

DEFINIO REPLY BACKTESTING

The Definio Reply platform can be used as a support tool for the implementation of the Backtesting process, understood as a methodology for measuring the predictive character of market risk evaluation models.

"VaR is only as good as its backtest. When someone shows me a VaR number, I don't ask how it is computed, I ask to see the backtest"

(Aaron Brown – Risk Manager)

SCENARIO

From the moment when banks and insurance companies began to develop and apply risk evaluation models, it became necessary to check over time the performance, quality and stability of the models used. Backtesting methodologies then turned out to be indispensable. Indeed, they represent the essential prerequisite and not just a best practice solution for all risk management systems based on estimate models.

Moreover, Bank of Italy and CONSOB regulations for internal risk management systems highlight that "it is necessary for the Risk Management function to perform backtesting on the risk models in use, suggesting modifications if necessary".

As the Bank of Italy has made clear:

"Backtesting involves a comparison between realised exposures and predicted ones, the latter being calculated as a function of the probability distributions of the different market variables considered by the model and for different time horizons.

The value recorded for each reference portfolio is calculated in relation to different time horizons using the time series of important market factors (interest rates, shares, exchange rates, etc.).

These values will then be compared with the corresponding expected exposures predicted by the model. The tests will be performed on a number of dates, so as to cover a wide spectrum of market conditions (e.g. rising interest rates, curved rates, high volatility, etc.)”.

Backtesting is a quantitative and/or qualitative methodology that is necessary, but not sufficient, to measure the predictive character of the models implemented in the framework of proactive risk management. It consists in the retrospective comparison of parameters deriving from the risk indicator calculation system with the results observed over the period analysed. It is therefore a matter of ascertaining, in a verification logic of the process efficiency, that the risk measures “achieved” are statistically comparable with the estimated ones.

Nowadays, backtesting is an essential, if not structural component of a portfolio risk evaluation model.

The need to perform backtesting of an ex-ante risk model is largely in response to two different requirements:

1. Managerial (internal)
2. Control (internal or external)

A reliable measure of the risk indicators (e.g. VaR), can lead to its use not just in the context of a regulatory framework, but as a datum to provide to the manager, which is able to provide specific limits and controls of the risk measures (for example, introducing concepts of risk budget or of a simple absolute risk limit). In the banking field, the accuracy of the risk measure determines the exact quantity of assets to allocate to enable operations to be performed comfortably within set limits.

The backtesting system must be capable of supplying the inspection body with all the information about the processes for producing the internal risk estimates and their verification via the backtesting process. Under this heading the traceability and repeatability of the results obtained play an extremely important role.

Backtesting thus constitutes an essential part of the authorisation process. In particular, it is necessary to ensure the representativeness of the portfolios retrospectively tested in terms of sensitivity to risk factors for different analytical aggregations (share types, foreign exchange, sectors, etc.).

SOLUTION



Definio Reply is an open and flexible system for the control, analysis and support of financial and asset management decisions.

Definio Reply has a specific module for backtesting in its architecture, where the modular approach of the platform allows the use of product risk indicators from the Definio Risk Management module (within the system) and products from external systems (exogenous to the system).

Definio Reply has already been successfully used in the backtesting of risk models exogenous to the system. Its structure, devised for the creation and management of dynamic portfolios, makes it an ideal system for the acquisition of data from external systems.

A specific module is used to import and historicise data from external environments on the file system and database (e.g. VaR results). In this way a result will always be regenerated, for a shared historical depth during the installation phase.

Its interface, which is arranged for the management and simulation of portfolios, is helpful for the creation of special backtesting portfolios.

The security database (master record) enables the definition of all risk factors mapped by the calculation and indicator estimation process.

A flexible system makes it easy to produce all the reports necessary for structured analyses.

BACKTESTING PROCESS

The backtesting process can be summed up as follows.

Definition of the period of observation and of the quantiles to consider for the purpose of backtesting. The choice of these parameters is governed by the type of result desired (purpose of the backtesting), as well as by the willingness to activate a *frozen portfolio* process and to perform the *mark-to-market* with the logics implemented within the risk system.

This aspect is usually one of the most critical points when a backtesting system is being implemented. Indeed, if the horizon of observation is long (relative to the operativeness of the portfolio), it is necessary to implement portfolio freezing logics and the option of performing the *mark-to-market*. The *frozen portfolio* thus enables the backtesting of real portfolios, eliminating however the management of the portfolio by results. In this way we try to focus the *profit/loss* of the portfolio under examination solely on the market component.

The implementation of static portfolios in the backtesting system is an easy solution to this problem. These portfolios are constructed by assembling the var model's risk factors. The logic of portfolio creation can therefore follow various philosophies: replica of the strategic asset allocation of real portfolios, or construction of a mix of risk factors that particularly stress the model (correlation logics). The breakdown of the portfolio into basic risk factors also leads to its simple re-evaluation.

Acquisition of the results of risk and *profit/loss* indicators of the portfolio and generation of test statistics, i.e. the number of overshootings of the portfolio in relation to the chosen indicators.

Choice of which statistical hypotheses to implement to determine whether or not to accept the risk model, or to generate the analytical measures of the backtesting process. This is the point that leaves more space to the definition of the customer's backtesting needs. The choice could be: a zone test, as specified by the Basle Committee; a non-conditional test, for example via Kupiec's approach; or, if we focus on the time aspect of the exceptions, an independence test could be used.

A system of analysis and reporting with easy traceability of the results produced and the ability to reproduce them if necessary.

CHARACTERISTICS OF THE DEFINIO REPLY PLATFORM

DATA ANALYSIS AND DISTRIBUTION. As well as offering a rich set of analyses, dashboards and what-if environments, the Definio Reply platform can also be considered a data source for:



- data analysis in Office® environments;
- integration with QlikView® (Associative Query Logic) technology, which is immediate, powerful and flexible for interactive data analysis;
- data acquisition and contribution with Matlab® via the *Definio Interface module to MATLAB®*;
- distribution of reports, analyses, dashboards, financial statements, etc. and also to users outside the company (Internet - Extranet) via the *Definio NET module*.

DATA ACQUISITION. The Definio Reply platform is equipped with connectors to external data sources designed to feed the *Definio Data Layer component* (Definio Reply's financial data management and organisation component): standard and parameterisable connectors that enable immediate access to the required data.

It is possible to acquire data from the following sources:

- Administrative systems, Back Office, legacy systems;
- Market products;
- Depository banks;
- Market data from Information Provider.

The connectors are able to control and verify the quality of the data acquired.

TECHNOLOGY. Definio Reply is an *enterprise* application comprising a suite of software modules, developed with a totally web-based technology to be usable by different types of users, inside and outside the company, and personalisable according to the requirements and characteristics of each of these.

The approach taken in the technical choices made in creating the Definio Reply user interface and database has led to the adoption of the most innovative Microsoft® solutions (ASP.NET/C#, AJAX and SQLServer).

The specialised Definio Reply calculation modules are based on directly developed statistics-financial libraries that are integrated into the product. The Definio Reply system is technologically designed to provide all the necessary levels of data processing security.

It supplies tools for the administration, configuration and control for the management of all application modules, for the profiling of roles and users, for the scheduling of the data update processes, and the tasks of pricing and calculation of indicators. Definio Reply provides tools to control and verify the consistency of system data and the outcomes of the tasks performed.

Key features	Key Benefits
A single and integrated environment for all financial and investment data	Completely web-based
Standard connectors to Back Office and administrative systems	Standard and parameterisable connectors that acquire data from a number of systems and providers
Standard connectors to Data Providers	Multi-provider time series
Technological platform for the control and administration of data acquisition, profiling of roles and users and task performance	Single multi-user technological platform automatically fed by a number of data sources
Portfolio management modules	Scalable and modular platform
Financial calculation engine for performance and ex-post risk indicators	Rich computing environment, reports and data analysis
Financial calculation engine for ex-ante risk	Sophisticated risk indicator models
Customer advice orientated modules	Alignment with recent regulations
Analysis, reporting, account rendering and simulation environments	Financial Decision Support System
Data distribution	Financial Data Warehouse

REPLY VALUE

Besides the Definio Reply platform, Reply is able to supply all the direct services for the system for personalisation and, as a consequence, for the overall objectives of the change programme.

Specialised personnel accompany customers during the project's implementation phases. Reply has its own team of specialists capable of covering all the planning phases from design phase to the implementation and maintenance of the systems.



Definio Reply is a technological platform capable of directing the demands of management, analysis and reporting on portfolios of financial instruments (managed, administered and owned) Definio Reply provides a concrete and efficient response to the increasingly pressing requirements of the managed funds market, in terms of analytical tools and decision-support.

Definio Reply
www.definioreply.eu



Reply [REY.MI] is specialized in design and implementation of solutions based on new digital media and communication channels. Operating through a network of highly focused companies, Reply provides the leading European Groups in the Telco & Media, Manufacturing and Services, Banking and Insurance Industries as well as the Public Sector with an effective support aimed at defining and developing business models enabled by the Web 2.0 and by the convergence paradigms. Reply services include: Consultancy, System Integration, Application Management and Business Process Outsourcing.

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