

# DSGE models in a second-best world of policy analysis

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## Confession/apology

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  - Sims: most perceptive critic of macro policy analysis over past 30 years
  - Svensson: most cogent advocate of new more 'scientific' approach to central banking

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And how does that make you feel...

- Answer: Queasy
- When I try to occupy both couches I find myself writing what may be heresy to both Chris and Lars.

## Question

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- Simple: if the DSGE model *right* , should play major role
- Too high a standard:  
George Box: *All models are wrong (but some are useful)*
- Nobody suggests we follow DSGE models literally or mechanically

## More subtle

- How decide when DSGE-generated advice about day-to-day policy actions should be ‘taken seriously’?
- ‘taken seriously:’ means, perhaps,
  - treat the advice as the baseline or center for discussion; or
  - Presumption that CB view should generally remain close to what the model says
  - Use model as mainstay in public communication

## Bottom line

- DSGE-based policy optimal policy analysis is on **no better footing** than policy analysis in traditional models say, from standpoing of critiques of 1970s models
- The footing is clearly worse is some important dimensions
- No reason to take them more seriously on these grounds

## Bottom line

- DSGE-models have important role to play in policy, but for reasons largely unrelated to supposed strengths
- I suggest tools for capitalizing on the actual strengths  
And justifying taking the models more seriously

## State of play

- Since turmoil of 1970s, policy analysis in macro characterized by:  
fundamental confusions, disagreements,  
loose ends, contradictions
- Makes life difficult for central banker  
hoping to follow best scientific practice

## For example

- Lucas, 1981
  - Due to Lucas critique, conventional models 'in principle provide *no* useful information' about policy analysis
  - Outside RE equilibrium 'economic reasoning will be of no value'
- Sims: Lucas critique a nonissue from standpoint of most day-to-day policy analysis

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- Perhaps, listening to Sims, you don't worry so much about the Lucas critique
- You keep your 1970s-style model, hire scores of bright young economist from top programs, refine your 1970s-style model for the next 20 years.
- Then Sims pays a visit. . .

## Sims pays a visit:

- 2002: [I]f there is progress, it certainly isn't clear, and my own view is that the changes in these models over time have by and large been more regress than progress
- Loosely, it had become more difficult to see the models as coherent probability model for the data

## Lars vs. Chris

- Lars seems comfortable with new Keynesian DSGE model  
we should consider taking these models seriously for policy analysis.
- Chris: Value of the New Keynesian Phillips Curve at the core of these models 'may lie in the flames that are emerging from its dying embers'

## Lars vs. Chris

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we should consider taking these models seriously for policy analysis.
- Chris: Value of the New Keynesian Phillips Curve at the core of these models 'may lie in the flames that are emerging from its dying embers'
- Both say take the model seriously, but to Chris, mainly as tinder

## Confusion, loose ends, contradiction

- Is economic reasoning worthless outside microfounded RE equilibrium?
- Were CB models improving or regressing through the 1990s?
- Are current New Keynesian DSGE models just tinder?

## My heresy

- We need a policy modelling theory of the second best
- Welfare theory of the second best: in a distorted economy the merits of reducing any given distortion are ambiguous
- In the policy analysis equivalent: the merits of any given change in policy analysis model are ambiguous

# What is 'world of second best'

- Two key elements

## What is 'world of second best'

- Two key elements
- First-best is well defined:  
Environment such that there exists optimal policy advice and it coincides with conventional optimization of a microfounded model.
- Second best assumption: The model that would give rise to the optimal policy behavior is intractable.
- Now what is the best policy analysis model?

## Trivial example to fix ideas

- Policymaker is playing chess for money.  
Wants a policy analysis model to advise his moves.
- Complete solution is well-defined, we even know how to compute optimal strategies,  
doing so is intractable.

## Two approaches

- Use first-best-style solution of a simpler model  
Assume they play checkers (as of 2007)
- Use pol. advice from some model that is *ad hoc* in Lucas's sense

## Facts

- Pol. advice from the best *ad hoc* models now dominates all but the best human play.
- No one has found a useful way to exploit first-best solutions of simpler problems. Except as pedagogy in constructing the *ad hoc* approach

## Toward a theory of the second best

- Possible lesson 1: Lucas overstated.  
Lucas made no argument or proof that economic reasoning is of *no value* outside the first-best perspective. Examples say otherwise.
- Possible lesson 2: No foundation for view that best policy analysis model in the second-best world is the first-best solution of a simpler problem.

So...

- It takes a (microfounded) model to beat a (microfounded) model?
- Manifestly not: *ad hoc* models literally beat all comers at chess.
- Many analogous examples

## Radical view?

- No, entirely traditional
- Roots in Hicks vs. Hicks on IS/LM

## Solow, first Hicks lecture, 1984

- Suppose all [economics] can do is help us to organize our **necessarily incomplete** perceptions about the economy, to see connections the untutored eye would miss, to tell plausible stories with the help of a few central principles. . . . In that case what we want a piece of economic theory to do is precisely to train our intuition, to give us a handle on the facts in the inelegant American phrase. (1984,p.15)

## Friedman, $k$ -percent rule

- It is not perhaps a proposal that one would consider at all optimum if our knowledge of the fundamental causes of cyclical fluctuations were considerably greater than I, for one, think it to be... (1948, p.263)
- The proposal may not succeed in reducing cyclical fluctuations to tolerable proportions... I do not see how it is possible to know now whether this is the case

## Could explain a good deal

- Lucas and Sims critiques of 1970s models were from first-best perspective
- Lucas is right that, e.g., chess programs are of no value in 'solving' chess
- Also right that second-best solutions rest on unsatisfactory foundations

As Friedman notes, in the second best world we can't hope for great confidence we are doing the right thing

## Could explain a good deal

- Sims arguably right that model revisions were regress from first-best perspective  
And central bankers right that the models better met their needs (from second best persp.)
- In face of incomplete understanding, may not prefer complete prob. model

## Modest implications of this heresy

- We should appraise any new model from both perspectives
- Casual view might be that main gains in DSGE modelling have been from first best (optimizing, etc.)

## Bottom line: first best

- DSGE models embed great advances in basic research
- **Current models** represent no more than promising starting point on actually answering the first-best critiques

## Specifically

- Lucas critique: new starting point and tools, but no real progress
- Sims critique: no progress at all
- Hendry critique: regress

## Bottom line: second best

- Even current DSGE models have great advantages from second-best perspective
- Rapidly becoming, in general terms, ‘the way we think’
- Facilitate much tighter reasoning about dynamic macro  
and thereby sharpen our trained intuition
- Indispensable for certain questions

## But

- None of these suggest ‘taking seriously’ for day-to-day policy analysis/communication/etc.
- Large and largely unrealized potential here
- Constructive part of paper is about how to maximize value in this regard.

# The goal

- For day-to-day policy analysis, want model to reflect and structure how we think about new macro information and its implications for policy
- But current approaches to model formulation problematic

## Traditional model design/evolution

- I observed evolution of new FRB/US FRB/Global in 1995

And some of Chris's interviews about the process for the 2002 paper

- Process opaque, undocumented, nonsystematic.
- But . . .

## Traditional model design/evolution

- Policymakers at all levels heavily involved
- Process didn't stop until relevant group of policymakers agreed model was a reasonable representation of key aspects of their crude and incomplete understanding.

## DSGE evolution: caricature

- Take core consumption/production problem
- Add a large number of frictions  
Which frictions and their form only loosely motivated
- Add lots of shocks to margins and elsewhere  
Which shocks and their dynamic form largely unmotivated

## DSGE evolution: caricature

- Specify a largely unmotivated and moderately diffuse (but highly informative in some dimensions) prior
- Do Bayesian estimation
- And there we have our formal posterior.

## DSGE evolution: caricature

- Interplay of model, data, and expert judgment very unclear
- Looks most like an attempt to purge most prior judgment

## Note

- The DSGE process I caricature makes sense from many perspectives
- Demonstrate generic viability of the model
- Produce posterior suitable for re-weighting with more interesting priors

# But

- This process hard (impossible?) to justify from standpoint of building model for actual policy analysis

## Bayesian: opportunity missed

- Can tell a reasonable Bayesian story about traditional approach
- The DSGE approach much harder to justify from Bayesian perspective
- Clearly an opportunity missed

## Fulfilling the promise

- We want to check coherence between the formal posterior and our actual posterior possibly leading to adjustment of each
- Our actual posterior is incomplete and we know it is at odds (in some important respects) with the model

## A defining issue for policymaker

- When the model produces a surprising result from standpoint of your understanding,
  - In which cases do you mainly revise your intuition
    - core areas of trust in model
  - In which cases do you mainly just ignore the model
    - The unsavory bits we have not yet been able to fix

## Return to question we started with

- Should we ‘take the model seriously’?
- In my view, shouldn’t take the model seriously until pretty clear on broad aspects of this defining issue
- Otherwise
  - Not right as centerpiece for discussion
  - Clearly not right as vessel for communicating CB thinking

# Tools

- Geweke 2008 lays out almost precisely the case we are discussing  
Evaluating a complete formal model against incomplete expert understanding
- Key suggestion: specify core beliefs and check these in the model
  - What does the formal prior say about them?
  - What does the formal posterior say about them?

# Tools

- I will just illustrate using a version of Ramses  
The Riksbank's model

## Note of thanks

- I was given a huge amount of help by many Riksbank folks
- An amazing testament to commitment to transparency, accountability, and outside scrutiny

## Core beliefs: Examples

- Adequate business cycle model should roughly account for the variation in the data in the low, business cycle, and high frequency ranges
- Long (and variable) lags of effects of monetary shocks
- Short-run consumption/saving/investment trade-offs in DSGE models remain suspicious

# Pictures ...

Share of Variance Output Growth & Inflation at  
 Low B.C. High

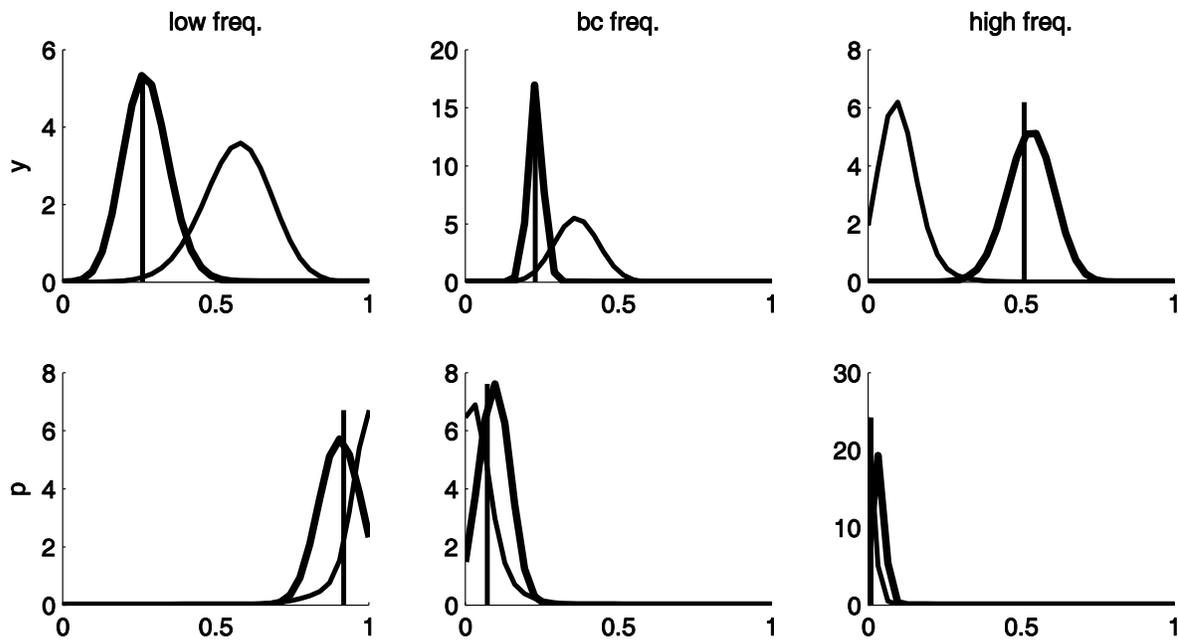


Figure 1: Prior, posterior, and sample values for share of variance of output growth ( $y$ ) and inflation ( $p$ ) at low, business cycle and high frequencies. Note: prior is thin; posterior is thick, sample is vertical.

## Effect of Pol. Shock Raising Int. Rate 25 b.p. on Annualized GDP growth rate and annualized Inflation

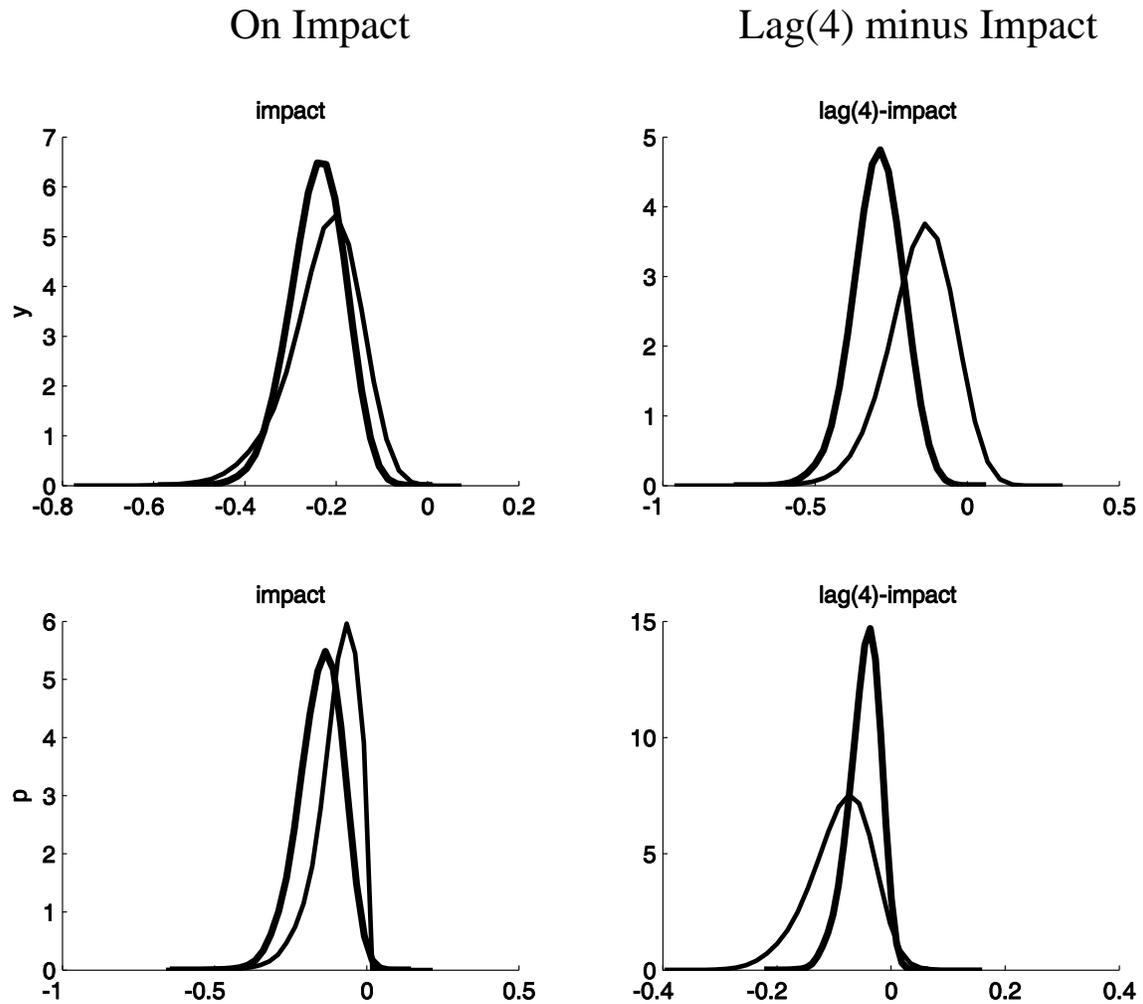


Figure 2: Prior and posterior for the response of output growth (y) and inflation (p) to monetary policy shock on impact and after 4 quarters. The shock raises the interest rate 25 basis points on impact. The responses are in annualized percentage points. The left column gives the impact effect; the right column gives the effect after 4 periods minus the impact effect. Prior is thin; posterior thick.

# Unconditional Correlation, Consumption growth, Int. Rate and Consumption, Investment

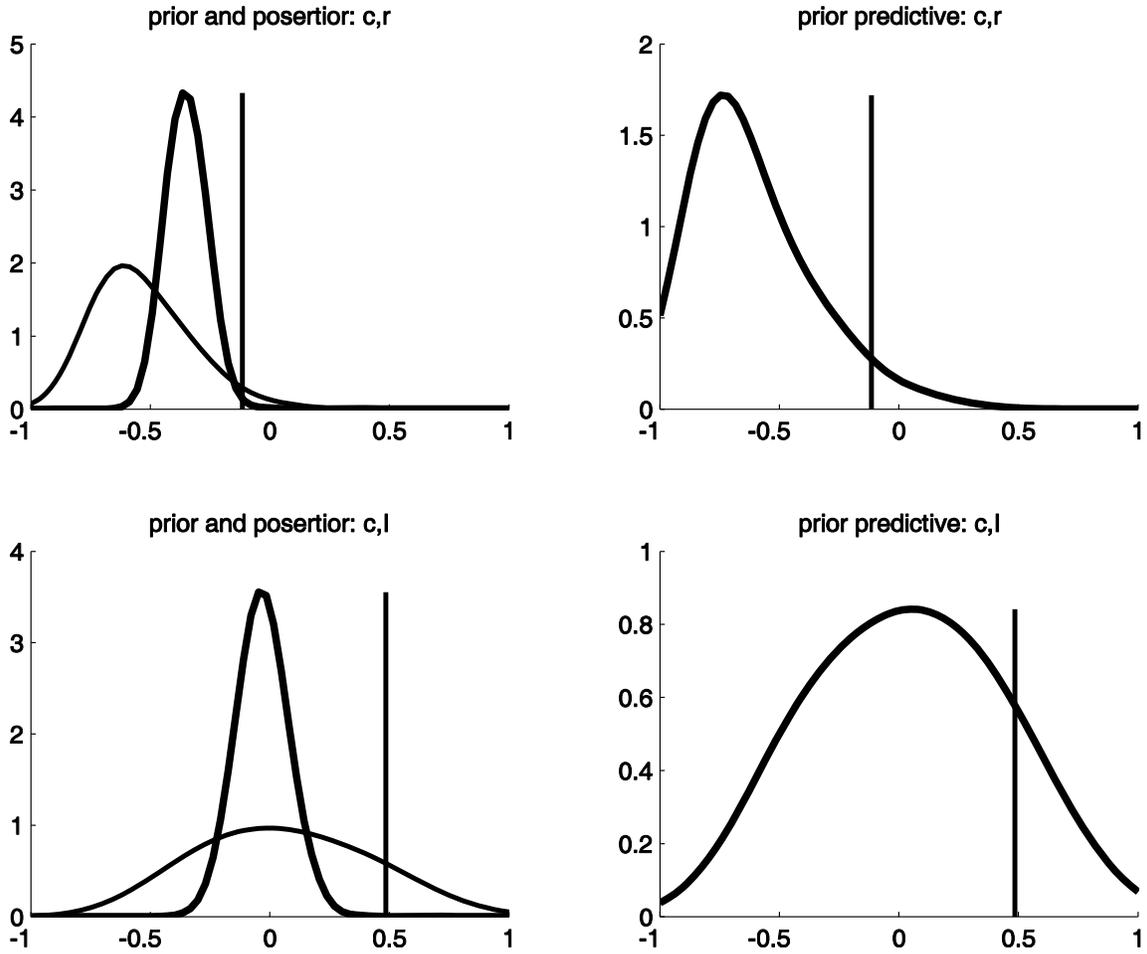


Figure 3: Prior, posterior, and prior predictive densities and sample value for the unconditional correlation between consumption growth and interest rates (c,r), and consumption and investment growth (c,I). On left , prior is thin, posterior thick, sample vertical; on right prior predictive is given, sample vertical.

## Summarizing

- Difficult to discern clear 'scientific best practice' in practical policy analysis
- Severely complicates life of earnest central banker

# DSGE-based optimal policy calculations

- Current models are on no better footing than 1970s models from first-best perspective of answering classic critiques
- But may be extremely useful from second-best perspective  
Structuring our thinking, etc.

## Maximizing the gains

- Before DSGEs play central role in discussions/communications...
- We should check the degree to which they coincide with our thinking
- Bayesian structure provides nice tools for systematically doing this  
but frequentist analogs might be fine too...