The Dynamic Effects of Forward Guidance Shocks

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Forward Guidance Shocks at the Zero Lower Bound

What are the dynamic effects of forward guidance shocks on macroeconomic aggregates at the zero lower bound?

Can a standard DSGE model generate these estimated dynamics?

Forward Guidance Shocks at the Zero Lower Bound

What are the dynamic effects of forward guidance shocks on macroeconomic aggregates at the zero lower bound?

⇒ Forward guidance shocks which lower expected future policy rates increase economic activity and prices.

Can a standard DSGE model generate these estimated dynamics?

⇒ Yes, a small scale New-Keynesian model can generate similar impulse responses.

⇒ Key is to use interest rate futures contracts to discipline the size of the forward guidance shock in the model.

Our Empirical Approach

We combine a high-frequency event study approach with traditional monetary VARs.

$\Rightarrow$ Isolate the surprise component of monetary policy from interest rate futures.

$\Rightarrow$ To measure the macroeconomic effects we input our high-frequency policy surprises into a monthly VAR.

High-Frequency Identification

Well-suited to extract forward guidance surprises.

$\Rightarrow$ We use a daily event window.

$\Rightarrow$ Implied interest-rate expectations are extracted from federal funds futures markets.

$\Rightarrow$ We scale the monthly policy surprises to convert them into FOMC meeting frequency surprises.

VAR Model

We input our high-frequency policy surprises into a monthly VAR with macroeconomic aggregates.

$\Rightarrow$ Sample is December 2008-December 2014.

Macroeconomic Data: GDP, GDP deflator, Investment, and Capacity Utilization.

Monetary Policy: The policy surprise associated with the expected federal funds rate after the 7th next FOMC meeting.

$\Rightarrow$ Order policy last in a recursive VAR.

Empirical Responses to Forward Guidance Shock
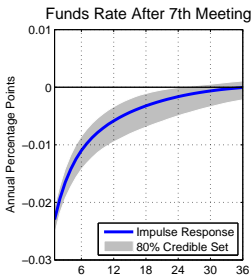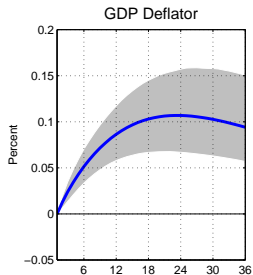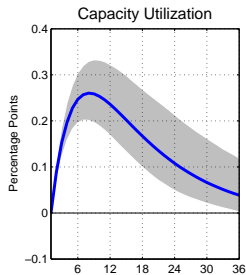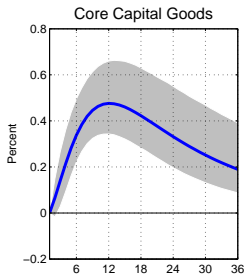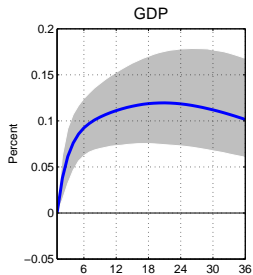
Forward guidance shocks which lower rates are stimulatory

We have found this result to be robust to:

$\Rightarrow$ Using longer-dated OIS and Eurodollar interest rate futures.

$\Rightarrow$ Using principle components from a vector of interest-rate futures.

$\Rightarrow$ Using other measures of economic activity and prices.

$\Rightarrow$ Including the release of the minutes and the FOMC chair's bi-annual congressional testimony in our event set.

$\Rightarrow$ Alternative VAR orderings.

Mapping results into a DSGE Model

We now estimate a small three variable VAR.

⇒ Consumption and Core PCE prices

⇒ Policy surprise is extracted from the 12-month ahead federal funds future contract.

These components can be mapped into a small-scale New-Keynesian model.

Mapping forward guidance shocks into a DSGE Model
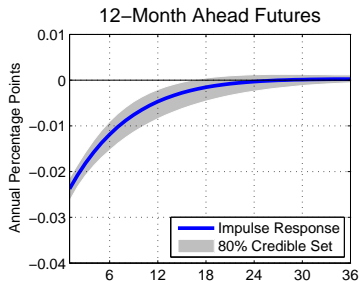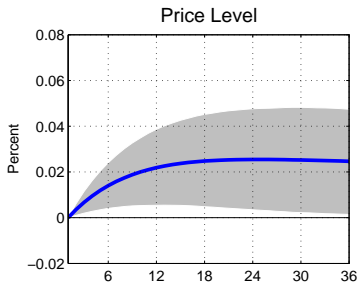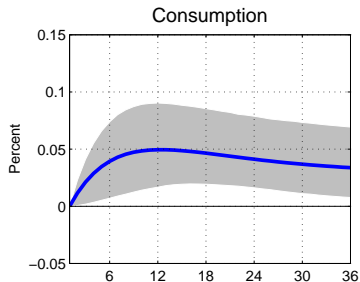
Can a standard business cycle generate these estimated dynamics?

New-Keynesian sticky price model without capital
  ⇒ Shares features with models by Ireland (2003, 2010).

Firms employ labor & produce
  ⇒ Quadratic cost of adjusting prices.

Household consumes, works, & receives firm dividends
  ⇒ External habits in consumption.
  ⇒ The household's SDF prices federal funds futures contracts.

Monetary Policy

$$r_t^d = \phi_r r_{t-1}^d + \Big(1 - \phi_r\Big)\Big(r + \phi_\pi\big(\mathsf{E}_{t-1}\pi_t - \pi\big) + \phi_x \mathsf{E}_{t-1}x_t\Big) + \nu_t$$

$$r_t = \mathsf{max}\Big(0, r_t^d\Big)$$

$$\nu_t = \rho_\nu \nu_{t-1} + \sigma^\nu \varepsilon_t^\nu$$

At ZLB: Forward guidance shock.

Away from ZLB: Conventional monetary policy shock.

Solution Strategy and Estimation

The non-linear model is solved using the OccBin toolkit
  $\Rightarrow$ Efficient algorithm allows for model estimation.
  $\Rightarrow$ A good approximation to the global solution.

Estimate the key model parameters using IRF matching
  $\Rightarrow$ Minimize the distance between the data and the model
     counterparts following a forward guidance shock.

Simulating a forward guidance shock at the ZLB:

1. Use an aggregate demand shock to drive economy to ZLB.
2. Simulate an innovation to the C.B.'s desired rate.

Can a standard model generate the estimated dynamics?
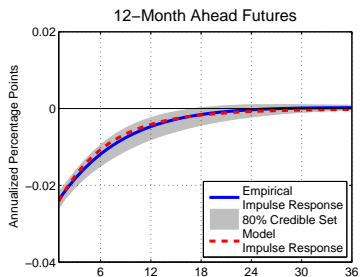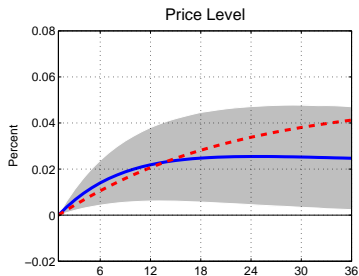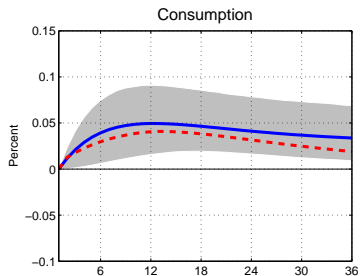
Conclusion

We find no disconnect between empirical evidence of the dynamic effects of forward guidance shocks and a standard DSGE model.

- ⇒ Forward guidance shocks revealing lower expected rates at the zero lower bound are stimulatory.
- ⇒ A fairly standard model can generate these dynamics.

Key to our approach is using interest rate futures contracts to link the forward guidance shocks in the data and the model.

Additional Details

Additional Model-Implied Responses
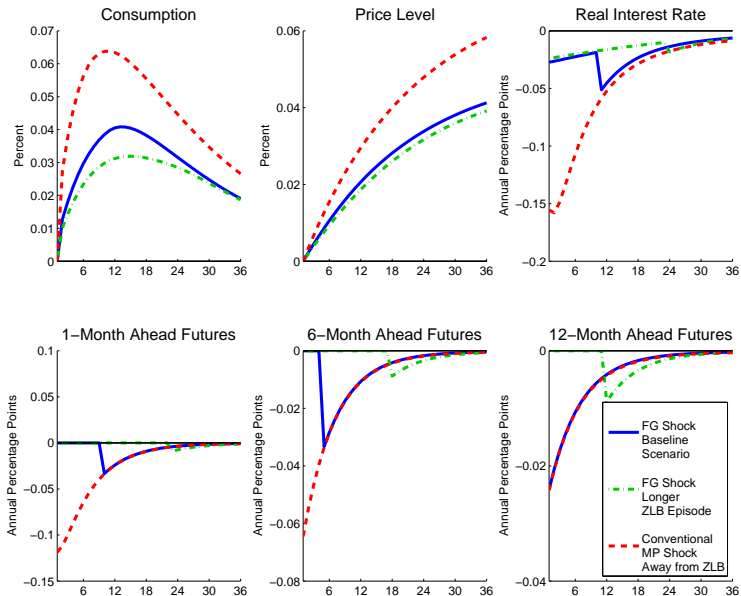
Global Solution and OccBin Solution
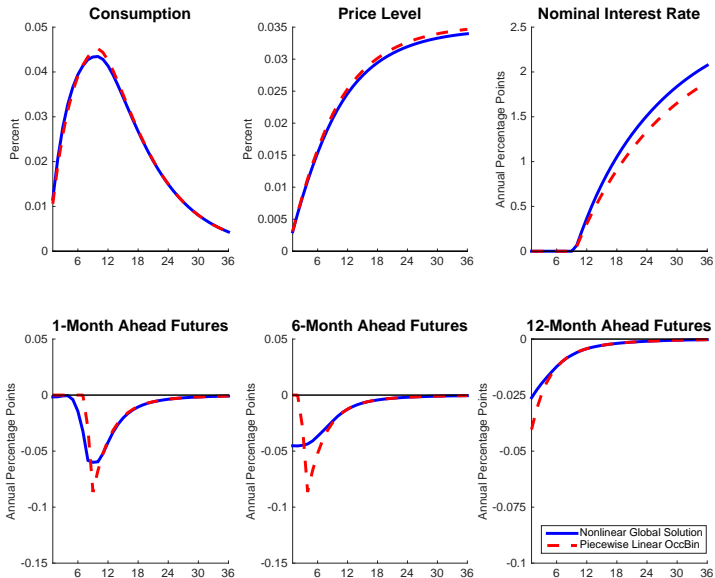
36 Month USD OIS
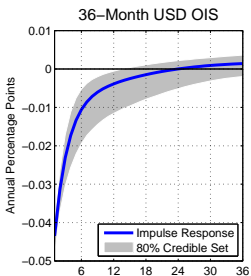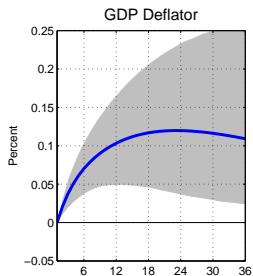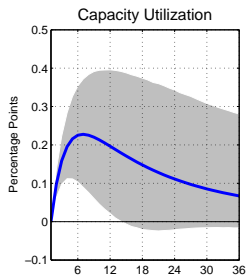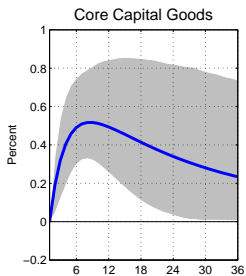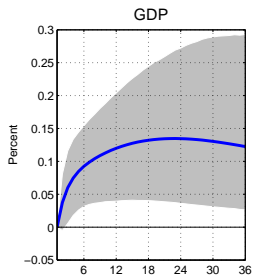
GSS Path Factor
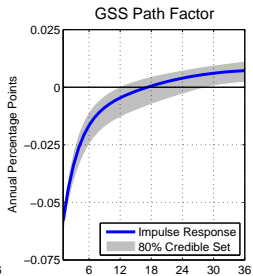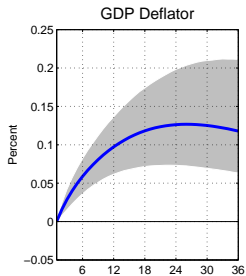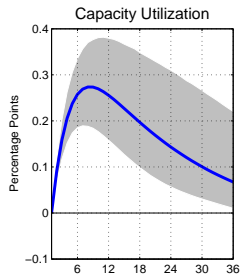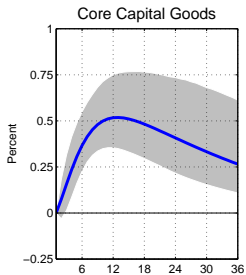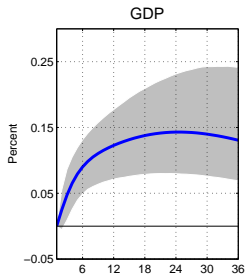
Industrial Production
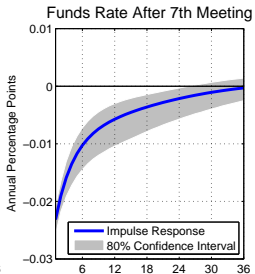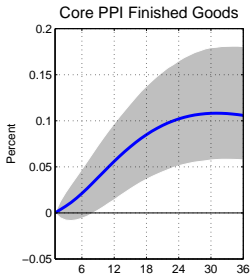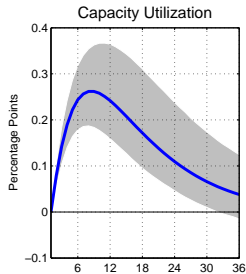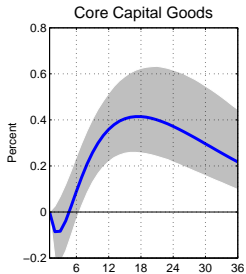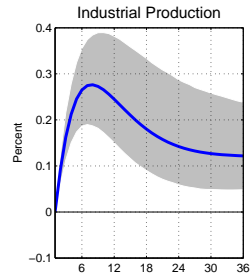
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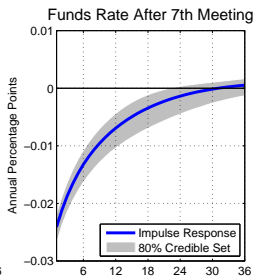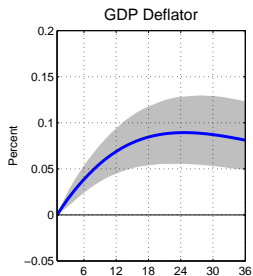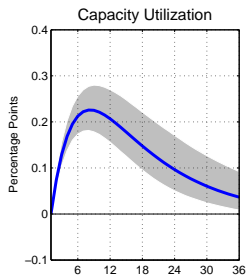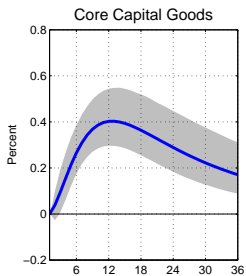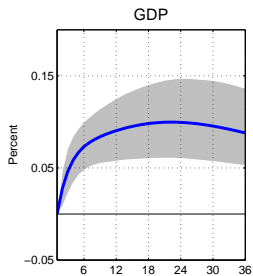
Policy Ordered First
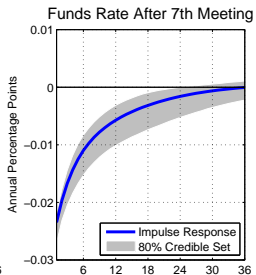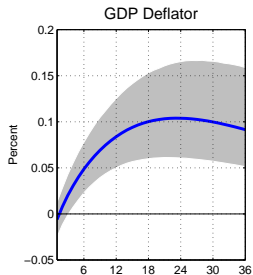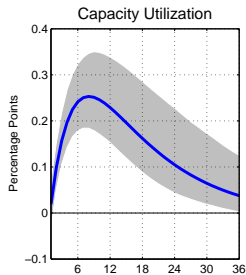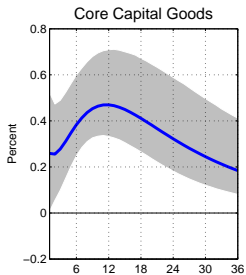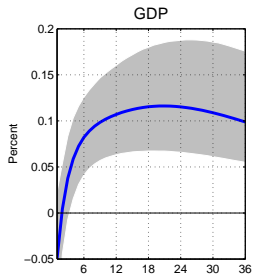
Forward Guidance Pre-ZLB
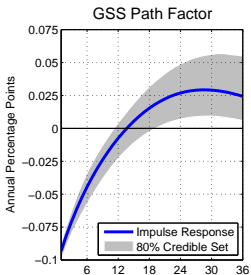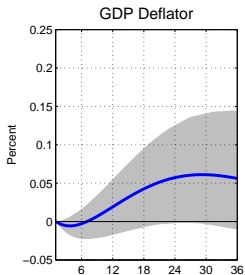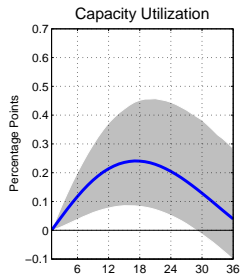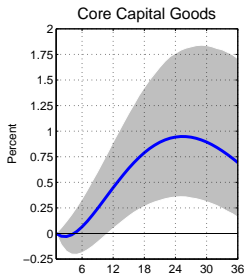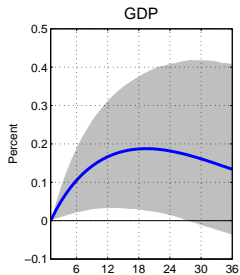
Relationship to previous work

The Forward Guidance Puzzle

One-Month Extension of Zero Lower Bound Duration

Consumption / Price Level / Nominal Interest Rate

Baseline Prior to FG Shock
Response After FG Shock

One-Year Extension of Zero Lower Bound Duration

Consumption / Price Level / Nominal Interest Rate

Baseline Prior to FG Shock
Response After FG Shock

Forward Guidance Shocks & Blue Chip Forecasts

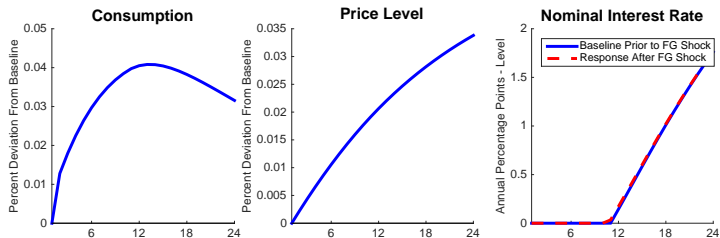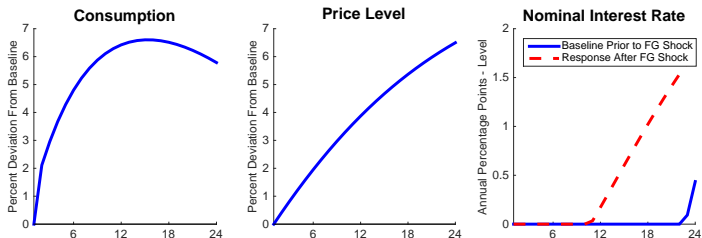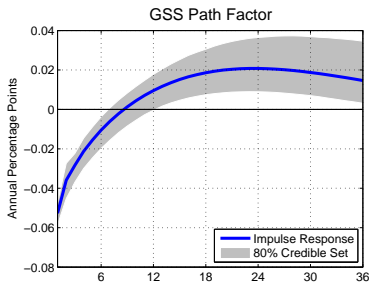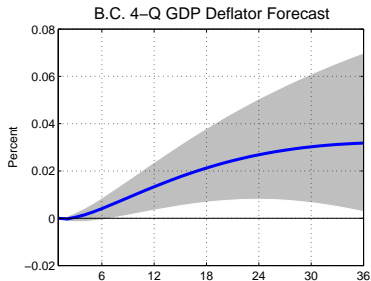| Forecast	Differences		Levels Lags of Dependent		Levels Lags of Each	
Unemployment Rate						
Next Quarter	ΔMP_{t-1}	-1.32^{***}	MP_{t-1}	0.47^{*}	MP_{t-1}	-0.45
		(0.36)		(0.24)		(0.39)
					MP_{t-2}	1.25^{***}
						(0.35)
2 quarters ahead	ΔMP_{t-1}	-1.09^{***}	MP_{t-1}	0.45^{**}	MP_{t-1}	-0.23
		(0.34)		(0.19)		(0.27)
					MP_{t-2}	0.95^{***}
						(0.26)
3 quarters ahead	ΔMP_{t-1}	-0.89^{***}	MP_{t-1}	0.46^{**}	MP_{t-1}	-0.06
		(0.18)		(0.06)		(0.22)
					MP_{t-2}	0.73^{***}
						(0.16)
4 quarters ahead	ΔMP_{t-1}	-0.66^{***}	MP_{t-1}	0.48^{***}	MP_{t-1}	0.15
		(0.18)		(0.17)		(0.22)
					MP_{t-2}	0.48^{***}
						(0.17)

Forward Guidance Shocks & Blue Chip Forecasts

Data

Policy Surprises

High-Frequency Policy Surprises

Legend:
- 7th Next FOMC Meeting (black)
- GSS Path Factor (blue)
- 36 Month USD OIS (green)