Flexible Deviations from FIRE in the Sequence Space

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Motivation

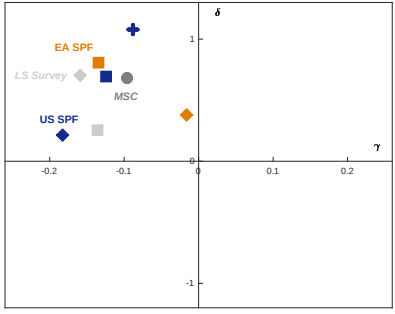
- **Question**: Can we depart from FIRE in a *flexible* and *standardised* manner that is consistent with the empirical literature (macro, micro and behavioral)?
- Recent HANK literature emphasises the importance of matching microeconomic evidence/moments
  - Auclert et al. (2020) also emphasise need to simultaneously match the macro evidence i.e. macro humps.
  - Their solution is sticky expectations which creates *persistence* but tends to kill *amplification*
  - This can be an issue e.g. Albuquerque et al. (2025).
- Growing empirical evidence base on the distance between actual expectations and rational expectations e.g. Adam et al. (2024),Coibion and Gorodnichenko (2015), Kohlhas and Walther (2021).

Idea/Proposal

- Propose that we can depart from FIRE in a similar way as in Auclert et al. (2020) but based on the reduced form used in Kohlhas and Walther (2021):

$$p_{t+k} - f_{it}p_{t+k} = \alpha_i + \underbrace{\gamma p_t}_{\text{Today}} + \underbrace{\delta(\bar{f}_t p_{t+k} - \bar{f}_{t-1} p_{t+k})}_{\text{News}} + \epsilon_{i,t|t+k}$$

Figure 1: Empirical evidence on δ and γ



Note: Evidence from Kohlhas and Walther (2021)

Idea/Proposal

What are the advantages of this approach:

1. Clear mapping from the empirical literature.
2. Allows for fact agents might simultaneously overreact to outcomes and underreact to news (Figure 1)
3. Nests different expectations models:
   - Asymmetric attention ($\gamma, \delta \neq 0$)
   - Sticky / noisy information ($\gamma = 0$,$\delta > 0$)
   - $\approx$ Diagnostic expectations ($\delta = 0$,$\gamma < 0$)
4. Is near-rational expectations with agents behaving rationally conditional on their subjective beliefs.

Implementation

- We can implement this expectations process by building up partial equilibrium Jacobians J in the model using the 'Fake News' matrix F outlined by Auclert et al. (2021).
- This allows us to map an arbitrary price path to p to block specific outcomes y.

$$F_{y,p} = \begin{vmatrix} F_{0,0} & F_{0,1} & \dots & F_{0,s} \dots & F_{0,T} \\ \dots & & & & \\ F_{T,0} & F_{T,1} & \dots & F_{T,s} \dots & F_{T,T} \end{vmatrix} \tag{1}$$

- Today focus on the simpler case where γ and δ do not vary by time horizon but this can be relaxed. We can also rewrite the algorithm to map from growth rate expectations to level expectations.

Implementation

$$p_{t+k} - f_{it}p_{t+k} = \alpha_i + \gamma p_t + \delta(\bar{f}_t p_{t+k} - \bar{f_{t-1}} p_{t+k}) + \epsilon_{i,t|t+k} \rightarrow$$

$$\bar{f}_t p_{t+k} = c + \frac{1}{1+\delta}(\delta \bar{f_{t-1}} p_{t+k} + E_t^{RE}[p_{t+k}] - \gamma p_t)$$

Consider the evolution of a price forecast initially k periods ahead. This evolves as follows:

$f_{ok} = c + \frac{1}{1+\delta}(\delta p_{ss} + p_{ss} + dp_k - \gamma(p_{ss} + p_o)) = p_{ss} + \frac{1}{1+\delta}(dp_k - \gamma dp_o)$, where we assume $c = \frac{\gamma}{1+\delta} p_{ss}$

....

$$f_{nk-n} = p_{ss} + \underbrace{\sum_{j=o}^{n} \left(\frac{\delta}{1+\delta}\right)^j \frac{1}{1+\delta} dp_k}_{News} - \underbrace{\gamma \sum_{j=o}^{n} \left(\frac{\delta}{1+\delta}\right)^j \frac{1}{1+\delta} dp_j}_{Extrapolation}$$

News effect converges to RE for $\delta > o$. Extrapolative effect fades over time

Implementation

To work out Jacobian just a case of mapping Fake new matrix to where prices show up. For example:

$$J_{0,0} = \underbrace{F_{0,0}}_{Impact} - \underbrace{\frac{\gamma}{1+\delta}(F_{0,1} + F_{0,2} + \ldots + F_{0,s} + F_{0,T})}_{Extrapolation}$$

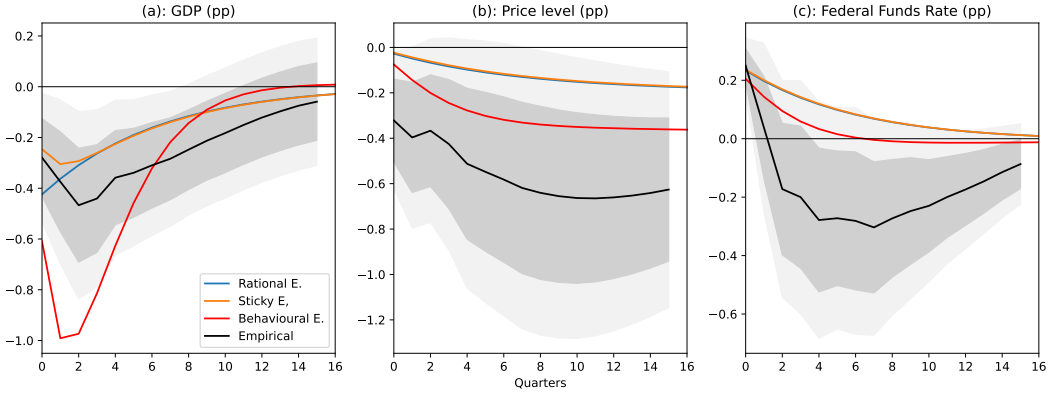
$$J_{3,2} = \underbrace{F_{1,0}}_{Impact} - \underbrace{\frac{\gamma\delta}{(1+\delta)^2}(F_{0,1} + F_{0,2} + \ldots + F_{0,s} + F_{0,T}) - \frac{\gamma}{1+\delta}(F_{1,1} + F_{1,2} + \ldots + F_{1,s} + F_{1,T})}_{Extrapolation}$$

$$+ \underbrace{\frac{1}{1+\delta}F_{3,2} + (\frac{1}{1+\delta} + \frac{\delta}{(1+\delta)^2})F_{2,1}}_{News}$$

Application: Canonical HANK

Lets apply the algorithm using common parameters from the literature ($\delta = 0.7, \gamma = -0.15$) in the canonical HANK framework of Auclert et al. (2024)

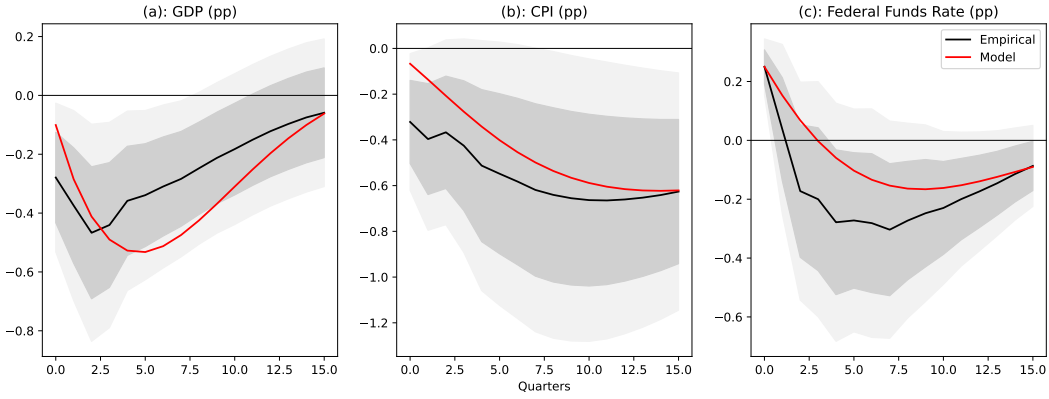
Figure Impulse Response to MP Shock: Model and Evidence



Application: Canonical HANK

Now what if we estimate $\delta = 10.98$ and $\gamma = -0.29$.

Figure Impulse Response to MP Shock: Model and Evidence

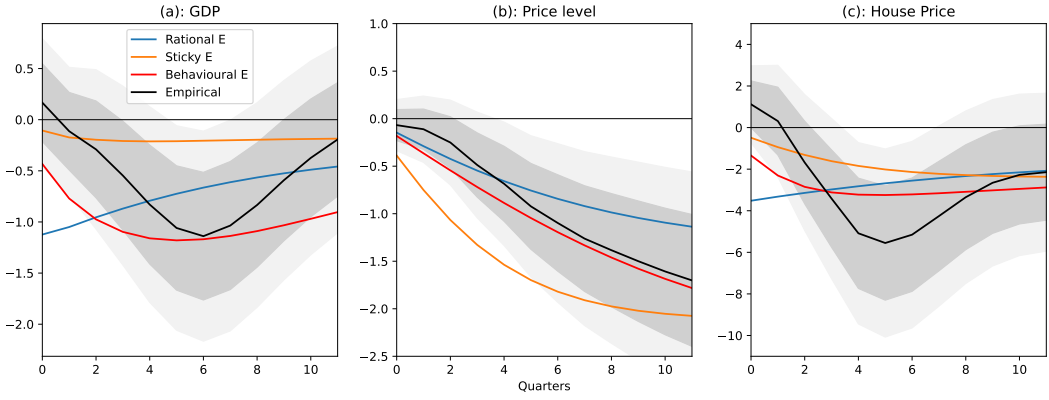


Forecast Bias

Application: HANK + Housing

And what about a model/evidence that needs big humps
($\delta = 2.86, \delta_{p_h} = 1.26, \gamma = -0.105, \gamma_{p_h} = 0.048$)

Figure Impulse Response to MP Shock: Model and Evidence



Conclusion/next steps

- Proposed a flexible approach to deviating from FIRE in the sequence space.
- Estimated parameters through IRF matching exercises.

Next steps

- Incorporate into other housing paper.
- More empirical work: e.g horizon varying parameters
- Interest rate expectations of particular interest
  - More information available to household on interest rate path
  - Deviating from FIRE has implications for the elasticity of intertemporal substitution
- Come up with New Keynesian model relevant example of asymmetric attention

References

Adam, K., Pfäuti, O., and Reinelt, T. (2024). Subjective housing price expectations, falling natural rates, and the optimal inflation target. *Journal of Monetary Economics*, page 103647.

Albuquerque, D., Lazarowicz, T., and Lenney, J. (2025). Monetary transmission through the housing sector.

Auclert, A., Bardóczy, B., Rognlie, M., and Straub, L. (2021). Using the sequence-space jacobian to solve and estimate heterogeneous-agent models. *Econometrica*, 89(5):2375–2408.

Auclert, A., Rognlie, M., and Straub, L. (2020). Micro jumps, macro humps: Monetary policy and business cycles in an estimated hank model. Technical report, National Bureau of Economic Research.

Auclert, A., Rognlie, M., and Straub, L. (2024). Fiscal and monetary policy with heterogeneous agents. Working Paper 32991, National Bureau of Economic Research.

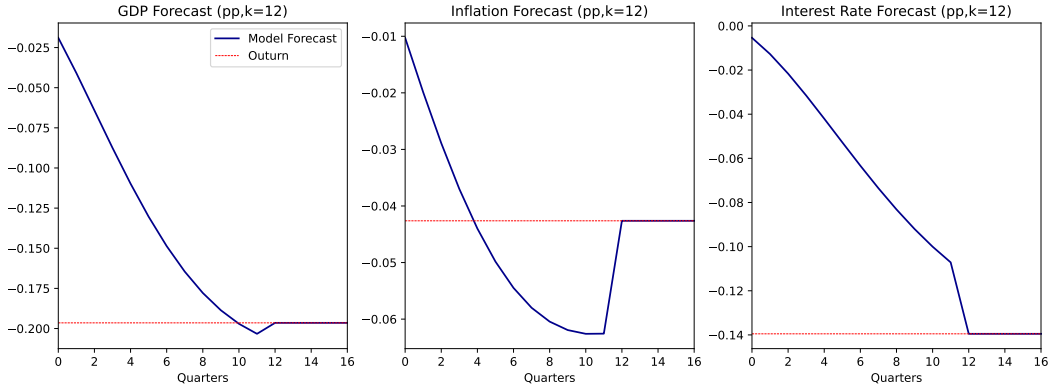
Coibion, O. and Gorodnichenko, Y. (2015). Information rigidity and the expectations formation process: A simple framework and new facts. *American Economic Review*, 105(8):2644–2678.

Kohlhas, A. N. and Walther, A. (2021). Asymmetric attention. *American Economic Review*, 111(9):2879–2925.

Application: Forecast Evolutions

Now what if we estimate $\delta = 10.98$ and $\gamma = -0.29$.

Figure Impulse Response to MP Shock: Price Forecasts



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