House of Finance at Goethe University
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HoF Project: *MacroModelBase*
Building an Archive of Quantitative Models for Managing Macroeconomic Risks

Remarks

by

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Quantitative models for managing macroeconomic risks

- Economy-wide dynamic stochastic models that may be used by
  - ➔central banks and finance ministries for designing stabilization policies that help reduce macroeconomic risk.
  - ➔business economists to assess macroeconomic fluctuations and likely policy responses, as an input for risk management at asset managers, banks, other large enterprises.

A platform for model comparison: *MacroModelBase*

- Joint initiative of J.B.Taylor (SIEPR-Stanford) V. Wieland (CFS-Goethe) to create a public archive of macroeconomic models on a common platform (Dynare).
  - ➔Tool to encourage comparative instead of insular approach to model-based research.
  - ➔Tool to provide policy advice at central banks and treasuries by comparing competing models, or across different economies.
  - ➔Tool for quantitative assessments of macroeconomic risks and likely policy reactions for asset managers, banks, etc.

05.06.08 17:42 MATLAB Command Window

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%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
Dynare Model Base
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1   Small Calibrated Models
    1.1. NK RW97: Simple NewKeynesian model as in Woodford & Rotemberg (1997)
    1.3. NKHy CGG99: Hybrid NK model  as in Clarida, Gali, Gertler (1999)
    1.4. NK2C CGG02: Two-Country NK model as in Clarida, Gali, Gertler (2002)
2. Estimated US Models
    2.1. US FM95:  Small US model by Fuhrer & Moore (1995)
    2.2. US MSR04: Small US model by FRB Monetary Studies, Orphanides & Wieland (2004)
    2.3. US FRB03: FRB-US model linearized by Levin, Wieland, Williams (2003)
    2.4. US FRB08: FRB-US model 08 linearized by Laubach (2008)
    2.5. US FRB08mx: FRB-US model 08 mixed expectations, linearized by Laubach (2008)
    2.6. US SW07:  US optimization-based model by Smets & Wouters (2007)
    2.7. US ACEL05: Small US model by Altig, Christiano, Eichenbaum & Linde (2004)
    2.8. US ACEL05_2: without variable ordering
    2.9. US ACEL05_3: without variable ordering & without wage bill in advance financi
3. Estimated Euro Area Models
    3.1. EA CW05ta: Small Euro area model/Taylor-contracts by  Coenen & Wieland (2005)
    3.2. EA CW05fm: Small Euro area model/Fuhrer-Moore contr. by Coenen  & Wieland (20
    3.3. EA ECBAWM:  ECB Area Wide model linearized as in Kuester & Wieland (2005)
    3.4. EA SW03: Euro area optimization-based model by Smets and Wouters (2003)
4.  Estimated/calibrated Multi-Country Models
    4.1. G7 TAY93 :  model of the G7 economies by Taylor (1993)
    4.2. G3 CW03:  model of the G3 economies by Coenen and Wieland (2002)
    4.3. NK GEM03: Small open economy model by Laxton & Pesenti (2003)
    4.4. NK Sigma07: SIGMA: Two-country Model by Erceg, Guerrieri, Gust (2007)
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Small, calibrated models

US: FRBUS, ACEL,SW, ...

EUR: AW-ECB, CW, SW ...

Multi-Country: Taylor, CV
GEM-IMF, SIGMA-Fed

Case study 1: Monetary vs fiscal stimulus in the U.S.

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Currently Solving: US ACEL05
No Fiscal Policy Shock is available for Model: US ACEL05
Elapsed time is 3.266117 seconds.
Elapsed cputime is 1.7725 seconds.

Currently Solving: US SW07
Elapsed time is 2.428042 seconds.
Elapsed cputime is 2.0329 seconds.

Currently Solving: G7 TAY93
Elapsed time is 22.986525 seconds.
Elapsed cputime is 22.4122 seconds.

Currently Solving: US FRB03
Elapsed time is 72.421689 seconds.
Elapsed cputime is 71.2725 seconds.


Total elapsed cputime: 105.5718 seconds.
>>
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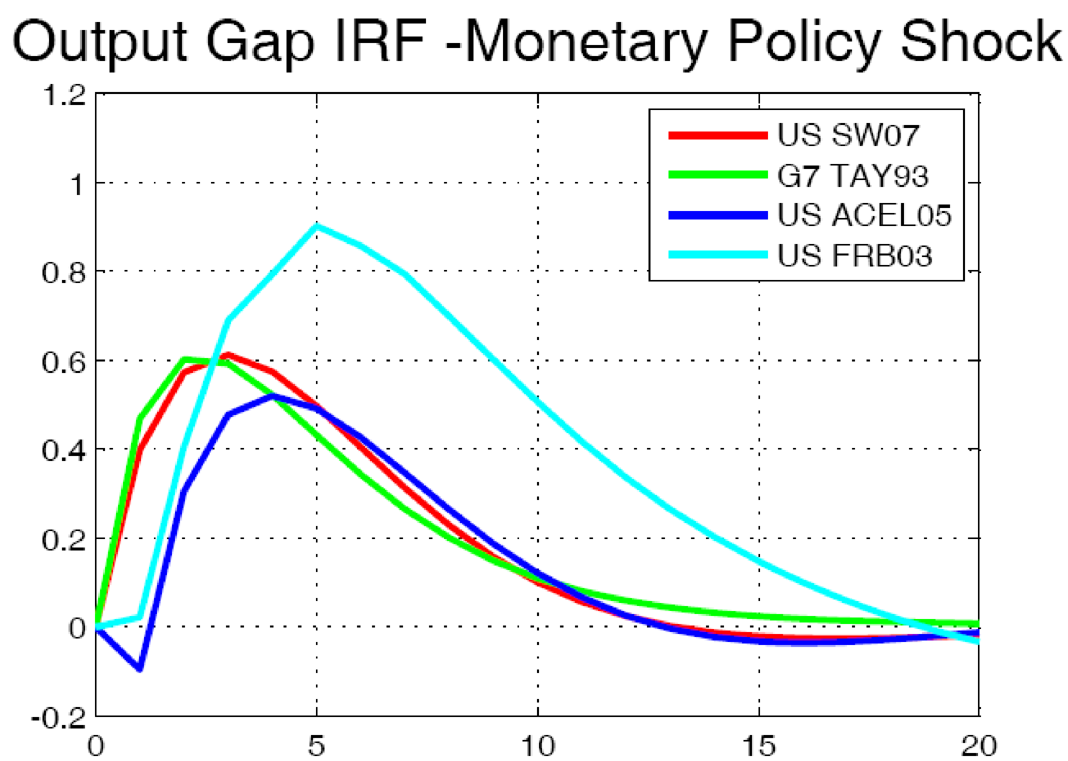
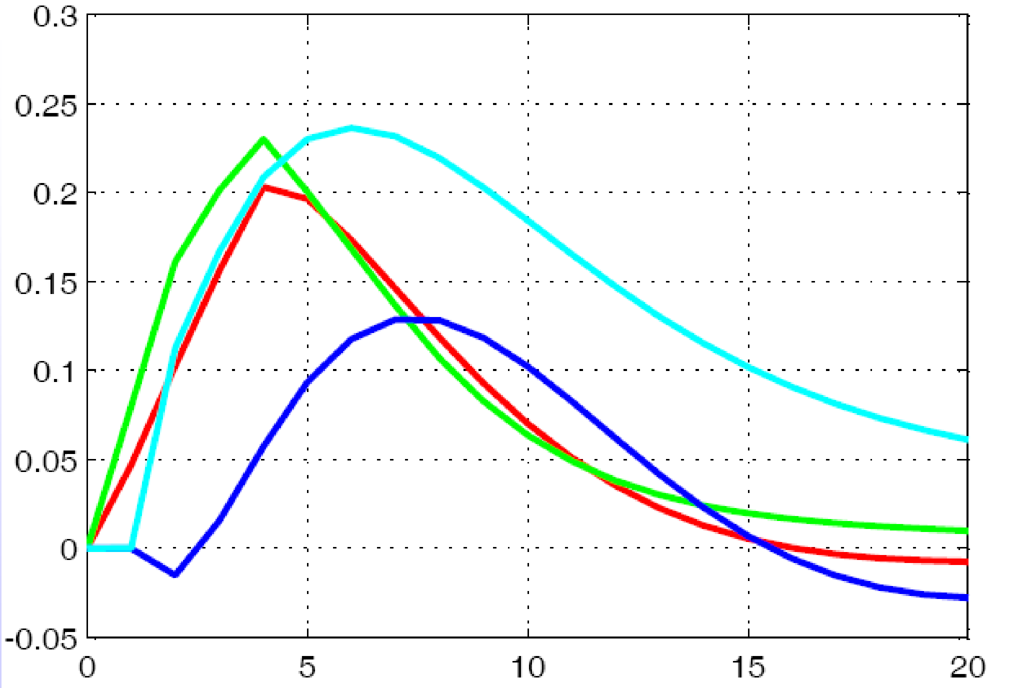
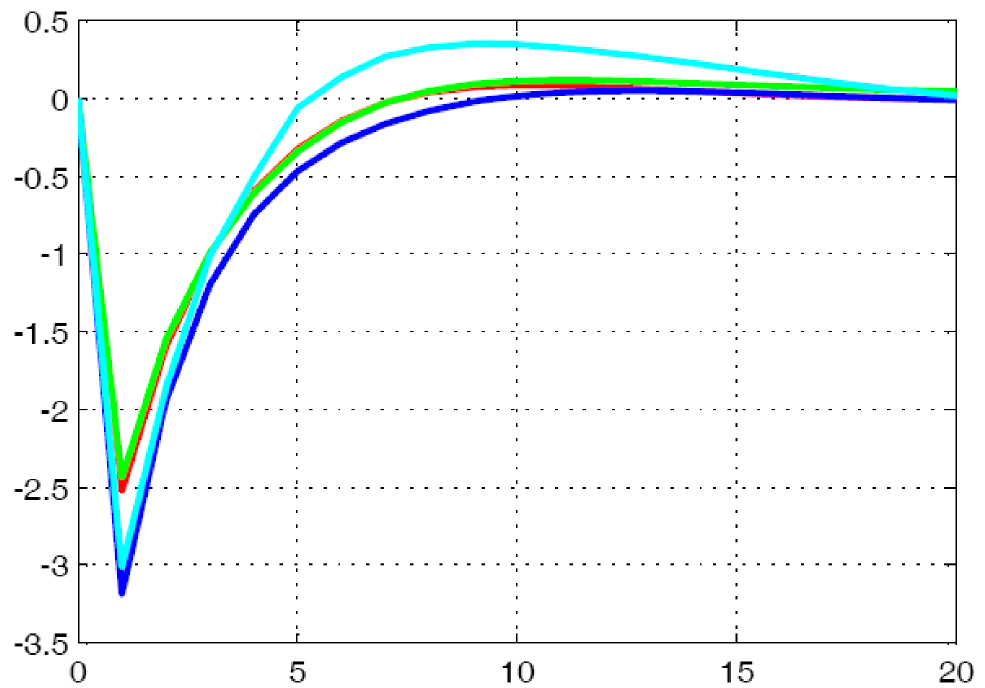


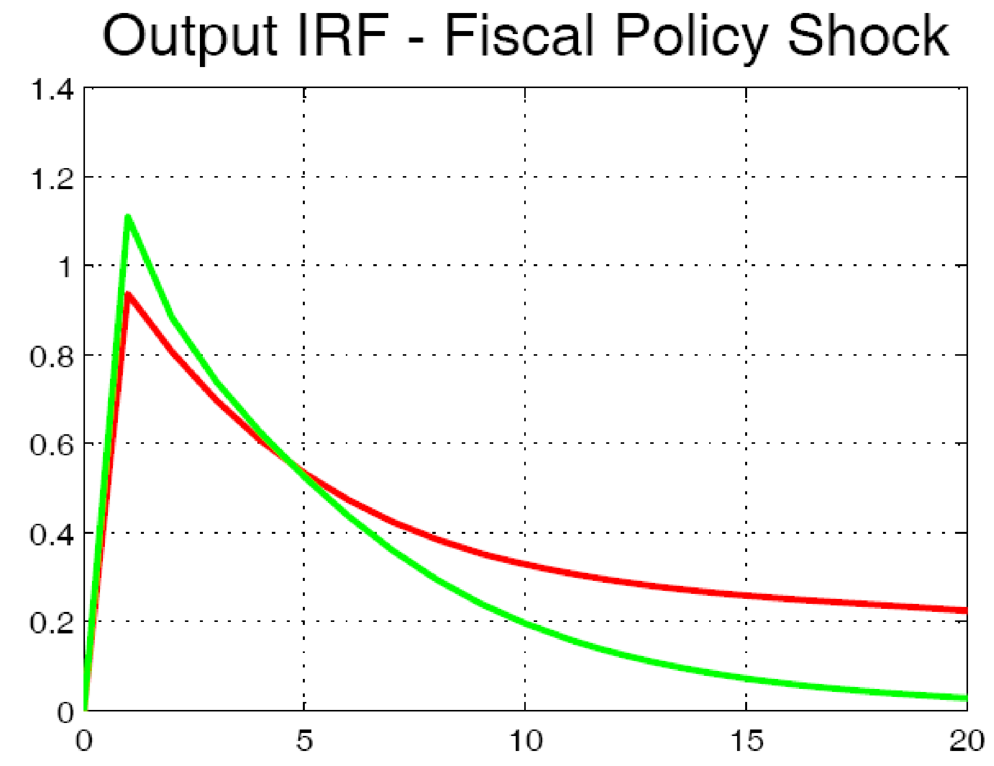
Reduction of federal funds rate by 3 percentage points

Inflation IRF - Monetary Policy Shock

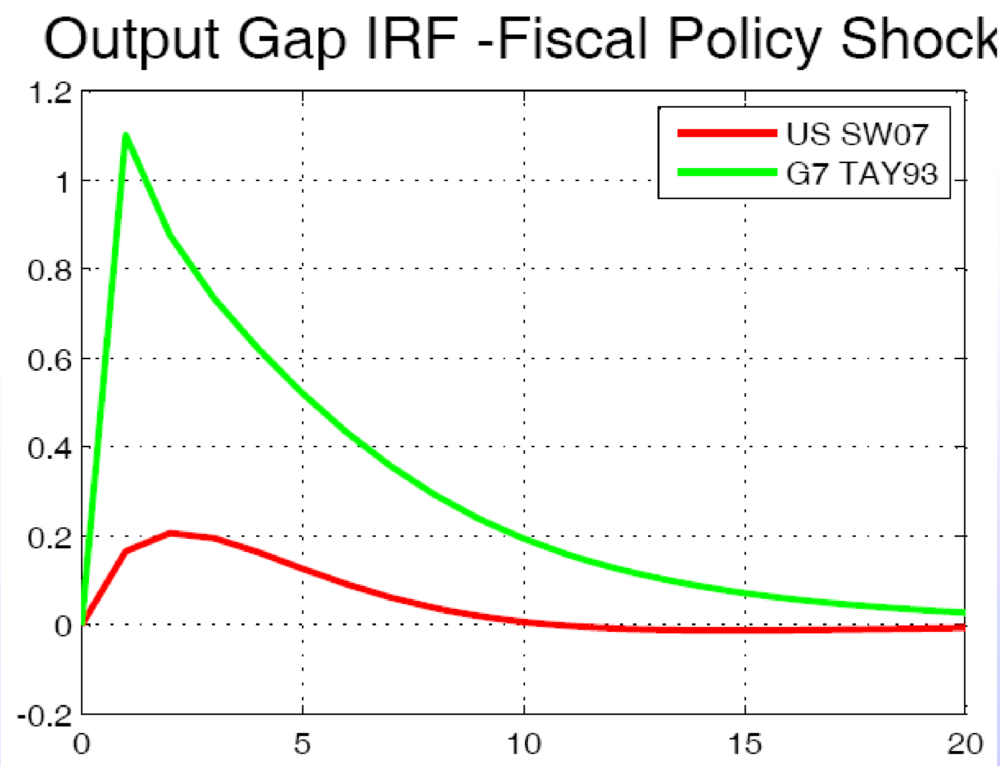


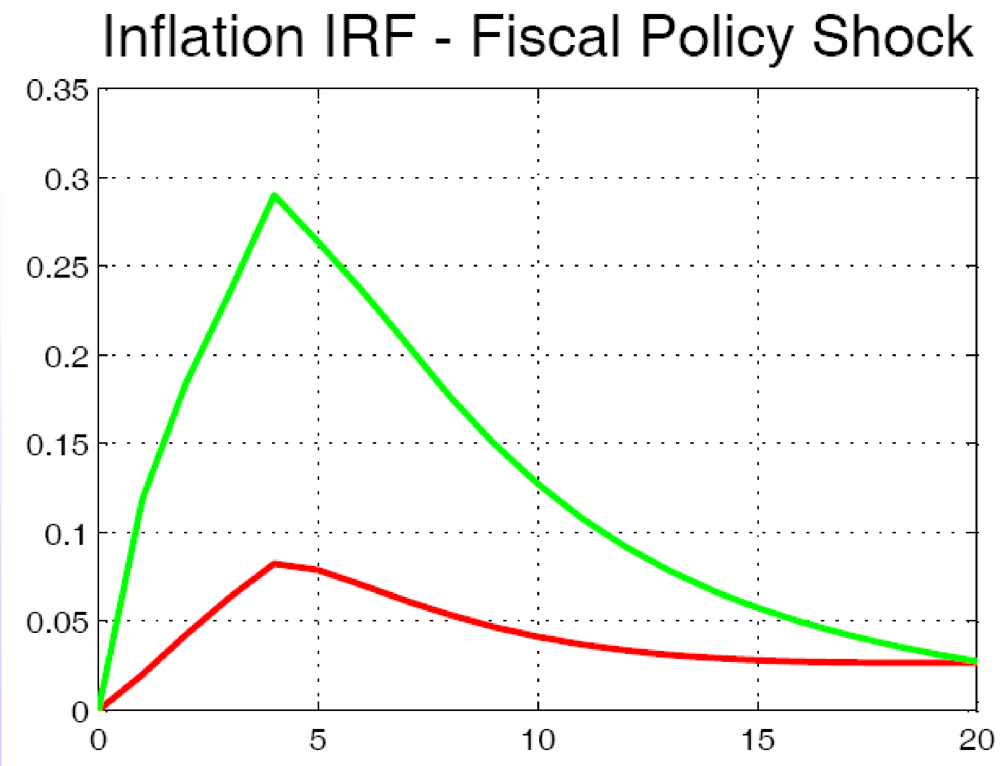
Interest Rate IRF -Monetary Policy Shock





Increase in government spending by 1 percent of GDP





Case Study 2: EMU and the ECB's models

ECB President Willem Duisenberg:

``We at the ECB are committed to developing and maintaining a set of tools that are useful for analyzing the euro area economy, and examining the implications for future inflation.

This is, however, not a trivial task given the large uncertainties that we are facing due to the establishment of a multi-country monetary union.´´ ECB-CFS conference on "Monetary policy under uncertainty", 1999.

The first-generation ECB toolbox

(1) **AW: Area-Wide Model** (ECB-WP 42, 1/2001, EM 2005)

(2) **SW: Smets & Wouters Model,** (WP 171, 8/02, JEEA 2003)

(3) **CW-F: Coenen & Wieland Model with Fuhrer-Moore Contracts** (ECB-WP 30, 9/2000, EER 2005)

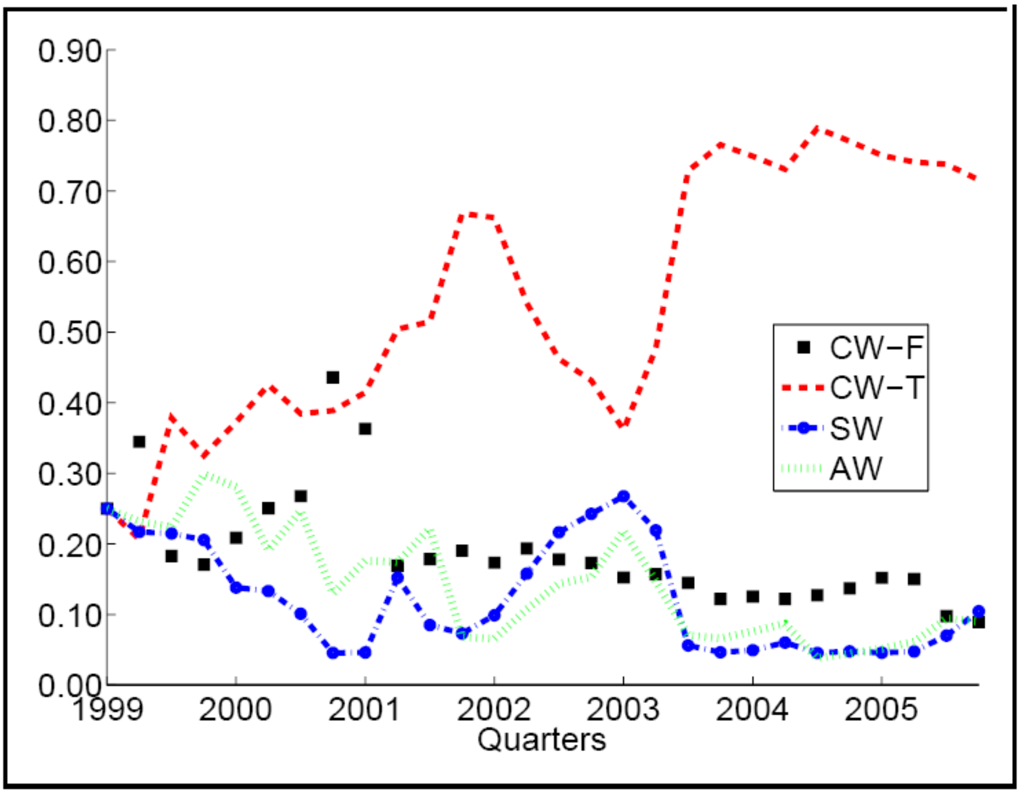
(4) **CW-T: Coenen-Wieland with Taylor Contracts.**

➔ Assess the range of uncertainty about inflation and output dynamics implied by these models.

Kuester and Wieland (2008 rev.)

- Imagine being at the start of monetary union with four models estimated from synthetic data.
- You checked and found out that optimized policy rules from one model do not always perform well in all other three models (lack of robustness).
- Design a monetary policy that is robust to the range of uncertainty spanned by the first generation of ECB models, and allow for learning from EMU data.

Evolution of model probabilities



Optimizing simple rules for a given model

- Taylor-style rules with int. rate smoothing:

$$i_t = \rho i_{t-1} + \alpha \pi_t + \beta y_t \qquad (4)$$

- Loss function (or model-based utility):

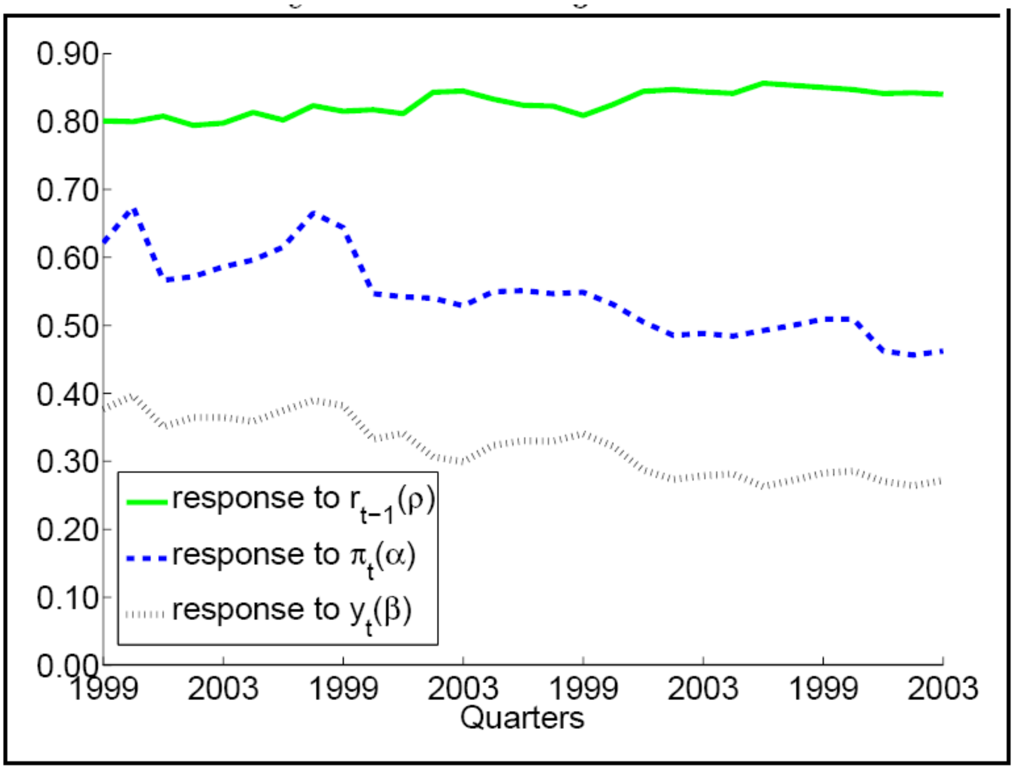
$$L = Var(\pi_t) + \lambda_y Var(y_t) + \lambda_i Var(\Delta i_t) \qquad (5)$$

Robust policy design with multiple reference models

- **Bayesian:** derive policy rule that minimizes expected loss across models:

$$L^B = \min_{(\rho,\alpha,\beta)} E_M\left[L_m\right] = \min_{(\rho,\alpha,\beta)} \sum_{m \in M} p_m L_m \qquad (6)$$

Evolution of Bayesian Policy



Duisenberg (1999) continued

… Not only can we expect some of the historical relationships to change due to this shift in regime, but also, in many cases, there is a lack of comparable and cross-country data series that can be used to estimate such relationships."

ECB Chief Economist Otmar Issing (1999):

``Given the degree of model uncertainty, central bankers highly welcome the recent academic research on the robustness of monetary policy rules across a suite of different models.“

Pointing towards research on the U.S. economy at the time as an example.