USER STORY

Banque Cantonale Vaudoise Speeds Financial Analysis Tasks with MATLAB®

THE CHALLENGE

To find the best way to model equity industrial indices

THE SOLUTION

Use MATLAB and related toolboxes to develop a clustering model

THE RESULTS

- Development time reduced significantly
- Minimizations performed quickly
- Access to the latest technical innovations

Financial strategies allocate clients' wealth into different asset classes to meet their clients' risk-return objectives. The Top-Down Research team at Banque Cantonale Vaudoise (BCV) Asset Management supplies tools to help their financial analysts model this asset allocation.

One of the team's projects involved forming groups of assets, consisting of sectors, that show similar fluctuations in yields in different stock markets. This strategy makes it possible for a small team to track the market. The group uses the fast analysis and development capabilities in MATLAB® to reduce the cost of these projects.

"Since our adoption of MATLAB, we've increased the number of projects and the pace at which they are implemented," says Pierre-Yves Boillat, quantitative analyst for BCV. "Because all the functions we need are integrated in MATLAB, we have everything on hand for the many models we produce."

THE CHALLENGE

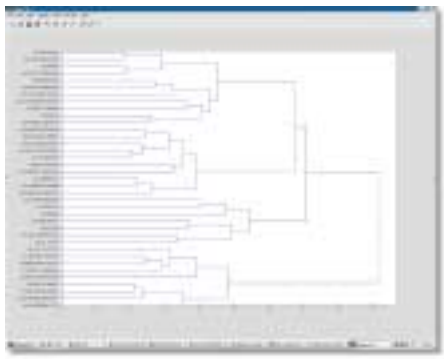
BCV Asset Management recently completed research on clustering equity industrial indices. Clustering objects, such as groups of industrial stocks, together according to their degree of similarity enables faster and more efficient analysis. For example, instead of sorting through 40 or more individual industrial indices, analysts can focus on just nine clustered indices and achieve similar results.

The Top-Down Research team needed to find the best way to model the clustering. "We could have recreated the model from scratch, but saw no need to reinvent the wheel when a wide array of clustering software already exists," said Boillat. "First, we needed a software package that would give us a degree of freedom in setting the parameters of the model. Then we had to find out if the results that we obtained had any relevance in economic terms. This involved testing our model in a risk-return framework to validate the obtained cluster."

THE SOLUTION

"We chose MATLAB because it offers a complete range of clustering functions, the parameters of which can be set to suit our needs," Boillat notes. "MATLAB has extensive graphic capabilities and offers a wide range of options for setting parameters."

The team also took advantage of the extensive MathWorks libraries, particularly in finance and optimization. "These libraries are reliable and have been optimized for years," says Boillat. "There is software designed especially for clustering, but based on our results, other packages would not have let us establish optimal portfolios. We would have had to export the results to another program."



Dendrogram, created by BCV in MATLAB, grouping industrial stocks according to fluctuations in yield.

> *Before we had MATLAB, we would not have been able to produce the clustering model within a reasonable time. We simply would not have done it. MATLAB has opened up new horizons for us.*
>
> Pierre-Yves Boillat,
> Banque Cantonale Vaudoise

For the clustering project, BCV imported their Excel data into MATLAB and performed statistical analysis of the data using cluster analysis functions in the Statistics Toolbox.

BCV represented the results of their cluster analysis in a dendrogram, which illustrates the clustered objects on the vertical axis and the distance between them on the horizontal axis. The dendrogram enabled the analysts to see the specified number of clusters almost immediately. "If we had had to code the dendrogram graph for the clustering project ourselves, we would have wasted several days," says Boillat. "MATLAB helped us complete this visualization work in just one day."

Using the Financial Toolbox, the Optimization Toolbox, and MATLAB graphics, they validated their results using the mean variance criterion to confirm that the clustering method they chose had segmented the investment universe in an ideal manner. The Financial Toolbox enabled them to analyze the portfolio statistics (risk and return).

The clustering model is run each quarter to track the market structure evolution and to set investment policy. This work is performed using MATLAB and distributed via Excel Link. The group plans to integrate the clustering model directly into the range of tools used by their strategists, either as a stand-alone application or directly in Excel. They also intend to standardize certain financial calculations within BCV, such as yield curve, call price, and yield to maturity.

THE RESULTS

- **Development time reduced significantly.** MathWorks libraries enabled BCV Asset Management to concentrate solely on modeling and avoid the computational element. "MATLAB greatly reduced our development time," Boillat says. "Developing this project with Fortran libraries would have taken us approximately ten times as long."
- **Minimizations performed quickly.** BCV now performs minimizations on complex variables in other allocation models, such as conditional value-at-risk, pair trading, and implied volatility trading. "The performance of MATLAB in terms of calculation is far superior to that of many systems," says Boillat. "For instance, MATLAB has enabled us to carry out minimizations on many thousands of variables that have an enormous set of constraints."
- **Latest technical innovations readily available.** The BCV Asset Management Top-Down Research team has benefited from the great amount of publicly available academic research on using MATLAB, says Boillat: "The codes are available on the Internet and can be implemented almost directly, giving us access to the latest innovations in the field."

To learn more about Banque Cantonale Vaudoise, visit **www.bcvgroup.ch**

APPLICATION AREAS

- Data acquisition
- Data analysis
- Financial modeling and analysis

PRODUCTS USED

- MATLAB
- Statistics Toolbox
- Financial Toolbox
- Optimization Toolbox
- Excel Link

www.mathworks.com

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