Business Cycles in the Indian Economy

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This paper attempts to examine the presence of business cycles in the Indian economy. Evidence from annual and monthly output variables is examined and research in the filed is reviewed.

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Introduction

The slowing down of growth in the Indian economy, particularly in the industrial sector, has raised significant interest in business cycle indicators. For India the interest in business cycle research is relatively new though industrialised economies have witnessed business cycles for many decades. From the great depression of the thirties to the most recent slowing down of growth in the US economy, there have been numerous ups and downs. Consequently most of the research on business cycles has been addressed from the point of view of advanced industrialised countries. Theories that explain business cycles are also located in the context of market economies. In general, both the theory and empirical evidence on business cycles originates in advanced industrialised market economies.

To approach the study of business cycles in India the researcher has to first ask some basic questions. The first and most important of these is: does the Indian economy witness business cycles? Until now there is no general consensus on this issue. Only if the answer is yes, does this question need to be followed by other questions such as what are patterns in the cycles, what are the explanations of these cycles, how can they be predicted, can monetary and fiscal policy impact them, etc.

The purpose of this paper is to answer the first basic question about whether there are business cycles in the Indian economy and if there are, then to identify these cycles. To do this we will examine the literature on business cycle research in India and look at the evidence. We look at both the evidence provided by annual GDP data since 1950-51 and monthly data since 1980. We make a distinction between monsoon related cycles in the period 1950-1997 and the growth cycles witnessed in the nineties.

I. Concepts

Business cycles are recurrent sequences of alternating phases of expansion and contractions that involve a number of diverse economic processes. These movements show up as distinct fluctuations in a number of seasonally adjusted series that measure all major aspects of

overall economic activity: production, employment, income, and sales. The cyclical fluctuations in these variables are highly diffused across the economy yet also sufficiently synchronized to dominate national aggregates. The same applies to many other economic and financial variables that participate in business cycles: money and credit, interest rates, yields and prices of assets, rate of inflation and sensitive commodity prices; unemployment and government budget balance, imports and trade balance.

Business cycles have been defined as fluctuations found in the aggregate economic activity of nations that organize their work mainly in business enterprises. A cycle consists of expansions occurring at about the same time in many economic activities, followed by similarly general recessions, contractions, and revivals, which merge into the expansion phase of the next cycle. This sequence of changes is recurrent but not periodic. Business cycles vary in duration from more than one year to ten or twelve years; they are not divisible into shorter cycles of similar character with amplitudes approximating their own (Mitchell and Burns (1946)). Business cycles are continuous - an expansion turns into a recession that is followed by a contraction and then a revival that in turn, begins the process all over; and it is sufficient to mark off turning points in business activity simply based on peaks and troughs. The term recession refers to the period from the upper turning point (the initial peak) to the lower turning point (the trough). Recovery refers to the period from the trough to the point at which business activity returns to its previous peak level. Expansion refers to the period when the economy increases beyond previous boundaries.

A relatively later concept of the business cycle is the growth cycle. The growth cycle is fluctuation around the long-run trend (Moore, 1980). In other words, it is a trend adjusted business cycle. The growth cycle is a pronounced deviation around the trend rate of change. This definition portrays periods of accelerating and decelerating rates of growth in the economy, a type of fluctuation that also has a longstanding history. A growth cycle has many of the same characteristics as the classical business cycle.

The turning points in the business cycle are dates, which mark when the actual level of economic activity reached a peak or trough, regardless of the long run trend. And the turning points in growth cycles are dates when aggregate economic activity was farthest above its

long run trend level (peak) or farthest below its long run trend level (trough).

II. Dating Business cycles

A number of methods have been developed to identify cycles and turning points. These vary in their degrees of technical sophistication. The focus of these methods is to forecast the beginning of a recession or expansion in the economy.

National Bureau of Economic Research's (NBER) approach, the most popular among these has a long history of research on U.S business cycles. The NBER business cycle dating committee's method for selecting turning point dates requires a consensus among members of the committee who use different methods to analyse the macroeconomic conditions and trends. The NBER selects the peaks and trough dates by looking for clear changes in both the trend and level of economic activity.

A number of data series, which seem to be coincidental with the aggregate economy are analysed and clustering of turning points are used to set the reference cycle dates. The committee's decision process closely adhers to Burns and Mitchell's concept of the business cycles. The latter requires (a) full cycle to last over 1 year and is skeptical of those lasting less than 2 years, and (b) chooses later turning point dates, both in periods of flatness and of multiple spikes (unless the spikes show a clear downward or upward pattern). For consistency in their results, they are compared to patterns observed at previous NBER dates. Even though the committee's decision can be criticised as slow in forthcoming, this approach avoids premature and false calls.

In the absence of such a chronology or 'dating' of peaks, troughs, recessions and recoveries the first step for a business cycle researcher seeking to construct leading economic indicators for India is to determine a chronology of business cycles in India.

Statistical research in business cycles indicates that when business cycles underlie economic processes, there would be series, which coincide with the business cycles (coincident indicator). The comprehensive series on production, employment, income and trade, which tend to move together, represent the principal "coincident indicator". They are measures of

different aspects of present economic activity. Many economic time series, which tend to reach their turning points before the corresponding turning point, are called 'leading indicators'. There are also many series whose turning points tend to occur after the peaks and troughs in the cycles of coincident indictors - they are known as the lagging indicators. If movements in many macroeconomic variables have a common element that can be captured by a single underlying, unobservable variable, then in the abstract, this variable represents the general "state of the economy". The problem is to estimate the current state of the economy, that is, this common element in the fluctuations of key aggregate time-series variables. This unobserved variable - the state of the economy - must be defined before any attempt can be made to estimate it.

Since in the Indian context variables such as sales, retail trade employment etc. are not often available even on annual basis, as the first step to determine the periods of recession we study annual GDP series. We examine GDP data for the period 1950-51 to 1999-00 (base=1993-94) from the National Accounts Statistics. (Quarterly data for GDP is available only since 1996-97.) We follow a very simple rule of thumb to identify cycles. As we will show the dates identified using this rule, find support from other studies that use more sophisticated techniques to examine business cycles in India.

There have been four episodes since 1950-51 when growth in GDP has fallen sharply. These have been in 1957-58, 1965-66, 1979-80 and 1991-92 (see Table 1). In each of these years the growth rate fell by 4 or more percentage points and to less than 1%. In each of these years there was observed a sharp decline in agricultural output. As the table shows GDP-Agriculture in each of these years was negative. While 1957-58 also saw a sharp decline in growth in manufacturing which turned to negative, in 1965-66 it was mainly the drought that caused GDP-Agriculture to decline by over 11 percent. 1979-80 saw a sharp fall in GDP-Agriculture by over 12 percent. GDP-Manufacturing also declined and its growth was -3.4 per cent. In 1991-92 there was a balance of payment crisis, a fall in agricultural and manufacturing growth and a decline in GDP growth.

Table 1: Growth rate of GDP

	GDP (Factor Cost)	GDP-Manufacturing	GDP-Agriculture
1951-52	2.33	3.16	1.49
1952-53	2.84	3.48	3.15
1953-54	6.09	7.74	7.70
1954-55	4.25	7.01	2.94
1955-56	2.56	7.83	-0.86
1956-57	5.69	7.51	5.44
1957-58	-1.21	3.85	-4.49
1958-59	7.59	4.95	10.08
1959-60	2.19	6.79	-1.01
1960-61	7.08	8.30	6.74
1961-62	3.10	8.54	0.08
1962-63	2.12	7.28	-1.99
1963-64	5.06	9.46	2.34
1964-65	7.58	6.91	9.22
1965-66	**-3.65**	**0.93**	**-11.04**
1966-67	1.02	0.79	-1.42
1967-68	8.14	0.39	14.87
1968-69	2.61	5.54	-0.16
1969-70	6.52	10.73	6.43
1970-71	5.01	2.35	7.09
1971-72	1.01	3.27	-1.88
1972-73	-0.32	3.92	-5.02
1973-74	4.55	4.45	7.20
1974-75	1.16	2.92	-1.52
1975-76	9.00	2.11	12.89
1976-77	1.25	8.77	-5.78
1977-78	7.47	6.22	10.04
1978-79	5.50	12.35	2.30
1979-80	**-5.20**	**-3.22**	**-12.77**
1980-81	7.17	0.19	12.89
1981-82	5.97	8.02	5.29
1982-83	3.06	6.64	-0.68
1983-84	7.68	10.10	9.56
1984-85	4.31	6.57	1.47
1985-86	4.45	3.93	0.75
1986-87	4.33	6.96	-0.65
1987-88	3.83	7.30	-1.33
1988-89	10.47	8.83	15.46
1989-90	6.70	11.76	1.48
1990-91	5.57	6.05	4.11
1991-92	**1.30**	**-3.65**	**-1.55**
1992-93	5.12	4.14	5.79
1993-94	5.90	8.49	4.12
1994-95	7.25	11.95	5.01
1995-96	7.34	14.90	-0.87
1996-97	7.84	9.66	9.61
1997-98	4.76	1.51	-2.43
1998-99	6.57	2.55	7.06
1999-00	6.37	6.79	0.67
2000-01	6.01	5.58	0.19

III. Review

Research on business cycles in India has been based on an analysis of data mainly using NBER methods. Turning points identified have been summarized in Table 2.

Chitre (1986) locates turning points in 94 monthly time series for the period 1957 to 1982. These includes cement production, quantam of exports, index of industrial production - capital goods, index of industrial production - intermediate goods, electric energy generated, railway traffic- total no. of wagons loaded, changes in bank credit, cheque clearance, quantam of imports, index of industrial production - consumer goods non-durables, index of industrial production - general index. He identifies 8 peaks and troughs in these, using the Bry-Boschan (1971).

The Bry-Boschan method is also used by Dua and Banerjee (2000) to identify cycles in the Indian economy in the period Jan 1957 to June 1990. A coincident indicator consisting of gross domestic product at factor cost and constant prices (interpolated to generate a monthly series), general index of monthly industrial production, wages to workers in factory sector (interpolated to generate a monthly series using the industrial production of consumer goods as the monthly reference series), monthly registered unemployed and Industrial production of consumer goods, is constructed. Peaks and troughs in the coincident indicator are identified.

Gangopadhyay and Wadhwa (1997) examine turning points in the IIP. The series is converted into a quarterly series, deseasonalised, smoothed and its annualised growth rates examined to identify turning points in the period June 1974 to March 1995. They find five sets of turning points.

Mall (1999) filters output to examine cyclical behaviour of the Indian economy since 1950. Six sets of turning points in IIP-Manufacturing are identified as the peaks and troughs of the cycle in the period.

Table 1 : Review - Turning points

Chitre (1986)	
Trough	**Peak**
	January - 1952
November- 1953	June - 1956
June - 1958	March-1961
February -1962	March-1965
January - 1968	April-1970
November - 1970	February - 1972
January - 1975	November - 1976
October - 1977	May - 1978
April - 1980	
Dua and Banerjee (2000)	
	November - 1964
November - 1965	April - 1966
April- 1967	June - 1972
May - 1973	April- 1969
March-1980	March-1991
September - 1991	May - 1996
February - 1997	
Gangopadhyay and Wadhwa (1997)	
	1977-Q2
1978-Q1	1978-Q4
1980-Q2	1982-Q2
1983-Q3	1987-Q3
1989-Q3	1990-Q2
1993-Q2	
Mall (1999)	
	1951-52
1953-54	1956-57
1959-60	1964-65
1967-68	1969-70
1974-75	1978-79
1980-81	1989-90
1992-93	1995-96

The identification of the year 1957-58 as a period of downturn is supported by O.P.Mall (1999) and V.S.Chitre (1986). Similarly the downturn in 1965-66 is also selected by Mall (1999), Chitre(1986) and Dua and Banerji (2000). The year 1979-80 is also selected as a trough by Mall (1999), Chitre (1986) and Gangopadhaya and Wadhwa (1997). The downturn in 1991-92 identified as a trough by Dua and Banerji (2000) and Gangopadhyay and Wadhwa(1997).

The concept of the business cycle here is contrary to the perception of business cycles as continuous expansions that follow contractions and are followed by recoveries caused by the intrinsic characteristics of market economies. These are cycles caused purely by an external factor - the monsoon. Since agriculture accounted for upto 40 per cent of output till the end of

the 1970s, the fall in GDP was mainly due to a monsoon failure.

In the literature on business cycles competing economic theories that seek to explain cycles in market economies are usually based on factors such as the stickiness of prices, wages or the role of expectations, technology and information asymmetries. In the Indian economy it was mainly monsoon cycles rather than market related factors that caused a decline in GDP. The usefulness of this evidence to understand and predict market related business cycles or to develop leading indicators that predict them is therefore limited.

Table 3 : Chronology of Business Cycles

	Peak & Trough	Dates supported by studies using other methods
PERIOD I	1956-57 , 1957-58	Mall (1999) , Chitre (1986)
PERIOD II	1963-64 , 1965-66	Mall (1999) , Chitre (1986), Dua & Banerji(2000)
PERIOD III	1978-79 , 1979-80	Mall (1999) , Chitre (1986), Gangopadhaya & Wadhwa(1997)
PERIOD IV	1990-91 , 1991-92	Dua & Banerji(2000) , Gangopadhaya & Wadhwa(1997)

In recent times the nature of the cycle appears to be changing. In the 1990's there has not been an actual fall in output. Cycles, that did occur, could be defined as "growth cycles" in which there is a periodic fluctuation in the growth rate of output, rather than in the output. In other words, the rate of growth at which the economy is expanding slows down or picks up. Though the economy keeps expanding there are visible cycles in the rate at which it does so.

In 1997-8 the fall in agricultural output only slowed down GDP growth rather than make it actually fall. This is partly because the share of agriculture had now declined to 26 per cent of GDP. Moreover, it appears that it was also the internal dynamics of the manufacturing sector itself that led to the slowdown in growth. For instance, one possible cause of the slowdown in industry was the initial period of overestimation of demand and hence huge investments made after industry was liberalised. The Indian market was estimated by both domestic

producers and multinationals to be much larger than it actually was. In 1994-95 there was sharp growth but soon the pent up demand was exhausted. As consumer demand slowed, inventories piled up, investment was cut, demand for inputs fell and there was an overall slowdown in growth.

IV. Business Cycles in the Nineties

We now try to answer the question: Were there growth cycles in the Indian economy in 1990s. Since our rule of thumb does not pick up growth cycles, it does not identify any business cycles in the 1990s. Our intention is to examine cycles (that are not monsoon cycles) occur in the Indian economy.

V. Composite Coincident Indicator

To look for business cycles we can look either at a single indicator or at a group of variables. The group of indicator is known as a coincident indicator. Some of the coincident indicators in other countries are real gross national income, real disposable personal income, real final sales, real manufacturing and trades sales, industrial production and employment. For instance, an index of coincident indicators for the US uses data on industrial production, real personal income, real manufacturing and trade sales, and employment in non-agricultural establishments from 1959 to 1987. For producing such an index, quarterly data over 30-40 years was used so that its performance could be assessed over a few business cycles.

Out of the available data for the Indian economy one candidate for coincident indicator is the Index of Industrial Production (which is available monthly). However, given its volatile behaviour and narrow base, it can result in false signals. To avoid picking up short cycles or volatility in industrial production that does not really represent an upturn or downturn we chose a set of variables that are coincident in nature to GDP. From the data set of variables available on monthly basis whose cycles coincide with the cycles in IIP are Non-petroleum imports and exports (both measured in US dollar terms). Before looking for turning points we combine these into an index. The rationale for forming an index is in part a pragmatic concern about the quality of statistical indicators. Composite indicators provide a more reliable gauge of economic activity, as they are more comprehensive and thus less dependent on any single measure.

To construct a composite coincident indicator we follow the procedure below :

1. The series are deseasonalised by the ARIMA X11 method
2. Then the series are normalised ((X-mean)/Standard deviation)
3. The normalised series are combined as a weighted index (W_1X_1+ W_2X_2+ W_3X_3+…+ W_nX_n) generate the Composite Coincident Indicator (CCI). The weights are determined using a Principal Component Analysis.

Principal Component Analysis is a statistical technique that linearly transforms an original set of variables into a substantially smaller set of uncorrelated variables that represents most of the information in the original set of variables. A small set of uncorrelated variables is much easier to understand and to use in further analysis than a larger set of correlated variables. The technique helps us to construct a proxy for a large set of variables without wasting valuable degrees of freedom and chance of collinearity being present. To do this, a mathematical process resolves the data on all components of the group into a set of linear combinations or weighted averages or indices, each weighted average accounting for a stated proportion of the total variation in the data set. The index chosen explains the highest proportion of this variance. This suggests that it is the most convincing surrogate or index, for all the constituent variables.

A composite coincident indicator using the series Non-petroleum imports and exports (in dollars) and the Index of Industrial Production -General is constructed. Peaks and troughs are now identified using the Bry-Boschan (1971) method.

One of the techniques that has been used to identify business or growth cycles is the Bry-Boshan method. The main steps in the Bry-Boschan's (1971) routine to select specific cycle turning point dates, are:

- Smooth the data after first adjusting the time series for any outliers.
- Select preliminary turning points using the smoothed series and then search for turning points in the raw series around the dates found in the smoothed series.
- Once tentative dates are selected in the raw series, a check is made of the duration. If the duration criteria are not met, then one pair of cycle dates is eliminated.
- A final check of the amplitude can be made using the Haywood amplitude criterion,

which is based on a moving standard deviation of the series.

- After the series has passed through all these tests, a statement of the turning point dates is given.

Table 4: Turning Point Dates

	Coincident Indicator
Trough	Feb-82
Peak	Dec-89
Trough	Sept-91
Peak	Feb-97

This suggests the existence of a growth cycle in the 1990s with a Peak in February 1997. This date is supported by the perception that Indian industry witnessed a period of deceleration in growth.

VI. Conclusions and Work Ahead

Evidence suggests that the Indian economy has experienced cycles that can be tracked by changes in annual GDP. Our dates are find broad support in the available literature on business cycles in India. Studies of business cycles in India show slowdown in that prior to the nineties GDP growth fell in 1957-8, 1965-66, 1972-73 and 1979-80. However, before the nineties, fluctuations in economic activity in India were primarily on account of the monsoon.

In the 1990's there has not been an actual fall in output. Cycles, that did occur, can be defined more accurately as "growth cycles" in which there is a periodic fluctuation in the growth rate of output, rather than in the output.

The issue of which variable or set of variables the leading/lagging index tracks is still far from clearly decided in the literature on business cycles in India. We have developed a *composite coincident indicator* that attempts to make the indicator more broad based and less volatile.

This provides the prerequisites for the study of leading indicators. Necessary for construction of a leading indicator index is one, a coincident indicator that tracks the state of the economy, because only then can it be said what the leading indicator leads, and two, a chronology of turning point dates, which are required to determine the lead periods. Further research in this field will attempt to identify variables that lead our coincident indicator and then to construct a leading indicator index. Though this research will be constrained by the number of observations- turning points, available it will pave the way towards collection and analysis of relevant data.

Further, there is a need to better understand the causes of growth cycles and in Indian industry, the impact of policy changes on them.

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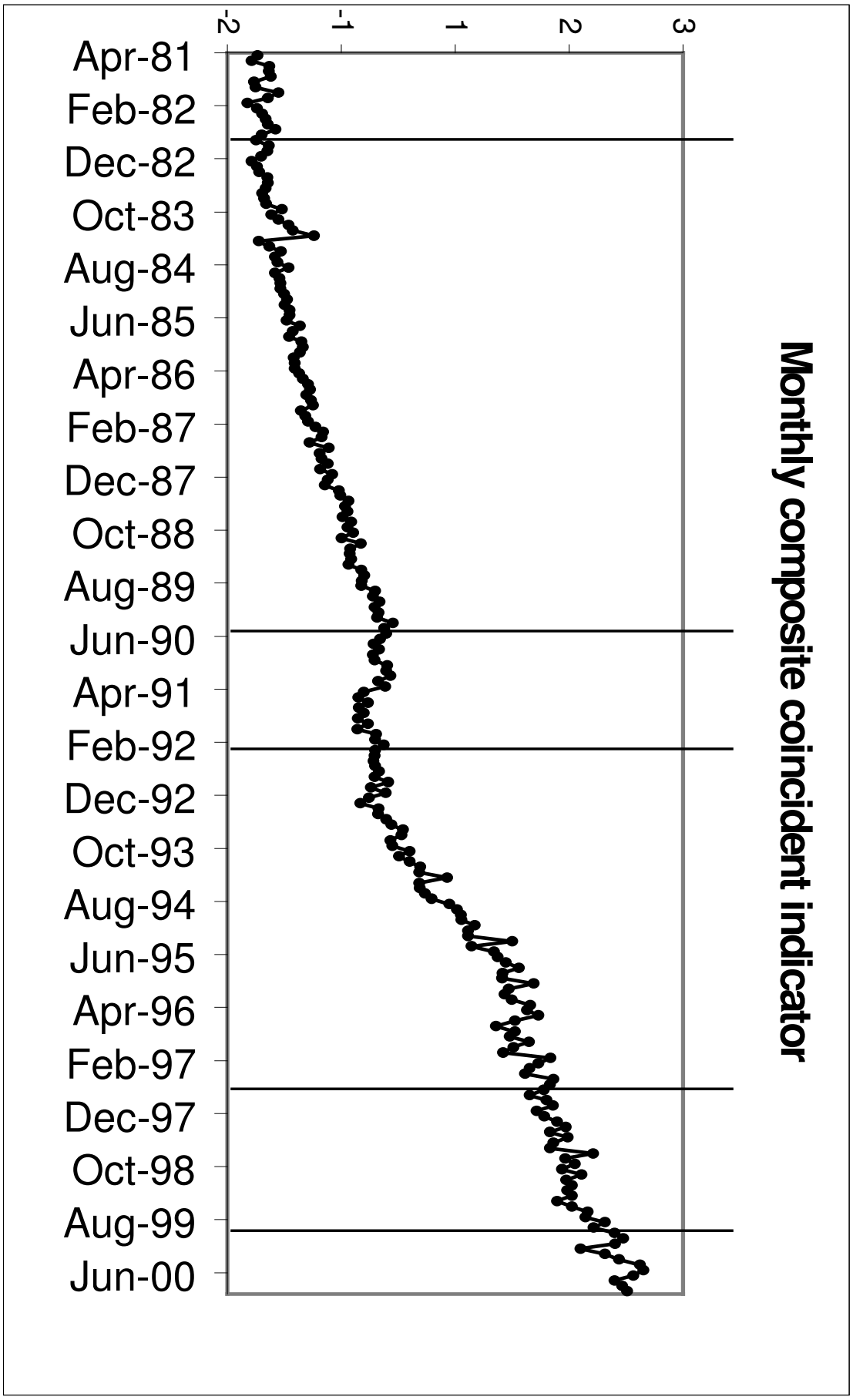
Monthly composite coincident indicator
-2
-1
1
2
3
Apr-81
Feb-82
Dec-82
Oct-83
Aug-84
Jun-85
Apr-86
Feb-87
Dec-87
Oct-88
Aug-89
Jun-90
Apr-91
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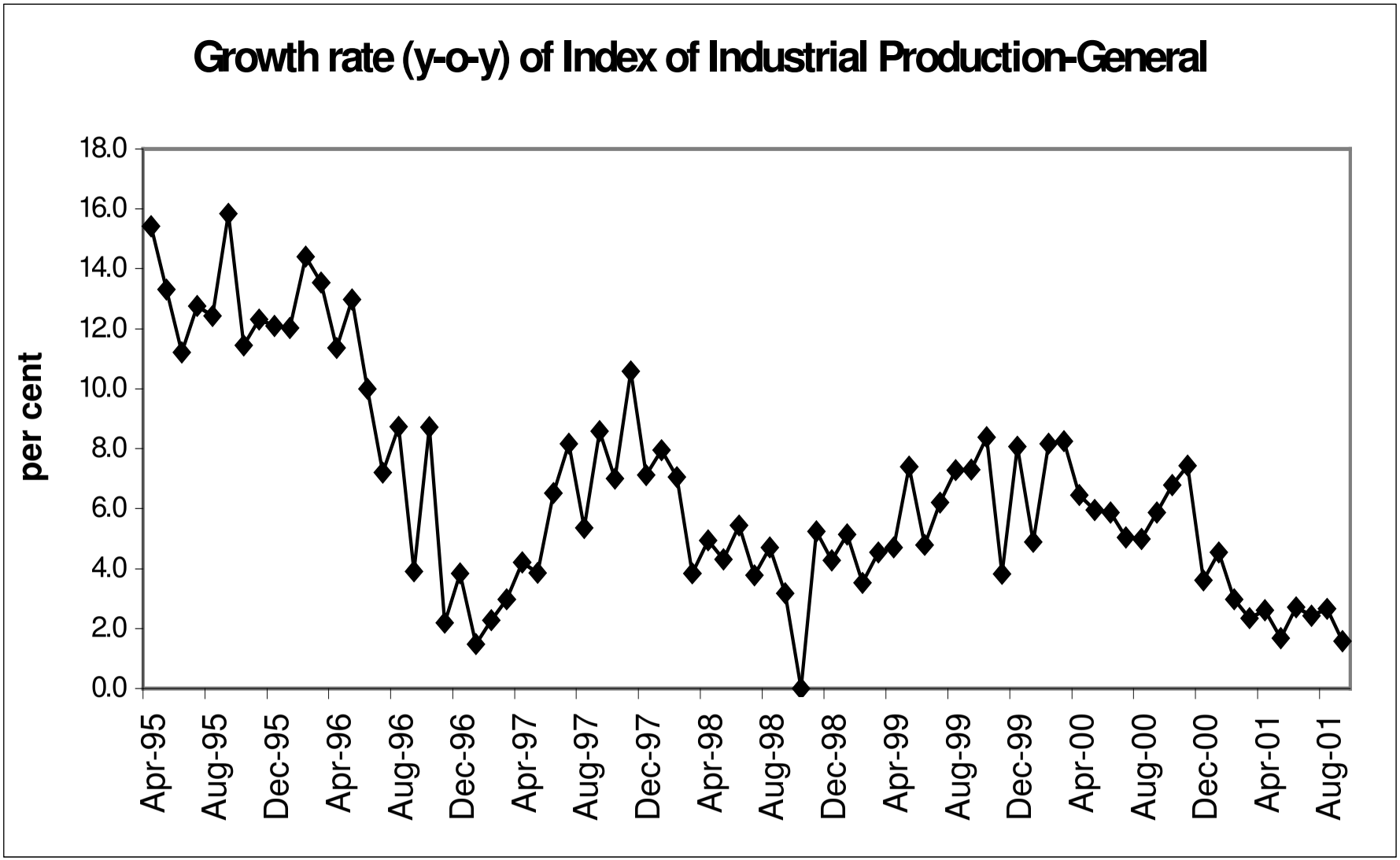
Apr-96
Feb-97
Dec-97
Oct-98
Aug-99
Jun-00


Growth rate (y-o-y) of Index of Industrial Production-General
per cent
18.0
16.0
14.0
12.0
10.0
8.0
6.0
4.0
2.0
0.0
Apr-95
Aug-95
Dec-95
Apr-96
Aug-96
Dec-96
Apr-97
Aug-97
Dec-97
Apr-98
Aug-98
Dec-98
Apr-99
Aug-99
Dec-99
Apr-00
Aug-00
Dec-00
Apr-01
Aug-01