
2006M05	4.63	102.62	Forecast
2006M06	4.63	102.54	Forecast

Note: The LOGPPI variable represents the logarithm of PPI year-over-year change (base = 100). The PPI variable represents the year-over-year change of producer prices (base = 100).

Chart 6

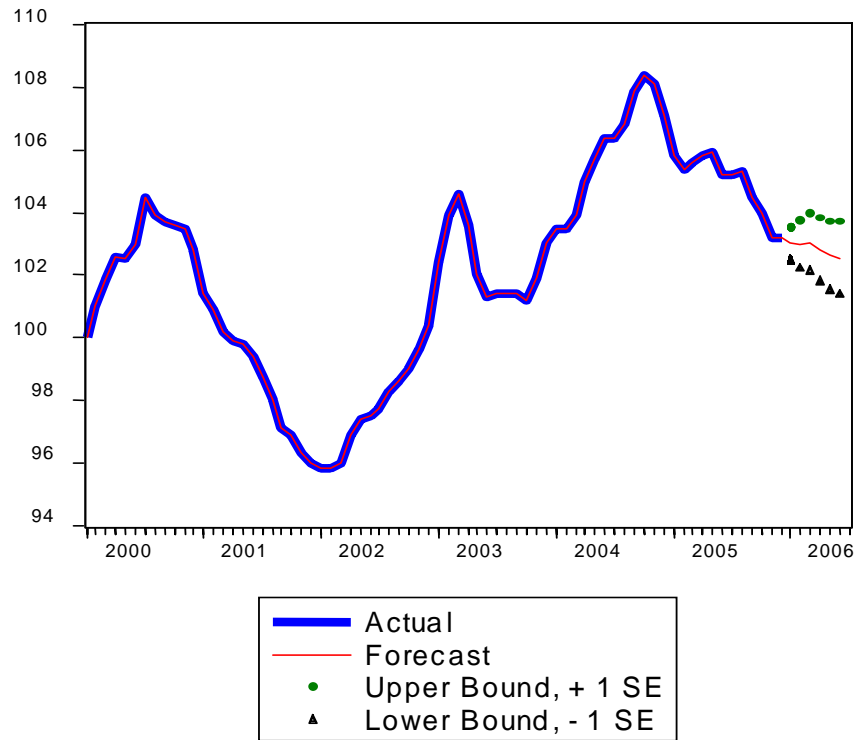


Table 13
Quarterly track record

		Initial Official Figure	Revised Official Figure	Month-end CQM** Forecast Figure	CQM Forecast Month
GDP (year-to-date, year-over- year index)	2004Q4	109.5	109.5	109.5 109.7	December 04 January 05
	2005Q1	109.5	109.9*	108.8 108.9 109.2 108.3 108.7	December 04 January 05 February 05 March 05 April 05
	2005Q2	109.5	110.1*	108.9 108.9 108.5 109.5 109.7 109.5 109.6	January 05 February 05 March 05 April 05 May 05 June 05 July 05
	2005Q3	109.4	109.8*	109.3 109.4 109.2 109.4 109.3 109.6 109.6	April 05 May 05 June 05 July 05 August 05 September 05 October 05
	2005Q4	110.1*		109.4 109.4 109.4 109.1 109.3 109.4 109.8	July 05 August 05 September 05 October 05 November 05 December 05 January 06

* GDP estimates for year 2005 were revised upward in January 2006 to reflect better accounting methods for output in the tertiary industry.

**CQM = Current Quarter Model

Table 13 (continued)

		Initial Official Figure	Month-end CQM* Forecast Figure	CQM Forecast Month
CPI (year-over- year index)	2004Q4	103.2	102.9	December 04
			102.8	January 05
	2005Q1	102.8	100.7	December 04
			101.4	January 05
			101.8	February 05
			103.2	March 05
			102.7	April 05
	2005Q2	101.7	100.5	January 05
			100.7	February 05
			102.4	March 05
			101.5	April 05
			101.2	May 05
			101.7	June 05
			101.6	July 05
	2005Q3	101.3	100.1	April 05
			100.1	May 05
			100.4	June 05
			101.4	July 05
			101.7	August 05
			101.4	September 05
	2005Q4	101.4	101.4	October 05
			101.0	July 05
			101.3	August 05
			100.9	September 05
			100.8	October 05
			101.2	November 05
			101.3	December 05
			101.2	January 06

*CQM = Current Quarter Model

Table 13 (continued)

		Initial Official Figure	Month-end CQM* Forecast Figure	CQM Forecast Month
PPI (year-over- year index)	2004Q4	107.9	107.5	December 04
			107.7	January 05
	2005Q1	105.6	106.0	December 04
			105.7	January 05
			104.9	February 05
			105.3	March 05
			105.3	April 05
	2005Q2	105.6	103.4	January 05
			102.4	February 05
			103.4	March 05
			104.3	April 05
			105.0	May 05
			105.6	June 05
			105.6	July 05
	2005Q3	105.0	102.6	April 05
			104.2	May 05
			103.9	June 05
			104.4	July 05
			104.7	August 05
			105.1	September 05
	2005Q4	103.5	105.1	October 05
			103.5	July 05
			103.6	August 05
			104.3	September 05
			103.7	October 05
			103.6	November 05
	103.4	December 05		
			103.3	January 06

*CQM = Current Quarter Model

Chart 7
 Gross domestic product (1980 – 2005)
 (Year-to-date, year-over-year index)

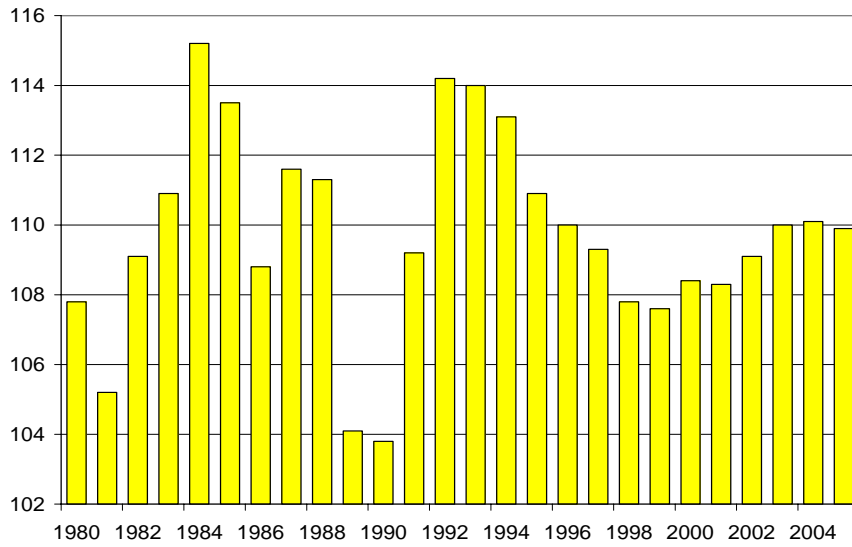


Chart 8
 GDP per Capita (1980 – 2005)
 (Yuan)

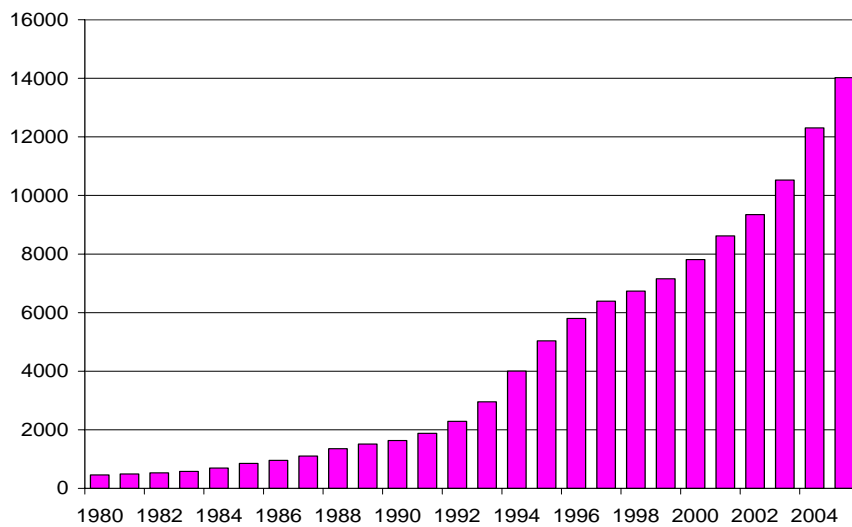


Chart 9
Population (1980 – 2005)
(Millions of persons)

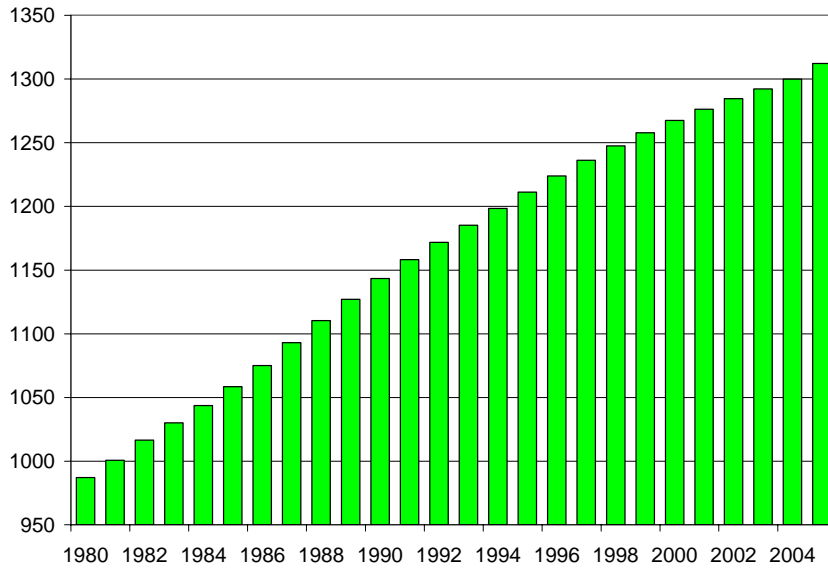


Chart 10
Trade Balance (1980 – 2005)
(Billions of US Dollars)

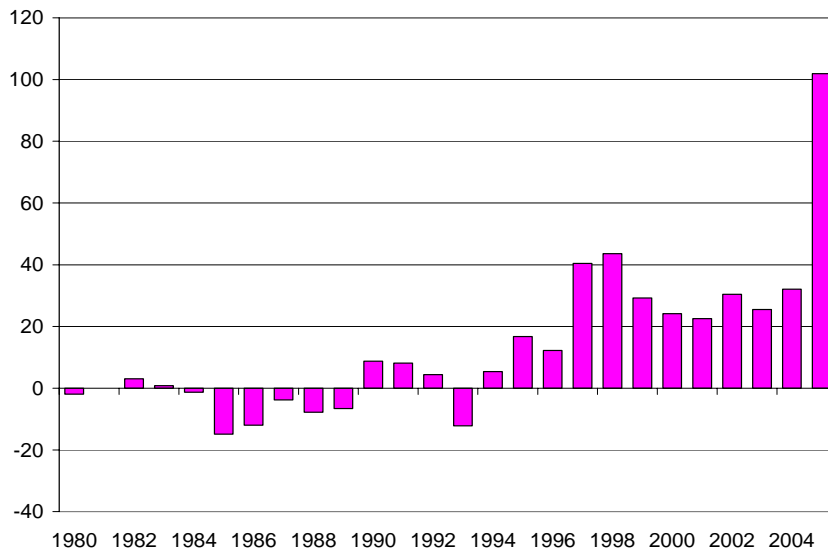


Chart 11
Exports (1980 – 2005)
(Billions of US Dollars)

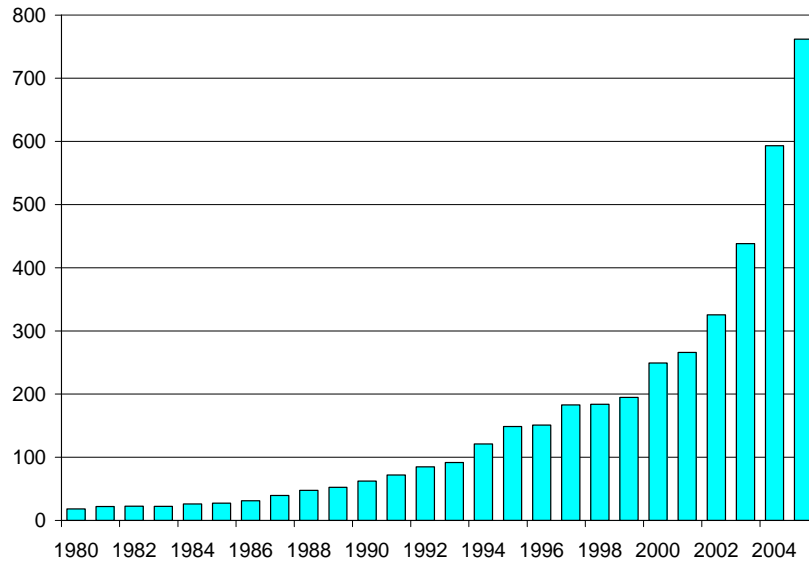


Chart 12
Imports (1980 – 2005)
(Billions of US Dollars)

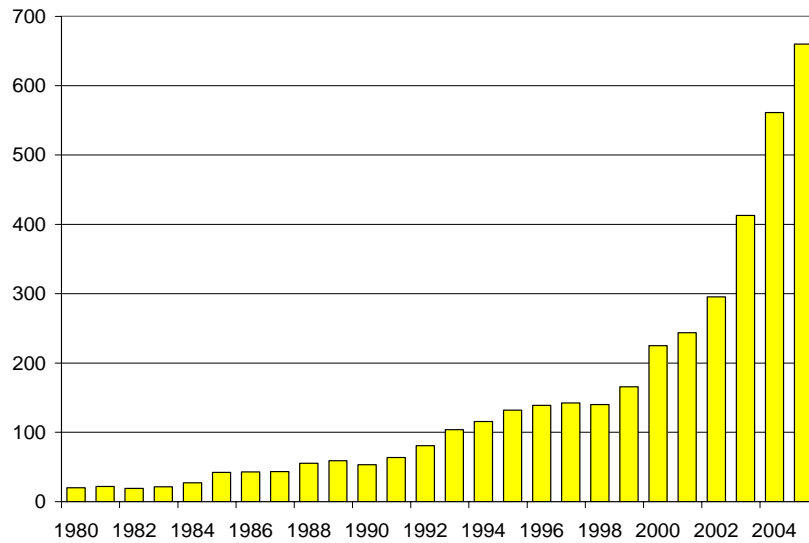


Chart 13
Foreign reserves (1982 – 2005)
(Billions of US Dollars)

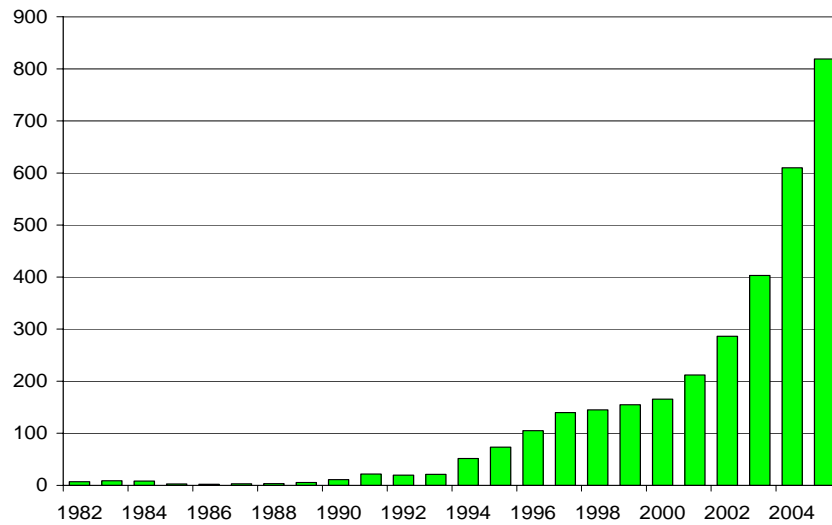
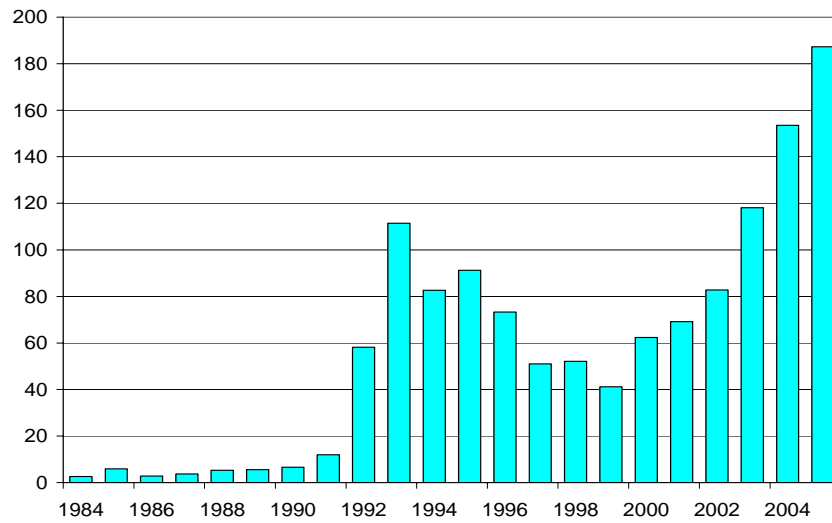


Chart 14
Foreign Direct Investment, Signed (1984 – 2005)
(Billions of US Dollars)



ENDNOTES

1. See L.R. Klein, and J Makino, "Interpretations of the Statistical Discrepancy", *Journal of Economic and Social Measurement*, 26, (2000), 11-29.
2. Advisory committee to Study the CPI, *Final Report of the Advisory Committee to Study the consumer Price Index*, Washington, DC, Government Printing Office, 1996.
3. L.R. Klein, Huiqing Gao, and Liping Tao, "Estimation of China's Inflation Rate" (in press).
4. See Ge Wei, *Special Economic Zones and the Economic Transition in China*, World Scientific, Singapore, 1999.
5. L.R. Klein and S. Ozmucur, "The Estimation of China's Economic Growth Rate", *Journal of Economic and Social Measurement*, 28, 187-202, 2002/2003.
6. J.R.N. Stone, "On the Interdependence of Blocks of Transactions", Supplement to *Journal of the Royal Statistical Society*, V. 14, Part I (1947), 1-32.