Salient Price Changes, Inflation Expectations, and Household Behavior

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May 17, 2018
Motivation

- Households' inflation expectations crucial for
  - Investment/wealth accumulation
  - Effectiveness of monetary & fiscal policy
    Bernanke (2007); D’Acunto, Hoang, & Weber (2017)

- Variation in inflation expectations pervasive
  Across-cohorts: Malmendier & Nagel (2016)

- Within cohort variation not well understood
  Purchases: Cavallo, Cruces, Perez-Truglia (2015); Madeira & Zafar (2015); Binder (2016)

"With trips to [...] the grocery store being some of the most frequent shopping experiences for many Americans, it is hardly helpful for the Fed credibility to appear to exclude all those prices from consideration in the formation of monetary policy"

(J. Bullard, President of the St. Louis Fed, 2011)
Research Questions

- Does *perceived* inflation from actual purchases drive expectations?
- Is the effect driven by rational inattention or frequency bias?
  - Rational Inattention:
    costly to gather information about inflation; HHs rely on prices to which exposed (e.g., Cavallo, Cruces, and Perez-Truglia, 2015)
  - Frequency Bias:
    HHs overweigh prices of goods they see changing frequently/saliently (e.g., Bruine de Bruin et al., 2015; Georganas et al., 2014)
- Which households react more to perceived inflation?
- Does perceived inflation predict consumption/investment plans?
- Major empirical hurdle:
  Need to observe BOTH consumption and expectations/plans
This Paper

- Observe for Nielsen homescan panel (90,000 households):
  - Detailed price/quantities of purchased goods
  - Expectations, consumption & investment plans from own survey

- Construct household-level measures of *perceived* inflation
  - (A) weigh price changes by actual purchases: “household CPI”
    *Rational inattention*: Cavallo, Cruces, Perez-Truglia (2015); Armantier et al. (2016)
  - (B) *over*weigh frequent purchase and salient price changes
    *Salience and consumption*: Bordalo, Gennaioli, & Shleifer (2013)
    *Frequency Bias*: Bruine de Bruin et al. (2011), Georganos et al. (2014)

- Same cost of acquiring information in (A) and (B)
  - If rational inattention, both (A) and (B) should predict expectations
Summary

- Data Sources
  - Novel survey on expectations and attitudes of Nielsen households
- Why do we focus on perceived inflation from groceries?
  - Doing the groceries predicts inflation expectations systematically
- Baseline: perceived inflation and inflation expectations
  - Perceived inflation *negatively* associated with inflation expectations
  - Results hardly consistent with rational inattention
- Heterogeneity across households
  - Grocery makers and economically illiterate households drive the results
- Perceived inflation and consumption decisions
- Perceived inflation and investment decisions
Data Sources

- Nielsen Homescan Database
  - Purchase file: quantities and prices at the UPC level
  - Trips file: expenditure growth
  - Panelist file: demographics

- Chicago Booth Expectations and Attitudes Survey
  - Customized survey on all households members in panel
  - 2 waves: June 2015 and June 2016
  - Expectations: inflation, interest rates, income, employment
Chicago Booth Expectations and Attitudes Survey I

- (Additional) Demographics
  Education, employment, industry, looking for job

- Other expenditures and income
  Income growth, mortgage, rent, college tuition, gas, health care, restaurants

- Prices, inflation, and house prices
  Short- & long-run, point estimate & distribution, prices of goods vs. inflation
Chicago Booth Expectations and Attitudes Survey II

- (General) economic outlook
  Aggregate & personal outlook, interest & mortgage rates, short- & long-run

- Consumption and savings
  Good time to consume & save, savings rate, portfolio allocation

- Financial literacy
  Inflation & real consumption, compounding, risk aversion
Inflation Measures

- Asking about inflation (NY Fed) and prices (Michigan) matters
  - Prices of goods people purchase results in (larger) upward bias

- Randomize questions

- Ask for point estimate and distribution

- Also elicit long-run inflation expectations
Channels and Mechanisms

- Question on primary grocery shopper in household
- Asked whether had specific prices in mind
- Sources of information
- Past price changes of specific goods
- Expenditure shares
Summary Statistics

- Full Nielsen panel: 92,511 unique households
- Survey: 49,383 individuals from 39,809 HHs (43% response rate)
- 40 questions with average response time of 14 min 49 sec
- 67% women
- Mean age: 53
- Modal income: USD 80k
- 28% with college degree
Four Measures of Perceived Inflation

- Measure 1: Household-level CPI: expenditure shares as weight
- Measure 2: Weigh more large price changes
- Measure 3: Weigh more frequent price changes in base year
- Measure 4: Combine weights of measures 2 & 3
- All measures ensure weights add up to 1

<table>
<thead>
<tr>
<th></th>
<th>HH CPI</th>
<th>Large Changes</th>
<th>Freq</th>
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<tbody>
<tr>
<td>Large Changes</td>
<td>0.164***</td>
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<tr>
<td>Freq</td>
<td>0.542***</td>
<td>0.638***</td>
<td></td>
</tr>
<tr>
<td>Freq &amp; Large Changes</td>
<td>0.462***</td>
<td>0.731***</td>
<td>0.847***</td>
</tr>
</tbody>
</table>
Work-in-Progress: Additional Measures

- Overweight large positive price changes
- Overweight recent purchases
- Calculate index of “witnessed” prices
- Long-run price changes
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- **Heterogeneity across households**
  - Grocery makers and economically illiterate households drive the results

- **Perceived inflation and consumption decisions**

- **Perceived inflation and investment decisions**
Why Perceived Inflation from Purchases?

- Well-known “fact”: women higher inflation perception than men
Why Perceived Inflation from Purchases cont?

From gender effect to “grocery effect”. LHS: perceived inflation

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>All</th>
<th>Women</th>
<th>Men</th>
</tr>
</thead>
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<tr>
<td><strong>Male</strong></td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>−1.32***</td>
<td>−0.46</td>
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</tr>
<tr>
<td></td>
<td>(0.18)</td>
<td>(0.32)</td>
<td></td>
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</tr>
<tr>
<td><strong>Fin. Literate</strong></td>
<td>0.58</td>
<td>0.62</td>
<td>0.21</td>
<td>−1.31</td>
</tr>
<tr>
<td></td>
<td>(0.39)</td>
<td>(0.43)</td>
<td>(0.89)</td>
<td>(1.27)</td>
</tr>
<tr>
<td><strong>Makes Groceries</strong></td>
<td>1.64***</td>
<td>3.89***</td>
<td>4.89***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.32)</td>
<td>(0.60)</td>
<td>(1.06)</td>
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<tr>
<td><strong>Male</strong> Fin. Literate</td>
<td>0.37</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>(0.76)</td>
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<tr>
<td><strong>Male</strong> Makes Groceries</td>
<td>−0.37</td>
<td></td>
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<tr>
<td></td>
<td>(0.38)</td>
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<tr>
<td><strong>Household FE</strong></td>
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<tr>
<td><strong>X</strong></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Nobs</td>
<td>25,595</td>
<td>25,595</td>
<td>17,246</td>
<td>8,349</td>
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<tr>
<td>Adjusted $R^2$</td>
<td>0.95</td>
<td>0.95</td>
<td>0.99</td>
<td>0.99</td>
</tr>
</tbody>
</table>

- Grocery shopping drives gender effect
- Grocery effect both for men and women
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- **Perceived inflation and investment decisions**
Perceived Inflation and Short-Run Expected Inflation

\[ \mathbb{E} \pi_i = \alpha + \beta \times \text{Perceived} \, \pi_i + X_i' \gamma + \eta_I + \eta_E + \epsilon_i, \]

<table>
<thead>
<tr>
<th></th>
<th>HH CPI</th>
<th>Large Changes</th>
<th>Freq</th>
<th>Freq &amp; Large Changes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Perceived Inflation</td>
<td>0.001</td>
<td>0.019**</td>
<td>0.013*</td>
<td>0.019**</td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Age</td>
<td>-0.002</td>
<td>-0.002</td>
<td>-0.002</td>
<td>-0.002</td>
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<tr>
<td></td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
<td>(0.008)</td>
</tr>
<tr>
<td>Male</td>
<td>-0.024</td>
<td>-0.022</td>
<td>-0.023</td>
<td>-0.023</td>
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<tr>
<td></td>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
<td>(0.017)</td>
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<tr>
<td>White</td>
<td>0.037*</td>
<td>0.038*</td>
<td>0.037</td>
<td>0.037</td>
</tr>
<tr>
<td></td>
<td>(0.023)</td>
<td>(0.023)</td>
<td>(0.023)</td>
<td>(0.023)</td>
</tr>
<tr>
<td>Retired</td>
<td>-0.002</td>
<td>-0.001</td>
<td>-0.001</td>
<td>-0.001</td>
</tr>
<tr>
<td></td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
<td>(0.020)</td>
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<tr>
<td>Home Maker</td>
<td>-0.029</td>
<td>-0.030</td>
<td>-0.029</td>
<td>-0.029</td>
</tr>
<tr>
<td></td>
<td>(0.031)</td>
<td>(0.031)</td>
<td>(0.031)</td>
<td>(0.031)</td>
</tr>
</tbody>
</table>

- Education level FE: X X X X X
- Income level FE: X X X X
- Nobs: 15,389 15,394 15,394 15,394
- Adjusted $R^2$: 0.01 0.01 0.01 0.01

- 1 std higher perceived inflation: expect 2 pp. lower inflation next 12 months
- Only measures that overweigh frequent/ salient price changes are relevant
Perceived Inflation and Short-Run Expected Inflation cont.

- Higher experienced inflation negatively predicts inflation expectations.

- Consistent with Cecchetti et al (2017): \( \Delta \) inflation neg autocorrelated.
## Perceived Inflation and Expected Inflation: Other Outcomes

<table>
<thead>
<tr>
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<th>Freq &amp; Large Changes</th>
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<tbody>
<tr>
<td><strong>Long-Run Inflation</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Perceived Inflation</td>
<td>$-0.017^{**}$</td>
<td>$-0.012$</td>
<td>$-0.016^{**}$</td>
</tr>
<tr>
<td></td>
<td>$(0.008)$</td>
<td>$(0.008)$</td>
<td>$(0.008)$</td>
</tr>
</tbody>
</table>

| **What spend money on** |               |      |                      |
| Perceived Inflation    | $-0.034^{***}$ | $-0.031^{***}$ | $-0.029^{***}$       |
|                        | $(0.008)$     | $(0.008)$     | $(0.008)$           |

| **Variance Exp. Inflation** |               |      |                      |
| Perceived Inflation       | $0.027^{***}$ | $0.019^{**}$ | $0.023^{***}$       |
|                          | $(0.008)$     | $(0.008)$     | $(0.008)$           |

Demographic Controls       | $X$           | $X$   | $X$                   |
Education level FE         | $X$           | $X$   | $X$                   |
Income level FE            | $X$           | $X$   | $X$                   |
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Perceived Inflation & Expected Inflation: Grocery Shoppers

Grocery Shoppers drive the negative association
Perceived Inflation & Expected Inflation: Financial Literacy

Financially Illiterate drive the negative association
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Perceived Inflation and Readiness to Purchase Durables

- Inflation Expectations and readiness to spend/ purchase
  
  
  Positive Effect: D’Acunto, Hoang, & Weber (2016)

- Does perceived inflation affect readiness to spend?

- If expect lower prices, should think now bad time to buy durables
## Perceived Inflation and Readiness to Purchase Durables

**Marginal Effect, multinomial logit. Likelihood reply not good time**

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<tr>
<td><strong>Panel A</strong></td>
<td></td>
<td></td>
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<tr>
<td>Perceived Inflation</td>
<td>0.010</td>
<td>0.057***</td>
<td>0.061***</td>
<td>0.036**</td>
</tr>
<tr>
<td></td>
<td>(0.018)</td>
<td>(0.018)</td>
<td>(0.018)</td>
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<tr>
<td><strong>Panel B</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Perceived Inflation</td>
<td>−0.010</td>
<td>0.040</td>
<td>0.055**</td>
<td>0.032</td>
</tr>
<tr>
<td></td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.026)</td>
<td>(0.026)</td>
</tr>
<tr>
<td>Expected Inflation</td>
<td>0.161***</td>
<td>0.161***</td>
<td>0.161***</td>
<td>0.161***</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.022)</td>
<td>(0.022)</td>
</tr>
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</table>

- Demographic Controls: X X X X X
- Education level FE: X X X X X
- Income level FE: X X X X X
- Nobs: 30,907, 30,914, 30,914, 30,914

- 1 std higher perceived inflation: 5 pp. more likely to say bad time to purchase
- Effect goes mainly through expected inflation
Perceived Inflation and Readiness to Purchase Durables

Grocery Makers experiencing higher prices think bad time to spend
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■ Perceived inflation and consumption decisions
■ Perceived inflation and investment decisions
Perceived Inflation, Expected Rates, Investment

■ Does perceived inflation affect expected nominal rates, investment?

■ Fisher equation:
  expect lower inflation, same real rates $\rightarrow$ lower nominal rates

■ If expect lower inflation and rates, invest more in bonds

■ Instead, unlikely to find any effect on investment in stocks
<table>
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<th>Large Changes</th>
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<th>Freq &amp; Large Changes</th>
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<tr>
<td><strong>Rates will drop</strong></td>
<td></td>
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<tr>
<td>Perceived Inflation</td>
<td>0.038***</td>
<td>0.027**</td>
<td>0.022*</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.013)</td>
</tr>
<tr>
<td><strong>Share in Bonds</strong></td>
<td></td>
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<tr>
<td>Perceived Inflation</td>
<td>0.050</td>
<td>0.813***</td>
<td>0.677**</td>
</tr>
<tr>
<td></td>
<td>(0.269)</td>
<td>(0.265)</td>
<td>(0.270)</td>
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<td><strong>Share in Stocks</strong></td>
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<td>Perceived Inflation</td>
<td>0.265</td>
<td>-0.325</td>
<td>-0.020</td>
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<td>(0.237)</td>
<td>(0.233)</td>
<td>(0.237)</td>
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<tr>
<td>Demographic Controls</td>
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<td>Education level FE</td>
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<tr>
<td>Income level FE</td>
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<tr>
<td>Nobs</td>
<td>30,914</td>
<td>30,914</td>
<td>30,914</td>
</tr>
</tbody>
</table>
Future Work

- Exploit within household and within individual variation
- Instrument shopping frequency w/ distance to primary shopping outlet
- Exploit changes in household size
Conclusions

- Individuals that *perceive* higher inflation in actual purchases
  - Expect lower inflation at all horizons
  - Want to postpone durable purchases
  - Expect interest rates will decrease
  - Want to invest in bonds

- Effects only detected with *salient* measures
  - Hardly consistent with rational inattention

- Heterogeneity: all the effects driven by individuals that
  - Go groceries shopping
  - Are less financially literate