

Postdoctoral position: Equity Factors identification through non-Gaussian features extraction

November 1, 2019

Laboratory name: CFM Chair of Econophysics & Complex Systems, LadHyX

CNRS identification code: UMR CNRS 7646

Internship location: Ecole polytechnique, Palaiseau, and Capital Fund Management, Paris.

Supervision: Michael Benzaquen (Ecole polytechnique)

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Subject

The asset pricing literature has witnessed an increasing popularity of factor models over the past decades. The number of "risk factors" today available is huge (400+) and expanding. From a purely statistical perspective, a number of questions have been raised and remain controversial: What is the effective number of factors? Is their risk rewarded? And if so, how? How significant are overfitting and in-sample biases? See [1-3] for some interesting views.

The main objective of our project will be to find a robust protocol for factor identifications which would be sound from an economic perspective. Building on the ideas of Pukthuanthong *et al.* [4], we would like to apply relevant statistical techniques to the problem of identifying "true" factors in a large dimensional space. Exploring the *Independent Component Analysis* (ICA) methodology will stand as a starting point [5-7]. Further, ICA should allow for the identification of non-Gaussian features in the to-be-identified factors. On this point, we will be inspired by the concept, introduced by Lempérière *et al.* in [8], which relates the Sharpe Ratio of a strategy to its negative skewness, that is, the left tail of the returns distribution.

The internship will be held within the CFM Chair of Econophysics and Complex Systems at Ecole polytechnique (visit www.econophysix.com) in close connection with Stefano Ciliberti and Jean-Philippe Bouchaud (Capital Fund Management). The internship will comprise theoretical and numerical components. A good background in statistical physics, data analysis and Python is advised.

References

- [1] Harvey and Liu, *Lucky Factors*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2528780
- [2] Harvey, Liu and Zhu, *...and the Cross-Section of Expected Returns*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2249314
- [3] Linnainmaa and Roberts, *The History of the Cross Section of Stock Returns*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2897719
- [4] Pukthuanthong, Roll and Subrahmanyam, *A Protocol for Factor Identification*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3197646
- [5] Zhu, Basu, Jarrow and Wells, *High Dimensional Estimation and Multi-Factor Models*, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3169905
- [6] Back and Weigend, *A First Application of Independent Component Analysis to Extracting Structure from Stock Returns*, http://andrewback.com/webpapers/ica_finance/ica_finance_ijns.htm
- [7] Chowdhury, Chakravarty and Hossain, *Short-Term Financial Time Series Forecasting Integrating Principal Component Analysis and Independent Component Analysis with Support Vector Regression*, <http://www.scirp.org/journal/paperinformation.aspx?paperid=83201>
- [8] Lempérière, Deremble, Nguyen, Seager, Potters and Bouchaud. *Risk premia: Asymmetric tail risks and excess returns*. <http://www.tandfonline.com/doi/pdf/10.1080/14697688.2016.1183035>