Visual Financial Data Analysis

The large amounts of data on the financial market today pose many computational challenges. Currently, companies like Reuters deliver around 50,000 data updates per second for financial stock market data. Such amounts of data can be analyzed by data mining algorithms, but for understanding market mechanisms and in order to evaluate the characteristics of assets, innovative visualization techniques offer many advantages over numeric techniques with regard to knowledge discovery in financial markets. One image can communicate more insight than ten thousand numbers.

The main objective of this project is the development of new approaches and algorithms for pixel-based visualization techniques to overcome the shortcomings of traditional techniques, and which significantly improve the insight into the behavior of financial markets. The work focuses on detailed performance analysis of assets with new focus-and-context techniques, inter-asset comparison techniques, and trend recognition in different market sectors, portfolio analysis, and also includes the development of scalable techniques for high-resolution financial data analysis on large displays walls (pawawalls).

We have developed an advanced pixel-based approach that extends the ability of traditional line charts and visualizes the growth of all possible time intervals in one image. Thus, each asset generates a unique fingerprint revealing the characteristics of the asset’s behavior. Further visualization techniques specialize on the evaluation of long-term investments, and allow to use Weight Matrices in order to focus on an investor’s interest. We also implemented techniques for performance-risk analysis as well as Dominance Plot and Pareto efficiency curves to analyze sets of assets.

DWS Technology Fund

This example shows a technology fund, which was highly profitable in the time intervals shown in dark green color. During the dot-com crisis in 2000/2001, the fund lost 2/3 of its original value. Note that the DWS Select-Rent bond above with its 2% growth was a good investment in the time when the stock market crashed.

DWS Select-Rent

This example shows the Select-Rent bond with its 2% growth. The time intervals, during which the fund lost 2/3 of its original value, are shown in dark red color. The DWS Select-Rent bond above with its 2% growth was a good investment in the time when the stock market crashed.

Discovery of Atypical Behaviour in Financial Time Series Data using 2-dimensional Colormaps

Combining the triangle matrices for absolute growth and relative market performance into one unified triangle can be achieved by constructing a two-dimensional colormap (right) that reflects all possible combinations of absolute growth and relative market performance [2]. This allows to recognize assets that perform worse the market median while still generating overall positive returns (see analysis of DWS Select-Rent above, indicating that other assets are better investments for given time intervals and shown by yellow color on the right). Assets that have exceptional stability during crisis (perform better than the market median although the whole market stock has losses, see blue arrows on the triangles on the right).

References


Acknowledgement

This work has been funded by the German Research Foundation (DFG) under the grant KI-1042, Explorative Analysis and Visualization of Large Information Spaces, University of Konstanz.