

# Panel Discussion on Uses of Models at Central Banks

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# How are models used at the Board of Governors?

- For forecasting
- For alternative scenarios and policy simulations

*Disclaimer: The views expressed are my own and are not necessarily shared by other members of the staff or by the Board of Governors.*

# Key questions

1. What models are used at various horizons?
2. Will DSGE models eventually improve enough to replace semi-structural models?
3. How is nonstandard data used at the BoG?
4. How to interpret the “regime-based” approach?

# 1. Forecasting at the Federal Reserve Board of Governors

- Approach is ultimately judgmental
- Consult many models
- No single “core” model

# Models used to aid judgmental forecast

## 1. Near-term

- Non-structural, time series

## 2. Medium-term

- Reduced-form and semi-structural

## 3. Longer-term

- A model-based approach
- Relatively structural

# 1.1 Near-term models

- Bottom-up, decentralized approach
- Example: GDP
  - Now-casting attempts to replicate BEA (statistical agency) procedure
    - Decentralized specialist forecasts of spending components
  - Factor models provide a cross-check
    - In practice, given a low weight

# Decentralized approach leads to a very diverse set of models

- Labor-market flows
  - Exploiting persistence in flows to predict unemployment rate
- Residential construction
  - Permit issuance predicts housing starts
  - Housing starts predict residential construction
- Business equipment spending
  - Two approaches:
    1. Order books of capital-goods producers (adjusted for exports and imports)
    2. Reduced-form models, focused on sentiment and financial conditions

## 1.2 Medium-term forecast

- Ultimately judgmental
- Both bottom-up and top-down model input
- Top-down:
  - Use of FRB/US and other multipliers to calibrate GDP responses to changes in financial and fiscal conditions
- Bottom up:
  - Decentralized
  - Reduced-form and semi-structural models used to inform judgment
  - Top-down and bottom-up tensions resolved through negotiation



# Examples of medium-term models

- Okun's Law
  - Linking GDP and labor-market forecasts
- Reduced-form consumption models
  - Relating consumer spending to income, financial conditions, consumer sentiment, and other factors
- Semi-structural models of investment
  - Relating investment to business output and the user cost of capital
  - "Accelerator"
- Reduced-form Phillips-curve models of inflation

## 1.3 The Long-Term Forecast

- We recently adopted a simple semi-structural model to generate our long-term forecast.
  - Core is a New Keynesian “three-equation model.”
- This model is close in spirit to a DSGE model.
- It is calibrated to have properties similar to our main large-scale semi-structural model, FRB/US.

## Experience with our long-term model

- In use since beginning of 2016.
- Difficult to evaluate forecast performance of a long-term model.
- In our view, simple structure is a virtue:
  - Very easy to use and explain.

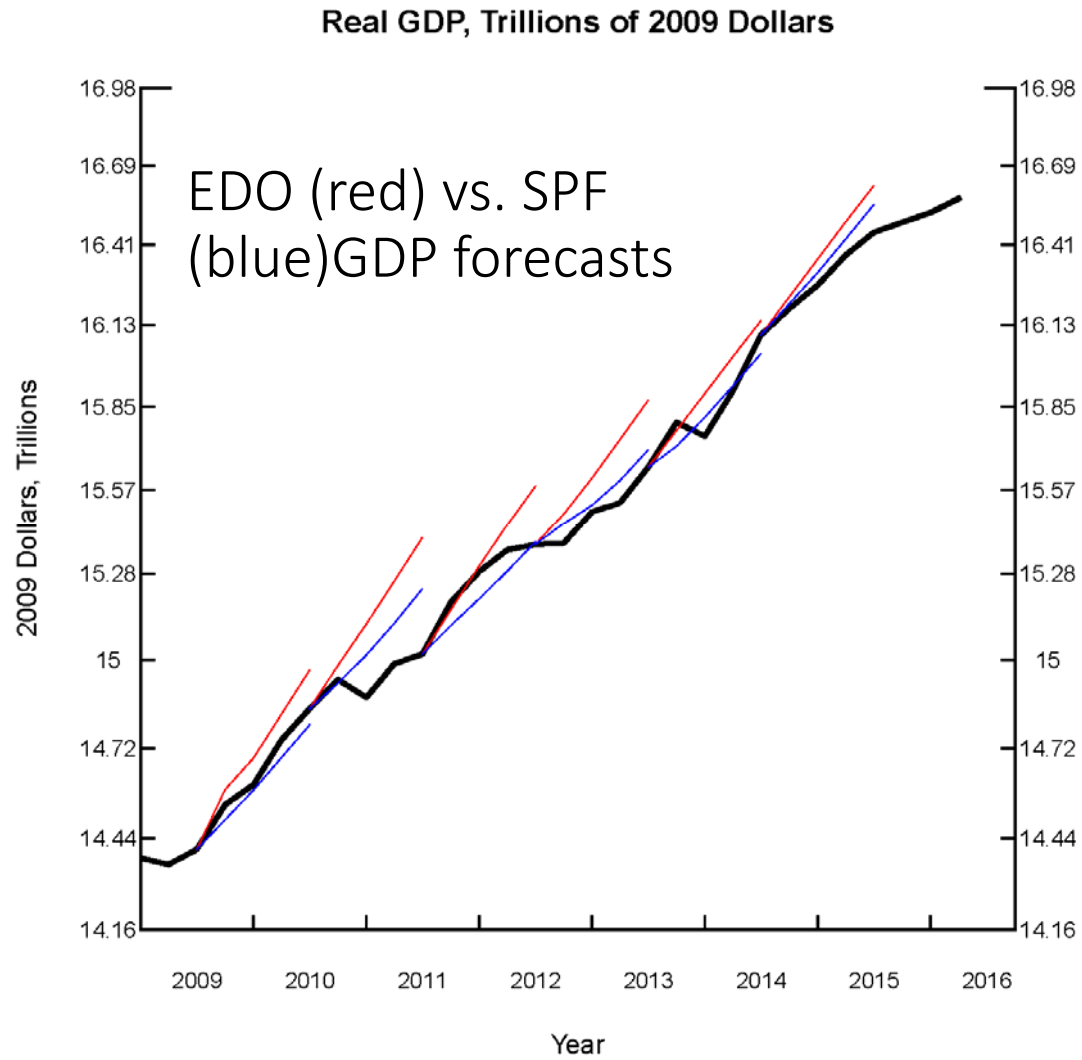
2. *Will DSGE models eventually improve enough to replace semi-structural models?*

DSGE models can be assessed on two key dimensions:

1. Forecasting
2. Story telling

## 2.1 EDO's forecast performance

- EDO is the Board staff's oldest domestically oriented DSGE model: In use since 2009.
- As a reminder, the Board staff doesn't use EDO—or any other one model—to generate its baseline forecast.
- It is nonetheless of interest to compare EDO's real-time forecasting performance with that of the Survey of Professional Forecasters (SPF).



## EDO has performed somewhat less well

- Four-quarter-ahead RMSE is about 12 percent higher than the SPF.

## But

- SPF is an average over many forecasts—an advantage in forecasting.
- A disadvantage in story-telling.

## 2.2 Models and stories

- In principle, DSGE models are well-suited to story-telling.
  - Because they are structural.
- Many practical policymakers disagree.

Blanchard: *DSGE models are bad communications devices.*



# Models and stories, continued

- Greater flexibility in model structure is an advantage of semi-structural models.
  - Don't need to wait for theory to catch up.
- Example: Wealth effect on labor supply.
  - Some more-recent DSGE models have dropped it.
- There are lessons in both directions.
  - For example, in FRB/US, all dynamics are determined by adjustment costs. Would probably want to allow for serially correlated errors.
- Possible outcome: Eventual convergence.
  - Theoretical stories catch up with reality.
  - Better understanding of theoretical stories.

## 2.3 How we use structural models at the FRBOG

- Not for forecasting
- But we have long used our workhorse semi-structural model, FRB/US, for many other purposes.
  - Alternative scenarios
  - Assessment of policy strategies
  - *We currently use DSGE models alongside FRB/US for these purposes.*
- As just noted, we recently moved away from FRB/US, toward a simpler semi-structural model, for our long-term forecast.
  - Closer to a DSGE model

### 3. Nonstandard data at the FRBOG

- Looking at a broad range of new data sources
- Current view is that **search data are not very helpful.**
- The experience of an early experiment in this area, Google Flu Trends
  - Top search result:

DAVID LAZER AND RYAN KENNEDY SCIENCE 10.01.15 7:00 AM

# WHAT WE CAN LEARN FROM THE EPIC FAILURE OF GOOGLE FLU TRENDS



## Nonstandard data, continued

- More promising are **transactions data**.
  - Credit-card transactions
  - Payroll processing data
- Working with traditional statistical agencies to improve timeliness, coverage, sample sizes.
- Evolutionary, not revolutionary

## 4. The regime-based approach

- Forecasting approach recently adopted by the St. Louis Fed
- While the St. Louis forecast is formally judgmental, it has many points of contact with a **Markov-switching approach**.
  - Focus on infrequent changes in regime.
- Will therefore consider some issues with forecasts in a formal Markov-switching approach

# Forecasting in the face of nonlinearities

- Casually, Board staff would characterize their forecast as a mode rather than a mean.
  - Prompted by desire to have a narrative.
  - Brexit either happens or it doesn't.
- In linear models with normal errors, the mean and the mode are the same, so there is no tension.
- But (U.S.) business cycle appears to be nonlinear.
  - Change in the unemployment rate is highly skewed.

## Nonlinearities, continued

- One useful nonlinear model is the Markov-switching model.
- In a two-state Markov-switching model, mean and modal forecasts can differ substantially.
  - If the states are persistent, the modal forecast will initially involve staying in one of the states.
  - The mean forecast will instead be a weighted average of the two states.
- After a while, however, the probability of staying in the initial state becomes very low.



## Preliminary assessment of regime approach

- Promising, because it recognizes the world isn't linear.
- Unresolved issues about interpretation of longer-horizon forecasts.