# Method for elaborating and representing data analysis in a decision support system.

## DESCRIPTION

### Technical Field

The present invention relates to a method for representing data analysis in a decision support system.

More specifically the invention relates to a method for elaborating and representing data analysis in a decision support system, the system comprising:

- an electronic data base which is daily updated by external data suppliers or providers;

- computer means comprising linking interfaces to allow on line connections to said data base;

- display means associated to the computer means for displaying information and data and for allowing the user to define data selection criteria by a mouse or a keyboard interface.

The invention will be hereinafter illustrated with specific reference to the application field of investment strategies and set of securities/asset management. However, this field of application must be intended as an indicative and non-limiting example just to simplify the following description.

### Background art

As is well known, the process of evaluating huge amounts of daily changing data and information is hard, difficult and

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time consuming.

This is generally true in many application field, but it's even more fatiguing in financial activities such as the set of securities/asset management.

In this specific technical field huge amounts of information are daily updated through usual specialized channels and expert managers spend their working time to evaluate, compare and decide the best investment opportunities.

As a matter of fact, the daily challenge of a professional set of securities manager is just that of spotting the right investment opportunities, reacting quickly to market changes while increasing the quality of the results.

This kind of activity is in the hands of expert professionals who offer their knowledge and capability to investors seeking the best investment opportunities. However, no one can assure that the chosen securities are really the best or are totally in line with the customers and investors expectations and criteria.

Good results are sometime obtained for casual reasons and don't necessary correspond to the efforts of the expert professional. Moreover, the evaluation activity is so time consuming to discourage deep analysis of huge amounts of data and information, thereby loosing some good investments opportunities.

Prior art solutions have already been proposed to support the expert professional in his or her decision process.

Those prior solutions consists in electronic data bases, which contain the historical data of a number of main

securities which are daily updated by specialized agencies or providers, and so-called electronic sheets, such as the well known software package MS® Excel, to display the data.

So, the data are displayed by software tools which allow the professional user to watch the current numerical value of many securities and to compare such a current numerical value with past values series.

Those solutions are not totally satisfactory for a number of reasons:

- the evaluation of the data is anyway left to the expert users;

- a comparison or integration between the data contained in different data bases is not always immediately available;

- moreover, a comparison of historical series of data for different securities is available only after hard and time-consuming computing;

- the data representation of the currently available software tools doesn't allow to check quickly different historical series;

- the whole information set is difficult to manage and to evaluate so that a decision based on the available information is not always taken according to the investment objectives.

A first object of the present invention is that of providing a new method of representing data analysis which may help the user to take faster decisions.

A further object of the present invention is to provide an

innovative system which allows full personalization of investment strategies using a large range of indicators.

Another object of the present invention is that of providing a software tool which may be used by non-expert users.

A further object of the present invention is that of representing information data in a friendly user manner in order to facilitate the taking of a decision according to the investment objectives.

A further object of the present invention is that of providing a easy-to-use interface which might help the user to work faster in taking all relevant investment decisions improving the results while reducing the risk of wrong decisions.

Summary of the invention

The solution idea on which the invention is based is that of providing a fast reactive computer program interface which allows the user to quickly scan the data base through graphical images or views corresponding to historical paths of selected data.

According to this solution idea, the technical problem is solved by a method for elaborating and representing data analysis in a decision support system, the system comprising:

- an electronic data base which is daily updated;

- a computer means managing said data base and comprising linking interfaces to allow on line and/or batch connections to external data suppliers or providers;

- display means for displaying information and data and for allowing the user to define data selection criteria;

- the method including the following steps:

- presenting on said display means a selection panel or menu reporting a list or table of data from said data base;

- detecting a user's data selection;

- scanning said data base according to a mask or filter corresponding to user's data selection to display a preferred selected panel;

- detecting a pointer of a user's preferred data;

- presenting on said display means a view or history chart showing to the user the variations versus time of the preferred data, while maintaining the selected panel as a side or background view;

- refreshing immediately said view or history chart at each different detected pointer of the user's data selection.

In this manner it's possible to quickly scan the securities in a set of securities flipping though detailed data and historical graphs.

Moreover, a plurality of different information data may be selected one after the other through said selection panel and a corresponding plurality of history charts are automatically shown in an overlapping format on said display means and with the same time base.

The feature and advantages of inventive method will appear from the following non-limiting description of a preferred embodiment given by way of example with reference to the

annexed drawings.

Brief description of the drawings

- Figures 1 shows a schematic diagram of an apparatus implementing the method according to the present invention;

- Figure 2 is an exemplary visual representation of a selection menu presented on a display according to the method of the present invention;

- Figure 3 is an exemplary visual representation of a selection panel according to the present invention;

- Figure 4 shows a schematic view of a historical data path of a selected data contained in a data base of the apparatus according to the present invention;

- Figure 5 is a further exemplary visual representation of a selection panel according to the present invention;

- Figure 6 shows a schematic view of a historical data path of a selected data shown in Figure 5;

- Figures 7 and 8 show respective overlapping historical data paths of a set of data contained in a data base of the present invention;

- Figure 9 is an exemplary visual representation of a graphic interface of the present invention;

- Figure 10 is a high level flow-chart representing the steps of a method in accordance with the present invention.

Detailed description

1. Overview

In accordance with the present invention, a method and an apparatus is provided for elaborating and representing data analysis in a decision support system.

The method and the apparatus allows to combine:

- fundamental information analysis;

- statistical information analysis; and,

- technical information analysis;

in order to integrate as many analytical tools are needed and give a specific weight to each indicator according to investor's individual risk profiles or investment objectives.

The inventive method are implemented in a decision support system 1 including computer means 2 which may operate in a stand-alone manner or may be interconnected on a local area network LAN 7.

The computer means 2 comprises memory means 3 and linking interfaces 4, such a gateway 6, to allow on line connections to external data providers managing a data base containing financial information. The external data providers may be structured with computers local area networks.

Video display means 5 are provided for displaying to the user information and data. A conventional keyboard 11 is associated to each computer means 2 and printer 12 is available too.

The memory means 3 are provided to store locally financial information such as set of securities which are received from the data provider.

Each computer means 2 which contains a computer program according to the present invention and which is structured by a set of functions which have been developed in a C++ programming language, within a Visual C++ MS® programming environment.

Each function assists the user in performing a specific task, such as:

- securities selection;

- set of securities scoring and optimization;

- set of securities analysis;

- benchmark comparison; etc...

The user may combine the functions use according to his favorite work flow as will be explained in the following description.

The functions operates on the set of securities data base. However, they are not designed to update the basic information which are treated by the data provider.

A set of securities is always presented as a browser with the list 15 of securities presented in a table, as shown in Figure 2. The user can quickly configure the table columns to display the values of any indicator in the data base, such as: date, market, weight, volatility, etc...

The table can be searched and sorted with respect to the values in any column.

1.2 Selection

A list of securities may be selected from a domain,

according to a predetermined set of user's specified criteria. Preferably, the set of securities data base is used as domain and a selection menu 16 is available to the user for defining the preferred selection.

The user may create a list of target securities using standard filters for security selection.

The security selection panel or menu 16 is presented to the user so that basic, fundamental, quantitative and technical data may be selected.

It is possible to define constrains on all the available indicators:

- basic; for instance: type, market, sector, currency, nationality;

- quantitative; such as: mean return, volatility, correlation, absolute and relative performance;

- technical; such as: long-term trend, short term momentum, noise;

- quantitative (second selection); such as: price/earning, price/book value, dividend.

Numerical constrains can be defined in a graphical way and may be quantitative, for instance a volatility of no more than 2,5%, or qualitative, for instance a price/earning low or very low; where "very low" means the lowest quartile of the values in the used domain and "low" means the quartile before the lowest.

Qualitative values are automatically computed with respect to the securities in the used domain.

The resulting selection is present as a browser, a table or a chart that will be defined hereinafter as the selected panel 18.

As a matter of fact, all the available information about a specific security may be displayed in a specific window. As many security display windows can be opened at the same time as needed.

Each of the displays is fully configurable to include only the information or indicators relevant for a current task.

1.3 Scoring

This function allows to define securities scores. This function may be used to define filters for personal and global asset scoring.

The user may choose on the video display 5 a set of indicators which, according to his strategy, must influence the relative weights of the securities in the current set of securities. Figure 9 shows a dialog window 22 which may be used by the user to set the score ranges of the securities.

For instance, it might be desirable that a security having a score in the range between 0.00 and 40.00 be labeled "sell", while a security having a score in the range between "70.00 and 90.00 be labeled "good".

Moreover, it might be desirable to allocate a visual flag or indicator on securities having a high score, such as a score inside the range 90.00 and 100.00. Such a flag may be shown as a "buy" label associated to a predetermined remaking color.

The score or weighting is displayed and defined by means of a very intuitive graphical interface 19, as shown in Figure 9.

The selected scoring is quickly computed and an optimized scored set of securities is presented on the selected panel 15 with respect to the combination of user's defined preferences.

User defined specific as well as generic constraints can be forced on the scored selection; for instance: a Beta parameter of no more than 40% on a certain security; and a Year to Date Total Return of 60% on another security, and so on.

Constraints are easily added, modified or removed according to the present invention by means of the graphical interface 19 shown in Figure 2.

1.4 Analysis

The data base set of securities may be deeply analyzed through a specific function.

The analysis function computes the average of the set of securities combining the historical quotes of the securities while taking into account the set of securities scoring.

The result is presented in a chart 25, as shown in Figure 7. Such a chart can be graphically compared with any other security in the data base as shown in Figure 8.

Pie charts 21, scatter diagrams 28 or heat maps may be presented on the video display by defining the indicators to focus on.

1.5 Comparison

A comparison function allows to compare and match any set of set of securities data.

The user indicates a reference set of securities and a number of actual set of securities to be compared. The comparison function computes the buy/sell actions needed to transform each of the set of securities into the reference and the implied turnover.

The actions may be filtered and presented in a fully customized way.

The comparison allows to analyze the differences among the set of securities under consideration with a powerful set of display tools, such as multiple synchronized pie charts, multiple scanner diagrams, etc...

The comparison computes the average of all the set of securities under analysis combining the historical quotes of the securities.

Hereinafter we will newly take in consideration the previous options to more deeply analyze the features of each program function.

2.1 Selection: Fast browsing of market data

Feature:

With specific reference to the example shown in Figures 2 and 3, the program presents to the user a selection panel 16 for displaying information and data and for allowing the user to define data selection criteria.

The data supplied by the external data provider are

received on line by the linking interfaces 4 of the computer means 2.

For each set of securities display, there is a current security, whose name is highlighted, for instance the security indicated with 23 in Figure 3.

After a selection, a table 18 is presented in front of the user as shown in Figure 3.

For the current highlighted security 23 it is possible at any time to open a window with detailed information.

Such a window is a graphical representation of the history of the security's market quotations, that is: a history chart 24 as shown in Figure 4. It is possible to open any number of such representations.

When the current highlighted security 23 is changed by the user, as shown in Figure 5, the representations (graphs and/or tables) on the last opened windows are immediately updated to the newly focused security as shown in Figure 6.

It is thus possible to quickly scan the securities in a set of securities flipping though detailed data and historical graphs.

Therefore, the exential features of the inventive method include the following steps:

- presenting on the display means 5 a selection panel 16 or menu reporting a list or table 15 of data from the data base;

- detecting a user's data selection;

- scanning said data base according to a mask or filter

corresponding to user's data selection to display a preferred selected panel 18;

- detecting a pointer 23 of a user's preferred data;

- presenting on said display means 5 a view or history chart 24 showing to the user the variations versus time of the preferred data, while maintaining the selected panel 18 as a side or background view;

- refreshing immediately said view or history chart 24 at each different detected pointer 23 of the user's data selection.

The automatic refreshment of the history chart is such that for the user get the updated view in the same instant in which a new highlighted security 23 is detected.

2.2 Implementation

The implementation is based on the Document-View model of an architecture based on Microsoft Foundation Classes (MFC). In each application's document a pointer to the current security is defined. The set of securities display (browser) as well as the history chart and the security display are implemented as Views.

When a security name is selected in the set of securities display or browser, the current security in the application document is updated and all the views are notified with the standard Update AllViews CDocument method in MFC.

When notified of a current security change, both the history chart 24 and the security selected panel 18 ask to the computer means 2 the information to be displayed. The needed data are acquired from the data provider in

numerical format to the requiring views, which in turn compute the proper graphical representation and update their displays on the screen.

3. Multiple historical series with dynamic rescaling

3.1 Feature

In a history chart it is possible to compare any number of securities histories, as shown in Figure 7. This is achieved by dragging form a set of securities display or browser the name of the security into the screen area 25 of a displayed history chart. All the displayed histories are rescaled to a reference value, for instance 100, at the beginning (first day) of the displayed period.

When a point 26 in the chart is clicked, the rescale day is moved to the day in the history corresponding to the clicked point. The arrow keys allow to move the rescale day backward and forward on the time line. It is thus possible to evaluate the relative performances of all the securities displayed in a history chart over any specific period in the past, simply by clicking on the proper day. In the history graph legenda, the market data of all the displayed securities at the rescale day are displayed together with the performance of each of them since the rescale day.

When a different security is selected in the set of securities display, the original security in the history chart is substituted with the new one and the chart is rescaled to the last selected rescale day.

3.2 Implementation

The history chart view obtains from the data provider the history of each added security as soon as it is dragged

into the chart screen area. The histories are stored in numerical format. The actual values to be displayed in graphical format are computed locally and by-need. When a new rescale day is selected, the value of all the histories is set to the reference value at the rescale day and each of them is transformed to keep unchanged the percentage variation of the value of each day with the value of the rescale day. After the transformation of the stored histories, a new graphical representation is computed and the display is updated.

This feature allows a plurality of different information data to be selected one after the other through said selected panel 18 and a corresponding plurality of history charts to be shown on said display means with the same time base and in an overlapping format, as clearly shown in Figure 7.

4. Scoring and evaluation

4.1 Feature

A score function allows to associate a score to each security in a list. A score is a real value between 0.00 and 100.0. The score of each security is relative to the scores of the other securities in the current list. The "best" security gets score 100.0 and the "worst" gets 0.0; all the securities in the range between 0.00 and 100.00 get a value proportional to their "goodness".

The scoring is computed by the system according to a set of criteria interactively defined by the user as shown in Figure 9.

Any numerical dimension on which the securities in the securities list can have a value can be used as an scoring

criteria. In particular, the values of all the numerical field offered by the data provider on each security can be adopted as a scoring criteria. The user can select the scoring criteria among the numerical parameters available for the securities.

The user can also weight the selected criteria by graphically manipulating a set of cursors 19 on the screen, one for each criteria. Weight of criteria is expressed in percentage. The user interface includes a set of tools for balancing the weights according to the user's preferences. When the weight of a criteria is manipulated with the interface, the weights of the other criteria are adjusted in real-time to keep their sum to 100 while respecting the ratios among them, as clearly shown in the display portion 17 of Figure 2.

It is anyway possible to "freeze" the weights of a subset of the criteria. In this case the automatic adjustment modifies only the weights of the remaining criteria. Each criteria can be used on a direct (higher values are preferred) or an inverse (lower values are preferred) scale.

When the user, after selecting and weighting the scoring criteria, asks for the computation of a new score, the system assigns a score value to each security in the current list. The score of each security is computed as a combination of the values of the data fields used as scoring criteria. The security with a better compromise of values for the weighted criteria gets a proportionally higher score than a security with a worse combined value.

Scores can be displayed in a column of the Browser View and can be used, as the value of any data field, to sort and

search the securities list.

For each security, the score function transforms the score into a symbolic evaluation. An evaluation is a colored short text associated to a range of scores. The user, with a graphical interface, defines the text, the color and the range of scores to be associated to each evaluation. Evaluations can be displayed in a column of the Browser view and can be used, as the value of any data field, to sort and search the securities list.

Each evaluation is displayed in the associated color making it easy to discriminate at a glance the securities by their quality.

4.2 Implementation

The user interface of this function is dynamically built on the set of criteria defined and weighted by the user. When a new criteria is added, the interface is restructured to host a new graphical object enabling the user to weight the criteria.

When a new configuration of parameters has been defined, the application asks the data provider for the values of the M parameters used as criteria for the N securities in the securities list.

A NxM matrix is built and locally stored. The securities values are thus cached by the application inside the local memory means 3 and it is not necessary to communicate with the data provider if the set of the criteria is not changed. The computation of a new scoring is performed as follows:

The weights of the parameters are stored in a column vector

of dimension M;

All the values in each column (same parameter) are normalized;

To each row (security) a score is assigned equal to the internal product of the row vector with the column vector of the parameters weights.

The method according to the present invention has the great advantage of allowing the managing of huge amounts of daily changing data and information which are transformed into image results helping the user in his decision process.

The method according to the invention may be considered as a very fast solving puzzle in which a huge amount of different pieces are correctly put together in order to provide a complete picture.

The method allows to work faster having all relevant investment information to take better investment decisions which may be based on the user preferred criteria.

This method allows to improve the investment results by taking optimized decisions according to security parameters.

The user may manage the risk by controlling set of securities and investment strategies.

## CLAIMS




What we claim is:

1. Method for elaborating and representing data analysis in a decision support system, the system comprising:

- an electronic data base which is daily updated by external data suppliers or providers;

- computer means comprising linking interfaces to allow on line connections to said data base;

- display means associated to the computer means for displaying information and data and for allowing the user to define data selection criteria by a mouse or a keyboard interface;

- the method including the following steps:

- presenting on said display means a selection panel or menu reporting a list or table of data from said data base;

- detecting a user's data selection;

- scanning said data base according to a mask or filter corresponding to user's data selection to display a preferred selected panel;

- detecting a pointer of a user's preferred data;

- presenting on said display means a view or history chart showing to the user the variations versus time of the preferred data, while maintaining the selected panel as a side or background view;

- automatically and immediately refreshing said view or

history chart at each different detected pointer of the user's data selection.

2. Method according to claim 1, wherein a plurality of different information data are selected one after the other through said selected panel and a corresponding plurality of history charts are shown on said display means with the same time base and in an overlapping format.

3. Method according to claim 2, wherein the different information data of the data base are quickly scanned by flipping through said historical charts.

4. Method according to claim 1, wherein the mask or filter selection is obtained by numerical constrains set by the user through a graphical interface.

5. Method according to claim 1, wherein the displayed history charts are rescaled to a reference value at the beginning of the displayed period of time.

6. Method according to claim 1, wherein the data base contains a securities set of securities.

7. Method according to claim 6, wherein said history chart represents the variations of the value of a selected security within a predetermined period of time and in a given currency.

8. Method according to claim 7, wherein the displayed history charts are transformed into a different currency taking into account the historical fluctuations of the exchange rate between the original currency and the new one.

9. Method according to claim 1, wherein the data are

presented as table columns which are configured to display the values of any indicator in the data base.

10. Method for elaborating and representing data analysis in a decision support system, the system comprising:

- an electronic data base which is daily updated by external data suppliers or providers;

- computer means comprising linking interfaces to allow on line connections to said data base;

- display means associated to the computer means for displaying information and data and for allowing the user to define data selection criteria by a mouse or a keyboard;

- the method including the following steps:

- presenting on said display means a selection panel or menu reporting a list or table of data from said data base;

- detecting a user's data selection;

- scanning said data base according to a mask or filter corresponding to user's data selection to display a preferred selected panel;

- selecting a scoring criteria among a plurality of numerical parameters available for the preferred set of data;

- weighting the selected scoring criteria by graphically manipulating one or more cursors on the screen, one for each criteria;

- automatically presenting on said display means the scores of the user's selected data at each different detected




selection of said cursors.

11. Method according to claim 10, wherein when the weight of a criteria is manipulated through the graphic interface, the weights of the other criteria are adjusted in real-time to keep their total sum to one hundred, while respecting the ratios among them.

12. Method according to claim 10, wherein the data base contains a securities set of securities.

13. Method according to claim 12, wherein when the user selects a new scoring criteria, the system assigns a percentage of the set of securities to each security in the selected list.

14. Method according to claim 13, wherein the percentages are proportional to scores of the securities with respect to the scoring criteria.

15. Method according to claim 14, wherein the score of each security is computed as a combination of the values of the parameters in the data base used as scoring criteria.