

Monetary policy analysis in an inflation targeting framework in emerging economies: The case of India

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Outline

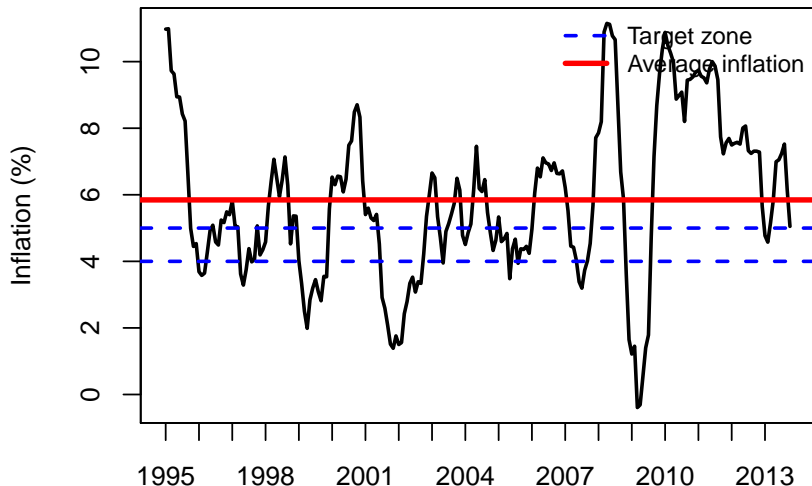
- Motivation
- Literature
- Contribution
- Model, data and calibration
- Results
- Policy implications
- Summary

Part I

Motivation

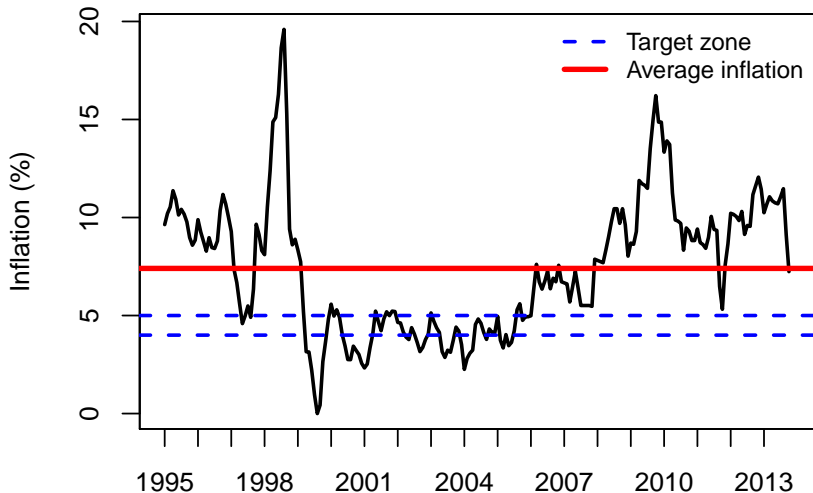
Inflation persistently above target zone

WPI, YoY (%)



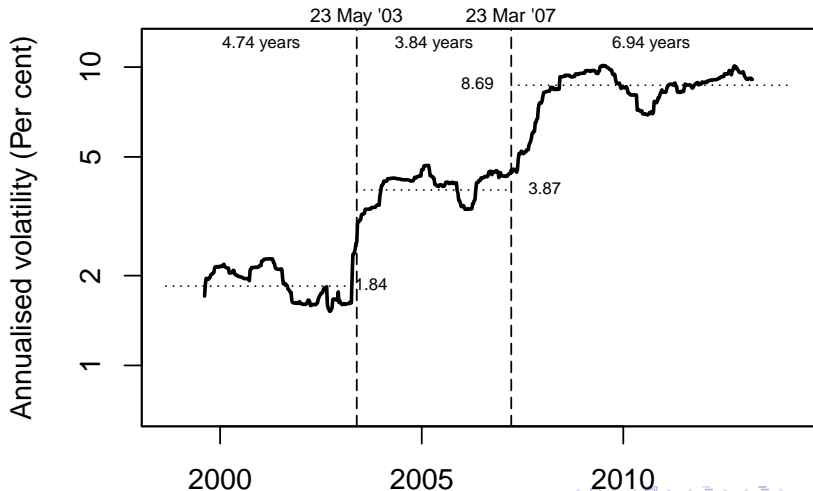
Inflation persistently above target zone

CPI, YoY (%)



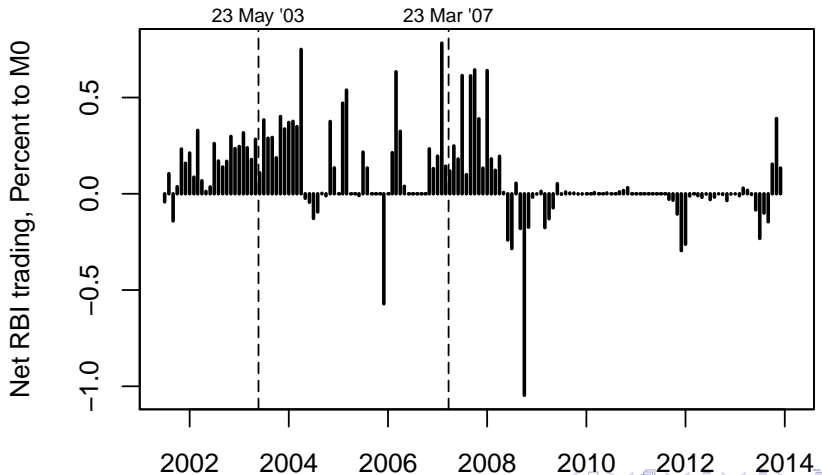
Transition from fixed to flexible exchange rate regime

Volatility in rupee-dollar exchange rate increased significantly after 2008

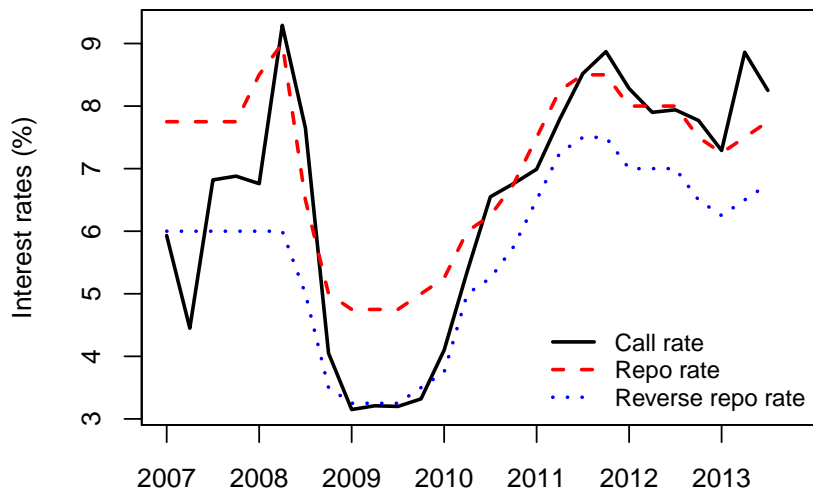


Transition from fixed to flexible exchange rate regime

RBI's intervention in foreign exchange market declined significantly after 2008

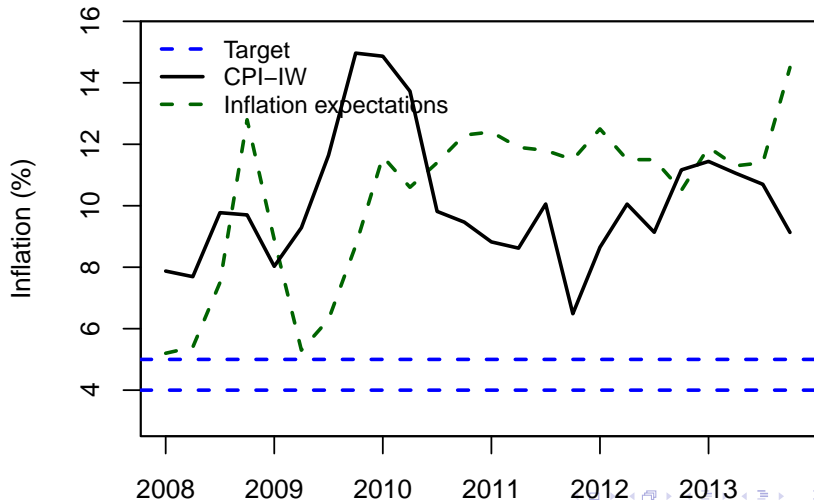


Despite monetary tightening, inflation pressures have persisted



Rising inflationary expectations

In absence of an alternative nominal anchor, inflationary expectations started rising and have persisted above 10% since 2010



Questions

- What are the factors that have contributed to post-crisis business cycle fluctuations and inflation dynamics in India?
- Is aggregate demand a contributor to inflation pressure in India? Does monetary policy have a role to play?
- What would have been the post-crisis monetary policy stance in a counter-factual scenario of inflation-targeting (IT) central bank in India?
- Would monetary policy be successful in anchoring inflationary pressure in recent times under a hypothetical scenario of IT central bank?

Part II

Literature review

Literature

- **Micro-founded DSGE** models with New-Keynesian features (Smets and Wouters, 2003; Gali, 2007; Gali and Gertler, 2009; Gali and Monacelli, 2008), which help in identifying:
 - Factors contributing to **business cycle fluctuations**
 - **Welfare-based optimal** monetary and fiscal policy rules under alternative policy regimes
- Recently developed **FPAS** models (Berg and Laxton, 2006; Laxton, Rose and Scott, 2009) apply **reduced form semi-structural New-Keynesian** model coherently with data and help in:
 - Providing a practical guide to **IT central banks to assess macroeconomic functioning** of the country in a single framework
 - **Predicting future monetary policy path** to contain inflation rate in the country at a desired level in medium to long term

Literature

- Variants of FPAS models have been applied in countries with a **existent, as well as those transitioning to, an IT framework**
- **Application by existing IT central banks:** ECB, Australia, New Zealand
- **Limited application to EMs:** Kenya (Andrle, Berg, Morales, Portillo, and Vlcek, 2013), Sri Lanka (Anand, Ding, and Peiris, 2011)
- **Implemented by Czech National Bank** (Andrle, Hledik, Kamnik, Vlcek, 2009)
- **Limited literature on India:** Estimated new Keynesian closed economy model for India (Patra, Kapur, 2010)

Part III

Contribution

Contribution

First semi-structural New-Keynesian open economy model for India, capturing main macroeconomic mechanisms, useful for:

Identification Of factors contributing to Indian business cycle fluctuations and inflation dynamics

Prediction Of inflation, and corresponding policy rate, in the medium to long run

Promoting Discussion on rules-based policy making in India

Comparison of FPAS with other models

- **DSGE:**

- FPAS allows abstraction away from micro-foundations and deep-parameters, estimation of which is unreliable for EMs

- **Structural time series models (SVAR, SVECM):**

- They take policy parameters as given, and are unable to incorporate forward looking features. However, each equation in FPAS carries an economic interpretation.
- Ad-hoc ordering of variables in SVAR leads to identification problems. The FPAS framework is free of such mis-specification errors.
- Additionally, our model allows analysis of policy intervention under alternative policy parameters.

Part IV

Model, data and calibration

Model

Domestic block

- **Aggregate demand (IS curve)**
- **Aggregate supply (Philips curve)**

Model

Domestic block

- **Aggregate demand (IS curve)**

$$\hat{y}_t = \alpha_1 y_{t-1} - [\alpha_2 \hat{r}_{t-1} - \alpha_3 z_{t-1}] + \alpha_4 E_t \hat{y}_{t+1} + \alpha_5 \hat{y}_t^* + \epsilon_t^{\hat{y}}$$

Components:

- Lagged aggregate demand
 - Real monetary conditions
 - Real interest rate gap
 - Real exchange rate gap
 - Expected output gap
 - Foreign output gap
 - Exogenous shock
- **Aggregate supply (Philips curve)**

Model

Domestic block

- **Aggregate demand (IS curve)**
- **Aggregate supply (Philips curve)**

$$\pi_t = (1 - \theta_1)\pi_{t-1} + \theta_1 E_t \pi_{t+1} + \theta_2 rmc_t + \epsilon_t^\pi$$

Components:

- Lagged inflation
- Expected inflation ($E_t \pi_{t+1}$)
- Real marginal costs
 - Real exchange rate gap
 - Output gap
- Exogenous shock

Model

Domestic & foreign block

- **Monetary policy (Taylor rule)**
- **Exchange rate (UIP condition)**
- **Foreign block**

Model

Domestic & foreign block

- **Monetary policy (Taylor rule)**

$$i_t = \rho_2 i_{t-1} + (1 - \rho_2)(i_t^n + \rho_3(E_t \pi_{t+4} - \pi_{t+4}^T) + \rho_4 \hat{y}_t) + \epsilon_t^i$$

Components:

- Deviation of expected inflation from target/objective
- Deviation of output from potential
- Exogenous shock
- **Exchange rate (UIP condition)**
- **Foreign block**

Model

Domestic & foreign block

- **Monetary policy (Taylor rule)**
- **Exchange rate (UIP condition)**

$$s_t = 0.7E_t s_{t+1} + 0.31s_{t-1}^e + (-i_t + i_t^* + prem_t)/4 + \epsilon_t^s$$

$$s_t^e = s_{t-1} + 0.5(\Delta \bar{z} + \pi^T - \pi_{ss}^*)$$

$$\Delta \bar{s}_t = \pi^T - \pi_t^{*ss} + \Delta \bar{z}_t$$

Components:

- Domestic interest rate
- Foreign interest rate
- Premium
- Purchasing power parity condition
- Exogenous shock
- **Foreign block**

Model

Domestic & foreign block

- **Monetary policy (Taylor rule)**
- **Exchange rate (UIP condition)**
- **Foreign block**
 - Modelled exogenously as an AR process, with constant drift representing the steady state of foreign variables

Calibration and Steady-state values

Calculated based on historical data, literature surveys and judgement about the Indian economy.

Description	Variable	Value
Inflation target	π_{SS}^T	5%
Real interest rate trend	\bar{r}_{SS}	2%
Real exchange rate trend	\bar{z}_{SS}	2
Output trend	y_{SS}	6.5%
Foreign real interest rate trend	\bar{r}_{SS}^*	0.5%
Foreign inflation target	π_{SS}^*	2%

Data description

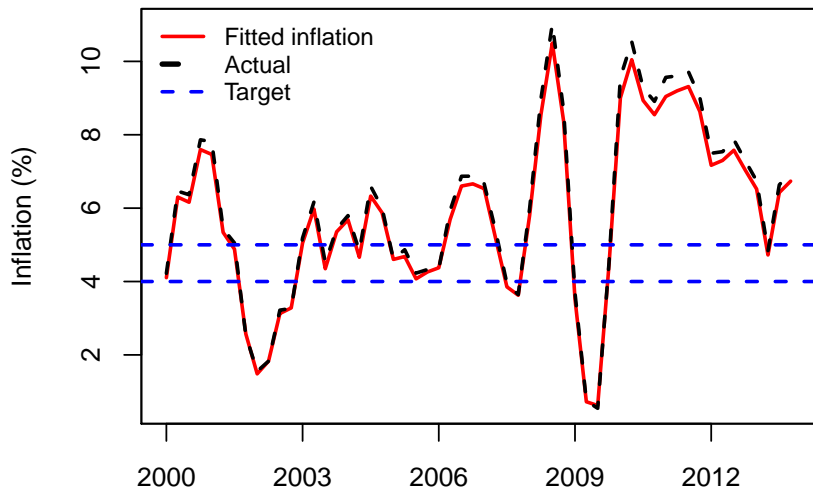
Series	Variable	Data used
Output	y	GDP, factor cost (Base: 2004-05)
Prices	p	Wholesale Price Index
Nominal exchange rate	s	INR/USD
Nominal interest rate	i	91-day Treasury Bill rate
Foreign demand	y^*	US GDP, market prices (Base: 2009)
Foreign prices	p^*	US Consumer Price Index
Foreign nominal interest rate	i^*	US 13-week Treasury Bill rate
Range: 1996 Q1 - 2013 Q4		
Source: Datastream		

Part V

Results

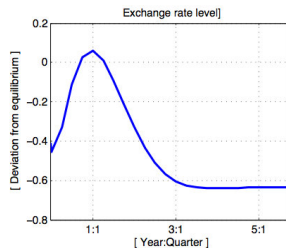
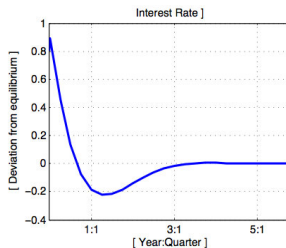
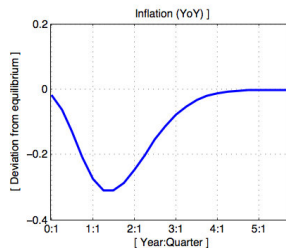
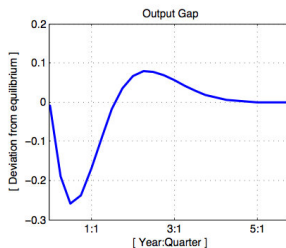
Model performance

Fitted and actual WPI inflation, YoY (%)



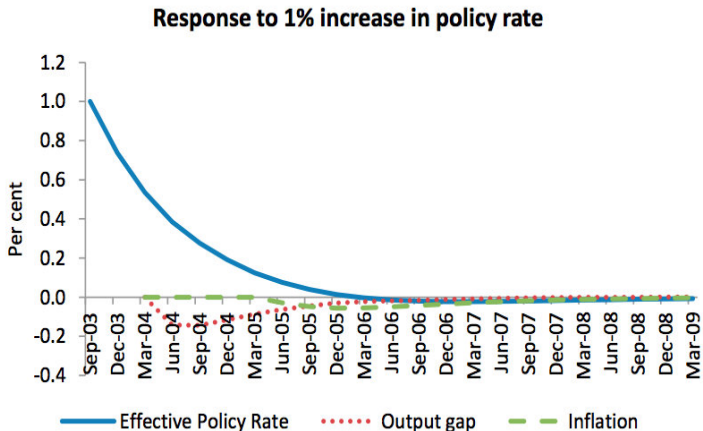
Monetary policy transmission in India: AD channel

IRFs from MP shock



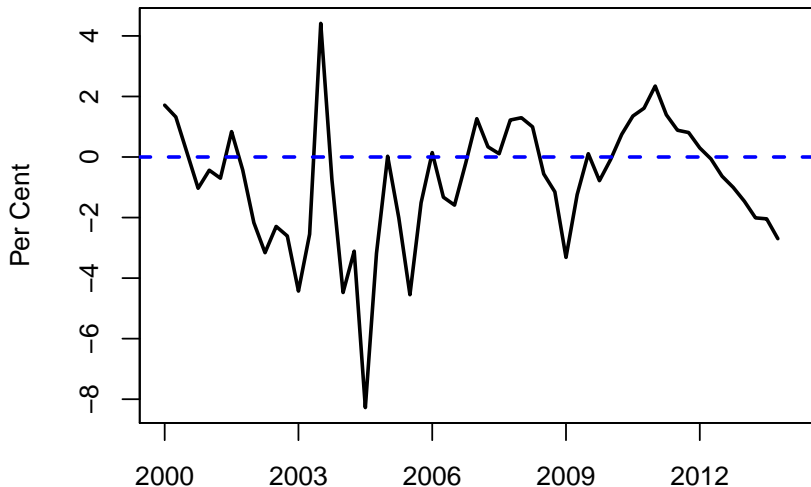
Monetary policy transmission in India: AD channel

IRFs from MP shock (Patra & Kapur 2010)



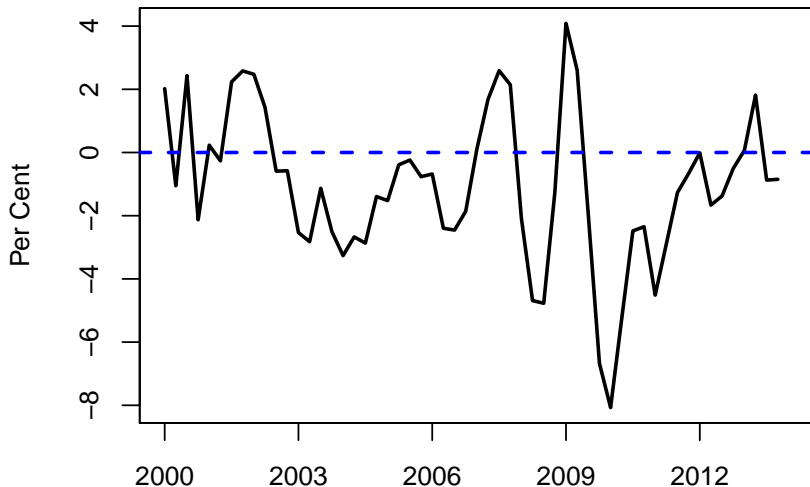
Patterns in post-crisis Indian business cycle

Output gap, per cent deviation from trend



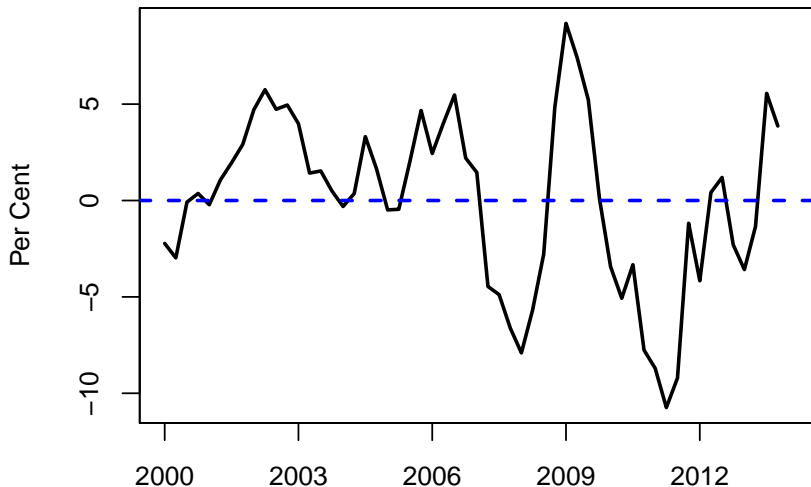
Patterns in post-crisis Indian business cycle

Real interest rate gap, per cent deviation from trend



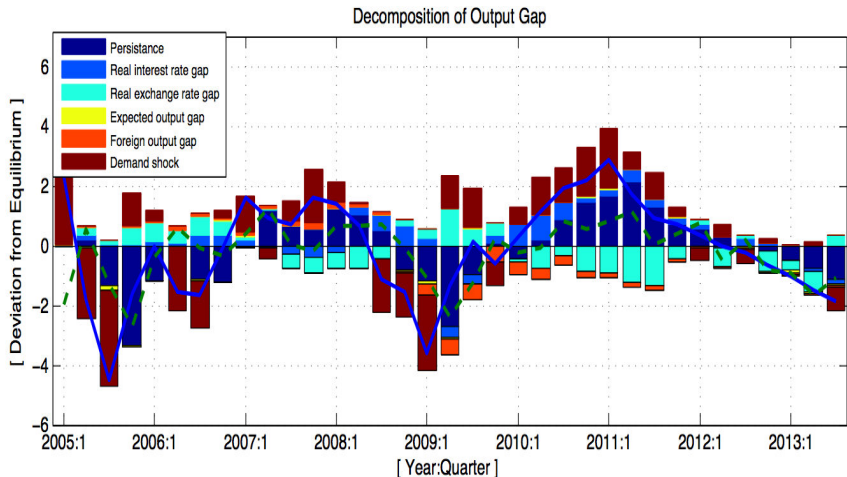
Patterns in post-crisis Indian business cycle

Real exchange rate gap, per cent deviation from trend

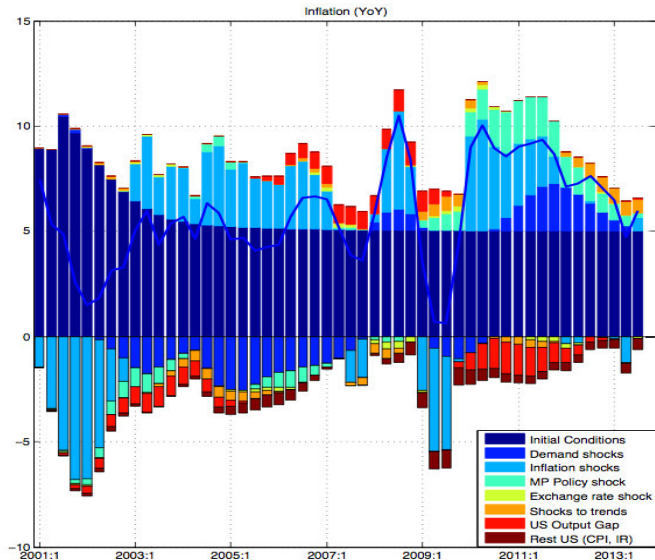


Factors affecting post-crisis business cycle

Output gap

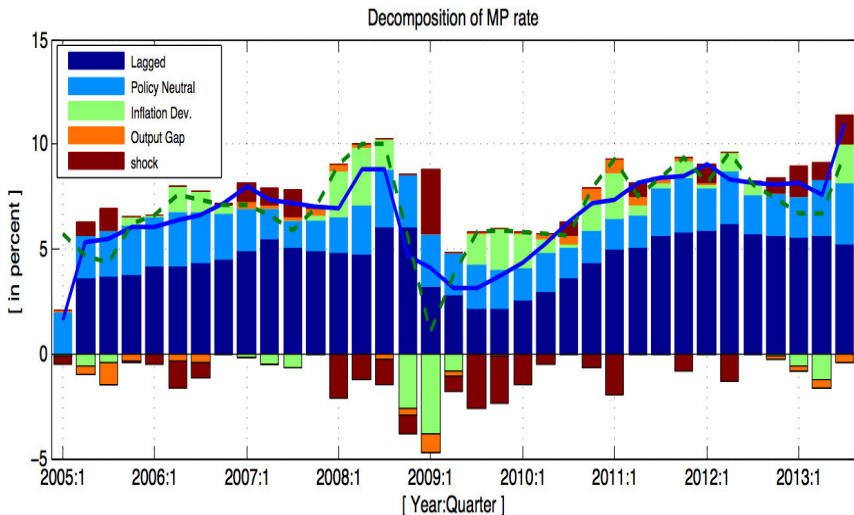


Factors affecting post-crisis inflation dynamics



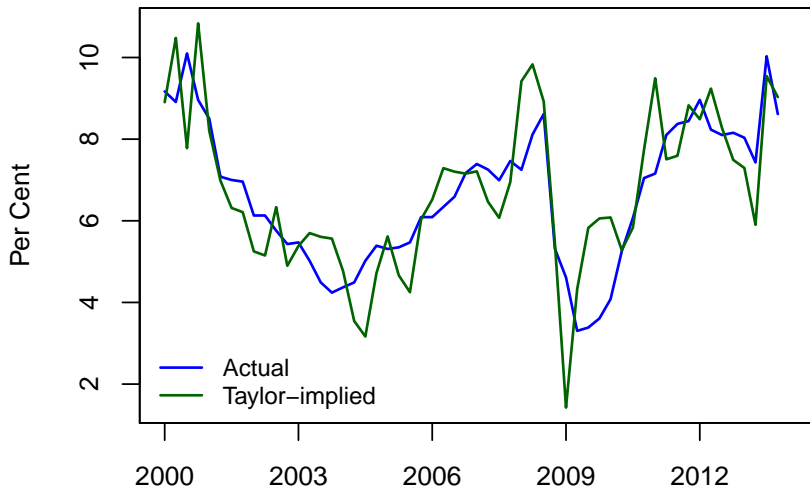
Factors affecting post-crisis monetary policy

Monetary policy



Factors affecting post-crisis monetary policy

Monetary policy



Part VI

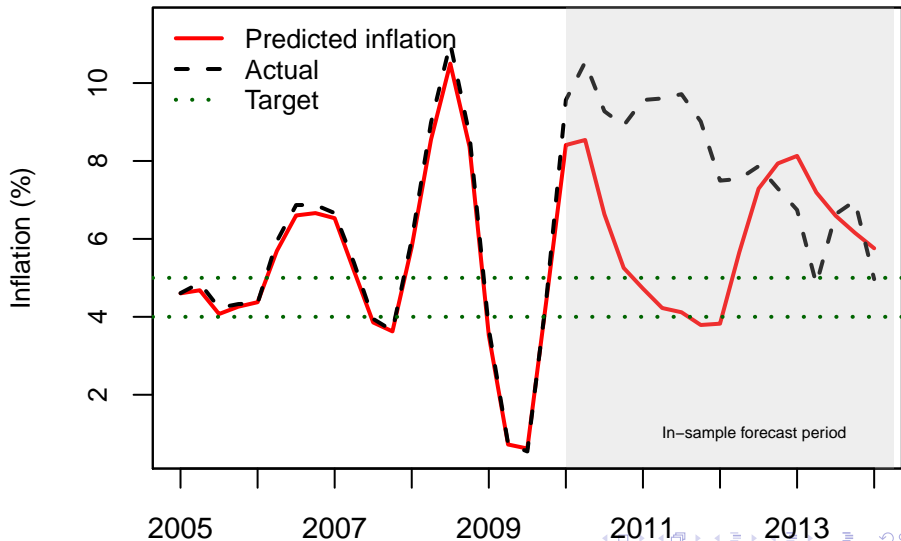
Policy implications

Post-crisis monetary policy stance

- Imagine an inflation targeting RBI in a post-crisis world
- They respond to deviations of inflation from target, and output gap from trend
- Could they have contained inflation and anchored expectations?

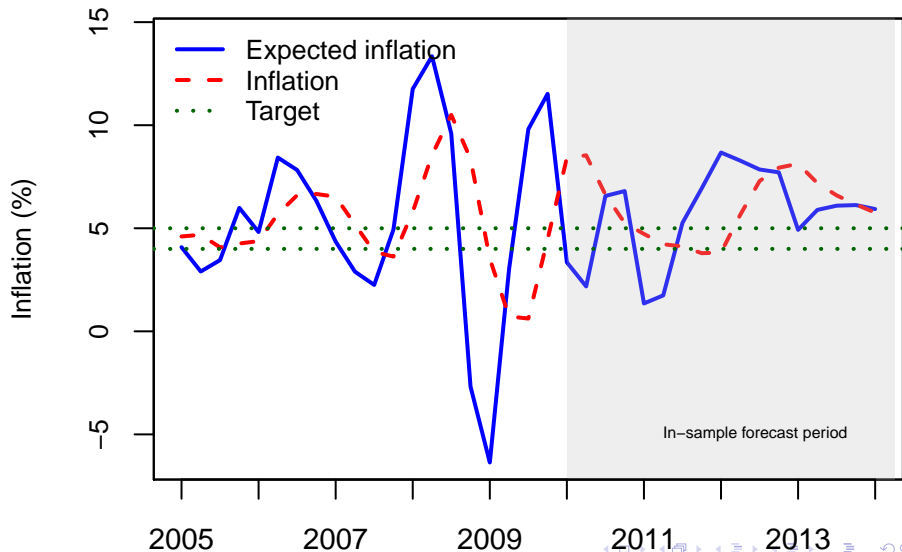
Post-crisis monetary policy stance: Inflation

Comparison of actual and counterfactual inflation



Post-crisis monetary policy stance: Expected inflation

In-sample forecasting, 2010 Q1 - 2013 Q4



Part VII

Conclusion

Summary

- Semi-structural New-Keynesian open economy model for India
- Demand plays a significant role in driving post-crisis inflationary pressure in India
- Monetary policy transmission via aggregate demand channel
- The model predicts tighter monetary policy during 2009 to beginning of 2011 implied by the Taylor rule
- Provides evidence for usefulness of inflation targeting in India

Thank you.