Accepted Manuscript

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PII: S0304-4076(17)30158-6
DOI: http://dx.doi.org/10.1016/j.jeconom.2017.08.008
Reference: ECONOM 4414

To appear in: *Journal of Econometrics*

Please cite this article as: Benatia D., Carrasco M., Florens J., Functional linear regression with functional response. *Journal of Econometrics* (2017), http://dx.doi.org/10.1016/j.jeconom.2017.08.008

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Functional linear regression with functional response*

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Abstract

In this paper, we develop new estimation results for functional regressions where both the regressor $Z(t)$ and the response $Y(t)$ are functions of Hilbert spaces, indexed by the time or a spatial location. The model can be thought as a generalization of the multivariate regression where the regression coefficient is now an unknown operator Π. We propose to estimate the operator Π by Tikhonov regularization, which amounts to apply a penalty on the L^2 norm of Π. We derive the rate of convergence of the mean-square error, the asymptotic distribution of the estimator, and develop tests on Π. As trajectories are often not fully observed, we consider the scenario where the data become more and more frequent (infill asymptotics). We also address the case where Z is endogenous and instrumental variables are used to estimate Π. An application to the electricity consumption completes the paper.

Keywords: Functional regression, instrumental variables, linear operator, Tikhonov regularization.

JEL classification: C13

*The authors thank the editors, two referees, Stéphane Bonhomme, Samuele Centorrino, Jan Johannes, and the participants of the 6th French Econometrics Conférence, CESG 2016, and the Workshop on Inverse Problems (Heidelberg, 2016) for helpful comments. Carrasco gratefully acknowledges financial support from NSERC. E-mail addresses: dbenatia@gmail.com (D. Benatia), marine.carrasco@umontreal.ca (M. Carrasco), jean-pierre.florens@tse-fr.eu (J.-P. Florens).

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