Discussion of:
“The People versus the Markets: A Parsimonious Model of Inflation Expectations,” Reis (2020)

Fernanda Nechio
Deputy Governor for International Affairs and Corporate Risk Management
Banco Central do Brasil

Macroeconomics and Monetary Policy
Federal Reserve Bank of San Francisco
March 26, 2021
This paper

- Long-term inflation expectations are key under inflation targeting frameworks
  - Expectations from markets, households, professionals frequently inconsistent
- Discrepancy between market and households’ expectations:
  - Large business cycle fluctuations
  - Driven by disagreement across households and traders, and within traders
- Expectations are modeled and mapped into a simple macro model
  - Fundamental expectations have declined since 2014
  - Discrepancy affects the Euler equation and the policy rule
- Policy implications
Decomposing the discrepancy

$$\phi_t = E'_t(\pi_{t,T}) - E''_t(\pi_{t,T})$$

$$\phi_t = E'_b(\pi_{t,T}) - E''_t(\pi_{t,T}) + E'_m(\pi_{t,T}) - E''_t(\pi_{t,T}) + E'_i(\pi_{t,T}) - E''_t(\pi_{t,T})$$

- disagreement across
- disagreement within
- risk compensation

Figure 1: The discrepancy (market-peole) over time

Figure 4: The decomposition of the US discrepancy
Extracting the fundamental inflation expectation

- Households’ expectations: incomplete information, over-confidence, learning and sticky information

\[ v_t^h = c_t \pi_t^2 + \pi_t^e + \theta_t (c_t^h + \pi_t^e - \pi_t^e) \]
\[ c_t^h | \pi_t^e \sim N(0, \sigma_t^2) \text{ and } c_t \sim Exp(\lambda_t) \]

- Markets’ expectations: choose bond holding to maximize expected discount profits subject to market clearing for bonds, heterogeneous beliefs on wealth and bond supply

\[ E^h(\pi) = \frac{\int \pi^e g(\pi^* - \pi^e) f(\pi^{med} - \pi^e) d\pi^e}{\int g(\pi^* - \pi^e) f(\pi^{med} - \pi^e) d\pi^e} \]

(a) Fundamental long-run inflation expectations

![Graphs showing inflation expectations from 2011 to 2019 and from 2000 to 2020.](image-url)
Inflation depends on fundamental expectations and shocks: \[
\frac{dp_t}{p_t} = \pi_t^e dt + \alpha' dZ_t
\]

The policy rate is filtered through financial markets and beliefs and discrepancy enters the Euler equation:
\[
s_t = \ln(\zeta) + \alpha' \pi + i_t^{CB} - \pi_t^e - \delta \phi_t
\]

Discrepancy enters the policy rule:
\[
dt^{CB}_t = -\rho(i_t^{CB} - i^*)dt + \eta \left( \frac{dp_t}{dt} - \pi^* \right) + \gamma d\phi_t
\]

Discrepancy from previous model:
\[
\phi_t = \chi_\pi \pi_t^e - \pi_t^* + \chi_\omega \hat{\omega}_t
\]

Output and financial noise shocks
\[
\pi_t^e = \pi^* + \frac{(\rho - \kappa_\pi)(s_t - s^*)}{\eta - \rho - \rho \delta \chi_\pi + \kappa_\pi(1 - \chi_\pi(\gamma - \delta))} + \frac{\chi_\omega[\kappa_\omega(\gamma - \delta) + \rho \delta] \hat{\omega}_t}{\eta - \rho - \rho \delta \chi_\pi + \kappa_\omega(1 - \chi_\pi(\gamma - \delta))}
\]

A larger CB response to discrepancy implies:
- Smaller effects of output shocks
- Larger effects of financial noise shocks
Market versus households’ expectations

- Households:
  - Sizable range of forecasts
  - Depend on education, business cycle, age, consumption basket
  - Scars?

- Markets:
  - Traders versus economists
  - Driven by various factors (foreign investors, flight to safety, business cycle)
  - Sizable volatility
  - 5Y5F?
Table 4: Michigan Survey – Partial effects over the business cycle, households with at least a college degree

<table>
<thead>
<tr>
<th>Partial Effects of Inflation</th>
<th>Unemp. gap &lt; 0</th>
<th>Unemp. gap &gt; 0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Null Hypothesis</td>
<td>mean diff</td>
<td>p-value</td>
</tr>
<tr>
<td>$F(t</td>
<td>\pi</td>
<td>\sigma</td>
</tr>
<tr>
<td>$F(t</td>
<td>\pi</td>
<td>\sigma</td>
</tr>
<tr>
<td>$F(t</td>
<td>\pi</td>
<td>\sigma</td>
</tr>
<tr>
<td>$F(t</td>
<td>\pi</td>
<td>\sigma</td>
</tr>
</tbody>
</table>

One-sided tests of the partial effects of inflation and unemployment. Notation is such that $F(t | \pi | \sigma | u_i)$ denotes the fraction of answers that indicate that interest rates will increase ($\pi$) in the next 12 months in the pool of answers that indicate that inflation will decrease ($\sigma$) and unemployment will decrease ($u_i$) over the same period. For each line, the column “mean diff” reports the difference in means used to construct the associated one-sided test. The unemployment gap is given by the difference between the unemployment rate and the non-accelerating-inflation rate of unemployment estimated by the Congressional Budget Office. Sample includes data from August 1987 to December 2007. P-values are based on standard errors computed by a block bootstrap with a 6-month window and 200 replications.

Carvalho and Nechio (2014)
Traders, economists and households

Inflation expectations 5-to-10 years ahead

Discrepancy Households versus Economists
Modelling expectations

\[ \phi_t = \underbrace{E^b_t(\pi_{t,T}) - E^p_t(\pi_{t,T})}_{\text{disagreement across}} + \underbrace{E^m_t(\pi_{t,T}) - E^b_t(\pi_{t,T})}_{\text{disagreement within}} + \underbrace{E^r_t(\pi_{t,T}) - E^m_t(\pi_{t,T})}_{\text{risk compensation}} \]

(c) The decomposition of the discrepancy over time

Figure 8: Estimates of expected long-run US inflation since 2000
Modelling expectations:
- Household’s expectations does not depend on business cycle, communication, age
- Traders’ expectations built from households’
- Is there any feedback from one group to the other?
- Is discrepancy enough? No role for within and across in the macro model?

Monetary policy response:
- Should a central bank respond to such a volatile measure? Under what conditions? Contemporaneously? Persistent deviations?
- How to respond? Policy rate? How about communication?
- How is discrepancy (within, across) affected by communication?
- QE? ELB? AIT?
Great paper!

Very important discussion with policy implications

Extensive list of robustness checks

Few suggestions:

- Data refinements

- Add discussion on the macro model assumptions and implications

To conclude