

132. HEDGEWORK

132. HEDGEWORK FEBRUAR 2016 DR. JOCHEN PAPENBROCK, FIRAMIS / PPI AG

Cognitive technologies to improve portfolio diversification

A cornerstone of modern finance is diversification, first formalised in the 1950s. Today, innovative financial technologies help to manage diversification and systemic risk more effectively.



Dr. Jochen Papenbrock

has more than 10 years' experience of management and technology consulting in the financial industry. Also, he has invented, developed and operationalised several innovative financial technologies. He is Managing Consultant at PPI AG and CEO/Founder of Firamis. He earned his doctorate and degree in business engineering at the Karlsruhe Institute of Technology.

FIRAMIS

is a Fintech company founded 2012 near Frankfurt, Germany, with services, consulting and automated b2b solutions for investment and risk management in financial institutions.

PPI AG

has been working successfully for banks and insurance companies for more than 30 years and has more than 400 employees today in several locations in Europe. PPI is active in the following lines of business: Consulting, Software development, Business Intelligence, and Products. PPI is specialist for payments, risk management, compliance, core processes and digitalisation.

Financial markets have become very integrated and synchronised because of instantaneous information processing, global trading activity, cross-border financial intermediaries, regulatory regimes, and benchmarking/indexation activity. Also, financial markets are characterised by complex dynamics because humans and machines are part of a huge market and information network governing investment and trading activities. In fact, financial markets are a prime example of complex systems due to their feedback loops, reflexivity and adaptivity. The ensuing systemic market dynamics can lead to cascading multiplier effects and emerging collective dynamics. As a result, the system might be rendered more fragile and vulnerable with increased severity of tail events. Approaching a systematic and more effective portfolio diversification, these complex market dynamics should not be ignored – rather, they should be embraced.

There are frameworks originating from natural and computer sciences to rationalise complexity in financial markets. For example, it is relevant to examine assets' dependence structure as measured by their correlation. Many investment managers already analyse these structures but on a more general level, often ignoring the hidden value provided in correlation information. This hidden value resides in the interconnectedness of assets. Using correlation network approaches allows to assess the degree of interconnectedness of certain assets and to judge whether systemic shocks spread to other assets in a contagious way. Conversely, there are also assets which are relatively unaffected by network impacts. These assets are potential diversifiers. Also, the overall shape of an asset network and its changes over time characterise different market regimes and thus the current and upcoming state of market fragility.

Cognitive technologies allow for algorithmic visualisations of the results for humans to evaluate and act on them. Also, the outcomes can be further processed in decision support systems, portfolio construction tools and automated investment services as provided by “robo advisory” offerings. We use an ensemble of cognitive technologies for systematic, transparent, and intuitive integration of diversification and systemic risk handling into portfolio and risk management. As a result, risk-adjusted investment performance can improve because of a robust, diversified and efficient investment management. It also enables an unimpaired process of harvesting risk premiums. Moreover, the measurement of asset interconnectedness will improve the way we communicate about diversification levels and risk concentrations. These developments will enhance the standards of communicating portfolio risk by just volatility or value at risk.

The detected structures are automatically processed by computers, e.g. to translate into better diversification. In this process we use essential components of nature that were designed to withstand fragile and stressed environments and adapt to emerging stress quickly. Specific portfolios are automatically monitored and permanently supervised for given risk and diversification levels as well as for specific assets that

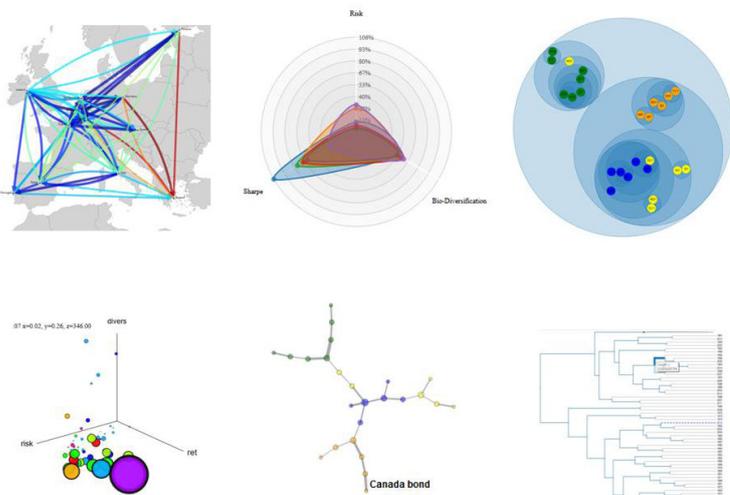
132. HEDGEWORK

mostly contribute to portfolio fragility. Meaningful scenario analyses and stress tests can be designed that help to construct more resilient and efficient portfolios.

To investigate the usefulness of cognitive technologies for investment and risk management we have launched several research initiatives with academic and industry researchers alike¹. For example, we investigate the use of sector correlation networks in investment strategies. In fact, a dense sector correlation network characterises a healthy market whereas a wider network indicates unstable markets. As a consequence, the diameter of a sector correlation network can be exploited for equity market timing strategies. Moreover, the network approach is also useful in explaining the cross-section of equity sector returns where more peripheral sectors tend to outperform more central ones. Consequently, one can implement a portfolio strategy that comprises the complete information content of the sector network topology conditional on a given level of risk aversion.

We have extended and generalised these approaches to other asset classes and financial instruments like ETFs and Futures. This extension is the basis for an active and dynamic investment and risk management framework for institutional overlay management strategies, product-sleeves, core-satellite models or advanced indices. Also, it is a powerful tool in wealth management and private banking as advisory intelligence is increased and client interactions on multiple channels can be based on these technologies. Finally, retail clients can use automated investment services at any day or night time. Investment platforms and ecosystems with empowered, self-directed and self-activated users can be designed based on our framework.

GRAPH 1: Understanding complex market dynamics with interactive visualisation technologies



The dynamic clustering and interconnection of assets is visualised by special algorithms. The system automatically detects underlying structures/patterns and transforms them into concrete asset allocations, portfolio constructions and risk management schemes. These transformations are fed back to the visualisation so humans can intuitively follow the underlying mechanisms and actions suggested by the system. Also, there is a permanent portfolio surveillance function highlighting investment opportunities and emerging risks which can be part of a client eReporting. Finally, very meaningful stress tests and scenario analyses can be designed in the context of complex market dynamics.

Footnotes

¹ Lohre, Harald and Papenbrock, Jochen and Poonia, Muddit, The Use of Correlation Networks in Parametric Portfolio Policies (October 24, 2014). Available at SSRN

Papenbrock, Jochen; Schwendner, Peter (2013). Handling Risk On/Risk Off Dynamics with Correlation Regimes and Correlation Networks. Financial Markets and Portfolio Management, Springer US

Schwendner, Peter and Schüle, Martin and Ott, Thomas and Hillebrand, Martin, European Government Bond Dynamics and Stability Policies: Taming Contagion Risks (May 24, 2015). Journal of Network Theory in Finance 1 (4), 2015

Packham, Natalie E. and Papenbrock, Jochen and Schwendner, Peter and Woebeking, Fabian, Tail-Risk Protection Trading Strategies (December 11, 2015). Available at SSRN

*“We are in the midst of the
Financial Revolution where
cognitive technologies improve
human investment and advisory
intelligence.”*

KONTAKT

Firamis

Dr. Jochen Papenbrock

Tel.: +49 174 143 5555

E-Mail: jp@firamis.de

Internet: www.firamis.de