Checking HANK

Evidence from size-persistence tradeoff.

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Outcomes of Kaplan et al. (2018) model

Kaplan et al. (2018) HANK model outcomes:

1. Size-Persistence trade-off: Cumulative elasticity of aggregate consumption declines with the increase in autocorrelation of monetary shock in a nonlinear manner.
2. Inflation-Output Tradeoff: the same Taylor rule shocks lead to the increased effects in Inflation-Output tradeoff.

Size-Persistence in RANK

Rate path:

$$r_t = \rho + e^{-\eta t}(r_0 - \rho).$$

NK policy

$$C_0 = \bar{C} \exp\left(-\frac{1}{\gamma}\int_0^\infty (r_s - \rho)\, ds\right).$$

Size:

$$R_0 = \int_0^\infty (r_s - \rho)\, ds,$$

$$\frac{-d \log C_0}{dR_0} = \frac{1}{\gamma},$$

Picture of Size-Persistence trade-off

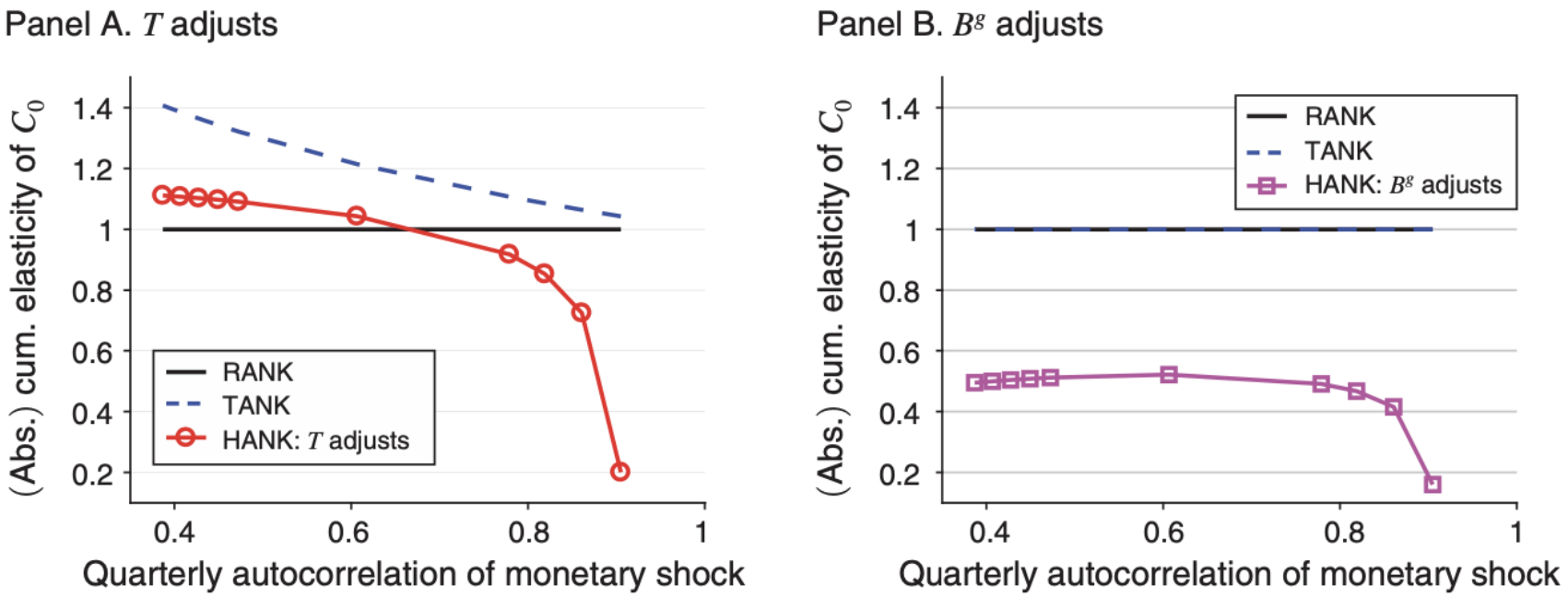


FIGURE 8. CUMULATIVE ELASTICITY OF AGGREGATE CONSUMPTION BY PERSISTENCE OF THE SHOCK

Figure: The difference between the New Keynesian models from Kaplan et al. (2018)

Size-Persistent tradeoff by Kaplan et al. (2018), formally

$$\textit{RANK:} \quad \frac{d}{d\nu}\frac{-d\log C_0}{dR_0} = 0 \tag{1}$$

$$\textit{TANK with } B^g \textit{ adjustment:} \quad \frac{d}{d\nu}\frac{-d\log C_0}{dR_0} = 0 \tag{2}$$

$$\textit{TANK with } T \textit{ adjustment:} \quad \frac{d}{d\nu}\frac{-d\log C_0}{dR_0} < 0 \tag{3}$$

$$\textit{HANK:} \quad \frac{d^2}{d\nu^2}\frac{-d\log C_0}{dR_0} < 0 \tag{4}$$

Empirics Related to HANK

Microdata

- Holm et al. (2021) find inconsistent Evidence of HANK – the response is larger than generated by HANK.

MPC

- Estimation of MPC's[a] by Gross et al. (2020): Increase of MPC is higher in 2008 than in 2011.

[a] Actually MPB, but they argue that it doesn't affect the results

Heterogenity in Portfolios

Luetticke (2021) find a heterogeneity in household portfolio responses to MP shocks.

Empirical approach

Systematic Monetary Policy Identification

Based on method of Hack et al. (2023).

I assume that the monetary policy rule is

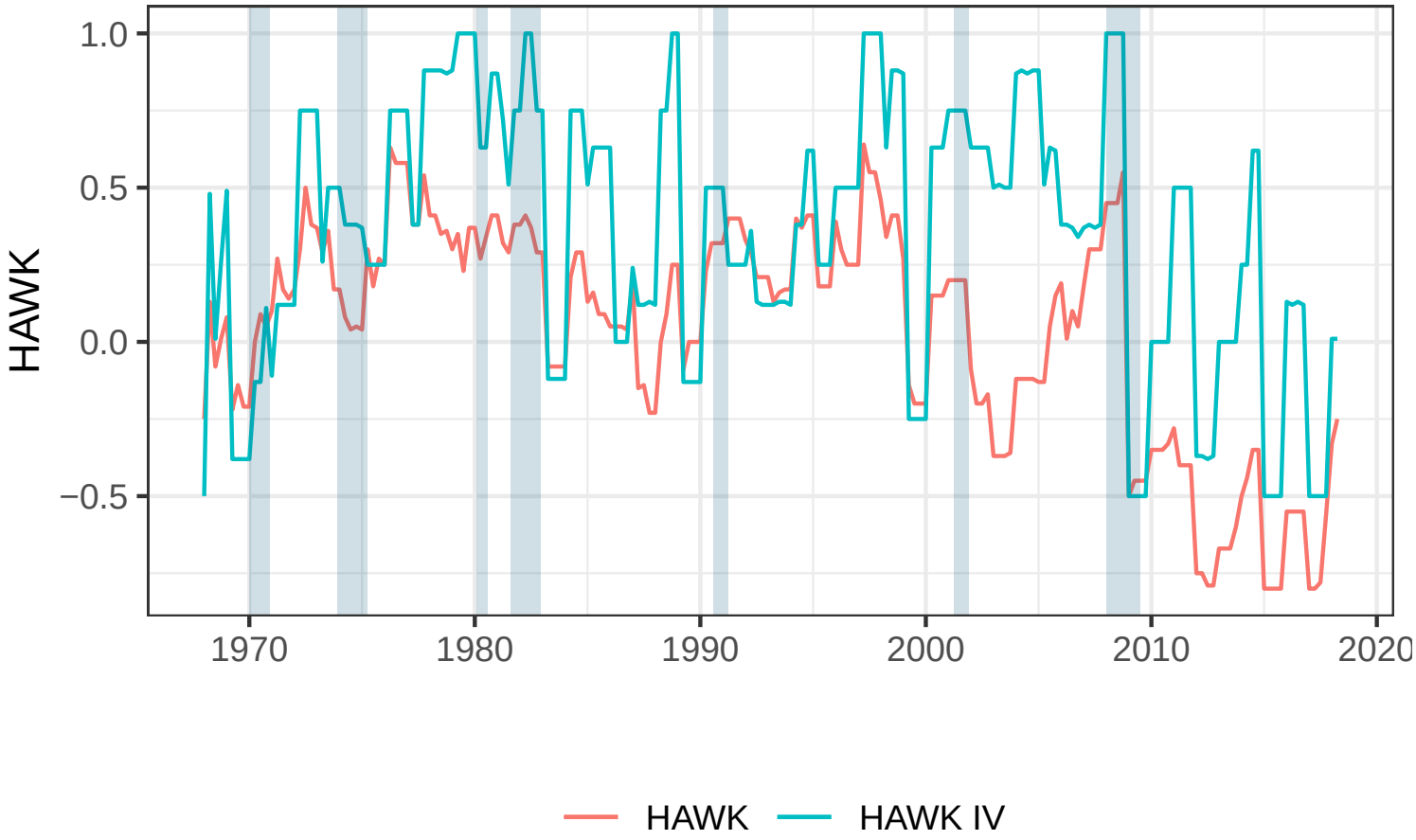
$$(r - r^*)_{t+h} = \phi_t^h \mathbb{E}\left[\pi_{t+1} \mid \mathcal{I}_t\right] + \psi_t^h \mathbb{E}\left[u_{t+1} \mid \mathcal{I}_t\right] + \varepsilon_t.$$

$\mathbb{E}_t \pi_{t+1}$ and $\mathbb{E}_t u_{t+1}$ are the expectations of monetary authority about the inflation and unemployment at quarter $t+1$.

I estimate the following State-Dependent LP-IV.

$$\begin{aligned}(r - r^*)_{t+h} = \alpha^h + \beta_\pi^h \hat{\pi}_t + \gamma_\pi^h \hat{\pi}_t \left(Hawk_t - \overline{Hawk}\right) \\ \beta_u^h \hat{u}_t + \gamma_u^h \hat{u}_t \left(Hawk_t - \overline{Hawk}\right) \\ + \delta^h \left(Hawk_t - \overline{Hawk}\right) + \zeta^h Z + e_{t+h}^h,\end{aligned}$$

Figure: HAWK and HAWK IV indexes from Hack et al. (2023)



Empirical approach

$$\hat{\phi}_{t+h} = \left(\hat{\beta}_{\pi}^{h} + \hat{\gamma}_{\pi}^{h}\left(Hawk_t - \overline{Hawk}\right)\right)\bar{\pi} + \left(\hat{\beta}_{u}^{h} + \hat{\gamma}_{u}^{h}\left(Hawk_t - \overline{Hawk}\right)\right)\bar{u} + \hat{\delta}^{h}\left(Hawk_t - \overline{Hawk}\right)$$

$$R_{0t} = \sum_{h=1}^{H} \hat{\phi}_{t+h}$$

$$\nu_t = \mathbb{E}_h\left[\left(\hat{\phi}_{t+h} - \bar{\phi}\right)\left(\hat{\phi}_{t+h-1} - \bar{\phi}\right)\right]$$

$$\log Consumption = \alpha_0 + \alpha_1 R_0 + \beta_1 R_0 \nu \tag{5}$$

$$\log Consumption = \alpha_0' + \alpha_1' R_0 + \beta_1' R_0 \nu + \beta_2' R_0 \nu^2 \tag{6}$$

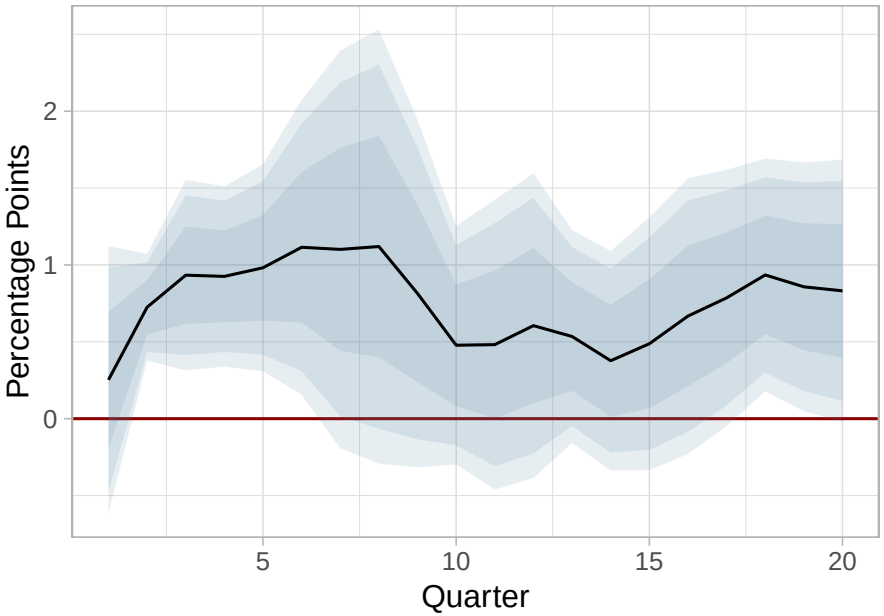
Data

- Natural rate of interest by Holston et al. (2017, 2023)
- Short-term rate (r) is by Wu and Xia (2016) and Fed Funds Rate
- Consumption is U.S. Bureau of Economic Analysis"Real personal consumption expenditures per capita " (FRED A794RX0Q048SBEA).
- FED inflation (deflator) and unemployment forecast is from Tealbook (average of 1 and 2 quarter ahead + average per quarter).
- HAWK index from Hack et al. (2023).

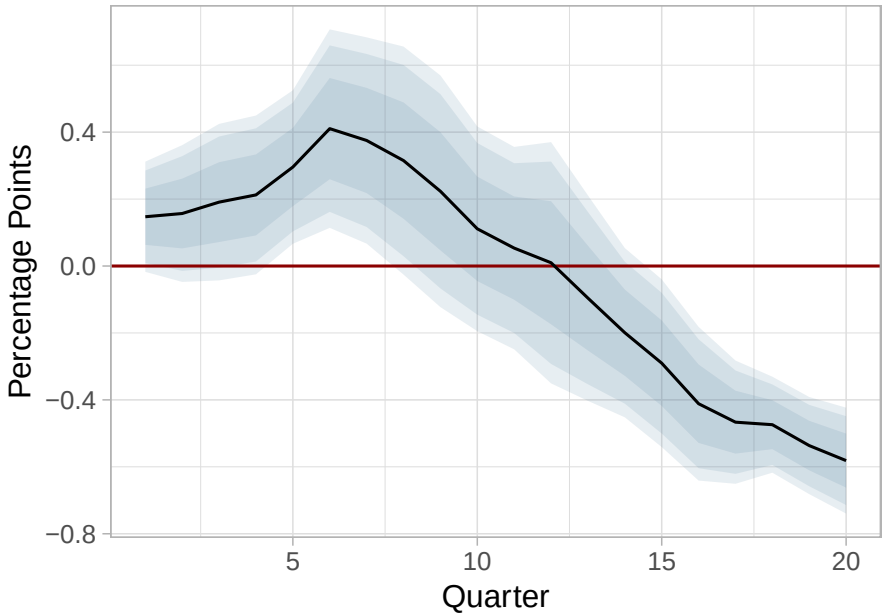
Results I

Policy Response to Inflation and FOMC Hawkishness

(a) Average Response to Inflation $\left(\beta_\pi^h\right)$



(b) Differential Response to Inflation $\left(\gamma_\pi^h\right)$

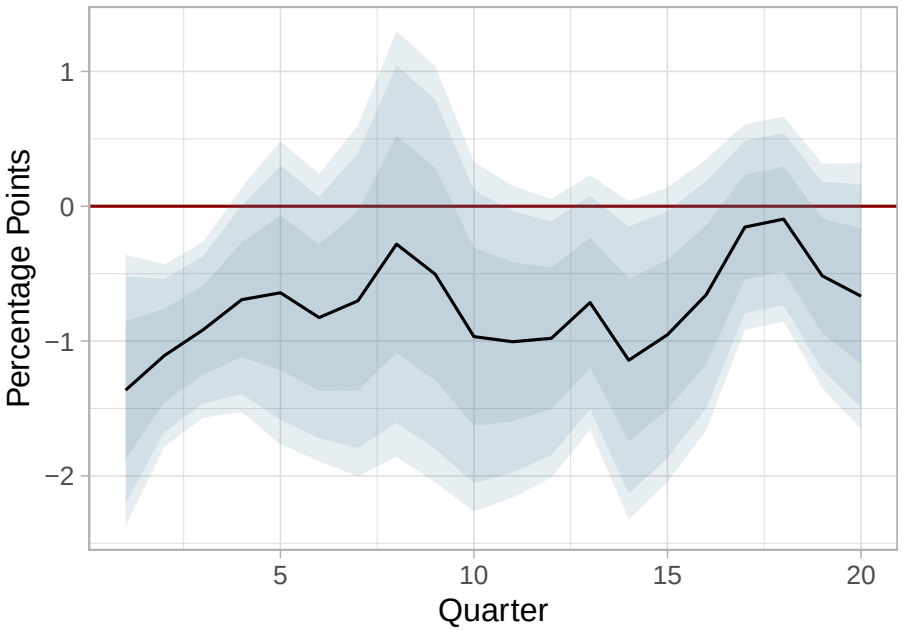


Notes: This figure reports the responses of the $r_t - \rho_t$ to an increase in the Tealbook inflation forecast of 1 p.p. (calculated as a predicted change in GDP deflator). The subfigure 3a reports the response for the *HAWK* index equal to the sample average and 3b is the addition to the response in case there are 2 (out of 12 in total) additional consistent hawks in the FOMC. The shaded areas correspond to 68%, 90% and 95% confidence bands calculated with Newey-West HAC estimator with Andrews-selected truncation parameter.

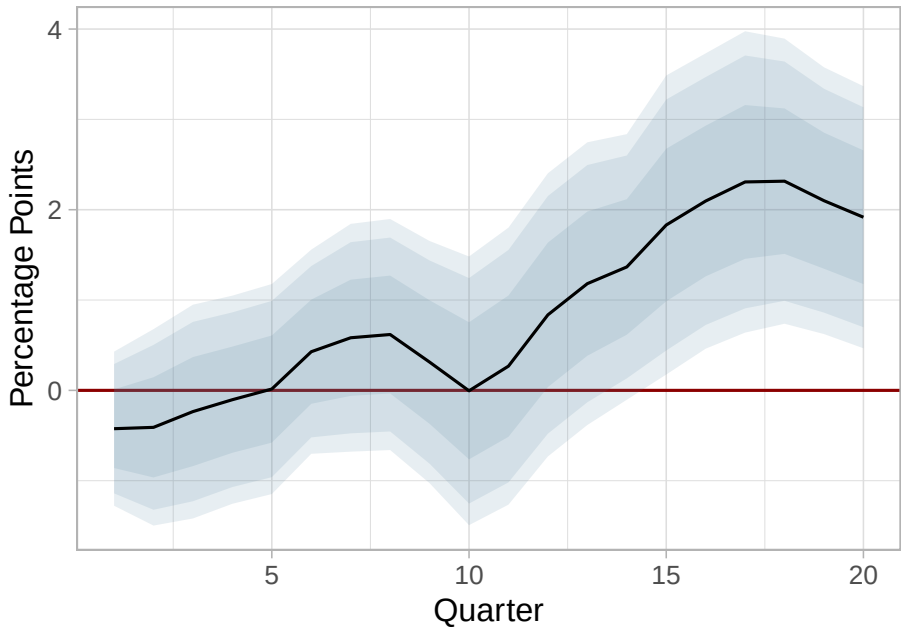
Results I

Policy Response to Unemployment and FOMC Hawkishness

(a) Average Response to Unempl. $\left(\beta_u^h\right)$

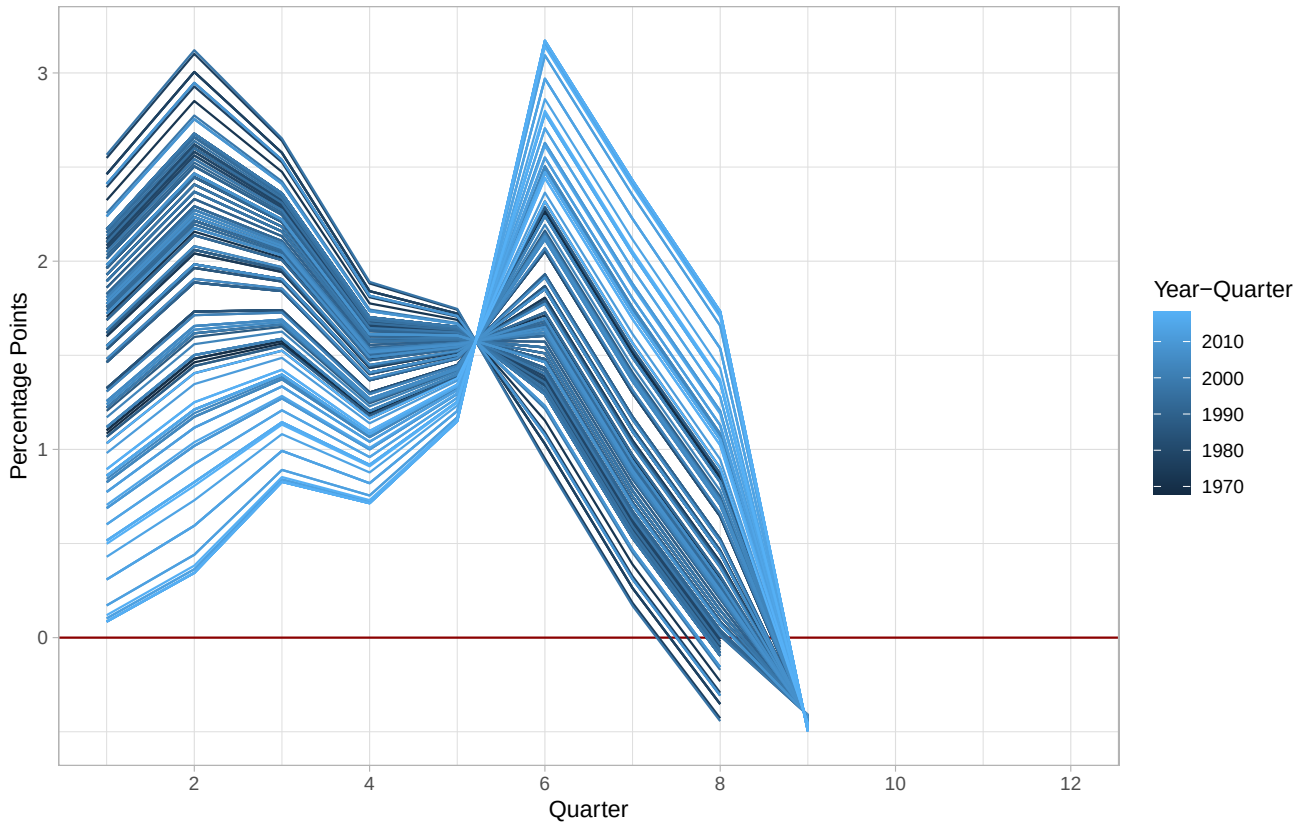


(b) Differential Response to Unempl. $\left(\gamma_u^h\right)$



Notes: This figure reports the responses of the $r_t - \rho_t$ to an increase in the Tealbook unemployment forecast of 1 p.p. The subfigure 4a reports the response for the *HAWK* index equal to the sample average and 4b is the addition to the response in case there are 2 (out of 12 in total) additional consistent hawks in the FOMC. The shaded areas correspond to 68%, 90% and 95% confidence bands calculated with Newey-West HAC estimator with Andrews-selected truncation parameter.

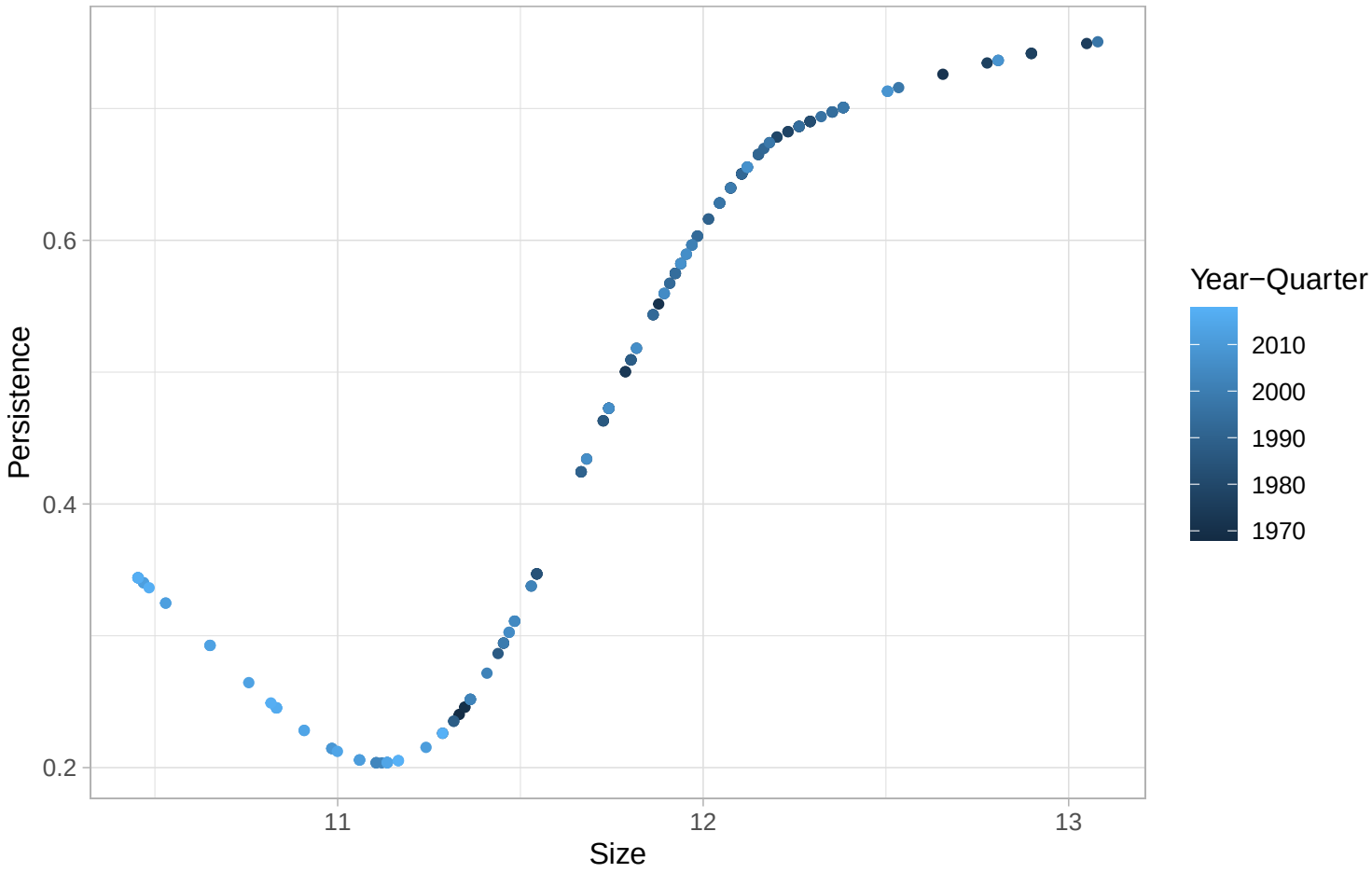
Figure: Predicted IRFs in each of the state



Notes: This figure shows the Impulse Response functions in each state calculated as in equation (3).

Results

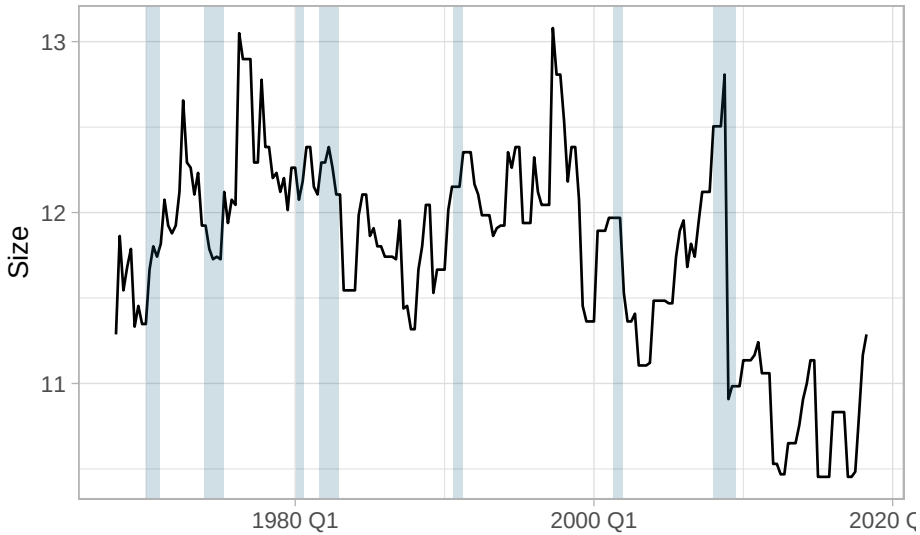
Figure: Estimates of Size and Persistence



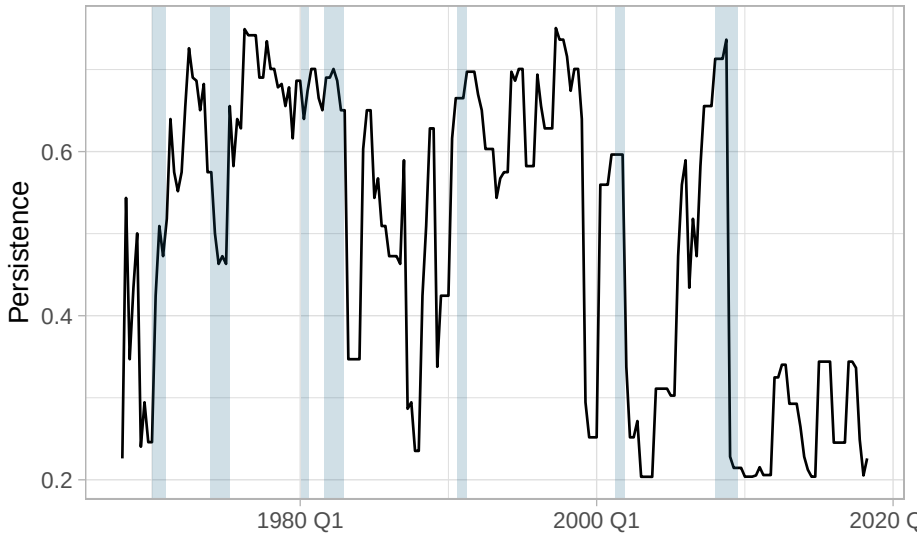
Results

Size and Persistence over time

(a) Size Dynamics



(b) Persistence Dynamics



Notes: This figure presents the size and persistence, calculated as mean and the first autocorrelation of impulse-response function in each state, constructed as described in section 1 on page 3, over time.

Results:

Size-Persistence Tradeoff

	Dependent variable:	
	log(*consumption*)	
	$H = 8$	
	(1)	(2)
Size (R_0)	−0.687 (−1.149, −0.133) [0.011]{0.997}	−0.451 (−1.495, 1.078) [0.857]{0.578}
Persistence (ν)	−0.100 (−0.693, 0.691) [0.746]{0.673}	1.223 (−3.598, 4.968) [0.517]{0.246}
ν^2		−1.042 (−4.271, 4.336) [0.517]{0.766}
$R_0 \times \nu$	0.765 (−0.177, 1.526) [0.0754]{0.0247}	−1.628 (−3.159, 2.748) [0.522]{0.759}
$R_0 \times \nu^2$		2.435 (−1.852, 3.838) [0.340]{0.145}
Constant	10.6 (10.1, 11.0) [0.0]{0.0}	10.5 (9.8, 11.0) [0.0]{0.0}
Observations	198	198

Conclusions

So, should we believe in HANK?

The evidence above suggests that, we should. At least we have found that consumption behaviour in size-persistent tradeoff corresponds to the TANK model.

Place for your suggestions and comments!

If you have any other suggestions/comments please write avlasov@nes.ru

References I

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