Putting the New Keynesian DSGE model to the real-time forecasting test

by

M. Kolasa , M. Rubaszek and P. Skryzpczinski

Discussant Kai Christoffel

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Introduction

Forecasting with DSGE models has reached some maturity, both in application in policy process but also in academic research:

- various 'handbook' articles on forecasting with DSGE models.
- increasing interest in 'real-time data' applications to be able to make proper comparison to forecasts based on other methods.

Del Negro and Schorfheide (2012): Handbook on Forecasting

Table 3: A Sample of Studies Reporting RMSEs for Medium-Scale DSGE Models

Study	Forecast Origins	Real Time
Rubaszek and Skrzypczynski (2008)	1994:Q1 - 2005:Q3	Yes
Kolasa, Rubaszek, and Skrzypczyński (2010)	1994:Q1 - 2007:Q4	Yes
Graeve, Emiris, and Wouters (2009)	1990:Q1 - 2007:Q1 (h=1)	No
Wolters (2010), Del Negro-Schorfheide Model	1984:Q1 - 2000:Q4	Yes
Wolters (2010), Fuhrer-Moore Model	1984:Q1 - 2000:Q4	Yes
Wolters (2010), SW Model	1984:Q1 - 2000:Q4	Yes
Wolters (2010), EDO Model	1984:Q1 - 2000:Q4	Yes
Edge and Gürkaynak (2010)	1992:Jan - 2004:Q4	Yes
Edge, Kiley, and Laforte (2009)	1996:Sep - 2002:Q4	Yes
Smets and Wouters (2007)	1990:Q1 - 2004:Q4 (h=1)	No
Del Negro, Schorfheide, Smets, and Wouters (2007)	1985:Q4 - 2000:Q2 (h=1)	No
Schorfheide, Sill, and Kryshko (2010)	2001:Q1 - 2007:Q4 (h=1)	No

Introduction

What is the focus and contribution of this paper?

- forecasting with DSGE and DSGE-VAR models: real time dimension for US.
- benchmarking against the Survey of Professional Forecasters (SPF)
- 'conditioning' DSGE forecasts on SPF.

Introduction

Results:

1. taking into account 'nowcast' from SPF improves real time forecasting performance of nominal variables.
2. DSGE models outperforms DSGE-VAR in forecasting *key* US macro variables.
3. absolute errors of DSGE remain 'unsatisfactory'.

The real time dimension

- obviously, the real time dimension is important for a fair comparison of DSGE to SPF.
- comes closer to the actual use of DSGE models in policy environment.
- can we say more on the real-time perspective and on the information content of the SPF nowcast?

The real time dimension

SPF nowcast versus revised data

- in terms of RMSE using the nowcast helps to improve the DSGE forecast.
- repeating the exercise with the revised data could provide an additional forecast to benchmark the value of the SPF nowcast.
- (maybe include some examples how the predictive density is shifted once we condition on SPF or use the revised data).

The real time dimension

Wages are dropped from set of observable variables, because they are not part of the Philly Fed real time data base.

- Del Negro and Schorfheide use real time data provided by BLS (Labor and Productivity Costs).
- dropping wages implies loosing an important dimension of the empirical analysis.
- comparability to several other studies using the Smets and Wouters model for forecasting with DSGE models for the US is also diminished when dropping wages.

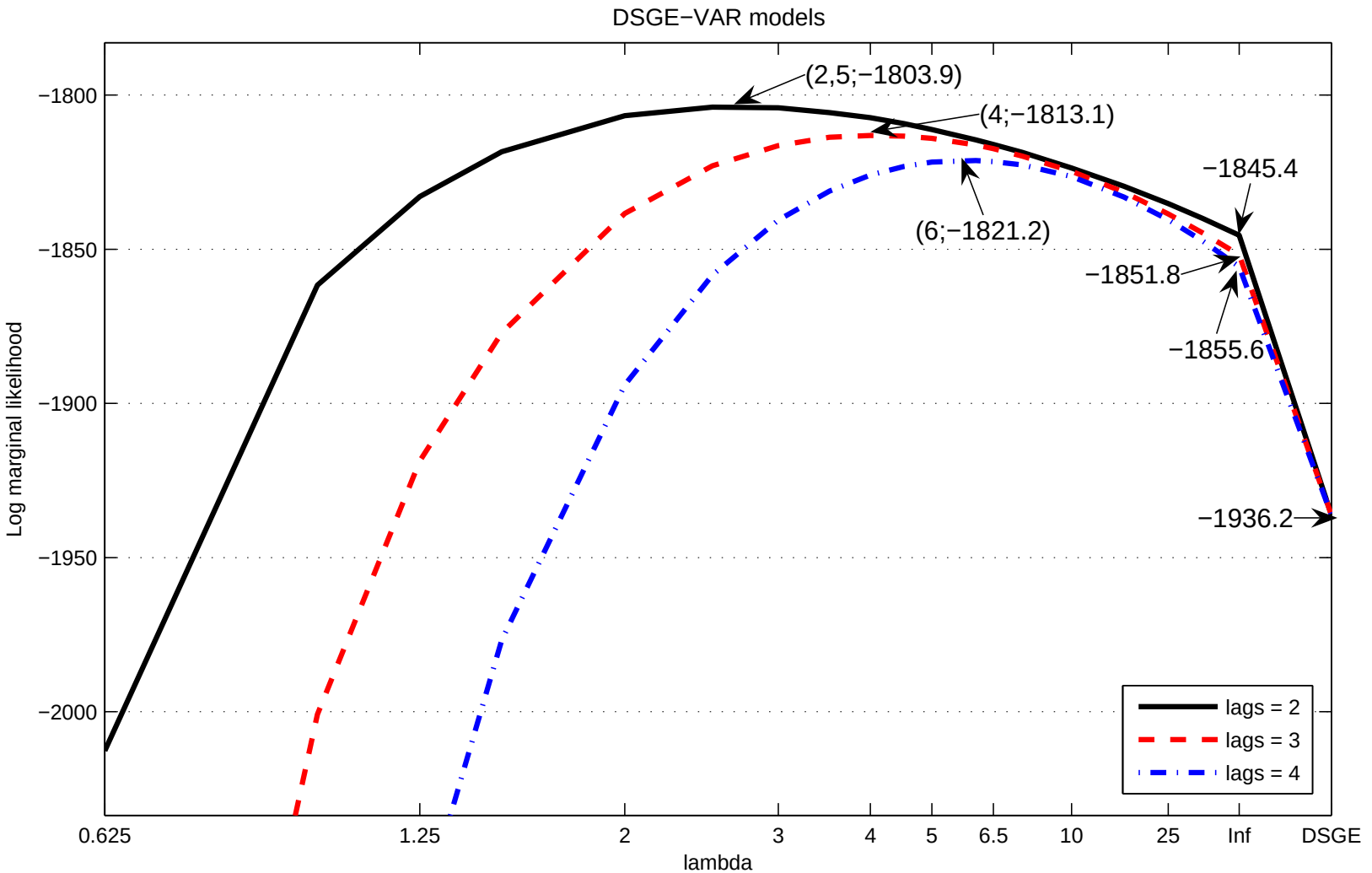
Why is the DSGE outperforming the DSGE-VAR?

The authors stress one result as striking:

" ...RMSEs from the DSGE model are at least as low as those from the DSGE-VAR for most variables and horizons".

- most studies find that DSGE-VAR outperforms DSGE in terms of forecasting.
- unrestricted VARs or VARs with diffuse priors don't do well because of overparametrization.
- DSGE based forecasts suffer from mis-specification, cross-equation restriction that are actually wrong.
- in DSGE-VARs the hyperparameter λ gives the relative weight that should be placed on the DSGE implied priors.
- Del Negro et al (2007) find that marginal likelihood of the DSGE-VAR shows an 'inverse U-shaped' function of λ.

Marginal Likelihood as a function of λ (in NAWM)



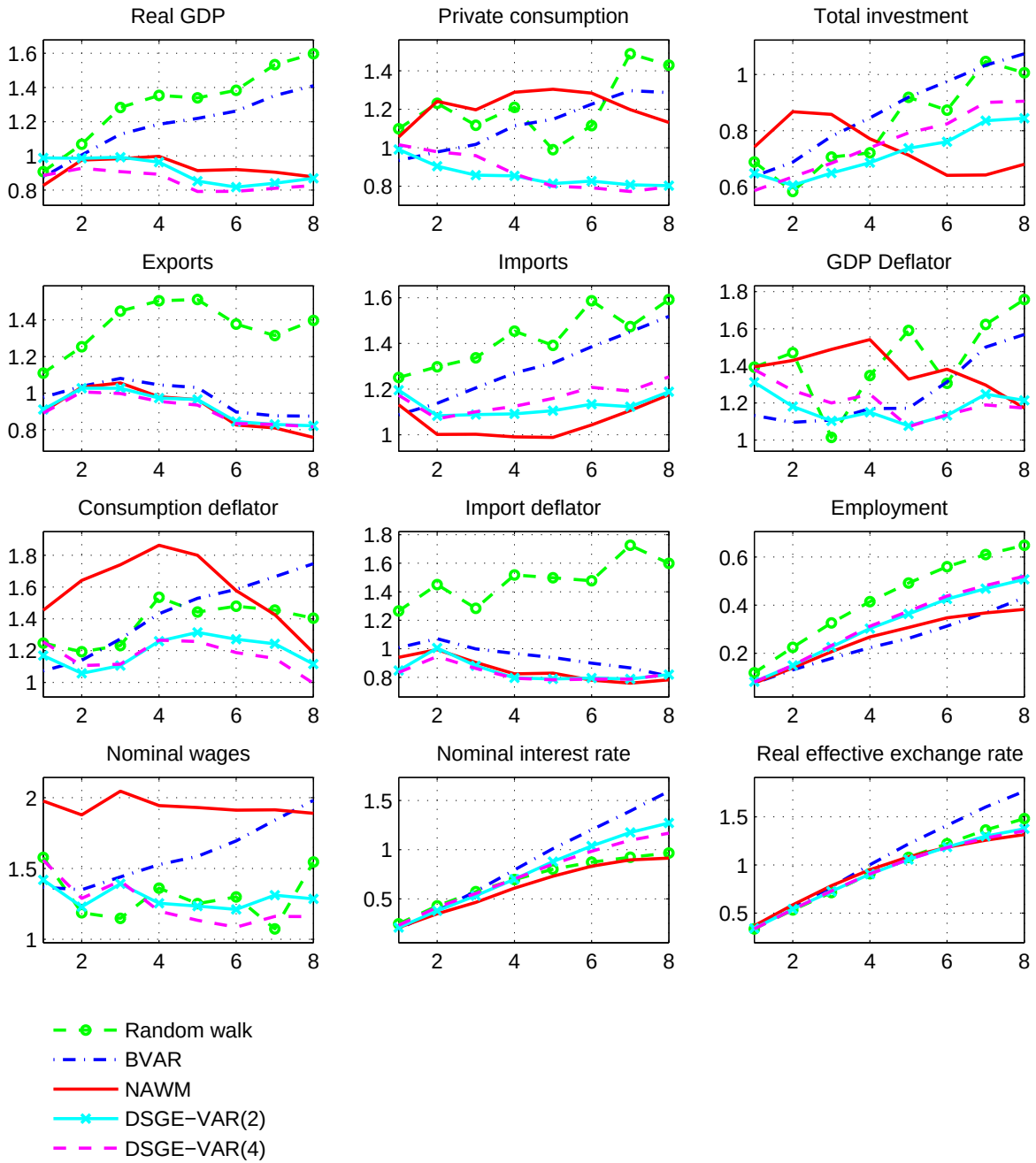
Why is the DSGE outperforming the DSGE-VAR?

- they argue "a VAR with a small number of lags is usually a poor approximation to a DSGE model with infinite-order VAR approximation" (see Chari et al., 2008).
- but the argument is more relevant if we want to identify the structural shocks directly from the VAR (Christiano et al., 2007).
- showing the plot of the marginal likelihood could help to see if the VAR approximation is the sorce of the problem.

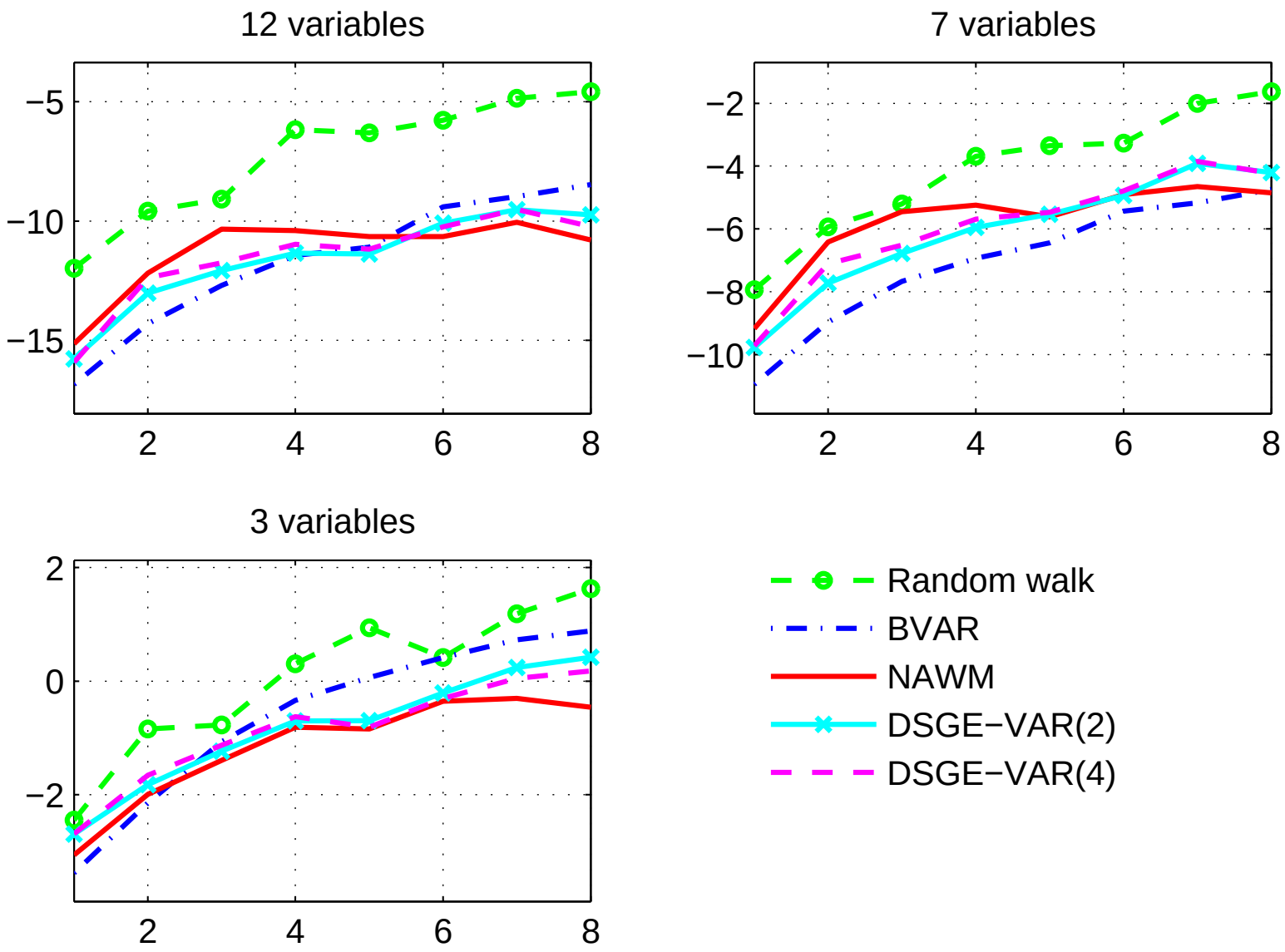
Why is the DSGE outperforming the DSGE-VAR?

- in-sample fit versus out-of-sample fit (or marginal likelihood versus predictive likelihood) could be an explanation why they get an 'interior' λ but an outperforming DSGE model.
- furthermore the DSGE-VAR is based on maximum likelihood criteria , while they evaluate forecast performance using univariate statistics.
  $\Rightarrow$ analyse the RMSE of all observable variables or go for a multivariate statistic such as log-determinant statistics.

RMSE in Warne et al. 2012



LogDeterminant in Warne et al. 2012



DSGE-VAR for forecasting and mis-specification

- even if the DSGE-VAR is outperformed by the DSGE is could be useful to use it to find out more about mis-specification of the DSGE.
- for example by comparing the estimated parameters over the range of DSGE-VAR models and the DSGE.
- maybe this could also help to improve the overall forecast performance of the DSGE which is considered to be 'poor'.

Summary

- interesting paper which helps to place DSGE and DSGE-VARS in the array of forecasting models.
- bringing the exercise closer to the standard model in terms of observables could further increase the value added.
- adding further (multivariate) statistics could broaden the comparison between DSGE ad DSGE-VAR.
- try to identify where (which variables) the DSGE model is not performing well.