Inflation Expectations, Interest Rates, and Consumption Behavior

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Motivation

- Consumption is a central part of macro models.
- Real interest rates are important determinants of consumption expenditure.
  - However, results from empirical studies are not conclusive.
- In the last decade, the response of private consumption to inflation expectations came to the forefront in modern macro due to the zero-lower-bound on nominal interest rates.

What We Do

Consumption function in the cross-sectional data:

$$C_{j,t} = C(r_{j,t}, Y^d_{j,t}, R_j, V_j) \tag{1}$$

where j denotes j-th household.

- It is crucial to control for the effect of $i_{j,t}$ on $C_{j,t}$.
  - In normal times: Taylor principle: $i_t = \phi_\pi \mathbb{E}_t \pi_{t+1}$ with $\phi_\pi > 1$

    $\mathbb{E}^j_t \pi_{t+1} \uparrow \Rightarrow i_{j,t} \uparrow\uparrow \Rightarrow r_{j,t} \uparrow \Rightarrow C_{j,t} \downarrow$
  - In ZLB: $i_t = \bar{i} \approx 0$

    If $i_{j,t} = \bar{i}$, then $\mathbb{E}^j_t \pi_{t+1} \uparrow \Rightarrow r_{j,t} \downarrow \Rightarrow C_{j,t} \uparrow$

- Focusing only on ZLB period is problematic.
  - Short sample
  - What if $\mathbb{E}^j_t \pi_{t+1} \uparrow$ implies an exit of ZLB $\Rightarrow i_{j,t} \uparrow$?

What We Do

- Test consumption theory using micro-level household data with **detailed decomposition of inflation expectations and nominal interest rate expectations** (annual BoE/TNS Inflation Attitude Survey, February 2011 - February 2020).
  - Isolate the effect of inflation expectations on consumption behavior controlling for **quantitative** individual interest rate expectations (which allows to test consumption theory regardless of ZLB period).
  - Consider both durable and nondurable consumption.
  - Link the empirical findings to a macro model.
- Investigate heterogeneity in intertemporal substitution of consumption due to differences in economic knowledge.
- Test discounting in the Euler equation (micro level data test of Gabaix (2020) model).

Main Findings

- Higher inflation expectations:
  - stimulates current durable consumption,
  - decreases nondurable consumption.
- This is consistent with a model:
  - Durables are more sensitive to real interest rates and go up.
  - Nondurables react but are less sensitive to real interest rate, and go down due to an eroding effect of inflation on nominal income.
  - Extensive tests based on a macro model and find that the model and the data are consistent.
  - **Nominal income erosion and wage growth expectations are key**.
- Other findings:
  - Economically informed households are more responsive in intertemporal substitution of durable goods to real interest rates than less informed households.
  - The consumption Euler equation has discounting.

Empirical Results: Baseline

Table: Baseline: Cut Back Spending

	(1) Avg. marginal effects	(2) Avg. marginal effects
$\mathbb{E}_t \pi_{t,t+1}$	0.015*** (–)	0.016*** (–)
	(0.002)	(0.004)
$\mathbb{E}_t i_{t,t+1}$	0.024** (+)	0.041** (+)
	(0.012)	(0.020)
$\mathbb{E}_t(w_{t+1} - w_t)/w_t$		-0.012** (–)
		(0.006)
Control variables	Yes	Yes
Observations	6327	2680
Pseudo R^2	0.052	0.033

Table: Baseline: Durables

	(1) Avg. marginal effects	(2) Avg. marginal effects
$\mathbb{E}_t \pi_{t,t+1}$	0.003*** (+)	0.004** (+)
	(0.001)	(0.002)
$\mathbb{E}_t i_{t,t+1}$	0.008 (–)	0.003 (–)
	(0.005)	(0.009)
$\mathbb{E}_t(w_{t+1} - w_t)/w_t$		0.002 (+)
		(0.003)
Control variables	Yes	Yes
Observations	6327	2680
Pseudo R^2	0.042	0.065

Explaining Baseline Empirical Results

- Higher inflation expectations:
  - increase the willingness to bring forward durable goods
  - increase the willingness to cut back spending
- This sounds counterintuitive, but it is not contradictory to the theory.
  - One can increase current durable consumption and cut back nondurable consumption.
    1. $\frac{u_C(C_t, X_t)}{u_C(C_{t+1}, X_{t+1})} = \beta \frac{1+i_t}{\Pi_{t+1}}$: higher Π_{t+1} increases the **ratio** of current nondurable consumption to future nondurable consumption.
    2. Current nondurable consumption **level** can decrease because higher Π_{t+1} could erode the values of nominal assets and/or future nominal income.
    3. $\frac{u_X(C_t, X_t)}{u_C(C_t, X_t)} = 1 - (1-\delta)\frac{\Pi_{t+1}}{1+i_t}$: higher Π_{t+1} increases the ratio of current durable consumption to nondurable consumption.
  - This is often missed when we just look at consumption Euler equation, $c_t = \mathbb{E}_t c_{t+1} - \sigma(i_t - \mathbb{E}_t \pi_{t+1} - r_t^n)$, without considering changes in income and two types of goods.

Infinite-horizon Model

- Household's lifetime utility function

$$U = E_0\left[\sum_{t=0}^{\infty}\beta^t u(C_t, X_t, L_t)\right] \tag{2}$$

with period utility function:

$$u(C_t, X_t, L_t) = \frac{1}{1-\frac{1}{\sigma}}\left[\left(\psi(C_t-\lambda_c C_{t-1})^{\frac{\eta-1}{\eta}}+(1-\psi)(X_t-\lambda_x X_{t-1})^{\frac{\eta-1}{\eta}}\right)^{\frac{\eta}{\eta-1}}\right]^{1-\frac{1}{\sigma}} \exp\left(\frac{\frac{1}{\sigma}-1}{1+\nu_l}L_t^{1+\nu_l}\right) \tag{3}$$

subject to the flow budget constraint

$$P_t C_t + P_t\{X_t - (1-\delta)X_{t-1}\} + B_t \leq P_t Y_t^R + W_t L_t + (1+i_{t-1})B_{t-1} \tag{4}$$

- Household's expectations:

$$\log(\Pi_t) = (1-\rho_\Pi)\log(\Pi_{ss}) + \rho_\Pi \log(\Pi_{t-1}) + \epsilon_{\Pi,t-1} \tag{5}$$

$$\log(1+i_t) = (1-\rho_i)\log(1+i_{ss}) + \rho_i \log(1+i_{t-1}) + \epsilon_{i,t-1} \tag{6}$$

$$\log(\tilde{w}_t^R) - \log(\tilde{w}_{t-1}^R) = (1-w_{index})(\Pi_{ss} - \Pi_t) + \epsilon_{w,t-1} \tag{7}$$

$$\log(\tilde{y}_t^R) - \log(\tilde{y}_{t-1}^R) = \epsilon_{y,t-1} \tag{8}$$

where $W_t^R = \frac{W_t}{P_t}$ and $\tilde{a}_t = \frac{A_t}{\gamma^t}$ (detrended variable)

Simulation: IRFs to Inflation Expectations Shock

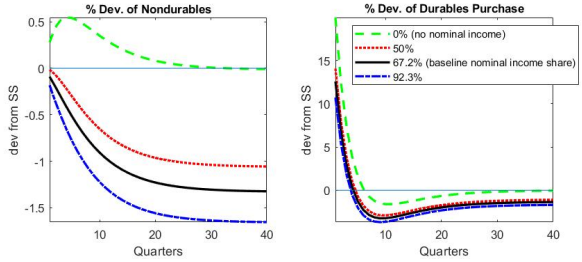

Figure: Wage Expectations set to 0.034 ($w_{index} = 0.034$) of Inflation Expectations

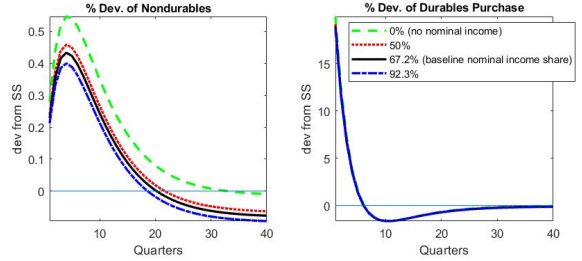

Figure: Wage Expectations set to 0.95 ($w_{index} = 0.95$) of Inflation Expectations