Thesis topics Ortec Finance

Thesis period September 2014 – January 2015

You can apply in May and June 2014. We will start making a selection and planning the interviews in the first week of July 2014.

We invite you to send your application letter, CV and grades to hr@ortec-finance.com or contact our HR Department on +31 10 700 50 00.

Title: Prototype new data management system in Python

Research area: Computer science

Department: Scenario Department

Supervisor: Alex Boer and Martin van der Schans

Description:

To calibrate our models, we use substantial quantities of historical data, which we update every month. The current system for managing this is based on Excel sheets and Gauss scripts. This is becoming increasingly cumbersome and we have concluded that our current setup should be replaced by something new. After considering several options we decided that Python is the most suitable language for this.

The aim of this project is to make a prototype for a new historic data management system in Python. A brief outline of the functionality required

- Data should be automatically collected for Bloomberg and separate text / Excel files in a specific format
- Data should be processed using a flexible set of functions, all intermediate steps should be transparent (viewable)
- Output text files should be created

We expect the student to take an active role in setting up the architecture of the new data management system

Title: Time series input for determining factors using PCA

Research area: Econometrics

Department: Scenario Department

Supervisor: Alex Boer and Kai Ming Lee

Description:

Ortec Finance's scenario generator DSG uses three factor models to model variables simultaneously. One for long term behavior (over business cycles, periods >16years), one for the medium term (business cycles range, 2-16 years), and an intra-year model (2-year-2 months). For each of these three models, historic factors are computed using PCA on a wide range of variables. There are various choices that can be made here (which series, weights) and we would like to know what the options are. The topic of this thesis is to write a literature overview on the subject, make an inventory of suitable input data, and test the results of the various methods. The paper by Stock and Watson is a logical starting point.

Background information:

Stock, J.H., and M.W. Watson (2002), Forecasting using principal components from a large number of predictors, *Journal of the American Statistical Association*, 97.

(hierover wordt gesproken met Rutger)

Title: Unique investment risk

Research area: Finance

Department: Research / Pension & Insurance

Supervisor: Bert Kramer & Sacha van Hoogdalem

Description:

In Ortec Finance's economic scenario generator DSG, we model hundreds of economic and financial time series. Part of these time series involve return indices on investment classes such as equity, real estate, commodities, infrastructure, private equity, hedge funds, credits and emerging market debt. The scenarios that are generated within our base economic set are based on broad, well-diversified benchmark portfolios (so a large number of underlying individual assets or funds, diversified with respect to maturity / stage / phase of the assets / funds (young versus mature)). However, in reality, not all our clients (institutional and private investors) hold well-diversified portfolios for all asset classes. Especially for (relatively illiquid) alternative asset classes like real estate, hedge funds and private equity, it is not uncommon that investors only invests in a limited number of assets or funds (i.e., they are less diversified than the benchmark). Usually a less diversified portfolio will lead to higher volatility as not all unique risk is diversified away. So, for an undiversified portfolio the volatility of the returns should be increased. As a guideline we currently increase the volatility with 30% when the investment is in only a very limited number of assets / funds. However, we would like to have a better scientific basis of how our benchmark modeling should be corrected in case of undiversified, concentrated portfolios.

Title: A model for the expected unemployment time to support Social Impact Bonds

Research area: Econometrics, Statistics

Department: Research / Municipality of Rotterdam

Supervisor: Bert Kramer & Kai Ming Lee

Description:

In 2013, Ortec Finance has analyzed the expected unemployment time and the differences herein dependent on the characteristics of the benefits recipient. Amongst others, the results of this research project are used by the municipality of Rotterdam to base business cases for Social Impact Bonds (SIB's, see http://en.wikipedia.org/wiki/Social_impact_bond) on solid grounds.

The objective of this master thesis project is a further validation of the developed model, amongst others based on an update of the database with all current and former benefits recipients and based on an analysis of possible further extensions and refinements of the current model. An additional research question is how the model can best be used to base new SIB business cases on solid grounds and to monitor (during) and evaluate (after) the success or failure of employment projects financed by SIB's.

Title: Forecasting house prices and the dynamic scenario generator

Research area: Econometrics

Department: Research and Real Estate Management

Supervisor: Marc Francke / Kai Ming Lee / Wolter Achterveld

Description:

Ortec Finance developed an error-correction model (ECM) for forecasting house price indices on a yearly basis, Francke, Vos and Vujic (2009). In 2011 this model has been modified in order to deal with monthly observations.

Ortec Finance uses the dynamic scenario generator (DSG) to model and forecast various time series, based on decomposition of time series (by frequency decomposition techniques) and dynamic factor models. For details, see Steehouwer (2009), Boer and Gerasymchuk (2010) and Lee and Steehouwer (2012). The time series that are used in the DSG include real estate series, including a monthly house price index for the Netherlands.

The goal of this project is to compare the results from the error correction framework and the dynamic scenario generator. The comparison consists of estimation results and forecasts from both models. The practical purpose of the project is to provide forecasts for house price indices that can be used by the Real Estate Management business group.

Currently the ECM and DSG use only 1 national house price index for all house types (apartment, detached, semi-detached, row houses), starting from 1800 (yearly, 1973 for monthly data). It is possible to disaggregate to local (by 40 COROP regions) and house types indices, starting from 1995. So part of the time series is only available on an aggregate level, and in the more recent period on a disaggregate level.

An additional research question is to model jointly the aggregated and disaggregated house price indices, preferably both in the DSG and ECM framework and compare the results, between the competing methods and to the model based on the aggregated series only. The question that needs to be addressed is whether substantial differences in volatility, autocorrelation, and correlation with other economic variables exist between regions and house types.

Background information:

Boer, A. and S. Gerasymchuk (2010), Technical specifications Dynamic Scenario Generator, *Ortec Finance Technical Working Paper* 2010-02, version 1.

Francke, M.K., S. Vujic and G. A. Vos (2009), Evaluation of house price models using an ECM approach: the case of the Netherlands, *Ortec Finance Methodological Working Paper* 2009-05.

Lee, K.M. and H. Steehouwer (2012). A Zero Phase Shift Band Pass Filter. *Ortec Finance Technical Working Paper* 2011-02, version 2.

Steehouwer, H. (2009). A frequency domain methodology for time series modeling, *Ortec Finance Methodological Working Paper* 2008-02.