Monetary Policy and the Redistribution Channel

Adrien Auclert

MIT

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Reductions in mortgage rates stimulate the economy substantially as households [can] reduce their stream of mortgage payments. This can be partially offset by the fact that the income and spending of net savers will be negatively affected by a decline in interest rates. However, the offsetting effect is likely to remain moderate.

(Peter Praet, ECB Conference Speech, October 2013)
Redistribution channel

- Traditional view: monetary policy affects household spending via a *substitution channel*

- A *redistribution channel* is also active when agents have correlated marginal propensities to consume and balance sheet positions
  - supported empirically: Johnson, Parker, Souleles 2006; Baker 2013

- Nominal interest rate changes impact balance sheets by:
  - redenominating nominal wealth (future inflation effect)
  - redistributing between unhedged borrowers and savers (real interest rate effect)

- This is expansionary if those agents whose balance sheets improve when interest rates fall have higher MPCs

- This project: understand and quantify the redistribution channel using model and micro data
Related literature

- Distributional effects of inflation:
  - Doepke and Schneider (2006), Berriel (2013)
- Monetary policy and inequality:
  - Coibion, Gorodnichenko, Kueng, Silvia (2012)
- Mortgages:
  - monetary policy transmission: Calza, Monacelli, Stracca (2013), Garriga, Kydland, Sustek (2013),
- MPC heterogeneity:
Outline

1. Theoretical framework
   - Partial equilibrium
   - General equilibrium

2. Data and next steps
No-uncertainty framework

- Consider an agent with arbitrary preferences, facing no uncertainty, earning real income $\{y_t\}$ and holding long-term contracts. Solves

$$\max \ U(\{c_t\})$$

$$\text{s.t. } P_t c_t = P_t y_t + (t-1B_t) + \sum_{s \geq 1} (tQ_{t+s})(t-1B_{t+s} - tB_{t+s})$$

$$+ P_t (t-1b_t) + \sum_{s \geq 1} (tq_{t+s})P_{t+s}(t-1b_{t+s} - t b_{t+s})$$

- Initial holdings:
  - Nominal assets: $\{-1B_{t+s}\}_{s \geq 0}$ (deposits, long-term bonds, mortgages)
  - Real assets: $\{-1b_{t+s}\}_{s \geq 0}$ (TIPS, price-level adjusted loans)

- Initial real term structure: $q_t = (0q_t)$ and expected price level $\{P_t\}$

- No arbitrage between nominal and real bonds: Fisher equation for nominal term structure $tQ_{t+s} = (tq_{t+s})\frac{P_t}{P_{t+s}}$
Present-value budget constraint

- Intertemporal budget constraint (using a TVC/TC)

\[
\sum_{t \geq 0} q_t c_t = \sum_{t \geq 0} q_t \left( y_t + (-1 b_t) + \left( \frac{-1 B_t}{P_t} \right) \right) \equiv W
\]

- All financial assets with same present-value are equivalent and can be restructured in each period

  \[\rightarrow \text{Initial balance sheets are arbitrary}\]

- Example: initial holding of a single real liability \( \frac{D}{P_0} \) in form of:
  - Adjustable rate: \(-1 B_0 = -D\)
  - Fixed rate: \(-1 B_t = -M, t = 1 \ldots T, \sum_{t=0}^{T} Q_t M = D\)
  - Price-level adjusted: \(-1 b_t = -m, t = 1 \ldots T, \sum_{t=0}^{T} q_t m = \frac{D}{P_0}\)
**Unexpected shock**

At $t = 0$ there is an unanticipated/uncontracted “shock” to monetary policy, resulting in a change in:

1. The price level $\{P_0, P_1 \ldots\}$
2. The real term structure $\{q_0 = 1, q_1, q_2 \ldots\}$
3. The agent’s real income sequence $\{y_0, y_1 \ldots\}$

The Fisher equation still holds after the shock.

Consider the first-order change in consumption $dc_0$ and welfare $dU$ that results from this change in the environment.

Consumer theory $\rightarrow$ $MPC = \frac{\partial c_0}{\partial W}, \epsilon^h_{0,t} = \frac{\partial c^h_0}{\partial q_t} \frac{q_t}{c_0}$ at initial $(\{q_t\}, W, \bar{u})$

$\rightarrow$ **now balance sheets matter**: for example,

$$-1B_t = 0 \quad -1b_t = c_t - y_t \quad \forall t$$

hedges against both the inflation and the real interest-rate shock.
Unexpected one-time shock

- At $t = 0$ there is an unanticipated/uncontracted “shock” to monetary policy, resulting in a one-time change in:
  1. The price level $\{P_0, P_1, \ldots\} \rightarrow dP = Pd\pi$
  2. The real term structure $\{q_0 = 1, q_1, q_2, \ldots\} \rightarrow dq = -qdr$
  3. The agent’s real income sequence $\{y_0, y_1, \ldots\} \rightarrow dy_0$

- The Fisher equation still holds after the shock
- Consider the first-order change in consumption $dc_0$ and welfare $dU$ that results from this change in the environment
- Consumer theory $\rightarrow MPC = \frac{\partial c_0}{\partial W}, \epsilon_{0,t}^h = \frac{\partial c_0^h}{\partial q_t^h} \frac{q_t}{c_0}$ at initial $\{\{q_t\}, W, \bar{u}\}$
- Assuming separable utility,

$$
\sum_{t \geq 0} \beta^t u(c_t) \quad \sigma(c) \equiv -\frac{u'(c)}{cu''(c)} \quad \epsilon_{0,0}^h = -\sigma(c_0)(1 - MPC)
$$
Consumption and welfare response

Impulse response to the shock

To first order, the date-0 consumption and welfare change in response to the shock are

\[ dc_0 = MPCd\Omega + c_0 \sum_{t \geq 0} c_{0,t} \frac{dq_t}{q_t} \]

\[ dU = U_{c_0} d\Omega \]

where \( d\Omega = dW - \sum_{t \geq 0} c_t dq_t \), the net-of-consumption wealth change, is given by

\[ d\Omega = - \sum_{t \geq 0} Q_t \left( \frac{-1B_t}{P_0} \right) \frac{dP_t}{P_t} \]

Revaluation of NNP

\[ + \sum_{t \geq 0} q_t \left( y_t + \left( \frac{-1B_t}{P_t} \right) + (-1b_t) - c_t \right) \frac{dq_t}{q_t} \]

Real revaluation of future flows

\[ + \sum_{t \geq 0} (q_t y_t) \frac{dy_t}{y_t} \]

Real income change
One-time change

One-time unexpected change

For a one-time change:

\[ dc_0 = MPCd\Omega - \sigma(c_0)(1 - MPC)c_0\, dr \]

where \( d\Omega \) comprises net nominal position (NNP) and unhedged rate exposure (URE):

\[ d\Omega = -\sum_{t\geq0} q_t \left( \frac{-1B_t}{P_t} \right) d\pi + \left( y_0 + \left( \frac{-1B_0}{P_0} \right) + (-1b_0 - c_0) \right) dr + dy_0 \]

- This formula continues to apply under forms of market incompleteness:
  - Uninsurable idiosyncratic risk \( \rightarrow MPC = \frac{\partial c_0}{\partial y_0} \)
    - \((\text{consumption response to one-time transitory income shock})\)
  - (In some cases) borrowing constraints \( \rightarrow MPC = 1 \)
Consider general equilibrium with heterogenous agents $i = 1 \ldots l$

Assume no net supply of financial assets/no government, and market clearing at every date:

$$\forall t \sum_{i} (-1 B^i_t) = 0 \quad \sum_{i} (-1 b^i_t) = 0 \quad C_t = \sum_{i} c^i_t = \sum_{i} y^i_t = Y_t$$

Hence

$$\sum_{i} URE^i = 0 \quad \sum_{i} NNP^i = 0 \quad \sum_{i} d y^i_0 = \sum_{i} d c^i_0 \equiv dC$$
GE aggregate demand response

Aggregate demand response to a one-time shock

\[ dC = \left( \sum_i \frac{y_i}{Y} MPC^i \right) dC + Cov_i \left( MPC^i, dy^i - y^i \frac{dC}{C} \right) - Cov_i \left( MPC^i, NNP^i \right) d\pi \]

Aggregate income channel

Earnings heterogeneity channel

Fisher/Pigou channel

\[ + \left( \text{Cov}_i \left( MPC^i, \text{URE}^i \right) - \sum_i \sigma^i \left( 1 - MPC^i \right) c^i \right) dr \]

Interest risk exposure channel

Substitution channel

- Flexible-price model: take redistribution as given, set \( dC = 0 \), solve for \( dr \)
- Keynesian model: take \( dr \) as given, solve for \( dC \). Example: New-Keynesian

\[ dC = -\sigma Cdr \]

- In either, the covariance terms quantify the redistribution channel
Correlations in the population

- Italian Survey of Household Income and Wealth 2010:
  - \( \text{URE} \equiv \text{Non-financial Income} - \text{Consumption} + \text{Deposits} - D \) (debt payment for fixed-rate and debt liability for adjustable-rate debt)

Using these numbers, the redistribution and substitution channels have the same *sign*, and same magnitude if the EIS is around 0.025-0.05
Cross-sector and cross-region redistribution

Issues:

1. The household-sector URE is not mean-0
   - Counterparts are banks, government. Their “MPC”?  

2. There is substantial cross-regional heterogeneity in household UREs

Next steps: model this cross-sector and cross-regional heterogeneity
Redistribution channel?

Source BEA. Sample includes all U.S. states except D.C. and North Dakota

Thank you!