Generalized dynamic factor models and volatilities estimation and forecasting

Matteo Barigozzi, Marc Hallin

PII: S0304-4076(17)30162-8
DOI: http://dx.doi.org/10.1016/j.jeconom.2017.08.010
Reference: ECONOM 4416

To appear in: *Journal of Econometrics*

Please cite this article as: Barigozzi, M., Hallin, M., Generalized dynamic factor models and volatilities estimation and forecasting. *Journal of Econometrics* (2017), http://dx.doi.org/10.1016/j.jeconom.2017.08.010

Generalized Dynamic Factor Models and Volatilities

Estimation and Forecasting

MATTEO BARIGOZZI[†] AND MARC HALLIN[‡]

[†]*LSE, Department of Statistics, Houghton Street, London WC2A 2AE, UK.*
E-Mail: m.barigozzi@lse.ac.uk

[‡] *ECARES, Université libre de Bruxelles CP114/4 B-1050 Bruxelles, Belgium*
E-Mail: mhallin@ulb.ac.be

July 28, 2016

Abstract

In large panels of financial time series with dynamic factor structure on the levels or returns, the volatilities of the common and idiosyncratic components often exhibit strong correlations, indicating that both are exposed to the same market volatility shocks. This suggests, alongside the dynamic factor decomposition of returns, a dynamic factor decomposition of volatilities or volatility proxies. Based on this observation, Barigozzi and Hallin (2016) proposed an entirely non-parametric and model-free two-step general dynamic factor approach which accounts for a joint factor structure of returns and volatilities, and allows for extracting the market volatility shocks. Here, we go one step further, and show how the same two-step approach naturally produces volatility forecasts for the various stocks under study. In an applied exercise, we consider the panel of asset returns of the constituents of the S&P100 index over the period 2000-2009. Numerical results show that the predictors based on our two-step method outperform existing univariate and multivariate GARCH methods, as well as static factor GARCH models, in the prediction of daily high–low range—while avoiding the usual problems associated with the curse of dimensionality.

JEL Classification: C32, C38, C58.

Keywords: Volatility, Dynamic Factor Models, GARCH models, High-dimensional time series.

1 Introduction

Decomposing asset returns and risks or volatilities into a *common*, market-driven, component and an individual, *idiosyncratic* one, is one of the main issues in financial econometrics, risk management, and portfolio optimization. Well-known theoretical results such as the Asset Pricing Theorem, indeed, show that market-driven risks cannot be diversified away, while individual ones can be eliminated

[‡]Supported by the IAP research network grant P7/06 of the Belgian government (Belgian Science Policy).