The NY Fed DGSE model: A Post-Covid Assessment

Marco Del Negro, Keshav Dogra, Aidan Gleich, Pranay Gundam,
Donggyu Lee, Ramya Nallamotu, Brian Pacula

DSGE Team, Federal Reserve Bank of New York

ASSA 2024

Are DSGEs of any use to central banks?

Economics Struggles to Cope With Reality

"... most people outside the discipline who take one look at these models [DSGEs] immediately think they're kind of a joke. They contain so many unrealistic assumptions that they probably have little chance of capturing reality. Their forecasting performance is abysmal. Some of their core elements are clearly broken. Any rigorous statistical tests tend to reject these models instantly, because they always include a hefty dose of fantasy."

Outline

- How did NY Fed DSGE actually fare in forecasting over the (rather turbulent) past 12+ years? How did it address the challenges it faced? How did it rationalize all that happened to the economy?

- The implicit promise of Smets and Wouters' work was to deliver a structural model that could be reliably used by central banks for understanding and forecasting economic developments, and quantitative policy analysis. How did the promise pan out?

1. NY Fed DSGE model

2. The NY Fed DSGE's forecasting performance

3. Covid and its aftermath; inflation and disinflation policies
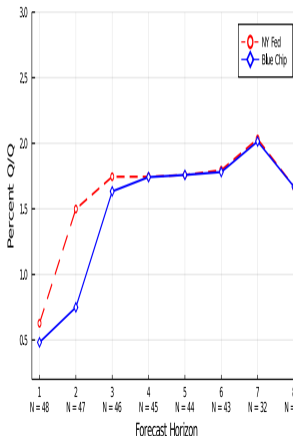
The NY Fed DSGE

- The NY Fed DSGE currently is a medium-scale DSGE following Smets and Wouters, 2007 *with financial frictions* as in Bernanke, Gertler, and Gilchrist, 1999/Christiano, Motto, and Rostagno, 2014

    - Model is **estimated** using the following observables (1960Q1-...): the growth rate of real output (*both GDP and GDI*), consumption, investment, real wage, hours worked, inflation (*both core PCE and GDP deflator*), *long run inflation expectations*, the FFR, *the ten-year Treasury yield*, *Fernald's TFP growth*, *Baa spreads*

    - Model's code is available on GitHub

- Since 2014, each quarter we publish the DSGE forecasts in the NY Fed Liberty Street Economics blog

    - **We forecast with the DSGE to test the model**

How did the DSGE fare in terms of forecasting?

- There is a literature documenting the *pseudo real-time* forecasting performance of DSGE models. Hindsight bias is always a possibility

- **Real ~~pseudo~~ real-time forecasts**: *Actual forecasts* produced and documented regularly as part of the policy process

    - On top of the LSE blog, since June 2011, the NY Fed DSGE forecasts have been part of a memo produced four times a year for the FOMC, and other NY Fed internal documents

RMSEs for GDP growth: DSGE vs Blue Chip Consensus

Full sample (2011Q1–2023Q2) · Full sample excluding 2020Q2–Q3 · Pre-Covid (2011Q1–2019Q4) · Post-Covid (2020Q4–2023Q2)
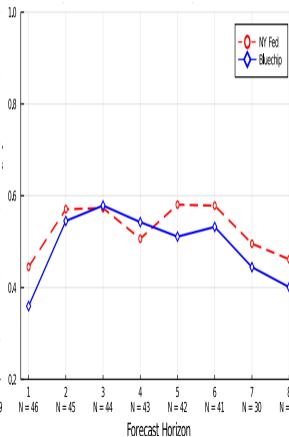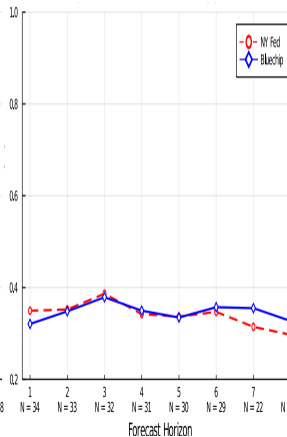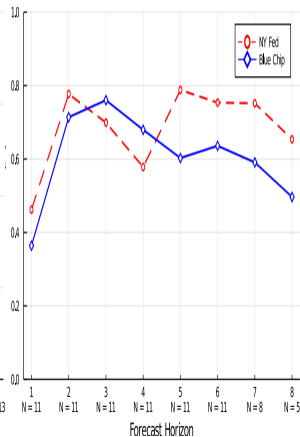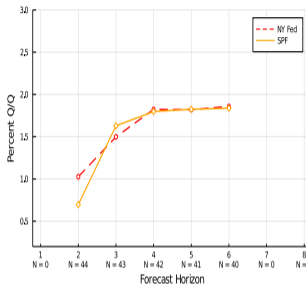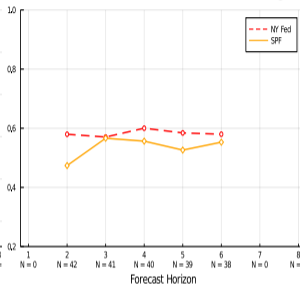
Results: (1) Economy much harder to forecast after Covid; (2) DSGE comparable to Blue Chip

RMSEs vs Median SPF
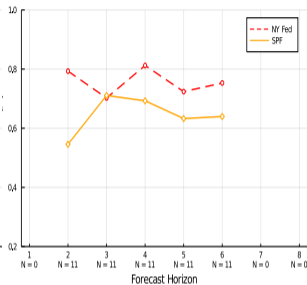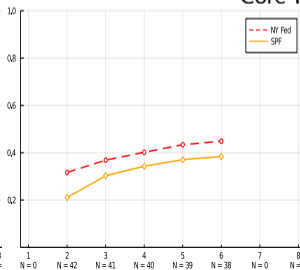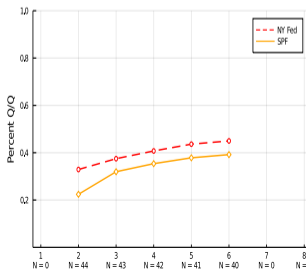
Forecast errors

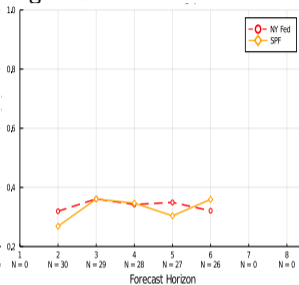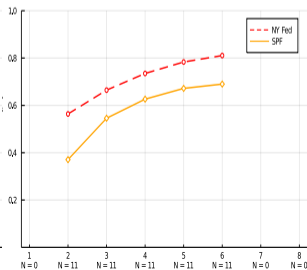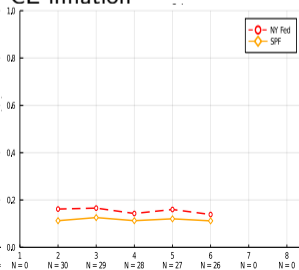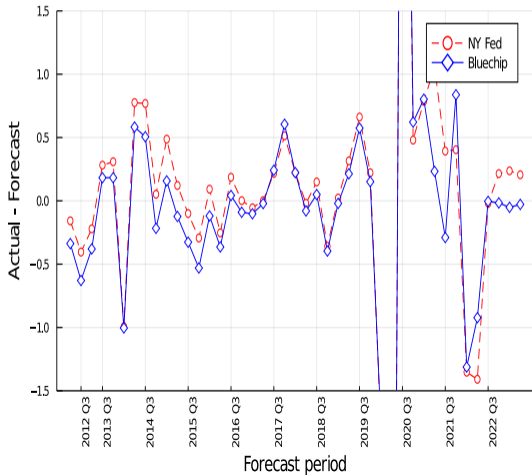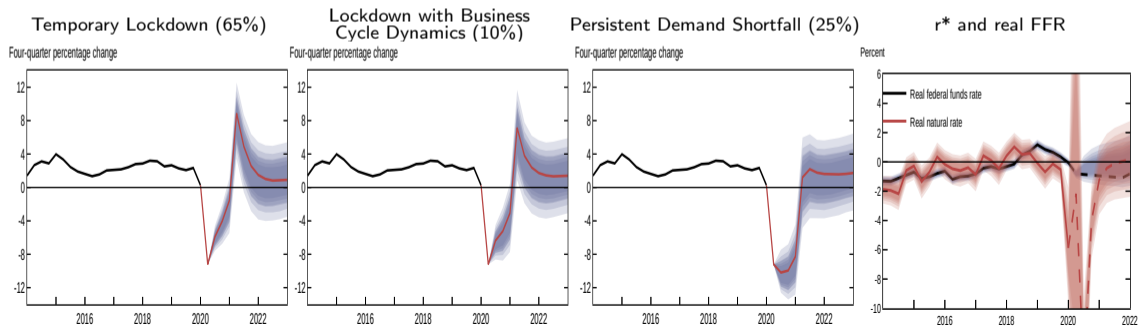### GDP growth
DSGE vs Blue Chip

core PCE inflation
### DSGE vs SPF

6 quarters ahead
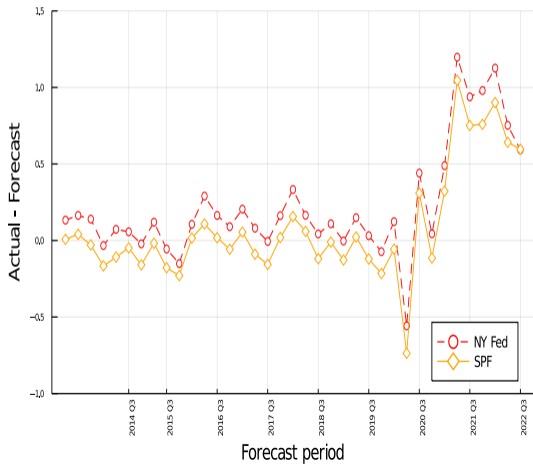
Modeling the pandemic–Covid shocks and scenarios

- We changed the model the fact that the economic effects of Covid were different from those implied by standard recessions. We introduced a **new** set of **temporary** shocks (discount rate, productivity, and leisure preference shocks) whose importance (standard deviation) reflected our *a priori* uncertainty on whether the Covid shock reflected demand or supply factors.
- To incorporate the substantial *uncertainty* surrounding the **persistence** of the economic effects of the pandemic, we constructed three scenarios.
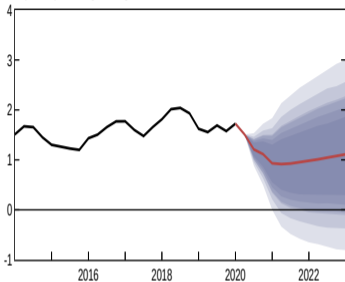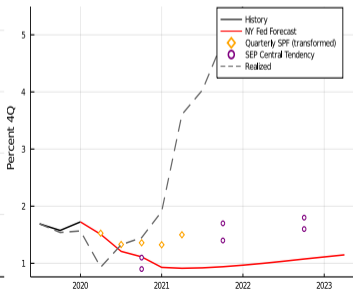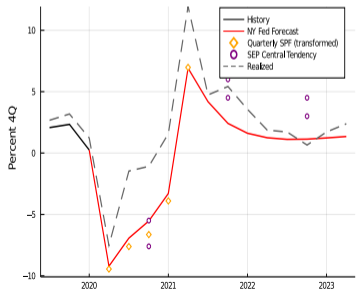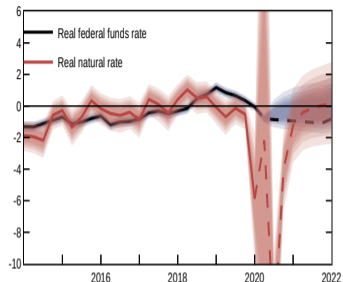
June 2020: Covid

GDP growth
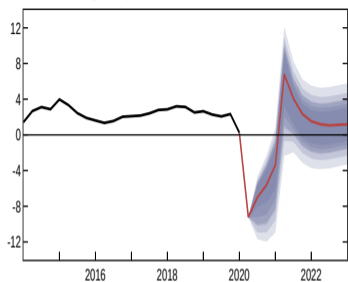
Core PCE inflation

real FFR and r*

Introducing Flexible AIT

- Starting in 2020Q4 we replaced the historical (estimated) policy reaction function with a new reaction function, **flexible average inflation targeting (AIT)**, reflecting our interpretation of the changes in the FOMC monetary policy strategy:
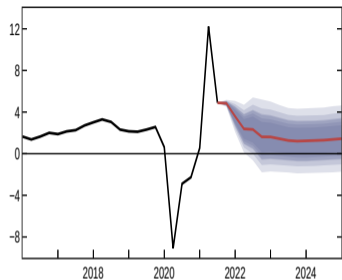
$$R_t = \rho_R R_{t-1} + (1 - \rho_R)(1 - \rho_p)\varphi_p pgap_t + (1 - \rho_R)(1 - \rho_y)\varphi_y ygap_t,$$

  where $pgap_t = (\pi_t - 2) + \rho_p pgap_{t-1}$, $ygap_t = (\Delta y_t + z_t - \gamma) + \rho_y ygap_{t-1}$ (ten-quarters half life), and reaction function parameters were chosen so that the liftoff of interest rates from the effective lower bound would take place in early 2023 (in line with FOMC communication then)
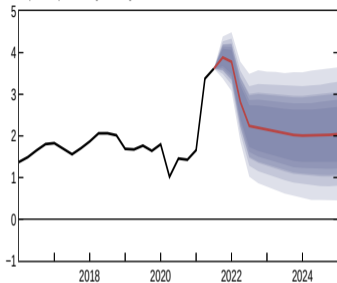
- We also assumed that the introduction of the new reaction function was only **gradually incorporated by the agents in forming expectations**: expectations are formed using a convex combination of forecasts obtained under the old and the new policy reaction functions (see the December 2020 blog post)

December 2021: Transitory?

Whatever happened to inflation (according to the model)?

core PCE inflation

GDP growth

Legend (both charts):
- Cost-Push till 2019Q4
- Cost-Push 2020
- Cost-Push 2021
- Measurement
- COVID-19
- Policy
- Other
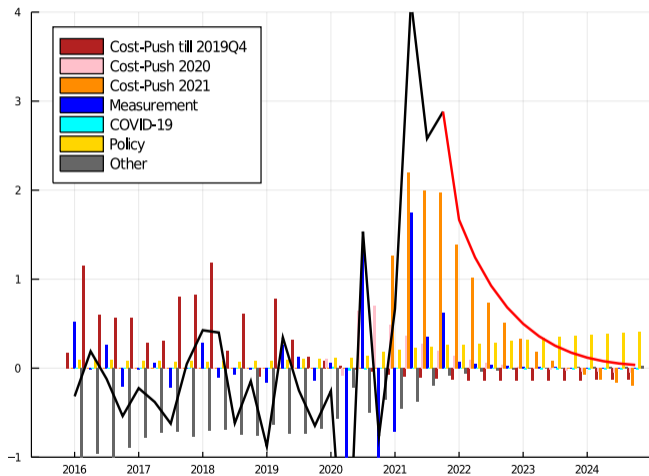
See Liberty St Blog post on Drivers of Inflation: The New York Fed DSGE Models Perspective
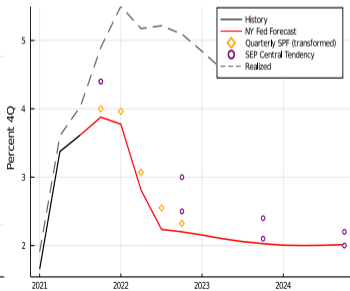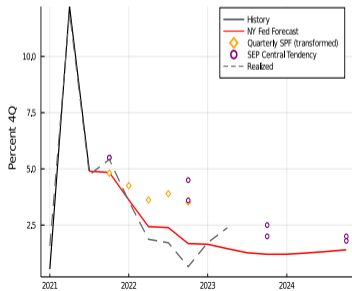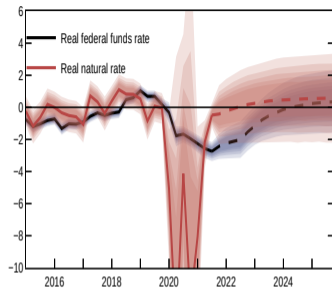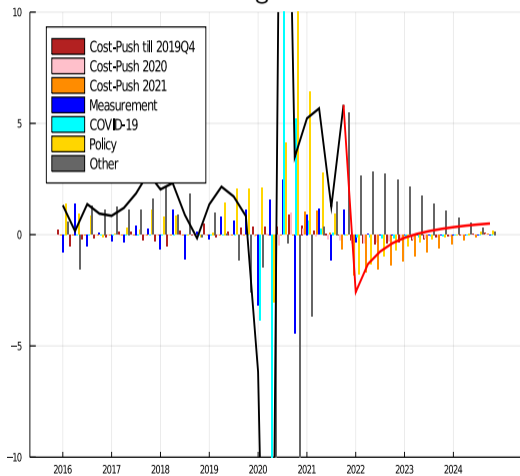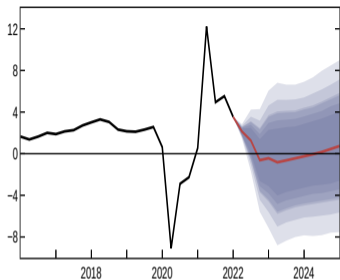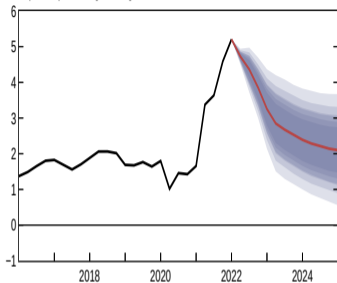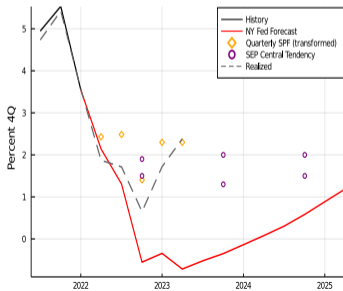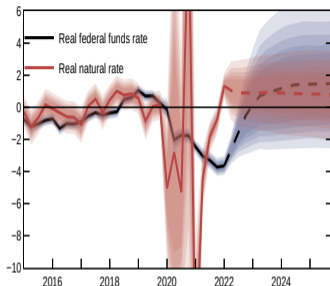
June 2022: Soft landing or recession?

GDP growth
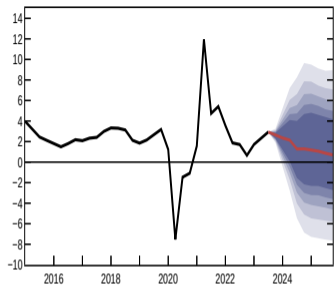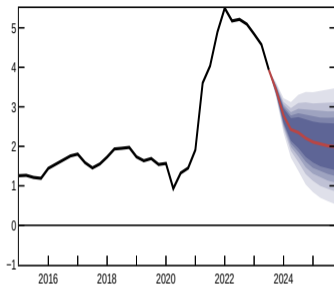
Core PCE inflation

r* and real FFR
- Real federal funds rate
- Real natural rate

December 2023: What's next?

GDP growth

Core PCE inflation

r* and real FFR
- Real federal funds rate
- Real natural rate

Legend:
- History
- NY Fed Forecast
- Quarterly SPF (transformed)
- SEP Central Tendency
- Realized
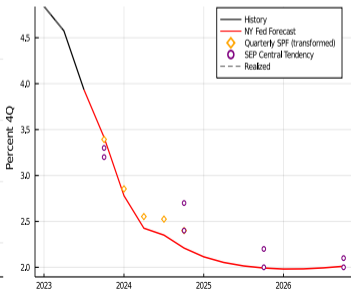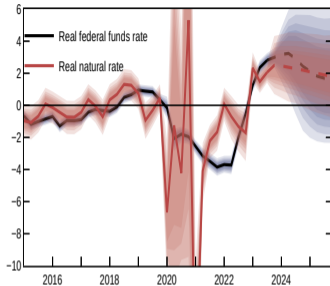
Conclusions

- Even if forecasting itself is not a model's purpose, assessing its forecast accuracy is arguably one of the most stringent tests of its realism

- The NY Fed DSGE's real time performance since 2011 has been on par with that of professional forecasters for output and a little worse for inflation

    - Perhaps not so bad for a model with "so many unrealistic assumptions"

- This performance has deteriorated since Covid, partly as a result of taking the wrong side on many recent key issues, from how transitory the inflation bout was to whether disinflation was compatible with a soft landing

- The DSGE's not so great performance for inflation suggests that more work is needed on this front. Alternatives approaches that allow for heterogeneity should also be explored, and we have already started work along these lines at the NY Fed