



# Inflation Expectation In India – An Analysis Based On Survey Data

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## Inflation Expectation

- An important variable in monetary policy framework.
- It influences the actual inflation.

## Primary Research Questions

- What is the impact of Inflation Expectation Survey of Household (IESH) on the New Keynesian Phillips Curve (NKPC) for India?
- What is the source of this expectation that is formed by general public?
- Why is there a regional disparity in this expectation i.e. identification of reasons behind the heterogeneity of expectation across India?

## Inflation Expectation Survey of Household (IESH)

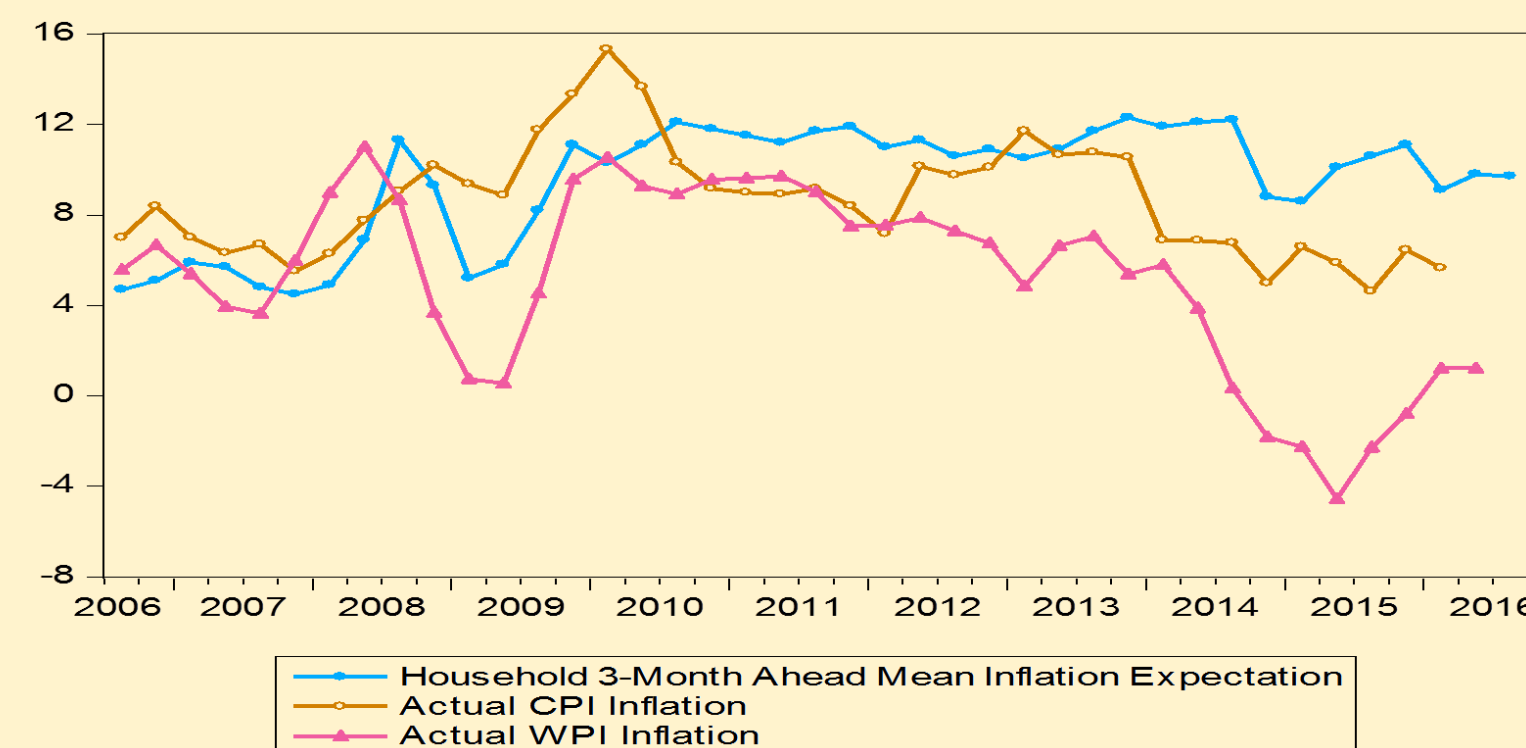
Table 1: Statistical Properties of Household Expectation and Actual Inflation

Variables	Mean	Standard Deviations	Skewness	Correlation with IESH 3-Months Ahead Mean
Actual WPI Inflation	5.18	4.06	-0.66	0.18 (1.09)
Actual CPI Inflation	8.64	2.48	0.62	0.34 (2.18)
IESH	9.47	2.58	-0.82	--

NOTE: Data Period 2006Q3 to 2016Q1. T-statistics are in brackets.

Source: Author's Calculations

Figure 1: Graphical Representation of Household Expectation and Actual Inflation Data



Data Source: RBI, Database of Indian Economy (DBIE)

## IESH: Rational in Nature

Table 2: Test of Bias for IESH

Variables	$\alpha = 0$	$\beta = 1$	F-Stats	Prob.
WPI Inflation	2.41 (0.96)	0.29 (1.19)	27.28	0.00
CPI Inflation	6.67 (4.40)	0.20 (1.38)	18.43	0.00

NOTE: Data Period 2006Q3 to 2016Q1. T-statistics are in brackets

Source: Author's Calculations

Table 3: Test for Efficiency of IESH

Variables	$\alpha_0$	$\alpha_1$	Durbin-Watson	Adj. R <sup>2</sup>
WPI Inflation	-8.54 (-10.37)	0.76 (6.22)	0.45	0.51
CPI Inflation	-5.11 (-3.09)	0.47 (2.57)	0.51	0.13

NOTE: Data Period 2006Q3 to 2016Q1. T-statistics are in brackets

Source: Author's Calculations

## Estimation of NKPC

### A. Gali & Gertler (1999)

- Forward Looking :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \epsilon_t$
- Hybrid :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \gamma \pi_{t-1} + \epsilon_t$

where  $\pi_t$  : Actual Inflation;  $y_t$  : Output Gap at time period t; and  $E_t \pi_{t+1}$  : Expected Inflation.

Table 4: Summary of Gali & Gertler (1999) Results

Dependent Variable: WPI Inflation								
Models	Household Survey Data	Perfect Foresight (Original Specification)	AR 2 Periods	AR 4 Periods	MA 2 Periods	MA 4 Periods	Single Exponential Smoothing	Kalman Filter
Forward Looking	✓	✗	✗	✗	✗	✗	✗	✓
Hybrid	✓	✗	✗	✗	✗	✓	✗	✗

NOTE: Estimation is by GMM methodology for sample period 2006Q4 to 2016Q1 using quarterly data and two lags each of following instruments: Seasonally Adjusted Output Gap, Seasonally Adjusted Output Agricultural Gap, GDP Deflator, CPI Inflation, WPI Inflation, Global Commodity Price Inflation, Primary Commodity Inflation, International Fuel Price, Exchange Rate and Money demand.

Source: Author's Calculations

### B. Patra and Kapur (2010)

- Forward Looking :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \epsilon_t$
- Simple Hybrid :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \gamma \pi_{t-1} + \delta \pi_t^G + \theta Dummy_t + \epsilon_t$
- Augmented Hybrid :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \gamma \pi_{t-1} + \delta \pi_t^G + \theta Dummy_t + \sigma x_t + \epsilon_t$
- Augmented Hybrid without Dummy :  $\pi_t = \alpha y_t + \beta E_t \pi_{t+1} + \gamma \pi_{t-1} + \delta \pi_t^G + \sigma x_t + \epsilon_t$

where,  $\pi_t$  : Actual Inflation at time period t;  $y_t$  : Output Gap at time period t;  $E_t \pi_{t+1}$  : Expected Inflation;  $\pi_t^G$  : Global Commodity Price Inflation at time period t;  $Dummy_t$  : Dummy Variable;  $x_t$  : Real Effective Exchange Rate at time period t.

The period of higher acceleration of primary article inflation is taken as dummy. In this study, 2010Q4 and 2011Q1 is considered.

Table 5: Summary of Patra & Kapur (2010) Results

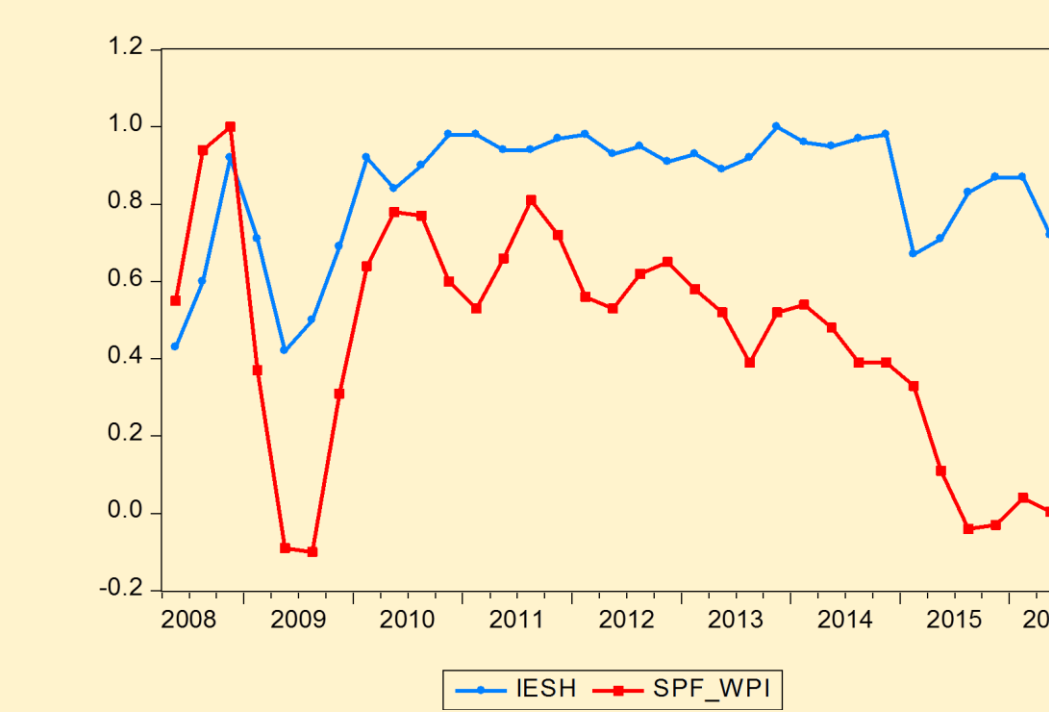
Dependent Variable: WPI Inflation								
Models	Household Survey Data	Perfect Foresight (Original Specification)	AR 2 Periods	AR 4 Periods	MA 2 Periods	MA 4 Periods	Single Exponential Smoothing	Kalman Filter
Forward Looking	✓	✓	✗	✓	✗	✗	✗	✗
Simple Hybrid	✓	✗	✗	✗	✗	✗	✗	✗
Augmented Hybrid	✗	✗	✗	✗	✗	✗	✗	✗
Augmented Hybrid without Dummy	✗	✗	✗	✗	✗	✗	✗	✗

NOTE: Estimation is by GMM methodology for sample period 2006Q4 to 2016Q1 using quarterly data and two lags each of following instruments: Seasonally Adjusted Output Gap, Seasonally Adjusted Output Agricultural Gap, GDP Deflator, CPI Inflation, WPI Inflation, Global Commodity Price Inflation, Primary Commodity Inflation, International Fuel Price, Exchange Rate and Money demand.

Source: Author's Calculations

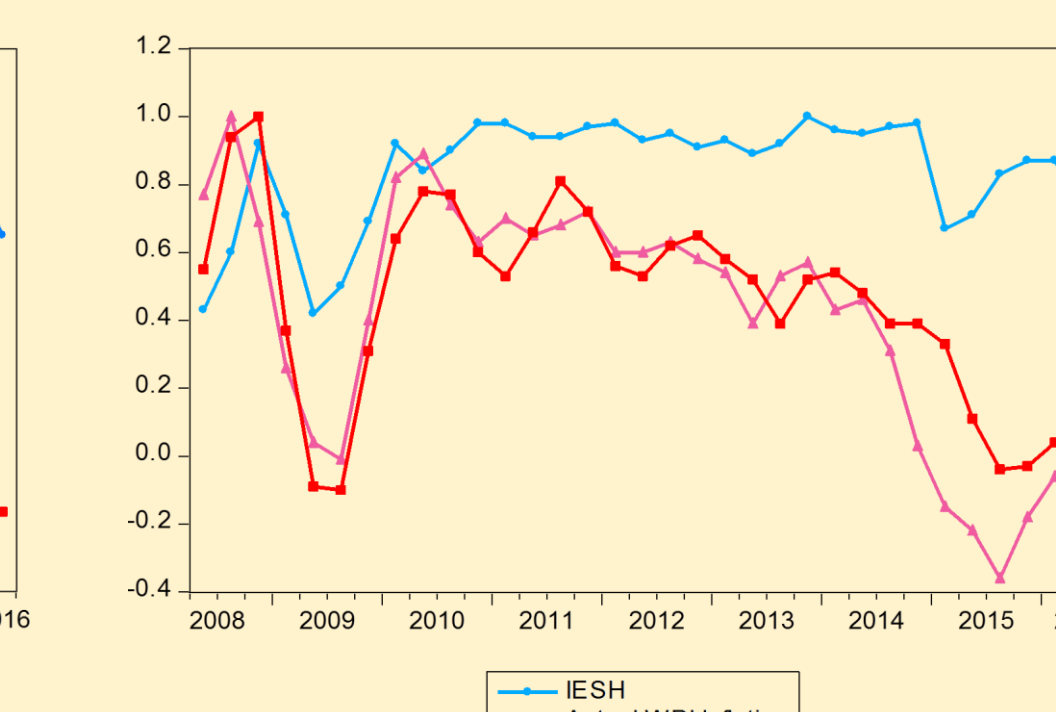
## Modelling Inflation Expectation

Figure 2: Graphical Representation of Household Expectation (IESH) and Professional Forecasters (SPF-WPI)



Data Source: RBI, Database of Indian Economy (DBIE)

Figure 3: Graphical Representation of Household Expectation (IESH), Professional Forecasters (SPF-WPI) and Actual WPI Inflation



## Epidemiological Model of Expectation Formation

- Epidemiological – A biological process in which a disease spreads from a common process and various people get infected from it depending on the immunity level of an individual.
- Similarly, the news media (akin to a common source) has its impact on the consumers, although not all consumers are affected uniformly.
- Such an analysis of consumer's expectation is new in India.
- This exercise will help to assess the impact of news media and will help to look into the nature of news reporting that led to symmetric expectation formation.

Table 6: Estimating the Stickiness of Inflation Expectation

Estimating Equation:  
 $M_t[\pi_{t,t+4}] = \alpha_0 + \alpha_1 S_t[\pi_{t,t+4}] + \alpha_2 M_{t-1}[\pi_{t-1,t+3}] + \alpha_3 P_t[\pi_{t-5,t-1}] + \epsilon_t$

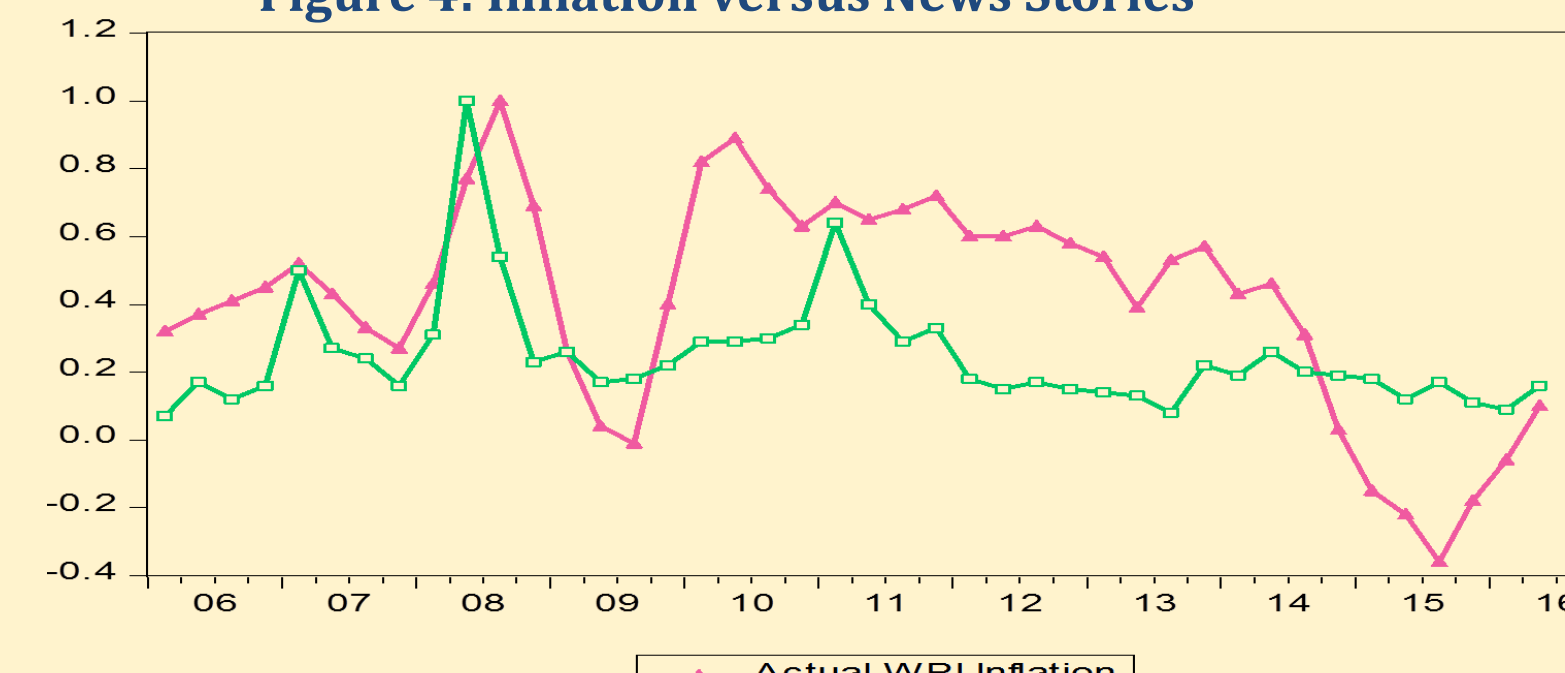
Equation	$\alpha_0$	$\alpha_1$	$\alpha_2$	$\alpha_3$	Adj. R <sup>2</sup>	Durbin-Watson	Std. Error	Test p-value
1	--	0.22 (3.17)	0.88 (20.60)	--	0.53	1.80	1.42	$\alpha_1 + \alpha_2 = 1$ 0.01
2	3.03 (2.70)	0.19 (2.82)	0.62 (5.96)	--	0.60	1.77	1.32	$\alpha_0 = 0$ 0.01
3	--	0.50 (3.74)	0.87 (21.83)	-0.27 (-2.38)	0.59	2.04	1.33	$\alpha_1 + \alpha_2 + \alpha_3 = 1$ 0.0107
4	2.49 (2.25)	0.40 (3.06)	0.66 (6.58)	-0.20 (-1.84)	0.64	1.93	1.25	$\alpha_3 = 0$ 0.07
5	--	--	0.94 (24.32)	0.09 (1.68)	0.69	1.76	1.48	$\alpha_2 + \alpha_3 = 1$ 0.23

NOTE:  $P_t[\pi_{t-5,t-1}]$  is lag of WPI inflation.  $S_t[\pi_{t,t+4}]$  is SPF\_WPI mean 3 month ahead forecast. T-stats are at parenthesis. The data period till equation 4 is from 2008Q2 to 2016Q2. Hence making total number of observations equal to 33. The data period for equation 5 starts from 2007Q1 to 2016Q2. There are total of 38 observations.

Source: Author's Calculations

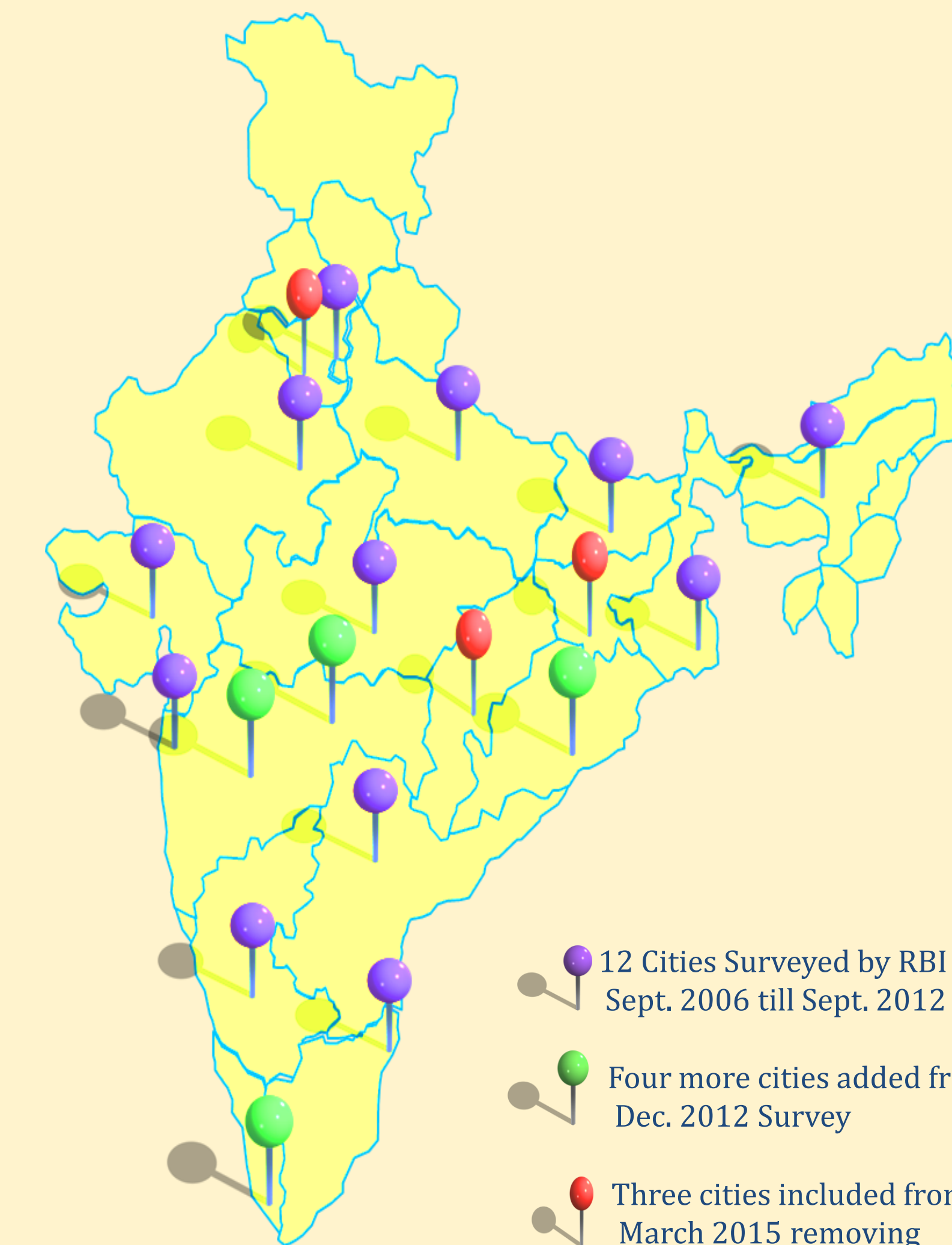
## Inflation News Coverage and Inflation Expectation

Figure 4: Inflation versus News Stories



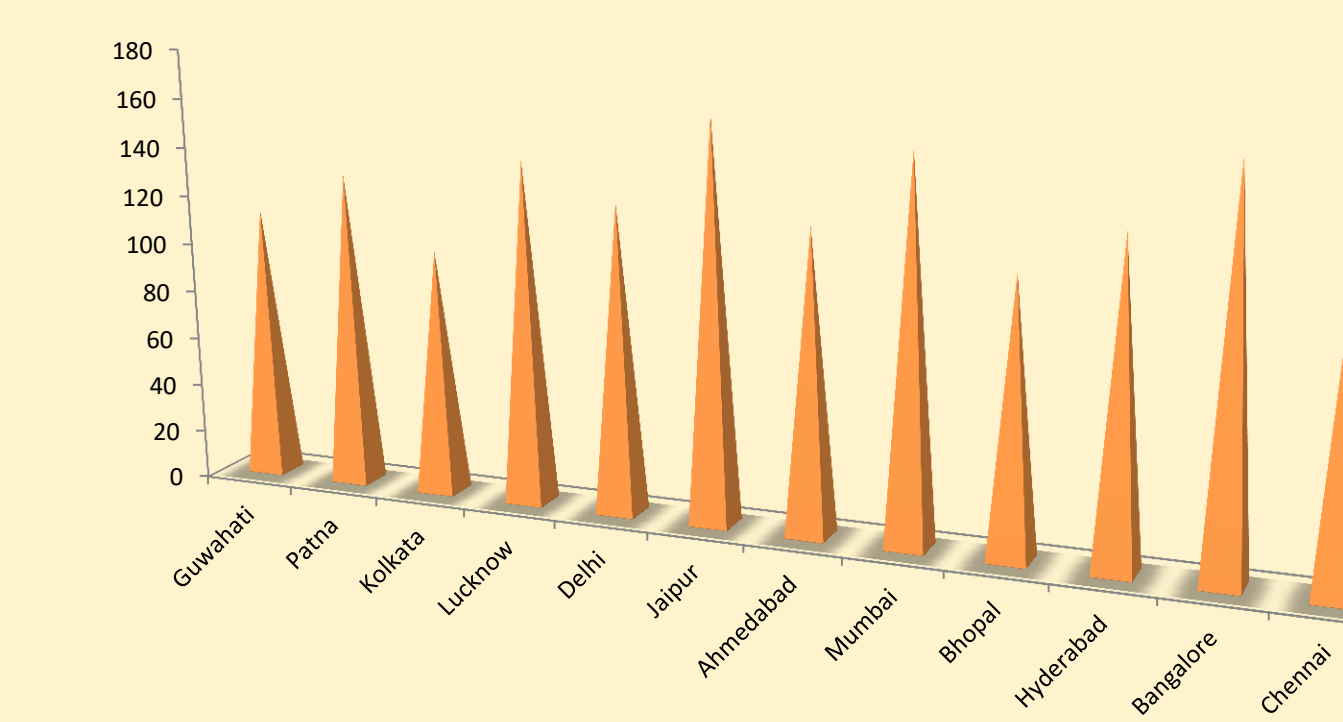
Data Source: RBI, Database of Indian Economy (DBIE)

## 3rd Research Question: Future Work



## City-wise data on Inflation Expectation

Figure 6: City-wise Variations of Inflation Expectation



Data Source: RBI, Database of Indian Economy (DBIE)

## Conclusion

- With survey method, both versions of NKPC (forward looking and hybrid) exist for India.
- There is evidence of epidemiological origin of inflation expectations in India.

## References

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- Gali, Jordi, and Mark Gertler, "Inflation Dynamics: A Structural Econometric Analysis", Journal of Monetary Economics, XLIV (1999), 195-222.
- Patra, Michael Debabrata and Muneesh Kapur, "A Monetary Policy Model Without Money for India", IMF Working Paper, WP/10/183, 2010.
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