The Term Structure of Monetary Policy News

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Introduction

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- ... but what are these EMPS? Are they short-term interest rate surprises? News about future policy?
- EMPS can be high dimensional objects: information about policy rates at many future horizons.
- Understanding this structure is *essential* for interpretation.



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This Paper

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- Killer app: using term structures of many EMPS, we can construct a *synthetic* MPS with any desired term structure
- We use synthetic MPS to study effects of true policy surprises and news

• A simple New Keynesian model:

New Keynesian Phillips curve: Euler equation: Taylor rule: Policy news: $\begin{aligned} \pi_t &= \beta \mathbb{E}[\pi_{t+1}] + \kappa y_t \\ i_t &= \mathbb{E}_t[\gamma(y_{t+1} - y_t) + \pi_{t+1}] \\ i_t &= \phi_y y_t + \phi_\pi \pi_t + \nu_t \\ \nu_t &= \nu_{0,t} + \nu_{1,t-1} + \nu_{2,t-2} + \dots \end{aligned}$

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- An EMPS is some combination of surprise/news shocks
- Each news shock has a unique IRF: *any* EMPS IRF can be rationalized by this model!

Do EMPS Look Like the NK Model?



(a) EMPS vs. NK Surprise Shock

(b)

Figure 1: CPI Responses to Monetary Shocks

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(a) EMPS vs. NK Surprise Shock

(b) NK News Shocks

Figure 1: CPI Responses to Monetary Shocks

... Yes, for Some Term Structure of News



(a) MPS Approximations

(b)

Figure 2: Rationalizing Gertler-Karadi with a Combination of News Shocks

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Theoretical Framework

General Framework: Monetary Policy

• Monetary policy is given by a Taylor-type rule $(y_t \text{ is the policy instrument})$:

$$y_t = x_t \phi + r_t \tag{1}$$

• The residual r_t may be autocorrelated:

$$r_t = \sum_{\ell=1}^{L} \rho_{r,\ell} r_{t-\ell} + \nu_t \tag{2}$$

• The monetary policy *innovation* ν_t is a linear combination of independent news shocks:

$$\nu_t = \nu_{0,t} + \nu_{1,t-1} + \nu_{2,t-2} + \dots + \nu_{H_\nu,t-H_\nu} \tag{3}$$

General Framework: Monetary Policy Shocks

EMPS contain some information about policy news at many horizons.
 EMPS w^j_t of type j is:

$$w_{t}^{j} = \sum_{h=0}^{H_{w}} \beta_{h}^{j} \nu_{h,t} + \xi_{t}^{j}$$
(4)

• ξ_t^j is iid orth. to $\nu_{h,t}$ (measurement error, CBI, etc.)

General Framework: Term Structure of Monetary Policy News

• The term stucture of EMPS *j* is the effect of the EMPS w_t^j on expectations of the MPI over many horizons:

$$\gamma_h^j \equiv rac{d\mathbb{E}[
u_{t+h}|w_t^j]}{dw_t^j}$$

• Given DGP (4), the term structure of EMPS can be written:

$$\nu_t = \sum_{h=0}^{H_w} \gamma_h^j w_{t-h}^j + u_t \tag{5}$$

with residual u_t

Empirical Strategy

• Would like to regress $u_t = \sum_{h=0}^{H_w} \gamma_h^j w_{t-h}^j + u_t$, but u_t is unobserved

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 - 4. Regress innovations on lags of EMPS to estimate the γ_h^j term structure coefficients

Estimation Strategy: One Step

• The 4-stage procedure can be estimated in one step:

 $\hat{\gamma} = (W'W)^{-1}W'M_{\mathbf{X}}(I - X(X'P_ZX)^{-1}X'P_Z)y$

where P_Z and M_X are projection matrices that depend on instruments Z and macro variables X.

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- ^γ consistently estimates the term structure if Z are valid instruments (exclusion: orthogonal to ν_t)
- This representation is useful because it has analytical standard errors:

 $Var(\hat{\gamma}|W,X,Z) = (W'W)^{-1}W'M_{\mathbf{X}...}$ $\times (I - X(X'P_ZX)^{-1}X'P_Z) \Omega (I - X(X'P_ZX)^{-1}X'P_Z)' M_{\mathbf{X}}W(W'W)^{-1}$

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• Smoothed LP will be especially useful when we construct synthetic MPS

- Monetary policy shocks from the literature
- Non-monetary macro shocks to use as instruments
- Standard macro time series for estimating the policy rule (inflation and output gap) and evaluating effects

Shock Source	Method	Notes	Range
Gertler and Karadi (2015)	HFI	30 min. window around FOMC decisions	1990:M1-2007:M12
Jarociński and Karadi (2020)	HFI	2 shocks: pure monetary and Fed information	1990:M1-2016:M12
Miranda-Agrippino and Ricco (2021)	HFI	Orthogonalized w.r.t. Greenbook forecasts	1991:M1-2009:M12
Bauer and Swanson (2023)	HFI	Includes Fed minutes and speeches	1988:M2-2023:M12
Swanson (2023)	HFI	Decomposed into 3 types of EMPS	1988:M2-2023:M12
Jarociński (2024)	HFI	Decomposed into 4 types of EMPS	1990:M2-2024:M9
Romer and Romer (2004),	Narrative	Orthogonalized w.r.t. Greenbook forecasts	1983:M1-2007:M12
Aruoba and Drechsel (2024)	Narrative	Natural language processing of Fed docs	1982:M10-2008:M10

Shock Source	Method	Notes	Range
<i>Government Spending Shocks</i> Romer and Romer (2016) Fieldhouse et al. (2018)	Narrative Narrative	Social Security expansions Government housing purchases	1951:M1-1991:M12 1952:M11-2014:M12
<i>Oil Shocks</i> Känzig (2021) Baumeister and Hamilton (2019)	HFI SVAR	Oil supply news Oil supply, consumption/inventory demand	1975:M1-2023:M6 1975:M2-2024:M3
<i>Other Shocks</i> Kim et al. (2022) Adams and Barrett (2024)	External SVAR	ACI severe weather shocks Shocks to inflation expectations	1964:M4-2019:M5 1979:M1-2024:M5

Estimation Results: Taylor Rule

- Baseline:
 - 12-month PCE inflation coeff.: 1.55
 - Monthly (filtered) real GDP coeff.: 0.75
 - *r_t* residual autocorr.: 0.95
- Robustness:
 - Inflation coefficient very robust across specifications, including inflation measure, lag selection, time periods, different IVs (but not inclusion of infl. expectations)
 - Real activity coefficient very sensitive to measure used
 - OLS not robust at all!
- We do expect coefficients to change depending on which variables appear in rule. Key question: are the implied term structures robust? (Mostly yes)

Estimation Results: Summarizing the Term Structures

- How should we quantify the term structures?
- R_k^2 statistic captures the proportion of ν_t variation that is explained by a shock at horizon k is

$$R_{k}^{2} \equiv \frac{Var(\nu_{t}|w_{t-k}^{j})}{Var(\nu_{t}|\{w_{t-h}^{j}\}_{h=0}^{H_{w}})} = \frac{(\gamma_{k}^{j})^{2}}{\sum_{h=0}^{H_{w}}(\gamma_{h}^{j})^{2}}$$

• Also report entire vectors • Term Structure Plots

Shock	$R_{0:1}^2$	$R_{2:6}^2$	$R_{7:12}^2$	$R^2_{13:24}$
Swanson FFR	0.01	0.40	0.47	0.13
Bauer-Swanson	0.04	0.45	0.32	0.18
Jarocinksi FFR	0.06	0.27	0.61	0.06
Jarocinksi LSAP	0.08	0.08	0.36	0.48
Swanson FG	0.11	0.59	0.23	0.07
Jarocinski-Karadi MPS	0.20	0.51	0.21	0.08
Miranda-Agrippino-Ricco	0.21	0.46	0.21	0.13
Aruoba-Drechsel	0.23	0.52	0.04	0.21
Jarocinksi Info	0.24	0.26	0.31	0.19
Jarocinksi FG	0.26	0.48	0.11	0.15
Gertler-Karadi	0.30	0.53	0.11	0.07
Swanson LSAP	0.41	0.50	0.02	0.07
Romer-Romer MPS	0.49	0.37	0.11	0.04

Table 1: Decomposition of Term Structure by Horizon

Synthetic Monetary Policy Shocks

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- Proposition: For a linear combination of MPS w^c_t = λ_aw^a_t + λ_bw^b_t, the resulting term structure of monetary policy news γ^c is proportional to the linear combination of term structures:

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• Valuable! Allows us to isolate the effects of specific components of monetary policy news, e.g. surprises or forward guidance.

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- Using 6 recent EMPS, we can accurately approximate these term structures.
- Then, estimate the macroeconomic effects using the standard Gertler-Karadi VAR

Synthetic Term Structures



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Macroeconomic Effects of Synthetic MPS



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Conclusions

- Analyzing an EMPS in a model requires knowing its term structure of monetary policy news; we derived a method to estimate it.
- Can use good EMPS to construct synthetic MPS with desired term structures
- Textbook-looking EMPS are not so ordinary when broken down into immediate shocks, forward guidance
- Main conclusions robust to most alternative specifications (except ZLB inclusion)





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