

Rochelle Edge, Mike Kiley, and Jean-Philippe Laforte

**“Natural Rate Measures in an
Estimated DSGE Model of the U.S. Economy”**

Discussed by Stephanie Schmitt-Grohé, Columbia University
September 6, 2008

What the paper does

1. The EDO Model (**E**stimated **D**ynamic **O**ptimization-based)
2. The Estimation
3. The Storytelling

The EDO Model

Extension of Christiano, Eichenbaum, and Evans (JPE, 2005)

- Sticky Prices (w/ indexation)
- Sticky Wages (w/ indexation)
- investment adjustment costs
- variable capacity utilization

- 2 sector economy
 - sector 1: used for nondurables consumption and residential capital
 - sector 2: used for durables consumption and non-residential capital

- Habit Forming Preferences over
 1. non-durable consumption
 2. durable consumption
 3. residential capital
 4. leisure

- Sources of business cycles: 14 shocks
 - 3 markup shocks
 - 2 permanent technology shocks
 - 3 temporary investment specific-shocks
 - 4 preference shocks
 - 1 aggregate demand shock
 - 1 monetary policy shock

Monetary Policy:

$$\hat{R}_t = \phi_r \hat{R}_{t-1} + (1 - \phi_r) \bar{R}_t + \epsilon_t^r$$

$$\bar{R}_t = \phi_1 \hat{\pi}_t^{gdp} + \phi_2 \hat{\pi}_{t-1}^{gdp} + \phi_3 \hat{g}_t^{gdp} + \phi_4 \hat{g}_{t-1}^{gdp}$$

Estimation

Bayesian methods

- **Eleven Observables, Sample: 1984Q1-2004Q4**
 1. Nominal GDP
 2. Nominal Consumption (non-durables and non-housing services)
 3. Nominal Consumption (durables)
 4. Nominal Investment (residential)
 5. Nominal Investment (business)
 6. GDP inflation
 7. C inflation (non-durables and non-housing services)
 8. C inflation (durables)
 9. Hours
 10. Wage inflation
 11. Federal Funds rate

- Estimate 39 structural parameters
- Back out time series for the 14 innovations (from 11 observables)

Q: Are those time series for the shocks identified?

- Which shocks are important sources of business cycles? Forecasting Error Variance Decomposition at horizon 10 years

	C^{nd}	I^{res}	C^d	I	Y
Perm Tech Shock ϵ^{zk}	0.35	0.08	0.21	0.01	0.59
Perm Tech Shock ϵ^{zm}	0.17	0.12	0.01	0.02	0.37
Inv. Tech Shock $\epsilon^{a,nr}$	0.34	0.64	0.34	0.92	0.01

- Find that **permanent technology shocks** are the most important sources of business cycles in output
- For the components of aggregate demand the main sources are **efficiency shocks to investment** and **the two permanent technology shocks**

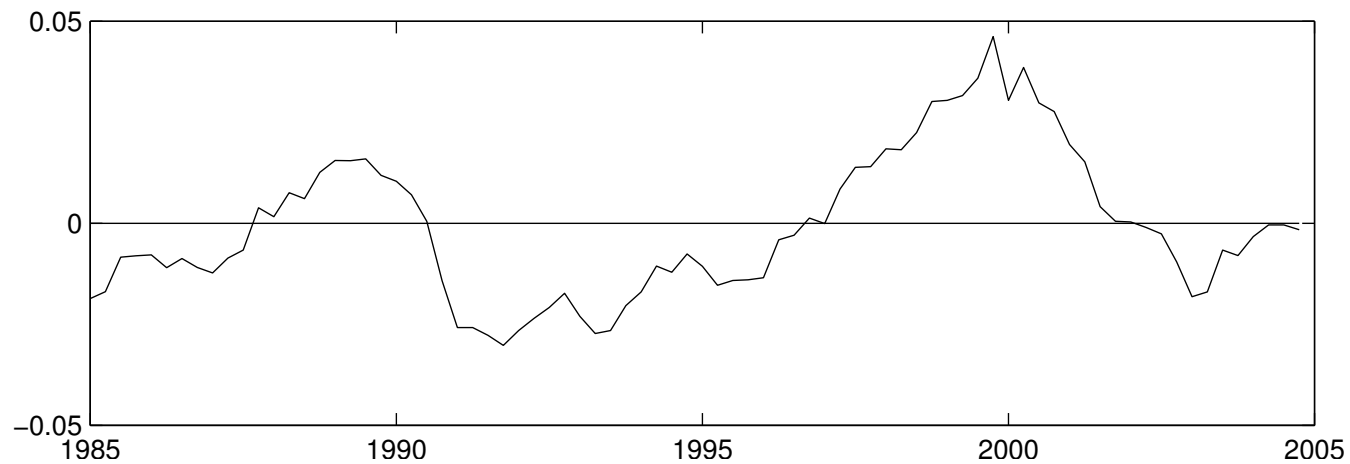
Q: Finding robust to including the relative price of business investment?

Storytelling in the EDO Model

- Traditional output gap measures deviations of actual output from trend. Example: Deviations from a linear trend:

NBER peak: 1990Q3 and 2001Q1

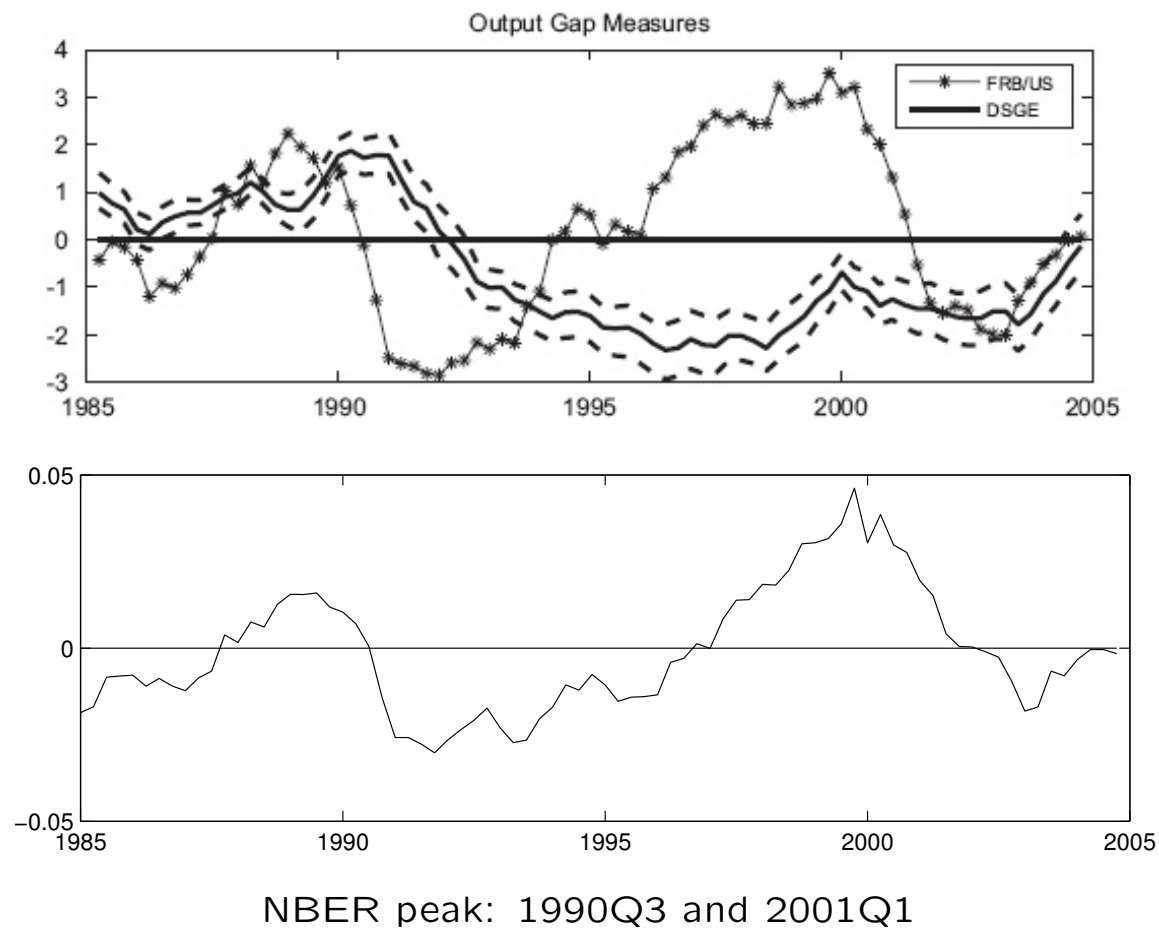
$$\ln Y_t - \alpha - \beta t$$



Model-Based Output Gap

- Potential output, Y_t^n : level of output in an economy *without*
 - price stickiness
 - wage stickiness
 - markup shocks
 - monetary policy shocks
- Output gap = actual - potential output

$$Y_t^{gap} = \log Y_t - \log Y_t^n$$



- Traditional output gap measures deviations of actual output from trend.
- Model-based output gap measures are a very different object.
- Q: Why judge a model as compelling if the model-based output gap measure coincides with a traditional output gap measure?

- **Why is this concept of the output gap important?**

In simpler frameworks it has been shown (eg Woodford '03) that

1. inflation dynamics depend on Y_t^{gap}
2. monetary policy should aim to stabilize Y_t^{gap} in order to maximize welfare
3. optimal interest rate rules should respond to Y_t^{gap} rather than other output measures

Is this concept of the output gap also important in the current theoretical framework?

- Can the authors show that the welfare criterion depends on their definition of the output gap?

- Is the model-based output gap important for optimal policy?
 - In a simple model, Sveen and Weinke (2006) show that an interest rate feedback rule that responds to wage and price inflation is at least as good (from a welfare point of view) as one that responds to inflation and the model-based output gap.
 - In a medium-scale estimated DSGE model, Schmitt-Grohe and Uribe (2007) show that the welfare loss of a rule that responds only to price and wage inflation vis-a-vis the Ramsey optimal policy is **minimal**.

Suggested Alternative Output Gap Measure

Use the welfare-maximizing (or Ramsey optimal) level of output as potential output