Modeling Challenges for Central Banks

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Post-Crisis Macro: I

- Macroeconomists’ reactions to the crisis

1. **Finger-wagging: **Government is the root of all evil
   - associated with RBC types from Minnesota & Chicago
   - claim: would have had V-shaped recession in absence of government interventions

2. **Chest-beating: **New Keynesian models are the fount of all economic wisdom
   - associated with saltwater founders of NK model
   - claim: just need to patch things up to account for financial anomalies
3. **Baby-tossing**: Past 40 years of macro were a distraction
   - associated with “new thinking”
   - claim: abandoning rational expectations, optimization & market clearing is essential

4. **Self-flagellation**: Mistakes were made; let’s learn from them
   - claim: critical assessment of DSGE models’ shortcomings can lead to improvements
   - LSW required reading for anyone interested in DSGE modeling
Post-Crisis Macro: Summary

- Finger-waggers & chest-beaters call for digging their trenches deeper
- Baby-tossers want to fill the trenches with 40 years of research and bury it
- Self-flagellators want to learn how to avoid falling into the trenches
- I lean toward the self-flagellators, but here I will step back and try to offer a broader perspective
Painting a Broader Landscape

- **Premise:** The inflation process is poorly understood

- **Needed:** A firmer grasp of the economic sources of low-frequency movements in macro time series and how those movements affect variables over central bank forecast horizons

- **Solution:** Develop the macro policy trinity—monetary, financial & fiscal policies—and identify other sources of low-frequency variation in data
  
  - integrate trinity into our models
  - produce a deeper understanding of the transmission mechanism of monetary policy

- **Non-Solution:** Fresh tweaks on existing money-only Calvo DSGE models through additional *ad hoc* frictions
My Mission

- To propose potential modeling issues that may arise in future
- Here I focus on three important candidates
  1. High or growing private sector and government indebtedness
  2. Evolving demographics that are drastically aging populations
  3. The need to take fiscal policy seriously
- These interact in various ways
  - operate at frequencies below the business cycle
  - all have implications for inflation that have barely been explored
  - none are adequately captured in existing central bank models
- Won’t talk about financial frictions—see Lindé-Smets-Wouters
The Real World Wants Joint Policy Analysis

- Long tradition of focusing on monetary policy, abstracting from fiscal & financial policies

- Global financial crisis strained the tenability of that approach

- A few observations about developments since 2008
1. Policy reaction to the financial crisis: rapid monetary easing & large fiscal stimulus

2. To combat the crisis and its effects, central banks bought private & government assets, actions that resemble fiscal policy

3. Euro zone’s sovereign debt crisis relieved by ECB’s pledge to “do whatever it takes”

4. Abenomics: mix of monetary, fiscal and structural policies to re-inflate Japan (though recent tax increases counteract stimulus)
Economic Developments

5. Net general government debt as percent of GDP

<table>
<thead>
<tr>
<th></th>
<th>2008</th>
<th>2015</th>
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<tbody>
<tr>
<td>Euro area</td>
<td>54.0</td>
<td>74.0</td>
</tr>
<tr>
<td>Japan</td>
<td>95.3</td>
<td>140.0</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>47.5</td>
<td>85.0</td>
</tr>
<tr>
<td>United States</td>
<td>50.4</td>
<td>80.9</td>
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As central banks exit from low interest rates, debt service will skyrocket, creating fresh fiscal pressures.

6. Looming over all advanced economies are aging populations and the uncertain resolution of this low-frequency fiscal stress.

7. As central banks engage in active macroprudential policies, large and risky balance sheets may become permanent—only fiscal policy can back the central bank.
Conflict with Existing Monetary Paradigm

- These economic developments run counter to maintained assumptions in new Keynesian analyses.

- Those analyses...
  - treat financial stability as “add-ons” to the basic structure.
  - trivialize fiscal behavior to render it neutral (eg: RAMSES, NAWM).
  - often treat low-frequency phenomena as exogenous (eg: random walk in TFP).

- We need to model monetary, financial & fiscal policies jointly.
Indebtedness

- We have some understanding of how government debt affects macro economy
- Have very little understanding about impacts of private debt
- Both kinds of debt surely matter at frequencies lower than business cycles
  - introduce new endogenous state variables that evolve slowly
  - their evolution affects private wealth and its composition
  - this alters relative rates of return & transmission mechanism of monetary policy
- Conventional DSGE models don’t do well in capturing these impacts
What deleveraging?
Private Indebtedness: Moderate Levels

Private Sector Debt As Percentage of GDP: Moderate

What deleveraging?
Riksbank’s Private Debt Measure

Percentage of disposable income

Sources: Statistics Sweden and the Riksbank
Concerns About Private Indebtedness

- Most common: a bad shock to income can make it difficult for households to service debt
  - to avoid default, severely cut back on consumption, reducing demand
  - alternatively, households will default, triggering system-wide financial problems
  - either scenario could lead to recession
But here is another concern: not only debt-income ratio that matters—it’s also the level of *nominal* debt outstanding.

- If inflation less than expected, generate...
  - Capital losses to creditors
  - Capital gains to debtors
- Redistributes wealth
- May create losses for financial institutions
- Potential to set the stage for financial instability?

To the extent that debt is private & domestic, representative agent models will have little to say.
Concerns About Private Indebtedness

- If increased credit growth fuels expenditures...
  - raises questions about impacts on inflation
- Tobin would argue that credit creation is part & parcel of monetary transmission mechanism
  - not completely captured by interest rates
  - calls for modeling monetary aggregates as well
- New Keynesian DSGE models have punted on this
  - Woodford argued it is a "virtue" of NK models that aggregates have no role to play
  - ECB has struggled—unsuccessfully—to find a role
- Lurking out there is a framework in which "excessive" credit growth can be inflationary
- Echoes Brunnermeier-Sannikov’s "financial dominance"
- We are still far from having such a framework
Government Indebtedness: High Levels
Government Indebtedness: Moderate Levels

Central Government Debt as Percentage of GDP: Moderate

![Graph showing Central Government Debt as Percentage of GDP for various countries from 2000 to 2012.](image)

Legend:
- AUS
- DNK
- DEU
- NLD
- ESP
- SWE
Sweden: Central Government Debt
(percent of GDP)

Including on-lending and assets under management

Central Government Debt
Concerns About Government Indebtedness

- Sweden an outlier among advanced economies
  - government debt-GDP *fell*—at least didn’t rise—throughout recession

- Fiscal framework adopted after 1992 crisis:
  1. nominal expenditure ceiling
  2. surplus target of 1% of GDP over business cycle
  3. balanced budget requirement for local governments

- Claim: fiscal framework, which maintains confidence in sustainability of public finances, frees monetary policy to focus on inflation and output stabilization

- Important: both the monetary & fiscal frameworks in Sweden were adopted within the domestic political process (with some nudging from markets)
  - both have strong public support
Swedish treats aggregate fiscal policy as having a single objective: don’t screw up!
- this is a worthy objective—one that many countries see unable to achieve
- but it denies any macroeconomic role for fiscal policy
- echoes the “money-only” view of the economy

Returning to the motivation for this talk...
- only in our simple, abstract models is government debt irrelevant
- Ricardian equivalence breaks down for many reasons
- the decline in debt since 1995 due to a variety of actions that affect economic behavior
- the overall level of government debt affects quantities of collateral & liquidity in economy

“Money-only” DSGE models miss these important dynamics
Demographics: “Old” Countries

Dependency Ratio: Population 65 & Older Relative to Ages 15-64
(Already Old in 2005)

- Denmark
- France
- Germany
- Italy
- Japan
- Netherlands
- Norway
- Spain
- Sweden
- UK

- 1960
- 2005
- 2050
- 2100
Demographics: “Middle-Aged” Countries

Dependency Ratio: Population 65 & Older Relative to Ages 15-64
(Middle Aged in 2005)
Demographics: “Young” Countries

Dependency Ratio: Population 65 & Older Relative to Ages 15-64
(Young in 2005)
Demographics

- So far, DSGE models used for policy analysis have been silent about demographics
- It’s easy to understand why: how can we maintain the representative household artifice?
- Serious models of financial stability also must bring in heterogeneity
- Little formal theory connecting demographics to monetary policy goals
  - how do low-frequency & gradual demographic shifts affect inflation at business-cycle frequencies?
- There is some suggestive empirical work
Based on Yoon-Kim-Lee (2014, IMF)
- data from 30 OECD countries over 55 years

Consider a number of demographic measures
- population growth
- dependency ratios of elderly and young
- life expectancy

Find that aging populations are associated with
1. reduced growth in per capita GDP
2. suppressed inflation

Demographics are a slow-moving fundamental
- affects “natural real rate of interest & output”
- implications for NK monetary policy prescriptions

In addition: long-run fiscal financing issues
- uncertainty about how old-age benefits will be funded
- impacts of that uncertainty on central bank’s ability to affect economy in usual ways
Low-Frequency Implications

- Private/government debt & demographics are examples of neglected fundamentals that operate at low frequencies

- Trend vs. cycle is an important, unresolved issue
  - statistical methods treat them as orthogonal
  - no policy maker believes this to be true

- Some DSGE models permit there to be multiple unit roots in exogenous processes

- Certain parametric restrictions can produce unit roots in endogenous processes

- Jointly optimal monetary-fiscal policies also produce unit roots endogenously

- Some evidence of low-frequency variation
Consumption: Where is the Spectral Power?

Smoothed Periodogram of Consumption Growth

Business cycle lies between [0.20, 1.05] on x-axis
Inflation: Where is the Spectral Power?

Smoothed Periodogram of Inflation

Business cycle lies between $[0.20, 1.05]$ on $x$-axis
Smoothing Periodogram of Growth Rates

- Output Growth
- Growth of Market Value of Government Debt
- Government Consumption Growth

Business cycle lies between [0.20, 1.05] on x-axis
Survey of Professional Forecasters

3-month T-bill expectations: 1-qtr (black); 4-qtr (grey)
Blue Chip Economic Indicators: 1-2 yr (blue); 5-10 yr (red)

Drift in Expectations: Interest Rates & Inflation

Blue Chip Economic Indicators

3-month T-bill expectations: 5-10 yr ahead (red)
Inflation expectations: 5-10 yr ahead (blue)

Drift in Expectations

▶ Eusepi-Giannoni-Preston (2015)
  ▶ low-frequency drift correlated with short-term forecast errors
  ▶ propose learning environment in which agents hold subjective beliefs that macro data contain low-frequency drifts
  ▶ drift may reflect uncertainty about or imperfect credibility of long-run policy targets

▶ This drift imposes limitations on central bank’s ability to control inflation
  ▶ expectations of long-term interest rates not anchored
  ▶ presents a new intertemporal tradeoff for policy makers: no Divine Coincidence for demand shocks
A Heretical Suggestion

- We need to ask ourselves an uncomfortable question:

  Is Sweden in a fiscal dominant regime?

- In many countries, primary surpluses may be largely independent of inflation & market value of government debt—driven by political, rather than, fiscal considerations

- In such a world, monetary policy doesn’t work the same way as in a purely Ricardian world
  - lower interest rates reduce interest receipts, which reduce household wealth & aggregate demand
  - this might raise inflation in the short run, but eventually it must lower inflation

- Fiscal dominance calls for a completely different monetary strategy if the desire is to raise inflation
A Heretical Suggestion

- Monetary transmission mechanism
  - interest rate channel still operates on output
  - wealth channel operates on expected inflation & does not rely on Phillips curve tradeoff, although it can
  - monetary policy can affect short-run inflation expectations, but long-run expectations anchored on surplus target
  - even if people believe central bank’s interest rate projections, they may not believe its inflation forecasts

- Central bank purchases of government bonds might be counterproductive
  - reduces debt in hand of public
  - reduces household wealth & aggregate demand
A Heretical Suggestion

- If this is so, why don’t we know it?
- RAMSES and other models estimated with prior that does not permit fiscal dominant regime to be discovered
- Reduced-form analyses cannot identify the regime
- Could add fiscal detail to model & estimate conditional on priors that put Sweden in monetary- or fiscal-dominant regime
  - conduct model comparison to ask which regime fits best
  - a non-trivial task that requires careful fiscal modeling
- I think this needs to be done
A Proposal to Raise Inflation

- **A foolproof** way to raise inflation:

  Adopt a fiscal policy that will keep surpluses low—or deficits high—until inflation hits its target

- **Points to bear in mind:**

  - the fiscal commitment must be credible and stuck to, even in the face of rising debt-GDP
  - although monetary policy cannot implement this, it can play a supporting role
    - maintaining *higher* nominal & real interest rates will grow the debt more rapidly
    - this enhances the inflationary impacts
  - this is equivalent to what some, inaccurately, call “helicopter drops of money”
    - both amount to an *unbacked fiscal expansion*
Even under fiscal dominance there is monetary policy to conduct, but it is much less studied.

Key point: monetary policy works differently
- monetary dominance assumes fiscal policy eliminates wealth effects
- when wealth effects are present, monetary policy can produce seemingly “perverse” monetary impacts
- this leads to different policy prescriptions for monetary policy

The alternative to taking a fresh look at the prevailing policy regime is to keep doing what you’re doing
  - and pray for a miracle
Main Takeaways

1. Standard analyses over-simplify inflation targeting

2. Last 7 years have shaken our understanding of the transmission mechanism of monetary policy
   ▶ financial conditions matter
   ▶ fiscal conditions matter

3. “Anchoring inflation expectations” requires more than a central bank that
   ▶ is explicit & transparent about its objectives
   ▶ communicates clearly about current & future actions
   ▶ behaves credibly

4. If non-monetary factors inconsistent with inflation target, may be *impossible* for CB to hit its target

5. In most countries there is likely a generic untethering of long-run expectations over the trinity of policies

6. Only an *unbacked fiscal expansion* can be assured to raise inflation