Dating business cycles in emerging economies

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Concepts of cycles

1. Classical Cycle
2. Growth Cycle
3. Growth Rate Cycle

Growth cycle approach

- Appropriate for chronology.
- Not appropriate for real time analysis.

Concepts

- Business cycle periodicity
- Turning point characteristics
  - Phase: Peak to trough or trough to peak
    1. Duration: Number of periods from peak to trough or from trough to peak
    2. Amplitude: Maximum drop from peak (trough) to trough (peak) during episodes of slowdown (speed-up).
  - Cycle: Peak to peak or trough to trough

Conventional wisdom

- EM cycles are different (Rand and Tarp, 2002, Alp, 2012).
- EM cycles have shorter duration. (1.5-6 years).

New views

Emerging economy cycles are a heterogeneous lot.

- South Africa and Philippines experience long contractions. (Du Plessis, 2006)
- Latin America and Caribbean experience short duration and small amplitude (Caldentey, 2013).

US experience

Cycles change over time

Cycles	Peak to trough	Trough to peak	Trough to trough	Peak to peak
1854-2009 (33 cycles)	17.5	38.7	56.2	56.4
1854-1919 (16 cycles)	21.6	26.6	48.2	48.9
1919-1945 (6 cycles)	18.2	35.0	53.2	53.0
1945-2009 (11 cycles)	11.1	58.4	69.5	68.5

Over time

- Recessions are shorter.
- Cycles are longer.

Motivation

- EM structures have changed.
- Have cycles changed in response?
- Studies find stylised facts do change (Ghate et.al, 2013, Alp et.al 2012, Kose et.al, 2003).
- Have periodicity and turning point characteristics changed?

Main finding

- Notion of “EM cycle” is doubtful.
- Dating methodology should reflect changing nature of EM cycles.

Part I

Work on Indian business cycles

Literature on Indian business cycles

	Reference time period	Methodology	Average duration of expansions	Average duration of recession
Rand and Tarp (2002)	1960-1999	Growth cycle	3 quarters	5 quarters
Mohanty (2003)	1970-2001	Growth cycle	4 quarters	5 quarters
Dua and Banerji (2006)	1960-2004	Growth rate cycle	5 quarters	6 quarters

Our previous work

- Patnaik and Sharma (2002)
  - Monsoon cycles: Pre-liberalisation
  - Growth cycles: Post liberalisation
- Jayaram, Patnaik and Shah (2009): Greater synchronisation of India and advanced economy cycles
- Ghate, Pandey and Patnaik (2013)
  - Comparison of business cycle stylised facts in the pre and post reform period.
  - Persistence and correlation of macro variables closer to advanced economies.

Part II

Methodology

Identifying turning points

- Seasonal adjustment and adjustment for outliers
- Extraction of cycles
- Application of the Bry-Boschan algorithm

Extraction of cycles

- Choice of a filter
- Band-pass filters to extract the business cycle periodicity: CF or BK filter
- Application of the NBER definition of business cycle periodicity (2-8 years).
- Apply the conventional EM business cycle periodicity (1.5-6 years).

Application of the dating algorithm

- Use Bry and Boschan algorithm to identify turning points (1971).
- Improved and extended to quarterly series by Harding and Pagan, (2002) and (2006).
- How do the turning points compare with the two business cycle periodicities?
  1. Conventional periodicity 2-8 years
  2. EM suggested periodicity 1.5-6 years

Rules of the dating algorithm

- Peaks and troughs must alternate.
- 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 the directions.
- Value of k as 5 for monthly frequency (Bry and Boschan) and 2 for quarterly series (Harding and Pagan).
- Avoidance of turning points at extreme observations

Part III

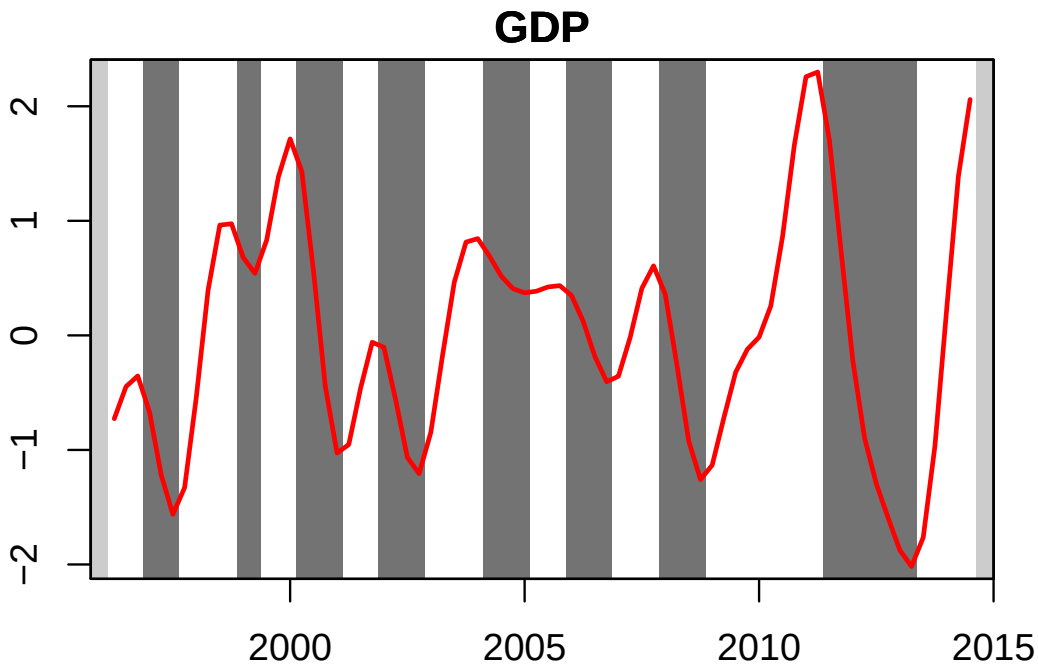
Empirical analysis and key findings

Baseline

- GDP as our reference series.
- Cycles using the Christiano-Fitzgerald filter.

Turning points with EM periodicity

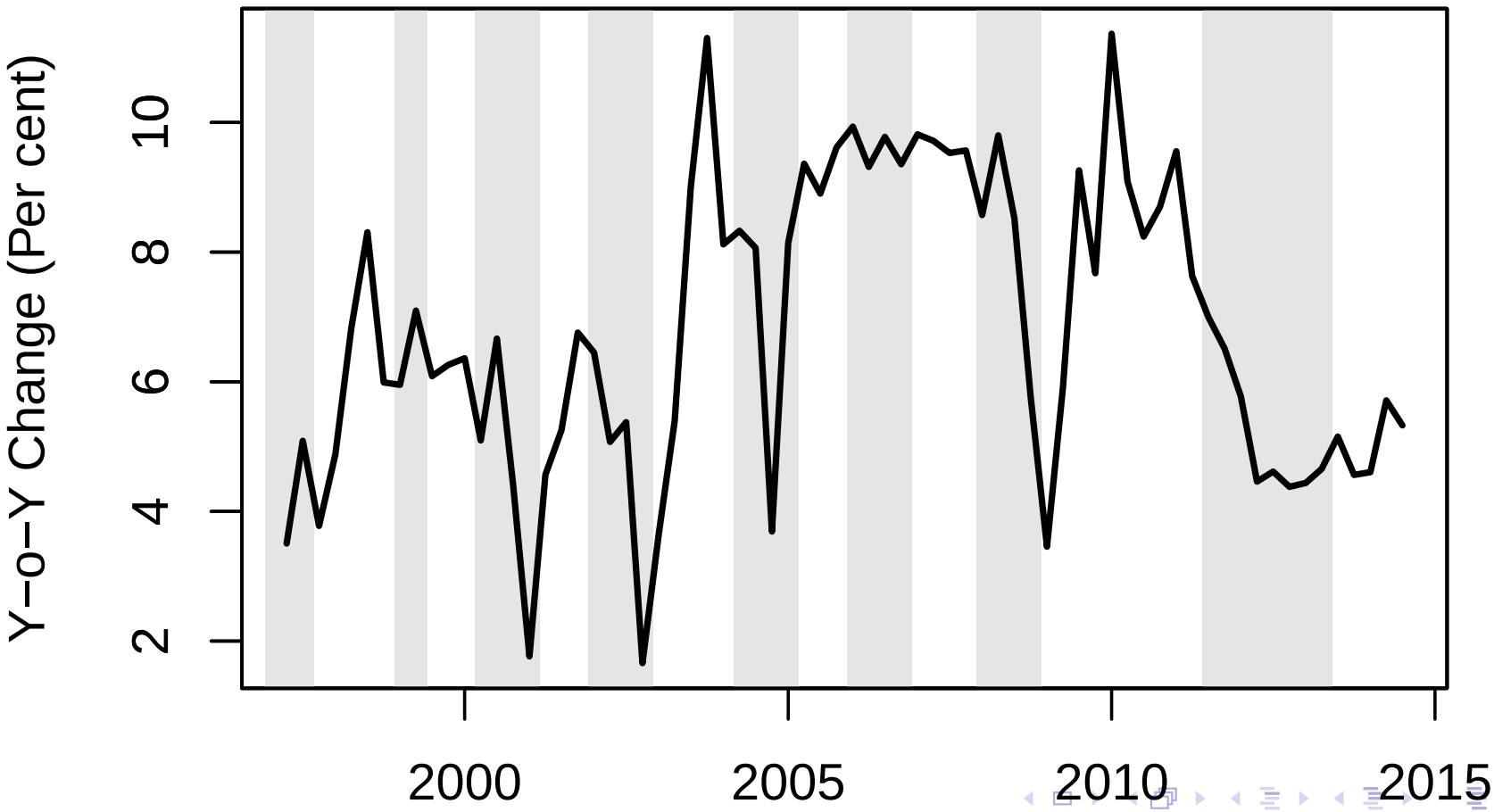
With CF filter



1. 1996 Q4–1997 Q3
2. 1998 Q4–1999 Q2
3. 2000 Q1–2001 Q1
4. 2001 Q4–2002 Q4
5. 2004 Q1–2005 Q1
6. 2005 Q4–2006 Q4
7. 2007 Q4–2008 Q4
8. 2011 Q2–2013 Q2

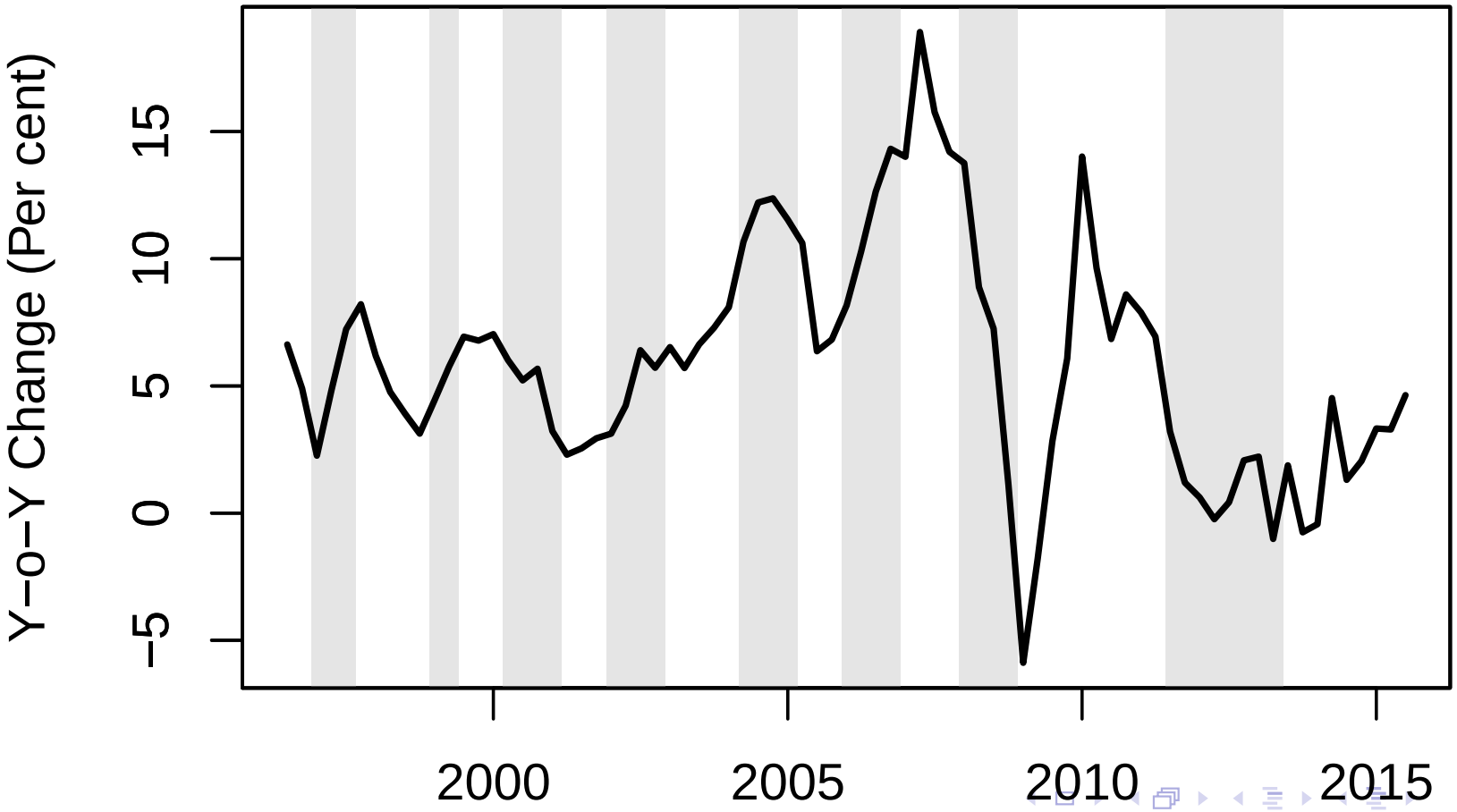
Do the standard indicators conform to the turning points?

GDP growth



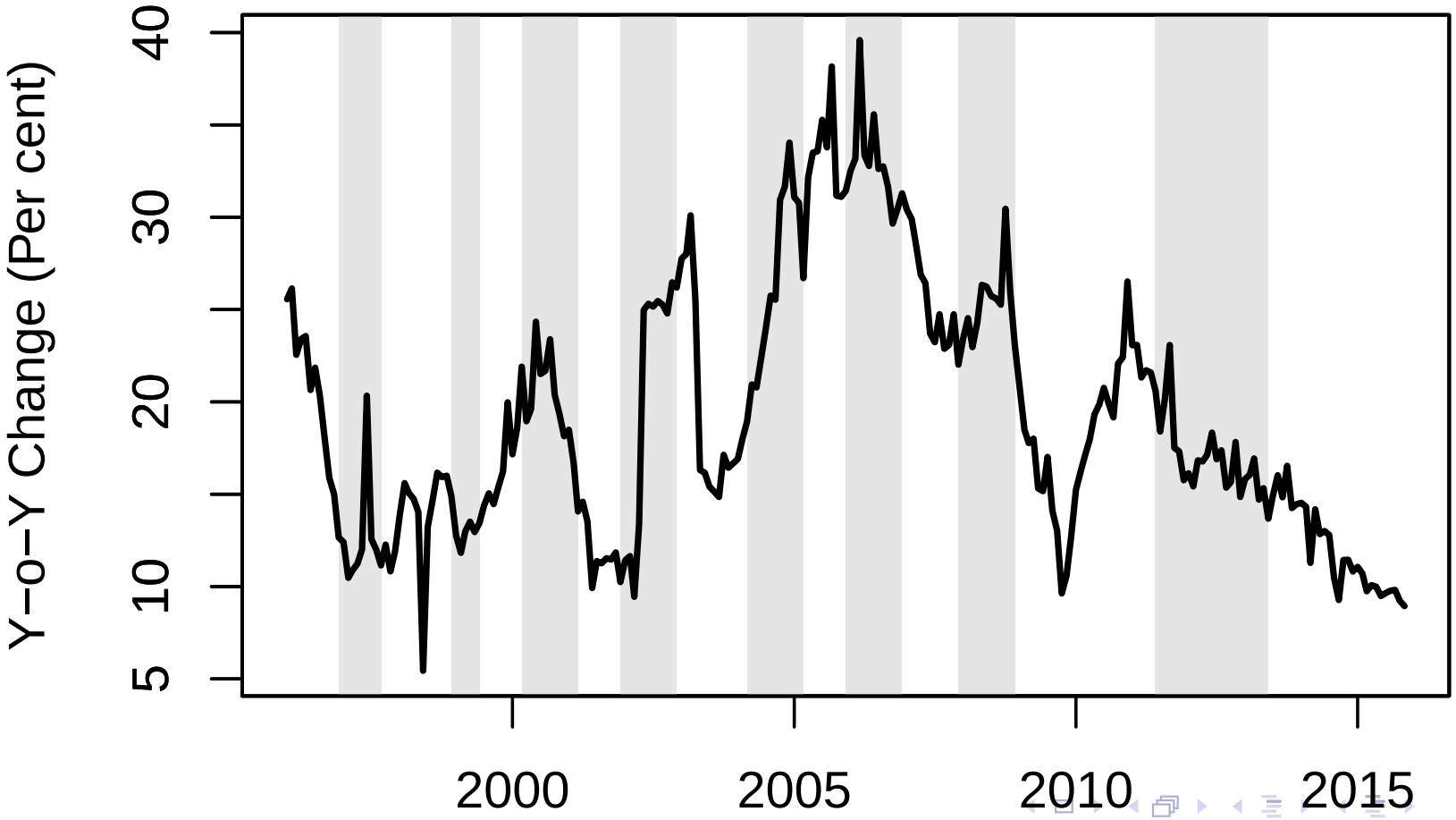
Do the standard indicators conform to the turning points?

IIP growth



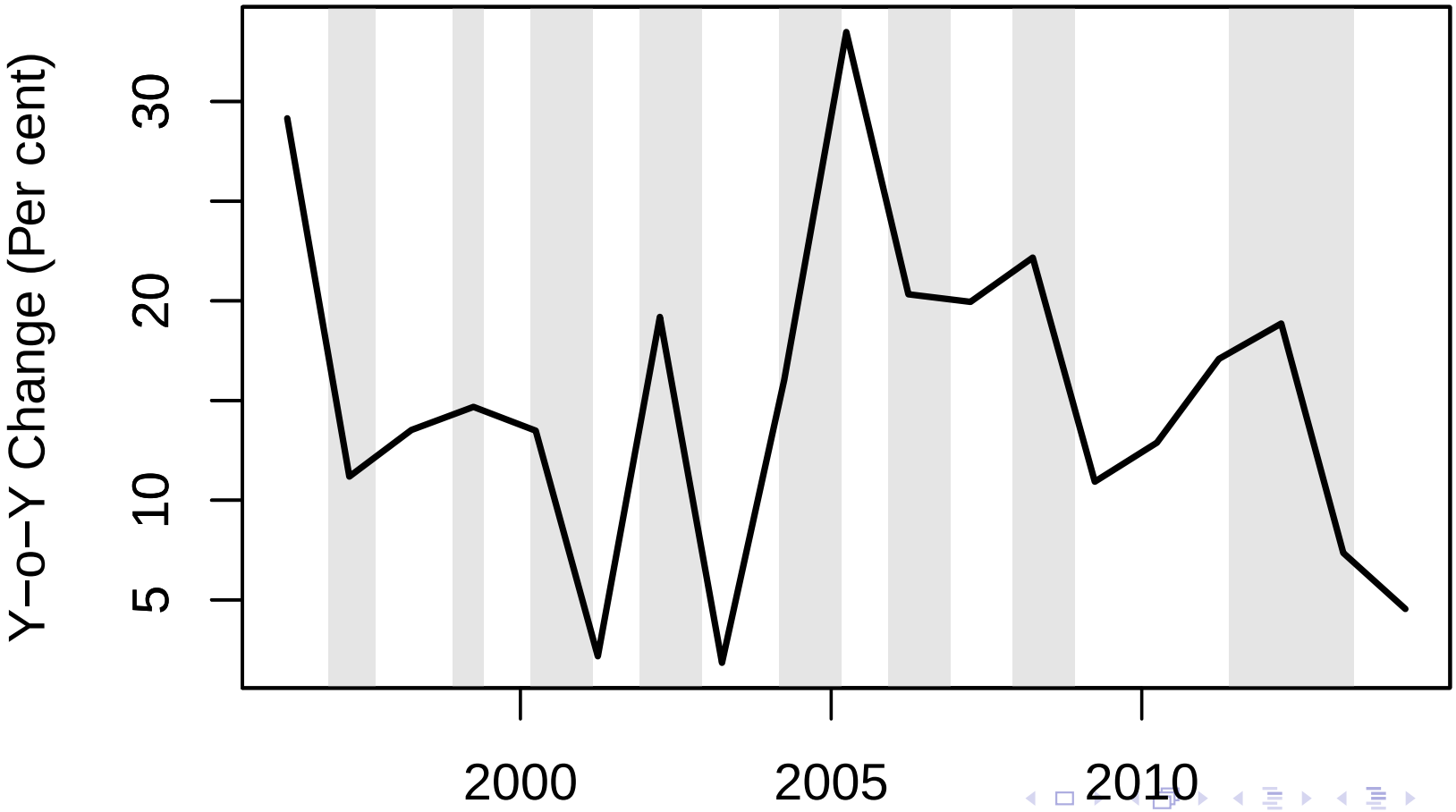
Do the standard indicators conform to the turning points?

Non-food credit growth



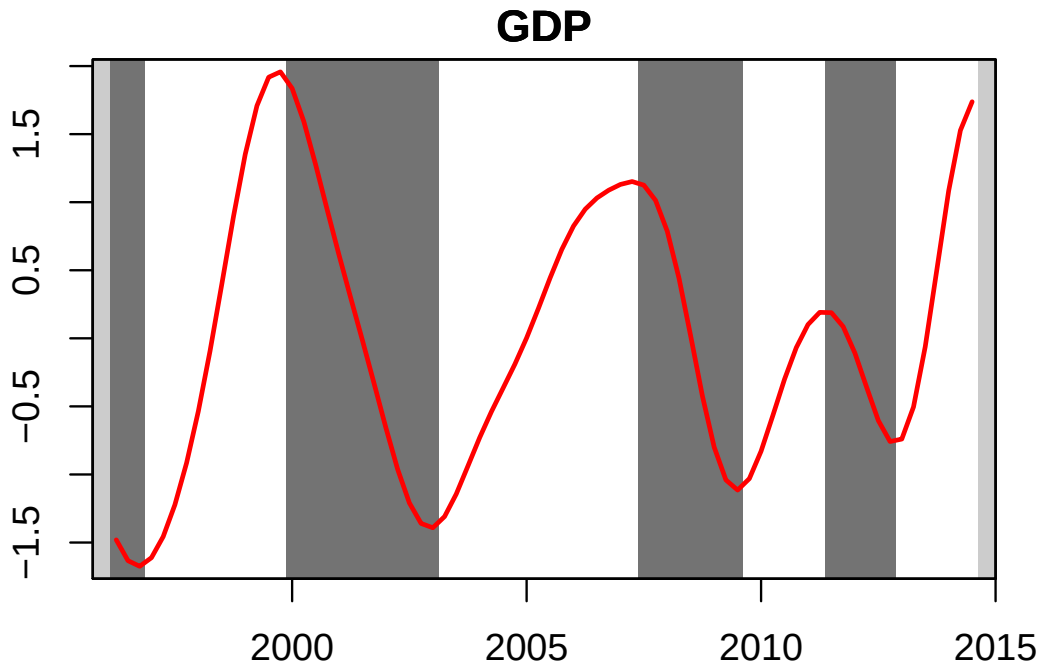
Do the standard indicators conform to the turning points?

Investment growth (annual)



Turning points with conventional business cycle periodicity

With CF filter (2-8 years)

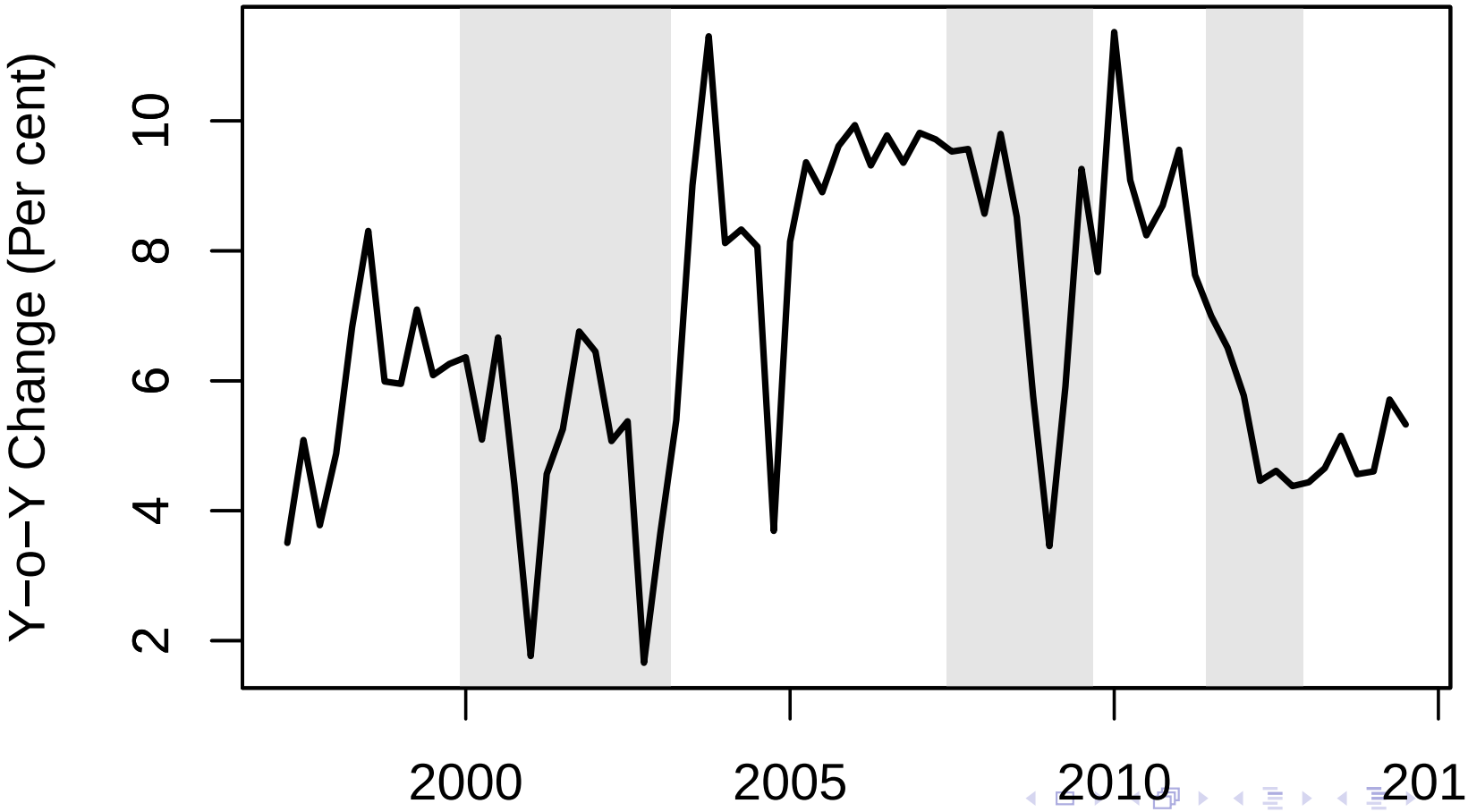


Three periods of recession

1. 1999 Q4 – 2003 Q1
2. 2007 Q2 – 2009 Q3
3. 2011 Q2 – 2012 Q4

Do the standard indicators conform to the turning points?

GDP growth



Do the standard indicators conform to the turning points?

IIP growth

Do the standard indicators conform to the turning points?

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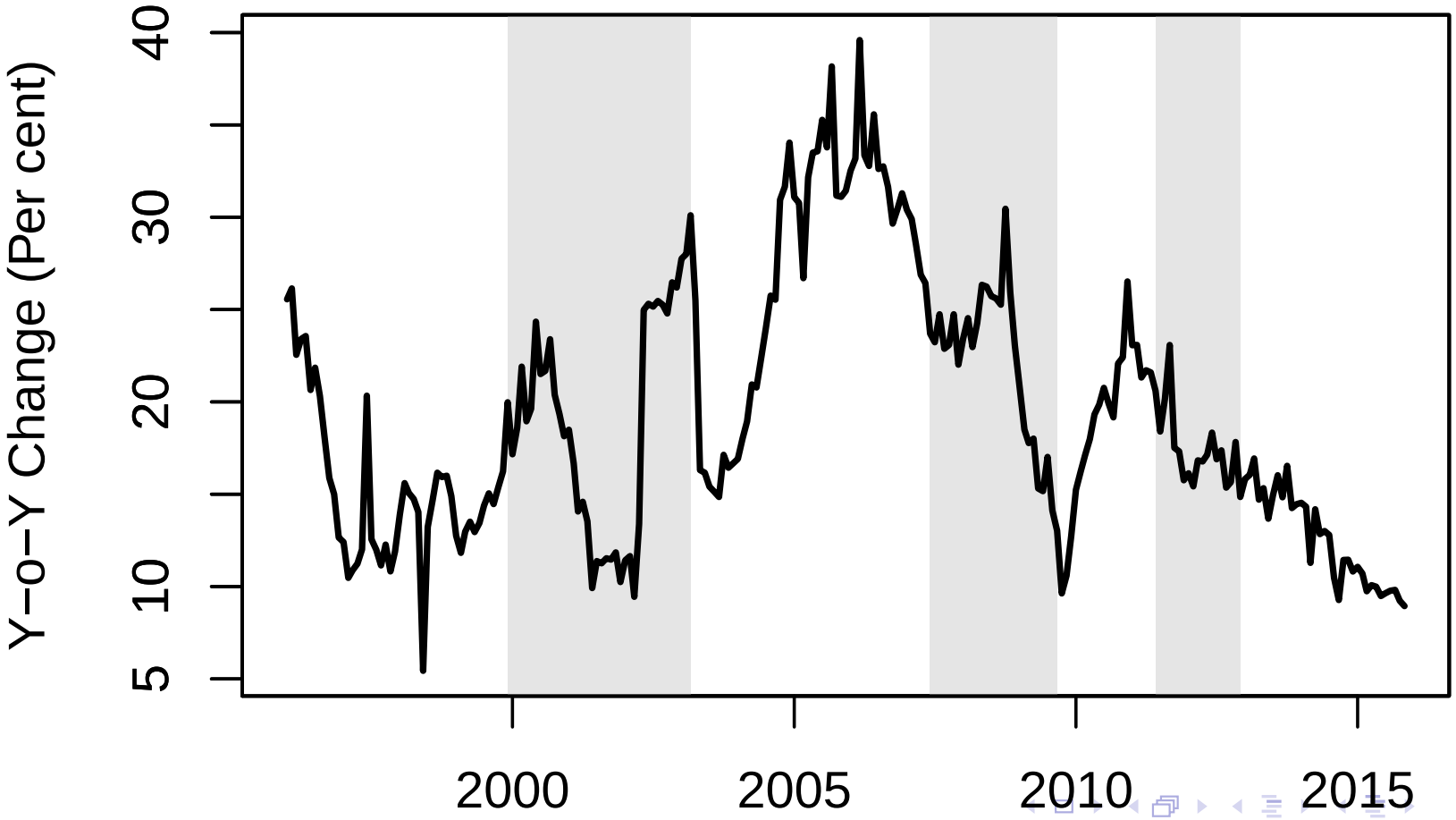

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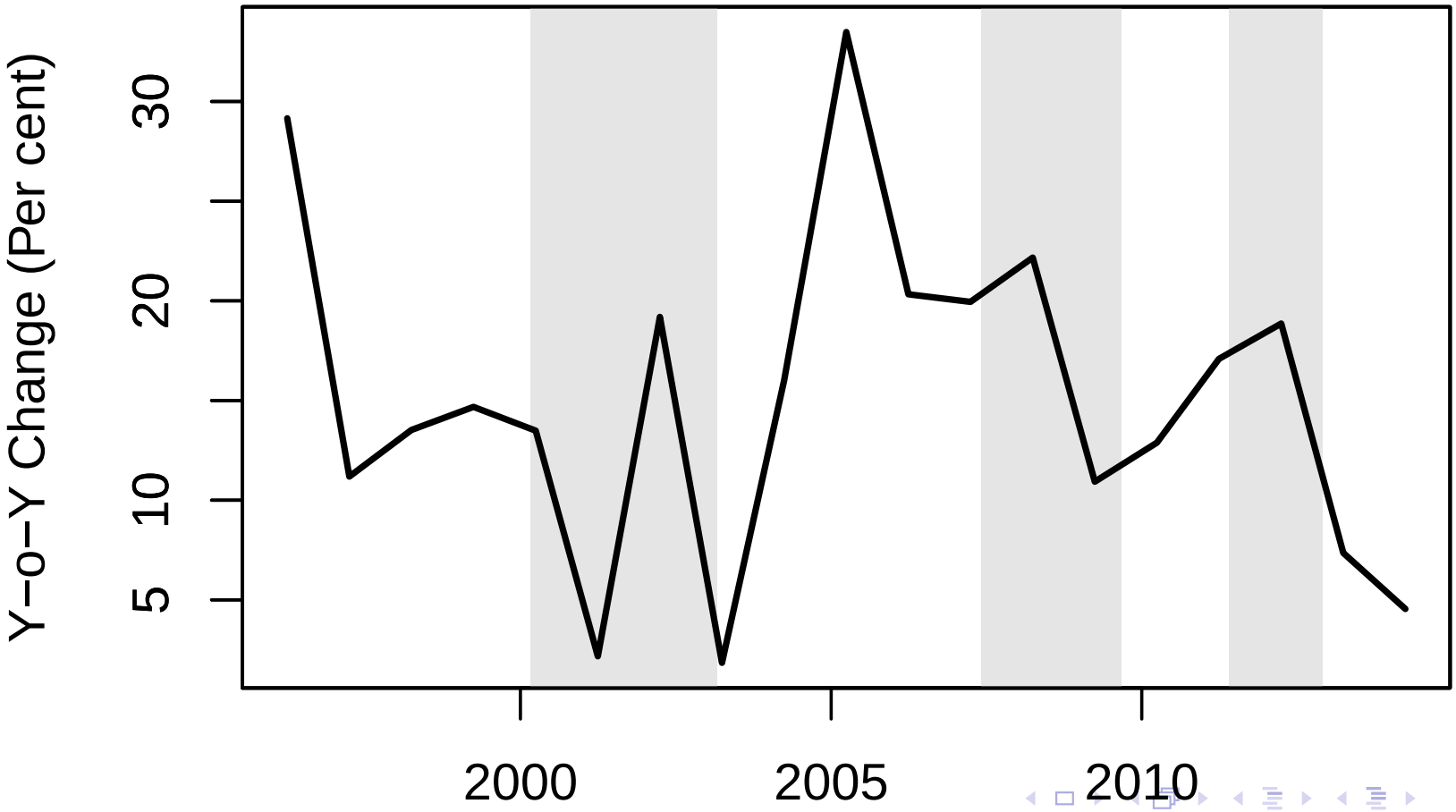
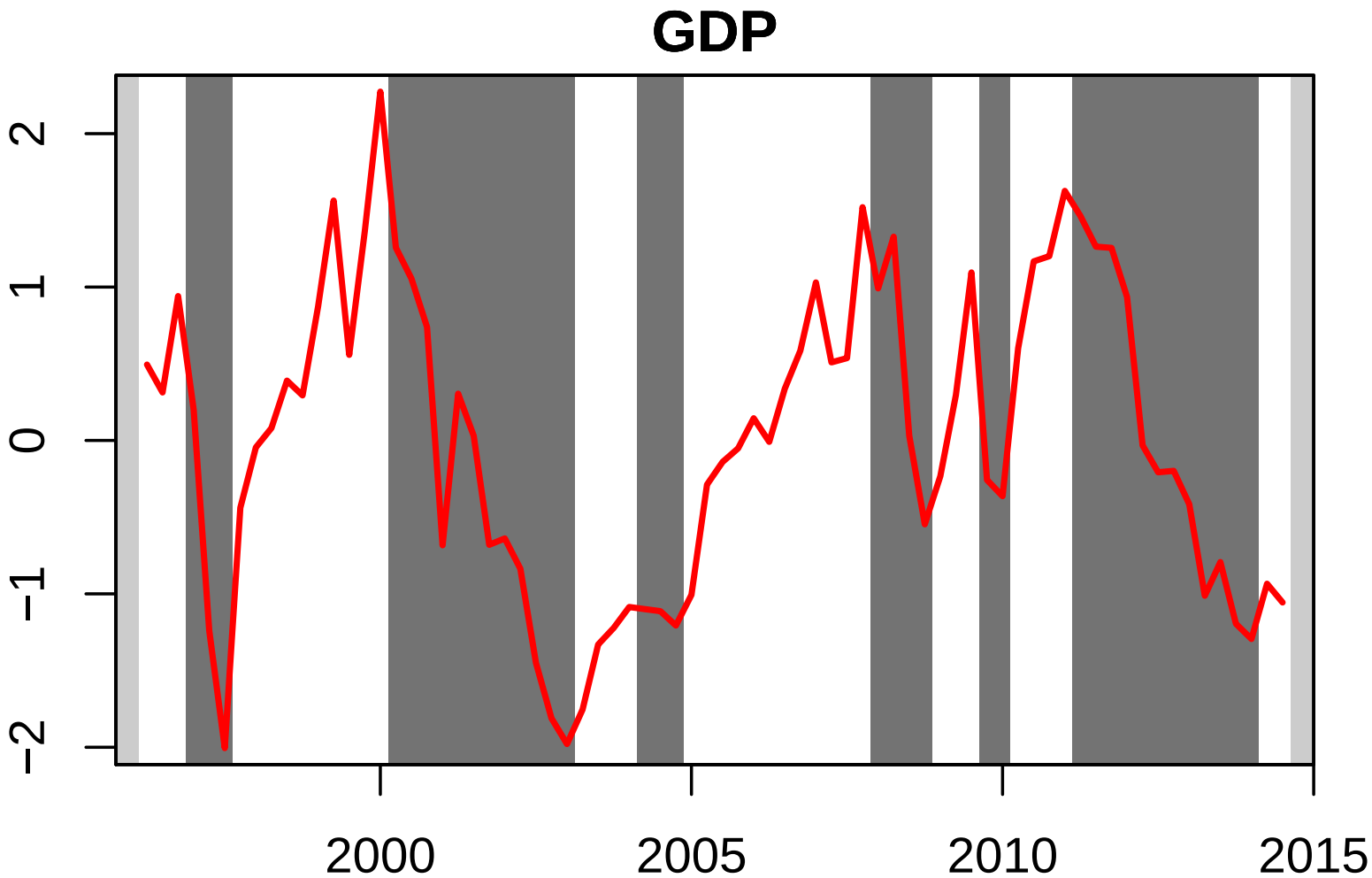


Part IV

Robustness checks

Robustness check I

With HP filter, conventional smoothing parameter of 1600



Summary statistics

GDP as the reference series: conventional approach using CF filter

Phase	Start	End	Duration	Amplitude
Recession	<NA>	1996Q4	NA	NA
Expansion	1996Q4	1999Q4	12	3.6
Recession	1999Q4	2003Q1	13	3.3
Expansion	2003Q1	2007Q2	17	2.5
Recession	2007Q2	2009Q3	9	2.3
Expansion	2009Q3	2011Q2	7	1.3
Recession	2011Q2	2012Q4	6	0.9
Expansion	2012Q4	<NA>	NA	NA

Exp/Rec	Amplitude	Duration
Exp=]T;P]	2.5	12.0
Rec=]P;T]	2.2	9.3

Robustness check II: Using other variables as proxy for business cycles

IIP

Phase	Start	End	Duration	Amplitude
Recession	2000Q2	2003Q3	13	2.2
Expansion	2003Q3	2004Q4	5	1.3
Recession	2004Q4	2006Q1	5	1.5
Expansion	2006Q1	2007Q4	7	3.8
Recession	2007Q4	2009Q2	6	5.3
Expansion	2009Q2	2011Q1	7	3.5
Recession	2011Q1	2013Q4	11	1.6
Expansion	2013Q4	NA	NA	NA

Table: Dates of turning points in IIP: 1999-2014

Robustness check II: Using other variables as proxy for business cycles

Non-agri, non Government GDP

Phase	Start	End	Duration	Amplitude
Recession	2000Q1	2003Q1	12	2.7
Expansion	2003Q1	2004Q2	5	0.6
Recession	2004Q2	2005Q1	3	0.2
Expansion	2005Q1	2007Q2	9	2.2
Recession	2007Q2	2009Q3	9	3.3
Expansion	2009Q3	2011Q2	7	1.8
Recession	2011Q2	2012Q4	6	0.7
Expansion	2012Q4	NA	NA	NA

Table: Dates of turning points in non-agri, non Government GDP: 1999-2014

Robustness check II: Using other variables as proxy for business cycles

Firms' net sales

Phase	Start	End	Duration	Amplitude
Expansion	NA	2000Q2	NA	NA
Recession	2000Q2	2002Q4	10	2.7
Expansion	2002Q4	2004Q3	7	1.9
Recession	2004Q3	2005Q4	5	0.9
Expansion	2005Q4	2007Q4	8	1.2
Recession	2007Q4	2009Q3	7	3.2
Expansion	2009Q3	2011Q2	7	3.8
Recession	2011Q2	2013Q4	10	3.1
Expansion	2013Q4	NA	NA	NA

Table: Dates of turning points in Firms' net sales: 1999-2014

Indian business cycles have changed over time

	Reference time period	Average duration of expansions	Average duration of recession
Rand and Tarp (2002)	1960-1999	3 quarters	5 quarters
Mohanty (2003)	1970-2001	4 quarters	5 quarters
Dua and Banerji (2006)	1960-2004	5 quarters	6 quarters
Our findings	1999-2014	12 quarters	9 quarters

Main findings

- Our findings cast doubt on the notion that there is a “standard EM cycle”.
- The characteristics of emerging economy cycles may have changed over time.
- EM dating methodology needs to take into account the changes in the nature of cycles.
- For India:
  1. Cycles are much longer
  2. NBER periodicity is more appropriate for extracting cycles.
  3. Periodicity now seems to move closer to that of advanced economies.

Thank you