The Causal Effects of Inflation Uncertainty on Households' Beliefs and Actions

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Some context on uncertainty research

This paper's approach and findings

A durables model with inflation levels and uncertainty

Wrapping up

Uncertainty Research is Hard

The first and second moments of inflation are **positively correlated**. Consider euro area inflation[1] π_t and its rolling volatility σ_t:

$$\sigma_t = \alpha + \underbrace{\beta}_{\hat{\beta}=0.10^{***}(0.02)} \pi_t + \gamma t + \varepsilon_t.$$

The systematic correlation of first and second moments is **not unique to inflation** but appears in a wide range of macro series.

These likely endogenous correlations have long bedeviled researchers seeking the **causal impact of uncertainty**. Typical strategies include VAR's, shift-share IV's, extreme events, or structural models. This paper takes **a different empirical approach**.

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[1] My simple calculations. Inflation π_t is the year-on-year monthly euro area HICP measure ex. food and energy, σ_t is its one-year rolling standard deviation. The date range is 2002:1-2024:12.

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What the Paper Does and Finds

Runs **an information RCT** in the ECB's Consumer Expectations Survey. Subjects randomly treated with

- inflation first moment info, i.e., pro forecast levels, and
- inflation second moment info, i.e., pro forecast dispersion.

Collects **inflation belief distributions** and tracks **subsequent behavior**, e.g., durables purchases, nondurables purchases, labor supply, and portfolios. The paper finds

- a **positive first-moment effect** with higher mean inflation expectations $\rightarrow$ higher durables spending, and
- a **negative second-moment effect** with higher inflation uncertainty $\rightarrow$ lower durables spending.

What I Think About the Paper

This is a **very strong paper** offering

1. a **credible solution** to the first vs. second moment challenge,
2. an impressive **survey and RCT apparatus**,
3. **intuitive results** merging intertemporal and precautionary stories about household behavior, and
4. an application to **clearly topical inflation uncertainty**.

Stepping back, the paper also offers an important reminder that **Euler equations are nonlinear**, even when intertemporal substitution sometimes gets more attention in monetary economics.

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A Standard-ish Model

I built on top of the **standard incomplete markets framework** to develop a partial equilibrium dynamic quantitative model including

- idiosyncratic **income risk**,
- **durables and nondurables** consumption,
- fixed durables **adjustment costs**,
- nominal savings subject to **borrowing constraints**,
- **stochastic inflation**, fixed nominal returns, and hence real return risk, and
- **advance knowledge** of the mean and uncertainty of the inflation distribution.

The model has the minimum ingredients, but no more, for modeling the impact of **inflation levels and uncertainty**.

The Gory Details

$$V(a, d_{-1}, y, \mu, \sigma) =$$

$$\max_{\tilde{a} \geq \underline{a}, d} \left\{ \frac{\left(c^{\alpha} d^{1-\alpha}\right)^{1-\gamma} - 1}{1-\gamma} + \beta \mathbb{E}\left[V\left(\frac{(1+i)}{\Pi'} \tilde{a}, d, y', \mu', \sigma' \right) | y, \mu, \sigma \right] \right\}$$

$$d = x + (1-\delta) d_{-1}, \quad c + x + \tilde{a} + F d_{-1} \mathbb{I}(x \neq 0) = y + a$$

$$\log y' = \rho_y \log y + \sigma_y \varepsilon', \quad \varepsilon' \sim N(0,1)$$

$$\mu \in \{\mu_l, \mu_h\}, \quad \Pi_\mu = \begin{bmatrix} 1 - p^{\mu}_{lh} & p^{\mu}_{lh} \\ 1 - p^{\mu}_{hh} & p^{\mu}_{hh} \end{bmatrix}$$

$$\sigma \in \{\sigma_l, \sigma_h\}, \quad \Pi_\sigma = \begin{bmatrix} 1 - p^{\sigma}_{lh} & p^{\sigma}_{lh} \\ 1 - p^{\sigma}_{hh} & p^{\sigma}_{hh} \end{bmatrix}$$

$$\log \Pi' \sim N\left(\log \mu - \frac{\sigma^2}{2}, \sigma^2 \right) \quad \text{Parameters}^2$$

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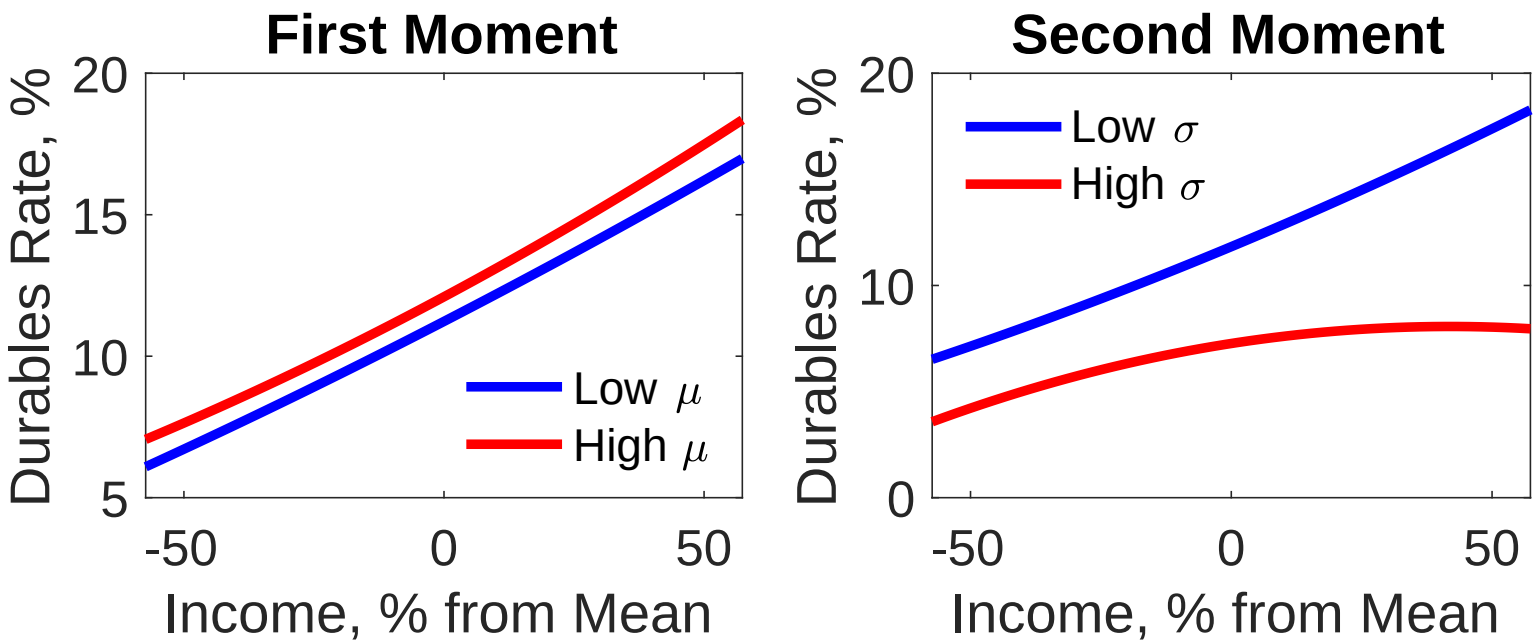
[2] Baseline exercise sets $\alpha = 2/3$, $\delta = 0.1$, $\beta = 0.96$, $\underline{a} = 0$, $\rho_y = 0.9$, $\sigma_y = 0.1$, $F = 0.02$, $\gamma = 2$, $\mu_l = 1.01$, $\mu_h = 1.05$, $p^{\mu}_{lh} = 0.1$, $p^{\mu}_{hh} = 0.15$, $\sigma_l = 0.05$, $\sigma_h = 0.1$, $p^{\sigma}_{lh} = 0.1$, $p^{\sigma}_{hh} = 0.2$, although numbers vary across some experiments.

The Paper's Results Hold!



First-moment: higher expected $\Pi \rightarrow$ more durables spending via lower real returns and **standard intertemporal substitution**.

Second-moment: higher Π uncertainty $\rightarrow$ less durables spending via **precautionary/utility** & **wait-and-see/fixed cost effects**.

Natural Asymmetry in Spending

The paper **does not find strong nondurables results**. One might initially suspect low power, measurement issues, or a conflict with the model. But, in the model, the asymmetry also arises:

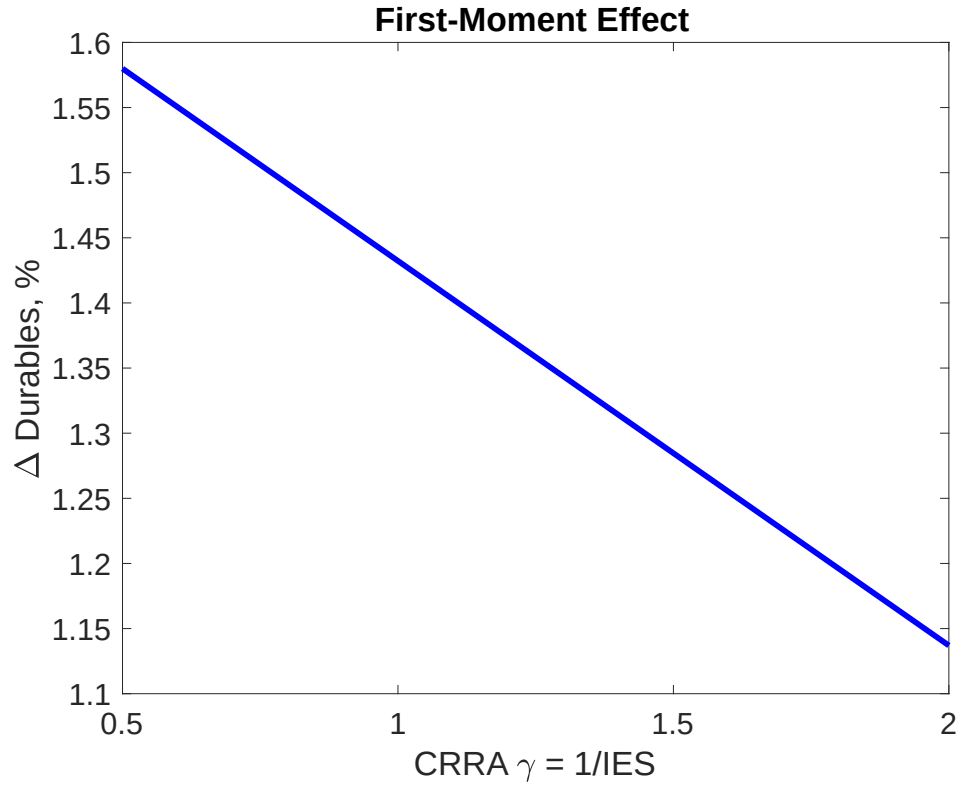
- the positive impact of inflation levels is ~ 10X **higher for durables** than nondurables spending, and
- the negative impact of inflation uncertainty is ~ 8X **higher for durables** than nondurables spending.

Intertemporal and precautionary effects **apply to both**, but

- **durables spending is a flow** rather than a stock, and
- durables spending moves nonlinearly with **fixed adj. costs**.

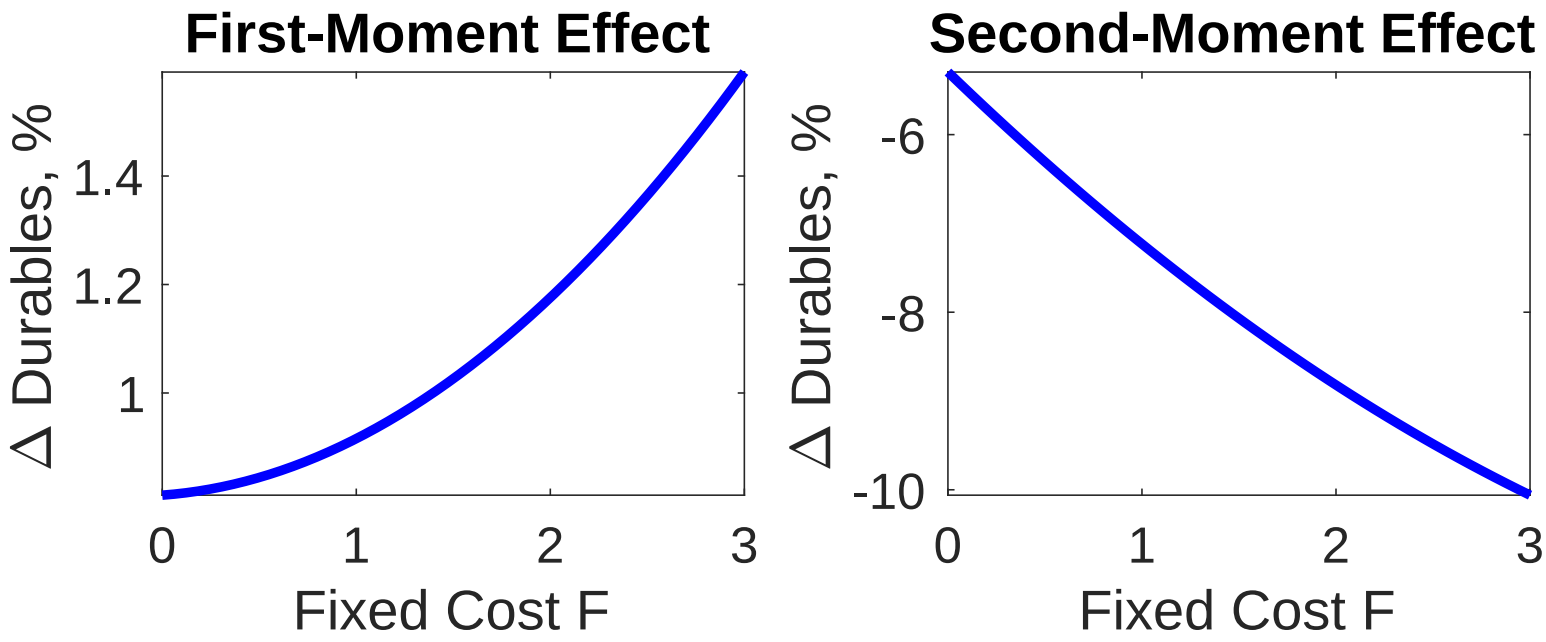
The spending asymmetry isn't necessarily a flaw. **Asymmetry is exactly what we should expect** from a standard durables model.

A Classic Tension Rears its Head?



Under CRRA utility, it's well known that increased risk aversion dampens the response to intertemporal substitution opportunities. So, is there an inherent **tension between the first- and second-moment effects**, at least absent the standard asset-pricing tricks?

No, Durables Adjustment Costs Resolve the Tension



With higher fixed costs, the **wait-and-see** or **inaction** effect of uncertainty becomes stronger. The **first-moment effect does not decline**, and in fact increases somewhat due to nonlinearity. So the specifics of durables adjustment **reconcile the dual presence of large first- and second-moment effects**.

What Did We Learn?

The biggest takeaway, obviously, is that **I utterly failed in my efforts** to turn up any glaring inconsistencies between the paper and one very natural model. But we can still say more...

1. The first- and second-moment effects do make sense in the model via **intertemporal sub. and precautionary channels.**

2. **Strong asymmetry** in the response of durables versus nondurables spending should be expected.

3. **Fixed durables adjustment costs appear important** for generating large first- and second-moment effects jointly.

The theoretical grounding for the paper's results **deserves substantially more discussion in the draft**. That tidbit is all I can muster as obligatory discussant criticism, given the intensely irritating alignment of the paper's results with my model.

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The paper even **lines up well along multiple dimensions** with a canonical model of household behavior extended to incorporate inflation levels and uncertainty.

Grrr...maybe I'll have better luck next time.