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Graphical Model Assessment of Probabilistic Forecasts

Moritz N. Lang, Reto Stauffer, Achim Zeileis

https://topmodels.R-Forge.R-project.org/

Motivation

Probabilistic regression models:

- Modelling the entire probability distribution rather than just the expectation.
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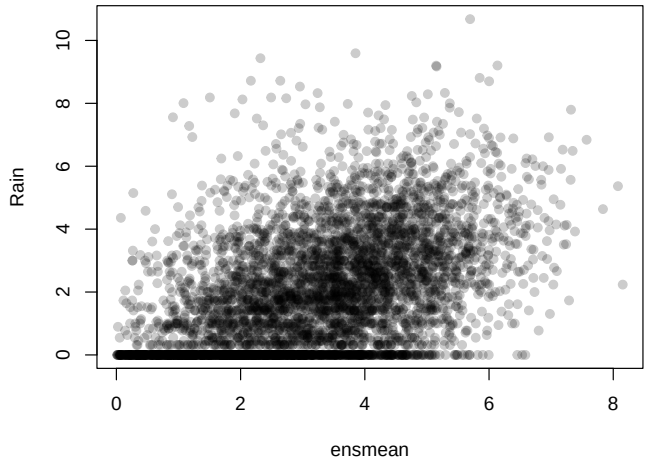
⇒ **What are relative (dis)advantages?**

Probabilistic precipitation forecasting

Observed vs. ensmean:



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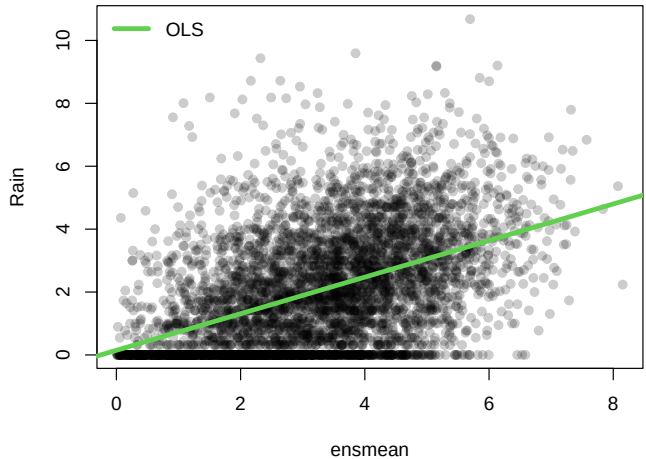

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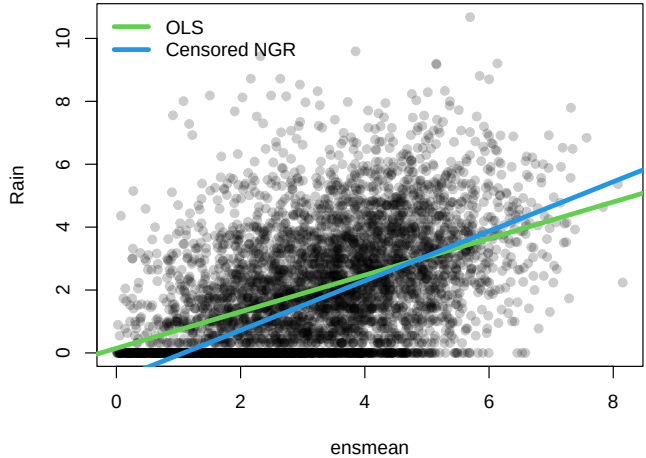

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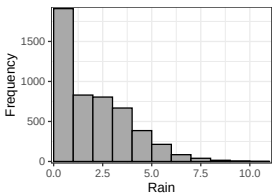

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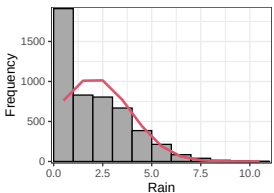

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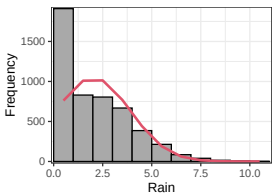

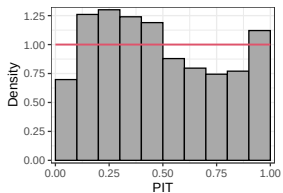

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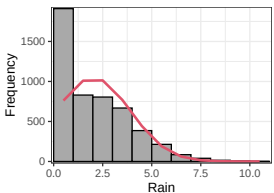

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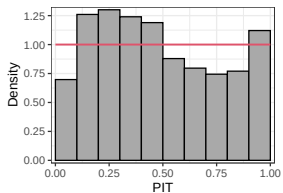

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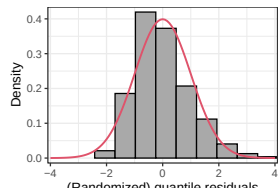
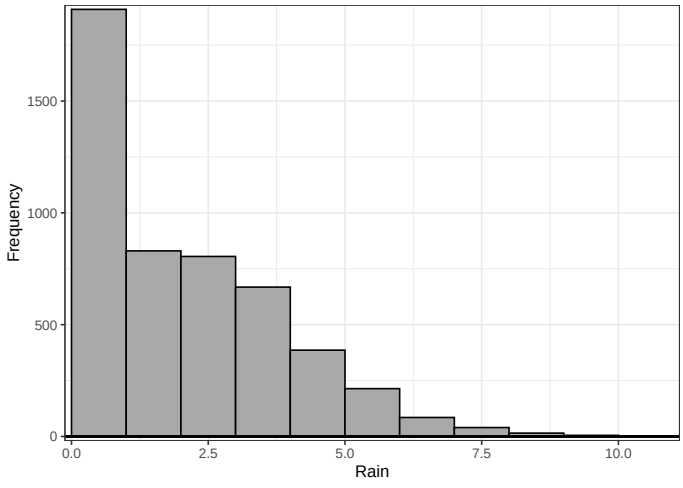


Probabilistic calibration:

- Quantile residuals: $\hat{r}_i = \Phi^{-1}(u_i)$.
- Compare: Normal

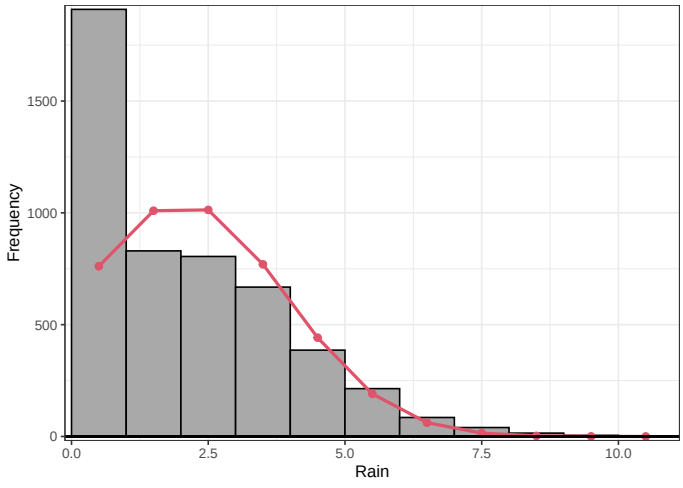
Marginal calibration

Frequencies: Observed



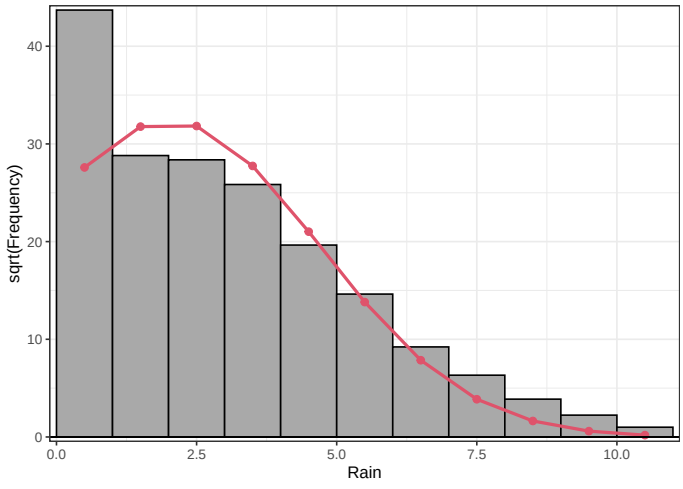
Marginal calibration

Frequencies: Observed vs. expected



Marginal calibration

Frequencies: $\sqrt{\text{Observed}}$ vs. $\sqrt{\text{expected}}$



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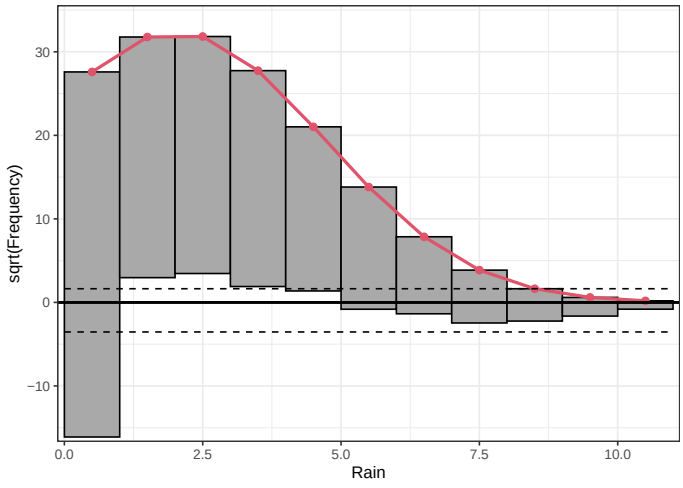

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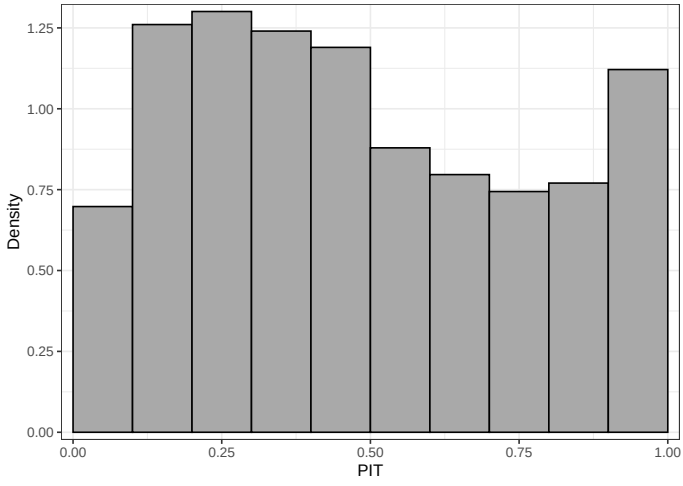

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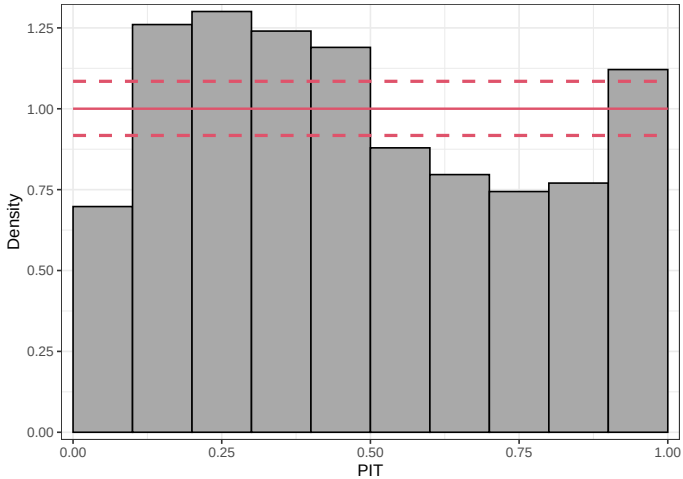

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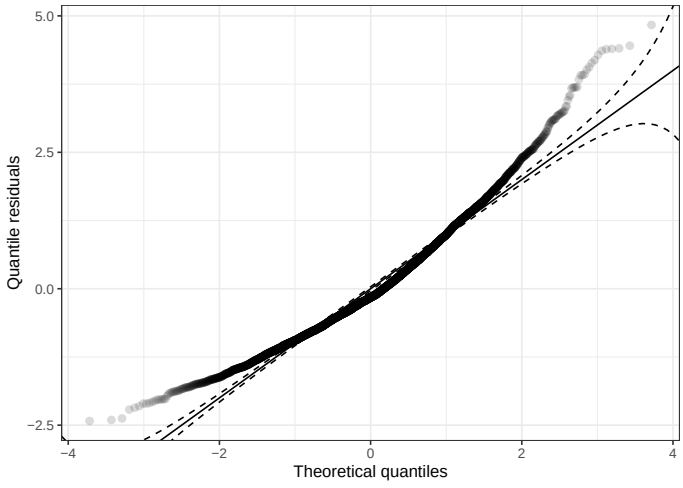
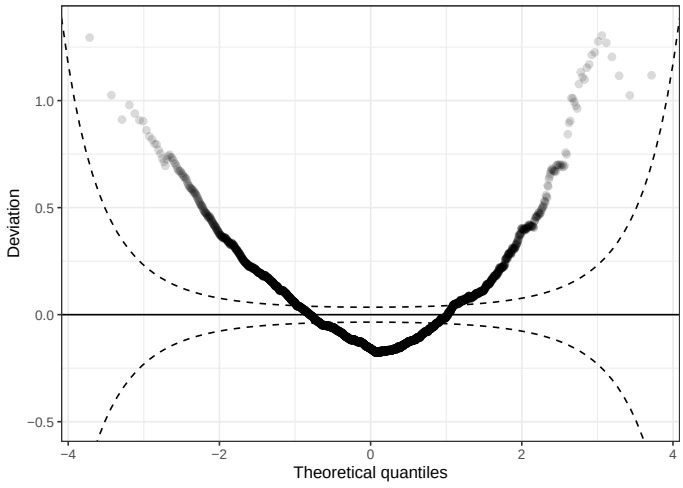
Quantile residuals: Observed vs. expected



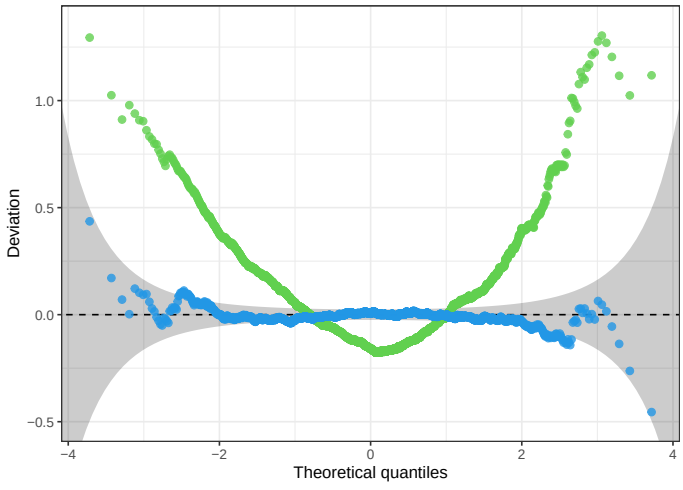
Probabilistic calibration

Quantile residuals: Deviations



Model comparison

Quantile residuals: Deviations



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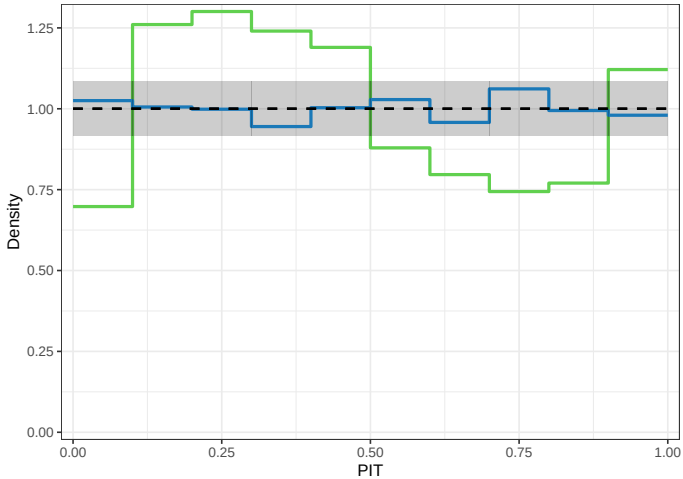

Summary

Graphical assessments: Various possibilities suggested in different parts of the literature.

- Rootogram.
- Probability integral transform (PIT) histogram.
- (Randomized) quantile-quantile residuals plot.
- Detrended Q-Q residuals plot or worm plot.
- Reliability diagram at prespecified thresholds.

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topmodels: Unifying toolbox for graphical model assessment.

- available on R-Forge at `https://topmodels.R-Forge.R-project.org/`

References

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