The NY Fed DSGE

NY Fed DSGE Team

Federal Reserve Bank of New York

Pushing the frontier of central banks macro modelling
BIS, 8-9 March 2018

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NY Fed DSGE

- Medium/largish-scale model with Smets & Wouters' nominal and real rigidities, and financial frictions as in Bernanke, Gertler, and Gilchrist, 1999/Christiano, Motto, and Rostagno (2014)
    - Observables (1960Q1-2017Q2): the growth rate of real output (*both GDP and GDI*), consumption, investment, real wage, hours worked, inflation (*both core PCE and GDP*), *long run inflation expectations*, the FFR, *the ten-year Treasury yield*, *Fernald's TFP growth*, *Baa spreads*
- Model's code is available on GitHub and its documentation is kept up to date here
    - 5th most popular Julia package ;-). 82 *forks* (people expanding on the code on Github)

- Model has been "vetted" (?) academically, so to say, in that versions of the NY Fed DSGE model have been used in variety of published/refereed papers:
  - "Safety, Liquidity, and the Natural Rate of Interest" with Domenico Giannone, Marc Giannoni, and Andrea Tambalotti, Brookings Papers on Economic Activity, Spring 2017
  - "Inflation in the Great Recession and New Keynesian Models," with Marc P. Giannoni, and Frank Schorfheide, American Economic Journal: Macroeconomics, 7(1), 2015
  - "DSGE Model-Based Forecasting" with Frank Schorfheide, Handbook of Economic Forecasting Vol. II, 2013

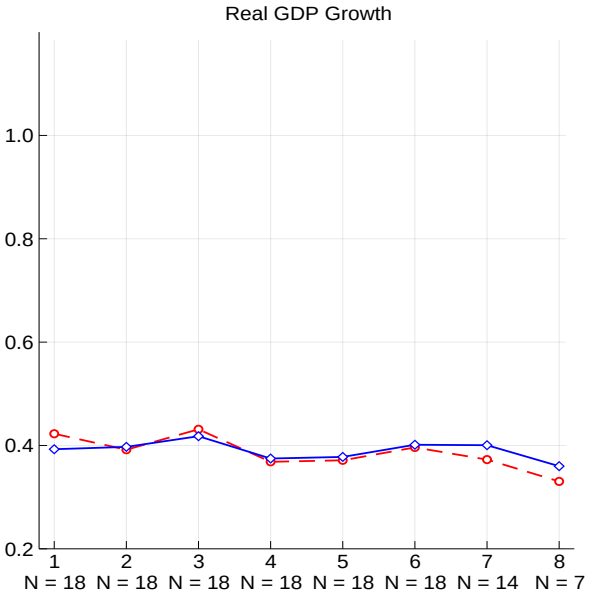
- The prospect of reasonably good academic publications generates incentives for the economists working on the model

- We try to advertise the model by publish its results (often the outcome of policy exercises) in blog posts:
  - Forecasting with Julia, Federal Reserve Bank of New York Liberty Street Economics Blog, May 2017
  - The Macro Effects of the Recent Swing in Financial Conditions Federal Reserve Bank of New York Liberty Street Economics Blog, May 2016
  - Why Are Interest Rates So Low?, Federal Reserve Bank of New York Liberty Street Economics Blog, May 2015
  - ...
- Since 2014 we regularly publish the DSGE forecasts on the Liberty Street Blog: September 2014, May and December 2015, May and November 2016, and in February, May, August and November 2017
- We do not forecast because the DSGE is "good" at forecasting — **we forecast with the DSGE to test the model**

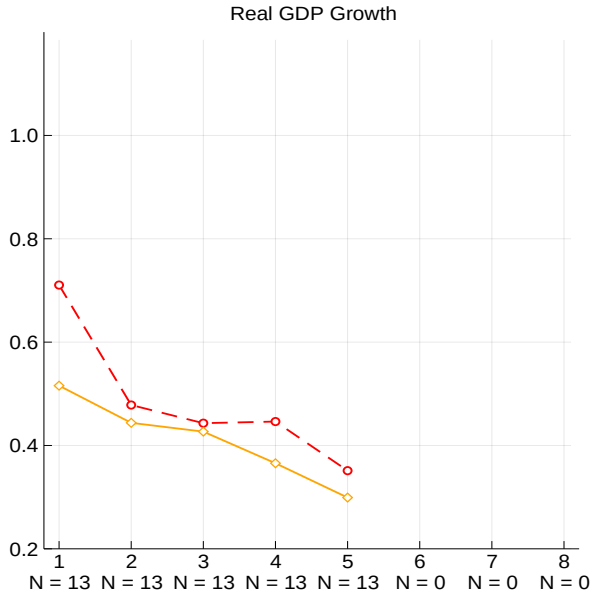
How Did the NY Fed DSGE Models Fare?

RMSEs: Jan 2011-Jan 2016

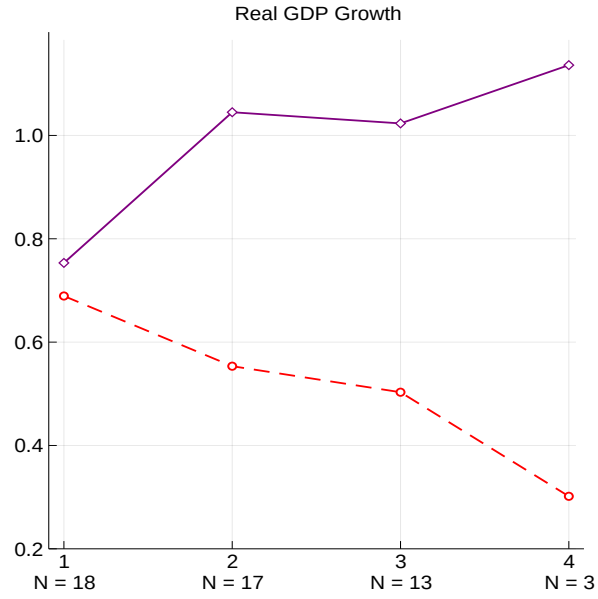
Blue Chip

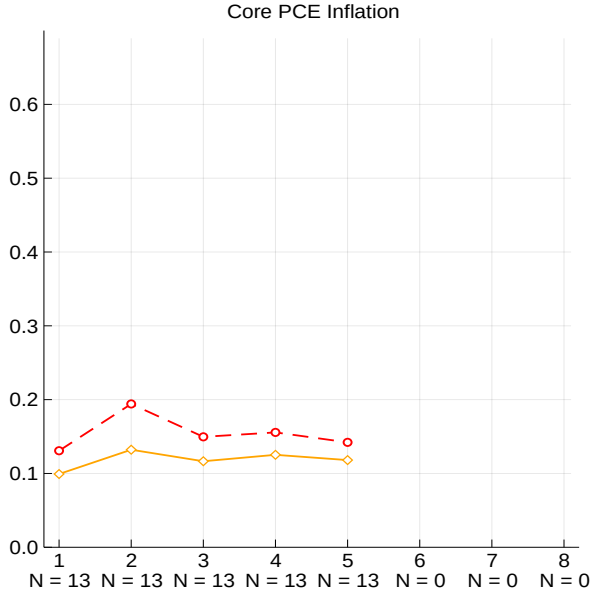


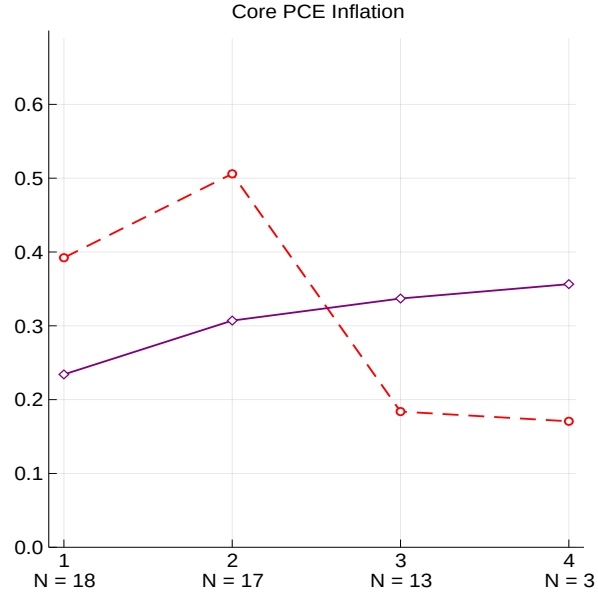
SPF



SEP





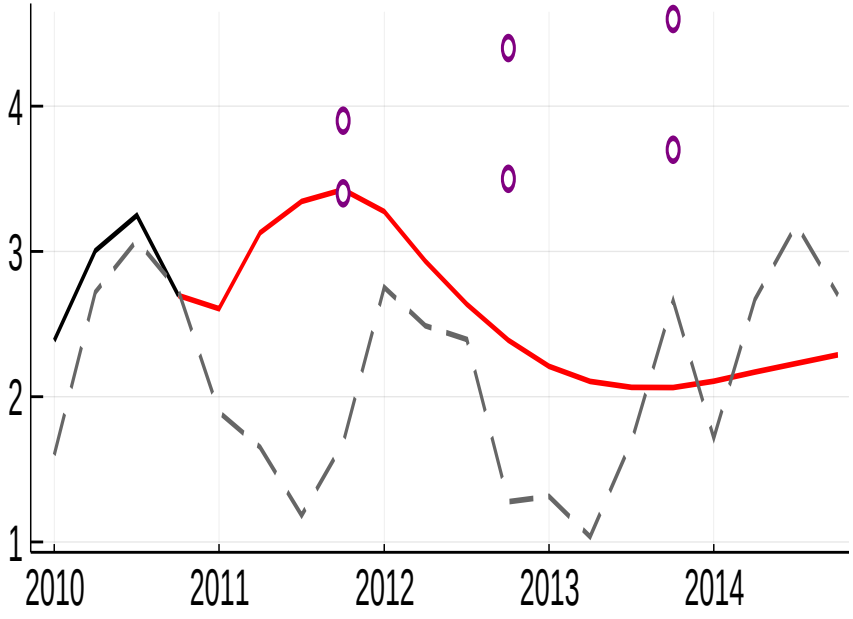


"Real" Real Time Forecasts from NY Fed DSGE

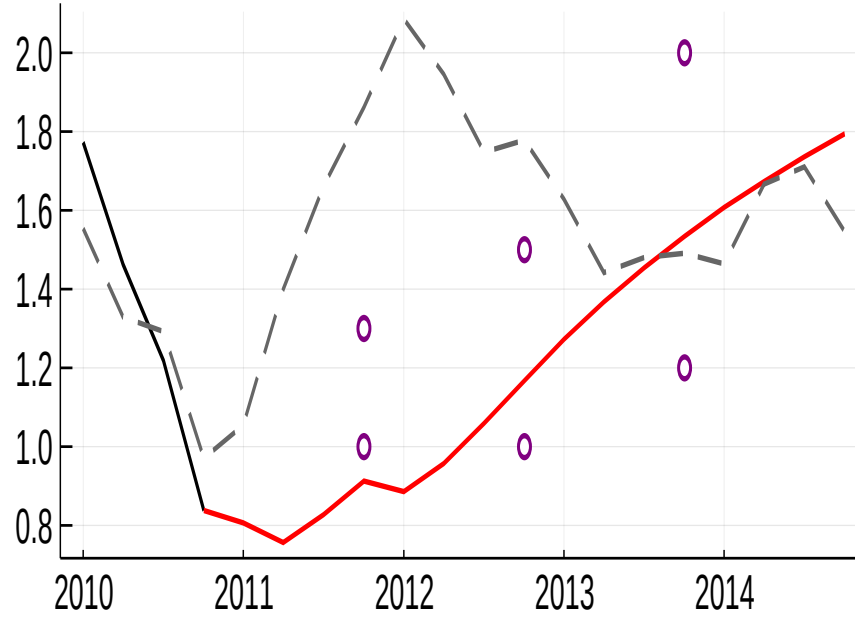
Evolution of 4Q forecasts

Output Growth

2011Q1

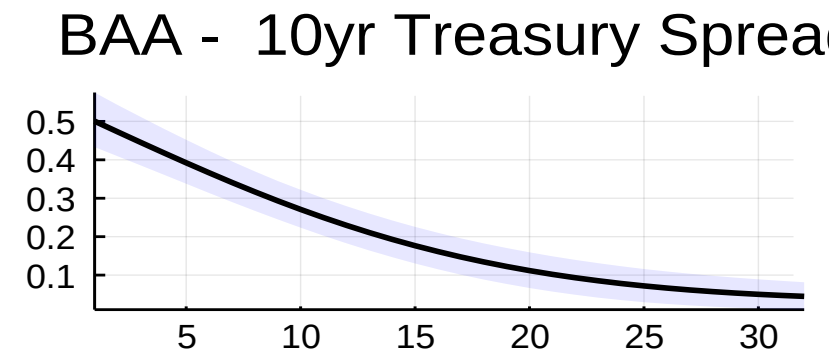


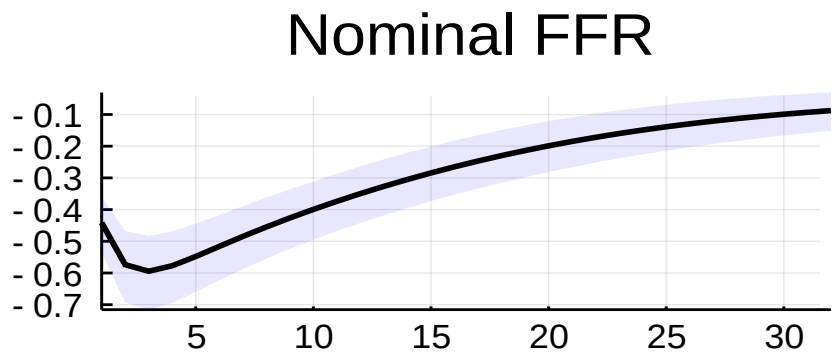
Core PCE Inflation

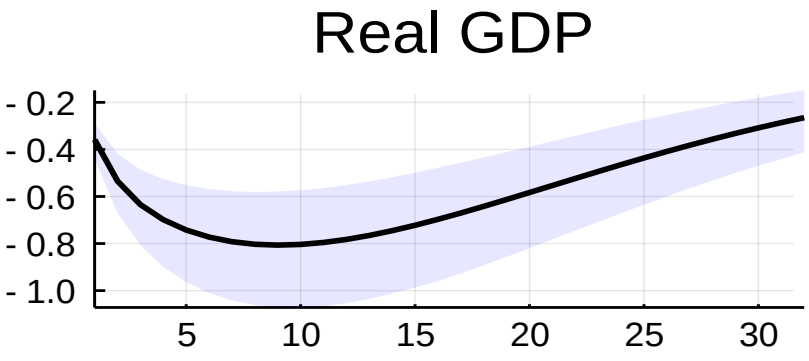


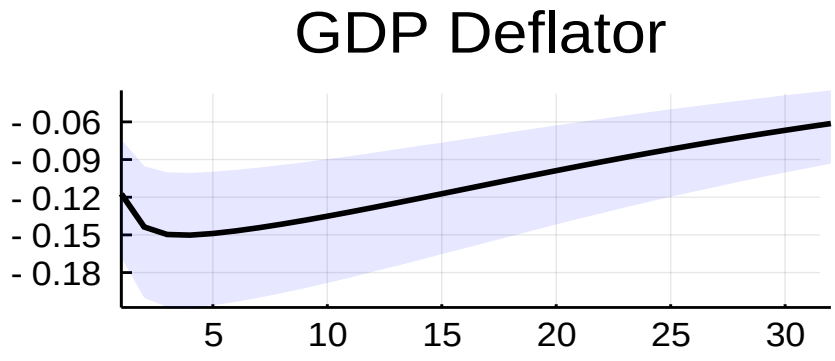
- Unlike the SEP participants, the NY Fed DSGE model projects a slow recovery from the financial crisis (Reinhard and Rogoff, 2009)
- Because it attributes the crisis to a *financial shock*
- Results from "DSGE Forecasts of the Lost Recovery"

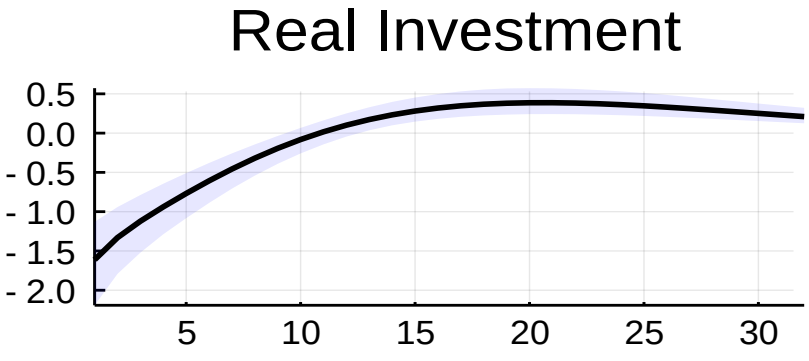
Responses to a Financial Shock

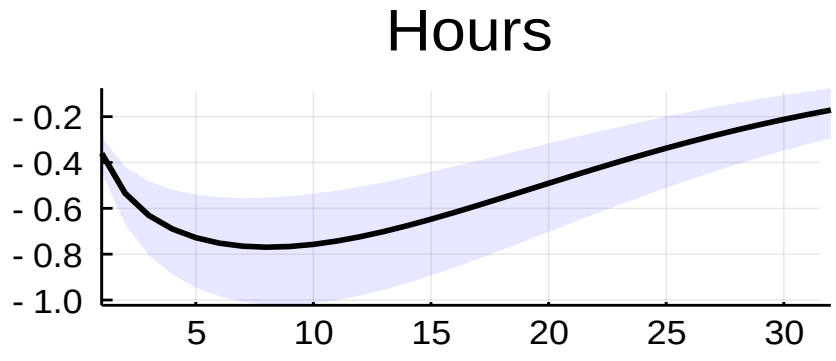




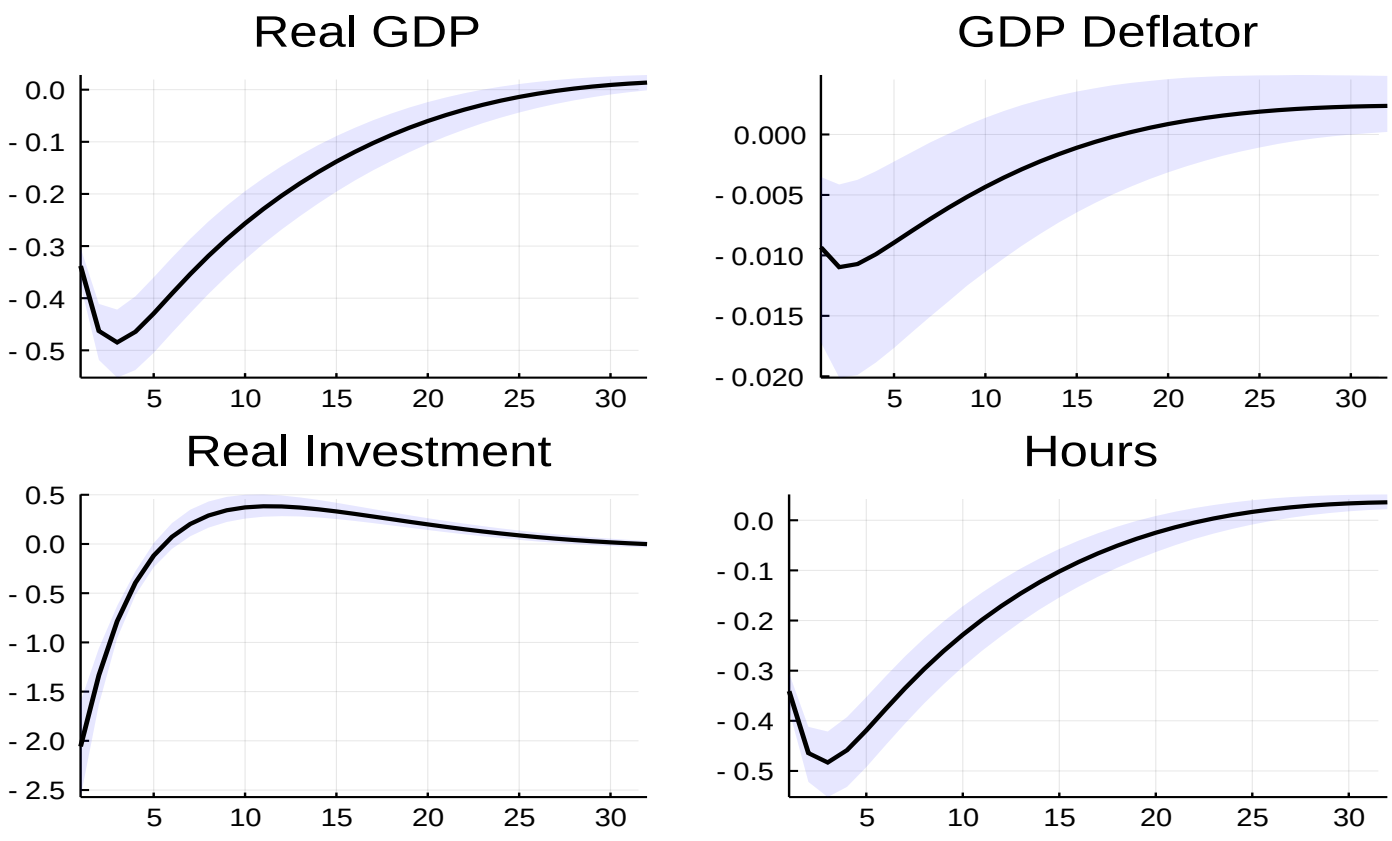






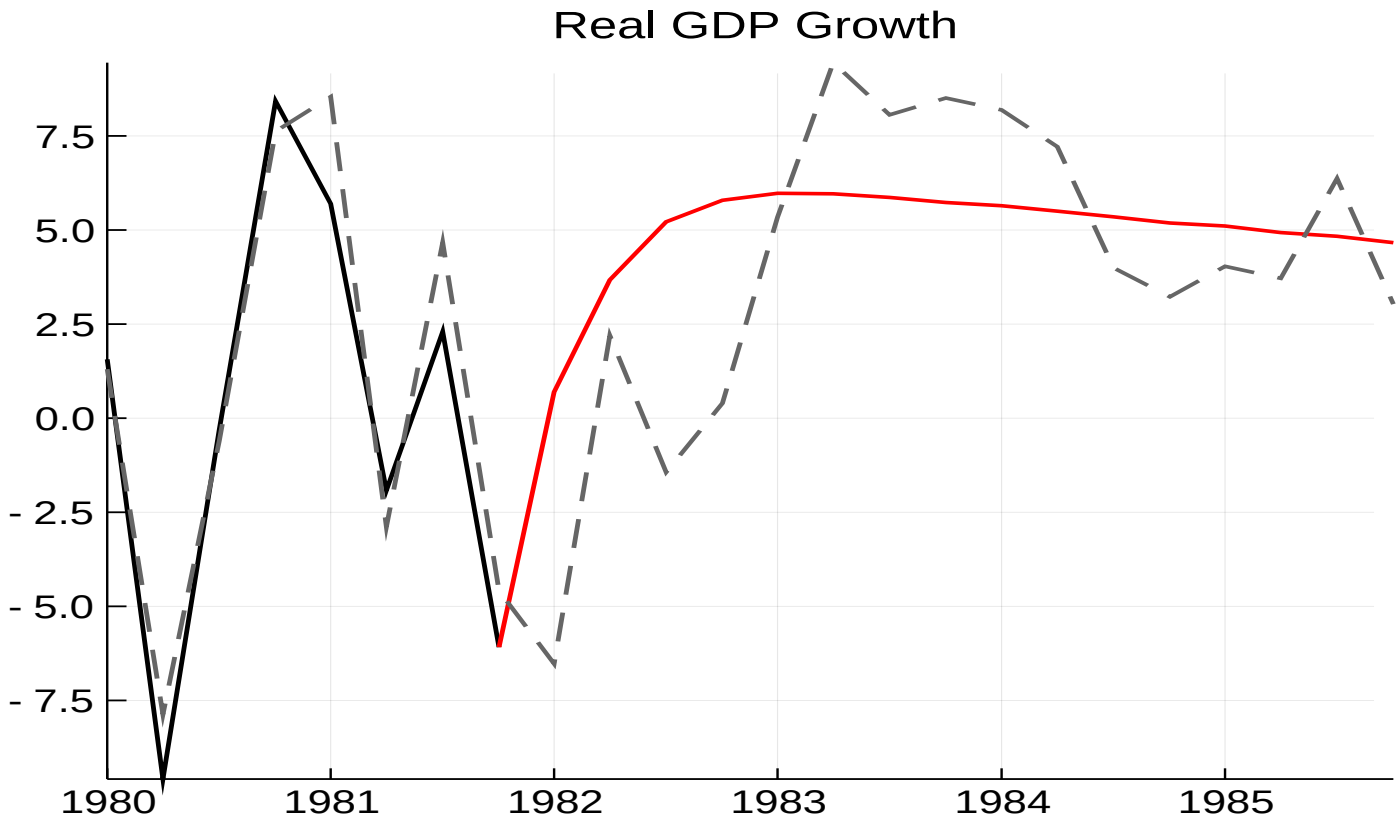


Responses to a Monetary Shock

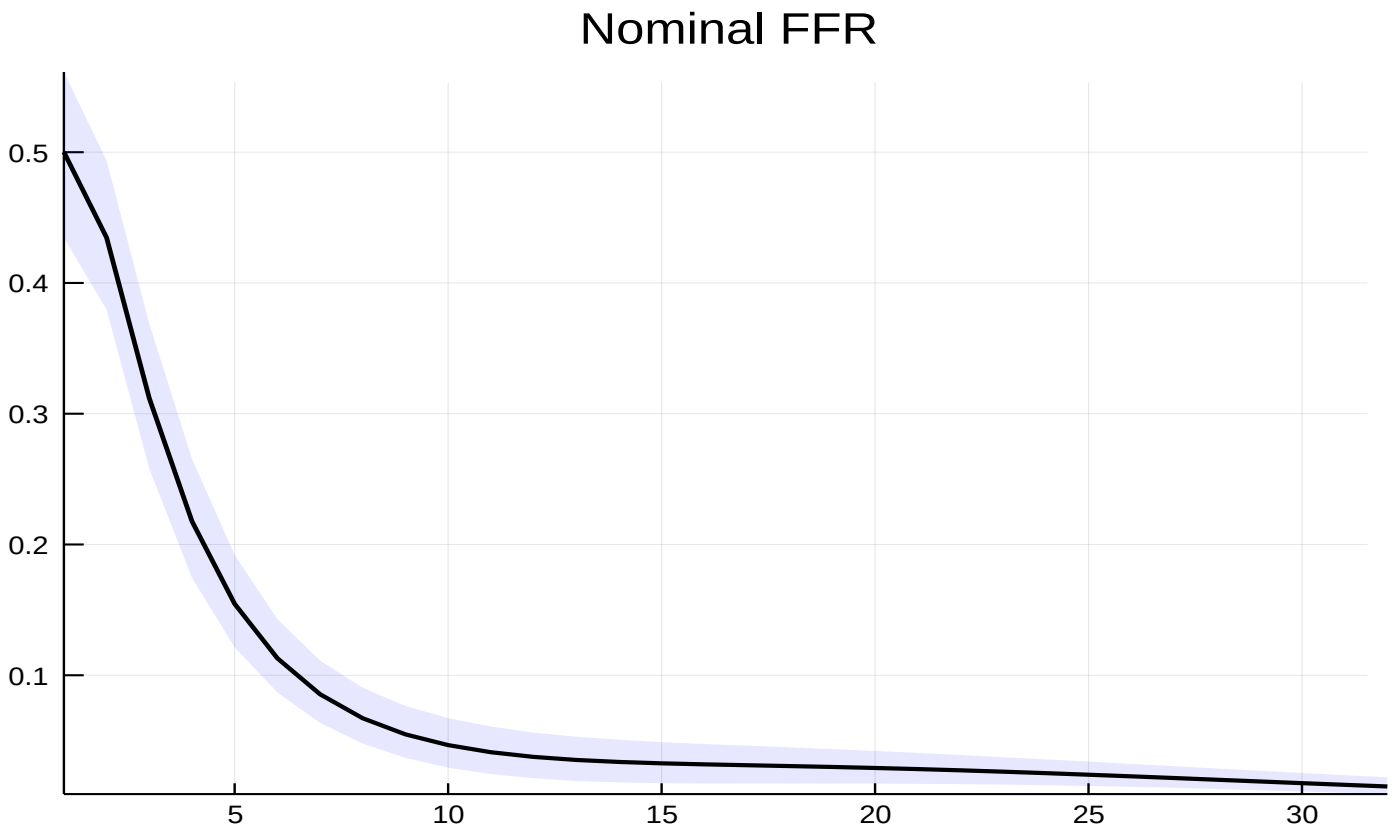


- Output reverts much more quickly following a *monetary shock*
- Model's forecast after the 1982 recession was for a fast recovery

SWFF Forecast of the 1982 Recession



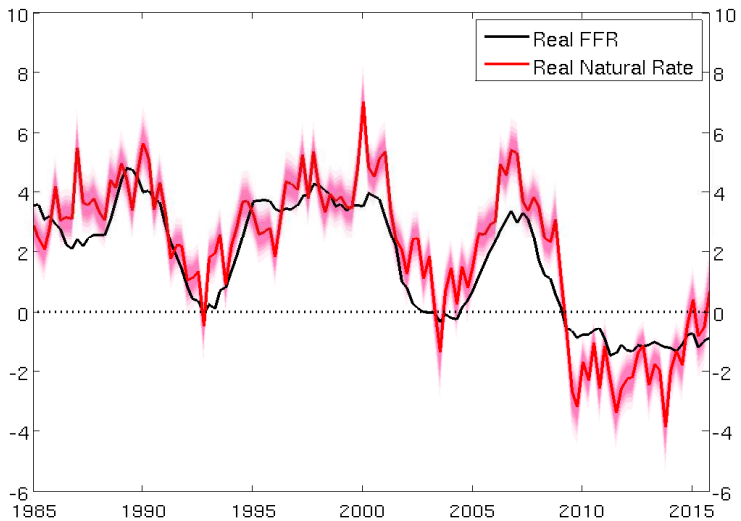
Responses to a Monetary Shock: FFR



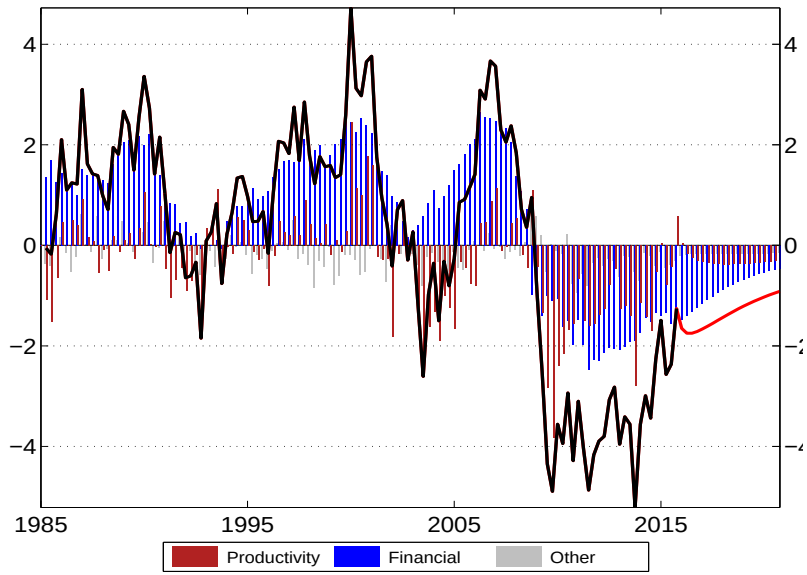
Storytelling, Unobservables, and Counterfactuals

- DSGEs can produce unobservables, and explain them in terms of the shocks that hit the economy:

Natural Rate of Interest



... and Its Decomposition

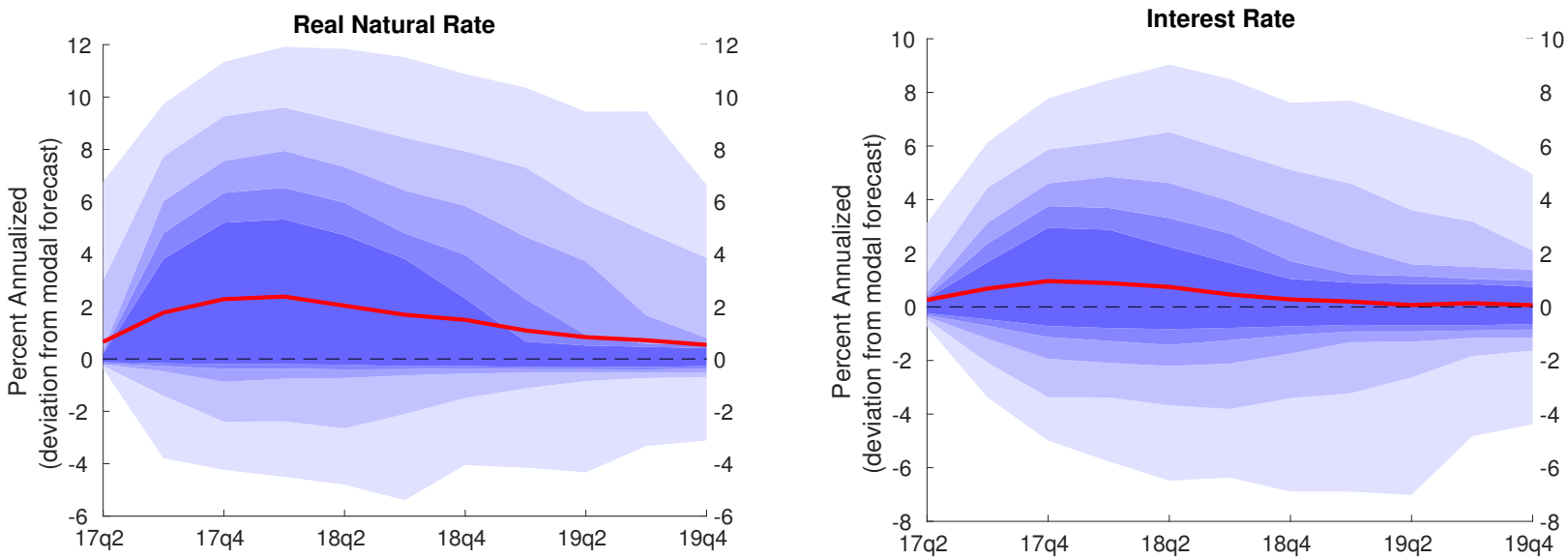


- *DSGEs, being full-fledged econometric models, can characterize the uncertainty surrounding these objects* (unlike Cowles foundation models). Can we trust DSGE models-implied uncertainty?

Balance of Risks

- Policy makers like to think of forecast uncertainty in terms of **scenarios** (recognizable events, e.g. Brexit; think about appropriate policy response to specific scenarios)
- Scenarios can be *judgmental*, or generated using a *BVAR* (reduced form model) or the DSGE model itself
- DSGE can 1) **interpret** the scenarios in terms of *policy-relevant unobservables* (e.g., r^*), and 2) evaluate *appropriate policy response*

Persistent Consumer Optimism Scenario



Time to Move Past Representative Agents/Perfect Information/Linear DSGEs

- DSGEs are not all the same, but still, most (if not all) are near-clones of Smets and Wouters.
- While there are good reasons for this, it is **time to move on**

  1. Not enough diversification/too much homegeneity
  2. Disconnect from academia
  3. Vast swaths of the economy are completely left out of the analysis (e.g., inequality – and in general anything to do with heterogeneity, financial markets,...)

- Laundry list of possible avenues: Agents heterogeneity with borrowing and liquidity constraints, financial considerations such as the demand for safe assets, deviations from perfect information/rational expectations ...

- *This does not mean discarding Smets and Wouters -type representative agents models.* That would be unwise as they will likely be better than the new crop of models at many things (e.g., forecasting, and describing aggregate data in general) for a while

- It is not easy – both computationally and econometrically – but let's start walking (as central bank's modelers) along some of these avenues!

From Talking the Talk to Walking the Walk

- Moving to non-linear and/or heterogeneous agents models involves a big *computational investment*

  1. Choose the *appropriate computing language*: **Matlab** $\Rightarrow$ **Julia**
  2. Build the *infrastructure*:

     - On the econometrics side:

     1) Tempered Particle Filter (Herbst and Schorfheide 2017);
     2) Sequential Monte Carlo (Herbst and Schorfheide 2014)

     - On the model solution side:

     1) Dolo (Pablo Winant)
     2) Functional Linearization (David Childers)