Understanding Food Inflation in India

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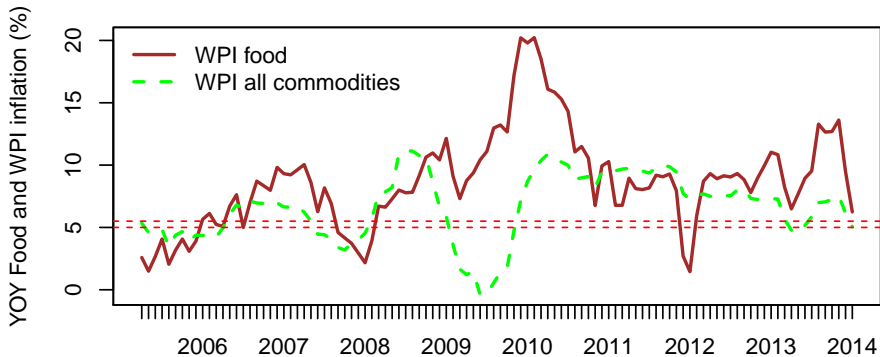[1] National Institute of Public Finance and Policy

[2] India Resident Mission, Asian Development Bank
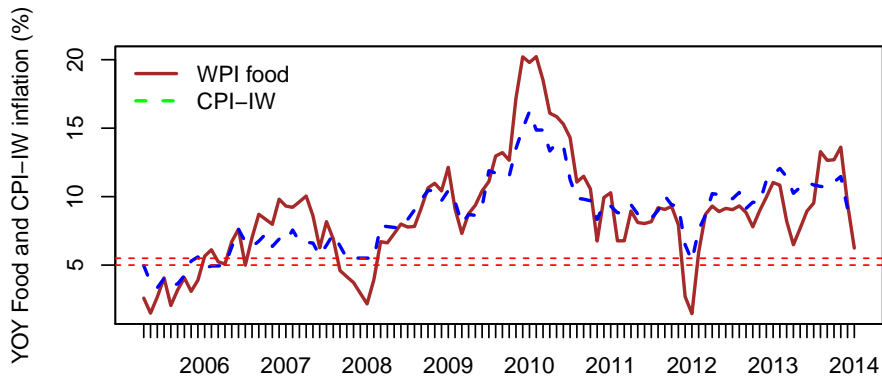
February 25, 2014

Outline

- Motivation and questions
- Stylised facts about food inflation
- Factors influencing food inflation
- Transmission of food to non-food and aggregate inflation
- Summary

Role of food inflation in WPI inflation

source: Office of Economic Adviser, Labour Bureau and & Authors' Estimates

Food inflation driving CPI-IW inflation

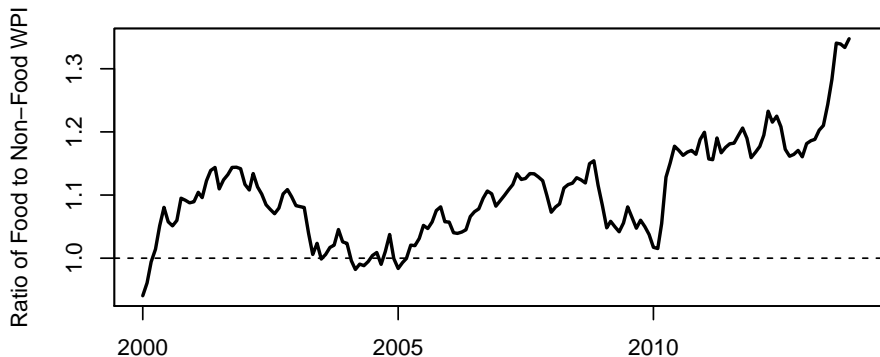source: Office of Economic Adviser, Labour Bureau and & Authors' Estimates

Questions

- What are the stylised facts about food inflation in India?
- What are the factors driving food inflation?
- What is the degree of transmission of food inflation to non-food inflation and aggregate CPI inflation?

Part I

Stylised facts about food inflation

Rising relative price of food: WPI

- WPI food price level has persistently been higher than WPI non-food price level since 2005
- Sharp rise in relative price of food to non-food inflation since 2010

source: Office of Economic Adviser & Authors' Estimates

Rise in persistence of food inflation

Persistence in food inflation has increased considerably after 2008 compared to non-food inflation

	Food Inflation		**Non Food Inflation**	
	Apr-97 to Mar-08	Apr-08 to Sep-12	Apr-97 to Mar-08	Apr-08 to Sep-12
1 month lag	1.042***	1.196***	1.112***	1.286***
2 month lag	-0.382***	-0.569***	-0.023*	-0.253*
3 month lag	0.255**	0.554***	0.080*	0.159*
4 month lag	-0.051*	-0.232*	-0.279***	-0.230**
No. of Observations	139	50	139	50
R-squared	0.766	0.789	0.947	0.960
Sum of Autoregressive Coefficients	**0.864**	0.949	0.890	0.962

Here ***, ** and * represent statistical significant at 1%, 5% and 10% respectively

The optimal lag is selected on the basis of Schwarz Bayesian Information Criterion

Drivers WPI food inflation (YOY)

Food inflation has driven by cereals, fruits and vegetables, milk, meat and fish at different points in time
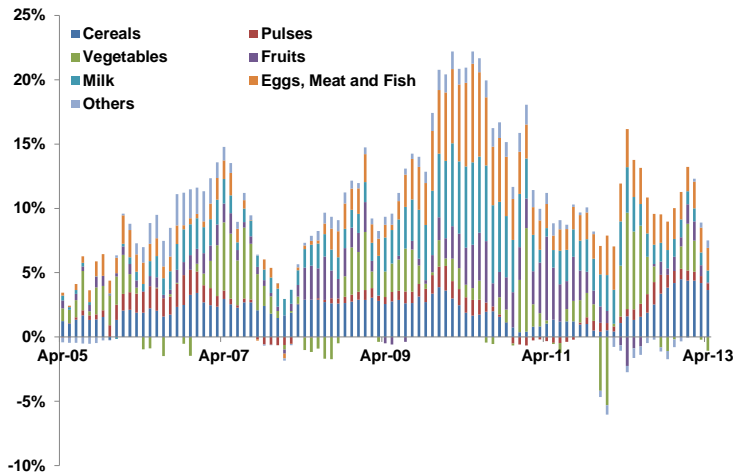
Source: Ministry of Commerce & Authors' Estimates

Part II

Factors influencing food inflation

Factors influencing food inflation

- Demand Supply mismatch
  - Dietary shift in a growing economy
  - Rising demand
  - Stagnant productivity
- Rising cost of inputs
  - Agricultural wages
  - Fuel prices

Part III

Demand-Supply mismatch

Shift in food basket with rising per capita income

- Rising per capita income and diversification of Indian diets has increased the demand for high-value food products
- Food consumption has also obeyed Bennet's law with starchy staples in the food basket are displaced by protein-rich foods
- These shifts in food basket are reflected in time series and cross section data
- Share of cereal steadily falls over time, while shares of protein and vitamin-rich diets rise over time
- For both rural and urban population, the ratio of average per capita monthly consumption of cereals by a household at above 70% of MPCE to that by a household at below 70% of MPCE is slightly greater than 1
- For rural and urban populations, such ratios for luxury items such as milk and fish and meat are 4 and 3 respectively

Bennet's Law: Time series evidence
Rural and urban food basket has changed over time

Region	Year	Cereals ↓	Pulses	Dairy ↑	EFM ↑	Vegetables ↑	Fruit ↑
	1972-73	55.7	5.9	10.0	3.4	4.9	1.5
	1987-88	41.1	6.3	13.4	5.2	8.13	2.5
Rural	1993-94	38.3	6.0	15.0	5.2	9.5	2.7
	1999-00	37.4	6.4	14.8	5.6	10.4	2.9
	2004-05	32.7	5.6	15.5	6.0	11.1	3.5
	2009-10	24.2	5.8	13.5	8.3	14.5	4.3

Region	Year	Cereals ↓	Pulses	Dairy ↑	EFM ↑	Vegetables ↑	Fruit ↑
	1972-73	36.1	5.3	14.4	5.1	6.8	3.1
	1987-88	26.6	6.0	16.8	6.4	9.4	4.4
Urban	1993-94	25.6	5.5	17.9	6.2	10.1	4.9
	1999-00	25.8	5.8	18.1	6.4	10.6	5.0
	2004-05	23.8	4.9	18.6	6.4	10.6	5.2
	2009-10	18.4	5.6	15.6	8.2	12.7	7.2

Source: NSSO Report on Household Consumption Survey, 61st round

Bennett's Law: Evidence from cross section

Monthly per capita consumption	Rural			Urban		
	Percentile class of MPCE			Percentile class of MPCE		
	0-30	30-70	70-100	0-30	30-70	70-100
Cereals	**11.09**	11.84	**12.43**	**9.97**	10.43	**10.07**
Pulse & Pulse Product	0.52	0.69	0.98	0.56	0.81	1.08
Milk & Milk Product	1.83	4.24	8.03	2.34	5.29	8.85
Sugar	0.49	0.76	1.1	0.58	5.29	8.85
Edible oil	0.44	0.6	0.8	0.51	0.74	0.92
Fish & Meat	0.24	0.42	0.81	0.31	0.52	0.83
Vegetables	4.16	4.98	6.16	4.04	5.22	6.78
Fruit Fresh	0.12	0.21	0.46	0.12	0.33	0.82

Source: NSSO Survey, 66th Round & Author's estimates

Stagnant productivity: Trend in yield

Decline in yield from the decade of 1990s to 2000s in wheat, pulses and vegetables

	1990s	2000s	Trend
Rice	1.4%	1.5%	
Wheat	2.9%	1.1%	↓
Pulses	1.8%	1.2%	↓
Fruits	0.7%	0.7%	
Vegetables	3.2%	1.7%	↓

Source: Agriculture Statistics at a Glance,

Ministry of Agriculture and Authors' Estimates

Estimation of demand-supply gap

- Gap between aggregate domestic demand and domestic production
- Aggregate domestic demand consists of
  - Household demand
  - Indirect demand for Feed, Seed and Wastage (FSW)
- Cereals, Pulses and Pulse product, Milk and Milk products, Vegetables, Fruits and Fish and Meat constitute 76% of Monthly Per Capita Consumption Expenditure (MPCE)
- Estimate household demand using 66th round of household consumption expenditure survey by NSSO for 2009-10 in Quadratic Almost Ideal Demand System (QUAIDS) framework
- Shares of indirect demand in total demand for the selected items are sourced from Planning Commission Report, 2011 to arrive at aggregate demand

Estimated expenditure elasticities

Items	Elasticity
Cereals	0.226
Pulses	0.515
Vegetables	1.535
Fruits	2.210
Milk and Milk Products	2.185
Meat and Fish	**0.796**

- Expenditure elasticities for milk and milk products, vegetables and fruits are greater than one
- 1% increase in household expenditure on food would lead to a more than 1% increase in the demand
- High expenditure elasticity for meat and fish
- In a growing economy, with rising expenditure on food, higher demand pressure due to high expenditure elasticities of milk and milk products, vegetables, fruits and meat and fish
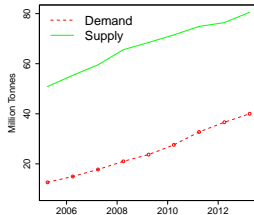
Estimated demand-supply gap
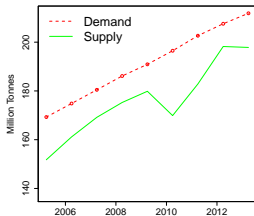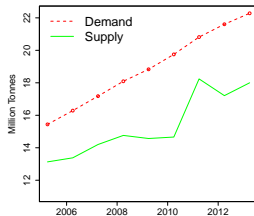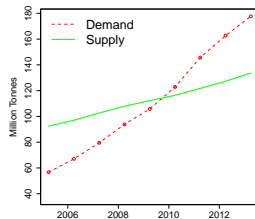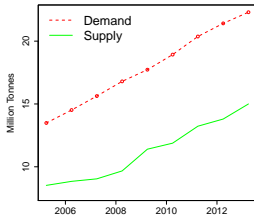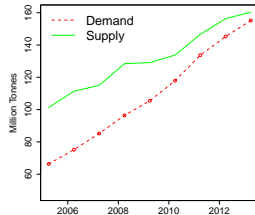
Demand Supply Mismatch

- For cereals, pulses, and fish and meat, demand continuously outstripped supply for past five years
- Demand for milk started exceeding supply from 2010
- However, for fruits and vegetables, the demand-supply gap is negative
- High rates of inflation in these fruits and vegetables can be explained by other factors
- Demand-supply gap in different items have driven inflation in respective item in different periods
    - For cereals and pulses, inflation shows co-moving pattern after the drought in 2009
    - For Egg, Fish, and Meat, inflation shows co-moving pattern during 2006-2011

Positive demand gap and cereal inflation
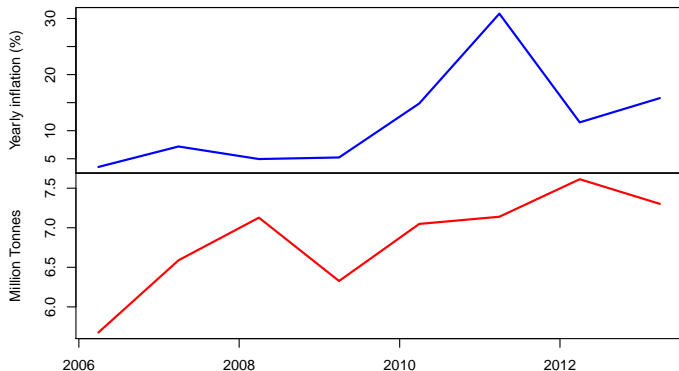## Yearly inflation in WPI Cereal and DD-SS gap in Cereal
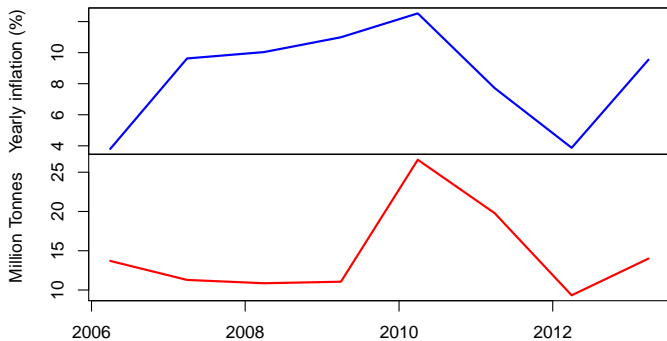
Positive demand gap and pulses inflation
Yearly inflation in WPI Pulses and DD-SS gap in Pulses

Positive demand gap and protein inflation
Yearly inflation in WPI Egg, Fish, & Meat and DD-SS gap in Egg, Fish, and Meat

Part IV

Rising cost of inputs: Agricultural wages

Agricultural wages

- It is often argued that universal implementation of NREGA has increased agricultural wages contributing to food price pressure
- We test for structural break in agricultural wages inflation for different activities using Bai-Perron test (1998)
- Estimate pass-through of agricultural wage inflation to food inflation in a VAR framework
- Average monthly agricultural wage (ploughing) data from August, 2005 sourced from RBI
- Food price index is the weighted average of WPI food articles and the component of manufactured food products
- No co-integration found at level
- VAR model with month-on-month wage and food (SA) inflation

Structural break in agricultural wage inflation

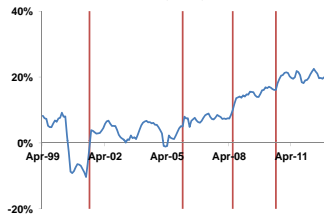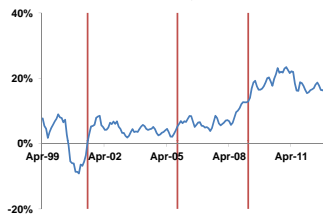Structural break in agricultural wage growth in 2008 for all agricultural occupations
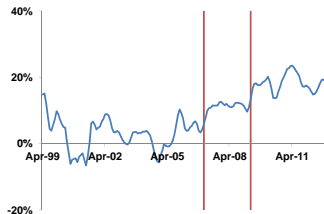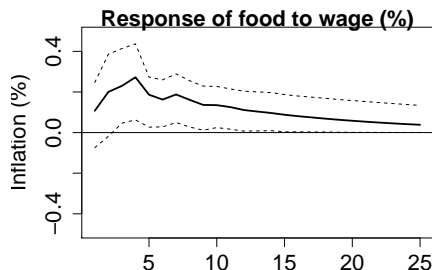

Ploughing
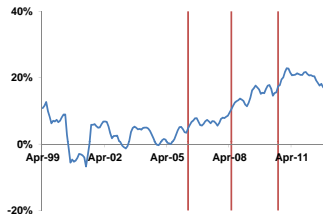
Sowing

Weeding

Transplanting

Source: Labor Bureau, Government of India & Authors' Estimates

Transmission of wage inflation to food inflation

Response of food to wage (%)

Response of wage to food (%)

Source: RBI Database, Office of Economic Advisor &Authors' Estimates

- 10% rise in wage inflation causes 2.3% rise in food inflation after 4 months of the shock and declines afterwards
- 10% rise in food inflation causes 3.8% rise in wage inflation, however the impact dies down in subsequent periods

Forecast Error Variance Decomposition of wage and food inflation

	Horizon	Wage	Food
FEVD for	1	100	0
wage inflation	5	92.242	**7.758**
	10	89.875	10.125
FEVD for	1	1.125	98.875
food inflation	5	14.702	85.298
	10	20.874	79.126

- The FEVD analysis tells us the proportion of the movements in a sequence due to its "own" shocks versus shocks to the other variables
- 5 months out, 14.7% variation in food inflation is due to wage inflation
- 5 months out, 7.8% variation in wage inflation is due to food inflation
- Wage-price spiral in agricultural wages and food inflation

Part V

Rising cost of inputs: Fuel prices

Effect of inflation in fuel prices

- Fuel is used to transport the produce from the producer to the consumer as well as power several machines
- In India, fuel prices have been administered to a large extent although there have been some recent movements towards integration of oil prices with market forces
- Estimate the degree of pass-through of fuel inflation to food inflation
- No co-integration relation among food and fuel price levels detected by the Johansen co-integration test
- Relationship between food and fuel inflation (month-on-month) investigated in a two-variable Vector Auto Regression (VAR) framework

Transmission of fuel to food inflation

Response of food to fuel (%)
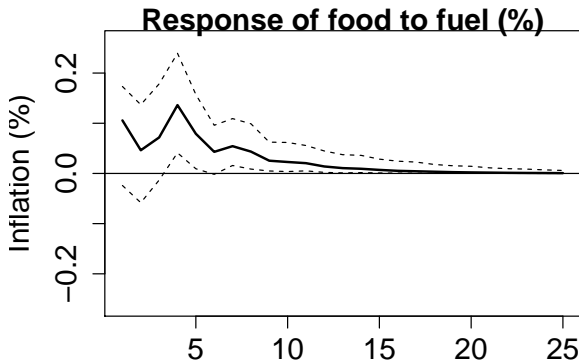
Source: Office of Economic Adviser & Authors' Estimates

- We find significant pass-through from fuel inflation to food inflation
- 10% rise in fuel inflation leading to a 1.3% rise in food inflation after 5 months, the effect declines afterwards

FEVD analysis for fuel and food inflation

FEVD analysis shows that 5 months out, 3.4% variation in food inflation is due to variation in fuel inflation

|	Horizon	Fuel	Food
FEVD for	1	100	0
fuel inflation	5	95.776	4.224
	10	94.872	5.128
FEVD for	1	1.096	98.904
food inflation	5	3.387	96.613
	10	3.938	96.062

Source: Authors' Estimates

Part VI

Transmission of food to non-food and aggregate CPI inflation

Transmission from food to non-food and CPI inflation

- Rising food inflation shifts demand from food to non-food items, causing upward pressure on non-food inflation via substitution effect
- What is the degree of transmission of food inflation to non-food inflation and aggregate CPI inflation?
- One co-integration relation found among WPI food, WPI non-food non-fuel and CPI-IW level
- Estimate Structural Vector Error Correction Model (SVECM) which identifies long-run and short-run relationships
- Identifying restrictions on structural errors following Cholesky structure

Transmission of food to non-food and aggregate CPI inflation
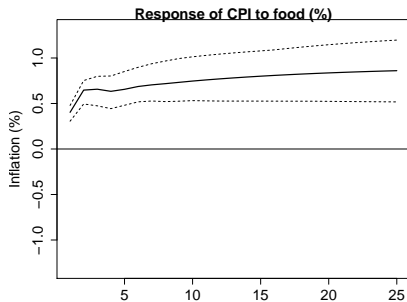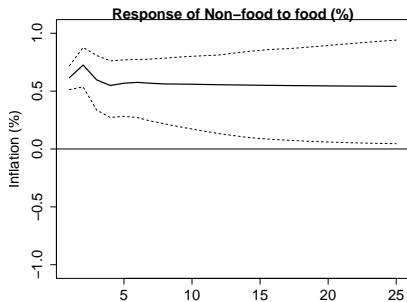
- Rise in food inflation by 10%, will raise non-food inflation by 6.1% immediately
- The effect increases to 7.2% in the next period and subsequently falls to 5.5%
- Rise in food inflation by 10% raises CPI by 6.5% after two months

Forecast Error Variance Decomposition

	Horizon	Food	Non-food	CPI
FEVD for	1	100	0	0
food inflation	5	97.476	0.448	2.076
	10	97.729	0.477	1.794
FEVD for	1	54.292	45.708	0
non-food inflation	5	48.834	50.923	0.242
	10	46.116	53.567	0.317
FEVD for	1	46.013	1.284	52.702
CPI inflation	5	63.468	0.503	36.029
	10	72.099	0.761	27.14

- 1 month out, 54% of variation in non-food inflation is due to variation in food inflation
- Variation in non-food inflation due to variation in food inflation falls to 48% after 5 months
- 1 month out, food inflation contributes 46% in variation of aggregate inflation which increases to 63% after 5 months

Summary

- Rising inflation in India due to both demand and supply side factors
- Widening gap between demand and supply of major food groups like cereals, pulses, meat and fish is a significant contributor to food inflation
- Rise in prices of key inputs like fuel and agricultural wages have also contributed to food inflation
- Food inflation has high and significant pass-through to non-food and aggregate CPI inflation

Thank you