If stress tests are predictable, are they still useful?

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What is a stress test?

A risk-management instrument used by banks and regulators to assess resilience in a hypothetical “what if” scenario.
Metric that Matters: Capital Ratio

$$Cap.Ratio = \frac{Capital}{Risk\, weighted\, assets}$$

Single number that captures stress test result. Key input into further regulation.

Pre 2016: “Pass” if cap. ratio > hurdle. This has been scraped from the test.
Surrogate Model

Actual Stress Test

State of the world → Macro Scenario → Risk factors → Impact function → Results

Surrogate

State of the world
- Macro
- Firm specific

Machine Learning Model
- Our Case: Random Forest Regression

Results
- Capital ratios
Informative Errors

- The stress test is just a model so its result $\theta$ is in part the true (unobservable) crisis behavior $\gamma$ and in part noise $\nu$
  
  $$\theta = \gamma + \nu$$

- When predicting the stress test outcome, we model both
  
  $$\hat{\theta} = \gamma + \nu + \epsilon_\gamma + \epsilon_\nu$$

- Ideally, the error from our model helps to improve the estimate $\gamma$

- This becomes easier if more about $\nu$ is known

- A new way of looking at optimal disclosure?
Training Procedure

- Use 2014 data to predict 2016, use 2014 & 2016 data to predict 2018
- Balance sheet and income statement from year before test
- Macroeconomic data from macroeconomic imbalance procedure
- In sample feature selection with random forest

- Conservative data use, scenario not an input
- (Specific data use subject to change in further research)
Selected Features (2014)

R1,…,R4 are profitability ratios
2016 prediction vs result $R^2 = 0.748$
Selected Features (2014, 2016)
2018 Prediction vs Result $R^2 = 0.480$
Takeaways

- Recent stress tests can be predicted fairly well even from little data.
- That does not mean we can also predict crisis from the same data.
- But we can provide more frequent ML driven insight.
- If setup right, stress tests can calibrate surrogate models.
Thank you for listening