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Discussion:
How is machine learning useful for macroeconomic forecasting?

Chiara Osbat, ECB

@ Modelling with Big Data and Machine Learning: Interpretability and Model Uncertainty
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Start with why

Question: How is ML useful for macro forecasting?

Brief answer: by allowing non-linearity (in a sparse setting).

I would take a step back and ask: WHY do we do macro forecasting?

Policy maker perspective:

1. Not only care about MSPE: also e.g. error dependence and turning points
2. We forecast to see if we need to do something → we might be willing to sacrifice some precision for interpretability

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Let’s look at the “what”: a horse race

Horse race among models that differ by some characteristics

5 target variables, USA, monthly:

1. Industrial production
2. Unemployment
3. Term spread
4. CPI inflation
5. Housing starts

Use standard US monthly macro dataset

Compute MSPE relative to simple benchmark

Core of the paper: what model features help reduce the MSPE?

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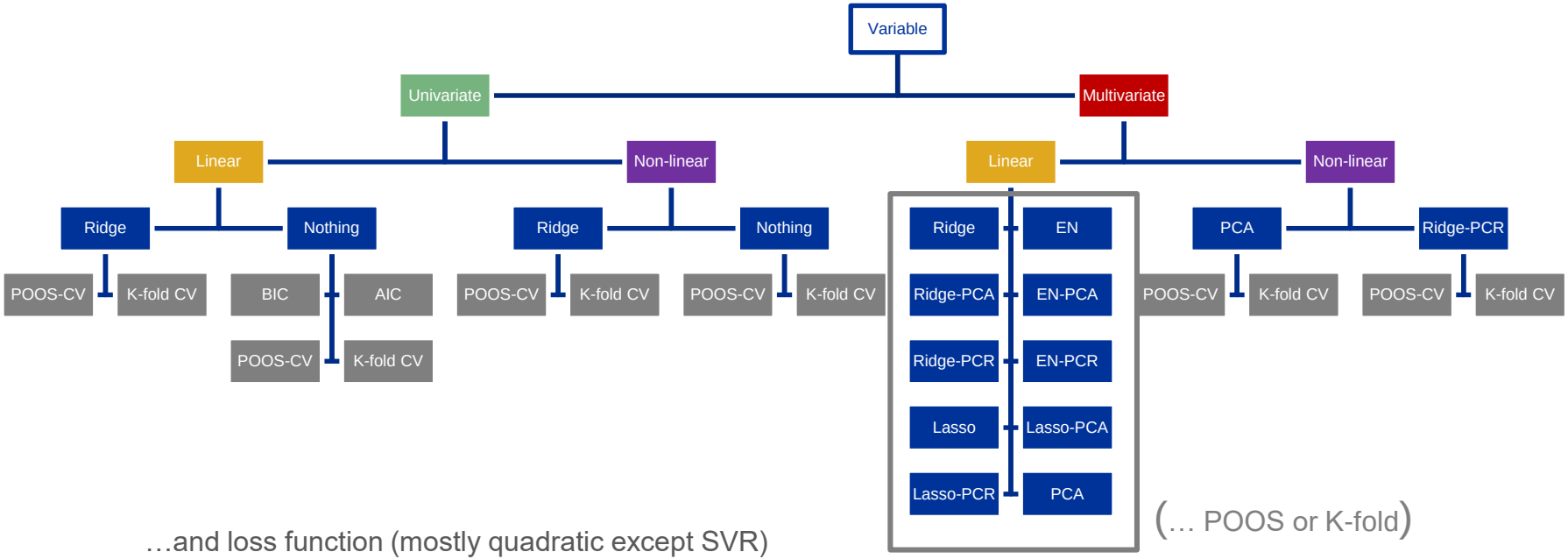
Let's look at the "what": model features



(… POOS or K-fold)

…and loss function (mostly quadratic except SVR)

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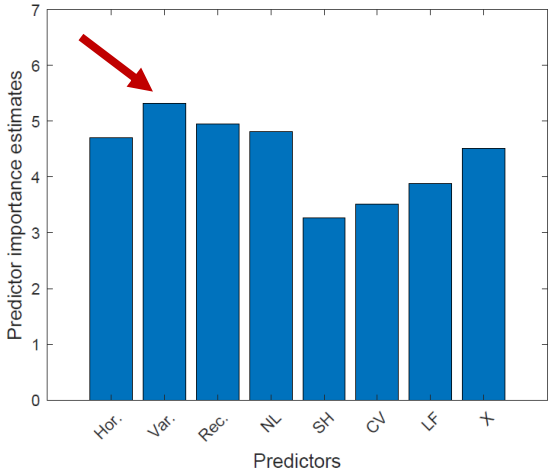
Very useful contribution: Which model features improve MSPE?

Look at it in 2 ways:

1. Random forest on the $R_{t,h,v,m}^2$
2. Regression with all "features" tells which ones are most important in reducing MSPE → partial effect of each feature

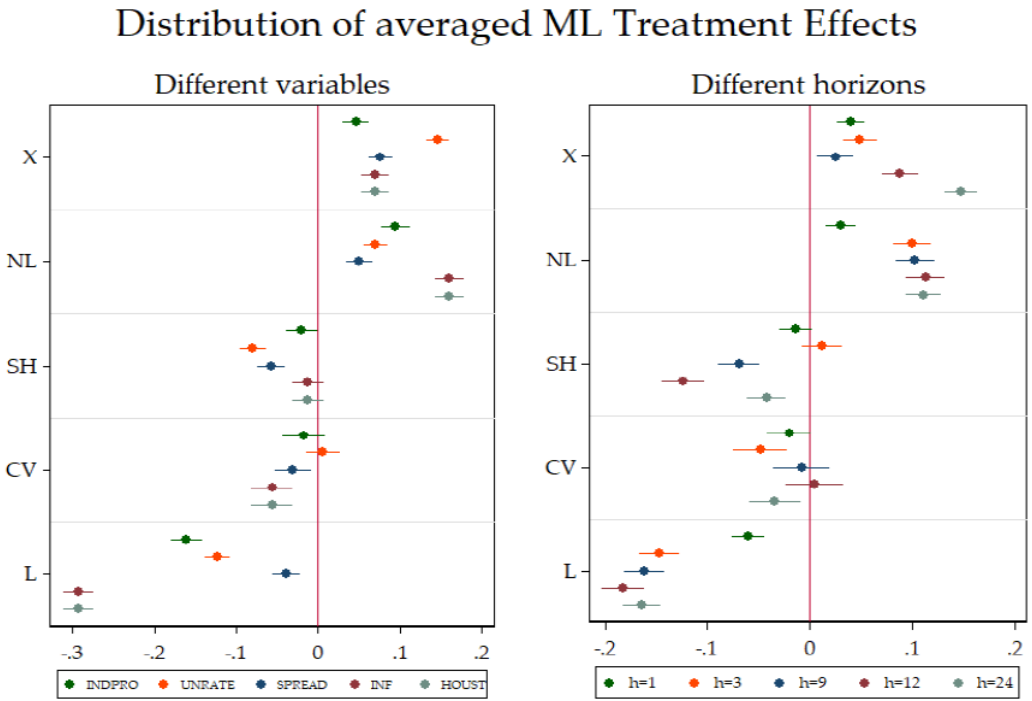
~ response surface analysis but we do not control the DGP

➔ Can you generalise beyond those 5 variables to “macroeconomic forecasting“?



Which model features improve MSPE?

Hard to see the big picture, the partial graphs help more:



Look into why CV is detrimental: K-fold outside its applicability range?

Loss function: maybe to be expected if the evaluation is on a quadratic loss?

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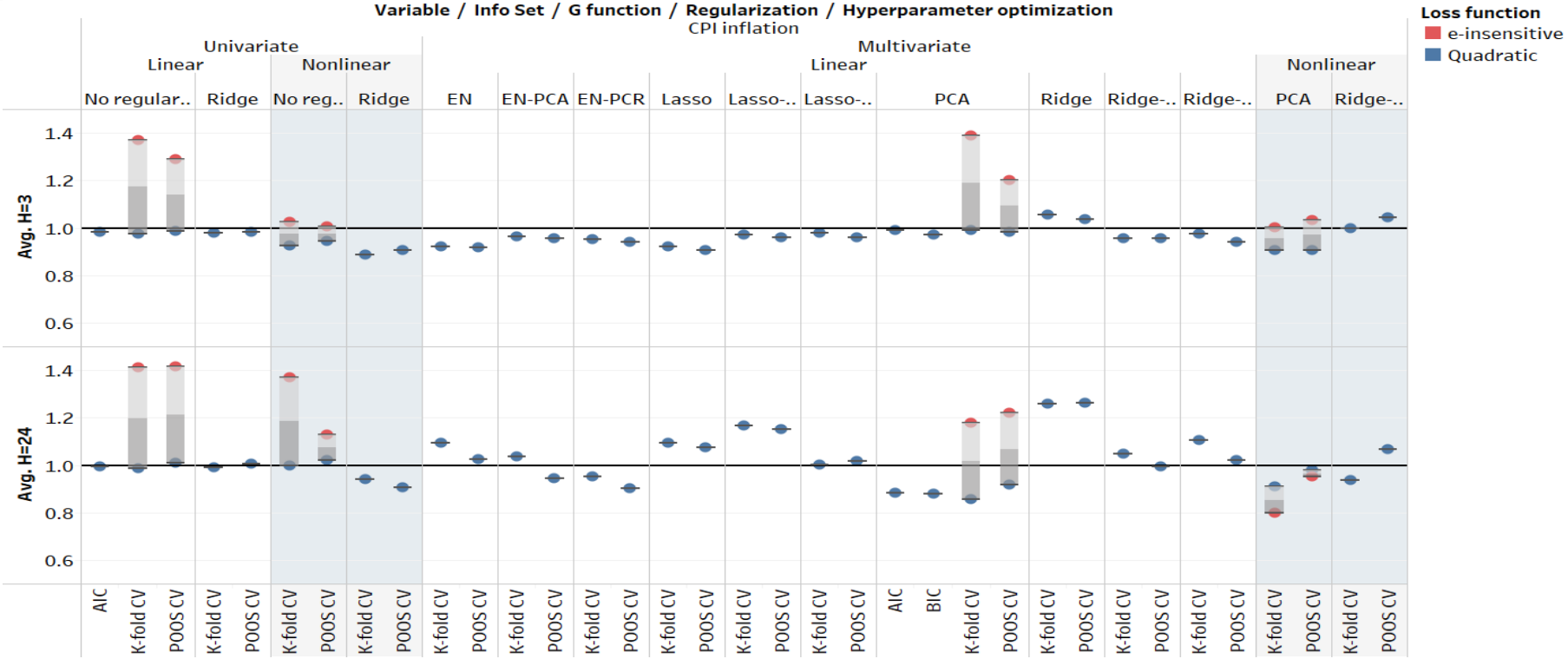
Drilling down: CPI inflation: different models at ≠ h?



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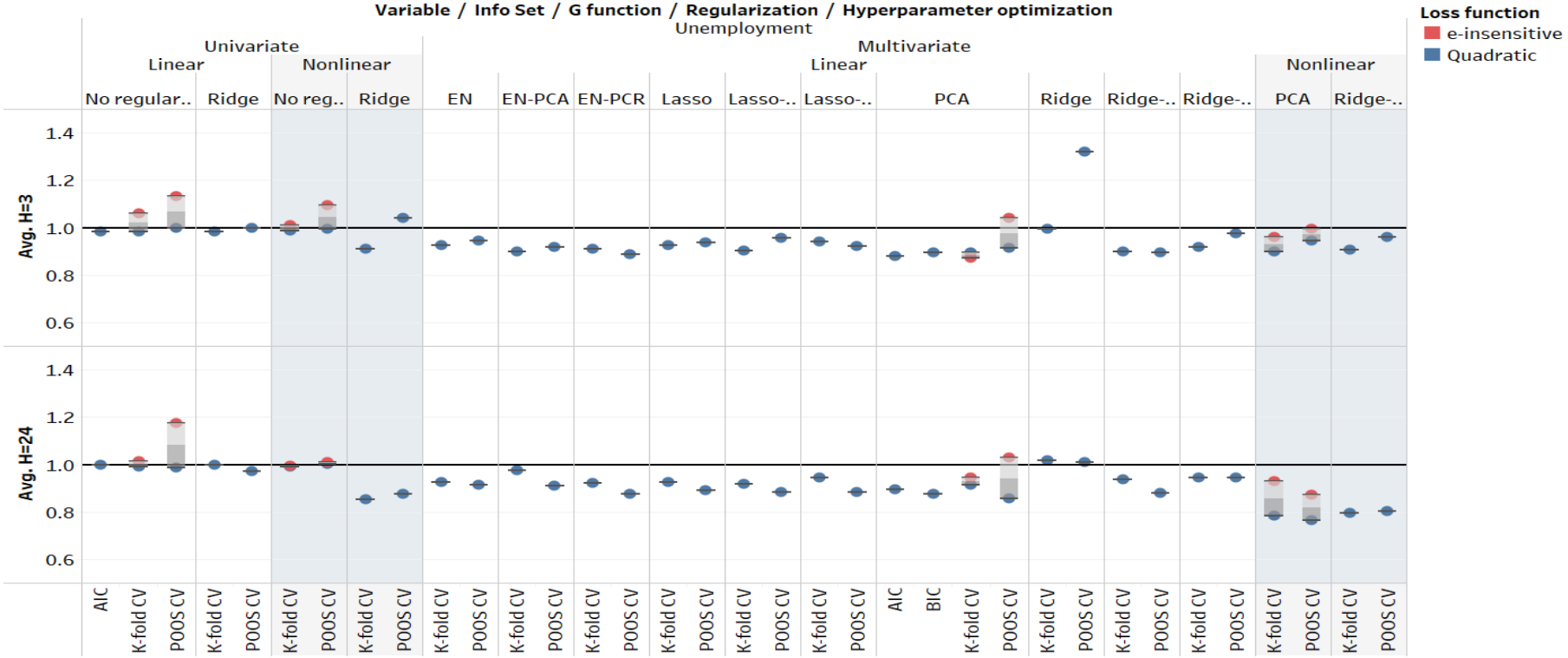
Drilling down: Unemployment: more nonlinearity?



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What I would do differently as a practitioner

- “Macroeconomic forecasting” is not well defined: separate by variable
- Use real time data or at least reproduce timeliness structure
- Also compare with other standard benchmarks: Blue Chip, SPF, Fed staff forecasts (give more emphasis to the quarterly results?)
- Look at more than MSPE: e.g. persistence of errors, predicting turning points
- Embed the analysis of the last section “Opening the Black Box” in the framework:
  - When and why does non-linearity help?
  - What form of it: interactions, thresholds?
- Could there be more value in the original dataset? Do I lose predictability if I regularise the original variables rather than starting with PCA?
  - Then look at feature importance among the best performing models
- Drop the “treatment effects” analogy

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