Bilbao, 4th of February 2022

Subject: Second revision of submission number 2020-140

Dear Prof. Cook,

Thank you very much for your quick response to our first revision of the paper. I am writing to you regarding the resubmission of our article with title: "tvReg: Time-varying Coefficients in Multi-Equation Regression in R", authored by Ruben Fernandez-Casal and myself, Isabel Casas. We have made changes in this second version following your comments and suggestions. You can find a point-by-point response to each comment in file *AnswerToReferee.pdf.*

The objective of the paper is to disseminate the R package *tvReg* which provides estimation, prediction and visualisation tools for the most common varying coefficient linear models whose estimation is done with kernel smoothing methods. These have been extensively studied in the theoretical statistics literature in recent years, but there is not comprehensive computational tool in any of the commercial and non-commercial languages.

Contribution:
The package includes the following multi-equation models with time-varying coefficients: (1) fixed effects, (2) random effects, (3) seemingly unrelated equations, and (4) vector autoregressive and its corresponding impulse response function. The estimation combines kernel smoothing techniques and least squares, making it very flexible and independent of the error term distribution. In addition, two single-equation models with time-varying coefficients are added for completion: (5) linear regression and (6) autoregressive model. The article summarises the theoretical background of all these models and the usage of the package to estimate them via recent empirical work in the fields of finance and macroeconomics. To the best of our knowledge, the estimation of models (1), (2) and (3) have not been implemented in another package in R. The estimation of (4) using kernel smoothing and least squares has been implemented in R package *mgm,* but this package does not implement the impulse response function with time-varying coefficients that is essential in the evaluation of macro-economic problems. Package *bvarsv* also estimates model (4) and its correspondent impulse response function via Bayesian inference. A comparative example can be found in pages 13-15 of the article. The estimation of (5) can be found in packages *MARSS* and *mgcv*. The former uses Bayesian techniques, and the latter combines splines with maximum likelihood techniques. The advantage of using the *tvReg* for model (5) arises in case of strong dependency and non-exponential distribution in the error term of model (5). In this case kernel smoothing combine with least squares

techniques allow for more flexibility in the model. This is illustrated in the example in pages 14-15 of the article and Figure 7.

Motivation:
The aforementioned models have many empirical applications for problems with longitudinal and time series data due to their capability to adapt to situations of change. However, the lack of computer applications with this functionality may have hindered the use and popularity of these flexible models. The package *tvReg* aims at closing this gap by providing a comprehensive software implementation of multi-equation linear models with varying coefficients. A publication of this paper in the R Journal would make the package *tvReg* visible to a larger empirical community that would benefit from it.

Our submission includes the complementary R code in the *CasasFernandez-Casal2022_code.R* file, which reproduces all values and plots in the .pdf document when using the *tvReg* version 0.5.6 (latest version), available at the CRAN. All examples in the article are reproducible with datasets attached to the package.

Looking forward to hearing from you.

Kind regards,

Isabel Casas