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Abstract:
Our work may be broadly divided into 3 parts.
In all parts , we proposed ourselves to give an example, using the same simple DSGE model from macroeconomic theory, of how researchers may quantify uncertainty in a State-Space Model(SSM) using a discrepancy term with a Gaussian Process(GP) prior. The main inspiration for this method of uncertainty quantification is [1]. So far, and to the best of our knowledge, no application of GP with the purpose of model uncertainty has ever been used in Macroeconomics.

The first part of the work, we used a full GP prior on the discrepancy term. Our experiments showed that despite the heavy computational constraints of our full GP method, we still managed to obtain a very interesting forecasting performance with such a restricted sample size, when compared with similar uncorrected DSGE models, or corrected DSGE models using state of the art methods for time series, such as imposing a VAR on the observation error of the state-space model. We relied on some work done in [2], where the authors do a GP regression, in a SSM.

In the second part of our work, we improved on the computational performance of our previous method, using what has been referred in the literature as Hilbert Reduced Rank GP. This method has close links to Functional Analysis, and the Spectral Theorem for Normal Operators, and Partial Differential Equations. It indeed improved the computational processing time, albeit just slightly, and was accompanied with a similarly slight decrease in the forecasting performance.

The third part of our work delved into how our method would account for model uncertainty just prior, and during, the great financial crisis of 2007-2009. The results were mildly interesting. Our technique allowed us to capture the crisis, albeit at a reduced applicability due to computational constraints. This latter part also was used to deepen the understanding of our model uncertainty quantification technique with a GP. Identifiability issues were also studied. One of our overall conclusions was that more research is needed until this uncertainty quantification technique may be used in as part of the toolbox of central bankers and researchers for forecasting economic fluctuations, specially regarding the computational performance.

References
[1] M. Kennedy, A. O'Hagan. Bayesian calibration of computer models, Royal Statistical Society B. 2002.
[2] R. Frigola-Alcalde, F. Lindsten, T. Schön and C. Rasmussen. Bayesian Inference and Learning in Gaussian Process State-Space Models with Particle MCMC, Advances in Neural Information Processing Systems. 2013.
[1] A. Svensson, A. Solin, S. Särkkä, T. Schön. Computationally Efficient Bayesian Learning of Gaussian Process State-Space Models, Proceedings of the 19th International Conference on Artifical Intelligence and Statistics. 2016.

Short biography
32 years
No links to industry
An undergraduate degree in Applied Mathematics, and a Master in Economics.