# What Does Anticipated Monetary Policy Do?

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[1] The views expressed herein are not necessarily those of the Chicago Fed or the Federal Reserve System.

# Research Question and its Relevance

Do beliefs about future monetary policy affect the current state of the economy?

- Policymakers have increasingly used "forward guidance" (FG) to shape interest rate expectations as a means to stimulate the economy.
- Theory predicts large FG effects. Yet, there is no conclusive evidence on whether the mechanism it postulates is actually in the data.
- We address this question by identifying anticipations of exogenous innovations to future monetary policy in a survey-augmented VAR and simulating forward-guidance scenarios.
- Quantifying the dynamic effects of FG on output, inflation, and employment.

# Our answer: Yes!

- Anticipations of MP innovations over next year predict large macro changes:
  - A 25-bp shock to average short-rate expectations over next year changes GDP and CPI by about 1% in the short run.
  - This is roughly equivalent to a 125-bp conventional MP shock.
  - It also happens faster and there is no price puzzle.
- A correctly anticipated MP innovation (similar to credible FG) of the same size has a 0.5 to 1 pp greater effect on GDP and CPI.
- At longer horizons, anticipated MP shocks have weaker effects.

# In Theory: Qualitatively

- In a NK model, if agents expect a low nominal short rate in the future, all else equal, they increase current consumption:

$$\begin{aligned} y_t &= E_t\left[y_{t+1}\right] - \frac{1}{\sigma}\left(i_t - \pi_t - r^*\right) \\ &= E_t\left[y_{t+T}\right] - \frac{1}{\sigma} E_t\left[\sum_{h=0}^{T}\left(i_{t+h} - \pi_{t+h} - r^*\right)\right] \end{aligned}$$

  - This also produces inflation through the NKPC.
  - The inflation feeds back to real rates and consumption through the Euler equation.

- This mechanism drives Krugman (1998), Eggertsson and Woodford (2003), Del Negro et al. (2011), Werning (2011), Campbell et al. (2012), etc.

# Does this actually happen?

To test whether expectations for future accommodation increase output and inflation, Campbell et al. (2012) ran regressions of the form

$$\Delta E_t \left[ x_{t+h} \right] = b \Delta E_t \left[ i_{t+h} \right]$$

where $E_t \left[ . \right]$ is a direct measure of expectations (from survey or interest-rate derivatives).

- They found the *opposite* of what the theory predicts: When short-rate expectations fall, forecasts for growth and inflation shift down.
- Their explanation:
  - Theory focuses on commitments to future deviations from historical policy rule (*Odyssean* FG)
  - But most Fed communication is perceived as providing signals about future macroeconomic performance (*Delphic* FG).

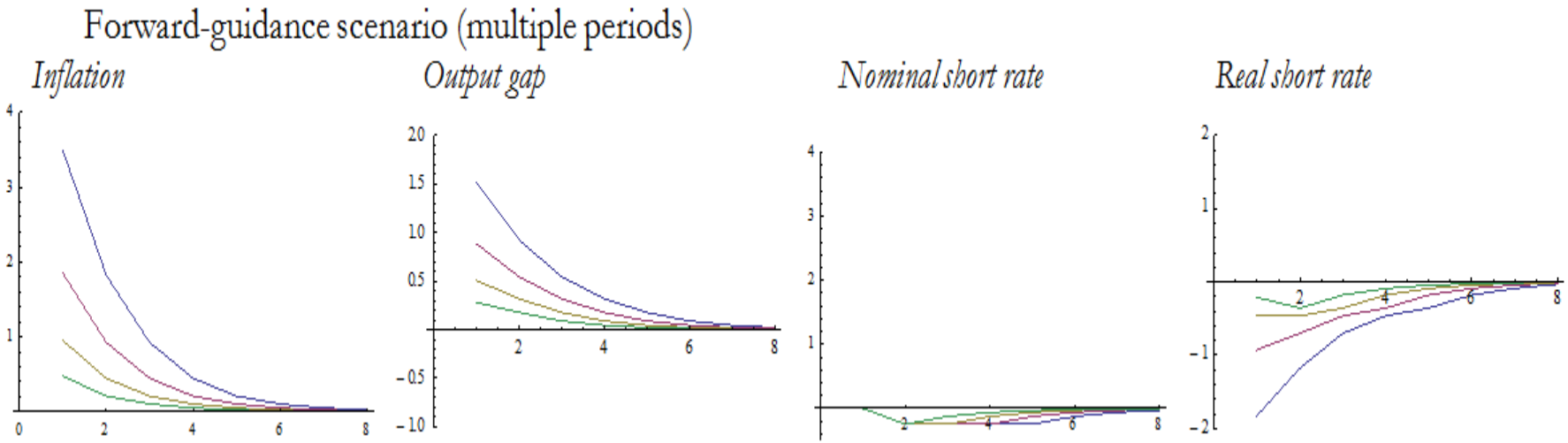
# What did we learn from their study?

Lower short-rate expectations can reflect either an anticipation of an exogenous easing of future monetary policy (good news) or an anticipated endogenous policy response to a weaker economy (bad news).

- The presence of these two types of short-rate expectations changes, with potentially *opposite* macroeconomic impacts, creates an identification problem.
- Measures of short-rate expectations alone are not sufficient to control for "Delphic" effects.
- Need to add forecasts of other key macro variables and embed them in SVAR to separate the sources of their fluctuations.
- Isolate the Odyssean component to see whether it works as advertised.

# In Theory: Quantitatively

Embedding "expectations shocks" in a standard NK model (Gali, 2008):




- -25bp FG for 1 year $\longrightarrow$ +1.5% output; +3.5% inflation in the short run
  - Both responses are persistent.
- Responses are larger for FG farther in the future.

# Does this make sense?

- These results seem implausibly large.
- But, since there are no model-free estimates of the effects of (Odyssean) forward guidance, how do we know for sure?
- Similarly, modifications to the basic NK model (Levin et al. 2011; McKay et al., 2015) can result in big changes in the quantitative effects of FG.
- How do we know which model is right?

# Our Approach

- Measure expectations with survey data since early 1980s;
- Use a SVAR augmented with survey forecasts of short-rate, growth, and inflation;
- Isolate anticipations of exogenous policy innovations with sign restrictions derive from theory:
  - Survey forecasts of the short rate must move in the *opposite* direction of survey forecasts of GDP growth and inflation.
  - (Note: In anticipated endogenous policy responses all 3 variables forecasts move in the *same* direction)
  - Also impose that contemporaneous short rate cannot fall when such a shock occurs.
- Identify conventional policy shocks using standard short-run restrictions in the same VAR.

# Interpreting Expectations Shocks

- To talk meaningfully about "anticipation of innovations" it must be the case that expectations can contain some exogenous component not related to contemporaneous observable fundamentals.
- It can be "news" (Barsky and Sims, 2009), "judgement" (Bullard et al., 2008), "sentiment" (Milani, 2011), "noisy" information (Lucas 1972, Sims 2003),....
- FG can be interpreted as "news": agents anticipate changes in future monetary policy as a result of explicit central bank communication aimed at signaling upcoming deviations from the historical policy rule.
- No matter the interpretation, we have to allow statistical and subjective (survey) beliefs to differ (Piazzesi,et al. 2015).

# Structure of the Economy

- Expectations are taken under the subjective measure

$$x_t = Ax_{t-1} + BE_t^{\mathbf{S}} x_{t+1} + \Sigma \varepsilon_t^x$$

- We divide $x_t$ into macro variables that cannot respond contemporaneously to MP shock ($x_{1t}$), those that potentially can ($x_{2t}$), and the short rate ($i_t$)

$$\begin{pmatrix} x_{1t} \\ x_{2t} \\ i_t \\ E_t^{\mathbf{S}} x_{t+1} \end{pmatrix} = \Phi \begin{pmatrix} x_{1t-1} \\ x_{2t-1} \\ i_{t-1} \\ E_{t-1}^{\mathbf{S}} x_{t+1} \end{pmatrix} + \epsilon_t$$

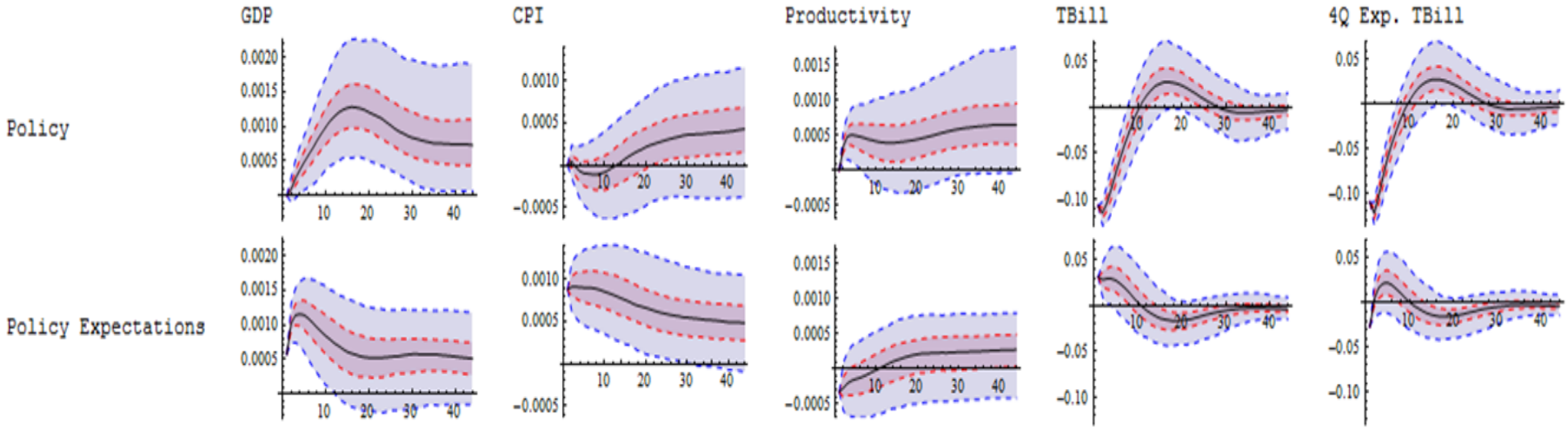
  where $\epsilon_t$ are reduced form errors with covariance matrix $\Sigma = \Gamma\Gamma'$.

- Thus, economic data and subjective expectations have a joint VAR structure.

# VAR details

- Baseline uses Blue Chip survey since 1983.
  - Forecasts of GDP, CPI, and average 3m TBill rate
  - Observed at 1-, 6-, and 11-year horizons
- Also includes GDP, CPI, labor productivity, 3m Tbill, M2, corporate profits
- Also includes long-term Treasury yield matching horizon of the forecast
- Specification and ordering follows Christiano et al. (2005)
- Arias et al. (2014) algorithm imposes sign and exclusion restrictions simultaneously.

# Baseline Results: 1-Year Expectations




- 1-stdev "policy-expectations" shock raises output, employment, and (quarterly) inflation by about 0.1% in the short run.
- Effects are larger and more persistent than those of a 1-stdev conventional policy shock.

# Some obvious concerns

- Are our "expectations shocks" really picking up positive aggregate-demand shocks that induce changes in expectations?
  - No. Such shocks would lead to expectations for policy tightening.
- Are our "expectations shocks" really picking up accommodative conventional monetary policy shocks that do not obey the timing restrictions?
  - No. Such shocks would lower the time-$t$ short rate.
- Are our "expectations shocks" really picking up news about stuff that would have happened anyway?
  - Maybe, but we show that accounting for this makes at most a small difference.

# Do the expectations shocks make sense?

| Std. Dev. | Date | FOMC Events |
|---|---|---|
| | | *Expected-Easing Shocks* |
| -2.5 | 2000Q3 | "Expansion of aggregate demand may be moderating" |
| -2.1 | 2001Q3 | [Sept. 11] |
| -1.1 | 2001Q1 | Balance of risks shifted to downside; easing cycle begins |
| -1.1 | 2006Q1 | "Some further policy firming may be needed" (rather than likely) |
| -1.1 | 2002Q3 | Balance of risks shifted to downside |
| -1.0 | 2004Q1 | "Committee believes it can be patient…" |
| -1.0 | 2006Q3 | Removal of phrase "some further policy firming may yet be needed"; "Economic growth has moderated" |
| -1.0 | 2008Q1 | "Economic growth is slowing… Recent developments... have increased the uncertainty surrounding the outlook"; 75 bp intermeeting cut and downside risks |
| | | *Expected-Tightening Shocks* |
| 1.9 | 2005Q4 | "Committee judges that some further policy firming is likely" (removed "measured pace" language) |
| 1.5 | 2001Q4 | ??? |
| 1.5 | 2004Q3 | Started tightening cycle |
| 1.5 | 2005Q2 | "Pressures on inflation have picked up in recent months", changed balance of risks from "roughly equal" to "should be kept roughly equal" with "appropriate monetary policy" |
| 1.4 | 2006Q4 | ??? |
| 1.3 | 2002Q2 | "Economy is expanding at a significant pace," downside balance of risks removed |
| 1.2 | 2000Q2 | 50bp tightening. "The Committee is concerned that this disparity in the growth of demand and potential supply will continue, which could foster inflationary imbalances." |
| 1.2 | 2007Q1 | "Committee's predominant concern remains the risk that inflation will fail to moderate." |

# A Comparison to Conventional MP Shocks

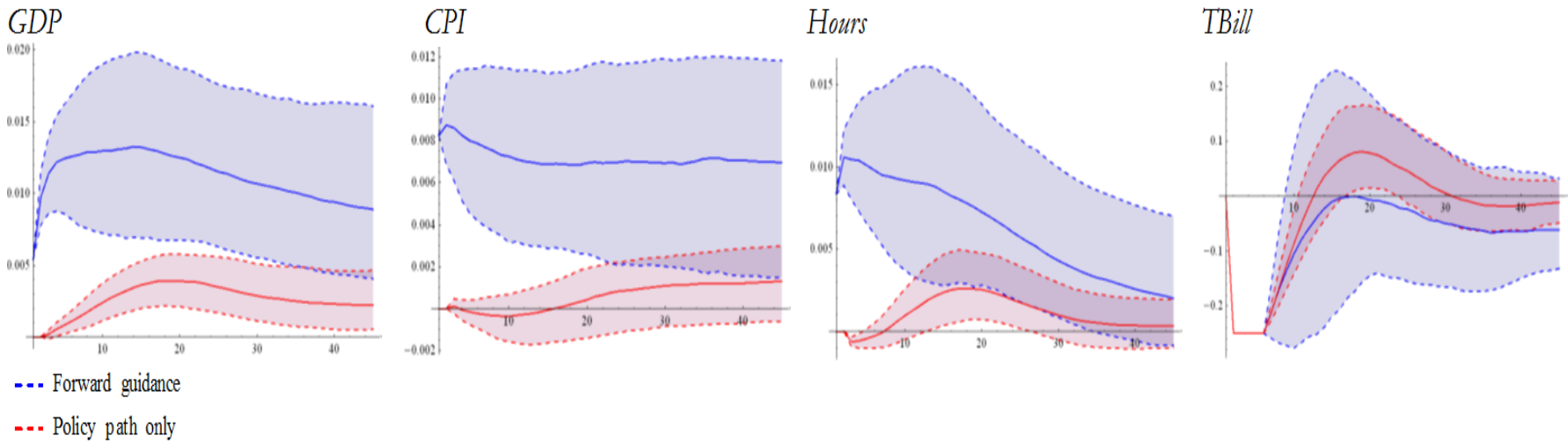
Size of conventional policy shocks required to equal the effect of a $-25$bp one-year expectations shock

| Horizon | Equal cumulative effect on GDP | Equal cumulative effect on CPI | Equal cumulative effect on hours |
|---|---|---|---|
| 1Y | $-123$ | | $-210$ |
| 2Y | $-46$ | | $-61$ |
| 4Y | $-18$ | $-81$ | $-4$ |
| 8Y | $-40$ | $-54$ | $-6$ |

# Modeling Forward Guidance

- A forward-guidance policy is one that
  1. Convinces agents that the short rate will follow a particular path
  2. Introduces subsequent short-rate shocks sufficient to achieve that path
- Thus, we can compute the effects of FG by combining a policy expectations shock with a series of conventional policy shocks.
- Experiment: Fed pre-announces that it will keep the short rate 25bp below its rule for one year and then return to the rule.
- Interesting comparison: What if Fed had followed the same policy-rate path without announcing it in advance?

# Effects of One-Year Forward Guidance




- Marginal effects of FG (relative to same but unanticipated shift in policy path):
  - *Short-run*: +0.5% to 1.2% GDP and hours; +.8% price level
  - *Medium-run*: +.4% to 1% GDP and hours; +.7% price level

# Robustness Checks

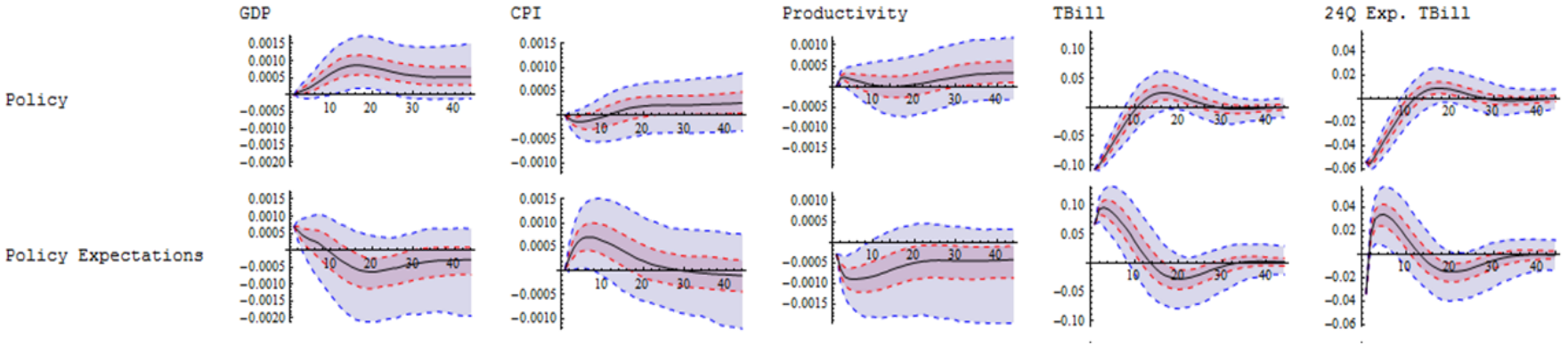
| | GDP | | CPI | | Hours | |
|---|---|---|---|---|---|---|
| | 1Y | 5Y | 1Y | 5Y | 1Y | 5Y |
| Baseline | 1.2%* | 0.9%* | 0.9%* | 0.7%* | 1.3%* | 0.6%* |
| Pre-ZLB period | 1.2%* | 1.0%* | 0.9%* | 0.9%* | 0.8%* | 0.3% |
| More lags | 1.3%* | 1.2% | 0.9%* | 0.7% | 1.4%* | 0.6% |
| SPF instead of BCS (begins 1981) | 1.6%* | 1.1%* | 1.4%* | 1.1%* | 1.5%* | 0.9%* |
| 1Y and 6Y surveys both included | 1.0%* | 0.7% | 0.9%* | 0.7%* | 0.7%* | 0.1% |
| Expectations shocks use sign restriction on real yield | 1.3%* | 1.0%* | 0.9%* | 0.8%* | 1.3%* | 0.6% |
| Policy shocks identified by sign restrictions | 1.0%* | 0.7% | 1.0%* | 0.7% | 1.0%* | 0.4% |
| Minnesota prior | 1.0%* | 1.2% | 1.4%* | 1.1%* | 1.4%* | 0.8% |

- All of these specifications give similar results.

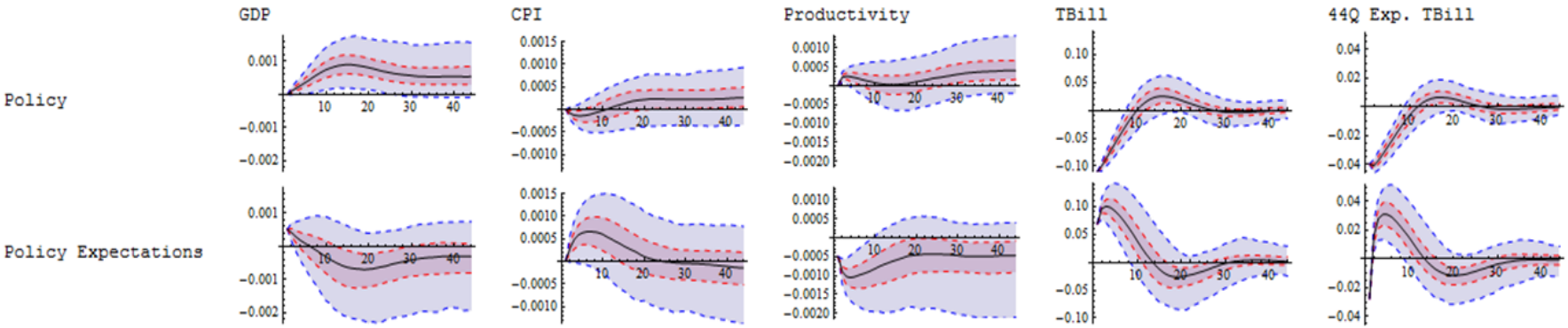
# Longer Horizons

- Using 6- and 11-year expectations, forward guidance is less effective:

Using 6-year expectations




Using 11-year expectations



# Longer Horizons

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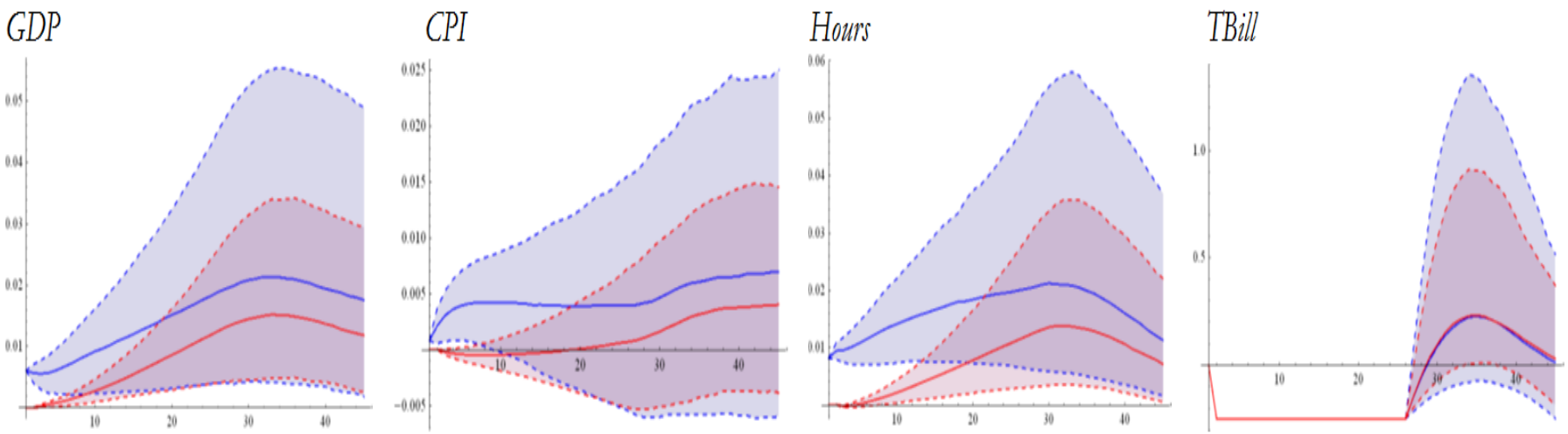

# Conclusions

1. Policy expectations have a powerful influence on economic outcomes.
   - A 1-std 1-year expectations shock has a similar effect on output as a 1-std conventional policy shock.
   - The effects on inflation and hours are larger.
   - The effects occur much faster.
   - But the basis-point size of the expectations shocks are 4 times smaller.
2. Forward guidance at the 1-year horizon has short-term effects close to what simple NK models predict:
   - -25 bp $\rightarrow$ +1% GDP, prices, and hours
3. The effects on the *levels* of output, prices, and employment persist for several years.

# Conclusions

However, differently from standard NK models

1. The response of inflation is not persistent.
   - Sticky-price models imply gradual decay after the initial shock.
2. Changes in expectations farther in the future are less powerful than those in near-term expectations.
   - Quantifies the "forward guidance puzzle."