

Heterogeneous Beliefs and the Phillips Curve

Roland Meeks and Francesca Monti

International Monetary Fund and UCLouvain

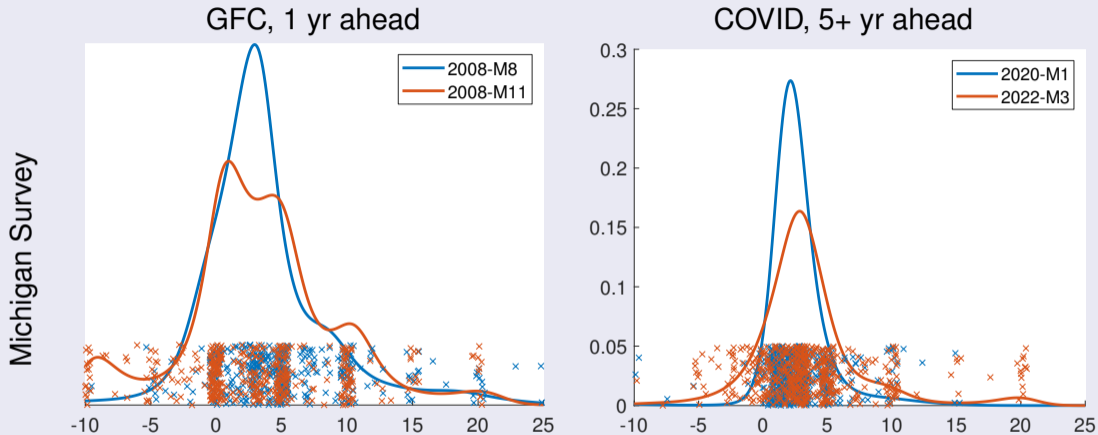
49th OeNB Economics Conference and 35th SUERF Colloquium

The return of inflation?

May 24, 2022

The views expressed in this presentation are solely those of the authors and should not be attributed to the International Monetary Fund, its Management, or its Executive Board.

Distributions of household inflation forecasts are complex and time varying



Note: Panels show distributions of individual Michigan survey respondents' point forecasts for inflation on selected dates. Forecasts are 1 year ahead (left) and 5 years ahead (right). Dates reflect when forecasts were made. x indicates individual responses (jittered horizontally and vertically).

Heterogeneous beliefs alter the New Keynesian Phillips curve

When there are differences of opinion, so everyone holds their own belief “ $\mathbb{E}^{(k)}$ ”, the micro-foundations of the standard NKPC fail (in general).

An additional term Δ_t that captures differences of opinion about *reset prices* enters the PC:

$$\pi_t = \alpha(u_t - u_t^*) + \beta \bar{\mathbb{E}}_t(\pi_t^e) + \gamma \Delta_t + \varepsilon_t \quad (\text{HBPC})$$

where $\bar{\mathbb{E}}[X] = \int \mathbb{E}^{(k)}[X]$ is the consensus belief. It's Roberts (1997) or Coibion et al. (2018) but with an extra term. Take this model to the data.

Heterogeneous beliefs NKPC estimated via functional principal component regression

We suggest that Δ_t in the heterogeneous beliefs NKPC can be approximated empirically by a function of the observed distribution of expectations:

$$\Delta_t \approx \int \gamma(\pi_t^e) \mathbf{p}_{t,h}(\pi^e)$$

where \mathbf{p} are mean-centered densities, $\gamma(\cdot)$ is a *function* to be estimated \implies standard model recovered when $= 0$. We're relying on there being some systematic relationship between beliefs about reset prices and about inflation here.

$$\pi_t = \alpha(u_t - u_t^*) + \beta \bar{\mathbb{E}}_t \pi_t^e + \int \gamma(\pi^e) \mathbf{p}_{t,h}(\pi^e) + \varepsilon_t$$

Heterogeneous beliefs NKPC estimated via functional principal component regression

We suggest that Δ_t in the heterogeneous beliefs NKPC can be approximated empirically by a function of the observed distribution of expectations:

$$\Delta_t \approx \int \gamma(\pi_t^e) \mathbf{p}_{t,h}(\pi^e)$$

where \mathbf{p} are mean-centered densities, $\gamma(\cdot)$ is a *function* to be estimated \implies standard model recovered when $\gamma = 0$. We're relying on there being some systematic relationship between beliefs about reset prices and about inflation here.

$$\pi_t = \alpha(u_t - u_t^*) + \beta \bar{\mathbb{E}}_t \pi_t^e + \sum_k \gamma_k s_{k,t} + \varepsilon_t$$

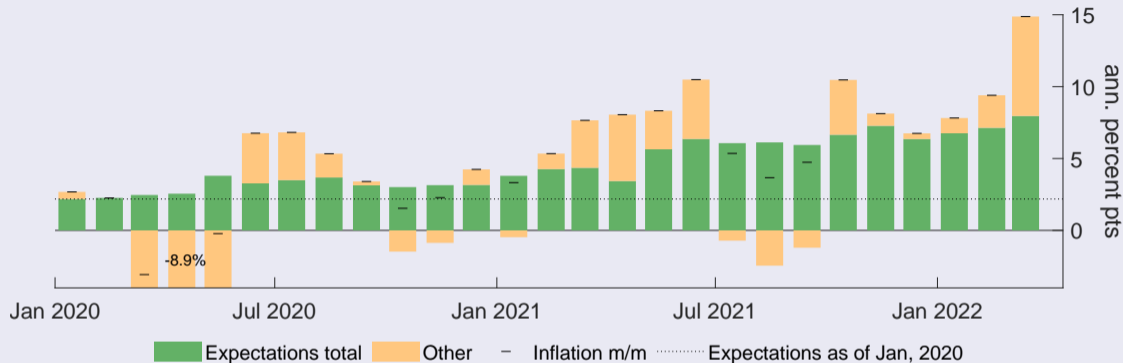
Expand both \mathbf{p}_t and $\gamma(\cdot)$ in the empirical basis (the principal components) to get a regression on the functional principal component scores $s_{k,t}$ (Reiss et al., 2017). You can test $H_0 : \gamma(\cdot) = 0$ via an F -test on the $\hat{\gamma}_k$'s (Kong et al., 2016).

Distributions of beliefs are statistically significant for US and UK inflation

<i>Dependent variable</i>	US/Michigan		UK/Basix	
	(1)	(2)	(3)	(4)
	CPI(Q)	CPI(Q)	CPI(Q)	CPI(Q)
Unemployment gap	-.177 ** (.079)	-.309 *** (.062)	-.027 (.101)	-.180 * (.095)
Lagged inflation	.231 *** (.067)	.083 (.063)	.111 (.074)	.073 (.059)
Average expectation	1.20 *** (.143)	1.61 *** (.192)	.918 *** (.133)	.814 *** (.188)
Number of FPCs	—	3	—	3
T_F -statistic	—	14.28 [.000]	—	4.99 [.003]
Supply factors	y	y	y	y
Outlier dummy	y	y	y	y
Sample	1978Q1–2017Q4		1986Q4–2017Q4	
R^2	.836	.872	.740	.770
BIC	.652	.497	.544	.536
Number of obs.	160	160	125	125

Note: Standard errors (scalar covariates) based on Newey-west adjusted (5 lags) in parentheses; T_F statistic for $H_0 : \gamma = 0$ shown, p -value in brackets. Lagged inflation is $(\pi_{t-1} + \pi_{t-2} + \pi_{t-3} + \pi_{t-4})/4$. Similar results for monthly inflation.

The overall contribution of expectations to inflation has been sizeable post-pandemic

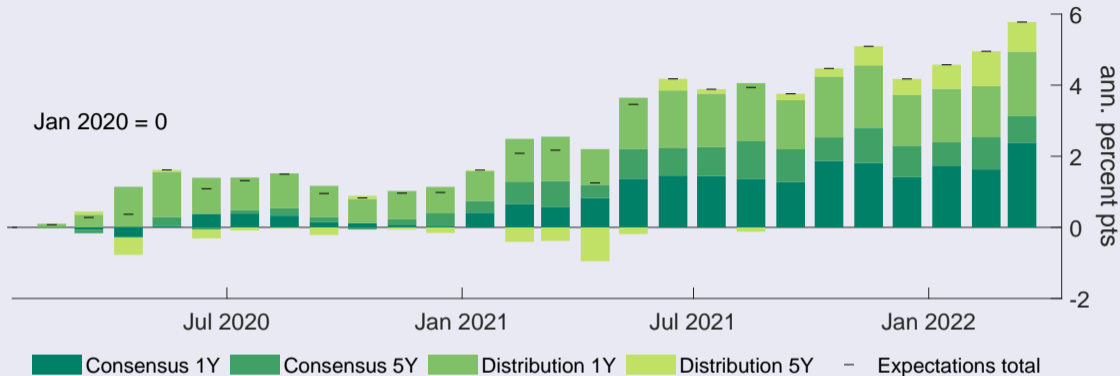


Fitted contributions to month/month inflation (at annual rates) of Michigan expectations from:

$$\pi_t - \bar{\tau}_t^e = \hat{\alpha}(u_t - u_t^*) + \hat{\beta}(\bar{\pi}_t^e - \bar{\tau}_t^e) + \sum_h \int \hat{\gamma}^h(\cdot) \mathbf{p}_{t,h}(\cdot)$$

for π^e = consensus 1 year ahead expectations, τ^e = consensus 5-10 year ahead expectations, \mathbf{p}_h = distributions of 1 and 5-10 year expectations. Monthly, 1990-M4 to 2022-M3.

The overall contribution is shaped strongly by heterogeneous beliefs



Decomposition of the expectations component of inflation:

- Estimates show consensus forecasts of near-term and trend inflation are weighted 2:1 ($\hat{\beta} \approx 0.66$)
- Heterogeneous beliefs for both horizons are quantitatively important drivers of inflation

Summary of the main messages

- Distributions of beliefs about future inflation are complex and time varying (but have a factor structure)
- Heterogeneous beliefs modify the standard Phillips curve, must test the extended model
- Find models that omit distributions misspecify the expectations component of inflation
- Heterogeneous beliefs can make an economically significant contribution to inflation in periods of macro dislocation

END OF PRESENTATION