

ESM STOCHASTIC DSA

DSA conference

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OVERVIEW OF DSA TOOLS & MARKET DISTRESS DEFINITION

Reduced-Form

- Traditional DSA spreadsheet
- Early Warning System analysis → short-term
- Stoch DSA: BVAR & Entropy Simulation Techniques → medium-term

Structural Forward Looking

- DSGE
- Different Monetary/Fiscal Policy interaction regimes

Definition of Market Distress

- Sovereign spreads increasing above 350bp (Zigraiova et al. 2019)

THE STOCHASTIC DSA – CHARTING THE FUTURE

New IMF MAC-DSA two-step approach

- Draw from unconditional distribution of debt drivers
- Centre simulations around baseline (with some twists if simulations signal ‘optimism’ or ‘pessimism’)

The synthesis: IMF approach with a twist

- Internal BVAR model for stochastic simulations
- Entropic methods to ‘*tilt*’ BVAR density towards baseline (Robertson et al. 2005, Cogley et al. 2005).

→ Asymmetric fan chart as a realism check

A TWO-STEP APPROACH

Unconditional forecast from mean-adjusted BVAR (Villani 2009)

- BVAR captures auto-correlation (realism), flexibility to work with limited data points
- Long-term behaviour anchored to baseline assumptions

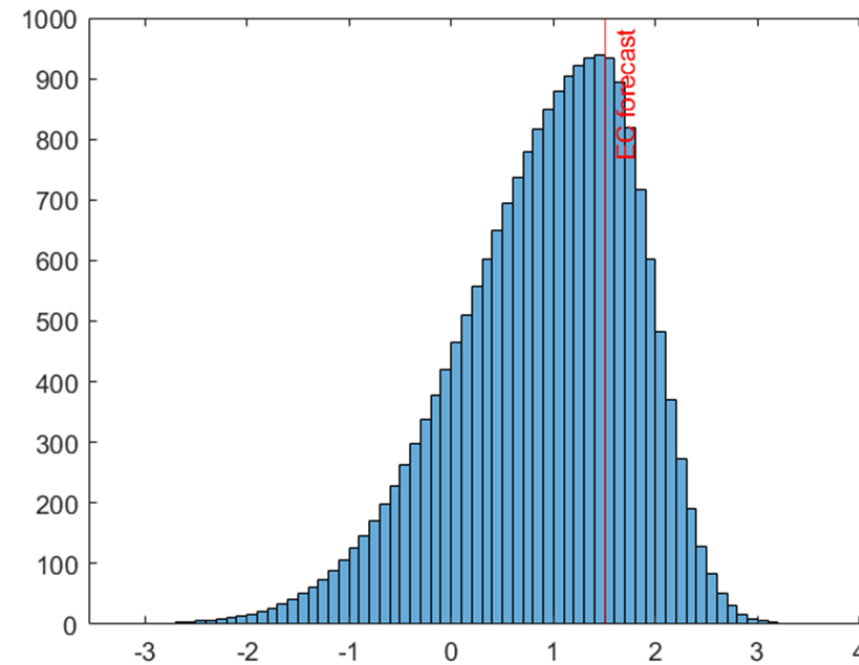
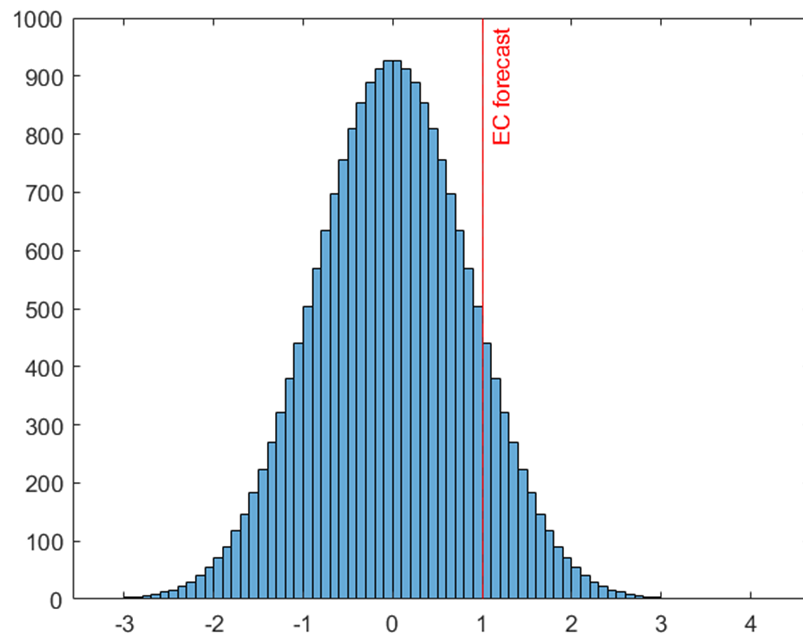
Combine BVAR projections with baseline scenario (Entropy simulations)

- Parametrize predictive density as two-part normal distribution
- Tilt BVAR density to impose baseline as the most likely value (mode)
- Adapt methodology used for BoE inflation fan-chart to a multivariate context

STEP 2 – COMBINE BVAR SIMULATIONS WITH THE BASELINE

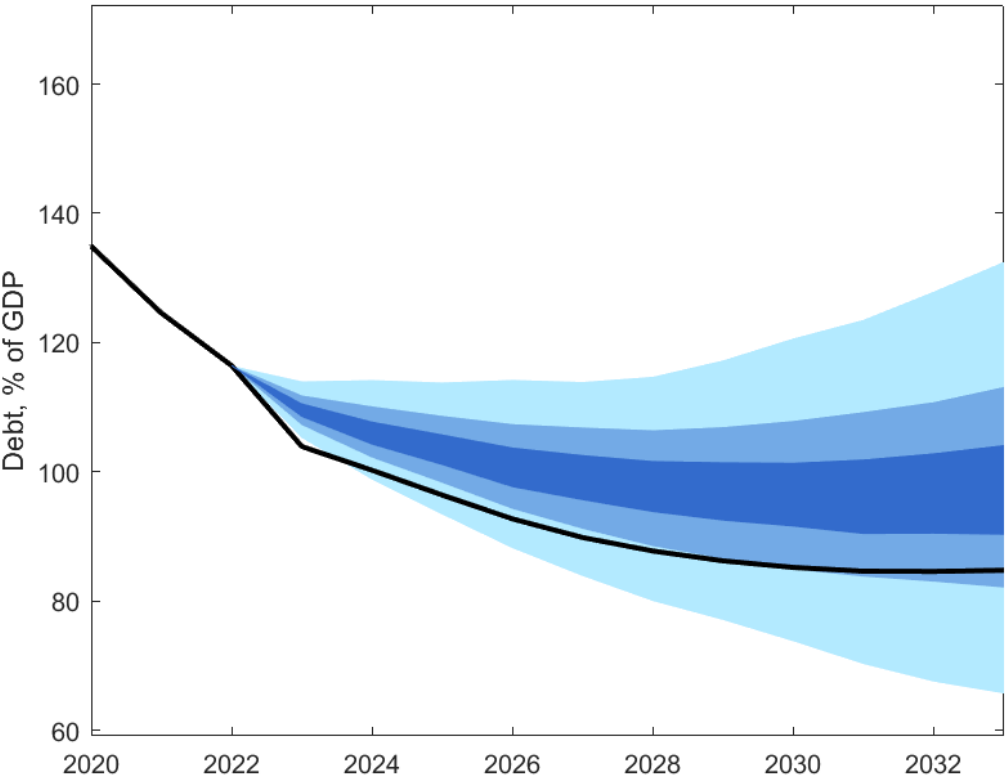
Tilt BVAR distribution by shifting density mass toward the baseline

- Parametrize a two-part normal with baseline as the mode for each debt driver
- Use quantiles to map BVAR simulations into new distribution

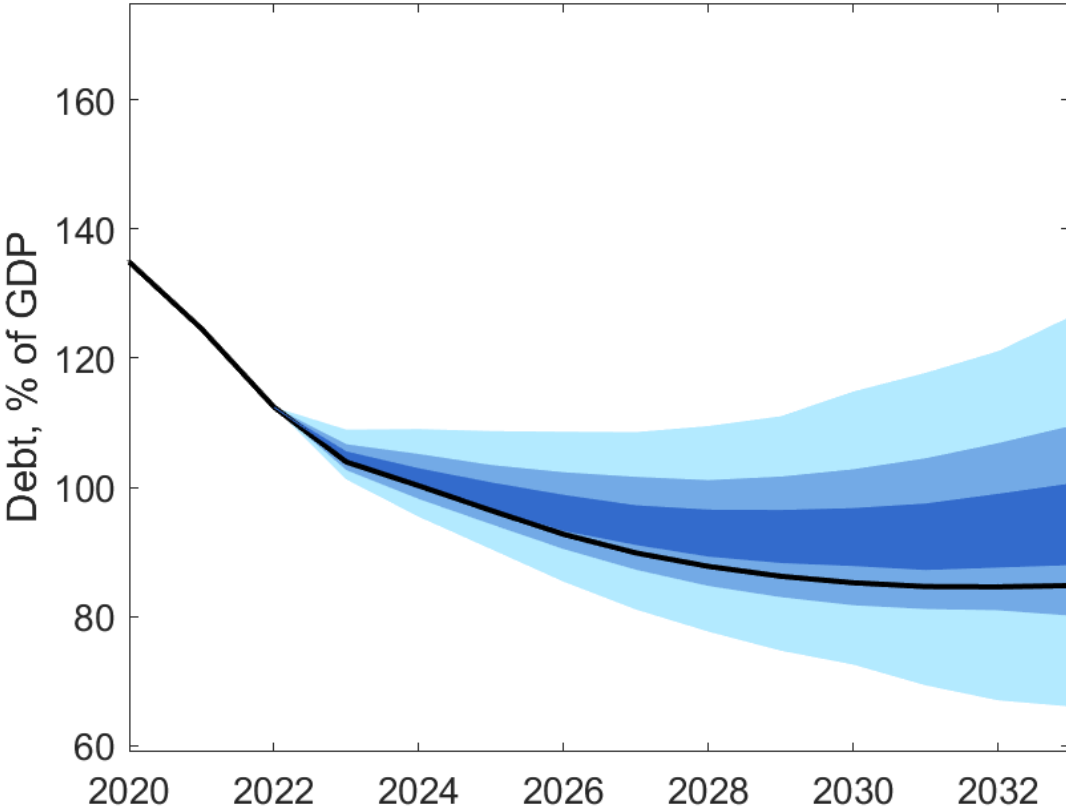


A CASE OF DOWNSIDE RISKS TO THE BASELINE (PECUNIA)

BVAR fanchart



SDSA fanchart



PROJECTIONS AND REAL LIFE: BACK-TESTING

Biannual fan charts for 16 EA countries from 2011 to 2020

- Baseline: EC's Debt Sustainability Monitor (when available) / EC's Forecast / Ageing report
- In-sample forecast from BVAR

—————→ ~ 300 observations

Test fan chart metrics to predict debt distress episodes between T+1 and T+3

- Debt distress: spreads > 350 bp (Zigraiova et al. 2019)
- Aggregate metrics in a *Probit index* based on predictive ability

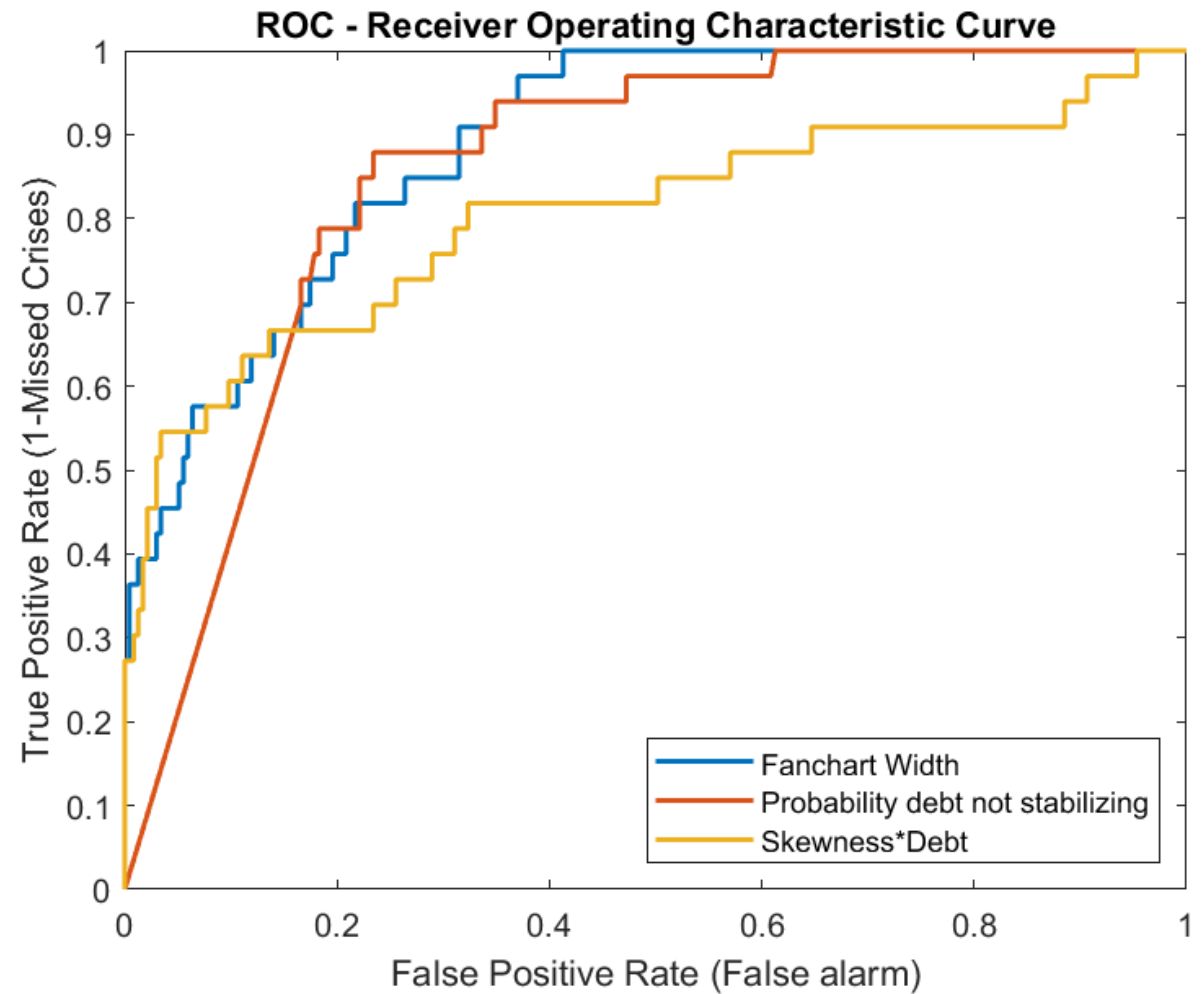
Risk classification in Low/Medium/High risk

- Based on missed crises / false alarm

BACK-TESTING: POSSIBLE METRICS

3 Metrics

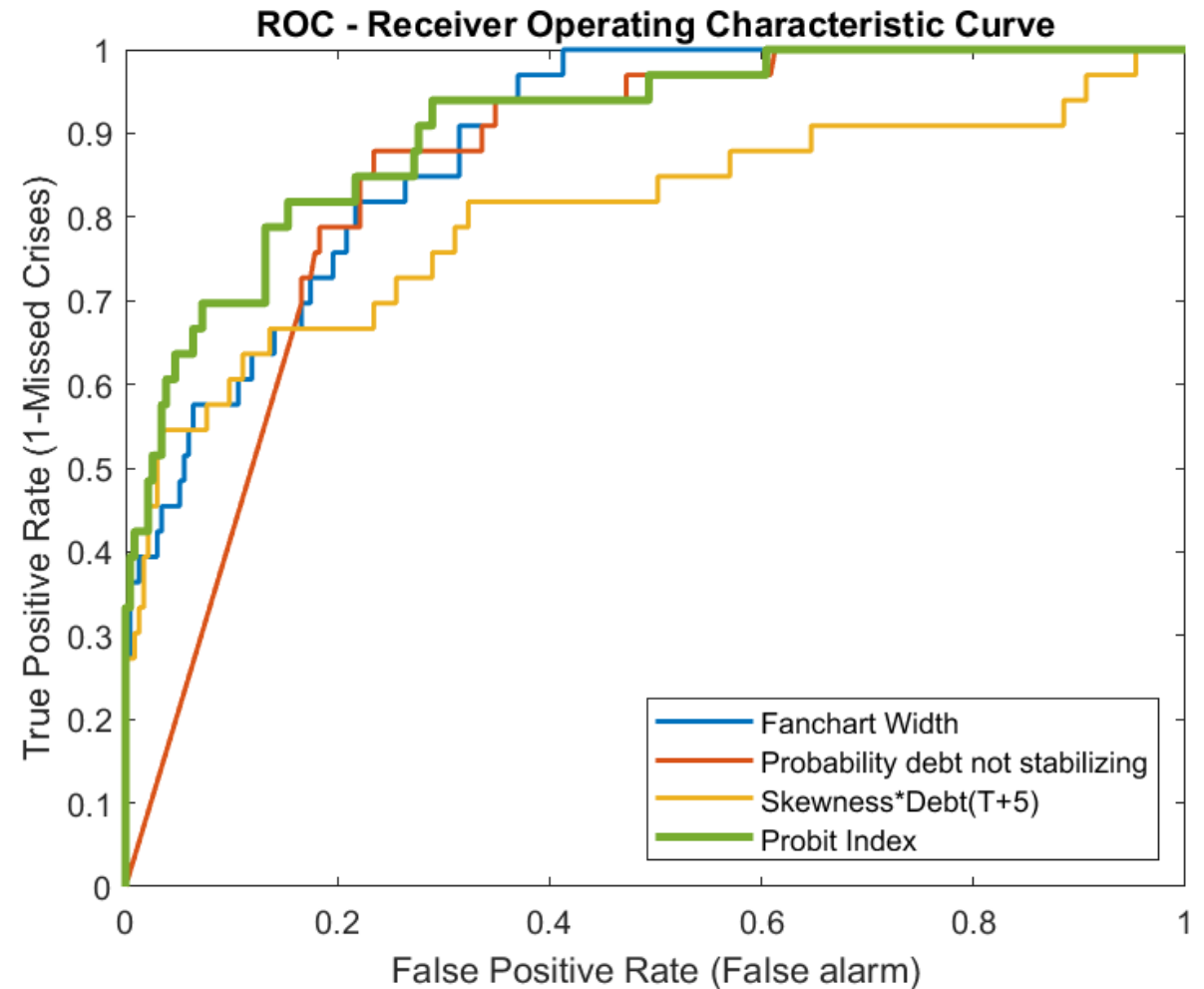
- Fan chart width
- Probability debt $T+5 >$ current debt
- Skewness*Debt (T+5)



BACK-TESTING: EFFICIENCY IN UNITY

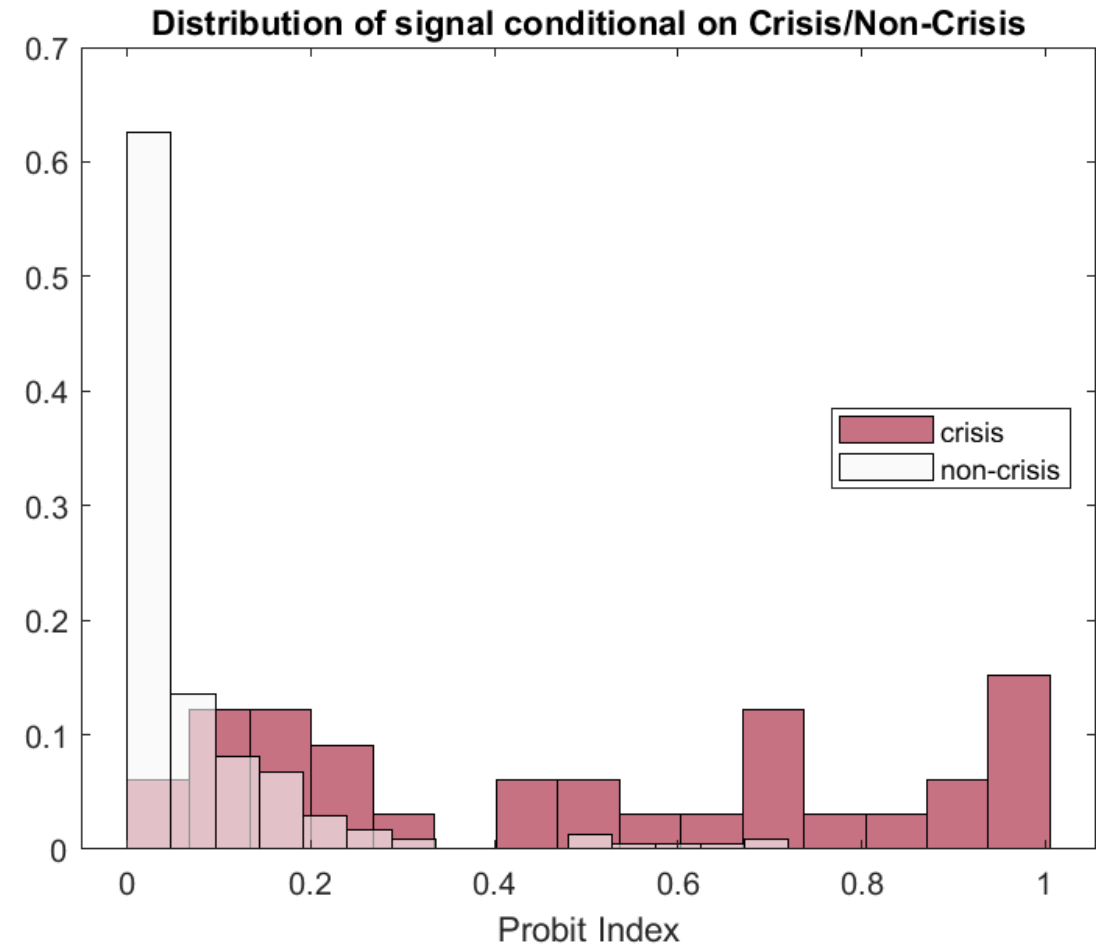
3 Metrics

- Fan chart width
 - Probability debt T+5 > current debt
 - Skewness*Debt baseline (T+5)
-
- Probit fanchart index
 - Weigh metrics according to predictive power
 - Improve compared to single metrics



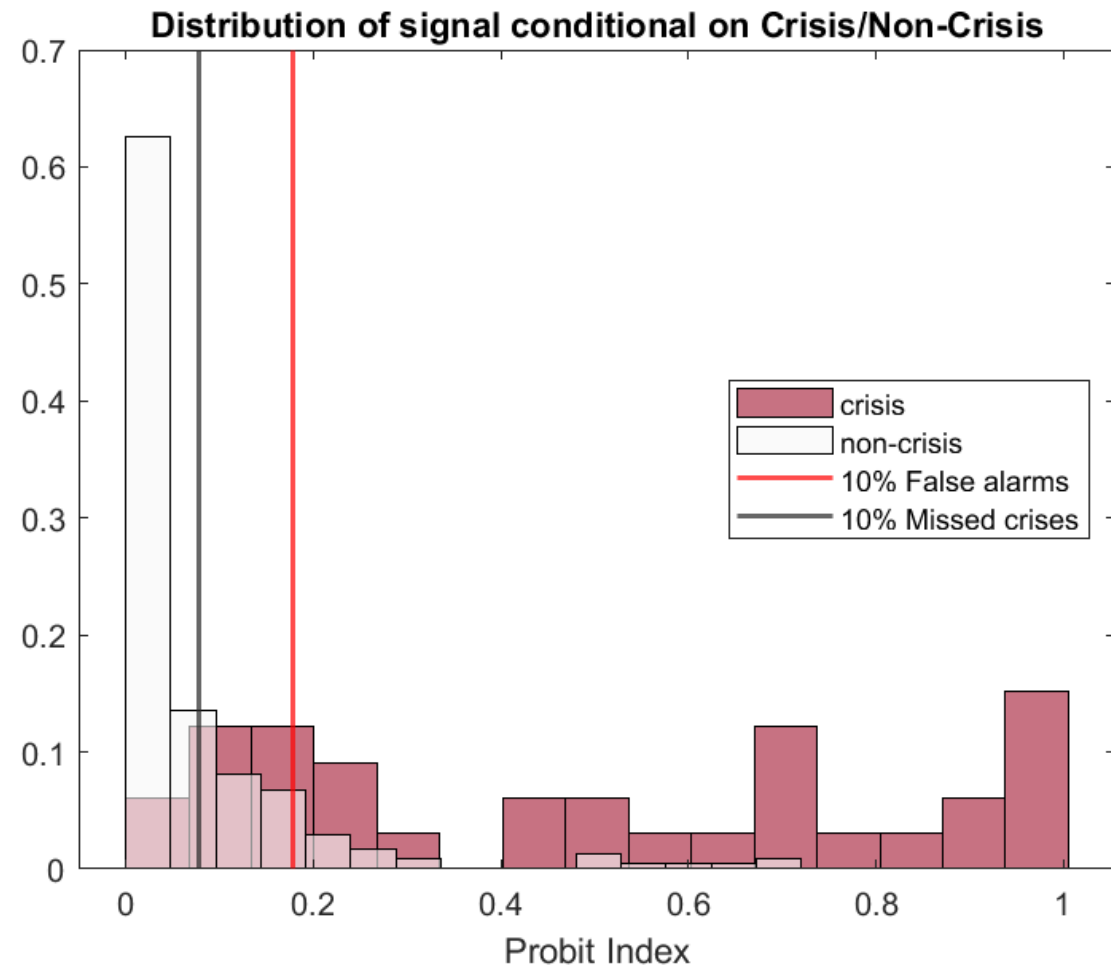
RISK CLASSIFICATION

- Good discriminatory power but limited and concentrated number of crises



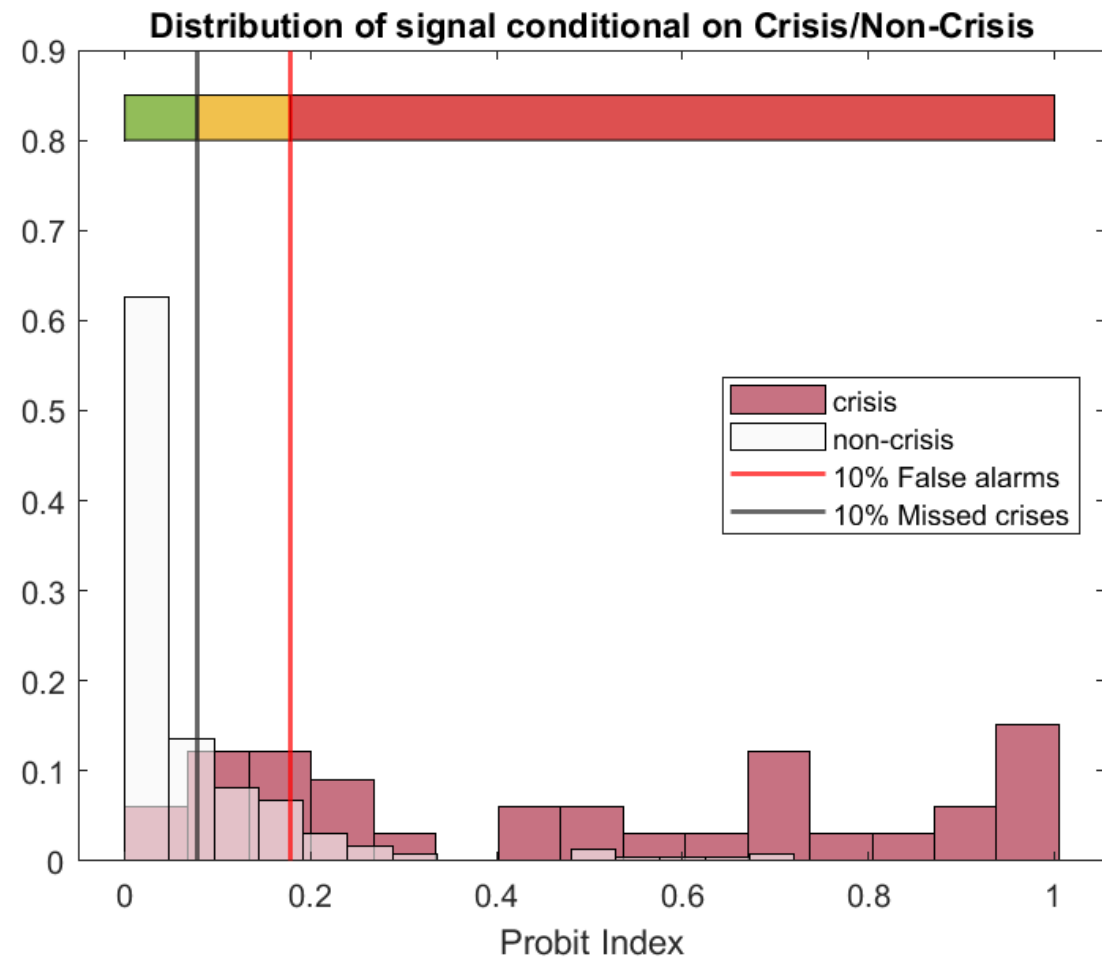
RISK CLASSIFICATION

- Good discriminatory power but limited and concentrated number of crises
- Calibrate thresholds:
 - 10% False Alarms
 - 10% Missed Crises



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- Classification based on low/medium/high risk





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