

Business cycle measurement in India

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Abstract

This chapter presents the business cycle chronology for the Indian economy. Two distinct phases are analysed. The pre-1991 period when the cycles were mainly driven by monsoon shocks. The post 1991 phase where we see the emergence of conventional business cycles driven by investment-inventory fluctuations. The chapter sheds light on the economic conditions that shaped the nature of cycles in the two phases. The concluding section of the chapter presents an overview of the economic conditions post 2012.

1 Introduction

In India, the interest in business cycle research is relatively new, though industrialised economies and some emerging economies have a fairly long history of business cycle measurement. Two distinct periods emerge in the analysis of business cycles in India: the pre 1991 period and the post 1991 period. In this chapter we present an overview of the methods used for arriving at the business cycle chronology in the two periods and the macroeconomic conditions that shaped the cyclical fluctuations in the two periods.

The next section presents an overview of literature on business cycle turning points in the pre 1991 period. The next section describes the Indian business cycles from 1991 onwards. This section first begins with a description of the Balance of Payments crisis in 1990-91 that served as a trigger event for a series of reform measures introduced to address the structural imbalances in the economy. Subsequently the section presents an overview of cyclical turning points in the post 1991 period. The subsequent section presents our work on cyclical chronology using official quarterly GDP numbers. Finally the chapter presents a description of the current cyclical conditions in the economy in the post 2012 period before concluding.

2 Indian business cycles: 1950-1991

In the India of old, business cycle downturns in the pre-liberalisation period were associated with drought or oil price hike and saw sharp declines in GDP. There were no investment-inventory cycles or periods of expansion followed by periods of contraction that are typically seen in industrialised countries. Few studies have attempted to establish the cyclical fluctuations in the pre-reform period at varying frequencies. The studies apply the three approaches of business cycle measurement: Classical, growth and growth rate cycle.

Table 1 shows the dates of peaks and troughs identified in the Indian business cycle literature using the different approaches to business cycle measurement.

Table 1 Trough and peak dates in literature: The pre 1991 period

This table captures the dates of troughs and peaks identified in the literature on Indian business cycle using different approaches to business cycle measurement.

Trough	Peak
Patnaik and Sharma (2002), classical approach, (annual)	
	1956-57
1957-58	1963-64
1965-66	1978-79
1979-80	1990-91
1991-92	
Dua and Banerji (2012), classical approach, (monthly)	
	November 1964
November 1965	April 1966
April 1967	June 1972
May 1973	November 1973
February 1975	April 1979
March 1980	March 1991
Dua and Banerji (2012), growth rate cycle approach, (monthly)	
	September 1960
July 1961	February 1962
November 1962	May 1964
November 1965	April 1966
March 1967	April 1969
February 1974	February 1976
September 1977	May 1978
December 1979	October 1980
February 1983	August 1984
September 1985	October 1986
December 1987	June 1988
May 1989	March 1990
September 1991	
Mall (1999), growth cycle approach, (quarterly)	
	1951-52
1953-54	1956-57
1959-60	1964-65
1967-68	1969-70
1974-75	1978-79
1980-81	1989-90
Mohanty (2003), growth cycle, (monthly)	
November 1971	December 1972
October 1973	July 1974
January 1976	August 1976
March 1978	March 1979
September 1980	May 1982
September 1983	September 1984
December 1986	July 1987
April 1988	January 1989
November 1989	September 1990
Chitre (2004), growth cycle, (monthly)	
	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	

Patnaik and Sharma (2002) examined annual GDP data¹ for the period 1950-51 to 1999-00 (base=1993-94) from the National Accounts Statistics to identify cycles.² The authors used a simple rule of thumb to identify cycles. The authors identified periods of contraction as those when growth rate fell by 4 or more percentage points and to around 1%. Following this rule of thumb, the authors identified four episodes of contraction: 1957-58, 1965-66, 1979-80 and 1991-92. Even if we apply the traditional definition of contraction (period of negative growth rate), we broadly identify the same periods with the exclusion of 1991-92 and the addition of 1972-73 when the growth in annual GDP contracted to -0.3%. The notable point is that in each of these years there was a sharp decline in agricultural output. 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%. 1979-80 saw a sharp fall in GDP (Agriculture) by over 12%. GDP (Manufacturing) also declined and its growth was -3.2%. In 1991-92 there was a balance of payment crisis, a fall in agricultural and manufacturing growth and a decline in GDP growth.³

Table 2 shows the GDP growth rate and the sector-wise breakdown of growth rates.

¹Annual data in Indian statistics follow the “financial year” convention i.e. from April to March. As an example, the year 1951-52 would cover the period from April 1951 to March 1952.

²Quarterly data for GDP is available only since 1996-97.

³Note: Meanwhile the GDP growth rate was positive. For a discussion of this phenomenon, See Section 3.2.

Table 2 Growth of GDP and its components

Year	GDP(at factor cost)	GDP (Manufacturing)	GDP (Agriculture)
1951-52	2.3	3.1	1.4
1952-53	2.8	3.4	3.1
1953-54	6.1	7.7	7.7
1954-55	4.2	7.0	2.9
1955-56	2.6	7.8	-0.8
1956-57	5.7	7.5	5.4
1957-58	-1.2	3.8	-4.5
1958-59	7.5	4.9	10.1
1959-60	2.2	6.7	-1.0
1960-61	7.1	8.3	6.7
1961-62	3.1	8.5	0.1
1962-63	2.1	7.3	-1.9
1963-64	5.1	9.4	2.3
1964-65	7.6	6.9	9.2
1965-66	-3.6	0.9	-11.0
1966-67	1.0	0.7	-1.4
1967-68	8.1	0.4	14.9
1968-69	2.6	5.5	-0.1
1969-70	6.5	10.7	6.4
1970-71	5.0	2.3	7.1
1971-72	1.0	3.2	-1.8
1972-73	-0.3	3.9	-5.0
1973-74	4.5	4.4	7.2
1974-75	1.1	2.9	-1.5
1975-76	9	2.1	12.9
1976-77	1.2	8.7	-5.7
1977-78	7.4	6.2	10.0
1978-79	5.5	12.3	2.3
1979-80	-5.2	-3.2	-12.7
1980-81	7.2	0.19	12.8
1981-82	5.9	8.0	5.3
1982-83	3.0	6.6	-0.6
1983-84	7.7	10.1	9.5
1984-85	4.3	6.5	1.4
1985-86	4.4	3.9	0.7
1986-87	4.3	6.9	-0.6
1987-88	3.8	7.3	-1.3
1988-89	10.4	8.8	15.4
1989-90	6.7	11.7	1.4
1990-91	5.5	6.0	4.1
1991-92	1.3	-3.6	-1.5

Source: Central Statistical Organisation (CSO)

Dua and Banerji (2012) identified business cycle monthly chronology for India using the classical approach. The authors identified periods of expansion and contraction based on the consensus of cyclical co-movements in the broad measures of output, income, employment and domestic trade measures. The authors constructed a coincident indicator using gross domestic product, general index of monthly industrial production, wages to workers in factory sector, monthly registered unemployed and Industrial production of consumer goods. The periods of contraction identified are: December 1964-November 1965, May 1966-April 1967, July 1972-May 1973, December 1973-February 1975, May 1979-March 1980 and April 1991-September 1991. The chronology of turning points by Dua and Banerji (2012) is also part of

the Economic Cycle Research Institute (ECRI) chronology for India.

Mall (1999) used the growth cycle approach to examine the cyclical behaviour of the Indian economy since 1950. The author identified six sets of turning points in Index of industrial production (IIP (Manufacturing)) as the peaks and troughs of the cycle in the period.

Mohanty *et al.* (2003) identified 13 growth cycles of varying durations during the period 1970-71 to 2001-02 using monthly Index of industrial production (IIP) series. The computation of cycles are based on the dates identified using the Bry-Boschan algorithm.

Chitre (2004) identified turning points in an index based on 94 monthly series for the period 1951-1982. After considerable experimentation, 11 monthly economic indicators are selected to determine the reference dates in India's overall economic activity. The author identified 8 peaks and 8 troughs using this index of 11 series.

The literature identified some common periods of contraction⁴ and deceleration⁵ for the period 1950-1991.

1. 1957-58 is identified as an year of contraction by Patnaik and Sharma (2002) and as a period of deceleration by Mall (1999) and Chitre (2004).
2. 1965-66 is identified as an year of contraction by Patnaik and Sharma (2002) and as a period of deceleration by Mall (1999) and Chitre (2004).
3. 1972-73 is identified as a period of contraction by Dua and Banerji (2012) and as a period of deceleration by Mohanty *et al.* (2003).
4. 1979-80 is identified as an year of contraction by Patnaik and Sharma (2002) and as a period of deceleration by Mall (1999), Mohanty *et al.* (2003) and Chitre (2004).
5. 1991-92 is identified as a period of contraction by Patnaik and Sharma (2002) and Dua and Banerji (2012).

The major drivers of fluctuations in the pre-nineties period were:

Agricultural growth : In the pre-nineties period, a good year was one with a good monsoon and a downturn was generally about a bad monsoon. These developments played out over a short horizon of one or

⁴Periods of contraction (decline in the level of output) are identified from studies using the classical approach.

⁵Periods of deceleration (slowdown in the rate of growth) are identified from studies using the growth or growth rate cycle approach.

two years. Output fluctuations were an outcome of uncorrelated monsoon shocks (Shah, 2008). India did not have a conventional business cycle. Table 3 shows the composition of GDP. Table shows that in 1951, agriculture contributed a sizeable proportion of GDP. Till the end of 1970's, agriculture accounted for upto 40% of output. Thus the fluctuations in GDP in the pre-nineties period was primarily driven by monsoon shocks.

Table 3 Changing composition of GDP ^a

	Agriculture	Industry	Services
1951-52	53.1	16.5	30.2
1992-93	28.8	27.4	43.8
2009-10	14.6	28.4	57.0

^a1951-52 represents the period from April 1951 to March 1952 and similarly for other years.

Restrictive economic policy : The economic policy landscape was characterised by an array of licenses and quotas that constrained output growth and expansion. These restrictions restricted the scope for private sector participation in business and prevented the interplay of investment-inventory fluctuations that is the basis of business cycle fluctuations.

1. Tariff and non-tariff barriers on imports: Import duties were amongst the highest in the world, with duty rates above 200% being fairly common. The restrictive approach towards imports is evident from the fact that in 1990-91, the import-weighted average rate of tariff for all imports was as high as 87% (Kotwal *et al.*, 2011; Ahluwalia, 1999). In addition to tariff barriers, a system of import licenses restricted the amount that could be imported.
2. Restrictions on private investments: Private investments were restricted through an investment licensing regime under which Central government permission was needed for investment by incumbents as well as by prospective entrants. In addition, industrial groups that were designated as 'large' could not expand without permissions that had to be obtained under the Monopolies and Restrictive Trade Practices (MRTP) Act. Some industry segments were 'reserved' for production by small-scale units to protect them from competition from large-scale units. Price and distribution

controls were often applied to industries such as steel, cement, fertilizers, petroleum and pharmaceuticals (Kotwal *et al.*, 2011).

While there were restrictions on imports and private sector investment, the prominent source of investment was public sector investment in the form of plan expenditure, which did not show any cyclical fluctuations. There were controls on capacity creation.

3. Restrictions on foreign investment: Until 1991 India followed a restrictive regime towards foreign direct investment. FDI was perceived as a means of acquiring industrial technology. Further, there were restrictions on the rate of royalty payments and technical fees. The erstwhile foreign investment law stipulated foreign firms to have equity holding only up to 40 per cent with exemptions granted at the government's discretion (Nagaraj, 2003).

3 Indian business cycles: 1991 onwards

3.1 Radical changes at the turn of the 1990th

The period from 1989 onwards was marked with a series of developments that shocked the economy further.

1. The break up of the Soviet Union: Soviet Union was India's significant trading partner in the eighties. In fact it emerged as the largest trading partner and the biggest destination of India's exports in the first half of the eighties decade. A significant proportion of capital goods imports from the erstwhile USSR was financed through long-term trade credits. These arrangements came to a halt, resulting in an increase in the repayment burden.
2. Iraq-Kuwait war: India depended on Kuwait and Iraq for its crude oil supplies. The invasion of Kuwait by Iraq at the beginning of August 1990 resulted in an increase in crude oil prices. India's oil import bill increased by about 60 per cent in 1990-1991.
3. Political uncertainty: The political uncertainty caused by frequent changes in Government during this period hampered the implementation of effective policy response.

The immediate cause was the Gulf war in 1990-91 which led to a surge in oil prices and India's import bill (Acharya, 2002).

3.2 The Balance of Payments crisis in 1990-91

India faced a severe Balance of Payments crisis in the early nineties. While the crisis hit India in 1990-91, it had been building for half a decade prior to the crisis year. The fiscal deficit was rising and exchange rate rigidity⁶ led to a rise in current account deficit. The restrictive framework governing foreign investments resulted in current account deficit translating into rising levels of external debt. A quick snapshot of the key macroeconomic indicators revealed that the situation was acute:⁷

1. The year 1990-91 ended with a fiscal deficit of 8.4% of GDP.
2. As a consequence of the increase in the import bill for crude oil and petroleum, imports in rupee terms rose by 21.9% as against an increase of 17.5% in the case of exports in 1990-91.
3. The trade deficit widened substantially. Combined with loss of remittance from West Asia in particular Iraq and Kuwait and a decline in non-resident deposits, the foreign exchange reserves got depleted from Rs 50.5 billion at the beginning of August 1990 to Rs 43.8 billion at the end of March 1991. The decline in reserves would have been much greater had the Government not resorted to borrowing from the IMF.⁸
4. Inflation surged to double digit in 1990-91

Most of the major industries recorded a lower growth in 1991 as compared to 1990. Three categories of industries: capital goods, consumer goods, and export-oriented industries were particularly affected. Capital goods industries suffered due to a decline in Government investment, consumer durables suffered owing to high cost of imported inputs, and export-oriented sectors suffered owing to collapse of demand in the market in erstwhile Soviet Union. However the infrastructure sector particularly the railways and coal production witnessed a respectable growth. Financial and transport services did

⁶India followed a fixed exchange rate regime administered by the Central Bank.

⁷Source: See (Ministry of Finance, Government of India, a)

⁸The first recourse was made during July-September when India drew Rs 11.7 billion which constituted 22% of India's quota and could be drawn upon without any obligations. This was followed by another recourse when Rs 33.3 billion were borrowed under the Compensatory and Contingency Financing Facility.

well, as a result we see a decline in GDP growth but not a steep contraction in the crisis hit year of 1991-92 (Ministry of Finance, Government of India, b). Clearly there was a need for effective reforms to address the problems that led to the emergence of chronic balance of payments crisis.

3.3 Reforms to address the crisis

To address the crisis like situation a series of reforms towards a market oriented economy were introduced. The government recognised that correcting the macroeconomic imbalances and replacing the myriad system of controls with the discipline of deregulation and competition could help in overcoming the crisis. The political establishment recognised that the Balance of Payments could be put on a sustained path through liberalisation of trade and investment flows. Some of the key reforms introduced in the early nineties were:

1. Devaluation and transition to a market determined exchange rate: This was achieved through a phased approach: a) A dual exchange rate system in the initial two years and b) a move to an integrated, market based exchange rate system in 1993-94.
2. Phased reduction of peak import duties: The peak rate of import duties was as high as 300% in 1990-91. In addition a vast array of general, specific and end-use exemptions were built in as part of the trade policy regime. The subsequent years were marked by a progressive reduction in peak custom duties to 40% in 1997-98 and further to 10% by 2007-08 and gradual elimination of exemptions.
3. Policies to encourage foreign direct and portfolio investment: The approach favoured liberalisation of external flows towards foreign direct investment (FDI) and foreign portfolio investment (FPI) while restricting debt, particularly the short-term debt flows. The foreign direct investment upto 51% foreign equity was allowed under the automatic route for a number of sectors. In parallel, a liberalised regime governing foreign portfolio investment was put in place. It was thought that the flow of foreign equity would help in developing the domestic equity market, by stimulating competition. Foreign portfolio investments were allowed up to 24% of the total equity of any company.
4. Abolition of industrial licensing and greater role for private sector participation: The licensing regime was considerably liberalised. Under the New Industrial Policy of 1991 no licenses were required for setting

up new industrial units or for substantial expansion in the capacity of the existing units, except for a short list of industries relating to country's security and strategic concerns, hazardous industries and industries causing environmental degradation. The New Industrial Policy also stressed on greater role for private sector participation through reduced reservation for public sector.

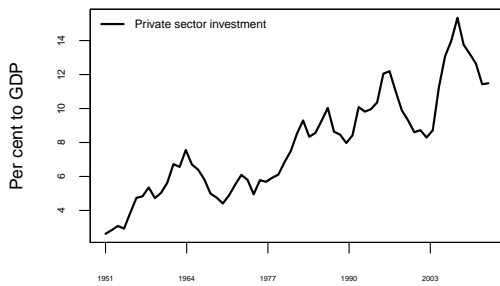
5. Gradual liberalisation of interest rates: In the pre-liberalisation period, the interest rate structure in India was highly regulated and controlled by the Government. Government propounded the philosophy of subsidised credit to certain sectors. Further Government directed banks to invest a mandated proportion of their deposits in Government securities. Referred to as the Statutory Liquidity Ratio (SLR), it was as high as 40% in the pre-liberalisation period. Expert Committees set up to propose reforms to the financial sector recommended that banks should be given greater freedom to determine the interest rates. Further financial repression through SLR and directed priority sector lending should be progressively reduced. In the post-liberalisation period, we have seen phased reduction of SLR and a move towards market-based determination of interest rates.
6. Setting up of Securities and Exchange Board of India (SEBI) as capital market regulator and decontrol of Government over raising of capital by companies. Prior to 1992, the pricing of capital issues was controlled by Controller of Capital Issues (CCI). The CCI granted approval for issue of securities and also determined the amount, type and price of the issue.

The CCI was abolished with the introduction of Securities and Exchange Board of India (SEBI) with the prime objective of protecting the interests of investors in securities, promoting the development of, and regulating, the securities market. Under the liberalised regime, the companies could issue securities directly in the market provided they followed guidelines related to disclosure and investor protection.

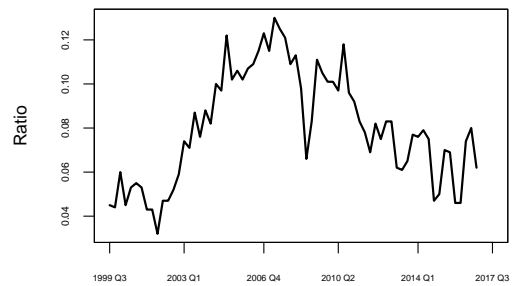
With eased controls on capacity creation and dismantling of trade barriers, private sector investment as a share of GDP has shown a significant rise. With reduced barriers, competition has increased. Profits are uncertain, and expectations about profit drive investment decisions, as is the case with firms in market economies. Since 1991, while India has seen a sharp increase in private corporate sector investment as a share of GDP, this share has shown sharp upswings and downswings. The first plot in Figure 1 shows the time series of private corporate gross fixed capital formation (GFCF) expressed

as a percent to GDP. In the mid-1990s, private corporate GFCF rose from 5% of GDP in 1991-92 to 9% of GDP. This fell dramatically in the business cycle downturn of 2000-03 and hovered around 5% of GDP. It again surged to 12-14% of GDP in the period 2005-07 before moderating in the recent years. Investment-inventory fluctuations are today central to understanding the emergence of business cycles in India. This is also reflected in the performance of firms. The second plot in Figure 1 shows the quarterly net profit margin of non-financial firms. The series exhibits business cycle fluctuations as opposed to short-lived shocks associated with monsoons (Shah, 2008). In contrast, the third plot shows the public sector capital formation (investment) as a percent to GDP. It was the dominant source of investment in the pre nineties period.

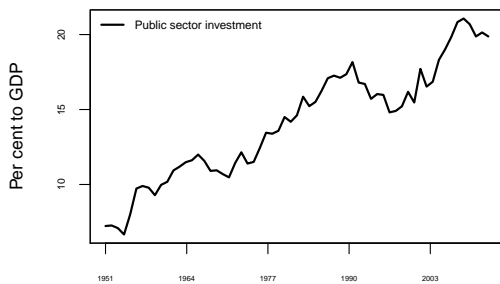
Figure 1 Gross fixed capital formation (private and public) and net profit margin of firms



Source: CSO



Source: CMIE Prowess



Source: CSO

3.4 Turning points

Table 4 shows the chronology of turning points using classical, growth and growth rate cycle approach at monthly frequency. In these studies either a

coincident index of monthly series or the monthly Index of Industrial Production (IIP) is used to arrive at the chronology of dates.

Table 4 Peak and trough dates in literature: 1991 onwards

Trough	Peak
Dua and Banerji (2012), classical approach	
September 1991	May 1996
November 1996	
Dua and Banerji (2012), growth rate cycle approach	
September 1991	April 1992
April 1993	April 1995
November 1996	September 1997
October 1998	March 2000
July 2001	April 2004
October 2004	October 2005
March 2006	January 2007
January 2009	March 2011
Mohanty (2003), growth cycle approach	
March 1993	November 1993
September 1994	May 1995
December 1995	August 1996
March 1998	November 2000
September 2001	

Dua and Banerji (2012) present monthly classical and growth rate cycle chronology for India. As far as the classical approach is concerned, we see an expansion in the first half of the nineties. A brief episode of contraction is seen from June 1996 to November 1996. The growth rate cycle approach identifies the periods of deceleration: May 1992 to April 1993, May 1995 to November 1996, and October 1997 to October 1998, April 2000 to July 2001, May 2004 to October 2004, November 2005 to March 2006 and February 2007 to January 2009.

Mohanty *et al.* (2003) present a growth cycle chronology using the monthly index of industrial production (IIP) series. The periods of deceleration identified are: December 1993 to September 1994, June 1995 to September 1995, September 1996 to March 1998 and December 2000 to September 2001.

The classical approach identifies the first half of the nineties decade as a period of expansion. The growth rate cycle approach also identifies the period from 1993-95 as a period of accelerated growth. The second half of the nineties see a combination of some brief spells of acceleration and deceleration in growth.

3.5 Methodology to identify turning points from 1996 onwards using GDP

In our analysis we use the quarterly GDP series to identify the chronology of turning points (Pandey *et al.*, 2017). We believe that the quarterly real GDP series is a better measure of the business cycle conditions since it is an aggregate of agriculture, industry and services.

The Indian GDP series at quarterly frequency is available from 1996 April-June onwards. In the Indian data, we do not see an absolute decline in levels of our proxy series: quarterly GDP. We use the growth cycle approach for establishing the turning points chronology. A brief description of methodology is presented below:

1. Seasonal adjustment: The first step is to adjust the series for seasonal fluctuations. In India, the official statistics do not feature seasonal adjustment. We seasonally adjust the series using the X-13-ARIMA-SEATS seasonal adjustment program using the steps developed in Bhattacharya *et al.* (2016).
2. Extraction of cycles: The next step is the extraction of the cyclical component. The seasonally adjusted series is filtered to extract the cyclical component.

One tool that is widely used for this purpose is the Hodrick-Prescott filter. In recent years, it has become increasingly clear that this filter, while elegant and readily implemented, has important shortcomings. The business cycle facts that emerge from HP-filtered data are sensitive to the different values of the smoothing parameter (Bjornland, 2000). Alp *et al.* (2011) find that the choice of the smoothing parameter (λ) in the HP filter has important implications for the volatility of the trend term and average business cycle length observed in the data. Hamilton (2016) shows that the HP filtered series produces spurious dynamic relations that have no relation with the underlying data-generating process. The literature has increasingly come to rely on alternatives to the HP filter.

The workhorses of the literature are the band-pass filters proposed by Baxter and King (1999) and Christiano and Fitzgerald (2003). Band-pass filters eliminate slow moving trend components and high frequency components while retaining the intermediate business cycle fluctuations. These filters approach the de-trending and smoothing problem in the frequency domain.

In a recent advance, Hamilton (2016) proposes a simple and robust estimator of the cyclical component. This is based on an estimate of an OLS regression of y_{t+h} on a constant and the 4 most recent values of y as of date t . Hamilton (2016) shows that the residual from this regression provides a reasonable de-trended approximation for a broad class of underlying processes. The residuals from the following OLS regressions:

$$y_{t+h} = \beta_0 + \beta_1 y_t + \beta_2 y_{t-1} + \beta_3 y_{t-2} + \beta_4 y_{t-3} + v_{t+h}$$

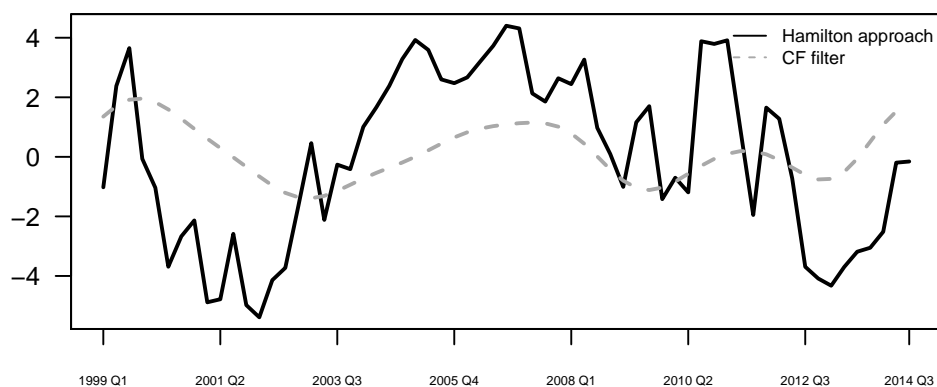
are the cyclical component of the series:

$$\hat{v}_{t+h} = y_{t+h} - \hat{\beta}_0 - \hat{\beta}_1 y_t - \hat{\beta}_2 y_{t-1} - \hat{\beta}_3 y_{t-2} - \hat{\beta}_4 y_{t-3}$$

In our work, we use the asymmetric Christiano-Fitzgerald filter (CF) to isolate the trend and cyclical component. The cyclical component is standardised before the application of the dating algorithm.

In addition, we also use the methods of Hamilton (2016). Figure 2 superposes the cycles extracted from the CF filter and the Hamilton (2016) methodology. We get broadly similar turning points through the cycles extracted by the two methods.

Figure 2 GDP cyclical component: CF filter and Hamilton method



- (a) Some observations are lost since we do lagged regression to extract the cyclical component using the Hamilton procedure;
- (b) The quarter designation is based on calendar year convention. As an example Q1 refers to January-March, Q2 refers to April-June.
-

3. The dating algorithm: The standardised cyclical component forms the input series for the application of the dating algorithm by Bry and Boschan (1971). The procedure was subsequently improved by Harding and Pagan (2002). The application of the dating algorithm gives us dates of peaks and troughs along with some summary statistics about the cycles.⁹

3.5.1 Quarterly growth cycle turning points

We use the quarterly GDP series (Base year 2004-05) to identify the chronology of business cycle turning points.¹⁰ With chain-linking, this series is available from 1996-Q2 (Apr-Jun) to 2014-Q3 (Jul-Sep).

First, we extract the cyclical component of GDP using business cycle periodicity of 2-8 years as the typical duration of business cycles identified by the NBER is 2-8 years or 8 to 32 quarters (King and Watson, 1996).¹¹ We then apply the dating algorithm by Harding and Pagan (2002).

Figure 3 and Table 5 show three episodes of deceleration in the economy during the period 1996-2014. Using GDP as the reference series, the first episode of deceleration was in the period: 1999-Q4 to 2003-Q1, the second deceleration was in the period 2007-Q2 to 2009-Q3, and the third deceleration in the period 2011-Q2 to 2012-Q4.¹²

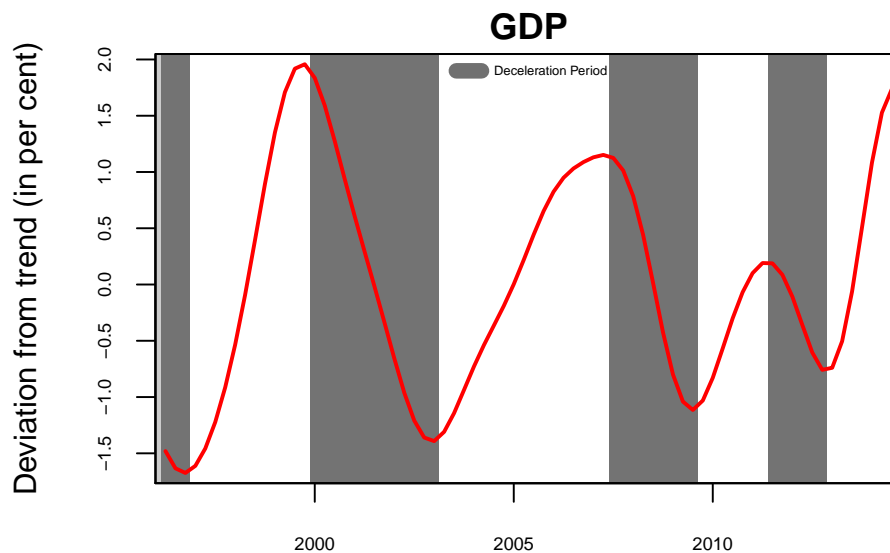
⁹See Appendix A for a description of the procedure used by the dating algorithm.

¹⁰The Central Statistical Organisation revised the GDP series with a new base year of 2011-12. The revised series is available only from 2011-Q2. Hence we stick to the series with the old base year for our analysis.

¹¹Some papers tweak the upper or lower bound of the length of the cycle. For example Agresti and Mojon (2001) allow the upper bound on the length of the business cycle to be 40 quarters (10 years) instead of 32 quarters (8 years) depending on the observed length of the business cycle in European countries.

¹²Since the series begins from 1996 onwards, we do not include the first phase i.e. from 1996 Q4 to 1999 Q3 in our formal analysis.

Figure 3 Turning points in GDP



Source: CSO and Authors' computation

Table 5 Dates of turning points in GDP and their summary statistics

This table shows the chronology of turning points using GDP as the reference series. It also shows the summary statistics of the turning points.

Phase	Duration (in quarters)		Amplitude (in per cent)	
Acceleration	1996-Q4	1999-Q3	12	3.6
Deceleration	1999-Q4	2003-Q1	13	3.3
Acceleration	2003-Q2	2007-Q2	17	2.5
Deceleration	2007-Q3	2009-Q3	9	2.3
Acceleration	2009-Q4	2011-Q2	7	1.3
Deceleration	2011-Q3	2012-Q4	6	0.9
	Average duration (in quarters)		Average amplitude (in per cent)	
Acceleration	12		2.5	
Deceleration	9.3		2.2	

Here Q1, Q2, Q3, Q4 follow the calendar year convention. Q1 refers to January-March, Q2 refers to April-June, Q3 refers to July-September and Q4 refers to October-December.

Table also shows the average amplitude and duration of phases of acceleration and deceleration extracted from these dates. The average duration of acceleration is 12 quarters and the average duration of deceleration is 9 quarters. The average amplitude of acceleration is seen to be 2.5% while the average amplitude of deceleration is 2.2%.

4 Description of acceleration and deceleration phases

4.1 The decade of nineties

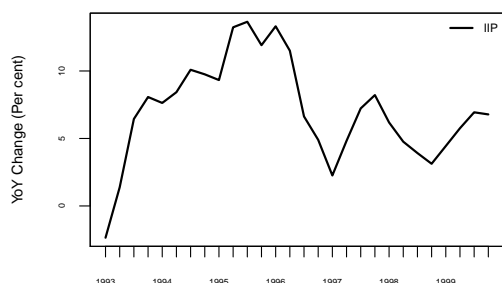
Against the backdrop of the reforms, (discussed in Section 3.3) the external and real sector witnessed a sharp turnaround. Table 6 shows a spurt in growth in GDP and its components in the initial post crisis years. Figure 4 shows a sharp growth in industrial production and exports during the initial years of the nineties. The initial post crisis years saw a sharp growth in IIP with growth peaking at 13.7% in mid 1995. Export growth surged to 20% in 1993-94.

Table 6 Growth rate in GDP and its sectors

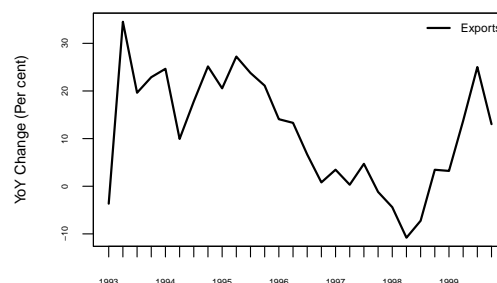
This table shows the growth rate in GDP and its sectors in the nineties. The table shows a pick-up in growth rate during the initial post-crisis years from 1992-1996. Since 1997 a broad-based moderation is seen in growth rates for overall GDP, agriculture and industrial GDP.

Year	GDP	Agriculture	Industry	Services
1991-92	1.4	-2.0	0.3	4.7
1992-93	5.4	6.7	3.2	5.7
1993-94	5.7	3.3	5.5	7.4
1994-95	6.4	4.7	9.2	5.9
1995-96	7.3	-0.7	11.3	10.1
1996-97	8.0	9.9	6.4	7.5
1997-98	4.3	-2.6	4.0	8.9
1998-99	6.7	6.3	4.2	8.3
1999-00	7.6	2.7	6.0	11.2

Figure 4 Industrial production and exports (in nominal terms) in the nineties



Source: CSO



Source: Ministry of Commerce and Industry

The external debt indicators also witnessed an improvement (Table 7). The external debt stock to GDP ratio improved from 38.7% in 1991-92 to 30.8% in 1994-95 and further to 22% in 1999-00. The ratio of short-term debt to total debt declined from 8.3% in 1991-92 to 4.3% in 1994-95 to 4% in 1999-00. Ratio of foreign exchange reserves to total debt and the ratio of short-term debt to foreign exchange reserves also witness an improvement in the nineties.

Table 7 External debt indicators in the nineties

This table shows the key external debt indicators in the nineties. One of the outcomes of the reform measures introduced in the nineties was the improvement in the external debt indicators.

Year	External debt to GDP (%)	Ratio of short-term debt to total debt	Ratio of foreign exchange reserves to total debt	Ratio of short-term debt to foreign exchange reserves
1991-92	38.7	8.3	10.8	76.7
1992-93	37.5	7.0	10.9	64.5
1993-94	33.8	3.9	20.8	18.8
1994-95	30.8	4.3	25.4	16.9
1995-96	27.0	5.4	23.1	23.2
1996-97	24.6	7.2	28.3	25.5
1997-98	24.3	5.4	31.4	17.2
1998-99	23.6	4.4	33.5	13.2
1999-00	22.0	4.0	38.7	10.3

Source: India's external debt: A status report 2014-15, Ministry of Finance. Government of India

Aggregate savings and investments were also buoyant during the first half of the nineties. Gross domestic savings as a percent to GDP rose from 21.3 in 1991-92 to 24.2% in 1997-98. Similarly gross domestic capital formation rose from 22.5% in 1991-92 to reach a peak of 26.1% in 1995-96 before slowing down to 22% in 1996-97.

The year 1997 saw a moderation in India's growth. (Acharya, 2012).¹³ GDP growth moderated to 4.3% in 1997-98 from 8% in 1996-97. Agriculture and industrial growth also slowed down in 1997-98. The growth in industry fell to 4% in 1997-98 from 6.7% in the previous year. Figure 4 shows a slump in industrial production and exports in 1997. The moderation seen from 1997-98 onwards could be attributed to the investment boom of the previous years that had built up large capacities, which discouraged further expansion. Another reason could be the advent of coalition governance that dampened business confidence. The massive depreciation of the Thai Baht in July 1997 which triggered the South-East Asian financial crisis also had a limited impact on the economy. India faced some fall in exports to the South-East Asian economies but given that these countries share in India's exports and imports was around 2-3%, the impact was not substantial. Another transmission channel was through exchange rate. There were periods of exchange rate depreciation and rise in volatility towards the end of 1997 and the beginning of 1998. However the Reserve Bank of India (RBI) intervened to arrest the excessive volatility of the rupee-dollar exchange rate. In addition a series of monetary tightening measures were introduced to stabilise the rupee.¹⁴

4.2 The phases of acceleration and deceleration from 1999 onwards

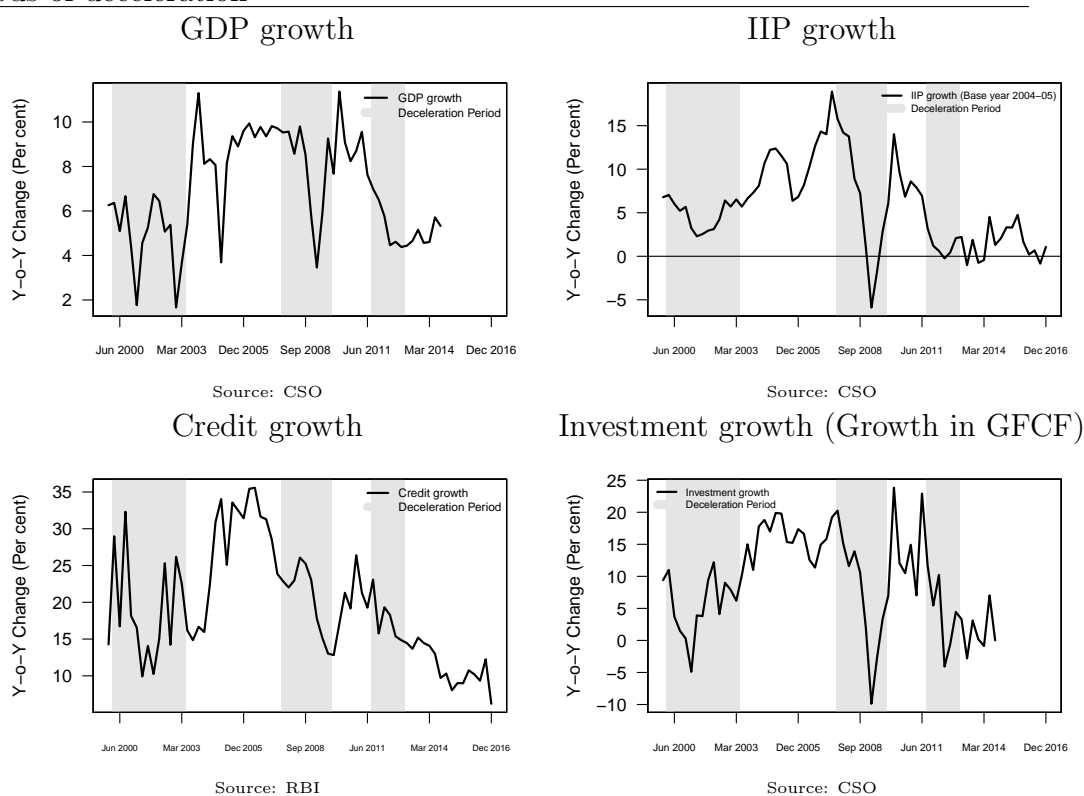
Figure 5 shows the performance of key macroeconomic variables during the three identified periods of deceleration. The shaded portions show the period of deceleration identified in the cyclical component of GDP. The first figure in the first row shows the year-on-year change in GDP growth. The year-on-year growth shows sharp moderation during the three shaded periods of deceleration from 1999 Q4 to 2003 Q1, from 2007 Q2 to 2009 Q3, and from 2011 Q2 to 2012 Q4. The second figure in the first row shows the year-on-year growth in IIP. The growth in IIP also shows a decline during the

¹³Table 5 shows slowdown from 1999-Q4 through the growth cycle approach. Since the data is available from 1996-Q2, the growth cycle algorithm identifies the initial quarters as a period of upswing and from 1999-Q4 we see a deceleration. However in the annual data of GDP growth we see a moderation starting from 1997-98 compared to the preceding years (See Table 6).

¹⁴Indian economy was largely unaffected by the onslaught of the crisis because a) The short-term external debt was under tight control, b) Resident firms and individuals were subject to strict capital controls, c) A series of financial sector reforms were undertaken in the period 1992 to 1997 which had helped to strengthen the financial sector. d) Prudential limits on exposure of financial intermediaries to stocks and real estates helped reduce systemic risk concerns.(Acharya, 2012).

shaded periods of deceleration. Similar trend is seen in credit growth and investment growth. Both the series show considerable decline during the shaded periods of deceleration. The above analysis shows that the trends in standard indicators conform to the chronology of deceleration.

Figure 5 Slowdown in macro-economic variables during the identified periods of deceleration



1999-Q4 to 2003-Q1 deceleration : Table 8 shows the performance of key macro-economic indicators during the period 2000-03. GDP growth slowed down from 7.6% in 1999-00 to 4.3% in 2000-01. The ratio of gross fixed investment to GDP was lower than the ratio of savings to GDP. With low private investment demand, foreign investment was sought to improve the investment climate. However in the aftermath of the Asian financial crisis, FDI inflows did not gain momentum. The bursting of the dot-com bubble, and the brief decline in software export growth after the “Y2K”¹⁵ problem also contributed to the slowdown

¹⁵Y2K was identified as a computer bug because of the practice of representing a year as two digit number by programmers, so years like 2019 and 1919 were hard to distinguish. It causes some date bugs in computer programs.

(Nagaraj, 2013). On the whole, the macro-economic conditions were largely moderate. But conditions began to look positive from 2003 onwards.

Table 8 Key macro-economic conditions in 2000-03

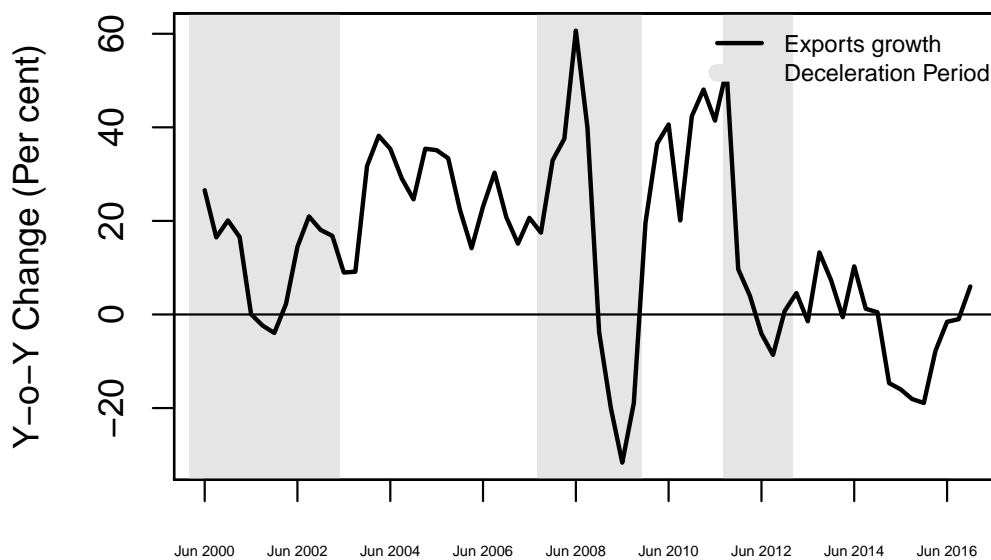
This table shows the growth rate in GDP, gross fixed investment as a ratio to GDP and savings as a ratio to GDP during 2000-03 period. We see a moderation in GDP growth rate. Broadly, the savings rate exceeded the investment rate in this period.

	1999-2000	2000-01	2001-02	2002-03
Annual GDP growth rate	7.6	4.3	5.5	4.0
Gross fixed investment (GFCF) (As % to GDP)	24.1	22.8	25.1	23.7
Savings (% to GDP)	25.7	23.8	24.9	25.93

2003-Q2 to 2007-Q2 acceleration : The economy witnessed an upswing in the cycle, primarily led by high credit growth during this period when firms borrowed and initiated a number of projects. What triggered this boom? From 2001 to 2004, Reserve Bank of India (RBI) engaged in sterilised intervention. In early 2004, it ran out of bonds. This period was marked by currency trading that was not backed by sterilisation. Without sterilisation dollar purchases resulted in injection of rupee in the economy. The economy became flush with funds, interest rates went down. This kicked off a bank credit boom from 2004 to 2007. The third graph of Figure 5 shows a surge in credit growth between 2004 to 2007. The credit growth reached a peak of 40% during this period. GDP growth remained strong at 8-10% during this period. The upswing was also driven by a boom in investment and a revival of foreign capital inflows that had moderated after the Asian financial crisis.

2007-Q3 to 2009-Q3 deceleration : Global financial crisis affected India through trade and financial linkages. Export growth saw a sharp deceleration in this period (Patnaik and Shah, 2010; Patnaik and Pundit, 2014) (See Figure 6). This could have been the result of greater synchronisation of domestic cycles with global cycles (Jayaram *et al.*, 2009). The immediate transmission of the financial crisis to India was through a slowdown of credit flows which was reflected in the spiking of overnight call money rates that rose to nearly 20 per cent in October and early November 2008. Investment growth also slowed down in 2008-09 (See the fourth graph of Figure 5).

Figure 6 Slowdown seen in merchandise exports (Y-o-Y growth rate) in 2008-09



Source: Ministry of Commerce & Industry

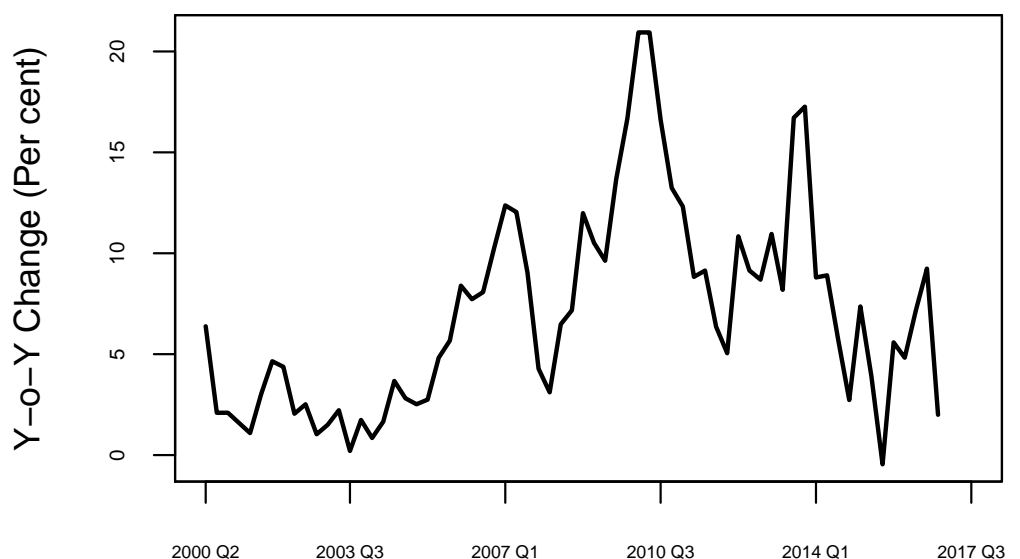
2009-Q4 to 2011-Q2 acceleration : We saw a business cycle upswing in 2009. GDP growth recovered to 8.6% in 2009-10 from 6.72% in 2008-09. The growth further strengthened to 8.9% in 2010-11. The acceleration was an outcome of a coordinated monetary and fiscal policy stimulus package announced in 2008-09. For example, the government introduced fiscal stimulus in the form of tax cuts and increased expenditure to boost consumer demand and production in key sectors.

The Fiscal Responsibility and Budget Management (FRBM) Act, 2003, (according to which, the government is required to follow fiscal prudence to reduce its deficits to a target rate), was suspended in 2009 in order to accommodate the stimulus policies. On the monetary side, the Reserve Bank of India introduced measures, such as rate cuts, to boost liquidity and ease credit in order to boost investment. The rate cut cycle began in October 2008 and continued till March 2010. Guidelines for External Commercial Borrowing were also liberalised to ease firms' access to external finance (Patnaik and Pundit, 2014).

2011-Q3 to 2012-Q4 deceleration : Since 2011, again, we saw a business cycle slowdown. GDP growth plummeted to 6.7% in 2011-12 and further to 4.5% in 2012-13. This was a culmination of a number of factors.

The macroeconomic policy stimulus intended to cushion the fallout of crisis, culminated in high inflation and current account pressures. The quality of the fiscal stimulus, which focused on tax cuts and increased revenue expenditure, added to demand pressures, resulting in high inflation. The efficacy of monetary policy in dealing with inflation was blunted by persistent rise in food prices (Bhattacharya and Sen Gupta, 2015). Figure 7 shows the year-on-year growth in food prices. The Indian Central Bank followed a tight monetary policy during this period. From March 2011 to October 2011, the policy rate (the repo rate) was raised by 175 basis points from 6.75% to 8.5%.¹⁶

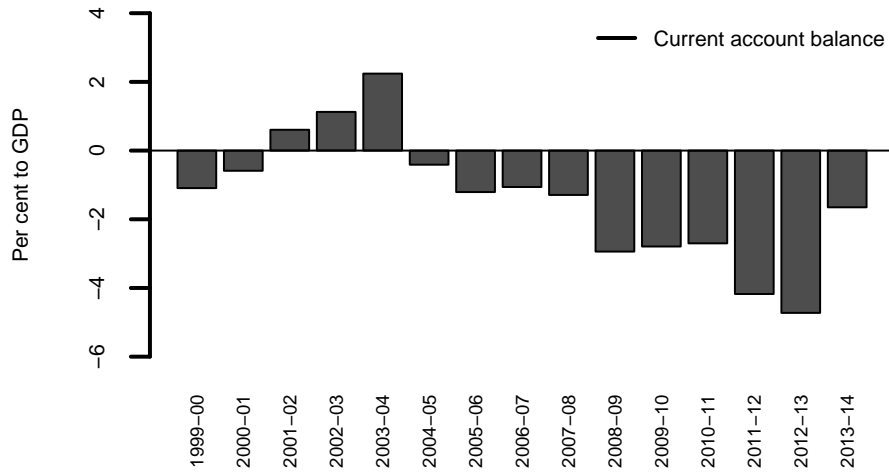
Figure 7 Rise in food prices in 2011-12



Inability to achieve fiscal consolidation coupled with surging current account deficit contributed to slowdown in the economy. The fiscal deficit as a ratio to GDP rose from 4.8% in the year ending March 2011 to 5.7% in the year ending March 2012. The current account as a percent to GDP also rose beyond comfort levels to 4.2% for the year ending March 2012 (See Figure 8). High domestic inflation (See Figure 9) and negative real interest rates on deposits encouraged gold imports thus adding to current account deficit pressures.

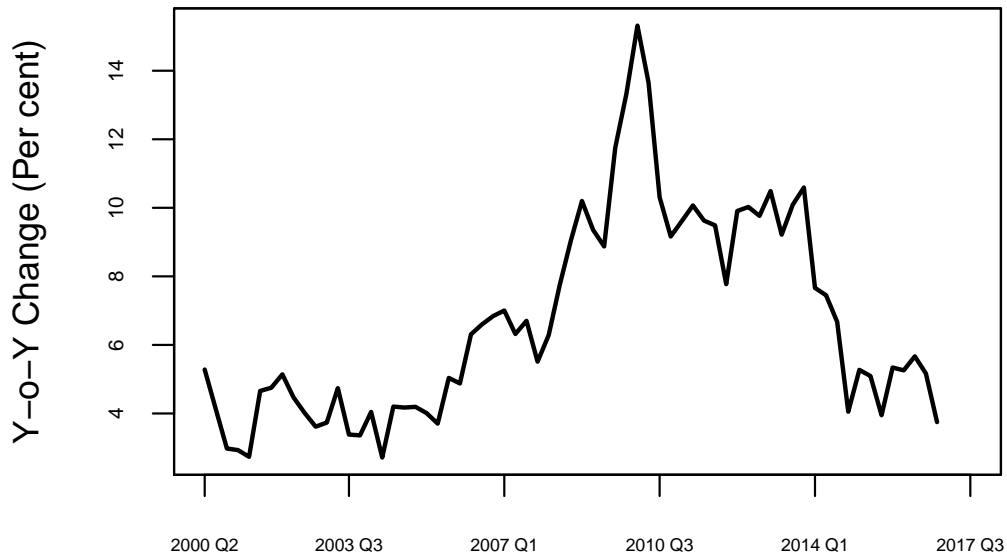
¹⁶See the RBI's monetary policy statements in 2011-12 at <https://www.rbi.org.in/scripts/Annualpolicy.aspx>

Figure 8 Surge in current account deficit as a ratio to GDP during 2011-12



Source: RBI for Current Account Balance; CSO for GDP

Figure 9 High domestic inflation from 2011 onwards averaging around 9%



A key manifestation of the growth slowdown was the weakness of the manufacturing sector during this time (See second graph of Figure 5). An explanation for the weakness in industrial activity can be traced

to the emergence of policy bottlenecks like obtaining environmental clearances, hurdles in land acquisition etc which resulted in stalling of a large number of projects (Mohan and Kapur, 2015).

5 Current cyclical conditions: Post 2012 Q4

The growth cycle chronology presented in the preceding section is based on the GDP series with base year 2004-05. In 2015, the Indian Central Statistical Office (CSO) introduced a new series of GDP with base year 2011-12, replacing the earlier series with 2004-05 as the base year.¹⁷ As a result, the GDP series with base year 2004-05 got discontinued since 2014 September. Our analysis using the old GDP series identifies a slowdown in the Indian economy till 2012 Q4. How has the economy fared since 2012? Has the deceleration phase identified till 2012 Q4 ended? Do we see signs of a pick up in growth in the last three years? While a systematic analysis of growth cycle turning points is not feasible as the span of the new GDP series is too short, we try to derive inferences by looking at some of the macroeconomic series. The analysis is based on variables expressed at quarterly frequency.

1. *Investment slump*: Two important components of demand in India are from investment and exports. Table 9 shows investment and exports as a percent to GDP. The table shows a consistent decline in the share of investment (as measured by gross fixed capital formation-GFCF) to GDP. The fourth plot of Figure 5 shows the year-on-year growth in quarterly gross fixed capital formation. The graph indicated slowing of investment growth.

Table 9 Investment and exports as a percent to GDP

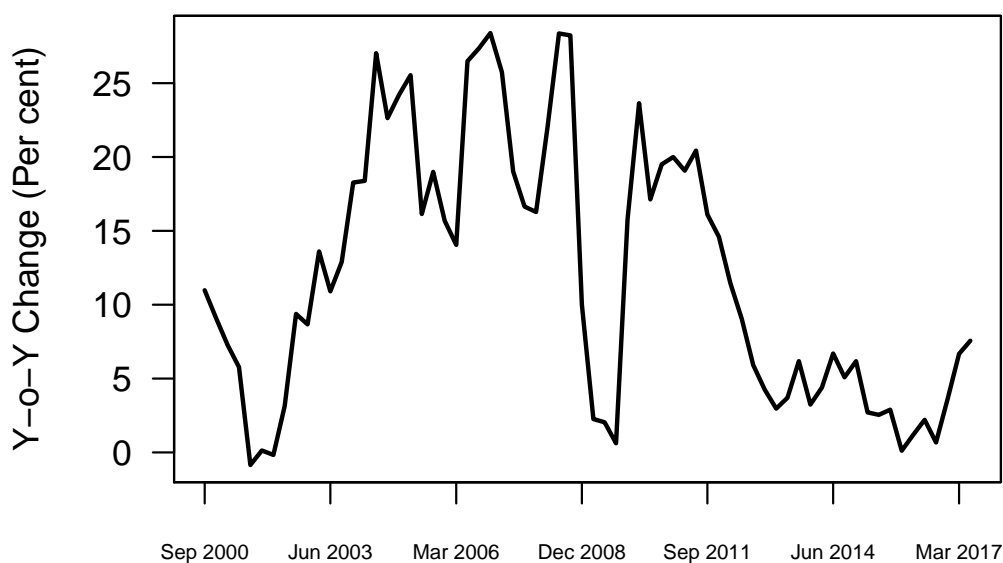
	GFCF	Exports
2011-12	34.3	24.5
2012-13	33.4	24.5
2013-14	31.3	25.4
2014-15	30.4	23.0
2015-16	29.3	19.9
2016-17	27.1	19.2

Source: CSO

¹⁷The new series has generated considerable debate amongst policy-makers, academicians and other stake-holders. For a discussion of the sources of debate please see Appendix B.

2. *Slowing credit off-take*: Another measure to gauge the performance of the economy is the credit demand. Since 2012, we have seen tepid growth in credit off-take from banks (See the third graph of Figure 5). The credit growth as measured through year-on-year growth slowed down to 13-14% in 2013 and 2014. Since the beginning of 2015, credit growth has plummeted further.
3. *Slowdown visible in corporate performance*: Signs of slowdown are also visible in corporate performance. An analysis of firms excluding those in finance and oil sectors shows that their sales growth has been moderating since the mid of 2012. Figure 10 shows the year-on-year growth in the net sales of non-oil, non-finance listed companies.¹⁸ The profit margins of firms tell a similar story. The second plot of Figure 1 shows a slide in profit margins of firms in this period. Here profit margin is computed as the ratio of profit-after-tax (PAT) to net sales of firms.

Figure 10 Deceleration visible in firms performance



Source: CMIE Prowess database

4. *Subdued exports*: Figure 6 shows the year-on-year growth in merchandise exports. The graph shows a tepid growth in merchandise exports.

¹⁸Finance companies have very different concepts underlying their accounting data, and are hence excluded. Oil companies sometimes experience very large jumps in their revenues owing to decisions by the government about administered prices. These fluctuations are not a feature of underlying business cycle conditions. Hence, oil companies are excluded.

Since the second half of 2016, we do see a recovery in exports. However given the subdued global demand conditions, it needs to be seen how far the recovery is sustainable.

As a percentage to GDP, exports have been falling. The second column of Table 9 shows that the share of exports in GDP has fallen from 24.5% in 2012-13 to 19.2% in 2016-17. The fall in exports is not limited to goods. India's services exports have also been falling primarily due to a slide in its software exports.

5.1 Drivers of deceleration post 2012

The decelerating conditions are an outcome of both domestic and external conditions.

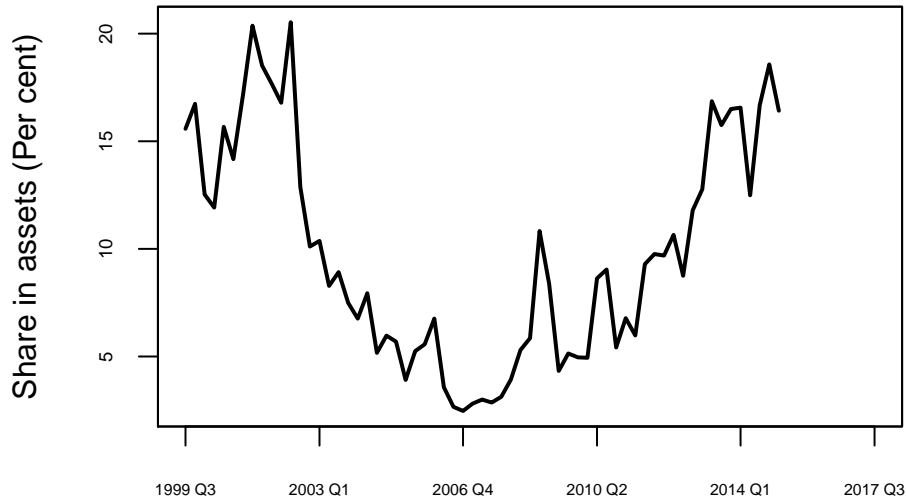
On the domestic front, an important dimension of this deceleration is the leverage of firms. From 2003-08, a lot of debt was taken on by firms. This is evident in the high credit growth seen in the third plot of Figure 5. It is likely that some of this credit was misallocated by banks who gave loans to firms without adequate due diligence. Some of these firms' profitability might have been adversely affected by the global financial crisis, and since 2011-12, the economy was hit by a deceleration. Deceleration hampered profitability of firms due to weakness in demand. For many firms, the combination of low profits and high debt has generated credit stress. A key measure of credit stress is the interest cover ratio (ICR). ICR is defined as the ratio of operating profits (PBDIT) to interest expenses. Credit stressed firms are defined as those whose ICR is less than 1 i.e. those firms whose interest expenses exceed their operating profits.

Our analysis of non-financial, non-oil listed firms shows that since 2012, the proportion of assets under credit stress has seen an increase as shown in Figure 11. The time period of the study is from September 1999 to March 2015.¹⁹ For each quarter we compute the ICR from the operating profits and interest expenses. Based on this, the firms with ICR greater than 1 are termed as *good companies* and those with less than 1 are termed as *stressed companies*. For each firm (good and stressed), we collate the data on their corresponding annual assets. This helps in understanding the distribution of total assets amongst good and stressed firms. We find that the proportion of assets owned by stressed firms has increased since 2012.

¹⁹We show this analysis till 2015 because the sample of firms who report their financial results drop dramatically in the recent quarters.

This implies that the credit stressed firms constitute a significant part of the total universe of non-financial, non-oil listed firms.

Figure 11 Proportion of assets held by credit stressed firms



Firms with credit distress are likely to have impaired investment activity which would result in lower capacity utilisation. To gauge the pulse of the Indian manufacturing sector, the RBI conducts *Order Books, Inventories and Capacity Utilisation Survey (OBICUS)*. A key variable measured through this survey is the capacity-utilisation of the manufacturing companies. Table 10 shows that the capacity utilisation rates have seen a decline since 2012 signalling presence of excess capacity in the manufacturing sector.

Table 10 Capacity utilisation in the manufacturing sector

Quarter	CU (%)
2012-Q1	78.4
2012-Q2	73.1
2012-Q3	73.3
2012-Q4	74.6
2013-Q1	78.0
2013-Q2	71.6
2013-Q3	72.8
2013-Q4	73.5
2014-Q1	76.1
2014-Q2	70.2
2014-Q3	73.6
2014-Q4	71.7
2015-Q1	74.0
2015-Q2	72.0
2015-Q3	71.1
2015-Q4	72.3
2016-Q1	74.4
2016-Q2	71.5
2016-Q3	71.0
2016-Q4	72.1
2017-Q1	74.1

Source: RBI

Stressed firms are likely to face difficulties in repaying loans to banks. On the supply side, an increase in the exposure of banks to stressed firms leads to surge in their non-performing assets. Surge in non-performing assets hamper their ability to advance loans to productive sectors, which leads to a further decline in investments.

On the external front, the slow and uneven recovery in advanced economies post the global financial crisis has weakened demand for emerging economy exports including those of India. The World Bank database²⁰, shows a moderation in world exports of goods and services as a percent to GDP since 2012. One of the key reasons for the slowdown in global trade has been the sharp decline in prices of crude oil and commodities such as base metals.

²⁰<http://data.worldbank.org/indicator/NE.EXP.GNFS.ZS>

6 Conclusion

India's analysis of business cycle measurement can be analysed into time-periods, from 1950-91 and from 1991 onwards. The nature of cyclical pattern is shaped by the economic structure and the policy environment in the two periods. In the first period, the economic fluctuations were driven by agricultural fluctuations and oil price shocks. The policy environment was characterised by restrictions to private sector growth and expansion. Foreign investment was also limited. As an outcome, we did not witness business cycle fluctuations in the conventional sense of the term.

In the early nineties, in response to the Balance of Payments crisis a series of reforms were taken to make the economy more open and market oriented. The policy environment became more amenable to private sector participation, import duties were reduced in a phased manner and foreign investment was allowed in a number of sectors. As a consequence of the changed policy environment, we saw the emergence of conventional business cycles.

We use quarterly GDP series for identifying the chronology of turning points. Since we do not see a decline in levels we use the growth cycle approach. The cyclical component of GDP is the input series for identifying the turning points. We identify three periods of deceleration: 1999-Q4 to 2003-Q1, 2007-Q3 to 2009-Q3 and 2011-Q3 to 2012-Q4. The Indian Statistical Office revised the GDP series in January 2015. The old GDP series used as the reference series for this analysis got discontinued since 2014 Q3. We find that the deceleration identified till 2012 Q4 is still visible in a number of key indicators such as investment, credit growth, exports and firm performance indicators.

A Detection of turning points using the dating algorithm

The Bry-Boschan (BB) and Harding Pagan (H-P) algorithms find the turning points as follows:

- The data is smoothed after outlier adjustment by constructing short-term moving averages.
- The preliminary set of turning points are selected for the smoothed series subject to the criterion described later.

- In the next stage, turning points in the raw series are identified taking results from smoothed series as the reference.

The identification of turning point dates is done subject to the following rules:

- The first rule states that the peaks and troughs must alternate.
- The second step involves the identification of local minima (troughs) and local maxima (peaks) in a single time series, or in y_t after a log transformation.
- Peaks are found where y_s is larger than k values of y_t in both directions.
- Troughs are identified where y_s is smaller than k values of y_t in both directions.
- Bry and Boschan (1971) suggested the value of k as 5 for monthly frequency which Harding and Pagan (2002) transformed to 2 for quarterly series.
- Censoring rules are put in place for minimum duration of phase (from peak to trough or trough to peak) and for a complete cycle (from peak to peak or from trough to trough).
- Harding and Pagan identify minimum duration of a phase to be 2 quarters and the minimum duration of a complete cycle to be 5 quarters.
- For monthly data, the minimum duration is 5 months and 15 months for phase and cycle respectively.
- The identification of turning points is avoided at extreme points.

B Appendix: Recent changes in the Indian GDP measurement

The business cycle chronology presented in the preceding section is based on the GDP series with base year 2004-05. In 2015, the Indian Central Statistical Office (CSO) introduced the new series of National Accounts Statistics with the base year 2011-12, replacing the earlier series with 2004-05 as the base year. In contrast to the earlier episodes of base year changes, this update was marked by changes to the methodology and data sources. The

Table 11 GDP and sub-sectors' growth rate

	Base year 2004-05		Base year 2011-12	
	2012-13	2013-14	2012-13	2013-14
GDP	4.4	4.7	4.9	6.6
Agriculture, forestry & fishing	1.4	4.7	1.7	3.8
Mining & quarrying	-2.1	-1.3	0.5	5.5
Manufacturing	1.1	-0.7	6.1	5.2
Electricity, gas & water supply	2.2	5.9	2.2	2.9
Construction	1.1	1.6	-4.3	2.5
Trade, hotels, transport, storage, communication	5.1	3.0	9.2	10.9
Financing, insurance, real estate & business services	10.9	12.8	8.9	7.9
Community, social & personal services	5.3	5.5	4.7	8.0

methodological changes were implemented to align the Indian National Accounts Statistics with international standards recommended by the System of National Accounts (SNA) 2008. The state of the economy is measured using Gross Value Added (GVA) at basic prices, in place of the earlier practise of measuring it using GDP at factor cost.

The key methodological refinement is seen in the manufacturing sector where the gross value addition is computed using comprehensive data sources such as the MCA-21.²¹ Despite methodological improvements, the revised series has attracted considerable debate amongst academicians, policy-makers and other stake-holders (Sapre and Sinha, 2016; EPW, 2015; Nagaraj, 2015a). In this section we discuss some concerns with the new series.

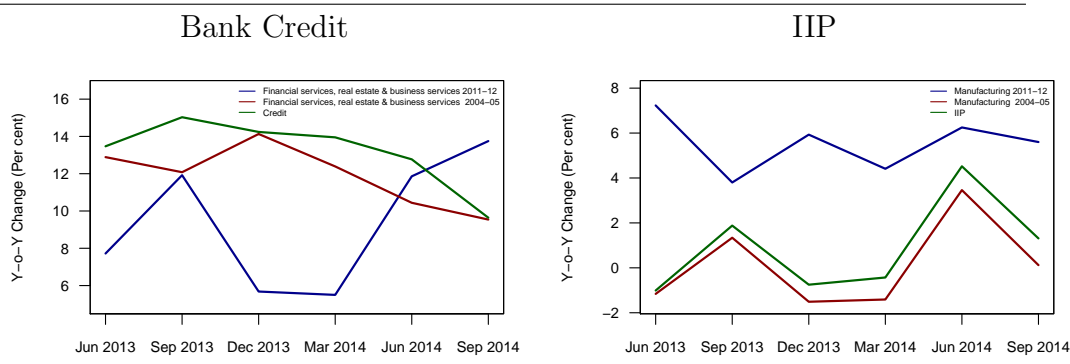
Changes in the sub-sectors' growth: Table 11 shows that there are striking changes in the sub-sectors' growth rate for the two intermittent periods when we have data from both the series. For instance, the growth rate of the gross domestic product (GDP) for 2013-14 according to the new series was 6.6%, compared to 4.7% in the earlier series. The greatest discrepancy is seen in the growth rates of manufacturing sector. According to the new series with base year 2011-12, the growth rate of manufacturing was 5.3% in 2013-14 while the old series shows a contraction in the manufacturing sector for the same year.

Disconnect between the high frequency indicators and the sectoral GVAs:

Due to changes in the methodology, the high frequency indicators which

²¹The MCA-21 is an electronic platform of the Ministry of Company Affairs created for companies to file their annual financial statements.

Figure 12 Comparison with high frequency indicators



conventionally mapped the trends in GDP sub-sectors, no longer seem to be in sync with the new sub-sectors' GVA. Figure 12 shows the discordant trends in the high frequency indicators and the related sub-sectors of GVA. Figure 12 shows that IIP is at odds with the movement of GVA in the manufacturing sector. Similarly bank credit data does not seem to be in sync with the new GVA of finance, insurance and real estate.

Choice of deflator: The estimates of real GVA in most advanced economies is arrived at using *double deflation*. In this method, nominal outputs are deflated using an output deflator, while inputs are deflated using a separate input deflator. Then, the real inputs are subtracted from real outputs to derive real GVA. But in India things are done differently. Here, we compute the nominal GVA, and then deflate this number using a *single deflator*.

If input and output prices are synchronous, both approaches will give similar results. But if the two price series diverge- as they have for the past few years in India- single deflation can overstate growth by a big margin (Sengupta, 2015).

Issues with manufacturing gross value-added: The manufacturing sector has been at the centre stage of the GDP debate.

1. Enterprise vs Establishment approach: In a major change in methodology, the data collection for GVA computation shifted from *establishment* or factories to *enterprise* or firms. Conceptualising value-addition at the enterprises level without clarity on measures of costs and output could lead to misleading estimates of GVA (Sapre and Sinha, 2016). The activities of *firms* can be much

more diverse than those of *factories*, and if all these go into the calculation of GVA, it could inflate the estimate of output.

2. Blowing up of GVA: GVA calculation involves identifying a set of “active companies” that have filed their annual returns at least once in past three years. The problem is that for any given year, information from several active companies remains unavailable till a cut-off date of data extraction. In such a case, the GVA of available companies needs to be “blown-up” to account for the unavailable companies. Literature has commented on a number of issues with the blowing-up method.

The year-wise number of available and active set of companies in the manufacturing sector is not publicly available, so the extent of blowing up is not known. Some experts have criticised the methodology of blowing-up. The critical input is the “blowing-up factor” which is the inverse of the ratio between the paid-up capital (PUC) for the available companies and that for the active set as a whole. Nagaraj (2015a) argues that this is inappropriate since a number of the companies in the “active set” could be shell companies-existing only on paper. This could overestimate gross-value added of the manufacturing sector.

3. Discrepancies in the underlying data sources: For the manufacturing sector, the GVA is derived from a combination of MCA-21 numbers, Index of Industrial Production (IIP) estimates and estimates of the unorganised sector from the Annual Survey of Industries (ASI). While the MCA-21 is a new database, the base year for the IIP data is still 2004-05. Also the data obtained from MCA-21 follows an “enterprise” approach as mentioned earlier, but the data obtained from ASI follows the old “establishment” approach. This could lead to misleading estimates of the GVA numbers (Sengupta, 2015).

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