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COOPERATION PROJECT ON THE DEVELOPMENT OF A SYSTEM OF CYCLICAL INDICATORS IN CHINA

PROGRESS REPORT

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REGIONAL COMPOSITE LEADING INDICATORS IN CHINA SHANGHAI REGION

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SHANGHAI REGION

1 Introduction

Regional composite leading indicators are gaining popularity in particular in big countries like the United States. There are several reasons for this trend including past performance of composite leading indicators at the national level in many countries and at the international level by systems like ”the OECD System of Composite Leading Indicators”. The relative simplicity of the methodology and construction of composite leading indicators is of course another reason for the popularity of such indicators.

The main reason for constructing regional leading indicators is, however, the differential pattern of economic performance in different regions that exist in many countries. The establishment of regional leading indicators for key regions in a country may also give feedback and input to the calculation of composite leading indicators at the national level. This is particular relevant in the case where the regions selected constitute an economic structure that tend to lead the development in the business cycle.

The OECD Secretariat has developed a “leading indicator system” for its Member countries, which is used by the Secretariat and member countries for analysing business cycles, and for predicting cyclical turning points. The OECD leading indicator system uses the “growth cycle” or “deviations from trend” approach. This is necessary because essential cyclical similarities between series may be obscured by different long-term trends. In periods with very high long-term growth trends the turning points in many level series are a poor guide to cyclical fluctuations in the economy because the series are dominated by the trend.

This paper reports the results of a research project between the National Bureau of Statistics of the People’s Republic of China and the Division for Non-Members of the Statistics Directorate in the framework of the work program of the Centre for Co-operation with Non-Member Economies at the OECD. The aim of the project is to explore the possibility of applying the OECD indicator approach for cyclical analysis to the Chinese economy.

The first phase of the research focus on the identification of a set of potential leading indicators and the construction of an overall composite leading indicator for China. The result of this work is presented in a report entitled “Business Cycles and Cyclical Indicators in China” published in Beijing in March 2001.

The second phase of the research investigate the possibility to construct regional composite leading indicators in selected economic regions of China. This paper reports on the results of such work for the Shanghai region conducted in co-operation with the Shanghai Municipal Statistical Bureau.

The paper is organised as follows. Section 2 outlines the methodology employed. Section 3 presents the choice of reference series and the reference chronology, whilst growth cycles in China and the Shanghai region are examined in Section 4. The selection and evaluation of cyclical indicators are outlined in Section 5. The construction of a set of alternative composite leading indicators for the Shanghai region is dealt with in the Section 6 which also covers the use composite indicators to monitor growth rates. A final section contains a summary and some concluding remarks.

2 Methods and Data

2.1. Basic methodology

The set of short-term indicators for China used in this study show very different long-term trends over the investigated period. Since the indicator series show different long-term trends, the analysis is conducted in terms of growth cycles. The methodologies used in derivation of trend estimates and turning points are outlined below. This is followed by a brief discussion of methodology used to evaluate the performance of the indicators.

Trend estimation

Trend estimation is a crucial step in detecting cyclical movements and identification of turning points when the growth cycle approach is used. The trend estimation method used in this study is a modified version of the Phase-Average Trend (PAT) method developed by the NBER and used in the OECD cyclical indicator system. This method has been designed specifically to separate the long-term trends from medium-term cycles. The latter are defined according to the criteria programmed in the Bry-Boschan computer routine for selection of cyclical turning points.

Estimation of turning points

The estimation of turning point dates is a key step in the PAT procedure and the Bry-Boschan routine is used to estimate tentative turning points, identified in the deviations of the series from a first trend based on a 75 month moving-average estimate of the long-term trend. The routine specifies a minimum duration of five months for a phase, defined as the number of months between successive turning points, and fifteen months for a cycle, measured from either peak to peak or trough to trough. These tentative turning points are used as input to the final trend calculation with the PAT method.

The PAT trend of a series is estimated by first splitting the series into phases, defined by the tentative turning points identified in the Bry-Boschan routine. The means of the observations in each phase are then calculated and these phase-averages are used to compute a three-term moving average. The values obtained from the moving average are assigned to the mid-point of the three-phase-period, known as "triplet", to which they refer. The trend is then obtained by computing the slope between mid-point of successive triplets. The trend is extrapolated from the last available triplet to the end of the series by a least-square log-linear regression starting from the mid-point of the last triplet.

The turning points determined by the Bry-Boschan routine for this study were evaluated and selected to match corresponding major turning points in the reference series so that the trend estimation for each variable was done in a manner consistent with that for the other indicators and the reference series itself. These turning points were used as input to the final trend estimation and formed the turning point chronologies for the indicator series and reference series.

Evaluation of performance of indicators

Two methods were used to evaluate the performance of the indicators. The first entailed looking at the ability of each indicator to forecast cyclical turning points in the reference series, i.e. a peak-and-trough analysis. Forecasting turning points is one of the main objectives of the cyclical indicator technique, because predicting the timing of cyclical turning points is one of the least reliable activities in economic forecasting.

For peak-and-trough analysis, mean or median lags and mean deviations from the mean were calculated at cyclical turning points of indicator series compared to the reference series. The number of extra or missing cycles in indicator series compared to the reference cycle were considered as well. However, these figures are usually not statistically significant in the usual sense due to the limited number of turning points over the period covered in the investigation.

Second, a cross-correlation analysis was used to complement the peak-and-trough analysis concerning the average lag of the indicators and to give information about the cyclical conformity of each indicator to the reference series. This is important if the cyclical indicators are to give information about the likely amplitude of the movements in the reference series.

The cross-correlation analysis was performed on de-trended and smoothed indicator and reference series. The numbers of months lag at which the correlation has the highest value is a guide to the average lag of the indicator over the reference series and the value of the correlation coefficient is a measure of the "general fit" of the indicator in relation to the reference series. However, this method measures only the linear relationship between variables and the presence of extreme values can effect the estimate of the correlation coefficient.

2.2 Data, Filters and Seasonal Adjustment

All indicators used in the study are monthly and most indicators accounted in values are only available in current prices. A few key indicators such as GDP and gross industrial output are adjusted to constant prices with a base of 1990. Although some series go back to 1978 most series only go back to 1983 or later. The main analysis is carried out over the period 1987 to 2000. The indicators are set out in Table 1 and include 17 quantitative series expressed in values or physical units in all cases except one interest rate series.

The data are not available in seasonally adjusted from the source. Seasonal adjustment, a prerequisite for cyclical analysis, was carried out using the X-12 ARIMA program of the US Bureau of the Census.

Indicators displaying a long-term trend are considered in terms of deviations from trend. Calculation of deviations from trend is performed either in the form of ratios or differences depending on the form of the data and the underlying structure of the original series. In general economic time series show a multiplicative structure and to divide the original series by the trend will give a ratio-to-trend series.

The indicator series are adjusted for irregular movements using the "Months for Cyclical Dominance" (MCD) moving average procedure. This method ensures approximately equal smoothness between series, and also ensures that the month-to-month changes in each series are more likely to be due to cyclical than irregular movements.

The de-trended and smoothed data are standardised so that their movements have the same amplitude in the aggregation of individual indicator series to obtain composite indicators. The method used to calculate standardised indices for each component series is to first, subtract the mean and then divide by the mean of the absolute values from the mean.

Indicator systems are normally used to monitor cyclical fluctuations in *real* output and to do this it is essential to use, as far as possible, nominal value series adjusted for inflation. The only price series available are year to year changes in retail prices and consumer prices, so it is not possible to deflate the nominal value series.

Another data requirement specific for time series analysis is accuracy and comparability over time. This covers topics related to data collection and use of data and to data adjustments and includes the following issues:

- data coverage;
- classifications and definitions;
- recording practices, including cumulative reporting
- use of appropriate price indices; and
- compilation of indices

A detailed discussion of data problems experienced in transition countries related some of above issues are provided in the OECD publication, *Seasonal Adjustment of Industrial Production Series in Transition Countries in Central and Eastern Europe and The Russian Federation*

Table 1 List of indicators

Indicator	Start date	Unit of measurement
(0) Gross industrial output	1978	100 000 000 Yuan, constant prices of 1990
(1) Gross Domestic Product (GDP)	1992	100 000 000 Yuan, constant prices of 1990
(2) Retail sales value of consumer goods	1978	100 000 000 Yuan, current prices
(3) Investment in fixed assets	1986	100 000 000 Yuan, current prices
(4) Investment in capital construction	1978	100 000 000 Yuan, current prices
(5) Freight tyraffic	1978	10000 ton
(6) Cargo handled at ports	1985	10000 ton
(7) Total exports value	1978	100 000 000 US$, current prices
(8) Total imports value	1983	100 000 000 US$, current prices
(9) Base interest rate Central Bank, < 20 days	1987	Per cent
(10 Share price index Shanghai Stock Market	1992	
(11) Total loans State Banks	1979	100 000 000 Yuan, current prices, end month
(12) Household savings	1979	100 000 000 Yuan, current prices, end month
(13) Enterprise deposits	1986	100 000 000 Yuan, current prices, end month
(14) Number of project of foreign capital	1989	Units
(15) Foreign direct investment	1989	100 000 000 US$, current prices
(16) Total wages & other payments	1983	100 000 000 Yuan, current prices
(17) Number of employed staff and workers	1990	Persons

Seasonal adjustment is a tool for massaging basic data to facilitate the analysis of time series. The X-12 ARIMA program will not remove any of the underlying problems that may be inherent in the basic data (see data requirements issues above). There is an underlying assumption that the basic data in seasonal adjustment actually measure what it purports to measure, i.e. that the sub-annual movements in the series reflect real movements. Data problems related to cumulative reporting and the use of appropriate price indices are of particular interest in this respect.

The result of seasonal adjustment of the quantitative indicators used in the study is set out in Table 2 below.

Combined identifiable seasonality is detected by the X-12 ARIMA program for all indicators with exception of four series: (1) base interest rate by the Central Bank of China, (2) share price index,

Shanghai Stock Market, (3) Number of projects of foreign capital and (4) foreign direct investments. Moving seasonality is identified for a majority of the series and the identification of an ARIMA model is a problem in the case of a few series. A default model is used in these cases. The disturbance from the irregular component is also important for some of the problem series, where a MCD value of 6 or above indicates a very irregular series. In addition, the seasonal pattern in some series is extreme and/or very strong in the first and fourth quarter for some series and data problems related to the data requirement issues mentioned above might explain this pattern.

The results noted above means that five series are rejected on the basis of the combined quality statistics in X12 ARIMA. These series are the four mentioned above and the series on total import values. The series on total export values is just on the boarder to be rejected as well according to the Q-value, where a series is rejected if the Q-value is above 1.

The recording practice for the investment series is a special case. No data are reported for the month of January, but included in the February figure. In order to get continuos time series, the data reported for the month of February have been allocated evenly to the two months. In addition, the December figure shows an exceptionally large value. This may partly be explained by reporting to meet plan targets for the whole year. This practice results in a seemingly large seasonal component in December for the investment series. However, seasonal variation includes both seasonal proper effects and other systematic effects and the reporting practice represents a persistent, predictable calendar-related effect. It is not possible to determine the pure seasonal effect from the plan target reporting effect and the full effect is taken into account in the seasonal factor for December.

Table 2 Seasonal adjustment results (X-12 ARIMA)

	Time span	**Pre-adjustment**		**ARIMA Model**	**Disturbance from irregular component**	**Identifiable seasonality**		**Combined quality statistics**
		TRD	**EAST**	**ID**	**MCD** (1)	**Mov**	**Comb**	**Q value**
(0) Gross industrial output	1978-2000	No	No	Fixed	3	**Yes**	Yes	0.30
(1) Gross Domestic Product (GDP)	1991-2000	No	No	Fixed	3	**Yes**	Yes	0.52
(2) Retail sales value of consumer goods	1978-2000	**Yes**	No	Fixed	2	**Yes**	Yes	0.38
(3) Investment in fixed assets	1986-2000	No	No	Fixed	4	No	Yes	0.33
(4) Investment in capital construction	1978-2000	No	No	**Default**	5	No	Yes	0.37
(5) Freight tyraffic	1978-2000	No	No	Fixed	5	No	Yes	0.52
(6) Cargo handled at ports	1985-2000	No	No	Fixed	**6**	No	Yes	0.68
(7) Total exports value	1978-2000	No	No	Fixed	**6**	**Yes**	Yes	**1.01**
(8) Total imports value	1983-2000	No	No	**Default**	**7**	**Yes**	Yes	**1.07**
(9) Base interest rate Central Bank, < 20 days	1987-1999	No	No	Fixed	5	**Yes**	**No**	**1.26**
(10 Share price index Shanghai Stock Market	1991-2000	No	No	Fixed	3	**Yes**	**No**	**1.17**
(11) Total loans State Banks	1978-2000	No	No	Fixed	1	No	Yes	0.33
(12) Household savings	1978-2000	No	No	Fixed	1	**Yes**	Yes	0.45
(13) Enterprise deposits	1986-2000	No	No	Fixed	1	No	Yes	0.46
(14) Number of project of foreign capital	1989-2000	No	No	**Default**	**7**	**Yes**	**No**	**1.31**
(15) Foreign direct investment	1989-2000	No	No	**Default**	**12**	**Yes**	**No**	**1.40**
(16) Total wages & other payments	1983-2000	No	No	Fixed	2	**Yes**	Yes	0.26
(17) Number of employed staff and workers	1990-2000	No	No	Fixed	1	**Yes**	Yes	0.78

(1) Months for Cyclical Dominance (MCD) = The number of months it takes the change in the trend-cycle to surpass the amount of change in the irregular component
(2) F-test for the presence of stable seasonality at the 1 per cent level

3 Reference Series and Chronology

A useful method in defining regional business or growth cycles is to use monthly or quarterly series that, at the *national level*, are defined as coincident to the business or growth cycle. These regional series can then be combined into a coincident composite indicator or a single coincident series can be selected to represent the regional business or growth cycle. Two obvious single candidate coincident indicators for a region would be GDP and/or industrial production if such indicators would be available at the regional level.

Cyclical indicator systems are constructed around a "reference series" or "reference chronology". If a single variable is used as reference series Gross domestic Product (GDP) would be the obvious reference indicator in determining the reference cycle and in establishing the reference chronology of turning point dates. Monthly statistics of GDP are now available for Shanghai, but they are not calculated before 1990 i.e. only a bit over ten years of data which is a rather short period for cyclical analysis.

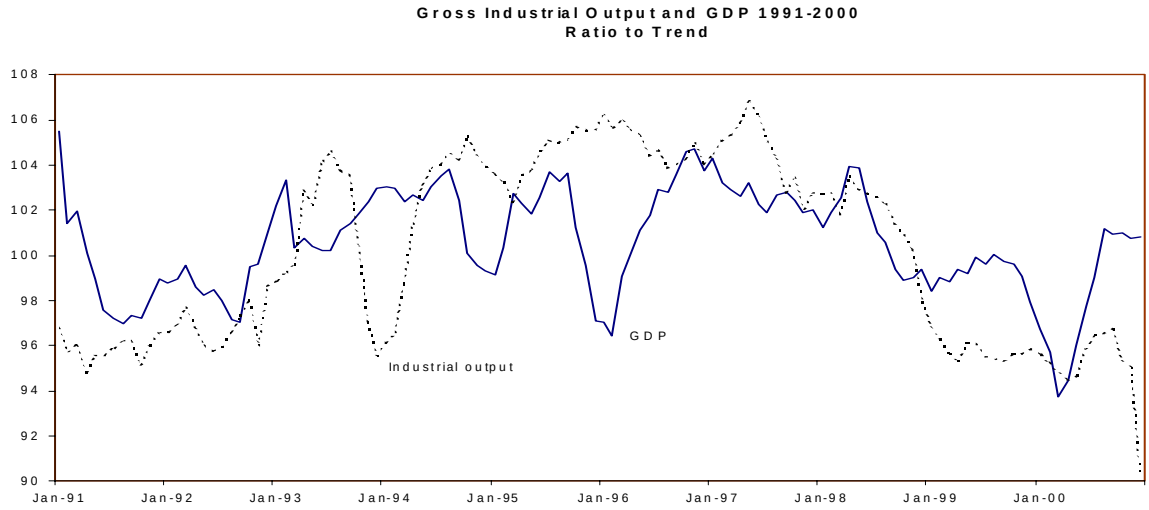
Gross industrial output is however available on a monthly basis since 1978 and is used as the main *target* reference series for the cyclical indicator system. The monthly series is calculated from sales data in value terms of enterprises at township level and above. Industrial output of these enterprises covers over 70 per cent of total gross industrial output. The series is analysed for the period January 1978 to December 2000 and recalculated for the whole period to constant prices of 1990. The series is seasonally adjusted by the X12-ARIMA program and is subject to medium irregular variations (MCD=3).

The cyclical development of gross industrial output, GDP and a composite coincident indicator as an alternative reference series is evaluated in the following sections.

3.1 Gross Industrial Output and GDP

The cyclical developments of gross industrial output and GDP are shown in Chart 1 over the period 1991 to 2000. The relationship between cycles in GDP and industrial output measured by median or mean lags at turning points and by cross correlation results show quite different results. Turning points in GDP lag turning points in gross industrial output by about a year as measured by median or mean lag.

Chart 1

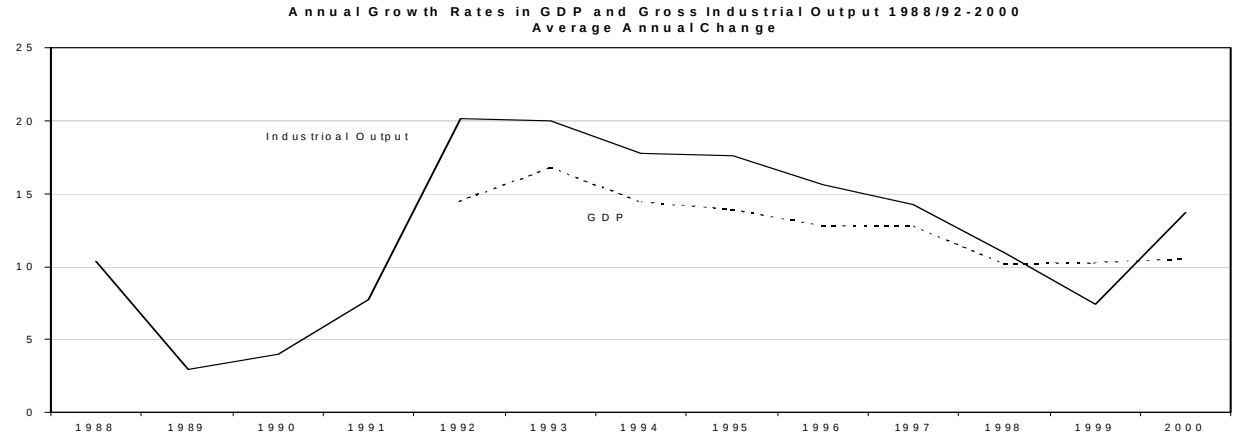


On the other hand, cross correlation results indicate that GDP leads gross industrial output by five months. The correlation between GDP and gross industrial output is not very good with a correlation coefficient of 0.59. However, both industrial out put and GDP show rather irregular developments over the investigated period, which makes dating of turning points difficult. The irregular component in both series is very high and reflected in a MCD value of 6 for both series. In particular the big drop in industrial output in 1993 is not registered in the reference indicator while a big decrease in GDP in 1996 is not reflected in industrial output.

The differences noted above for monthly data on GDP and industrial output are not present when data are aggregated to annual levels. This is shown in Chart 2 where the average annual growth rates are presented for GDP and industrial output. The two series show the same cyclical movements with only some timing differences at turning points and with less cyclical amplitudes in GDP compared to industrial output.

Despite these differences, which may be explained by measurement problems, the results support the use of gross industrial output as a proxy for the aggregate cycle in the region.

Chart 2



3.2 Composite Reference Indicator

A first alternative reference series is based on a *selected* set of reference series combined into a *composite reference indicator* is used to verify the choice of industrial production as the target reference series. The set of indicators used to calculate the composite reference indicator includes:

(1) Gross industrial output
(2) GDP
(3) Total value of wages and other payments to individuals
(4) Number of employed staff and workers

It should be noted that the series on wages and other payments is used in nominal terms and the effect of inflation in the series is not removed. This is due to the fact that no monthly price series are available to adjust the three series expressed in Yuan for the effect of inflation.

The Cyclical characteristics of the indicators included in the reference composite indicator are set out in Table 3 and the cyclical development is illustrated in Chart 3. The general fit between the reference indicator and gross industrial output over the total period for which it may be calculated i.e. 1983-2000 is 0.89 at zero lag as measured by the cross-correlation coefficient. For the more recent period 1987 –2000, the cross-correlation results show a coefficient of 0.90 at zero lag. However, both industrial out put and the reference indicator show rather irregular developments over the period 1990-1997, which makes dating of turning points difficult. In particular the big drop in industrial output in 1993 is not registered in the reference indicator. Despite this difference, which may be explained by measurement problems, the results support the use of gross industrial output as a proxy for the aggregate cycle in the region.

Chart 3

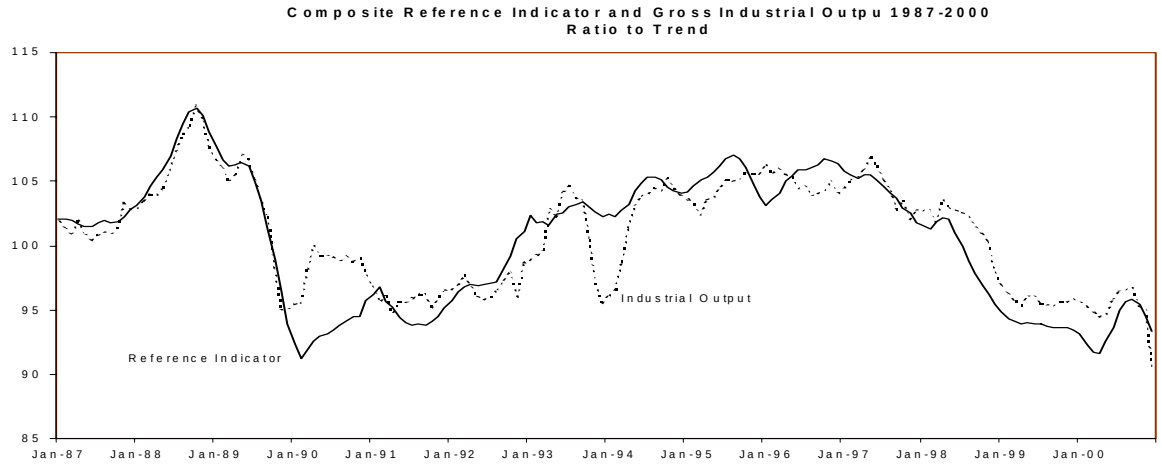


Table 3 Characteristics of Reference and Coincident Indicators, 1978 - 2000

		Start date	MCD (1)	Median lag (2)		Mean lag (2)		Mean deviation (3)		Cross correlation			
				Total period	1987-2000	Total period	1987-2000	Total period	1987 - 2000	Total period lag (2)	coef	1987-2000 lag (2)	coef
	Composite Indicators												
	Reference Indicator (indicators 0, 1, 4, 5)	1983	2	0	-3.5	-1	-4.8	6.5	5.5	0	0.89	0	0.90
	Coincident Indicator (indicators 0, 2, 5, 6, 7)	1978	1	0	4	1.9	2.2	5.6	7.2	0	0.88	0	0.92
	Indicators												
0	Gross industrial output												
1	GDP	1991	6	8		10.6		9.4		-5	0.59		
2	Retail sales value in Yuan	1978	4	4	2.5	5.5	3.7	7.7	6.3	0	0.56	1	0.81
3	Total loans in current prices	1978	2	4	-7	2.2	-5.4	17.1	17.7	15	0.42	15	0.57
4	Total wages in current prices	1983	6	11	12	9.7	9.7	6.3	7.8	-8	0.72	-8	0.78
5	Employment	1990	2	-2.5		-1.2		8.3		-12	0.66		
6	Investment in fixed assets	1986	4	4.5	-2	3.7	-1.7	14.9	12.5	-2	0.72		
7	Investment in construction	1978	5	0	9	0.3	13.7	14.4	9.0	1	0.67	1	0.76

(1) Months for Cyclical Dominance
(2) A negative sign indicates a lead (months) of the indicator against gross industrial output at cyclical turning points
(3) Standard deviation

3.3 Composite Coincident Indicator

A second alternative reference indicator is constructed from a set of identified coincident indicators combined into a composite coincident indicator. The set of indicators used to calculate the composite coincident indicator includes:

(1) Gross industrial output
(2) Value of retail sales of consumer goods
(3) Total value of investment in fixed assets
(4) Total value of investment in construction
(5) Employment

It should be noted that the three value series are used in nominal terms and the effect of inflation in the series is not removed. This may effect both amplitude and timing of cycles between the same series measured in real and nominal terms.

The cyclical characteristics of the indicator series included in the composite coincident indicator are set out in Table 3 and the cyclical developments are illustrated in Chart 5. The general fit between the composite coincident indicator and gross industrial output over the 1978-2000 as measured by the cross-correlation coefficient is 0.88 at zero lag. For the more recent period 1987-2000, the cross-correlation increases to 0.92 at zero lag (Chart 5).

The analysis of turning points for the two alternative reference series show, however, different results as indicated in Table 3. The reference composite indicator tends to lead gross industrial output over the period 1987-2000, while the composite coincident is lagging gross industrial output over this period. This is explained by the inconsistent lead/lag results obtained from the turning point analysis and the cross-

correlation analysis for some of the component series. In particular the series related to wages and employment where the two analyses indicate very different results. In the case of wages, a lag of 10-12 months is registered according to median and mean, while the peak cross-correlation shows a lead of 8 months against industrial output. The employment series is showing a lead of 12 months against industrial output measured by the peak cross-correlation while the mean and median only indicate a lead of 1-2 months. Despite these differences, which may be explained by measurement problems, the results support the use of gross industrial output as a proxy for the aggregate cycle in the region.

Chart 4

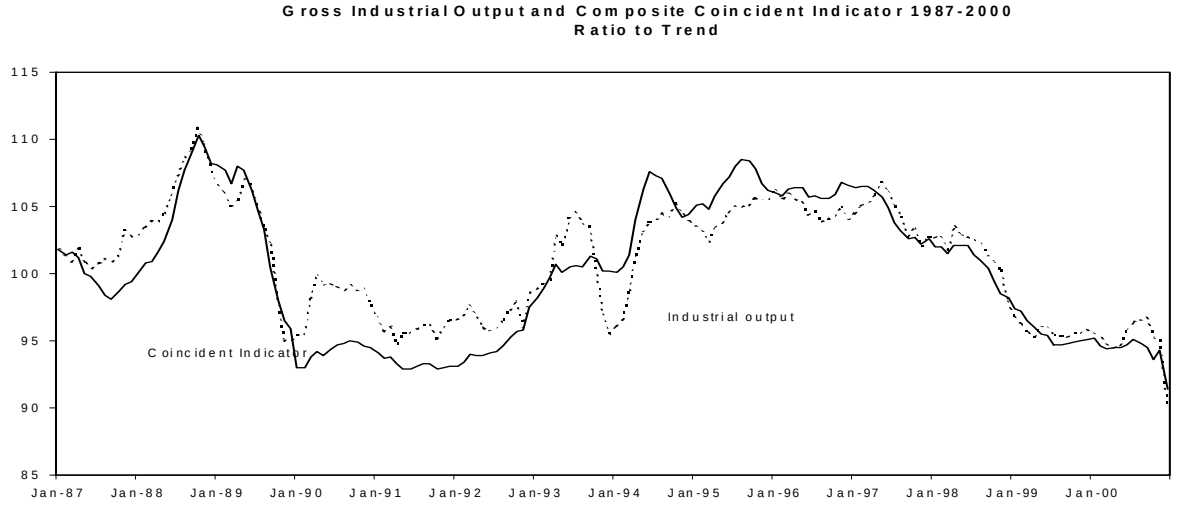
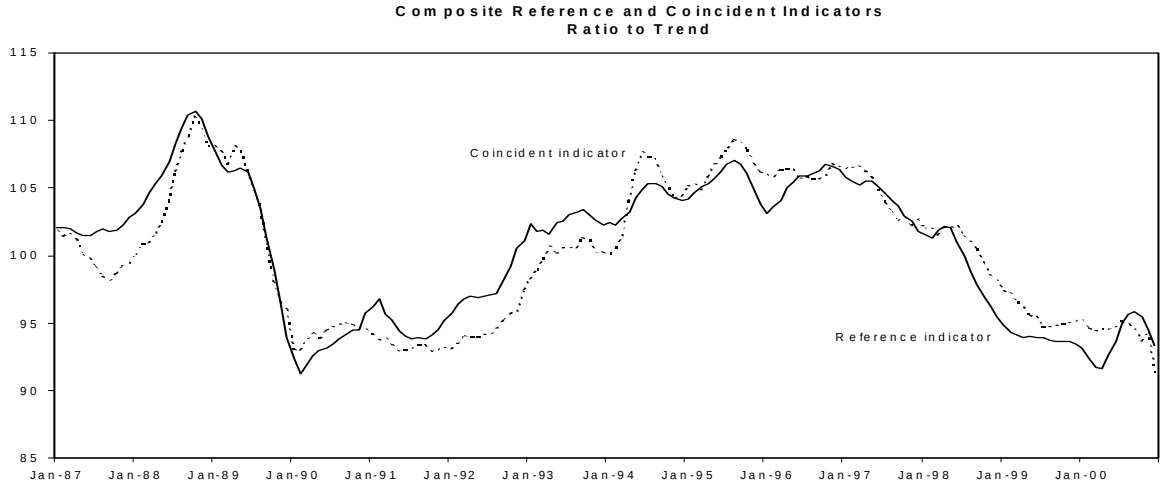


Chart 5



4 Growth Cycles in China and Shanghai Region

The business or "growth" cycle in a region is of course very closely related to the overall business cycle in the country. Despite this, the economic structure may differ so much that the cyclical development in the country may not always serve as a basis for the development in the region.

Differences in economic structure can be explained by differences with regard to, for example, industrial or branch structure, export intensities and the level of component production by enterprises. The linkage between the cyclical development in China at the national level and the Shanghai region is investigated in the following paragraphs. The timing relationships between growth cycles in Gross Industrial Output at the national level and the Shanghai region are presented in Table 4 and the cyclical developments at the national and regional levels are illustrated in Chart 6 and 7.

The cyclical development is investigated over the full transition period 1978-2000 and the recent transition period transition 1990-2000. The choice of 1990 as the starting year for the recent transition period is selected because Chinese society experienced major changes in the transformation to a market economy over this period. The shortness of the recent transition period, i.e. 10 years of data, and the number of turning points over this period do not allow any firm conclusions to be drawn. The results should therefore only be taken as indications of the timing relationships between cycles in China and the Shanghai region.

The timing relationships are measured with mean and median lag at major turning points and cross-correlation lag over the relevant periods. The results for the period 1978-2000 indicate coincident timing between growth cycles at the national and the regional level (Chart 6). However, over the recent period 1990-2000, the results show that the cyclical development in the Shanghai region is leading the cyclical development at the national level (Chart 7). The median and mean indicate leads of 10 and 6.5 months respectively for industrial output in Shanghai against industrial output at the national level. The cross-correlation analysis confirms these results with a peak-correlation of 0.63 at a lead of 8 months. These results are very interesting and means that if a good composite leading indicators can be constructed for the Shanghai region, such an indicator could be used as a leading indicator at the national level and included in a composite leading indicator for China.

Table 4 Gross industrial output in Shanghai and China, 1978 - 2000

Turning points chronologies and lead or lag in months of Gross Output for Shanghai in relation to China

	Turning points: Peak (P) and Trough (T)												
	T	P	T	P	T	P	T	P	T	P	T	P	T
Shanghai	7/78	2/80	2/81	2/82	2/83	4/85	2/86	10/88	2/91	8/93	12/93	3/96	4/00
China	1/79	2/80	2/81	2/82	1/84	4/85	2/86	10/88	12/91	6/94	10/94	10/95	9/00
Lead (-)	-6	0	0	0	-11	0	0	0	-10	-10	-10	5	-5

Cyclical Characteristics of Gross Output in Shanghai in relation to China

	1978-2000	1990-2000
Median lead (-)	0	-10
Mean lead (-)	-3.6	-6.5
Standard deviation of mean lead	5.3	7.2
Cross correlation		
Lead (-)	1	-8
Coefficient	0.67	0.63

Chart 6

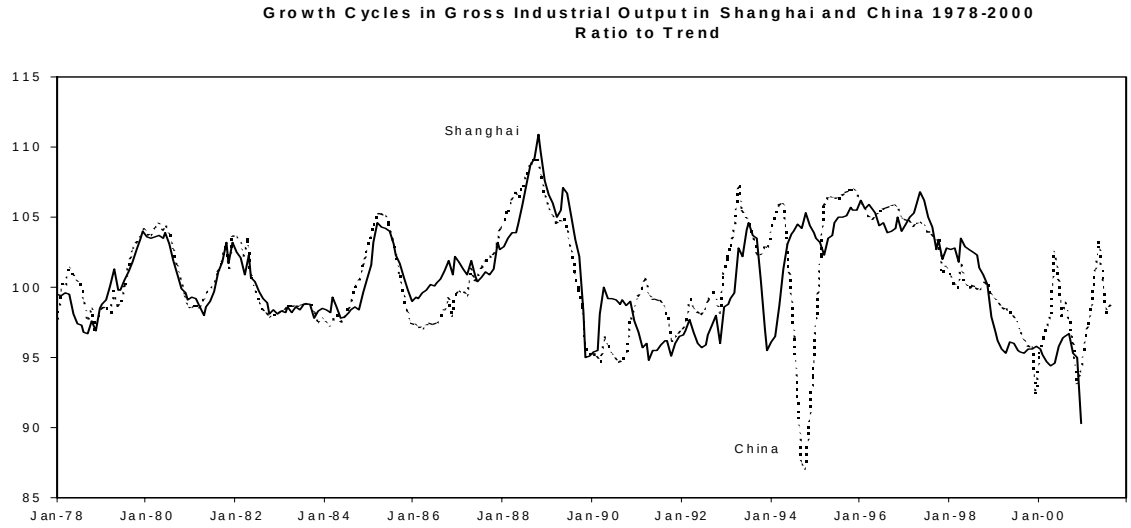
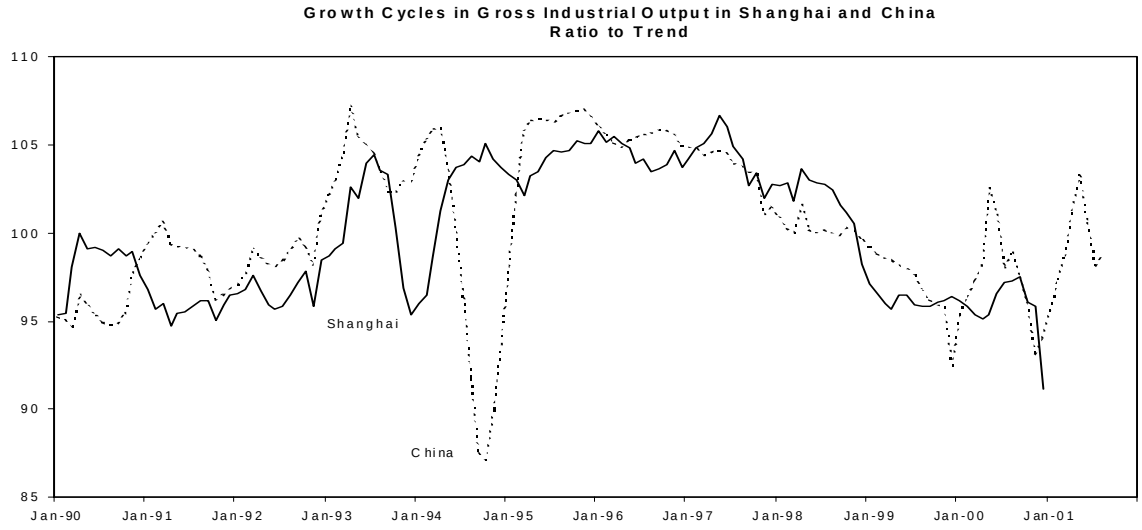


Chart 7



5 Cyclical Indicators

5.1 Selection of Indicators

Once the underlying cyclical behaviour of the reference series has been established the next step is to select indicators whose cyclical movements pre-date, coincide or follow those of the reference series. The selection of indicators requires some judgement and knowledge of data sources and conceptual issues. Issues to be considered for example could include determining whether an indicator should be considered as a leading or lagging indicator for the general economic cycle or if an indicator should conform positively or inversely to the business cycle. Both theoretical and practical issues must be taken into account in the selection of potential cyclical indicators and in the case of leading indicators the following criteria is in general used in the selection process:

Relevance:
- economic significance -- there has to be an economic reason for the observed leading relationship before the series can be accepted as an indicator;
- breadth of coverage -- series with a wide coverage, in terms of the representation of the economic activity concerned, are preferred to narrowly-defined series;

Cyclical behaviour:
- length and consistency of the lead of the indicator over the reference cycle at turning points;
- "cyclical conformity" between the indicator and the reference series -- if the cyclical profiles are highly correlated the indicator will provide a guide, not only to approaching turning points, but also to developments over the whole cycle;

Practical considerations:
- frequency of publication -- monthly series are preferred to quarterly ones;
- absence of excessive revisions;
- timeliness of publication and easy accessibility for data collection and updating;
- availability of a long time series of the data with no breaks.
- timeliness of publication and easy accessibility for data collection and updating;
- availability of a long time series of data with no breaks.

In following above criteria for selection of potential leading component series, several problems may arise in the selection of regional leading components. The limited number of candidate series may be one problem and the limited number of time periods for which the candidate series are available may be another. In order to identify the cyclical behaviour of the reference series and of the potential leading indicator series, data must be available on a monthly or quarterly basis for a period of at least 9 years. This is necessary in order to carry out seasonal adjustments and to detect cyclical movements.

It is very important to have a broad range of indicators reflecting the cyclical development from different parts of the economy when analysing fluctuations in aggregate economic activity. In the selection of potential cyclical indicators for the Shanghai region the indicator series included in the national leading indicator for China were used as the reference frame in addition to the leading indicators used in the OECD system. The potential and finally selected leading indicators for the Shanghai region are set out in Table 5 by subject areas together with the leading indicators used for China and OECD countries.

The table covers indicators from 8 subject areas and shows that most OECD countries use indicators from several subject areas to compile composite leading indicators. In the case of China, leading indicators are selected from four subject areas, while leading indicators for the Shanghai region is only selected from one

subject area. The potential indicators investigated for the Shanghai region cover also a limited number of subject areas and to have a more reliable composite leading indicator it would be necessary to investigate alternative indicators from other subject areas as well. One subject area of special interest in the case of the Shanghai region would be the area production, stocks and orders. The industrial sector is going trough a fast restructuring and output indicators from the new pillar industries should be included in the list of potential leading indicators. These industries include branches like steel, motor vehicles, telecommunication equipment, household electrical appliances, power plant equipment and petrochemical and fine chemical manufacturing.

Table 5 Leading Indicators in OECD Countries, China and Shanghai region

Indicators by subject area	Number of countries/indicators				
	OECD	China		Shanghai	
	Selected	Potential	Selected	Potential	Selected
Production, stocks and orders					
Industrial production branches/commodities	4	6	2		
Orders	4				
Stocks	6				
Construction, sales, trade and transport					
Construction approvals/starts	9	1	1		
Sales, production or registration of vehicles	5	1			
Retail sales	5	1		1	
Transport		3		2	
Labour force					
Layoffs/initial claims	2				
Hours worked	2				
Employment				1	
Prices, costs and profits					
Wages and salaries and W&S per unit of output	3	1		1	
Price indices	5				
Profits, flow of funds etc.	2				
Monetary and financial					
Foreign exchange holdings	2				
Deposits/credits, investment	4	4	1	7	4
Money supply	17	2			
Interest rates	11	1	1	1	1
Share prices	12			1	1
Foreign trade					
Exports/imports	3	2		2	1
Terms of trade	8				
Economic activity in foreign countries					
Foreign series	4				
Business and consumer surveys					
General situation	6	1	1		
Production/sales	12	1			
New orders	8				
Order books	10	2			
Stocks/supply	13	2	1		

5.2 Evaluation of Indicators

To determine the cyclical behaviour of potential indicator series, two separate tests are carried out -- a peak-and-trough analysis and a cross-correlation analysis.

For peak and trough analysis, statistics are assembled on each series' behaviour at cyclical turning points: the mean or median leads, the mean deviation from the median and the number of extra or missing cycles when compared with the reference series. Usually these figures are not statistically significant in the usual sense because of the limited number of turning points

available over the period investigated, and because most series contain irregular movements and double or multiple peaks and troughs. Peak and trough analysis therefore involves a substantial amount of judgement. Cross-correlation analysis is used to complement the peak-and-trough analysis concerning the average lead of the indicator, and to give information about the extent to which the cyclical profiles of indicator and reference series resemble each other.

Certain practical factors need to be considered too, if the indicator system is to be updated regularly and used for current analysis of the economic cycle. These factors refer to matters of data collection, updating and computation, so that the final composite indicator can be calculated quickly and, as far as possible, automatically.

The cyclical characteristics of the selected reference and coincident indicators are set out in Table 3 and the cyclical characteristics of the potential leading indicators in Table 5. These two tables give the median and mean lags at turning points and the cross-correlation results. Annex 1 gives turning point chronologies (dates of turning points) for all types of indicators and leads and lags for all indicators at individual turning points.

6 Composite Leading Indicators

6.1 Alternative Composite Leading Indicators

The cyclical characteristics of ten potential leading indicators for the period 1978-2000 and three alternative composite leading indicators calculated for the period 1987-2000 are set out in Table 5. The cyclical profiles of the alternative composite leading indicators and gross industrial output as reference series are illustrated in Charts 8-10.

The turning point and correlation analysis between the potential leading indicators and gross industrial output show, however, very inconsistent results for some of the potential indicators and these series are not included as component series in the construction of the alternative composite leading indicators. The three series excluded are freight traffic volume, cargo handled at ports and imports. All of these series show very long leads (20 months) but very weak correlation (< 0.26) with the reference series for the period 1987-2000. The turning point analysis indicates on the other hand that imports is lagging and freight traffic volume is coincident while cargo handled at ports is showing both leading and lagging relationships against the reference series depending on the time period analysed.

The *composite leading indicator 1* (CLI1) is based on the following four component series:
(1) Exports value in US$
(2) Share price index
(3) Enterprise deposits in current prices
(4) Foreign direct investment in current prices

The composite leading indicator 1 shows a lead of about 6 months against the reference series over the period 1987 - 2000 according to the median and the mean lag and a lead of 5 months according to the peak-correlation lag. The cyclical profile between the leading indicator and the reference series is good with a correlation coefficient of 0.76. The leading indicator is, however, not smooth enough (MCD=2) to be fully reliable and shows an extreme value in 1989 and an extra cycle in 1991-1992 (Chart 8).

The *composite leading indicator 2* (CLI2) is based on the following six component series:
(1) Exports value in US$
(2) Share price index
(3) Household savings in current prices
(4) Enterprise deposits in current prices
(5) Foreign direct investment in current prices
(6) Number of projects of foreign capital (FDI numbers)

The composite leading indicator 2 shows a lead of 6 and 5 months against the reference series over the period 1987 - 2000 according to the median and the mean lag respectively and a lead of 4 months according to the peak-correlation lag. The cyclical profile between the leading indicator and the reference series is good with a correlation coefficient of 0.79. The leading indicator is, however, not smooth enough (MCD=2) to be fully reliable and shows an extreme value in 1989. The leading indicator is also showing a short lag (4 months) at the last turning point in the reference series in April 2000 (Chart 9).

The *composite leading indicator 3* (CLI3) is based on the following five component series:
(1) Exports value in US$
(2) Base interest rate, inverted
(3) Share price index
(4) Enterprise deposits in current prices
(5) Foreign direct investment in current prices

The composite leading indicator 3 shows a lead of 5 and 4 months against the reference series over the period 1987 - 2000 according to the median and the mean lag respectively and a lead of 6 months according to the peak-correlation lag. The cyclical profile between the leading indicator and the reference series is rather good with a correlation coefficient of 0.71. The leading indicator is, however, not smooth enough (MCD=2) to be fully reliable and shows an extra cycle in 1991-1992. The leading indicator is also showing a rather long lag (8 months) at the last turning point in the reference series in April 2000 (Chart 10).

The above results indicate that the composite leading indicator CLI1 score best on median and mean leads while CLI2 show the best general fit with the reference series. Both composite indicators register an extreme value in 1989, but CLI1 shows in addition an extra cycle in 1991-1992. The choice between these two composite indicators is not easy, but the fact that CLI2 is based on a broader set of components make this indicator a better choice.

Chart 8

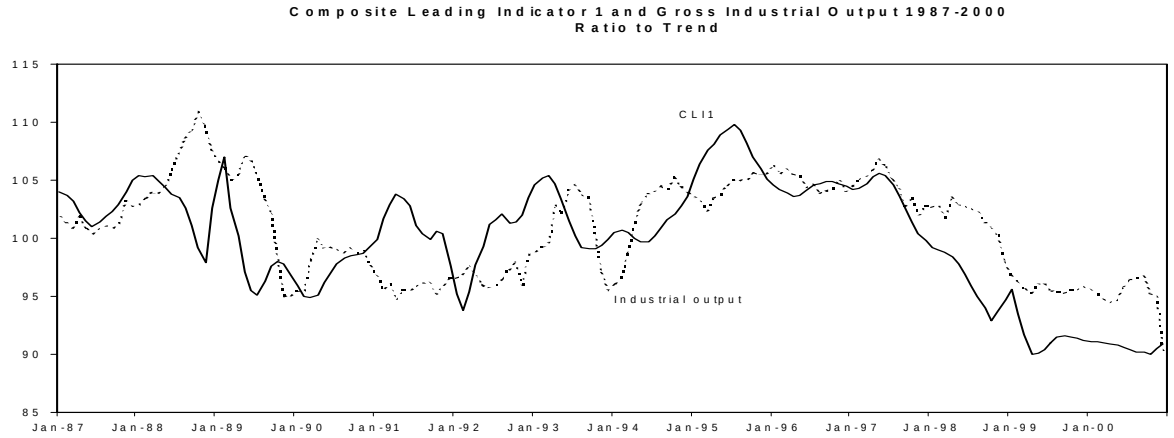


Chart 9

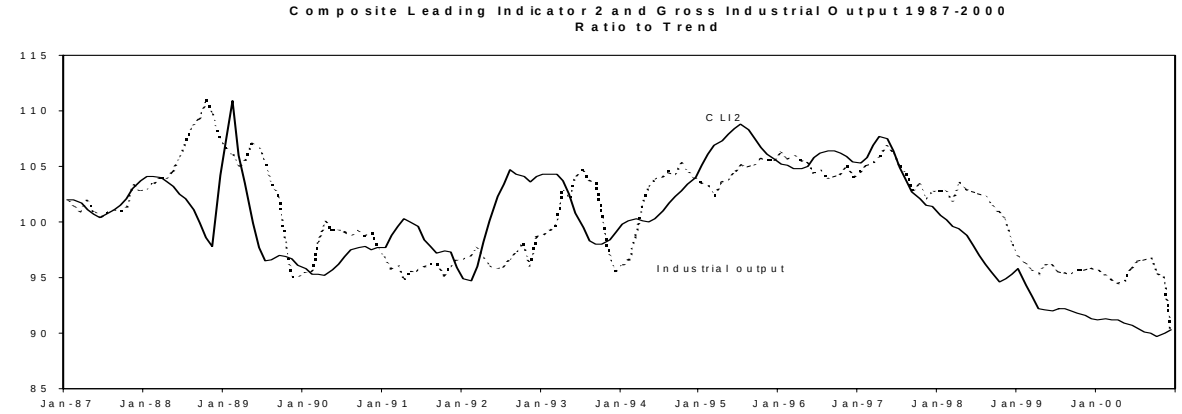


Chart 10

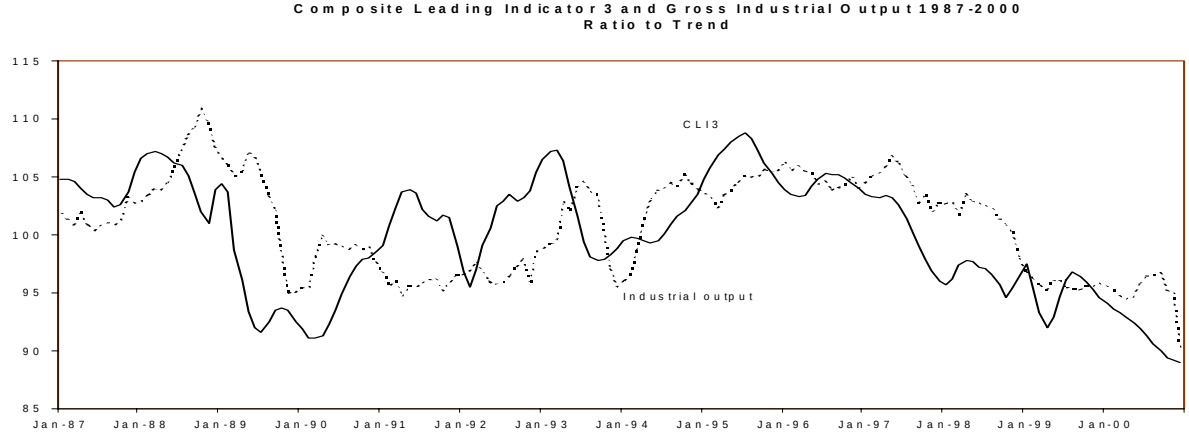


Table 5 Characteristics of potential leading indicators, 1978 - 2000

		Start date	MCD (1)	Median lag (2)		Mean lag (2)		Mean deviation (3)		Cross correlation			
				Total period	1987-2000	Total period	1987-2000	Total period	1987 - 2000	Total period lag (2)	coef	1987-2000 lag (2)	coef
	Composite Indicators												
	Leading Indicator 1 (CLI1) (indicators 3, 6, 8, 9)	1987	2		-6.5		-5.7		4.1			-5	0.76
	Leading Indicator 2 (CLI2) (indicators 3, 6, 7, 8, 9, 10,)	1987	2		-6.5		-5.0		5.4			-4	0.79
	Leading Indicator 3 (CLI3) (indicators 3, 5, 6, 8, 9)	1987	2		-5.5		-4.5		6.2			-6	0.71
	Indicators												
1	Freight traffic volume	1978	6	1	-2	4.6	-2.7	10.3	4.0	-20	0.12	-20	0.20
2	Cargo volume handled at ports	1985	6	5	0	3.5	-5	17.9	15.2	-20	0.28	-20	0.26
3	Exports value in US$	1978	6	-8.5	-12.5	-11.4	-14.8	10.2	7.9	-8	0.24	-9	0.28
4	Imports value in US$	1983	6	1	0.5	2.1	2	12.0	14.2	2	0.21	-20	0.16
5	Base interest rate, inverted	1987	3	-5		-9.8		11.0		-20	-0.41		
6	Share price index	1991	3	0.5		0.5		11.5		-3	0.38		
7	Household savings in Yuan	1978	2	-8	-9	-7.7	-13.2	18.6	19.1	0	0.61	0	0.63
8	Enterprise deposits	1986	2	-5.5		-6.8		6.3		-4	0.68		
9	Foreign direct investment	1989	6	-3		-3.3		2.5		-4	0.62		
10	FDI numbers	1989	5	-27		-19.3		13.3		-4	0.30		

(1) Months for Cyclical Dominance
(2) A negative sign indicates a lead (months) of the indicator against gross industrial output at cyclical turning points
(3) Standard deviation

6.2 Monitoring Growth Rates in Composite Leading Indicators

In order to make the de-trended raw composite indicators more readily comparable with the reference series and to allow for calculation of growth rates two adjustments are made to the raw composite indicator. The first adjustment is carried out to give the composite indicator the same form of the cyclical component as the reference series. Amplitude adjustment is carried out by adjusting the first the mean to unity and then adjusting the cyclical amplitude of the composite index to agree with that of the de-trended reference series by means of a scaling factor. The second adjustment is made to give the composite indicator the same trend as the reference series. Trend restoration is done by multiplying the amplitude adjusted composite index by the trend of the reference series in its original units.

The trend restored composite indicator can now be transformed to different types of growth rates in order to detect turning points in advance and to monitor or forecast growth rates at all stages of the cycle. For estimating changes in the trend on a current basis period-to-period growth rates i.e. month-to-month or quarter-to-quarter percentage changes would be the ones that give the most up-to-date information. However, these growth rates give only reliable information for series with no or little irregular variation (MCD=1).

The irregular variation present in most economic indicators has led to an extensive use of annual or annualised growth rates for analysing short-term trends. The most frequently used growth rate related to annual trends is the 12-month (4-quarter) rate of change.

The *12-month (4-quarter) rate of change* is calculated as the percentage variation over 12 months for monthly series, over 4 quarters for quarterly series and over one year for annual series. This type of growth rate has the same problems as the indirect technique of seasonal adjustment. This growth rate gives no information on current developments because it is measuring changes over the same period of the previous year.

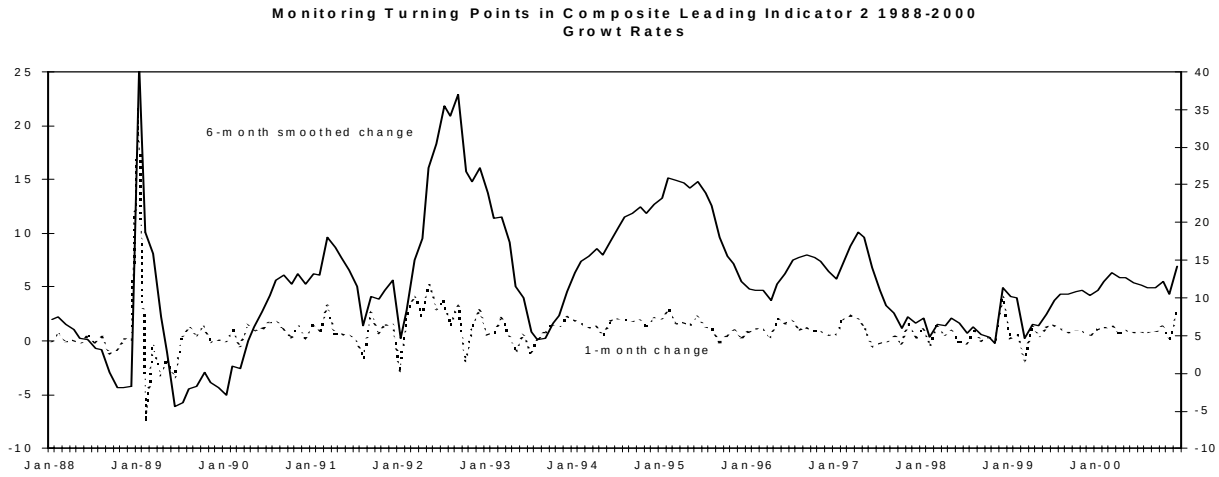
The *smoothed 6-month rate of change at annual rate* is a better measure in that it both smoothes and compares with a more recent period, which makes it well adapted for identification of correctly dated turning points in the cycle. This rate is calculated by dividing the figure for a given month m by the 12-month moving average centred on m-6.5. This smoother growth rate is annualised. This method is a way of smoothing out some volatility inherent in percentage changes while attempting to preserve the cycle.

Two commonly used growth rates used in cyclical analysis are the one-month percentage change and the six-month smoothed percentage change at annual rate. These measures give advanced warning of approaching cyclical turning points about six months ahead in the case of regular well-behaved symmetrical cycles but may not do so when the original series has skewed cycles and sub-cycles.

The above two measures calculated on the composite leading indicator 2 (CLI2) are provided in Chart 11 for the period 1988-2000. The irregular development of the one-month percentage change measure is well illustrated and the absence of clearly distinguished cycles makes this measure less attractive for monitoring growth cycles. The six-month smoothed percentage change at annual rate shows, on the other hand, well behaved cycles and clearly identified turning points.

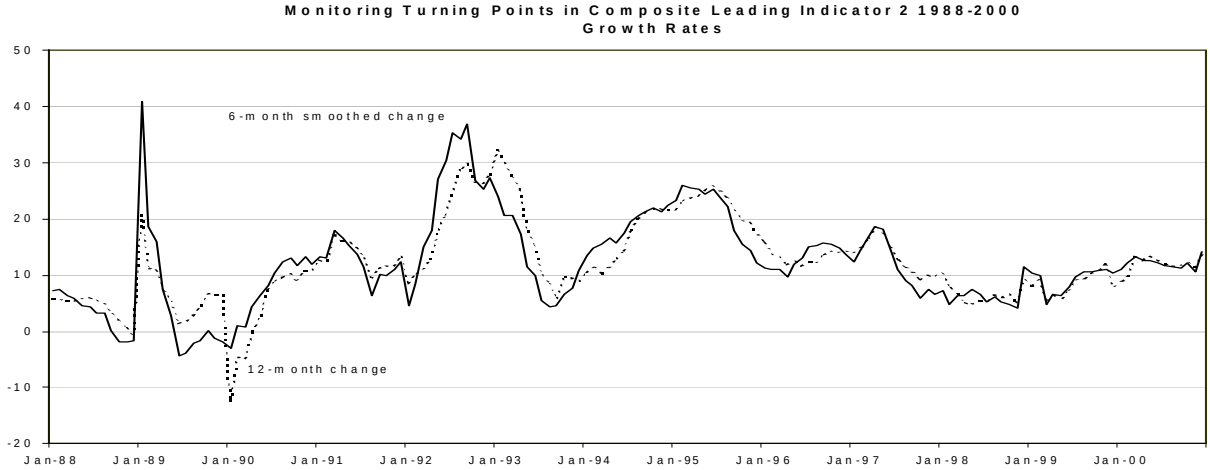
However, a frequent problem with these measures is the number of extra turning points. Given this problem, all derived measures must be used with care. They all however give some information about approaching or current turning points and in combination they can be used to monitor cyclical developments.

Chart 11



The 12-month rate of change and the 6-month rate of change at annual rate calculated on the composite leading indicator 2 are provided in Chart 12. The performance of the two measures at turning points clearly shows the leading characteristics of the 6-moth rate of change in the case at well behaved cycles such as the one over the period 1991-1993.

Chart 12



In order to verify the quality of the trend restored composite leading indicator 2, the 12- month rate of change of the indicator and the reference series are plotted in Chart 13. The composite indicator is much smoother than the industrial output series and shows well-behaved cycles with clear identification of turning points. The two series move closely together and are well correlated which indicates that growth rates in the composite indicator can be used to monitor growth rates in industrial output.

Annual growth rates of the composite leading indicator 2 and industrial output are plotted in Chart 14 and confirm the ability of the composite indicator to monitor growth rates in the reference series. The fit is, however not so good due to different timing of some minor cycles between the two series.

Chart 13

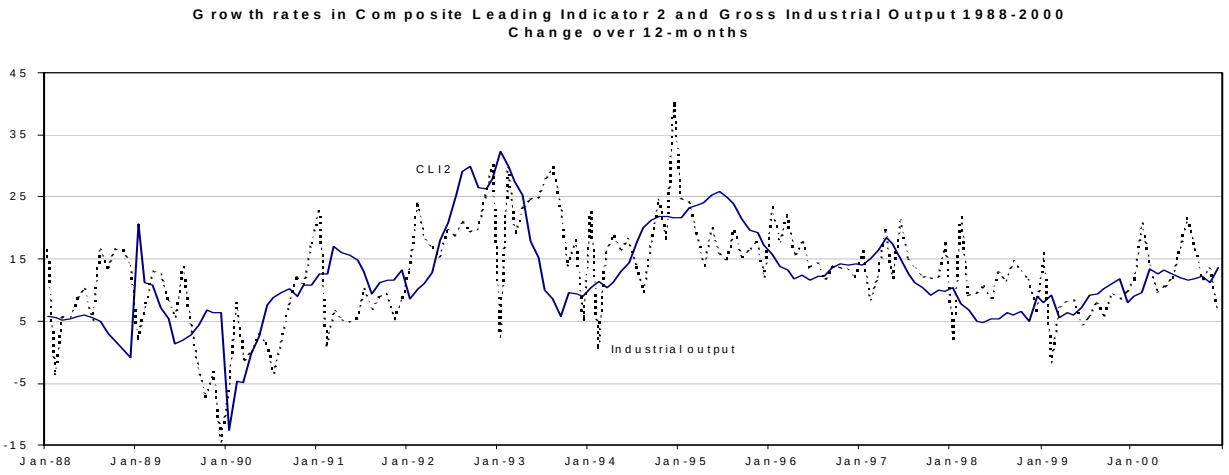
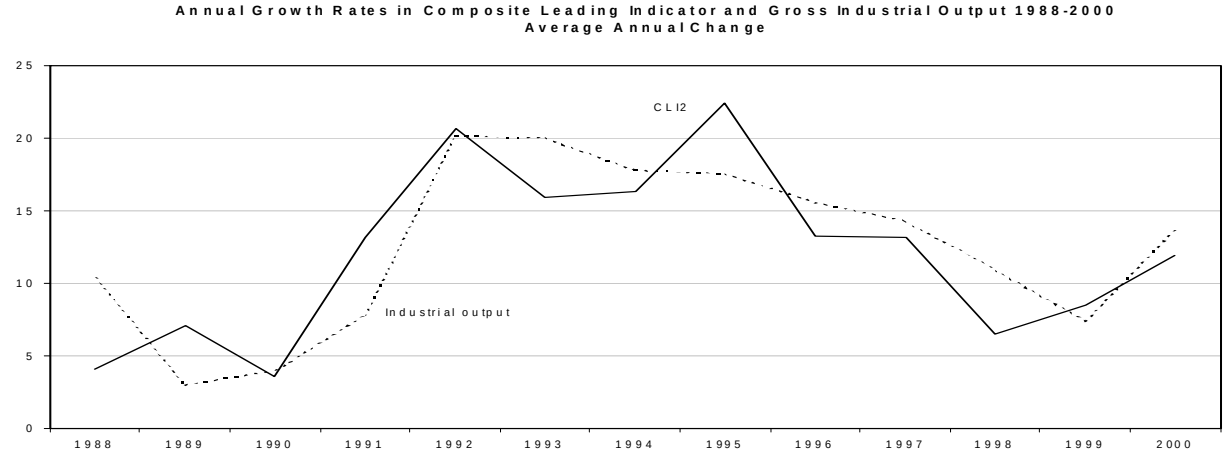


Chart 14



7 Summary and conclusions

This paper has explored the possibility of constructing a composite leading indicator for assessing and forecasting cyclical fluctuations in the Shanghai region. The cyclical development of gross industrial output was investigated and used as the main target reference series for the business cycle. A reference cycle based on monthly GDP estimates available from 1991 were investigated and compared with the cycle in gross industrial output. The Two alternative reference series, one based on a set of coincident indicators and the other based on a selected set of reference indicators, were constructed and used to validate the reference chronology of the industrial production cycle. A wide range of potential cyclical indicators were analysed for behaviour at cyclical turning points and a set of potential leading indicators were identified and aggregated into different sets of composite indicators. These had better forecasting and tracking qualities than any of its individual components.

The cyclical development in the Shanghai region was not found to be well synchronised across the investigated coincident indicators over the period 1978-2000 and the selected reference indicators over the period 1983-2000. The turning point and correlation analysis showed different results, which may be explained by measurement problems. However, the composite reference and coincident indicators showed rather good cyclical correspondence with industrial output despite these differences and support the selection of industrial output as a proxy for the aggregate economic cycle. The two analysis showed also conflicting results for monthly GDP estimates in relation to industrial output. However, a close relationship was found between cycles in GDP and industrial output when the monthly data were aggregated to annual levels.

The linkage between the cyclical development in China at the national level and the Shanghai region was studied by investigating timing relationships between growth cycles in gross industrial output at national and regional levels. Two periods were investigated, the full transition period 1978-2000 and the recent transition period 1990-2000. The results for the period 1978-2000 indicated coincident timing between growth cycles at the national and regional level. However, over the recent period 1990-2000, the results showed that the cyclical development in the Shanghai region was leading the cyclical development at the national level. This is very interesting and means that if a good composite leading indicator can be constructed for the Shanghai region it could also be used at the national level and included in a composite leading indicator for China.

Three alternative composite leading indicators for the Shanghai region were constructed from a selection of ten potential leading indicator series. A first composite leading indicator (CLI1) combined the following four series: total export value in US$, share price index, enterprise deposits and foreign direct investment. CLI1 registers a median lead of 6 months and a correlation with industrial output of 0.76. The indicator shows, however, an extra cycle in 1991-92.

A second composite leading indicator (CLI2) was constructed from the four components in CLI1 plus the following series two series: household savings and number of projects of foreign capital. CLI2 registers also a median lead of 6 months and a correlation with industrial output of 0.79. The indicator shows, however, a short lag at the last turning point in April 2000. This composite indicator was considered to be the better one of the two indicators because it is based on a broader set of components.

In order to make the de-trended raw composite indicators more readily comparable with the reference series and to allow for calculation of growth rates, the trend of the reference series is added to the raw composite indicator giving a trend restored composite indicator.

Two commonly used growth rates used in cyclical analysis are the one-month percentage change and the six-month smoothed percentage change at annual rate. These measures give advanced warning of approaching cyclical turning points about six months ahead in the case of regular well-behaved symmetrical cycles but may not do so when the original series has skewed cycles and sub-cycles.

The above two measures were calculated on CLI2 and showed that the irregular development of the one-month percentage change measure and the absence of clearly distinguished cycles makes this measure less attractive for monitoring growth cycles. The 6-month smoothed percentage change at annual rate shows, on the other hand, well behaved cycles and clearly identified turning points. The leading characteristics of the 6-moth rate of change against the 12-month rate of change calculated on CLI2 was also shown in the case of well behaved cycles such as the one over the period 1991-1993.

In order to verify the quality of the trend restored CLI2, the 12- month rate of change of the indicator and the reference series were investigated. CLI2 turned out to be much smoother than the industrial output series and showed well-behaved cycles with clear identification of turning points. The two series moved closely together and were well correlated which indicated that growth rates in the composite indicator can be used to monitor growth rates in industrial output.

Annual growth rates of CLI2 and industrial output were calculated and confirmed the ability of the composite indicator to monitor growth rates in the reference series. The fit was, however not so good due to different timing of some minor cycles between the two series.

It is very important to have a broad range of indicators reflecting the cyclical development from different parts of the economy when analysing fluctuations in aggregate economic activity. In the selection of potential cyclical indicators for the Shanghai region the indicator series included in the national leading indicator for China were used as reference frame in addition to the leading indicators used in the OECD system.

Most OECD countries use indicators from several subject areas to compile composite leading indicators. In the case of China, leading indicators are selected from a few subject areas, while leading indicators for the Shanghai region is only selected from one main subject area i.e. monetary and financial indicators. The potential indicators investigated for the Shanghai region cover also a limited number of subject areas and to have a more reliable composite leading indicator it would be necessary to investigate alternative indicators from other subject areas as well. One subject area of special interest in the case of the Shanghai region would be the area production, stocks and orders. The industrial sector is going trough a fast restructuring and output indicators from the new pillar industries should be included in the list of potential leading indicators. These industries include branches like steel, motor vehicles, telecommunication equipment, household electrical appliances, power plant equipment and petrochemical and fine chemical manufacturing.

However, problems relating to changing cyclical behaviour, statistical problems and data availability will mean that the selected potential leading indicators used in this study will have to be monitored regularly to see if the cyclical characteristics remain stable in the future.

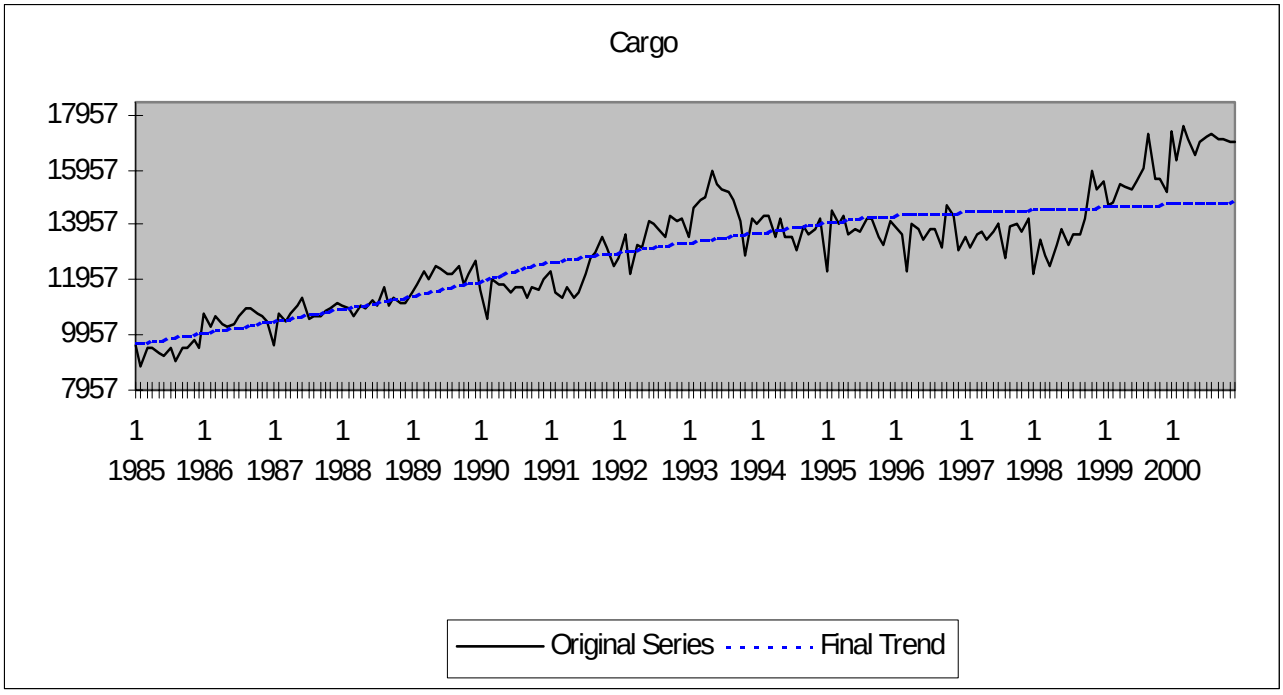
Annex 1 Indicator Chronologies 1978 - 2000

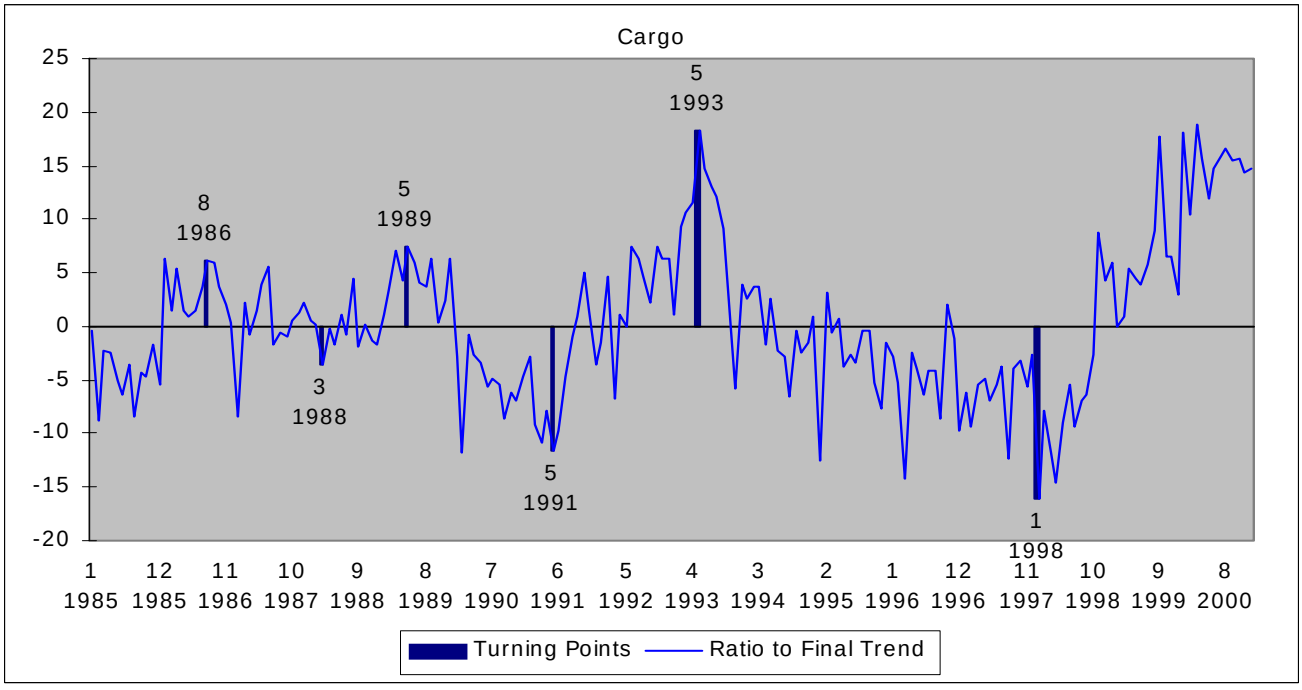
	Turning points: Peak (P) and Trough (T)												
	T	P	T	P	T	P	T	P	T	P	T	P	T
Reference series													
Gross Industrial Output	7/78	2/80	2/81	2/82	2/83	4/85	2/86	10/88	2/91	8/93	12/93	3/96	4/00
GDP									11/92	9/94	12/95	11/96	5/00
Reference composite indicator					11/83	4/85	4/86	10/88	2/90			9/95	3/00
Coincident composite indicator	6/78	6/80	4/81	1/82	2/84	4/85	10/85	10/88	10/91			8/95	12/00
Leading composite indicator 1								2/88	3/90	3/93	11/93	7/95	3/00
Leading composite indicator 2								2/88	3/90	3/93	10/93	7/95	8/00
Leading composite indicator 3								4/88	3/90	3/93	8/93	7/95	11/00
Indicators													
Retail sales value in Yuan					2/84	2/85	8/87	2/89	4/92	4/93	1/94	10/96	4/00
Freight traffic volume	6/78	6/80			12/84	7/86			3/91	6/93			9/99
Cargo volume handled at ports						8/86	3/88	5/89	5/91	5/93			1/98
Exports value in US$		7/80			7/82	12/83	7/85	2/88	5/89	5/91	4/93	6/95	12/98
Imports value in US$						5/85	6/86	10/88	9/92	4/93	4/95	4/96	10/98
Base interest rate, inverted								5/88	8/89	3/93	7/93	5/96	2/98
Share price index										2/93	7/94	4/97	4/99
Total loans in current prices	10/79	1/81			9/84			3/88	8/89	10/90	9/93	2/98	
Household savings in Yuan		1/80			3/84			1/88	2/89	6/90	4/93	4/97	
Enterprise deposits								8/88	10/89	5/93	12/93	7/95	3/97
Foreign direct investment										2/93	11/93	12/95	
FDI numbers									11/89	4/93			1/98
Total wages in current prices					12/83			11/88	2/92	12/84			
Employment										1/93	2/94	12/96	7/99
Investment in fixed assets							10/87	8/88	1/92			4/96	
Investment in construction		2/79	9/79	2/82			4/85	6/89	11/91	8/95			

Annex 1 Leads (-) and Lags of Indicators at Turning Points 1978 - 2000

	Turning points: Peak (P) and Trough (T) *Leads (-) and Lags in Months*												
	T	P	T	P	T	P	T	P	T	P	T	P	T
Reference series													
Gross Industrial Output													
GDP									16	4	24	8	1
Reference composite indicator					9	0	2	0	-12			-6	-1
Coincident composite indicator	-1	4	2	-1	12	0	-4	0	8			-7	8
Leading composite indicator 1								-8	-11	-5	-1	-8	-1
Leading composite indicator 2								-8	-11	-5	-2	-8	4
Leading composite indicator 3								-6	-11	-5	-4	-8	7
Indicators													
Retail sales value in Yuan					12	-2	18	4	14	-4	1	7	0
Freight traffic volume	-1	4			22	15			1	-2			-7
Cargo volume handled at ports						16	25	7	3	-3			-27
Exports value in US$		5			-7	-16	-7	-8	-21	-27	-8	-9	-16
Imports value in US$						1	4	0	19	-4	16	1	-20
Base interest rate, inverted								-5	-18	-5	-5	2	-28
Share price index										-6	7	13	-12
Total loans in current prices	15	11			19			-7	-18	-22	-3	23	
Household savings in Yuan		-1			13			-9	-24	-38	-8	13	
Enterprise deposits								-2	-16	-3	0	-8	-12
Foreign direct investment										-6	-1	-3	
FDI numbers									-27	-4			-27
Total wages in current prices					10			1	12	16			
Employment										-7	2	9	-9
Investment in fixed assets							20	-2	11			1	
Investment in construction		-12	-17	0			-10	8	9	24			

Annex 2


Cargo
17957
15957
13957
11957
9957
7957
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
Original Series
Final Trend


Cargo
25
20
15
10
5
0
-5
-10
-15
-20
8
1986
5
1989
3
1988
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1991
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1993
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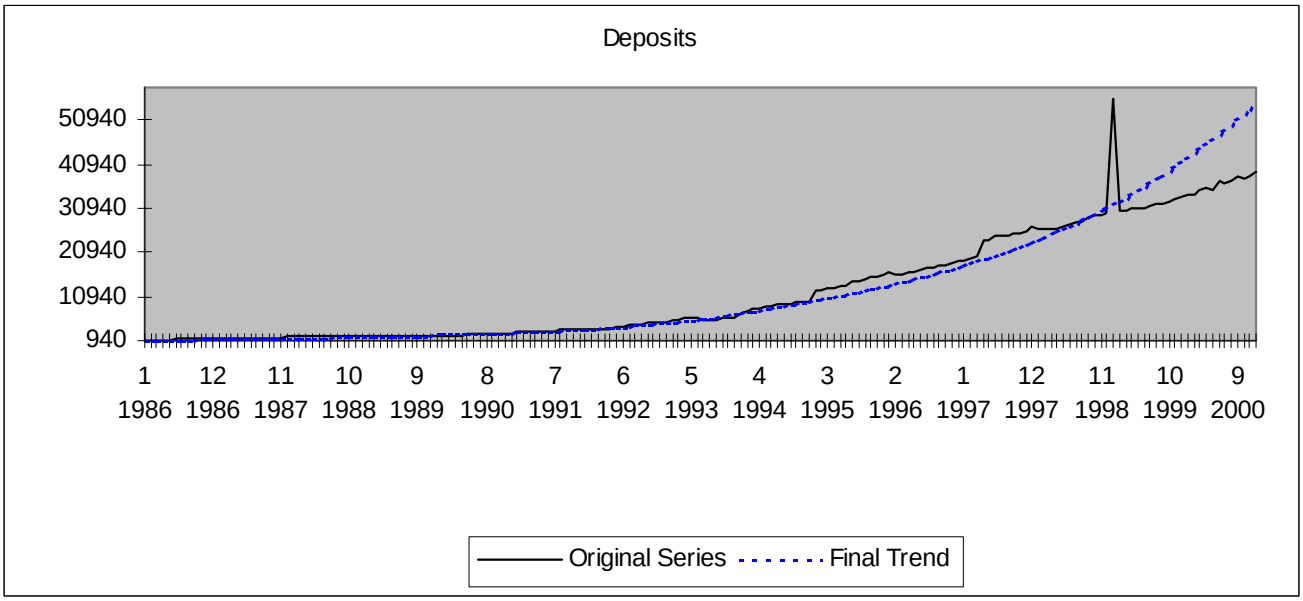
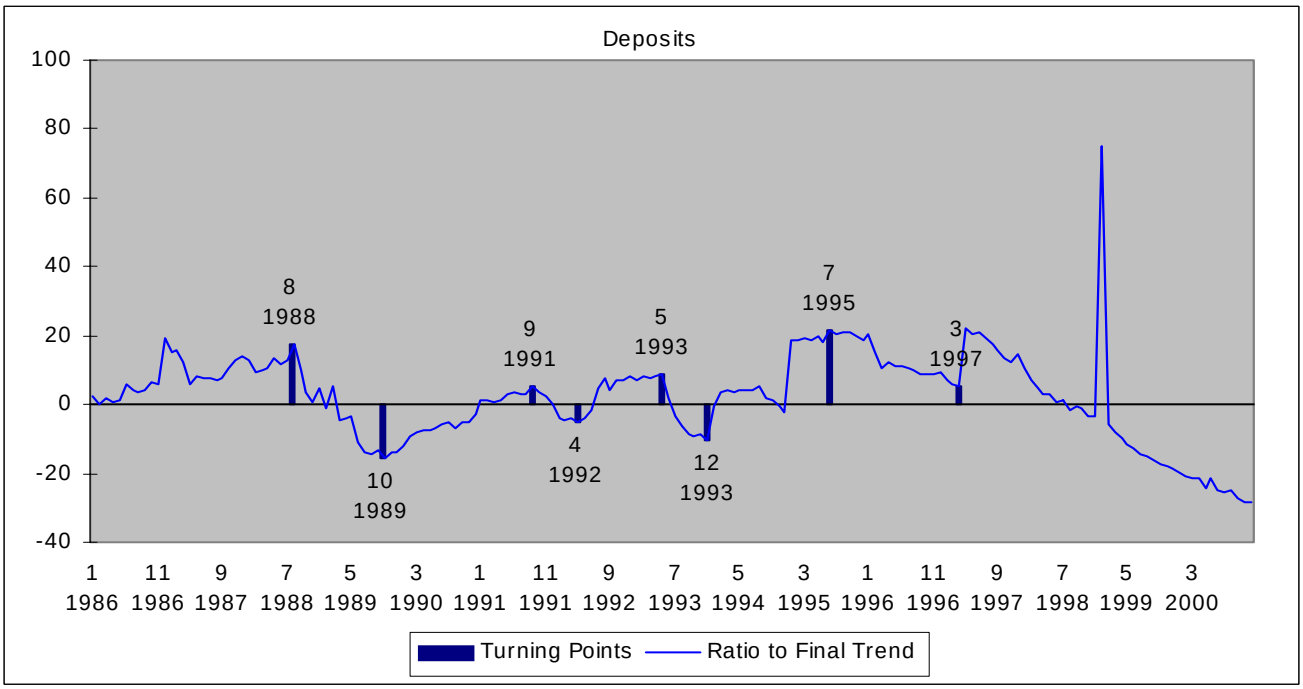
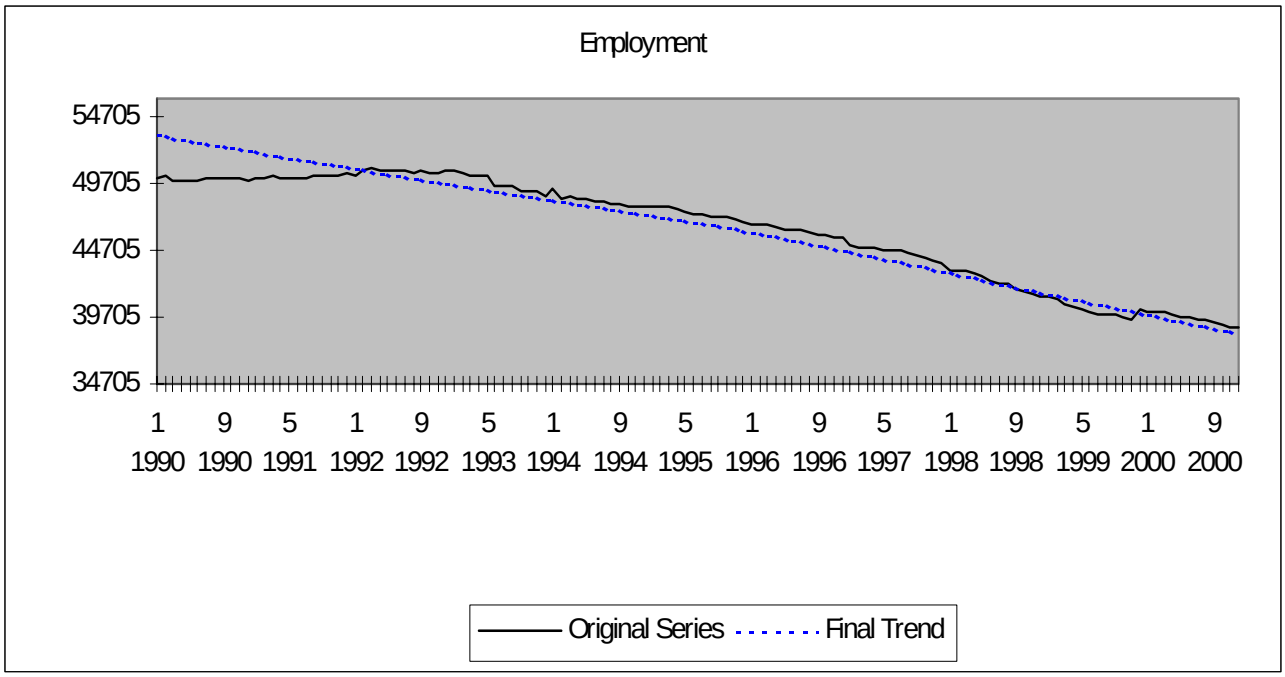
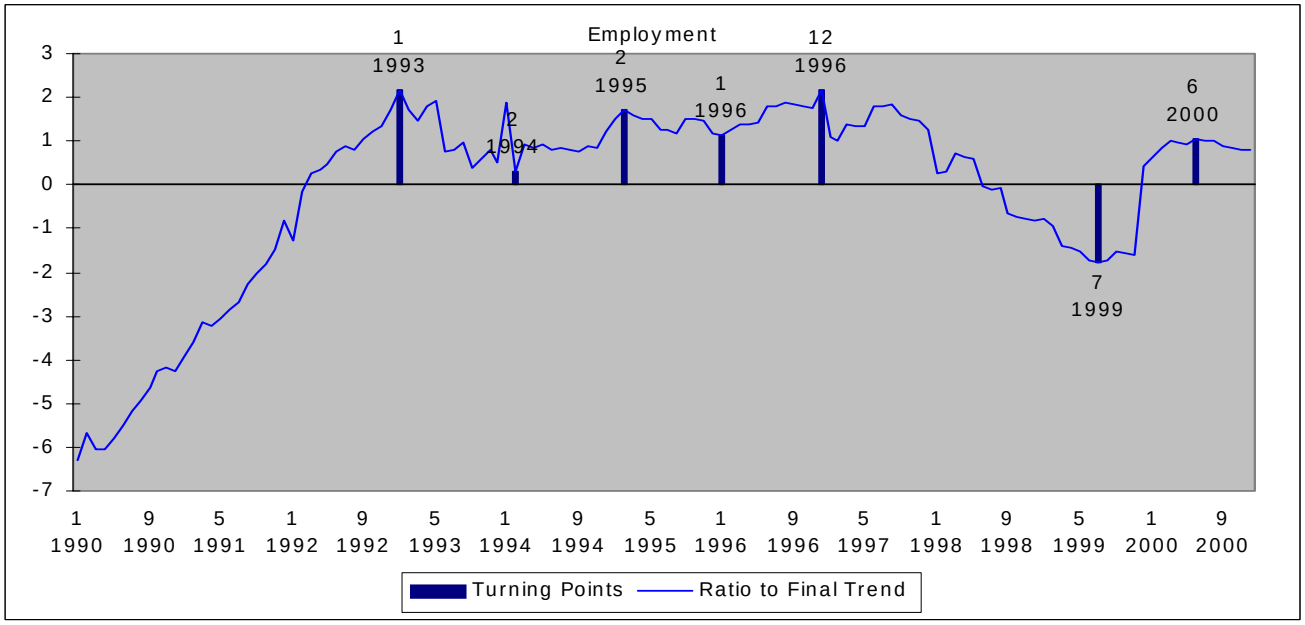
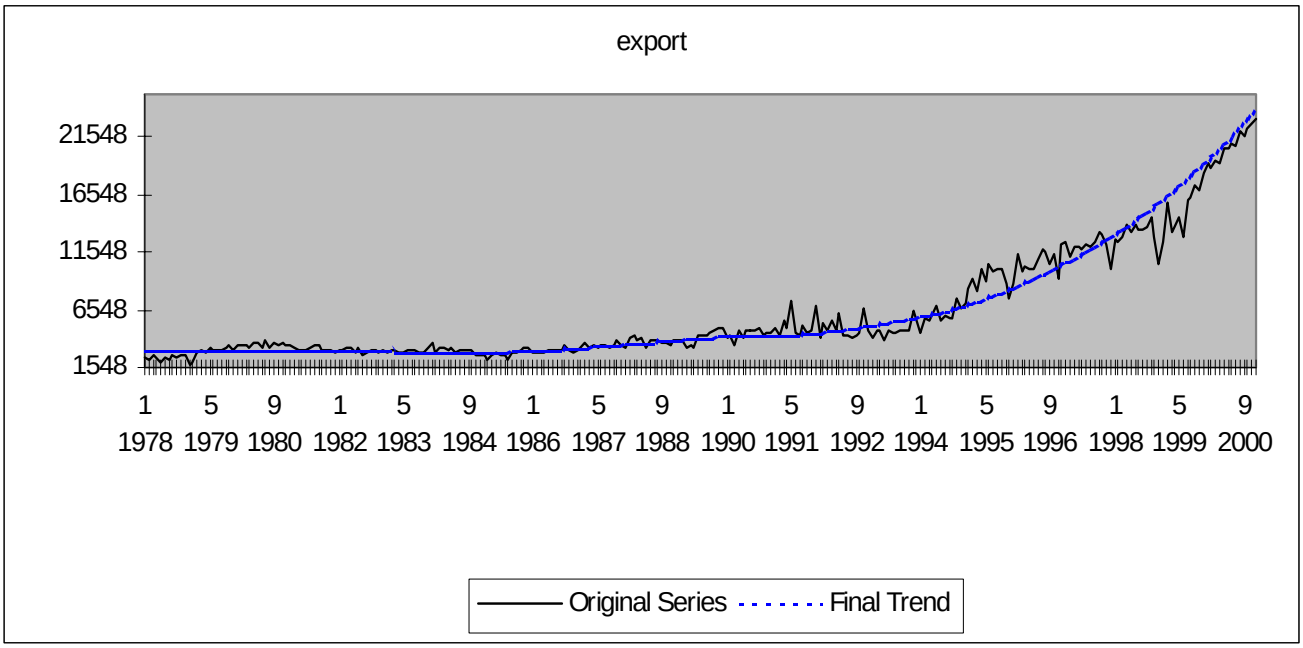
1998
1 12 11 10 9 8 7 6 5 4 3 2 1 12 11 10 9 8
1985 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1996 1997 1998 1999 2000
Turning Points
Ratio to Final Trend

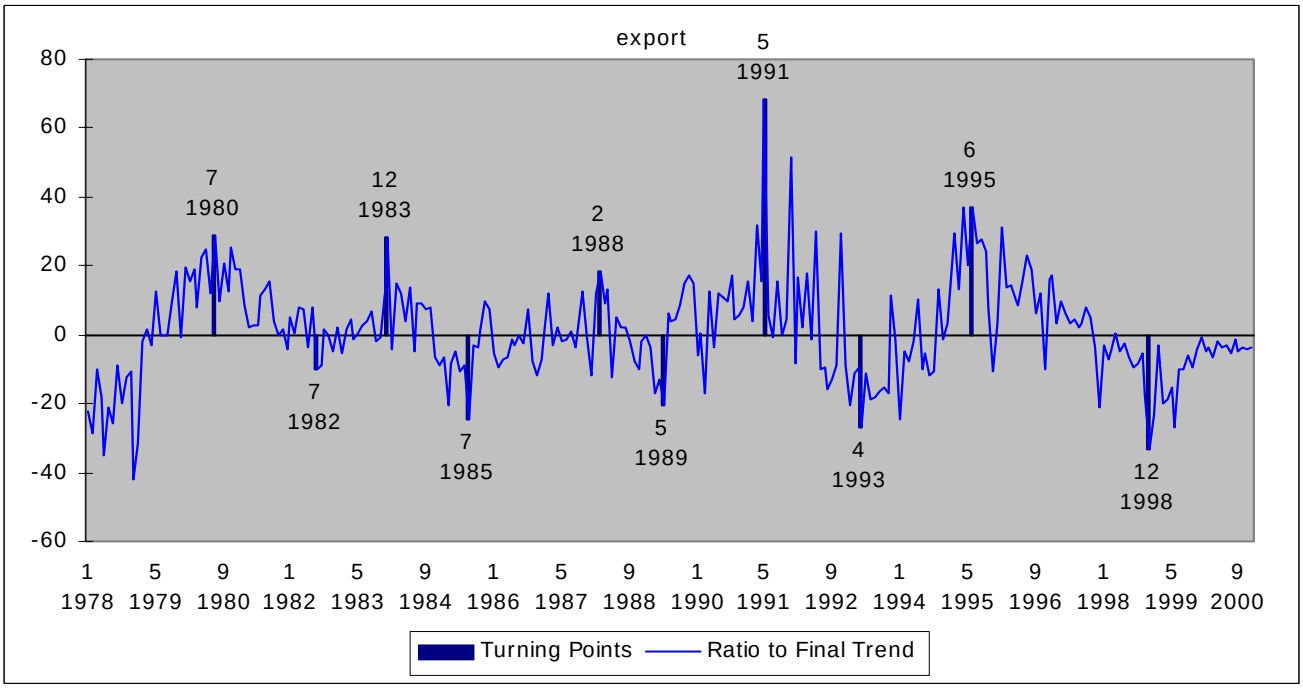

Deposits
50940
40940
30940
20940
10940
940
1 1986
12 1986
11 1987
10 1988
9 1989
8 1990
7 1991
6 1992
5 1993
4 1994
3 1995
2 1996
1 1997
12 1997
11 1998
10 1999
9 2000
Original Series
Final Trend

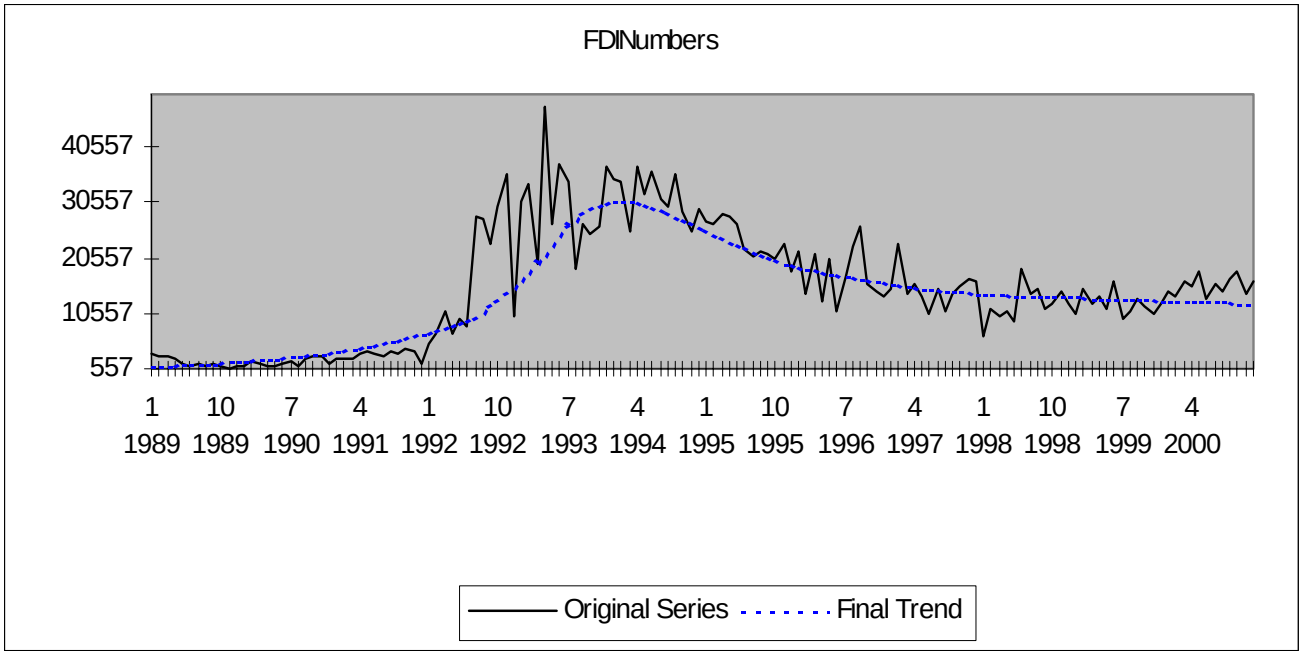

Deposits
100
80
60
40
20
0
-20
-40
8
1988
10
1989
9
1991
4
1992
5
1993
12
1993
7
1995
3
1997
1 1986
11 1986
9 1987
7 1988
5 1989
3 1990
1 1991
11 1991
9 1992
7 1993
5 1994
3 1995
1 1996
11 1996
9 1997
7 1998
5 1999
3 2000
Turning Points
Ratio to Final Trend

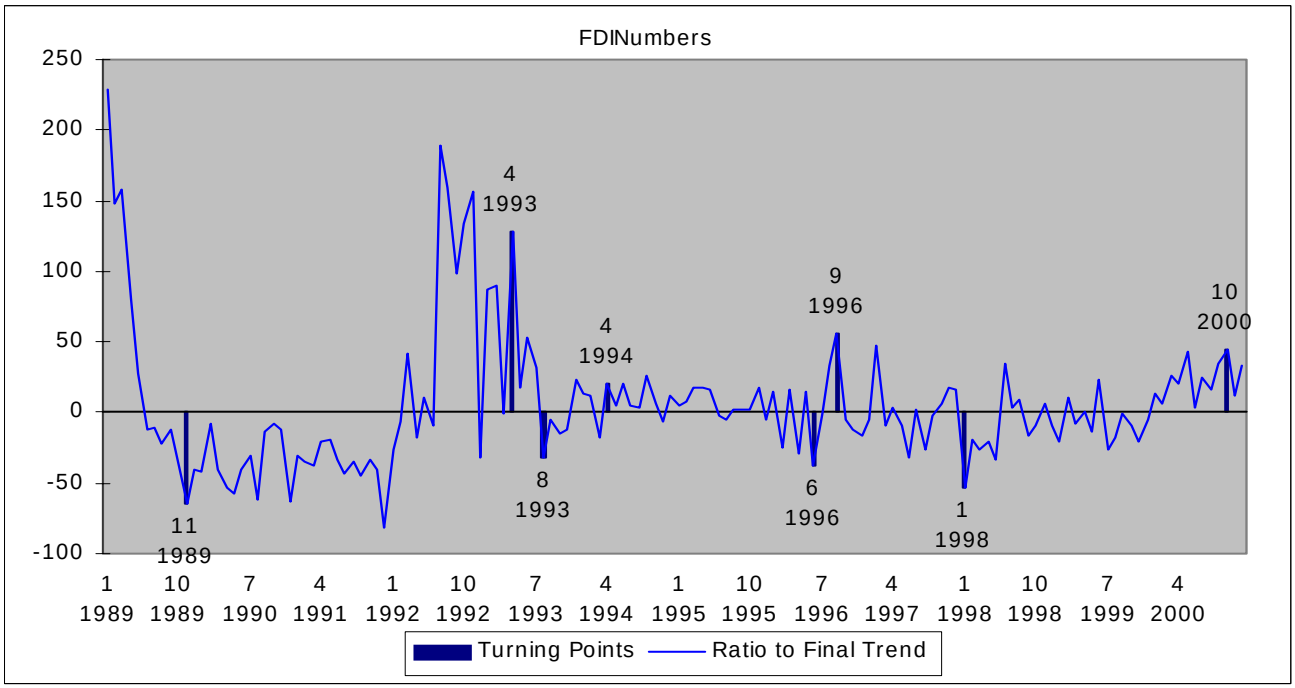

Employment
54705
49705
44705
39705
34705
1 9 5 1 9 5 1 9 5 1 9 5 1 9 5 1 9
1990 1990 1991 1992 1992 1993 1994 1994 1995 1996 1996 1997 1998 1998 1999 2000 2000
Original Series
Final Trend

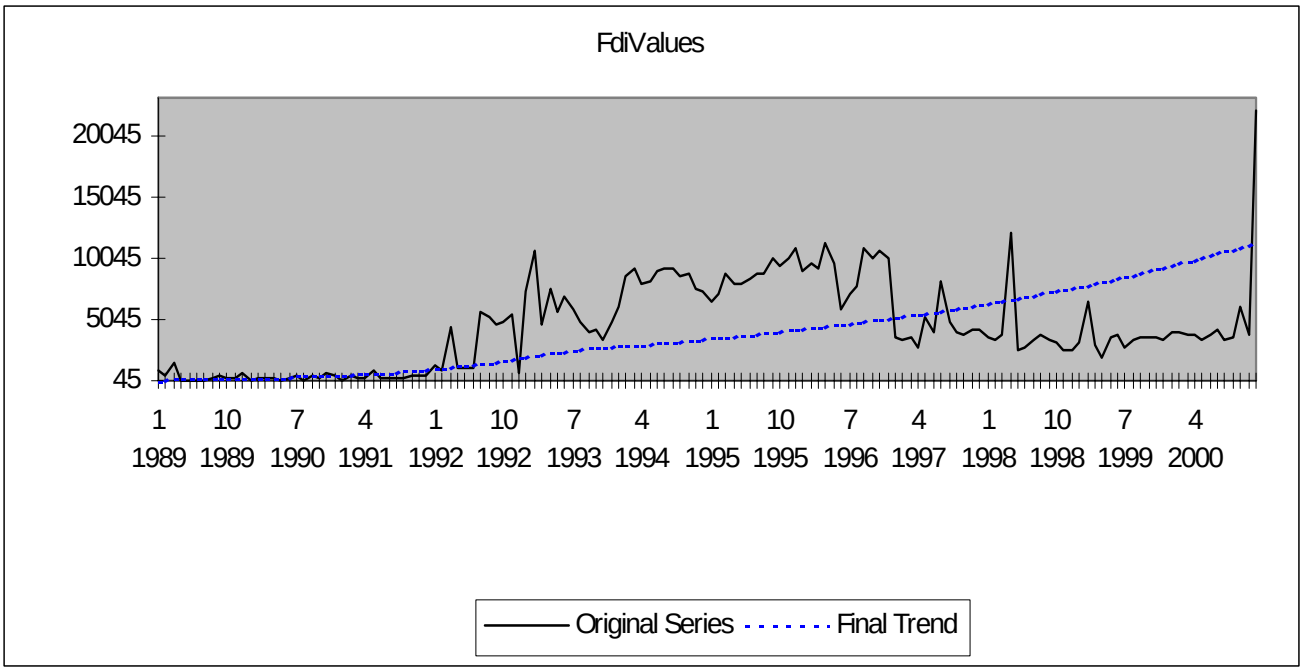

Employment
1
1993
2
1995
1
1996
12
1996
2
1994
6
2000
7
1999
3
2
1
0
-1
-2
-3
-4
-5
-6
-7
1 9 5 1 9 5 1 9 5 1 9 5 1 9 5 1 9
1990 1990 1991 1992 1992 1993 1994 1994 1995 1996 1996 1997 1998 1998 1999 2000 2000
Turning Points
Ratio to Final Trend

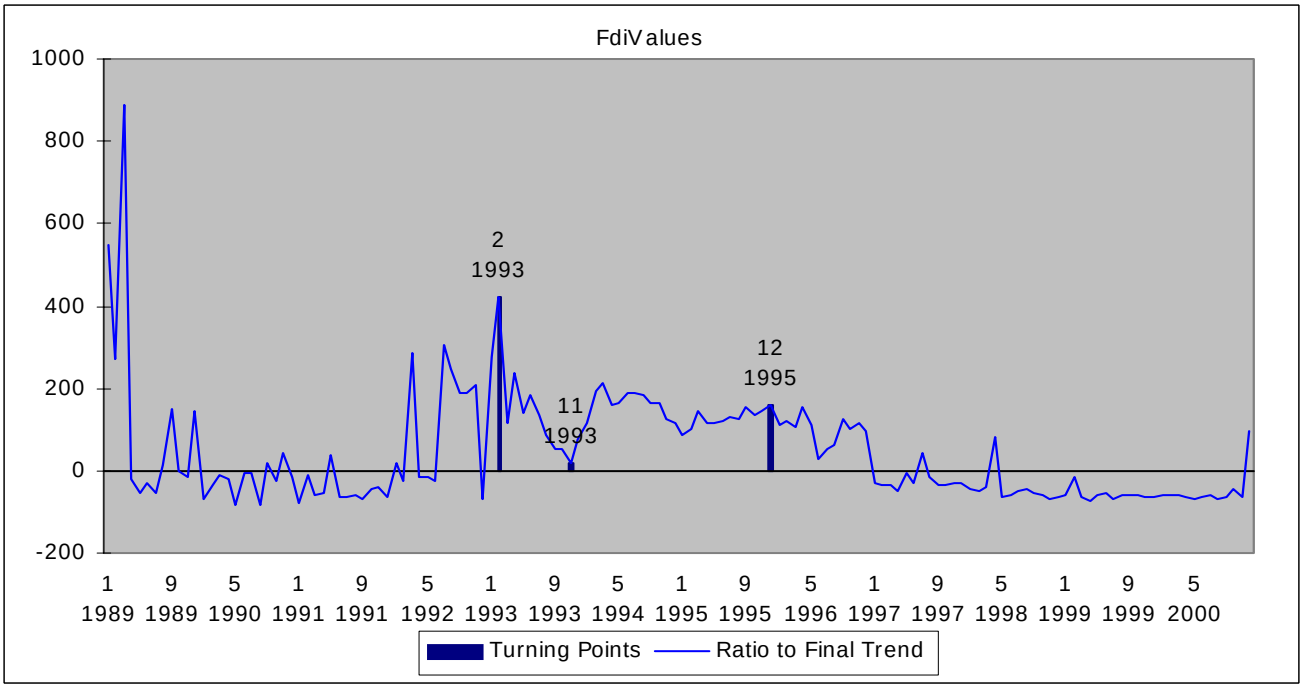

export
21548
16548
11548
6548
1548
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Original Series
Final Trend

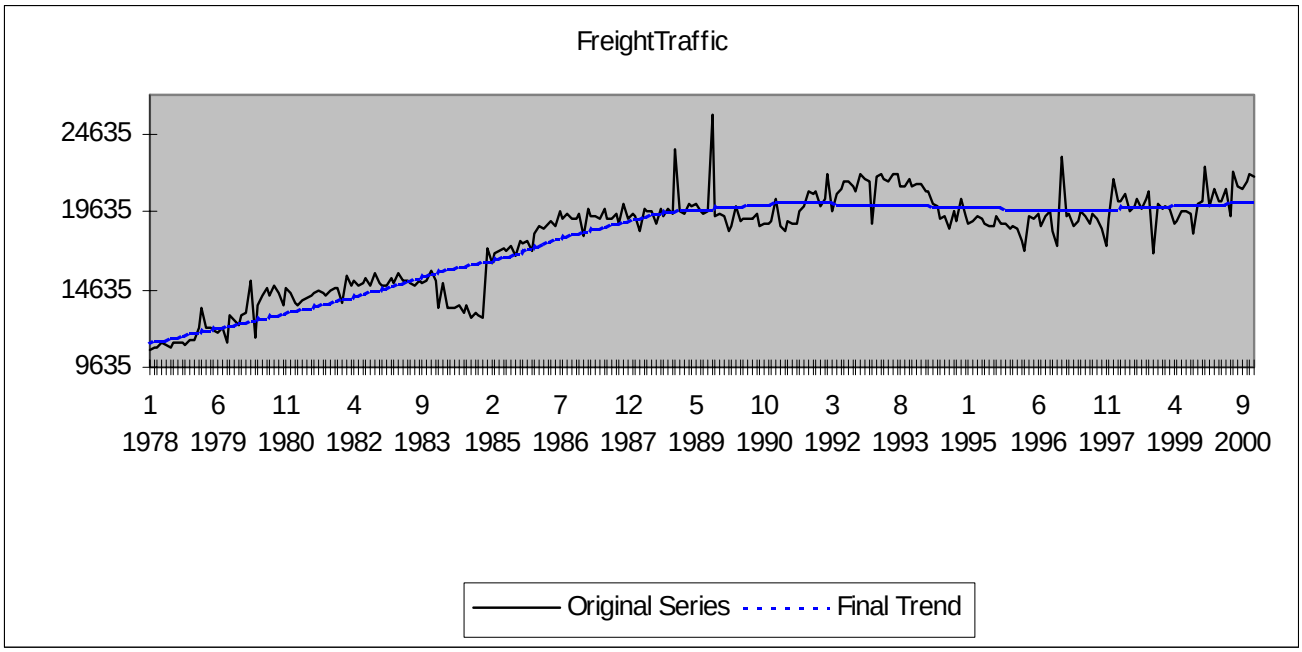

export
80
60
40
20
0
-20
-40
-60
7
1980
12
1983
2
1988
5
1991
6
1995
7
1982
7
1985
5
1989
4
1993
12
1998
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Turning Points
Ratio to Final Trend

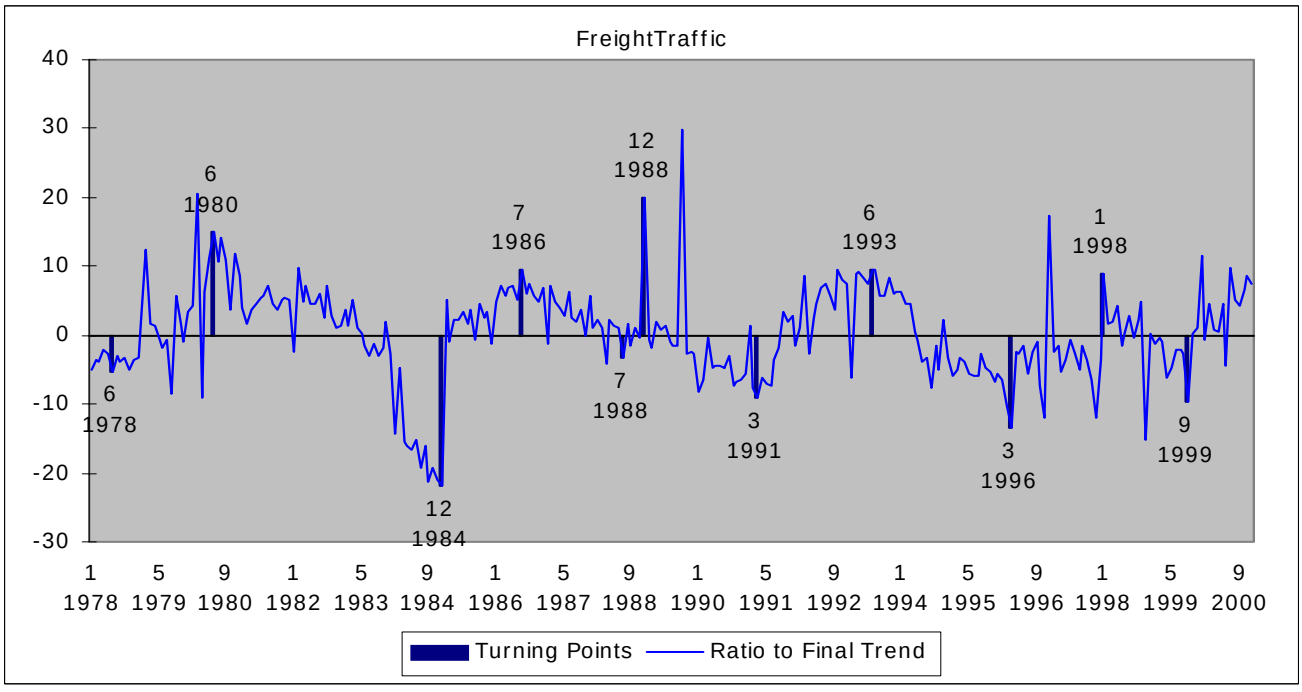

FDINumbers
40557
30557
20557
10557
557
1 1989
10 1989
7 1990
4 1991
1 1992
10 1992
7 1993
4 1994
1 1995
10 1995
7 1996
4 1997
1 1998
10 1998
7 1999
4 2000
Original Series
Final Trend

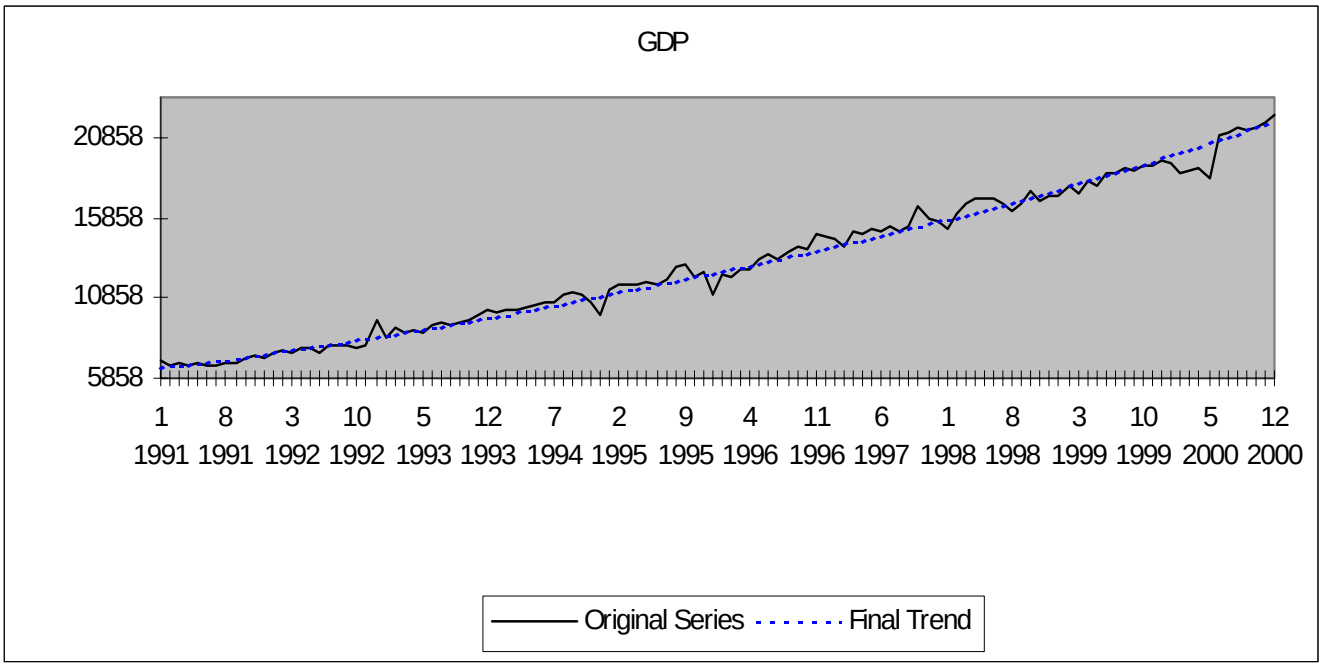

FDINumbers
250
200
150
100
50
0
-50
-100
4 1993
4 1994
9 1996
10 2000
11 1989
8 1993
6 1996
1 1998
1 1989
10 1989
7 1990
4 1991
1 1992
10 1992
7 1993
4 1994
1 1995
10 1995
7 1996
4 1997
1 1998
10 1998
7 1999
4 2000
Turning Points
Ratio to Final Trend

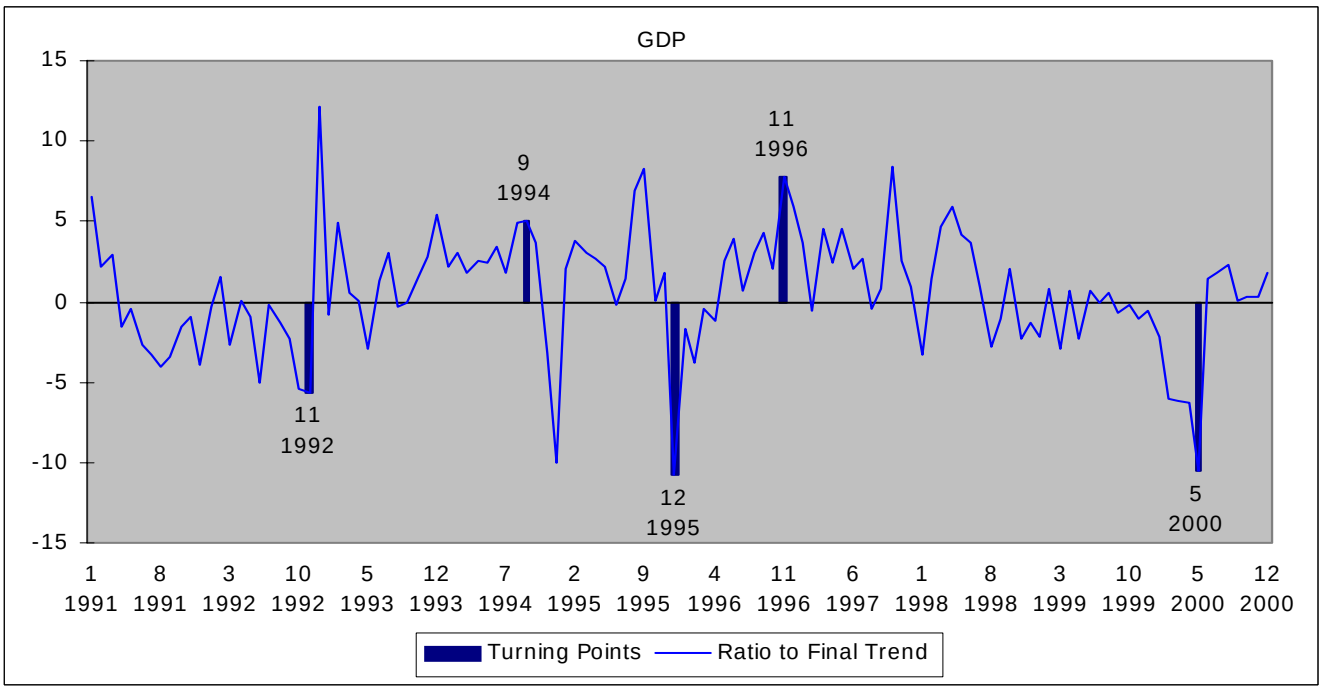

FdiValues
20045
15045
10045
5045
45
1 1989
10 1989
7 1990
4 1991
1 1992
10 1992
7 1993
4 1994
1 1995
10 1995
7 1996
4 1997
1 1998
10 1998
7 1999
4 2000
Original Series
Final Trend

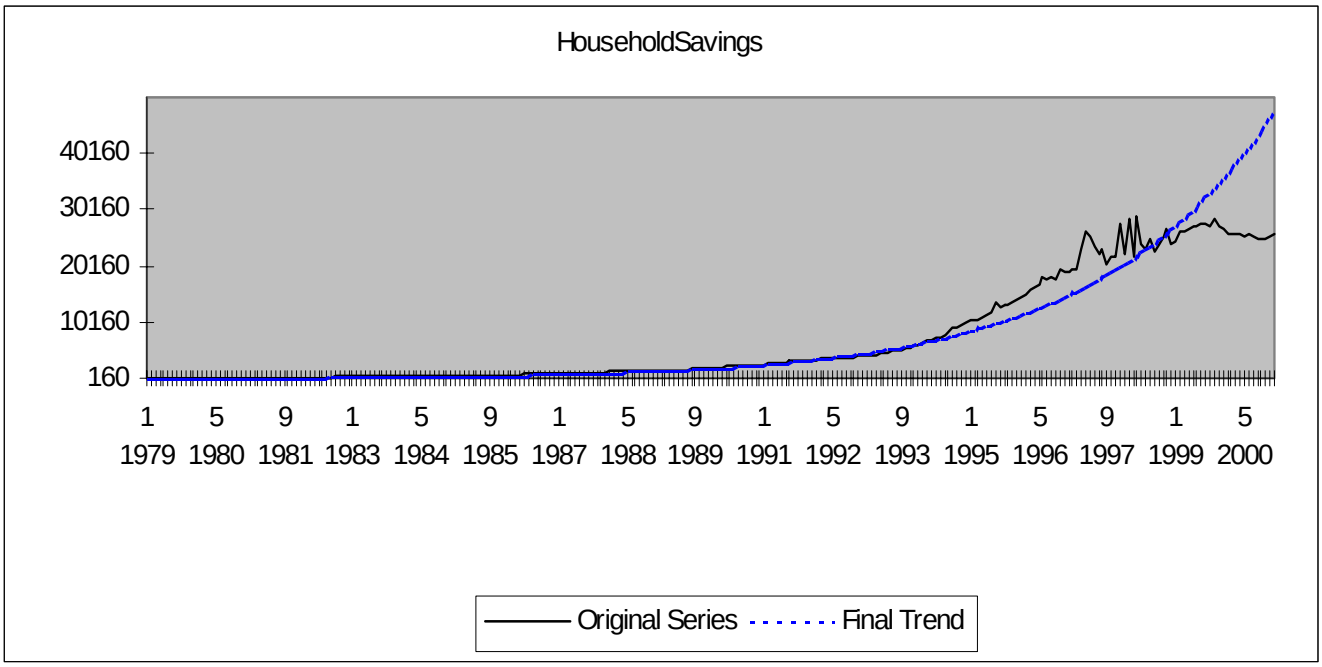

FdiValues
1000
800
600
400
200
0
-200
2
1993
11
1993
12
1995
1 1989
9 1989
5 1990
1 1991
9 1991
5 1992
1 1993
9 1993
5 1994
1 1995
9 1995
5 1996
1 1997
9 1997
5 1998
1 1999
9 1999
5 2000
Turning Points
Ratio to Final Trend

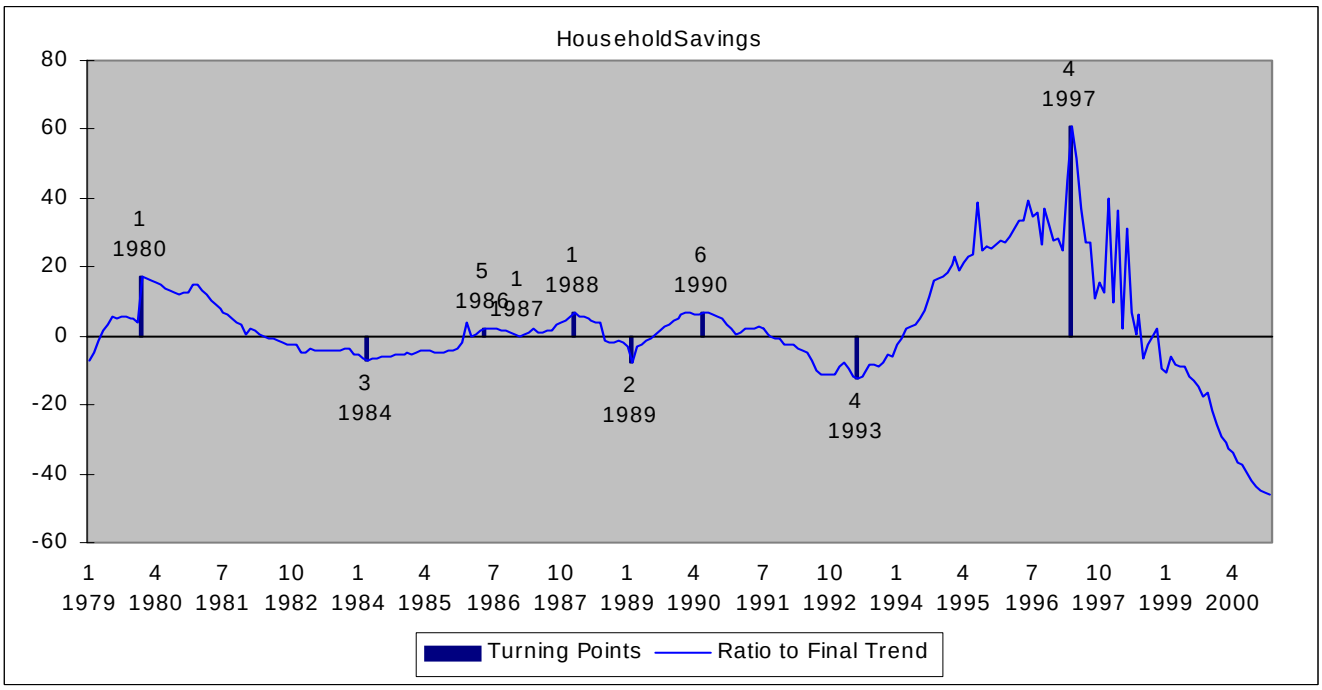

FreightTraffic
24635
19635
14635
9635
1 6 11 4 9 2 7 12 5 10 3 8 1 6 11 4 9
1978 1979 1980 1982 1983 1985 1986 1987 1989 1990 1992 1993 1995 1996 1997 1999 2000
Original Series
Final Trend

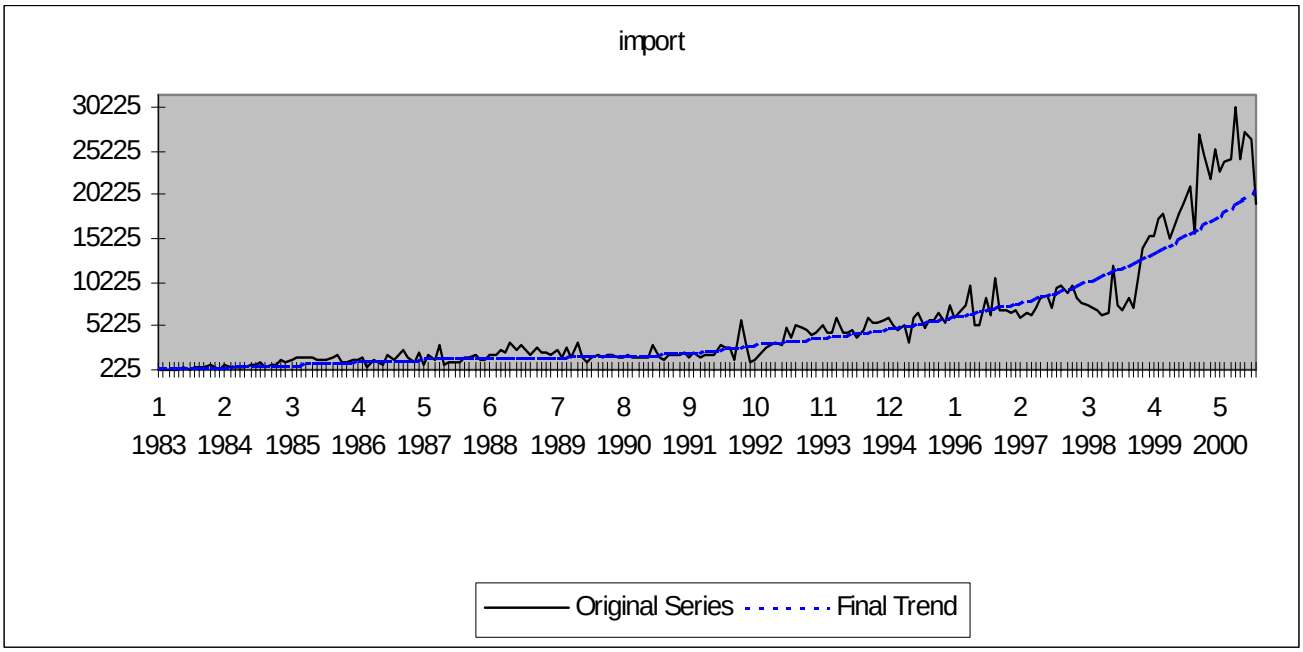

FreightTraffic
40
30
20
10
0
-10
-20
-30
6
1980
7
1986
12
1988
6
1993
1
1998
6
1978
12
1984
7
1988
3
1991
3
1996
9
1999
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Turning Points
Ratio to Final Trend

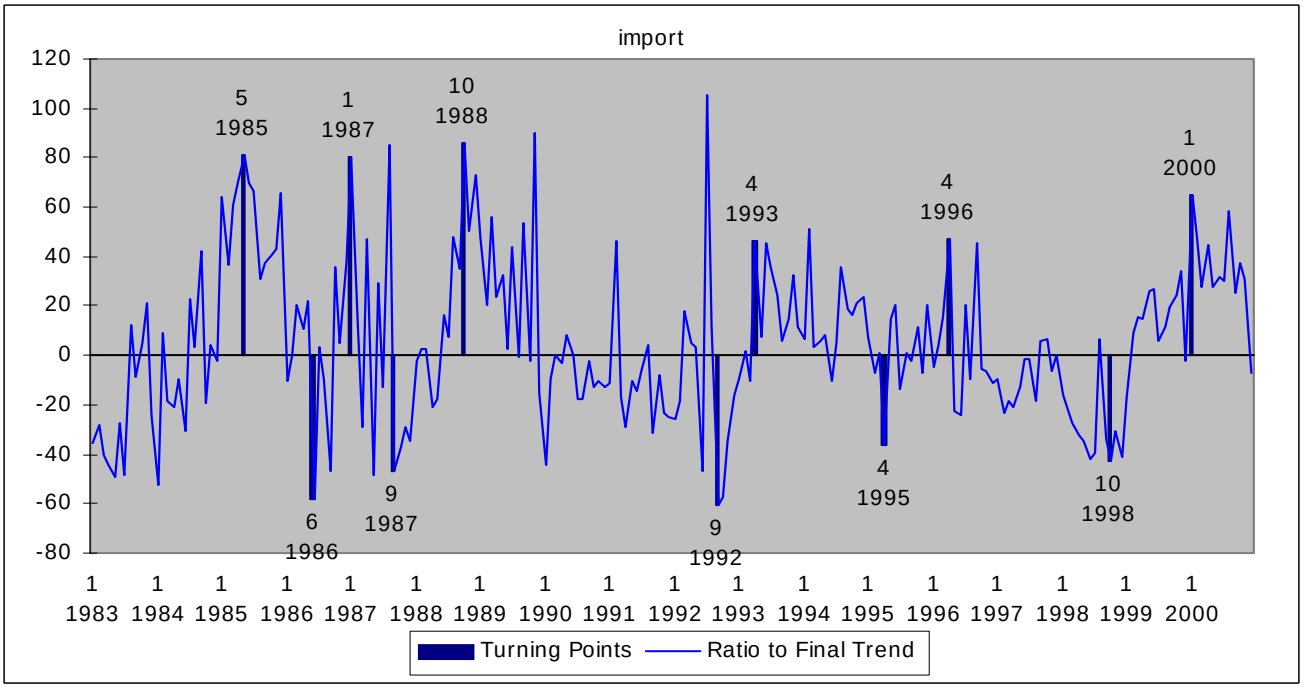

GDP
20858
15858
10858
5858
1 1991
8 1991
3 1992
10 1992
5 1993
12 1993
7 1994
2 1995
9 1995
4 1996
11 1996
6 1997
1 1998
8 1998
3 1999
10 1999
5 2000
12 2000
Original Series
Final Trend

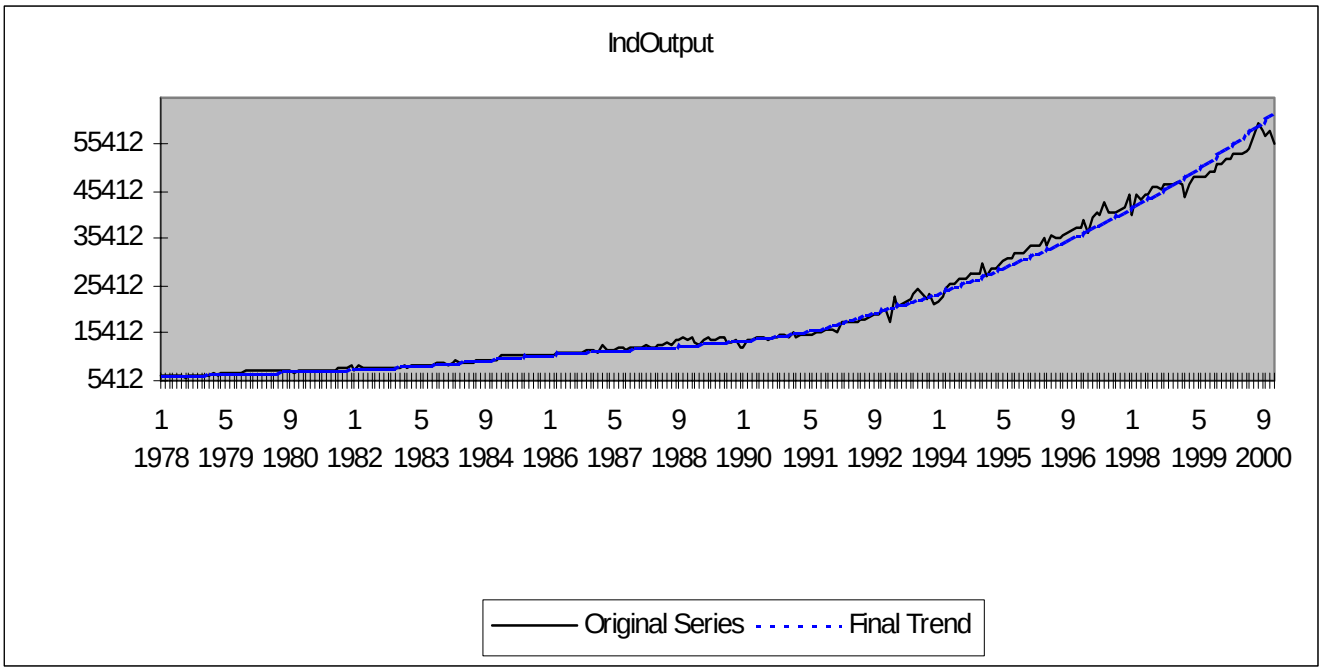

GDP
15
10
5
0
-5
-10
-15
11
1992
9
1994
12
1995
11
1996
5
2000
1 1991
8 1991
3 1992
10 1992
5 1993
12 1993
7 1994
2 1995
9 1995
4 1996
11 1996
6 1997
1 1998
8 1998
3 1999
10 1999
5 2000
12 2000
Turning Points
Ratio to Final Trend

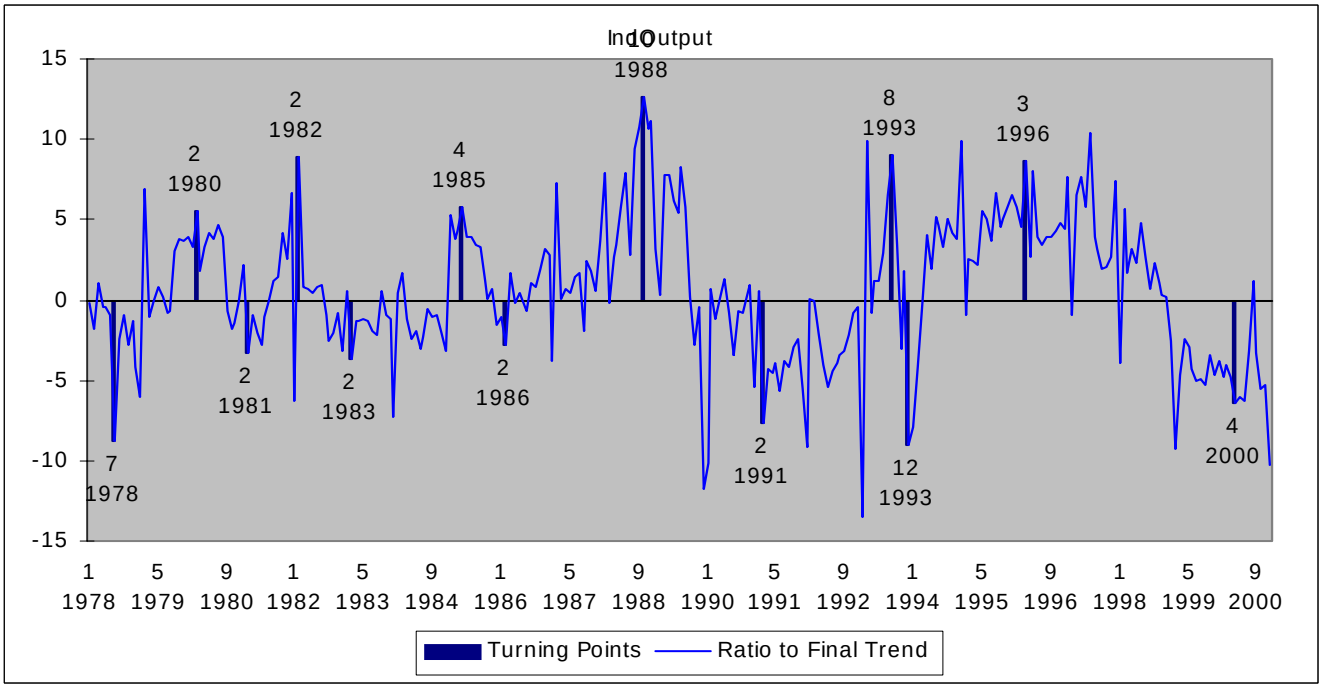

HouseholdSavings
40160
30160
20160
10160
160
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5
1979 1980 1981 1983 1984 1985 1987 1988 1989 1991 1992 1993 1995 1996 1997 1999 2000
Original Series
Final Trend

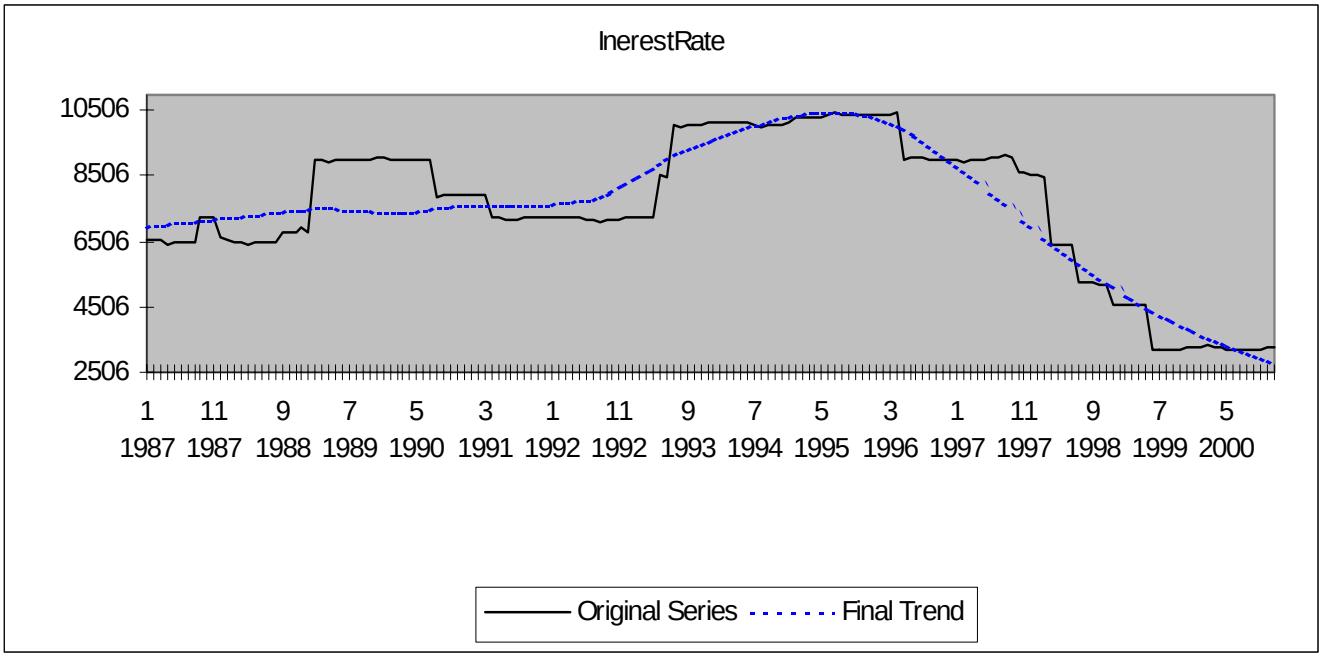

HouseholdSavings
80
60
40
20
0
-20
-40
-60
1 1980
3 1984
5 1986
1 1987
1 1988
2 1989
6 1990
4 1993
4 1997
1 4 7 10 1 4 7 10 1 4 7 10 1 4 7 10 1 4 7 10 1 4
1979 1980 1981 1982 1984 1985 1986 1987 1989 1990 1991 1992 1994 1995 1996 1997 1999 2000
Turning Points
Ratio to Final Trend

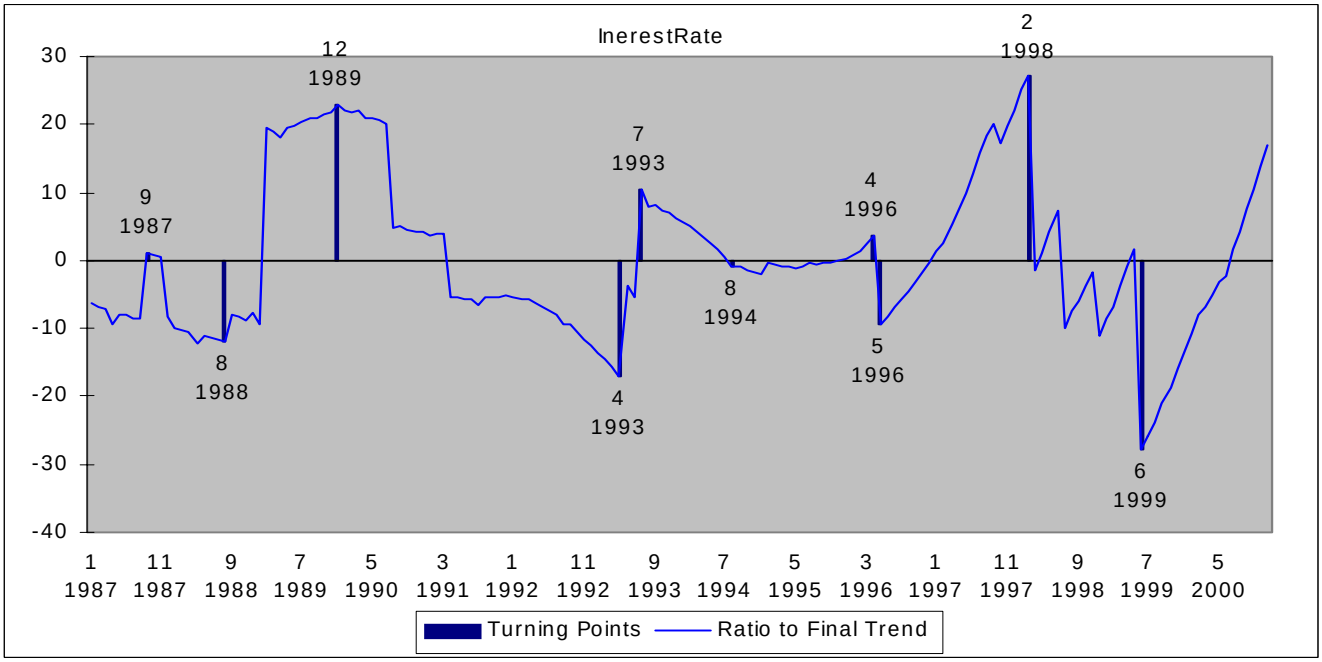

import
30225
25225
20225
15225
10225
5225
225
1 2 3 4 5 6 7 8 9 10 11 12 1 2 3 4 5
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1996 1997 1998 1999 2000
Original Series
Final Trend

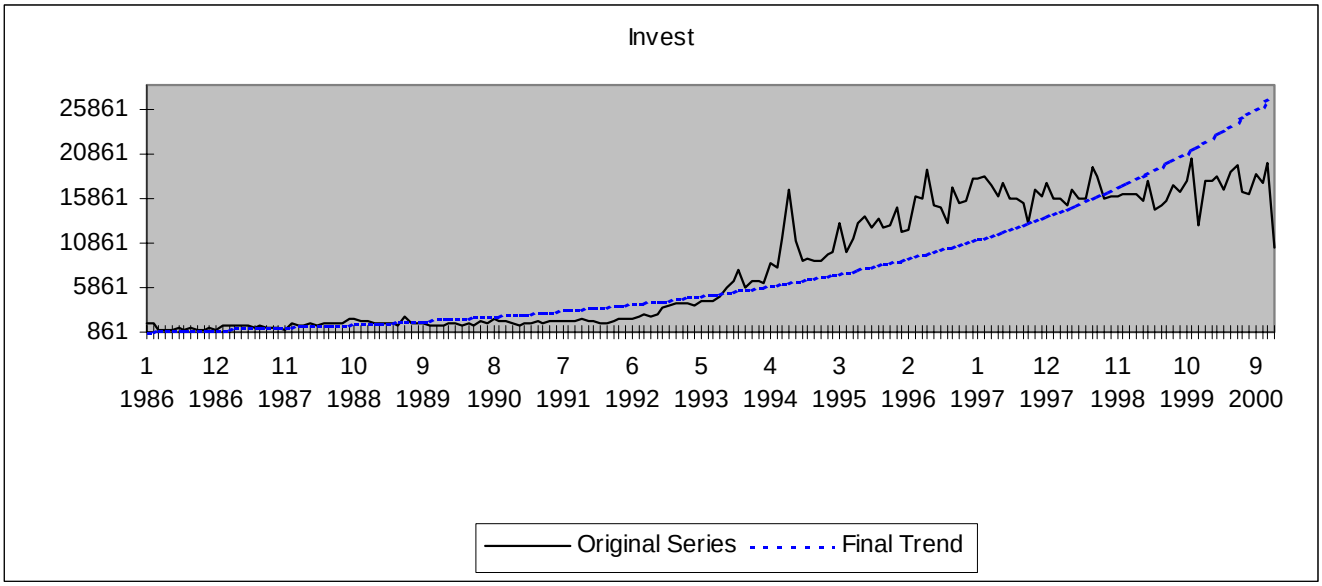

import
120
100
80
60
40
20
0
-20
-40
-60
-80
5 1985
1 1987
10 1988
4 1993
4 1996
1 2000
6 1986
9 1987
9 1992
4 1995
10 1998
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000
Turning Points
Ratio to Final Trend

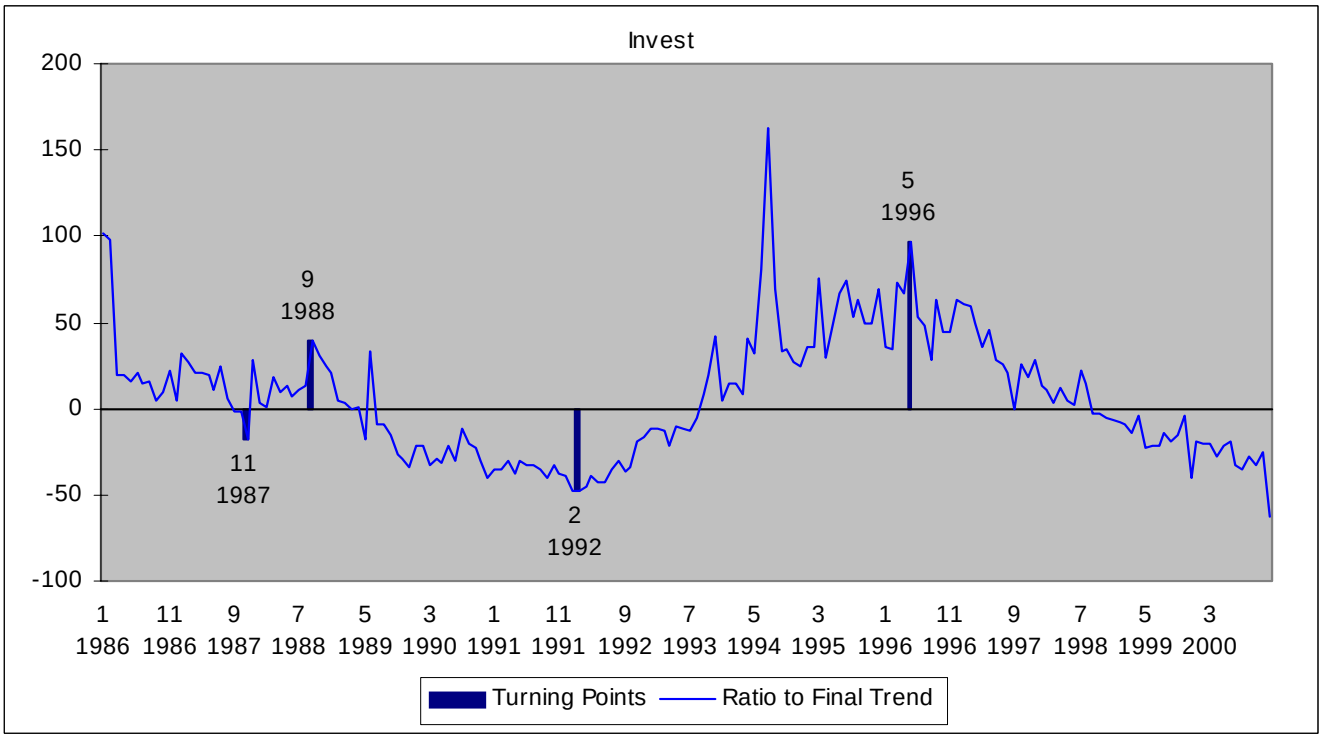

IndOutput
55412
45412
35412
25412
15412
5412
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Original Series
Final Trend

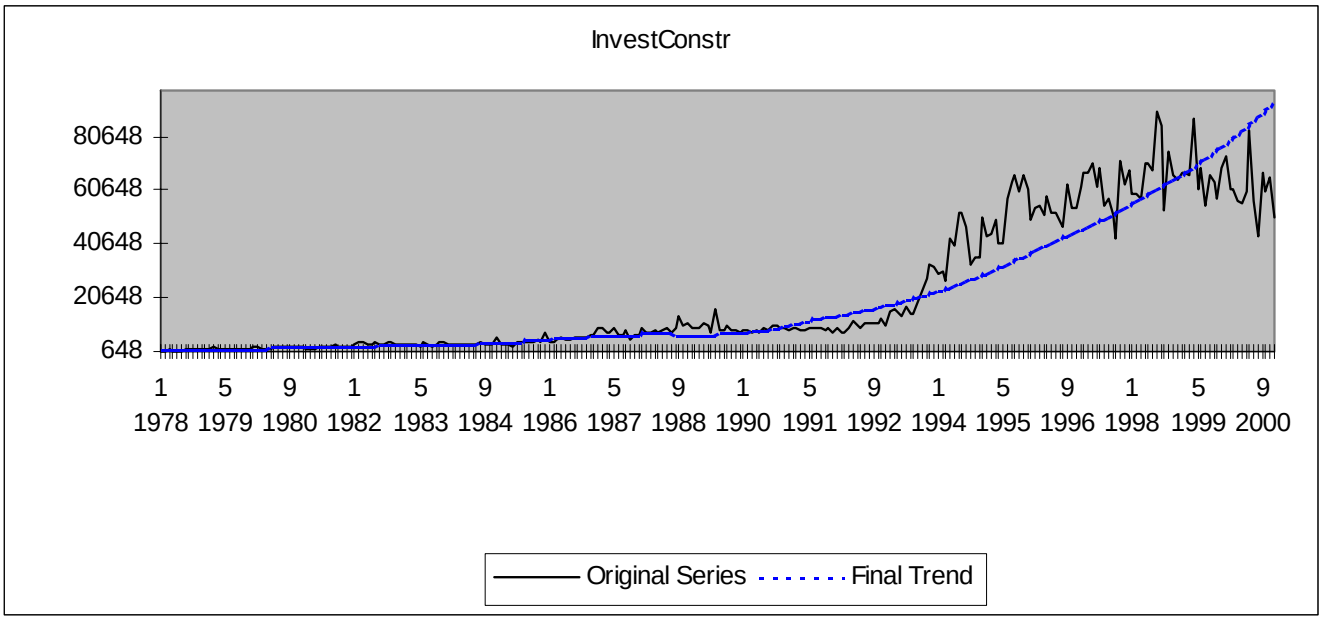

IndOutput
15
10
5
0
-5
-10
-15
7
1978
2
1980
2
1981
2
1982
2
1983
4
1985
2
1986
10
1988
2
1991
8
1993
12
1993
3
1996
4
2000
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Turning Points
Ratio to Final Trend

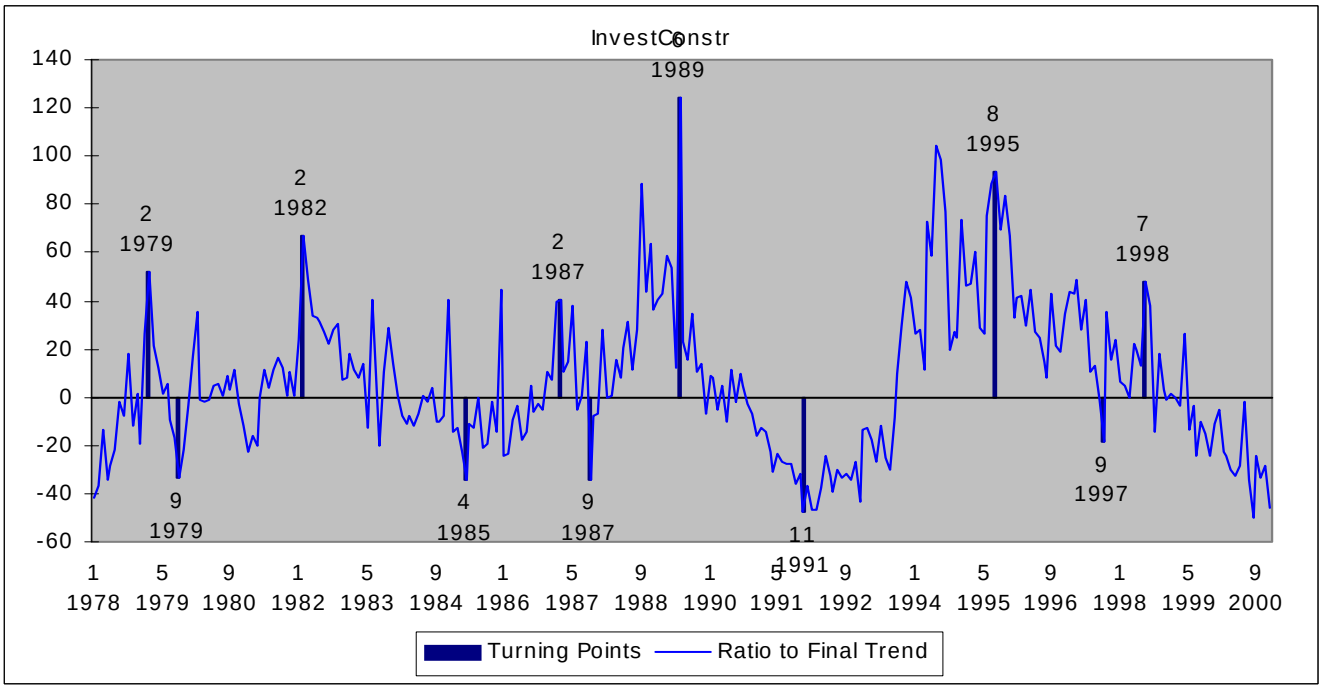

InerestRate
10506
8506
6506
4506
2506
1 11 9 7 5 3 1 11 9 7 5 3 1 11 9 7 5
1987 1987 1988 1989 1990 1991 1992 1992 1993 1994 1995 1996 1997 1997 1998 1999 2000
Original Series
Final Trend

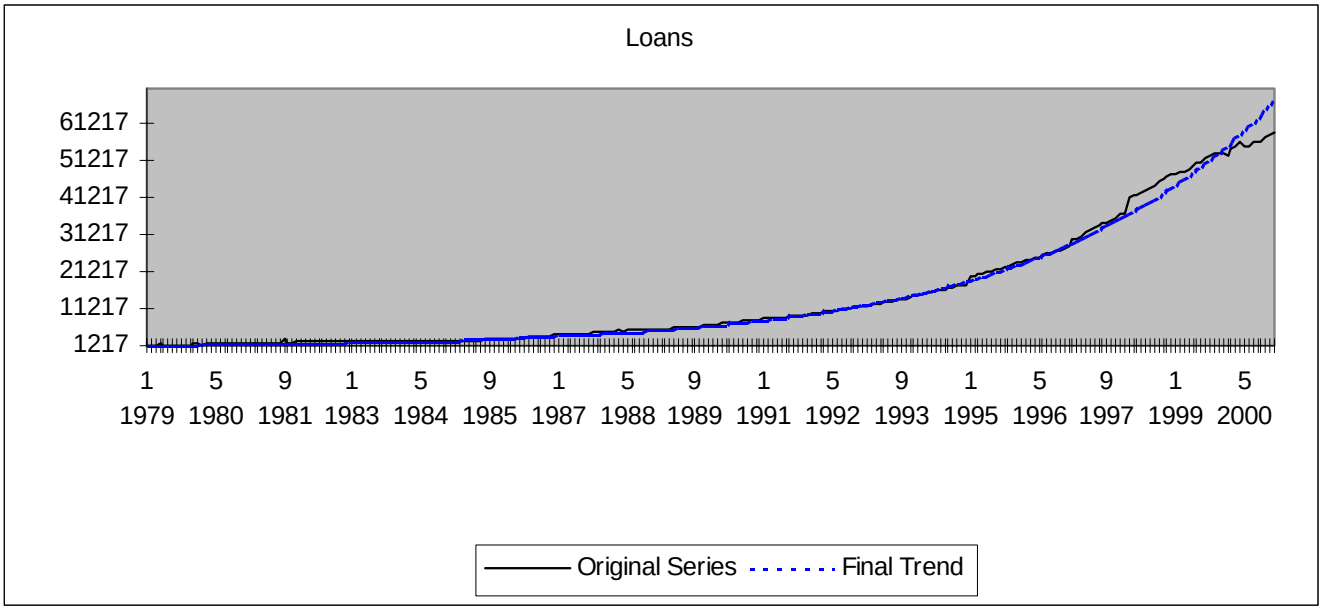

InerestRate
30
20
10
0
-10
-20
-30
-40
9 1987
12 1989
8 1988
7 1993
4 1993
8 1994
4 1996
5 1996
2 1998
6 1999
1 11 9 7 5 3 1 11 9 7 5 3 1 11 9 7 5
1987 1987 1988 1989 1990 1991 1992 1992 1993 1994 1995 1996 1997 1997 1998 1999 2000
Turning Points
Ratio to Final Trend

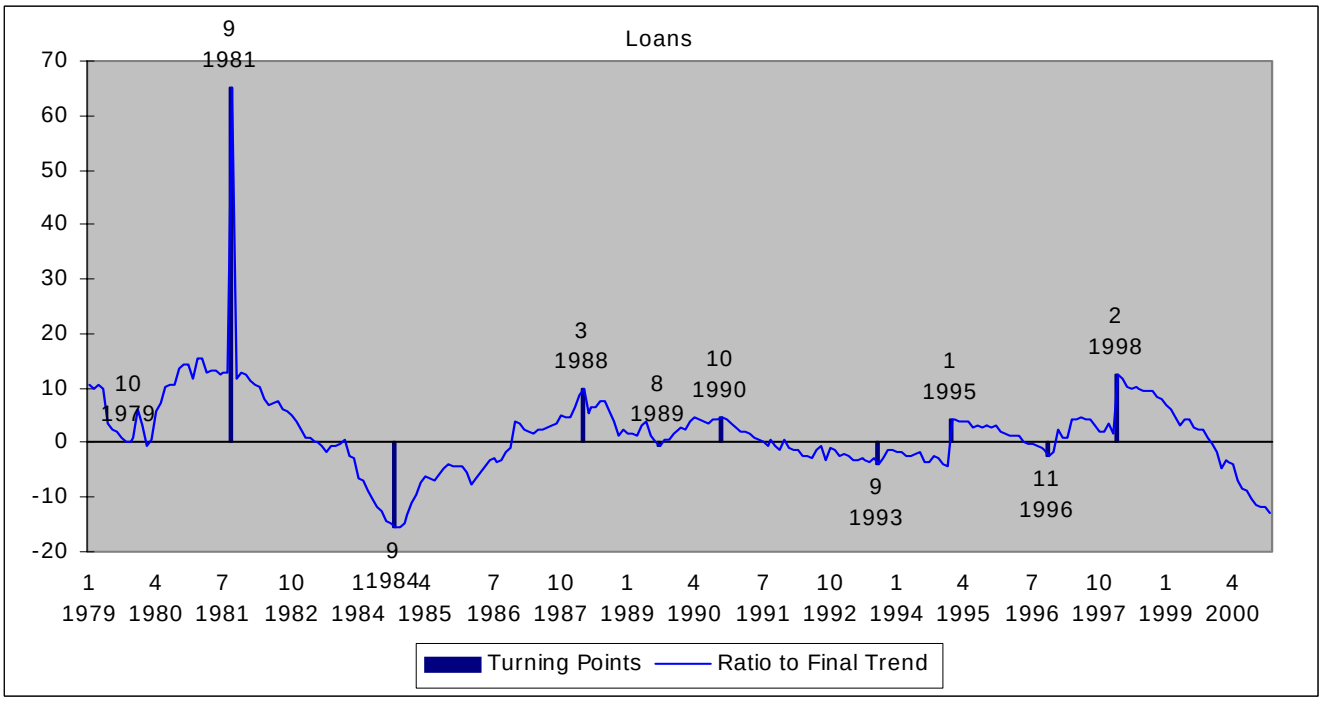

Invest
25861
20861
15861
10861
5861
861
1 12 11 10 9 8 7 6 5 4 3 2 1 12 11 10 9
1986 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1997 1998 1999 2000
Original Series
Final Trend

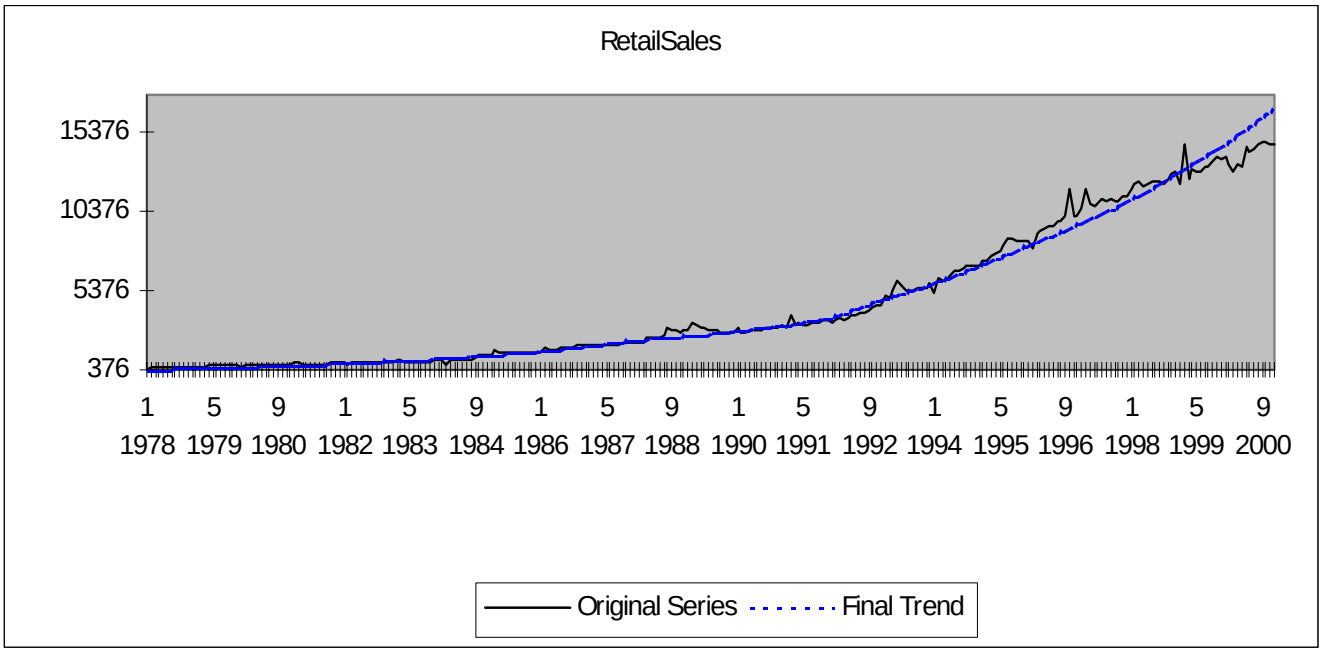

Invest
200
150
100
50
0
-50
-100
9
1988
11
1987
2
1992
5
1996
1 11 9 7 5 3 1 11 9 7 5 3 1 11 9 7 5 3
1986 1986 1987 1988 1989 1990 1991 1991 1992 1993 1994 1995 1996 1996 1997 1998 1999 2000
Turning Points
Ratio to Final Trend

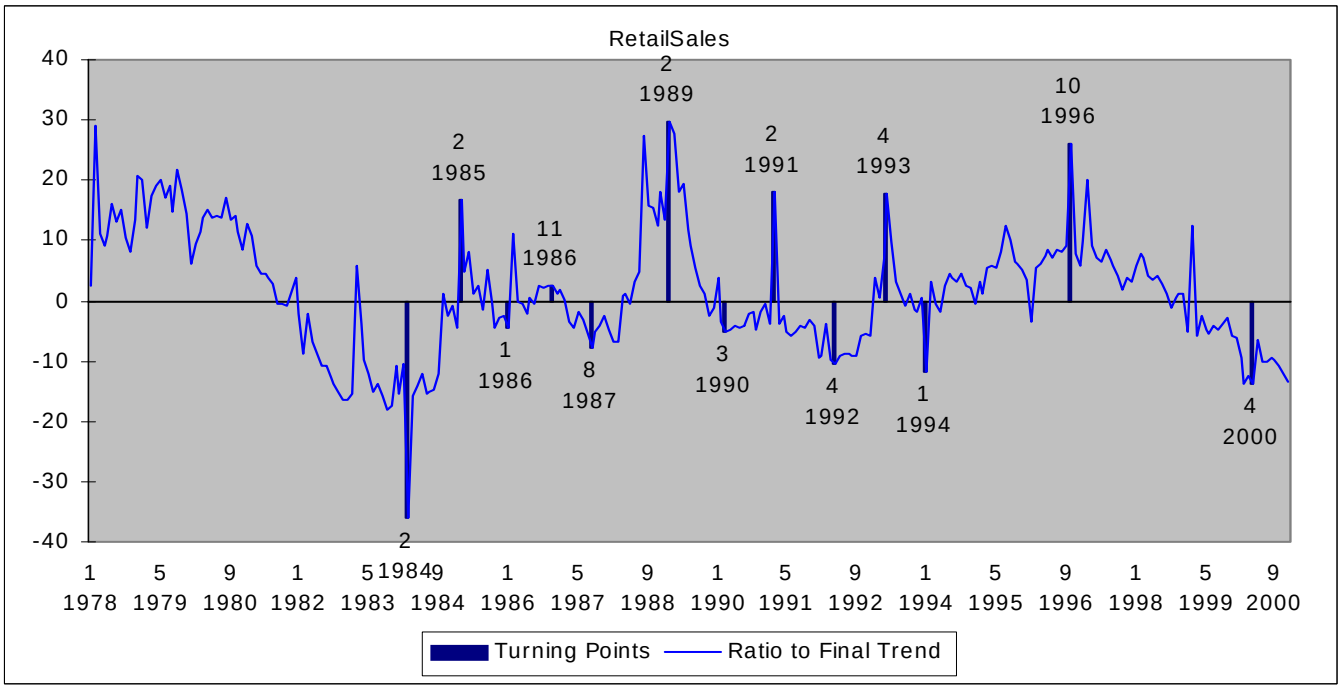

InvestConstr
80648
60648
40648
20648
648
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Original Series
Final Trend

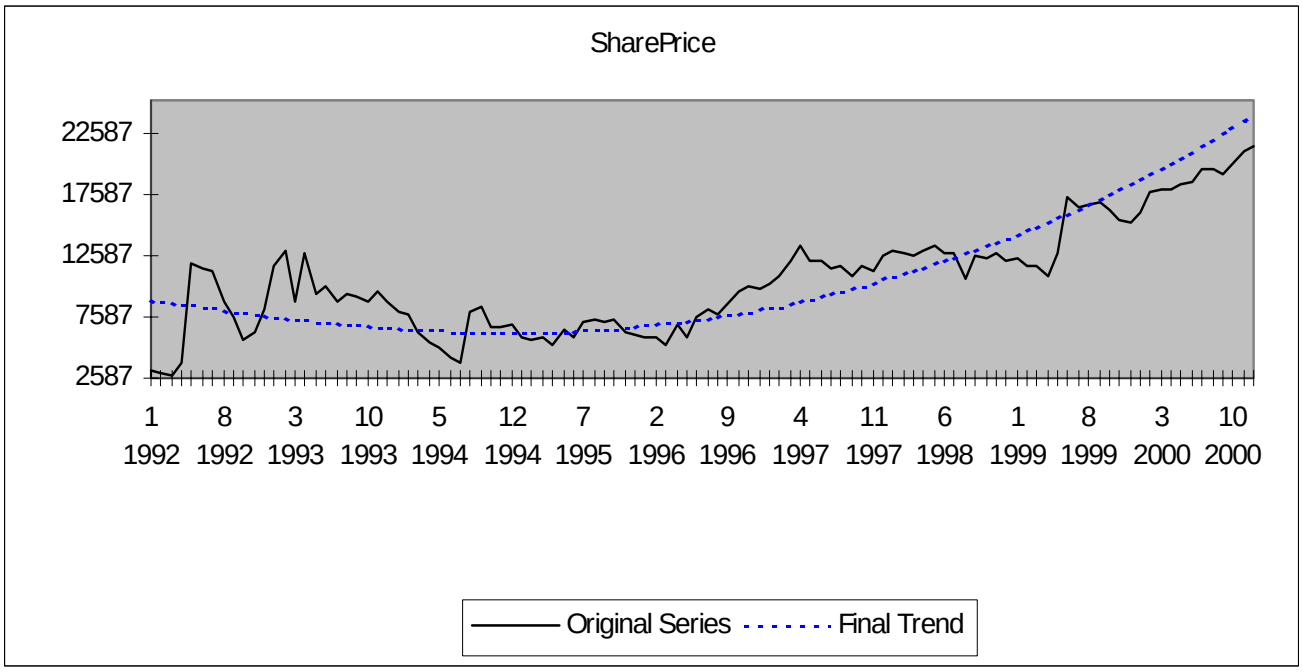

InvestConstr
140
120
100
80
60
40
20
0
-20
-40
-60
2
1979
9
1979
2
1982
4
1985
2
1987
9
1987
6
1989
11
1991
8
1995
9
1997
7
1998
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Turning Points
Ratio to Final Trend

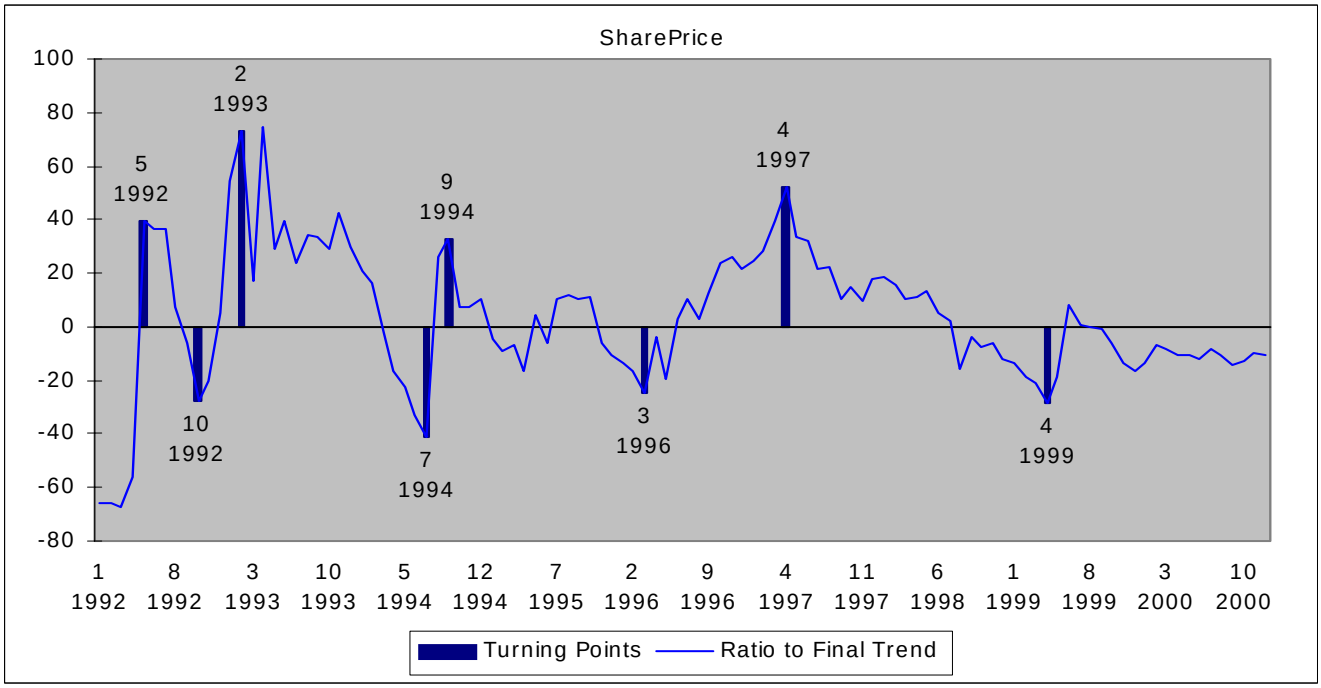

Loans
61217
51217
41217
31217
21217
11217
1217
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5
1979 1980 1981 1983 1984 1985 1987 1988 1989 1991 1992 1993 1995 1996 1997 1999 2000
Original Series
Final Trend

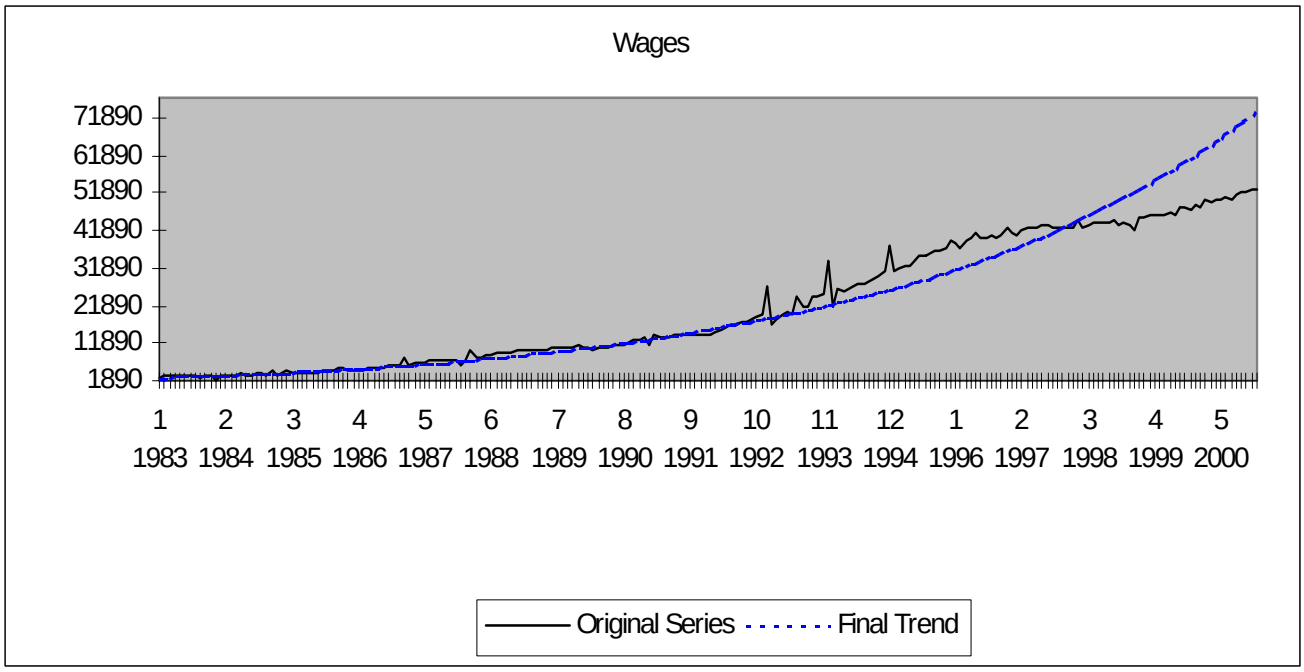

Loans
9
1981
10
1979
3
1988
8
1989
10
1990
1
1995
2
1998
9
1993
11
1996
9
70
60
50
40
30
20
10
0
-10
-20
1 4 7 10 1 4 7 10 1 4 7 10 1 4 7 10 1 4
1979 1980 1981 1982 1984 1985 1986 1987 1989 1990 1991 1992 1994 1995 1996 1997 1999 2000
Turning Points
Ratio to Final Trend

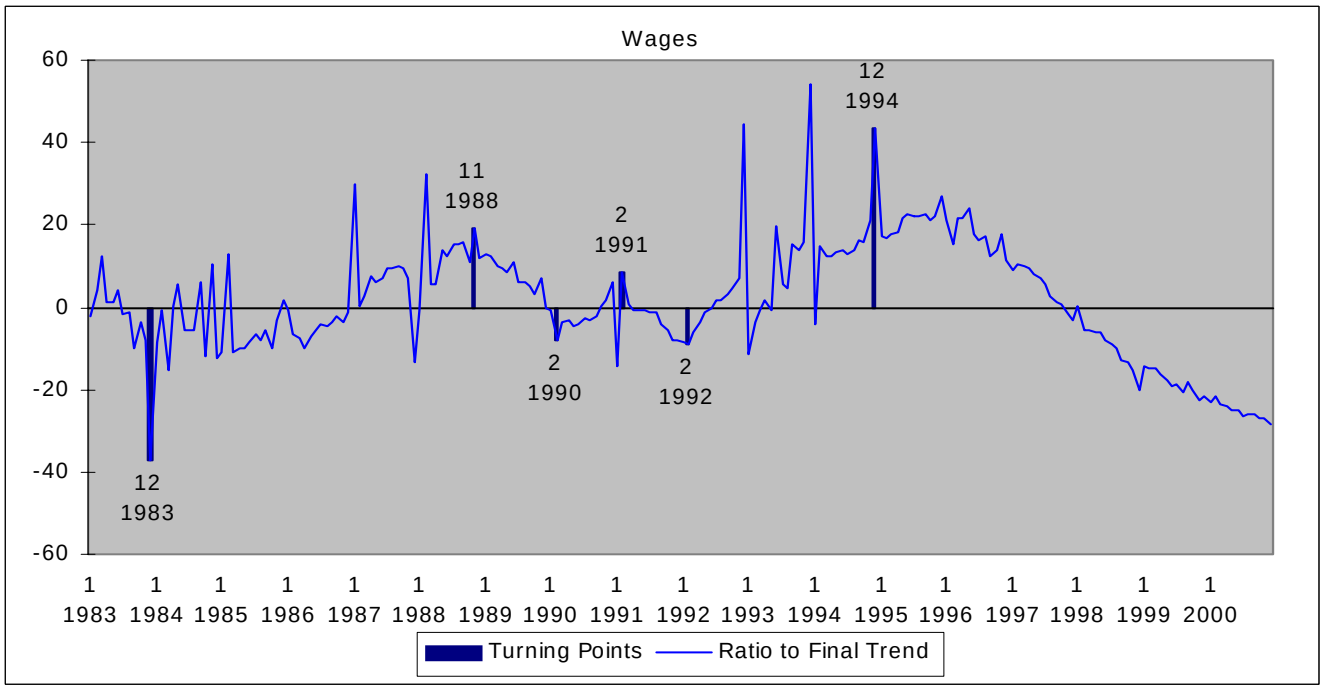

RetailSales
15376
10376
5376
376
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Original Series
Final Trend


RetailSales
40
30
20
10
0
-10
-20
-30
-40
2 1985
11 1986
1 1986
8 1987
2 1989
3 1990
2 1991
4 1992
4 1993
1 1994
10 1996
4 2000
2 1984
1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9 1 5 9
1978 1979 1980 1982 1983 1984 1986 1987 1988 1990 1991 1992 1994 1995 1996 1998 1999 2000
Turning Points
Ratio to Final Trend


SharePrice
22587
17587
12587
7587
2587
1 1992
8 1992
3 1993
10 1993
5 1994
12 1994
7 1995
2 1996
9 1996
4 1997
11 1997
6 1998
1 1999
8 1999
3 2000
10 2000
Original Series
Final Trend


SharePrice
100
80
60
40
20
0
-20
-40
-60
-80
2 1993
5 1992
9 1994
4 1997
10 1992
7 1994
3 1996
4 1999
1 1992
8 1992
3 1993
10 1993
5 1994
12 1994
7 1995
2 1996
9 1996
4 1997
11 1997
6 1998
1 1999
8 1999
3 2000
10 2000
Turning Points
Ratio to Final Trend


Wages
71890
61890
51890
41890
31890
21890
11890
1890
1 1983
2 1984
3 1985
4 1986
5 1987
6 1988
7 1989
8 1990
9 1991
10 1992
11 1993
12 1994
1 1996
2 1997
3 1998
4 1999
5 2000
Original Series
Final Trend


Wages
60
40
20
0
-20
-40
-60
12
1983
11
1988
2
1990
2
1991
2
1992
12
1994
1 1983
1 1984
1 1985
1 1986
1 1987
1 1988
1 1989
1 1990
1 1991
1 1992
1 1993
1 1994
1 1995
1 1996
1 1997
1 1998
1 1999
1 2000
Turning Points
Ratio to Final Trend

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