

Accepted Manuscript

A quadratic Kalman filter

Alain Monfort, Jean-Paul Renne, Guillaume Roussellet

PII: S0304-4076(15)00012-3

DOI: <http://dx.doi.org/10.1016/j.jeconom.2015.01.003>

Reference: ECONOM 4017

To appear in: *Journal of Econometrics*

Received date: 13 March 2014

Revised date: 23 November 2014

Accepted date: 1 January 2015



Please cite this article as: Monfort, A., Renne, J.-P., Roussellet, G., A quadratic Kalman filter. *Journal of Econometrics* (2015), <http://dx.doi.org/10.1016/j.jeconom.2015.01.003>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

A Quadratic Kalman Filter^{*}

Alain MONFORT[†], Jean-Paul RENNE[‡] and Guillaume ROUSSELLET[§]

First version: November, 2013.

This version: November, 2014.

Abstract

We propose a new filtering and smoothing technique for non-linear state-space models. Observed variables are quadratic functions of latent factors following a Gaussian VAR. Stacking the vector of factors with its vectorized outer-product, we form an augmented state vector whose first two conditional moments are known in closed-form. We also provide analytical formulae for the unconditional moments of this augmented vector. Our new quadratic Kalman filter (QKF) exploits these properties to formulate fast and simple filtering and smoothing algorithms. A simulation study first emphasizes that the QKF outperforms the extended and unscented approaches in the filtering exercise showing up to 70% RMSEs improvement of filtered values. Second, it provides evidence that QKF-based maximum-likelihood estimates of model parameters always possess lower bias or lower RMSEs than the alternative estimators.

JEL Codes: C32, C46, C53, C57

Key-words: Non-linear filtering, non-linear smoothing, quadratic model, Kalman filter, quasi maximum likelihood

^{*}Functions for the Quadratic Kalman Filter are implemented with the R-software and are available on the [runmycode](http://www.runmycode.org/companion/view/313)-website at <http://www.runmycode.org/companion/view/313>.

[†]CREST and Banque de France, alain.monfort@ensae.fr

[‡]Banque de France, jeanpaul.renne@banque-france.fr

[§]Corresponding author. Banque de France, CREST and CEREMADE guillaume.roussetlet@banque-france.fr

The authors thank participants to the CREST financial econometrics seminar, to the Banque de France seminar, to the 2013 CFE-ERCIM conference, to the 2014 IAAE conference, to the 2014 COMPSTAT conference, and to the 2014 Computing in Economics and Finance conference. We also thank Martin ANDREASEN, Christophe HURLIN, Olivier SCAILLET, and Jean-Michel ZAKOIAN for interesting discussions and comments. Particular thanks are addressed to Michel JUILLARD for providing access to the Banque de France computation platform Hubeco.

The views expressed in this paper are those of the authors and do not necessarily reflect those of the Banque de France.

Download English Version:

<https://daneshyari.com/en/article/5095776>

Download Persian Version:

<https://daneshyari.com/article/5095776>

[Daneshyari.com](https://daneshyari.com)