

# NOWCASTING TRADE WITH MACHINE LEARNING A THREE-STEP APPROACH

Menzie CHINN, Baptiste MEUNIER, Sebastian STUMPNER

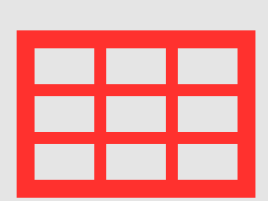


## Motivations

- Trade in *volumes* available with considerable lag
- Numerous trade indicators available in the meantime
- Trade highly volatile

→ Why not nowcasting?

→ Why not non-linear approach – what about machine learning?



## Data

- 600 variables
- Covering all aspects of the economy
- Identified in literature on trade nowcasting



## Approach

- Setting a three-step framework
- Distinguishing *tree*-based and *regression*-based among machine learning methods

### Pre-selection

- Ranking by predictive power
- Improving accuracy in factor models



### Factor extraction

- Summarizing information (of selected variables)
- Orthogonalizing inputs to regression



### Non-linear regression (on factors)

#### “Traditional”

Markov-switching  
Quantile reg.

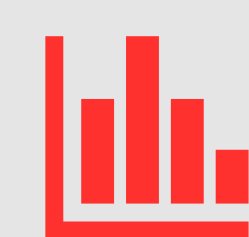
#### Machine learning

##### Tree-based

Random forest  
Gradient boosting

##### Regression-based

Macroeconomic RF  
Linear GB



## Main results

Figure 1. Accuracy relative to OLS (= 1)

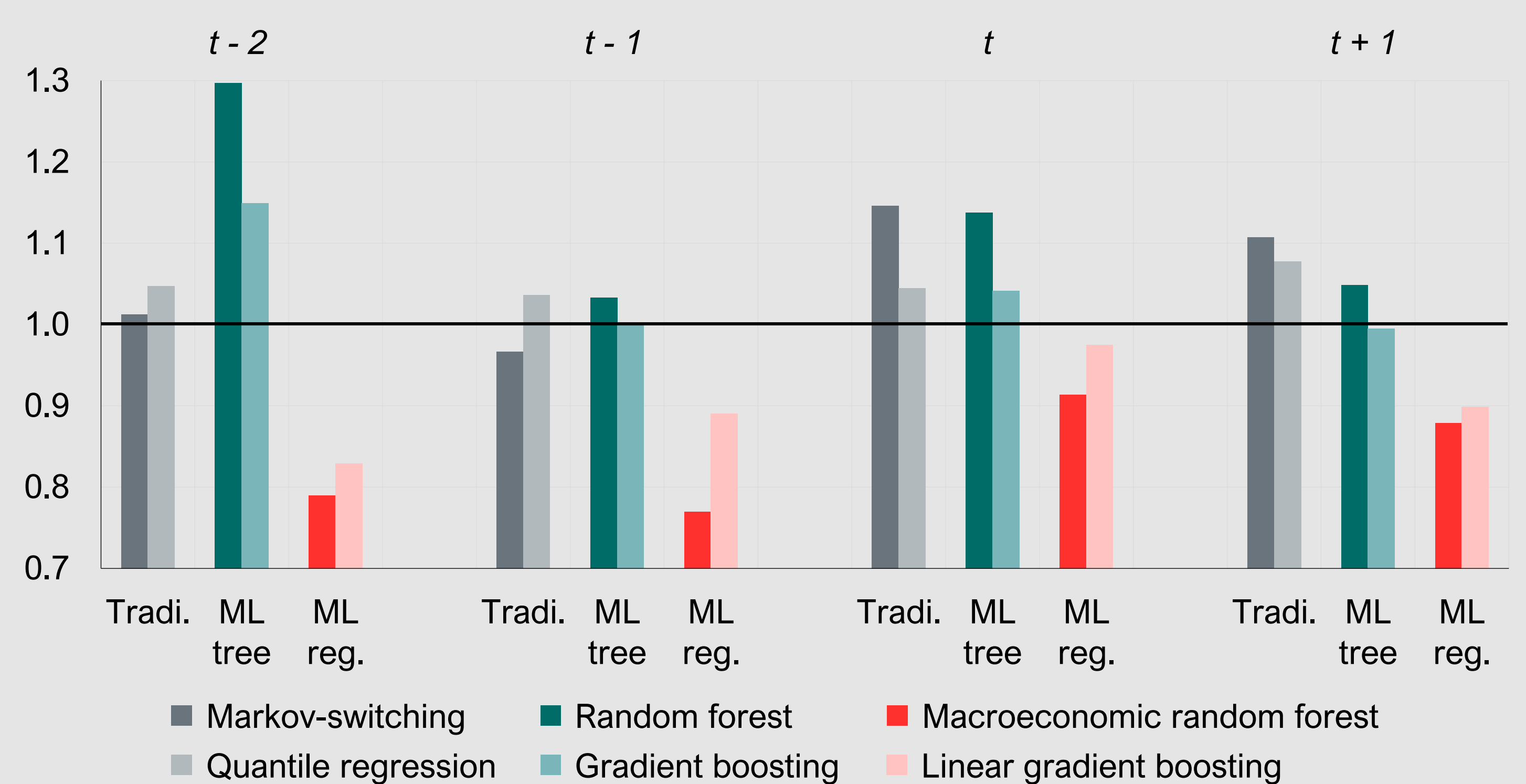


Figure 2. Accuracy relative to no pre-selection (= 1)

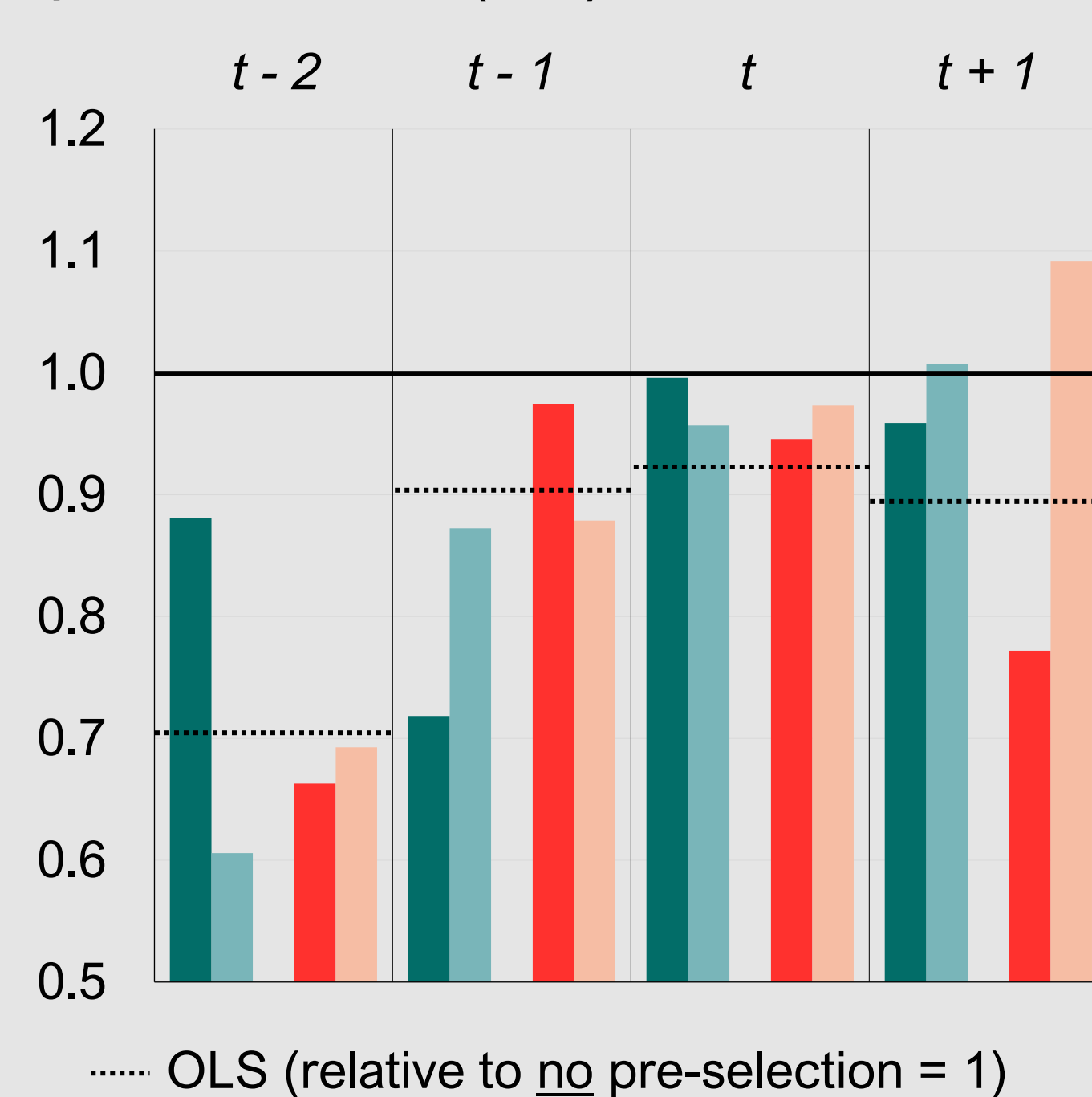
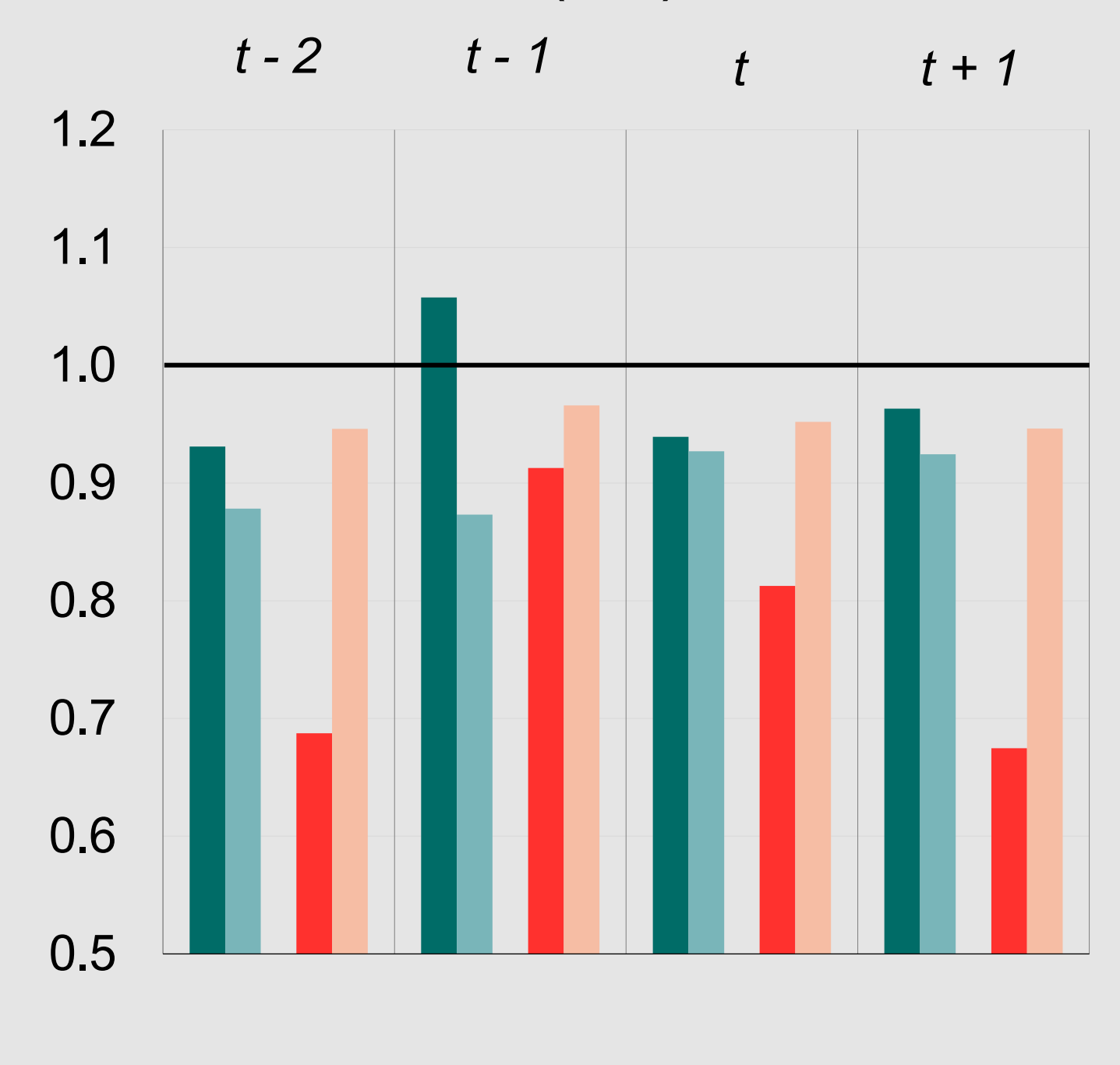


Figure 3. Accuracy relative to no factor extraction (= 1)



Notes: Accuracy measured by out-of-sample RMSE over Jan. 2012 - April 2022. Results averaged over datasets mirroring data available to forecaster at 1<sup>st</sup>, 11<sup>th</sup>, and 21<sup>st</sup> days of the month, using LARS for pre-selecting the 60 most informative regressors, and extracting factors with PCA on pre-selected set.



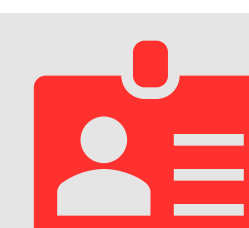
## Key takeaways

- *Regression*-based machine learning (ML) outperforming significantly usual *tree*-based ML and benchmarks (linear and non-linear)
- Machine learning performance significantly enhanced by pre-selection and factor extraction
- Approach outperforming a dynamic factor model



## Real-time horserace

- *In-sample* pre-selection and hyper-parametrization
- *Out-of-sample* back-casts ( $t-2$  and  $t-1$ ), now-cast ( $t$ ) and forecast ( $t+1$ )
- Over Jan. 2012 to Apr. 2022



## Contact

baptiste.meunier@ecb.europa.eu