Verifying HANK

Evidence from size-persistence tradeoff.

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Contents

What is HANK?

NK = New Keynesian = Monetary Policy is not Neutral

RANK = Representative Agent + NK

TANK = Two-Agent[1] + NK = One agent is Spender, one is Saver + NK

HANK[2] = Heterogeneous Agent+NK = Heterogenity in saving portfolio+NK

[1] Sometimes referred as Spender-Saver Model

[2] The version by Kaplan et al. (2018)

[2] See Gali (2018) for review.

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

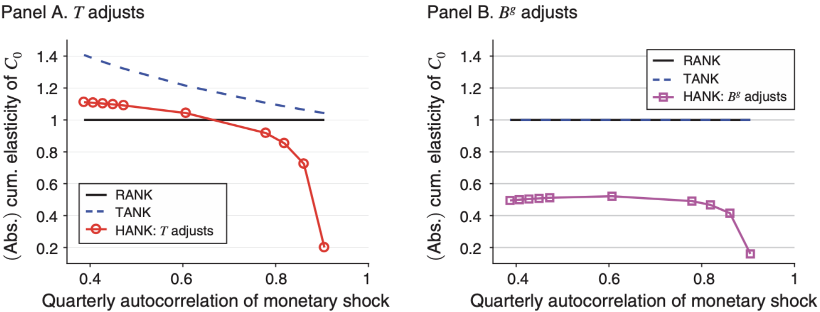


FIGURE 8. CUMULATIVE ELASTICITY OF AGGREGATE CONSUMPTION BY PERSISTENCE OF THE SHOCK

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

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

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

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

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

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

Contents

Systematic Monetary Policy Identification

Monetary Policy Rule Counterfactuals

- McKay and Wolf (2023); Barnichon and Mesters (2023) use the identified shocks and impulse responses to them to minimize a loss function.

FOMC Preferences

- Hack et al. (2023) use Istrefi (2019) data on preferences of FOMC members and using the FOMC rotation mechanism they are able to construct an IV.

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

I assume that the monetary policy rule is

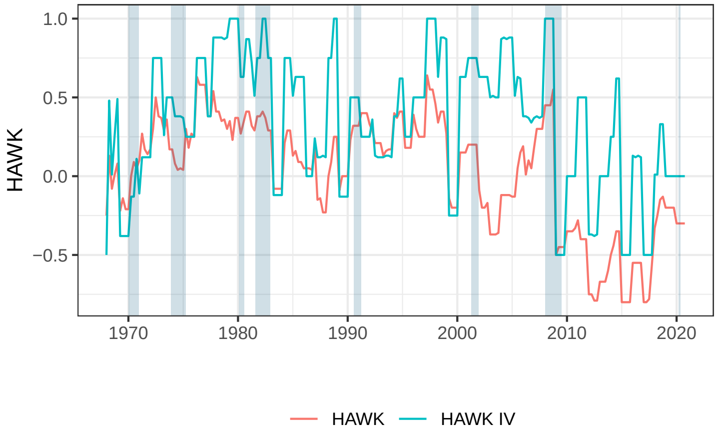
$$(r - r^*)_{t+h} = \phi_t^h \mathbb{E}\left[\pi_{t+1} \mid \mathcal{I}_t\right] + \psi_t^h \mathbb{E}\left[x_{t+1} \mid \mathcal{I}_t\right] + \varepsilon_t.$$

$\mathbb{E}_t \pi_{t+1}$ and $\mathbb{E}_t x_{t+1}$ are the expectations of monetary authority about the inflation and output gap (or unemployment) at quarter $t+1$.

I estimate the following State-Dependent LP-IV.

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

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



Empirical approach

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

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

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

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

$$\log Consumption = \alpha'_0 + \alpha'_1 R_0 + \beta'_1 R_0 \nu + \beta'_2 R_0 \nu^2 \tag{6}$$

Contents

Data

- FED inflation (deflator) and unemployment forecast is from Tealbook (average of 1 and 2 quarter ahead + averaging per quarter).
- HAWK index from Hack et al. (2023).
- 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)

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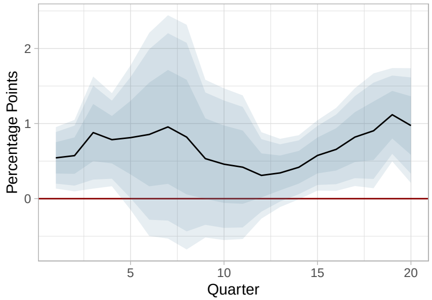
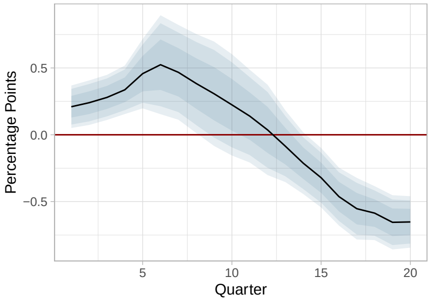
Results I

Policy Response to Tealbook GDP Deflator Inflation and FOMC Hawkishness

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



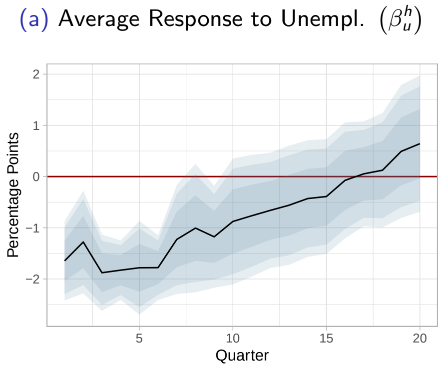
(b) Differential Response to Inflation $\left(\gamma_{\pi}^{h}\right)$

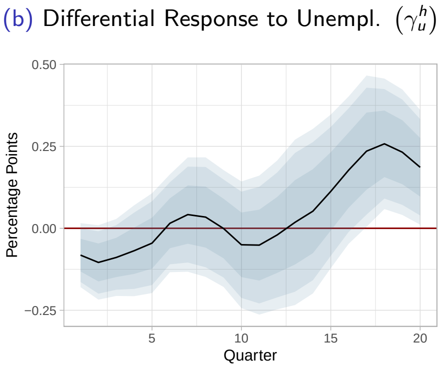


Notes: This figure reports the responses of the $r_t - \rho_t$ to an increase in the Tealbook inflation forecast of 1 p.p. (calculated as a predicted change in GDP deflator). The subfigure 5a reports the response for the *HAWK* index equal to the sample average and 5b is the addition to the response 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 Tealbook Unemployment and FOMC Hawkishness



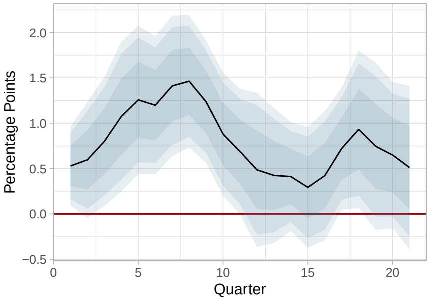


Notes: This figure reports the responses of the $r_t - \rho_t$ to an increase in the Tealbook unemployment forecast of 1 p.p. The subfigure 6a reports the response for the *HAWK* index equal to the sample average and 6b is the addition to the response in case there are 2 (out of 12 in total) additional 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.

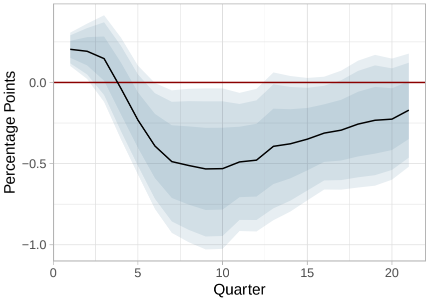
Results II

Policy Response to Tealbook CIP Inflation and FOMC Hawkishness

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



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

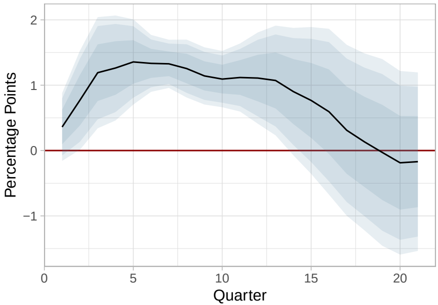


Notes: This figure reports the responses of the $r_t - \rho_t$ to an increase in the Tealbook inflation forecast of 1 p.p. (calculated as a predicted change in GDP deflator). The subfigure 5a reports the response for the *HAWK* index equal to the sample average and 5b is the addition to the response 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.

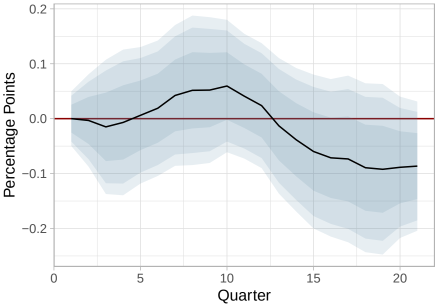
Results II

Policy Response to Tealbook Output Gap and FOMC Hawkishness

(a) Average Response to Output Gap (β_u^h)

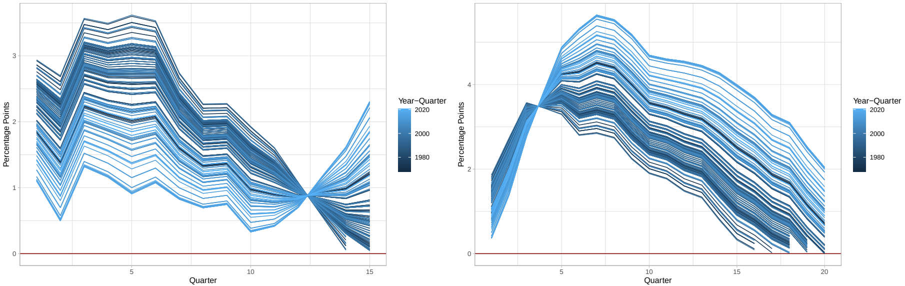


(b) Differential Response to Gap (γ_u^h)



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 6a reports the response for the *HAWK* index equal to the sample average and 6b 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.

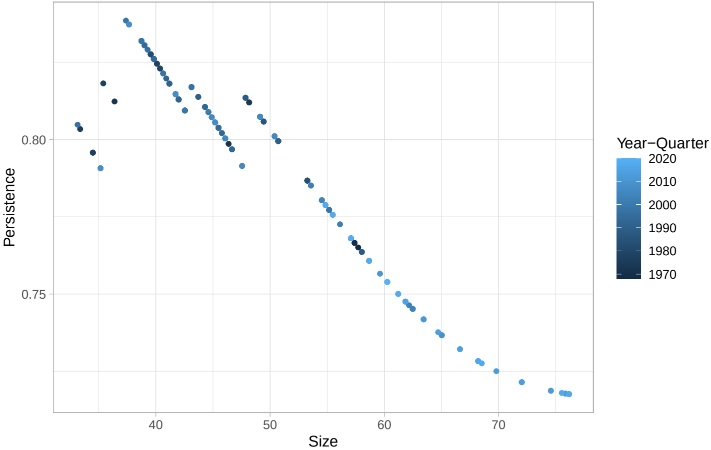
Figure: Predicted IRFs in each of the state



Notes: This figure shows the Impulse Response functions in each state calculated as in equation (5).

Results

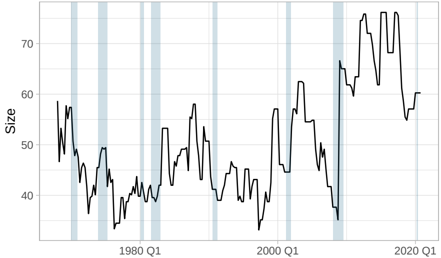
Figure: Estimates of Size and Persistence



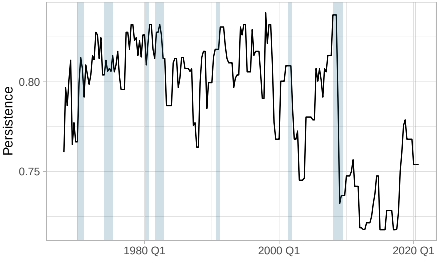
Results

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 5, over time.

Results:
Size-Persistence Tradeoff

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

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