Inflation Expectations and Portfolio Rebalancing of Households: Evidence from Inflation Targeting in India

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Motivation

- Growing interest in the use of inflation expectations as a policy tool (From Bernanke to Yellen to Powell)

- Lack of empirical evidence for portfolio rebalancing of households
    - Affects aggregate risk in the economy
    - Build on the literature that study the relationship between inflation and stock market returns (Fama (1981), Fama and Schwert (1977), Amihud (1996), Barnes et al. (1999))

- No consensus on the impact of increase in inflation expectations on consumption
    - No effect on consumption (Burke and Ozdagli (2013))
    - Increase in consumption (D'Acunto et al. (2019))
    - Decrease in consumption (Coibion et al. (2020))

This paper

- Provide evidence of portfolio rebalancing due to changes in households' inflation expectations
  - A fall in inflation expectations by 100 basis points increased savings by 25 percent (1085 rupees) and decreased risky investments by 2 percent (170 rupees).

- Show that households' balance sheets play an important role in studying inflation expectations
  - Households with liquid assets are the most responsive

- Highlight rigidity of savings deposit rate (Neumark and Sharpe (1992), Craig and Dinger (2011), Driscoll and Judson (2013)) in the passthrough of changes in inflation expectations

Empirical Challenges

Challenge 1: Research Design

- Inflation expectations and households' decisions are potentially endogenous
- Challenging to study changes in inflation expectations due to information rigidities in macroeconomics

Proposed Solution:

- Large-scale natural experiment: Inflation Targeting in India
  - Announced on February 2015
  - Adopted a central target of 4 % for the inflation rate with bands of $\pm$ 2 percent
  - Prior to that, 'Multiple Indicators Approach' was used

Empirical Challenges

Challenge 2: Data Availability

- Households respond to changes in inflation expectations in different domains (consumption, savings and asset portfolio decisions)

Proposed Solution: Combine 2 sets of data

- Inflation Expectations Survey of Households conducted by the Reserve Bank of India
- Administrative bank data with information on various consumer outcomes

Dataset 1

- Inflation Expectations Survey of Households conducted by RBI
- Quarterly inflation expectations of households between 2014 and 2016 across different cities in India
- Demographics: City, Gender, Age
- Focus on households in 6 cities: Ahmedabad, Bhubaneshwar, Chennai, Delhi, Kolkata and Mumbai (that can be mapped with the administrative data)

|	Number	Mean	SD
	(1)	(2)	(3)
Age	19,530	38.7	14.44
Female	19,530	0.44	0.5
Current Inflation Expectations	19,530	13.58	11.47

Dataset 2

- Random sample of individuals from a leading bank in India
- Demographics: Occupation, City, Gender, Age, Martial Status, Income
- Individual-level monthly data from 2014 to 2017:
    1. Consumption
        - Credit card spending (with MCC Codes)
        - Debit card spending (with MCC Codes)
        - ATM withdrawals
    2. Investments in Risky Assets
        - Mutual Fund Investments
        - Equity Investments
    3. Bank Deposits
        - Savings/Checking Account (**Constant Interest Rate of 4 %**)
        - Term Deposits

Summary Statistics of Dataset 2

	Number	Mean	SD
	(1)	(2)	(3)
Panel A: Demographics			
Age	153,071	48.1	15.6
Female	153,071	0.25	0.44
Married	153,071	0.61	0.49
Panel B: Consumption			
Credit Card Spending	1,071,497	3,030	12,475
Debit Card Spending	1,071,497	2,175	9,486
Total Card Consumption	1,071,497	5,206	15,714
ATM Withdrawals	1,071,497	11,724	22,794
Total Consumption	1,071,497	16,930	29,666
Panel C: Bank Deposits			
Total Savings	1,071,497	210,663	883,023
Total Term Deposits	1,071,497	297,683	4,881,455
Total Deposits	1,071,497	508,346	5,033,866
Change in Savings	1,071,497	1,898	573,069
Change in Term Deposits	1,071,497	3,003	542,252
Change in Total Bank Deposits	1,071,497	4,900	664,084
Panel D: Investments in Risky Assets			
Mutual Funds Investment	1,071,497	4,685	63,086
Direct Investment	1,071,497	2,505	46,024
Total Investments in Risky Assets	1,071,497	7,191	78,087

Empirical Strategy 1: by City

- Follow the literature that highlights the importance of regional heterogeneity.
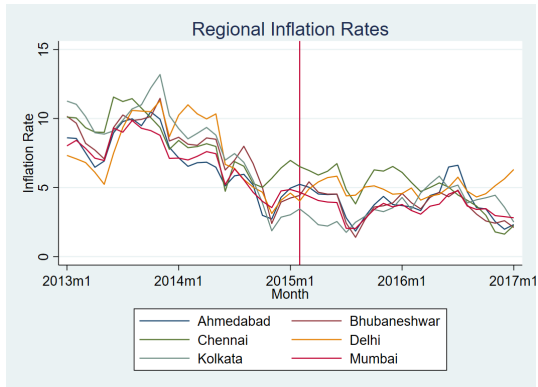
Empirical Strategy 2: by City-Age Group-Gender Bin

- As households in the same city, age group and gender are most likely to be exposed to the same information and experiences (Drivers)

$$\pi_{it} = \sum_j (\delta_j Y_j + \gamma_j Y_j * Post) + \beta Post + \epsilon_{it}$$

- π_{it} refers to the inflation expectations of individual respondent i at time period t

- Y_j relates to the 24 bins: 6 cities, 2 gender groups, 2 age groups. (Example: Bin 1 refers to a younger male in Delhi, Bin 12 refers to an older female in Kolkata)

- Post is an indicator which is defined as the time period on and after 2015 Q1

Methodology

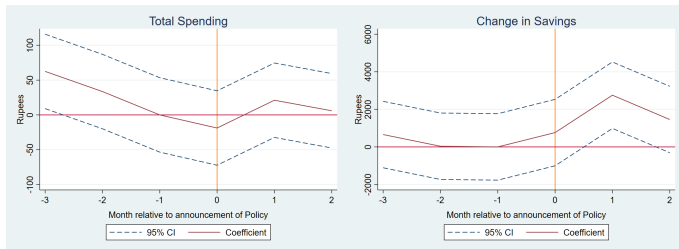$$Y_{it} = \gamma_i + \lambda_t + \beta I_{it} + \epsilon_{it}$$

Y_{it} refer to Consumption Spending, Investments into risky assets, Change in Bank Deposits

I_{it} refers to the changes in inflation expectations (treatment intensity)

γ_i is the individual dummy variable to absorb differences in individual preferences
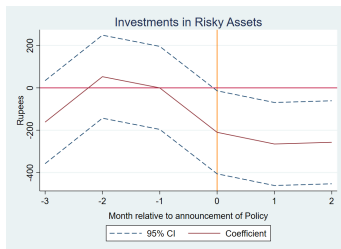
λ_t is the month dummy variable to control for time fixed effects

Event Study

(a) Total Spending

(b) Δ Savings
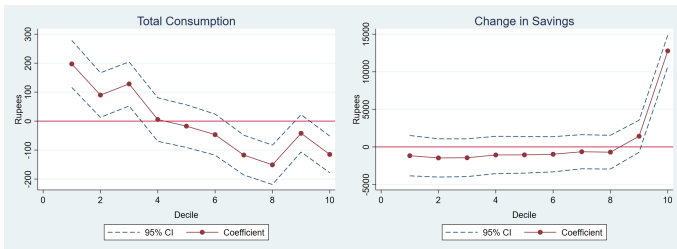

(c) Investments in Risky Assets

Main Results

Households rebalance their portfolios by switching from risky assets to bank deposits when faced with a fall in inflation expectations

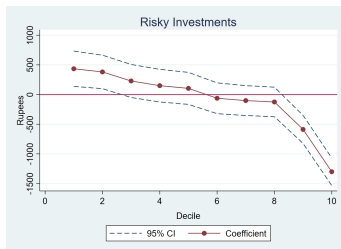| Dep. Var.:	Consumption	Δ Bank Deposits	Investments
	(1)	(2)	(3)
Treat Indicator	-22.74	1,085***	-170.3**
	(15.77)	(328.0)	(77.62)
Observations	1,071,497	1,071,497	1,071,497
R-squared	0.571	0.065	0.169
Individual FE	Y	Y	Y
Month FE	Y	Y	Y

Asymmetric impact on real returns

- Due to the nominal rigidity of savings account, the nominal return of the risk-free rate does not change 1 to 1 with changes in inflation expectations

- From the Fisher equation, a decrease in inflation expectations would lead to an increase in the real interest rate of the risk-free assets directly

- Real return of risky assets should remain unchanged with inflation (Campbell and Vuolteenaho (2004))

Heterogeneous Effects (by liquid savings)

(a) Total Spending

(b) Δ Savings

(c) Investments in Risky Assets

Heterogeneous Effects based on those with loans

Dep. Var.:	Consumption	Δ Bank Deposits	Investments
	(1)	(2)	(3)
Intensity* Post	-21.33	1,160**	-181.0**
	(16.98)	(561.4)	(62.23)
Intensity*Post	49.86	560.8	482.7***
* Loans	(44.87)	(1,483)	(164.4)
Observations	1,071,497	1,071,497	1,071,497
R-squared	0.571	0.065	0.169
Individual FE	Y	Y	Y
Month FE	Y	Y	Y

Robustness Test

- Using Stock Market Participation Rate in different cities as a measurement of treatment intensity Stock Market Participation Rate

- Falsification test based on the time period April 2014 to September 2014 Falsification test

- Placebo test by randomising the different bins Placebo

Policy Implications

- Risk-taking behavior as households rebalance their portfolios

- Role of household balance sheet

- Rigidity in bank deposit rates

Conclusion

- Due to nominal rigidity in bank deposit rate, households rebalance their portfolios by switching from risky assets to bank deposits when faced with a fall in inflation expectations

- While the overall impact on consumption is statistically insignificant, there is a decrease in consumption spending as the savings and income deciles increase

- Portfolio rebalancing takes place primarily for households with large amount of liquid assets

Stock Market Participation as Treatment Intensity

Dep. Var.:	Consumption	Δ Bank Deposits	Investments
	(1)	(2)	(3)
Investor * Post	-3,657***	16,659	-549.4
	(1,311)	(43,349)	(4,806)
Observations	1,071,497	1,071,497	1,071,497
R-squared	0.571	0.065	0.169
Individual FE	Y	Y	Y
Month FE	Y	Y	Y

Back

Placebo Treatment Intensity

Dep. Var.:	Consumption	Δ Bank Deposits	Investments
	(1)	(2)	(3)
Intensity* Post	-12.25	732.8	-248.1
	(21.06)	(1,205)	(177.4)
Observations	1,071,497	1,071,497	1,071,497
R-squared	0.571	0.065	0.169
Individual FE	Y	Y	Y
Month FE	Y	Y	Y

Falsification Analysis (March to August 2014)

Dep. Var.:	Consumption	Δ Bank Deposits	Investments
	(1)	(2)	(3)
Intensity* Post	130.2	-448.2	423.1
	(105.6)	(571.7)	(300.2)
Observations	918,426	918,426	918,426
R-squared	0.507	0.094	0.105
Individual FE	Y	Y	Y
Month FE	Y	Y	Y

Factors driving Inflation Expectations

1. Consumer's priors and perceptions of inflation
   - Malmendier and Nagel (2015), Cavallo, Cruces and Perez-Truglia (2017)
2. Personal experiences
   - D'Acunto, Malmendier, Ospina and Weber (2021)
3. Media
   - Carroll (2003)
4. Knowledge about monetary policy
   - Pfajfar and Santoro (2013)
5. Gender Roles
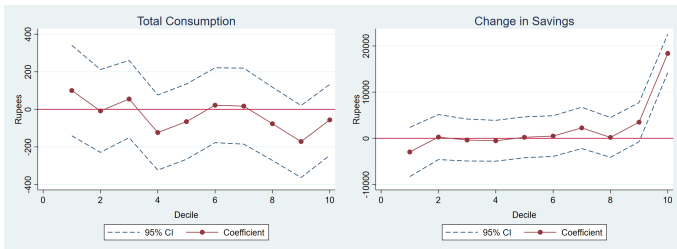   - D'Acunto, Malmendier and Weber (2019)

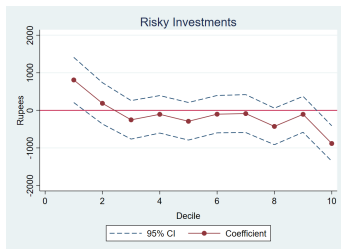# Variation in Inflation Expectations (by bin)

Some examples:

- Bin 1 (male, younger respondent in Delhi): Fall in inflation expectations of 572 basis points (significant at 1 percent)

- Bin 12 (female, younger respondent in Kolkata) have a smaller fall of 414 basis points (significant at 1 percent)

- Bin 18 (female, younger respondent in Chennai) have a smaller fall of 332 basis points (significant at 1 percent)

Heterogeneous Effects (by Income deciles)

(a) Total Spending

(b) Δ Savings

(c) Investments in Risky Assets