ECB Workshop on Forecasting Techniques

"Understanding the Sources of Macroeconomic Uncertainty" by Rossi, Sekhposyan and Soupre

Discussion by Michel van der Wel and Didier Nibbering

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Paper Summary

- A lot of interest in measuring uncertainty
- Paper proposes uncertainty measure based on forecast densities
- Furthermore, provides two decompositions:
  - Knightian uncertainty and risk
  - Ex-ante and ex-post uncertainty
- Applies measure to SPF densities, for GDP (main) and Inflation
- Provides relation with macroeconomic effects and studies measure through the lens of a model

1. Relation with CRPS

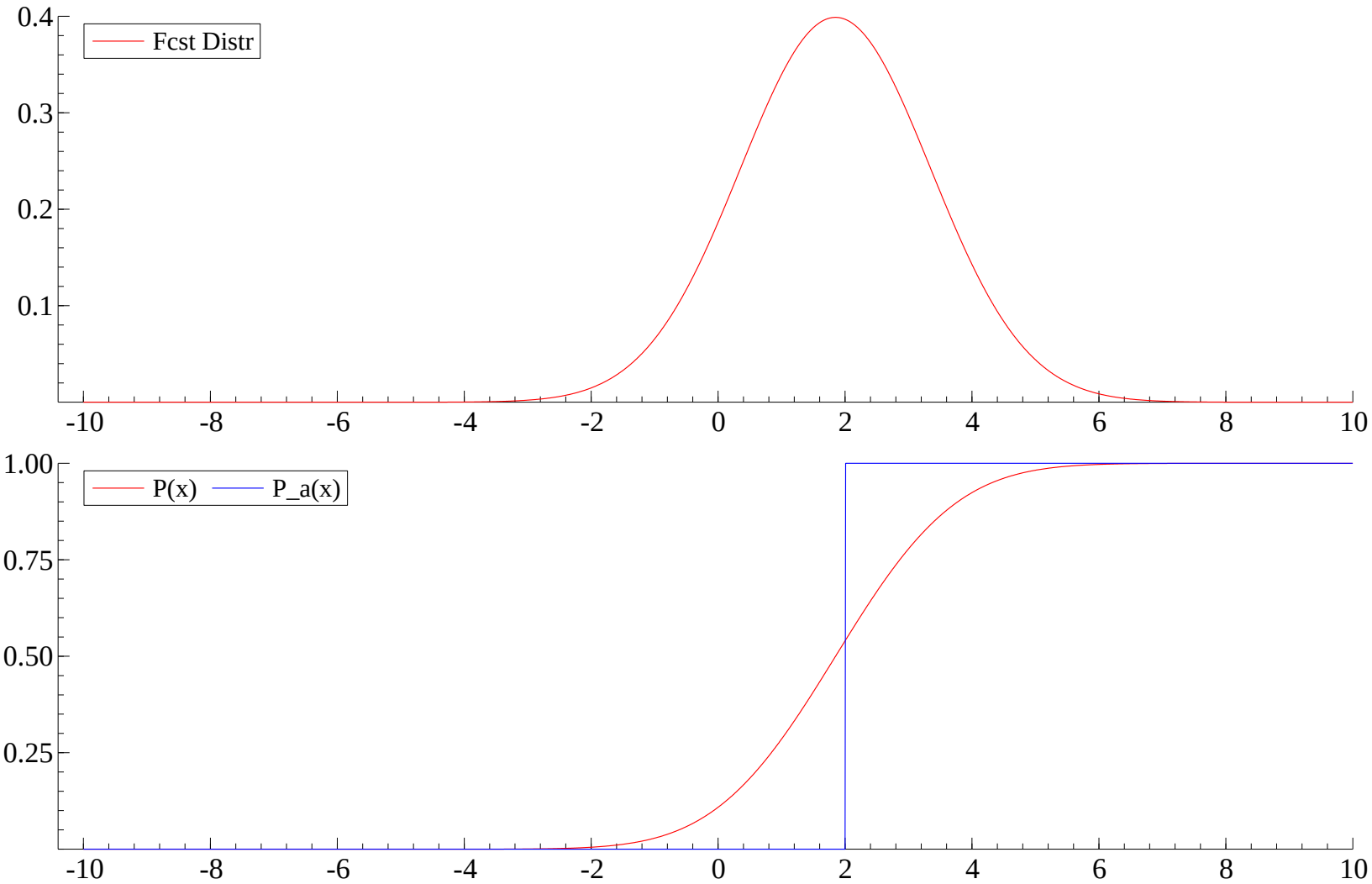
- In forecast evaluation literature, Continuous Rank Probability Score (CRPS) often used
- Measures difference between forecasted distribution and realization
- CRPS definition (Hersbach, 2000):

$$CRPS = \int_{-\infty}^{\infty} [P(x) - P_a(x)]^2 \, dx,$$

with

$P(x)$ cdf of forecast distribution
$P_a(x)$ cdf of realization (with actual value x_a); 1 if $x \geq x_a$, 0 else

Example CRPS



CRPS and New Uncertainty Index

- Index proposed in paper:

$$U_{t+h|t} = \int_{-\infty}^{\infty} E\left[\left(x_{t+h}(r) - p_{t+h|t}(r)\right)^2\right] dr$$

  based on (2), plugging in (1) with $N = 1$, with $x_{t+h}(r)$ cdf of actual [like $P_a(x)(?)$] and $p_{t+h|t}(r)$ probability forecast of $x_{t+h}(r) = 1$ [like $P(x)(?)$]

- Compared again to CRPS:

$$CRPS = \int_{-\infty}^{\infty} \left[P(x) - P_a(x)\right]^2 dx$$

- What is precise relationship between measures?

2. Decompositions

- For first decomposition need/use
  - $Cov(x_{t+h}(r)p_{t+h|t}(r)) \approx 0$, to decompose Aggregate Uncertainty in Mean-Bias, Dispersion and (Realized) Risk
  - $V_{t+h|t} \approx 0$, this is Dispersion / variability in predictive density

  Both cases point out “empirically small"

  $\rightarrow$ How small empirically?

  $\rightarrow$ Small here or always?

  $\rightarrow$ Under what conditions?

  $\rightarrow$ What are implications?

- Second decomposition on ex-ante / ex-post under Gaussianity

  $\rightarrow$ Study consequences of deviations in density?

3. Deeper takeaways

- Possible to get further implications of using different indices?
- Now studied through VAR with macros and find ‘differences’
- How do we know whether one index is truly ‘better’?
- Are there other/deeper takeaways of the measure and decompositions?

4. Model of ambiguity

- Follows Ilut and Schneider (2014)

  $\rightarrow$ Study ambiguity about TFP

- In this application same setting used for ambiguity about GDP growth, with for GDP

$$Z_{t+1} = \rho_z Z_t + \mu_t^* + u_{t+1},$$

  while agent *i* beliefs about GDP are based on

$$Z_{i,t+1} = \rho_z Z_{i,t} + \mu_{i,t} + u_{t+1}$$

- Plausible to take GDP as hard to measure as TFP?

- What if at time t (or $t+1$) actual Z_t is observed?

Smaller points and conclusion

Smaller points:

1. Timing of surveys varies over time
   $\rightarrow$ Causes difference in measure and decompositions?
2. Fixed event interpolation
   $\rightarrow$ Assumes flat growth over year?
   $\rightarrow$ For robustness try annual data?

In conclusion:

- Very insightful decomposition
- Great work!

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