Paper discussion
State-Dependent Macroeconomic Policy Effects: A Varying-Coefficient VAR

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BANK OF ENGLAND

Advanced analytics:
new methods and applications for macroeconomic policy

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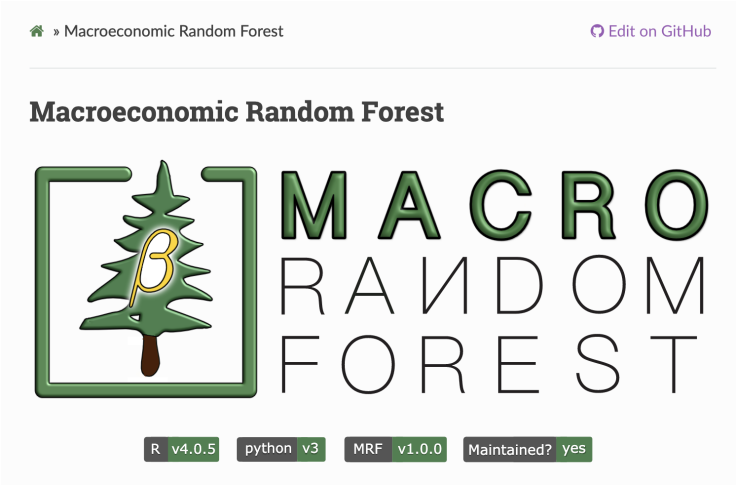
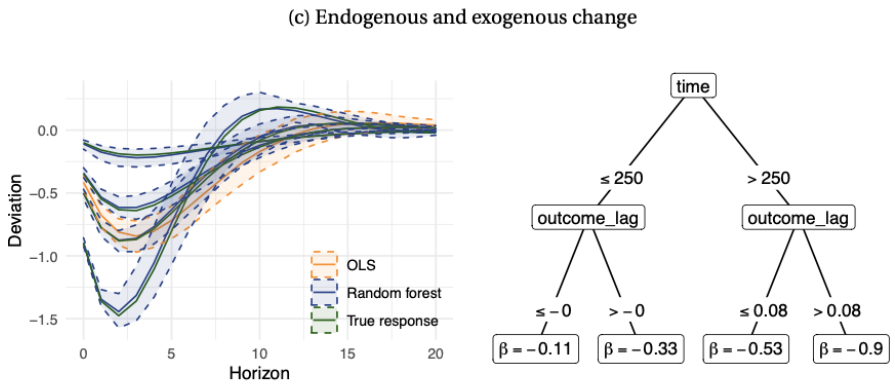
Recap on key methods





Key methods

- Varying Coefficient VAR

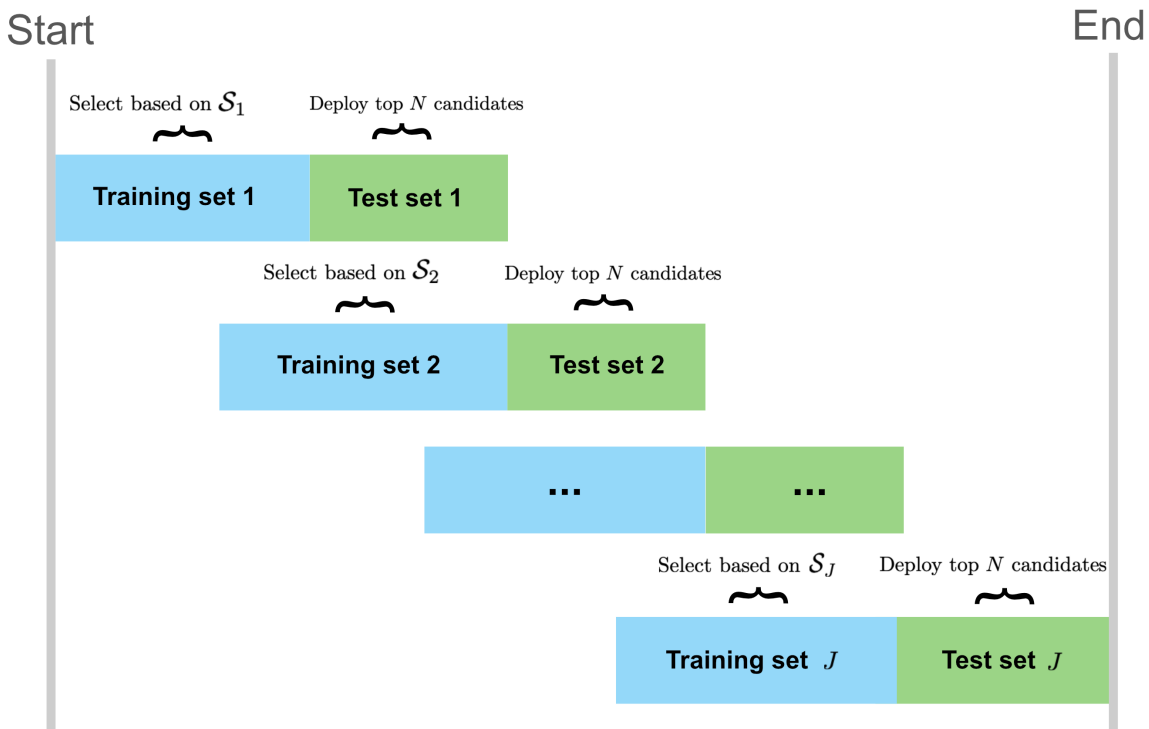
$$y_t = \beta_t \varepsilon_t^{PolicyShock} + x_t^T \gamma_t + u_t$$

  where x_t is the control vector.
- Policy coefficient modelling: β_t as a tree function of economic inputs.
- Standard Random Forest algorithm (Buergin and Ritschard 2017) [1]
- Obtained state-dependent Impulse Response Function for policy analysis

[1] Buergin, R. A. & Ritschard, G. (2017). Coefficient-wise tree-based varying coefficient regression with vcrpart. Journal of Statistical Software, 80(6), 1–33.

Estimating time-varying relationships

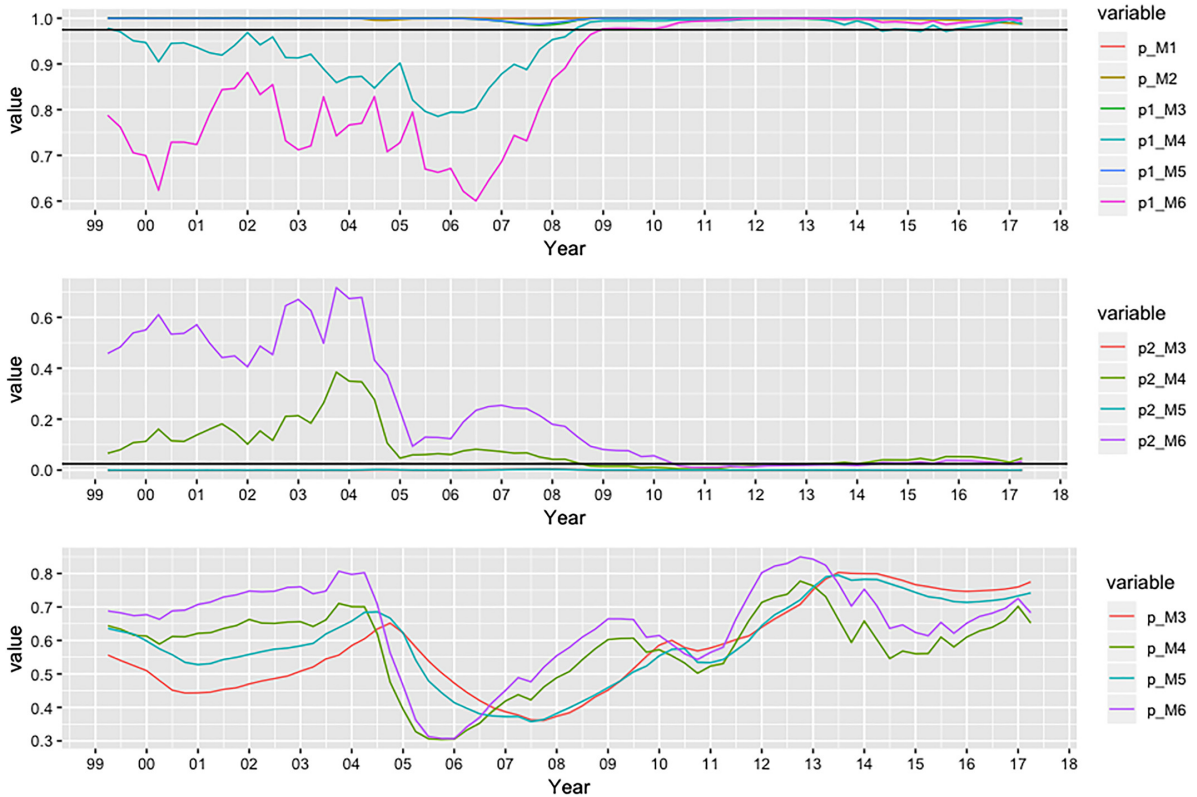
Consider adaptive methods of model determination or ensembling, such as Yang and Lucas (2022)[2]



[2]Yang, P. R. & Lucas, R.(2022). DMS, AE, DAA: methods and applications of adaptive time series model selection, ensemble, and financial evaluation. arXiv:2110.11156v3.

Interpreting time-varying relationships

Example: adaptive methods on yield curve [3]



[3] Yang, P. R. (2020). Using the yield curve to forecast economic growth. Journal of Forecasting, 39: 1057– 1080. https://doi.org/10.1002/for.2676

Robust estimation and user-algorithm interactions

- In this paper:

$$(\hat{C}_m, \hat{\beta}_m)_{m\in[M]} = \underset{(C_m,\beta_m)_{m\in[M]}}{\arg\min} \sum_{t\in[T]} (y_t - \hat{y}_t((C_m, \beta_m)_{m\in[M]}))^2$$

- More generic loss function suitable for time series modelling and forecasting (Yang and Lucas 2022):

$$\ell(\lambda, p) := \sum_{\tau=t-v+1}^{t} \lambda^{t-\tau} |\hat{y}_{\tau|\tau-k} - y_\tau|^p$$

- Various change-point literature

Conclusion

1. Innovative use of tree method for macroeconomic policy analysis.
2. Further time-series statistical engagements:
   - Robust estimation and change-points
   - Adaptive methods and associated interpretations