TCX-KfW International Research Symposium on Forecasting and Policy Analysis System: Does it Support Local Currency Financing?

KfW, Frankfurt am Main, December 11, 2009

Monetary Models for Developing Economies: Review and Outlook

Presentation

by

Volker Wieland
House of Finance
Goethe University of Frankfurt

Macro Models for Policy Analysis

15 years ago,

the research community building modern macro models for policy analysis and forecasting was concentrated at institutions such as the Fed, IMF, BoC, Brookings and select economics departments at U.S. and British universities.

Since then, we saw

➔rapid progress in the development of New-Keynesian macroeconomic models

➔ a wide-spread research effort in academia and central banks at large.

➔applications to policy practice around the world.

For example, in 07/08 …

at conferences organized by Central Bank of Chile and Bank Indonesia/BIS, respectively, I listened to economists from

➔Central Bank of Chile, Bank Indonesia, Bank of Thailand, Bank of Korea, Bank of Japan, Sveriges Riksbank, Bank of New Zealand,

presenting cutting-edge New-Keynesian DSGE models estimated to fit their economies.

➔ Quantitative modeling promises significant improvements in the overall quality of policy analysis and forecasting in emerging as well as developing economies.

Promise: Major benefits for policy analysis and forecasting!

- Quantitative models are an essential tool for a rational policy-making process.
  - ➔Enforce logical argument consistent with economic principles.
  - ➔Confront theory with macroeconomic data.
  - ➔Useful tool for obtaining logically consistent forecasts.
  - ➔Essential for a rational discussion of alternative policy scenarios.
  - ➔Required for ex-post evaluation of policy performance.

But the financial crisis has led to criticism

…,particularly of the modern New-Keynesian DSGE (dynamic stochastic general equilibrium) models with extensive micro-foundations.

- ➔Some critics focus on particular aspects such as the modeling of the financial sector.
- ➔More fundamentally, the extent of rational and homogenous behavior is questioned.

In my spring 08 lecture, I already suggested to watch out for the following **pitfalls**

Pitfall #1: Taking the easy way

- ❒ Easily available (benchmark) models are tremendously useful,
  - ➔but central banks and other policy institutions should make a serious effort to understand and model those factors that are specific to their economies.
- ❒ Standard tools (log-linear approximations, ..) and assumptions (rational expectations, ..) help us improve our understanding and obtain easily tractable models,
  - ➔but at the danger of neglecting some important risks.

Pitfall #2: Knowing the right way

- ❒ Beware of overconfidence and exclusive reliance on a narrow consensus approach.
  - ➔Consider competing modeling and estimation approaches and develop a suite of models.
  - ➔Ensure replicability of model-based analysis (model and data).
  - ➔Design policy recommendations that are robust to competing models.

4 Points for Discussion

1. Microeconomic foundations and linear-quadratic methodology
2. Expectations formation
3. Developing economies: Modeling special features
4. Model comparison and robustness

1. Micro foundations and LQ methods

- Great! Structural interpretation in terms of deep parameters.
  - ➔Simple example: NK Phillips curve, notation as in Walsh (2003)

$$\pi_t = \beta E_t \pi_{t+1} + \lambda x_t \qquad (1)$$

What's β?

slope λ?

output gap x?

Structural interpretation

$$\pi_t = \beta E_t \pi_{t+1} + \frac{(1-\omega)(1-\beta\omega)}{\omega}(\sigma+\eta)\left[\hat{y}_t - \left(\frac{1+\eta}{\sigma+\eta}\right)\hat{z}_t\right] \qquad (2)$$

- Probability that firm's price remains fixed: ω
- Household discount factor: β
- Household preferences for consumption, savings and leisure: η,σ
- Firms' prod.fn/ productivity shock: z
  - ➔Lucas critique taken into account w.r.t. to expectations formation and optimizing decision-making of firms and households.

But, ...

- The key Keynesian feature, that is price rigidity, is simply introduced by assumption.
- The representative agent exists for mathematical convenience. The implied restrictions may be very different from those implied by heterogenous individuals.
- Rationality assumption used in macro models is questioned in other areas of economic theory.

Linear-quadratic methodology

- The speed at which modelling efforts are proceeding for industrial and emerging economies,is truly impressive.
- This was possible due to the
  - ➔ transparency of log-linear approximations of complex nonlinear macro models,
  - ➔ the applicability of linear-quadratic solution, estimation and policy optimization methods that are easily accessible in standard software.

But …

nonlinarities may have crucial influence on the economy and policy design, and magnify effects of uncertainty.

- ➔Nonlinear micro-founded model may imply different disinflation costs.
- ➔Learning introduces a nonlinearity.
- ➔Zero bound on nominal interest rates.
- ➔Regime change is nonlinear.
- ➔Policy targets and ranges.

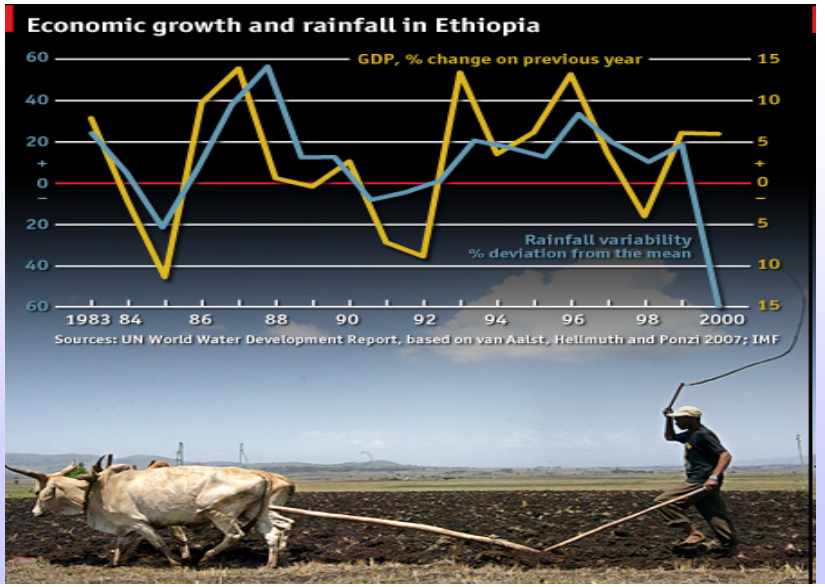
2. Expectations formation

- Standard framework:
  - ➔ expectations are fully rational, unique and incorporate much information regarding the known structure of the economy.
  - ➔ persistence in macro variables is due to a variety of frictions, policy and serial correlation in shocks, all incorporated in rational expectations.
  - ➔Important benefit: policy recommendations derived from such models are not predicated on the idea that governments can systematically fool market participants.

Deviations from rational expectations

- But, the RE hypothesis typically does not fare well in empirical tests or in explaining survey expectations.
- RE hypothesis may overstate structural rigidities.
- Policy-relevant deviations may arise due to
  - ➔imperfect information and rational learning
  - ➔bounded rationality, (see least-squares learning literature, Marcet&Sargent, Evans&Honkapohja)
  - ➔belief heterogeneity, (see rational beliefs literature, Kurz et al.)

3. Developing economies: Modeling special features



Developing economies features

- As a first step, it is very useful to estimate a standard small-open economy DSGE model with macro data of a developing economy.
  - ➔But regime change may be recent and not fully credible.
  - ➔The informal sector may be large.
  - ➔Certain sectors may be dominating the economy (raw materials prices, etc.)
  - ➔Certain institutions may be changing, (legal system, rule of law, property rights..)
  - ➔The financial system may be under-developed and foreign-currency based.

Models can be enriched with special features: Examples

„Monetary rules in emerging economies with financial market imperfections, Batini, Levin, Pearlman (2007).

- ➔Model calibrated to Peru, focus on financial frictions, liability dollarization, transactions dollarization, exchange rate choice.

„Learning, endogenous indexation and disinflation in the New-Keynesian model, Wieland (2009).

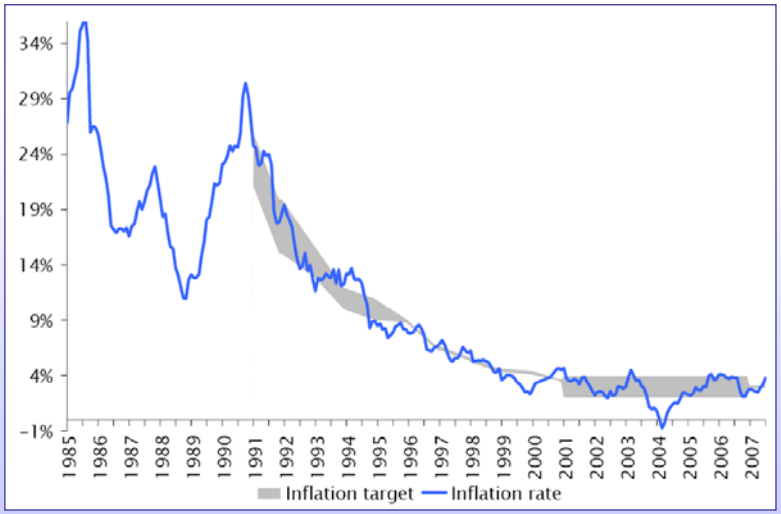
- ➔Transition in Chile from high to low inflation.

Chilean Inflation (Late 80s)

Inflation targeting in Chile

- Sep 1990: First official target.
  15-20% annual CPI inflation Dec 90 to Dec 91
- 1991-2001: annual targets lowered gradually, target ranges or point targets.
- Since 2001: constant range of 2 to 4 %.

Chile‘s successful disinflation



From Schmidt-Hebbel and Werner (2002) extended to 2007.

Wieland (2009)

1. Allows for adaptive learning by price setters.
2. Endogenizes the degree of backward-looking indexation by linking it to learning.
3. Investigates disinflation costs with temporary versus long-run targets.

   Lesson for models: Treating backward-looking indexation as exogenous overstates the cost of disinflation.

   Lesson for policy: Announcing temporary targets helps reducing the cost of disinflation.

4. Model comparison and robustness

All models are wrong,
and some are particularly biased,
but to beat a model you need one,
and competition is good.

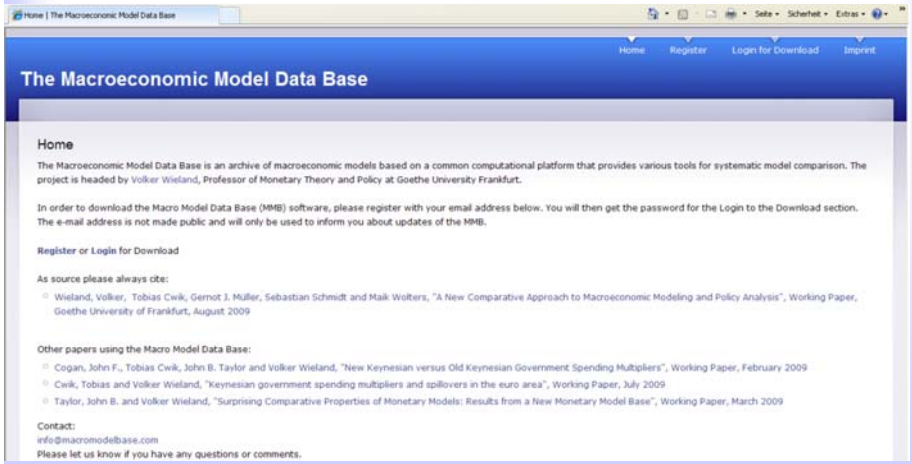
A new model comparison initiative (Wieland, Taylor, team at Frankfurt).

For description see: „**A new comparative approach to macroeconomic modeling and policy analysis**“, Wieland, Cwik, Müller, Schmidt, Wolters, August 2009.

Macro Model Data Base

- Create an archive of macro models and a platform for easy comparison (*Dynare*/*Matlab*) .
  - ➔Comparative instead of insular approach to model development.
  - ➔Evaluation and advice on discretionary and rule-based policies for central banks and treasuries.
  - ➔Analysis of macro shocks and policy responses by business economists, asset managers.

macromodelbase.com



Earlier Comparison Projects

- Brookings Institution:
  - Bryant, Currie, Frenkel, Masson, Portes, (eds.) (1989), and Bryant, Hooper, Mann (eds) (1993) (Taylor rule)
- NBER:
  - Taylor (ed.) (1999)

Note! Comparisons involved reseacher teams, each working with its own model.

Instead, we build a platform that makes a large range of models usable for individual researchers and adding models easy.

Models in the Data Base

- Estimated or calibrated macroeconomic models of the U.S. economy.
- Estimated or calibrated models of the euro area economy.
- Some estimated or calibrated multi-country models (G-3, G-7) .
- Some simple, calibrated textbook-style models.

Example Comparison (possibly live on laptop)

Compare

IMF's US Quarterly Projection Model (baseline version and with financial-real linkages)

To

➔Altig,Christiano, Eichenbaum et al, (2004),

➔Smets and Wouters (2007)

➔Fed's FRB-US Model (version Levin, Wieland, Williams 2003)

(1) Effect of interest rate shock on output and inflation.

(2) Output and inflation persistence with all other shocks.

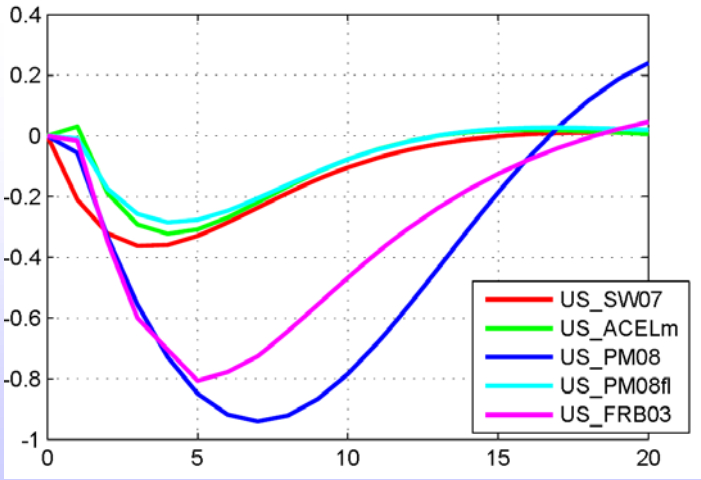
Approach

Systematic component of monetary policy is described by an interest rate rule. Consider an additive shock to the rule and investigate its effect on U.S. real GDP.

CEE05 / CGG02 rule:

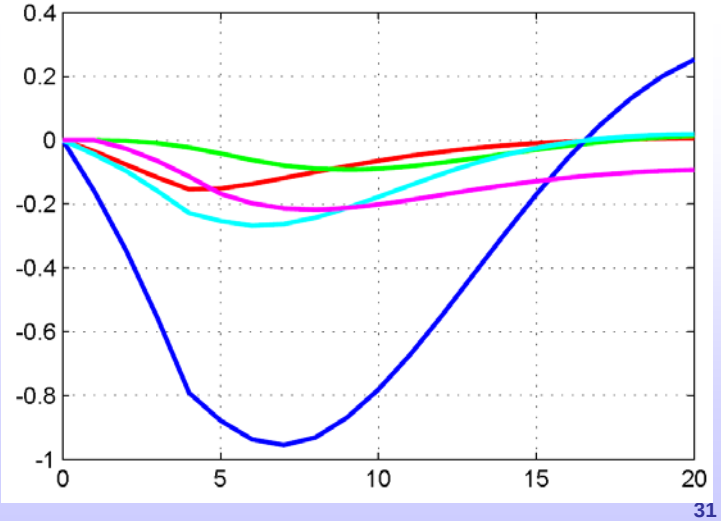
$$i_t = 0.80 i_{t-1} + 0.3 E_t \pi_{t+1} + 0.08 y_t + \varepsilon_t^i$$

GDP Effect of 1% Interest Rate Shock

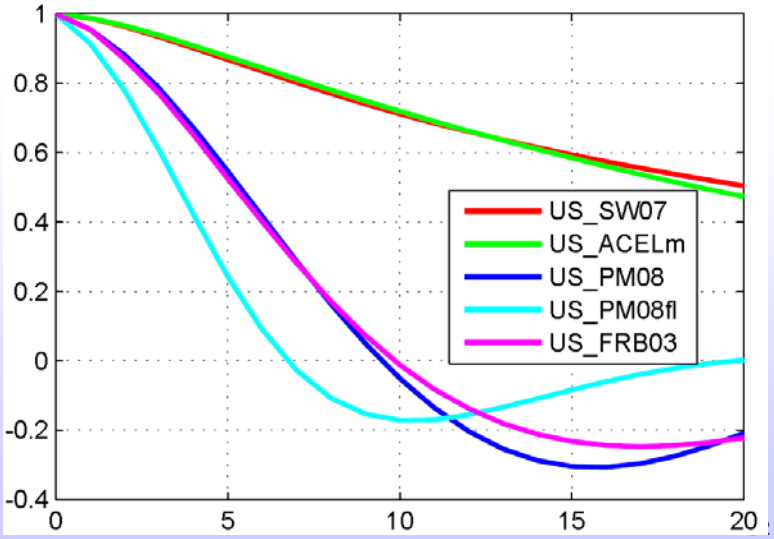


Interest rate rule: CEE 2005

Inflation Effect of 1% Interest Shock



Serial correlation of output (all shocks)



Serial correlation of inflation (all shocks)