Report on the dissertation of Dean Fantazzini

Modelling and forecasting univariate and multivariate time series using Google data and copulae

The dissertation is devoted to two main topics: the usage of Google Trends data and copulae in applied economic research.

Google Trends was introduced in 2006 and since that time it became a source of data for economists to study for forecasting in various areas: from macroeconomics (unemployment rate, national consumption, inflation rates, etc.), to finance (stock prices, real estate pricing, portfolio management), microeconomics (box-office revenues, retail sales, travel, etc.), sociology and politics.

Copula theory started in 1959 with the Sklar theorem, but it became very popular in applied research in the first decade of 2000s with the need to model multidimensional distributions. The use of copula allows to model multidimensional distribution using marginal distributions, estimating only a reasonable number of copula parameters. In many cases this provides a good approximation to the "true" distribution.

Dean Fantazzini was among the first researchers who intensively used both Google Trends and copula theory in applied research. In 2008, he suggested to use copulae to model operational risks taking the dependence of variables into account. Nowadays, about 45% of banks use copulae to model operational risks.

In 2009, he investigated how Value-at-Risk estimates depend on the misspecifications of the copulas and the marginal distribution estimates. In 2011, he published (in Russian) a large review of copula methods and theory. This review has stimulated many researchers in Russia to use copulae in their research.

In 2010–2013, Dean Fantazzini published a series of papers on the use of Google Trends data to model financial bubbles.

In 2013–2016, Dean Fantazzini published a series of papers for the forecasting of various economic indicators (the monthly number of food stamps recipients in US, the determinants of the decision to abandon or to proceed with a coal project, car sales in Germany). In 2016, he published a paper on the negative financial bubble in oil prices in 2014/15.

In 2018, he demonstrated that it is possible to use Google data to explain and predict the dynamics of the Russian social well-being indices.

In 2019, he investigated the predictive power of online search activity and implied volatility from option prices to forecast the realized volatility and the Value-at-Risk for the Russian RTS index. In that case, Google Trends did not improve the predictive power of the models.

During 2016–2020, he studied the cryptocurrency markets in a series of papers (using copulae and Google Trends). He proposed a set of models to estimate the market risk for a portfolio of crypto-currencies, and simultaneously to estimate their credit risk.

In 2019, Dean summarized the previous results in a 600-page monograph titled *Quantitative Finance with R and Cryptocurrencies*, which contains a very detailed discussion of copula methods and Google data for modelling and forecasting cryptocurrencies.

In my view, the set of results published in top international and Russian journals is very impressive and outperforms the usual standards of the doctor in economics dissertation in Russia.

The Thesis definitely corresponds to the criteria established at the National Research University Higher School of Economics, and Dean Fantazzini deserves to be awarded the academic degree of Doctor of Sciences.

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