Title : Realized HY-GARCH model and its extensions and applications

I. Context

Empirically observed returns of a financial time series are characterized by fatter tails compared to the Gaussian (normal) distribution, see e.g. Mandelbrot (1963). In addition, empirical volatility of returns is not constant over time, but is rather clustered. Thus, for the same asset, periods with high volatility (high gains/losses) can be seen as well as periods in which volatility is low (the gains/losses are close to zero). This issue can be tackled by volatility modeling. To deal with these feature, a large literature is developed during these last decade. Among the existing approaches, conditional heteroskedastic models, pioneered by Engle (1982) and Bollerslev (1986) with the ARCH and GARCH models, have known undeniable success. Although originally designed for inflation modeling, ARCH models have been found to replicate stylized facts of asset returns highlighted by Mandelbrot (1963) including, but not limited to, volatility clustering, fat tails in the distribution of returns and higher-order dependence in returns. Standard models have been, since then, improved in three major directions; dealing with asymmetries (see Glosten et al, 1993 ; Diongue et al, 2012 ; Lopez and Prass, 2013, 2014 among others), accommodating for long-range dependencies (Baillie et al, 1996; Christensen et al., 2010; Diongue and Guégan, 2007; Davidson, 2004 among others) and exploiting the potential of high-frequency data (see Hansen and Huang, 2012a, 2012b; Harry Vander Elst, 2015).

II. Aims

The aim of this thesis is contribute at the literature by introducing and studying a new class of model belonging to the class of Realized GARCH model introduced by Hansen (2012) and recently generalized and developed by Harry Vander Elst (2015). In order to generalize the existing literature, we propose in this to extend the FloGARCH model to the FloHYGARCH model. For that

1. The candidate need, first to study the Realized HYGARCH model which is the simpler case and allowing to generalize the work of Hansen (2012). Secondly, he has to study the properties (statistics and probability) of the proposed model.
2. The FloHYGARCH is investigated as well as its application to real data. Parameter estimation is studied and its performance using Monte Carlo simulation.

III. Planning

In the first four month of the thesis, the candidate has to undertood the problem of Realized volatility and its application. For the remaining period of the first year, he needs to develop the first model generalizing the one introduced by Huang (2012) and investigate its properties. The second year of the thesis is dedicated to the study of the FloHYGARCH model and the parameter estimation problem of that model. Monte Carlo Simulation will be done to evaluate the performance the parameter estimation methods. At the beginning of the third (first six months), the candidate will study some application of the proposed before he start the redaction the thesis.

Founding : CEA MITIC scholarship

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V. Skills

Degree requirements for the candidate is a Master in Statistics or in Finance. In addition, the candidate needs to have good skills in time series analysis and financial econometrics. In addition, the candidate has to have a good knowledge on programming in R.

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