Central Bank Macro Modeling

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Outline

- Methods, model types
- Monetary policy responses
- Financial shock responses
- Comparison to BPSS
- Absence of credit expansion $\rightarrow$ crisis

What's missing

- Fiscal-monetary interaction
- "Heterogeneity"
- How to model financial frictions: intermediation vs. net worth vs. liquidity
- Inattention and bounded rationality

Methods, model types

- Most of the models are variants on New Keynesian DSGE's.
- FRBUS and JEM are major exceptions.
- Most calibrate some parameters, estimate some others with "Bayesian methods".

Should we be worried about sticking with NK DSGE's?

- They didn't start out with financial sectors or financial frictions, but we can add them, and are doing so.
- They ignore or assume away intertemporal aspects of fiscal policy, but we can add them, though we are not doing so.
- They imply price level indeterminacy at the ZLB, which seriously limits their usefulness (a euphemism) for policy analysis in low interest rate environments.
- They center on the NK Phillips curve, a story no one believes except as a kind of "metaphor" to explain why nominal things have real effects.

- Still, as a starting point, they are the best we have.

- We should recognize that they arose as a way to tell more elaborate stories that remain consistent with SVAR's. We should not lose sight of that SVAR foundation as we elaborate and revise the DSGE framework.

FRBUS and JEM

- This approach has the claimed advantage that it allows equations and sectors to be added, subtracted, or respecified without changing the rest of the model.

- This approach allows bigger models at a given computational constraint level.

- But in the end it is not much different from regressing quantity and price and calling that "demand" and regressing price on quantity and calling that "supply".

Can FRBUS and JEM be useful?

- It is possible that FRBUS and JEM have enough recursive structure that they are close to restricted triangular VAR's, which would justify using the equation-by-equation OLS that they are largely based on.

- But I've seen no attempt to check this, i.e. to see how much implied simultaneity there is in the system and whether it can be isolated.

- This is not to say the models are useless. They can be a framework to enforce consistency among expert opinios, as can a spreadsheet. They just cannot be taken seriously as probability models of the data.

Calibration

- Most of the models calibrate some parameters and use Bayesian approaches for inference on others.
- In most cases, parameters that are thought to relate mainly to the "long run" or "trends" are calibrated.
- Furthermore, most commonly variables are detrended or differenced before formal inference begins.
- This is not as innocuous as deseasonalization. Seasonal variation is driven by distinct shocks, to some extent (e.g. weather). And seasonal frequencies are clearly distinct, in the frequency domain, from business cycle frequencies.

- We know that separating trend and business cycle frequencies is not easy (Granger's "typical spectral shape").

- Bayesian model comparison can be seriously distorted if uncertainty arising from detrending is not treated explicitly.

Estimation

- There are two sources of appeal for Bayesian approaches:
- They allow, via the prior, proceeding with models that have some weakly identified parameters, as large models generally do.
- They provide an internally consistent way to model parameter uncertainty and thereby potentially a way to provide realistic measures of uncertainty about model predictions.

The COMPASS priors and posteriors (an example)

- There are many parameters (about 50), all given independent priors. This in itself is hazardous, likely implying some unintended dogmatic beliefs.

- Many of the prior standard deviations seem to me unrealistically tight. For a decision-making model, we should use tighter priors than in a scientific paper where we are hoping to persuade an audience of diverse views, but these seem tight even by that standard. The line between calibration and estimation is thin here.

- Some prior means for variances have been set by looking at the data. This seems hard to justify.

- For many parameters, prior standard deviations and means are close to posteriors. These parameters are probably weakly identified. Since priors for them are very important, they deserve special attention.

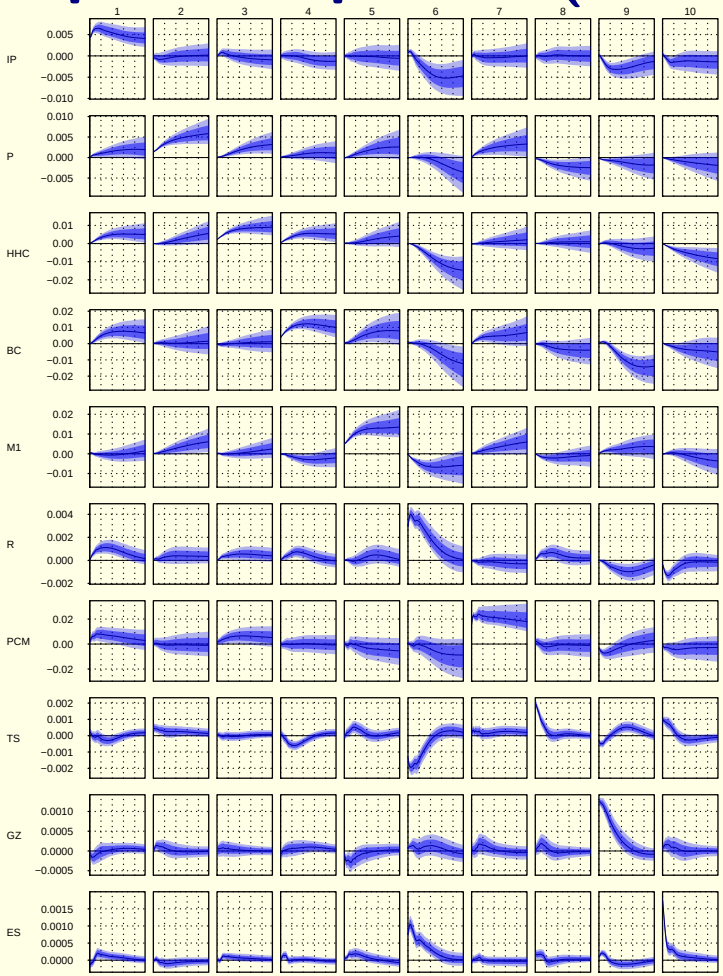
- Exploration of variants on the prior would be a good idea.

- The Bayesian approach is allowing use of a large model with weakly identified parameters, but it is probably not providing realistic assessments of posterior uncertainty.

Responses to monetary policy shocks

- The models imply quite similar patterns of response to monetary policy tightening.
- With full rational expectations, the responses are unrealistically front-loaded, implying strong, within-quarter, effects on GDP and prices.
- This is unsurprising, and not just a result of everyone copying Smets and Wouters. SVAR's have shown us that these patterns are robust across time, countries, and identificaions strategies.

“Average” impulse responses (t errors) in BPSS



Financial shocks

- In some cases, these responses are close to scalings of the monetary policy shock responses.
- In the NY Fed model at least, the effects of financial shocks are more persistent than the effects of a monetary policy shock.
- This is not there in the BPSS VAR, even though in the BPSS VAR the financial shocks play the same role in making forecasts during the great recession more pessimistic and realistic.
- None of the models, including BPSS, show low interest rates or expansion of credit aggregates creating a crisis. This is not a defect.

Fiscal/Monetary interaction

- These models, with their attention to bringing in financial frictions, may be fighting the last war.
- Unbacked fiscal expansion produces inflation, and may do so in the face of resistance from the central bank in the form of interest rate increases.
- If markets perceive the fiscal expansion as unbacked, interest rate increases exacerbate, rather than end, inflation.
- We do not see much of this historically in rich country data — just as we did not see many major financial crashes historically in postwar rich country data.

- But we should have our models ready to analyze this if it occurs.

- Models that begin by assuming zero government debt and/or zero deficits and/or passive fiscal policy with lump sum taxes, and thereby justify ignoring wealth effects of government debt, cannot help us here.

- Leeper, Traum and Walker have shown us that a model that includes dynamic fiscal policy and recognizes the difficulty of separating causal influences of monetary and fiscal policy in the historical data, is possible.

Heterogeneity

- The HANK model demonstrates that recognizing a wider array of agent types in NK models, with a more realistic treatment of liquidity, can change our conclusions about how monetary policy works.

- One implication of HANK, that its authors emphasizie, is that Ricardian equivalence is far from holding.

- Since monetary policy induced interest rate changes require fiscal responses under passive fiscal policy, the effects of monetary policy depend strongly on the fiscal response. Another reason to pay more attention to the dynamics of fiscal policy.

Heterogeneity

- But the non-neutrality of fiscal policy and the uncertainties this implies for the effects of monetary policy are the tip of the iceberg.
- As we disaggregate, the number of interactions across markets and agent types grows explosively.
- We don't have strong evidence about many of these connections, and it may be tempting to make simplifying assumptions to bound model complexity.
- This runs the risk of models that tell richer stories, while becoming worse, not better, at tracking the major aggregates.

- As we proceed into the thickets of heterogeneous-agent modeling, it is important to maintain the requirement that the models should not do worse than SVAR's at tracking the main aggregates.

Inattention and bounded rationality

- Mackowiak and Wiederholt have shown that inattention can be incorporated into a DSGE and that this is at least a partial substitute for other sources of "stickiness".
- Their model also, like HANK, implies that welfare analysis of monetary policy could be sensitive to the presence of this complication.
- But their setup is special. Models where markets have agents on both sides subject to RI constraints are much harder.
- But RI is likely to be pervasive. Recognizing that should make us realize that sluggish adjustment will be pervasive, and that it is dangerous to interpret it as created by "adjustment costs".

Machine learning?

- Importing numerical methods from the machine learning literature may let us handle bigger, more non-linear models.
- This opens possibilities, but also, as mentioned earlier, pitfalls. More complicated models that fit less well or mask uncertainty with calibrated parameters or unrealistically tight priors are not an improvement.
- ¡Aside on the difference between economic modeling and image recognition¿

Conclusion

- There's lots of important work to do. My own priorities:
  - Dynamic analysis of fiscal policy, with wealth effects, and thereby creating the possibility of modeling fiscal dominance.
  - Expanded and more sophisticated weakly identified models in the spirit of SVAR's, to provide a well-fitting benchmark to discipline DSGE-style models.