robKalman—An *R* package for robust Kalman filtering revisited

Bernhard Spangl[1,⋆], Peter Ruckdeschel[2]

1. University of Natural Resources and Life Sciences, Vienna
2. Fraunhofer ITWM, Department of Financial Mathematics, Kaiserslautern

⋆Contact author: bernhard.spangl@boku.ac.at

Keywords: EM algorithm, Kalman filter, recursive nonlinear filter, robustness

Building up on talks on this issue given at previous Use*R*! conferences, we report on progress made in the development of the package **robKalman**. The focus of this talk will be on

- (robust) Kalman filtering and smoothing
  - enhancing the functionality allowing for time-invariant and time-variant hyper parameters, even functions
  - but keeping the easy extensibility and modular approach of the general recursive filtering and smoothing infrastructure
- (robust) estimation of hyper parameters
  - via the EM Algorithm and its robustification
- (robust) recursive nonlinear filtering implementations, namely,
  - the extended Kalman filter and
  - the unscented Kalman filter

References

Durbin, J. and S. Koopman (2001). *Time Series Analysis by State Space Methods*. New York: Oxford University Press.

R Development Core Team (2011). *R: A Language and Environment for Statistical Computing*. Vienna, Austria: R Foundation for Statistical Computing. ISBN 3-900051-07-0. http://www.R-project.org/.

Ruckdeschel, P. (2010, May). Optimally Robust Kalman Filtering. Technical Report 185, Fraunhofer ITWM Kaiserslautern, Fraunhofer Platz 1, 67663 Kaiserslautern, Germany. http://www.itwm.fraunhofer.de/fileadmin/ITWM-Media/Zentral/Pdf/Berichte_ITWM/2010/bericht_185.pdf.

Ruckdeschel, P. and B. Spangl (2010). *robKalman: Robust Kalman Filtering*. R package version 0.3, http://robkalman.r-forge.r-project.org.

Shumway, R. and D. Stoffer (2000). *Time Series Analysis and Its Applications*. New York: Springer.

Spangl, B. (2008). *On Robust Spectral Density Estimation*. Ph. D. thesis, Dept. of Statistics and Probability Theory, Vienna University of Technology, Vienna.

Wan, E. and R. van der Merwe (2001). The unscented kalman filter. In Haykin (Ed.), *Kalman Filtering and Neural Networks*, Chapter 7, pp. 221–280. New York: Wiley.