DSGE Forecasting and Uncertain Instabilities

Shaun P. Vahey (Melbourne Business School)

June, 2008
Introduction

CB Modelling Strategies

DSGE Development and UI

NB Nowcasting Experience

BATMAN
Forecasting in Norway
The Shape of Future NB System

Conclusions
The Issue

- Model uncertainty now receives substantial attention in macro, eg Forthcoming JAE Special Issue (ed Durlauf and Vahey)

- Renewed emphasis on:
  - Model selection/comparison, and summarising across specifications
  - Evaluation of policy in presence of model uncertainty
Uncertain Instabilities (UI)

- Central role of UI forecasting applications
- Difficult to estimate break dates with real-time data errors and short samples
- Research agenda focus on forecast accuracy with UI
Some Common CB Modelling Approaches

- Calibrated DSGE, no breaks, no tvp, eg RBNZ FPS
- VARs, no breaks
- Factor models, no breaks; see Giannone et al (2007, JME)
No Breaks, Then Certain Instabilities?

- Bayesian VARs, perhaps really big; see Banbura et al (2008, JAE)
- Bayesian DSGE
- Bayesian VARs with TVP, then perhaps coming soon, DSGE with TVP
Common Elements in the Rise of CB DSGE Projects

- Forecasting performance of previous generation core model unconvincing
- Previous generation models too detailed for client (decision maker, DM)
- Need to build human capital
UI Implications for DSGEs

- No constant parameter DSGE model can be even approximately correct

- Optimal policy based on one DSGE model, may not be for other (quite-likely) specifications; see Onatski and Williams (2008)

- Don’t expect DSGEs to forecast well at short horizons—take nowcasting very seriously
Taking Nowcasting Seriously

- Recent history suggests central banks augment core DSGE modeling by adding more rigor to nowcasting

- Examples include: Norges Bank, BOE, Sveriges Riksbank and RBNZ

- Typically aim is not to replace DSGE project, but to supplement it
Benefits From Nowcasting Research

- Draws on empirical human capital built during DSGE modeling project
- Mitigates risk of research team becoming too "model-centric"
- Focus attention on short-term forecasting performance: a key component of monetary credibility
BAyesian Time(-series) Model Average Nowcasting System

- BATMAN System—someone who serves the officer (DM), a military butler

- Expert combination via (Linear Opinion) Pool

- Bayesian interpretation: a form of Bayesian Model Averaging
BATMAN System

- Given $i = 1, \ldots, N$ Experts, convex combination:

$$ p_{\tau}(y_{\tau}, h) = \sum_{i=1}^{N} w_{i, \tau, h} g(y_{\tau}, h \mid I_{i, \tau}), \quad \tau = \tau, \ldots, \bar{\tau} $$

where $g(y_{\tau}, h \mid I_{i, \tau})$ are h-step ahead forecast densities conditional on information set $I_{\tau}$
BATMAN System Details

- Publication delay in production of data ensures that information set contains macroeconomic variables dated $\tau - 1$ and earlier.

- Each individual Expert produces $h$-step ahead forecasts via the direct approach.

- The macro variables used to produce an $h$-step ahead forecast density for $\tau$ are dated $\tau - 1 - h$. 
BATMAN System Recursive Weights

- To weight predictive densities use:
  - Logarithmic score (Amisano and Giacomini, 2007, JBES), Hall and Mitchell (2005, Ox Bull)
  - Information criteria eg BIC, AIC (Kapetanios et al, 2007, JBES)
  - RMSFE (Andersson and Lof at Riksbank)
Forecasting in Norway

Forecasting from Norwegian VARs and DSGE

- VARs and DSGE (approx NEMO)

- DSGE low weight for most recursions 1997Q3 to 2006Q4

- DSGE densities too wide typically—similar findings for NZ (Lees, Mitchell and Vahey, 2007) and Aussie (Gerard and Nimark, 2008)
Quarterly Real Output Growth, Annualised, Per cent

Mean Forecasts

PEW Combination
VAR(4)
AR(2)

Probability Forecasts: \( P(\Delta Y < 0) \)

AR(2)
VAR(4)

Outturn

PEW Combination
DSGE
RW Combination

Figure1.gwg  15:14:37  07-Dec-2007
Table 3: Recursive weights at the end of 2006

<table>
<thead>
<tr>
<th>h=0</th>
<th>GDP growth</th>
<th>Inflation</th>
<th>Interest rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>0.0003</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>AR(rolling)</td>
<td>0.0000</td>
<td>0.115</td>
<td>0.000</td>
</tr>
<tr>
<td>VAR</td>
<td>0.0034</td>
<td>0.000</td>
<td>0.016</td>
</tr>
<tr>
<td>VAR (rolling)</td>
<td>0.1925</td>
<td>0.246</td>
<td>0.661</td>
</tr>
<tr>
<td>DVAR</td>
<td>0.001</td>
<td>0.0004</td>
<td>0.000</td>
</tr>
<tr>
<td>DVAR(rolling)</td>
<td>0.0035</td>
<td>0.060</td>
<td>0.225</td>
</tr>
<tr>
<td>Inf. Detrend</td>
<td>0.0072</td>
<td>0.000</td>
<td>0.002</td>
</tr>
<tr>
<td>Inf. Detrend (rolling)</td>
<td>0.2511</td>
<td>0.522</td>
<td>0.004</td>
</tr>
<tr>
<td>BiVAR</td>
<td>0.0032</td>
<td>0.000</td>
<td>0.005</td>
</tr>
<tr>
<td>BiVAR rolling</td>
<td>0.5385</td>
<td>0.056</td>
<td>0.087</td>
</tr>
<tr>
<td>DSGE</td>
<td>0.0000</td>
<td>0.056</td>
<td>0.087</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>h=4</th>
<th>GDP growth</th>
<th>Inflation</th>
<th>Interest rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR</td>
<td>0.072</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>AR(rolling)</td>
<td>0.000</td>
<td>0.001</td>
<td>0.812</td>
</tr>
<tr>
<td>VAR</td>
<td>0.002</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>VAR (rolling)</td>
<td>0.000</td>
<td>0.021</td>
<td>0.000</td>
</tr>
<tr>
<td>DVAR</td>
<td>0.574</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>DVAR(rolling)</td>
<td>0.000</td>
<td>0.068</td>
<td>0.000</td>
</tr>
<tr>
<td>Inf. Detrend</td>
<td>0.014</td>
<td>0.001</td>
<td>0.000</td>
</tr>
<tr>
<td>Inf. Detrend (rolling)</td>
<td>0.000</td>
<td>0.760</td>
<td>0.000</td>
</tr>
<tr>
<td>BiVAR</td>
<td>0.337</td>
<td>0.001</td>
<td>0.081</td>
</tr>
<tr>
<td>BiVAR rolling</td>
<td>0.000</td>
<td>0.149</td>
<td>0.108</td>
</tr>
</tbody>
</table>

Notes: Weights on selected subsets of models; see Table 1 for a description of the models.
The Shape of Future NB System

**BATMAN’s Components**

- ARs, factor models, VARs, BiVARs, TVP-BVARs
- DSGE policy model(s)
- Judgement and timely survey data
The Shape of Future NB System

NB Project Overview, Phase III

- September 2008 to July 2009, implementation
- Implement “front-end” suitable for regular policy use by non-specialists
- Prepare for future external evaluation of Norges Bank modeling, (Nowcasting plus DSGE, NEMO)
Conclusions

- Unknown instabilities literature suggests need for model diversity

- Many central banks find that nowcasting project provides an avenue to explore DSGE and UI

- The NB experience will be watched carefully by other central banks