

## **R/V Platform Risk Management System**

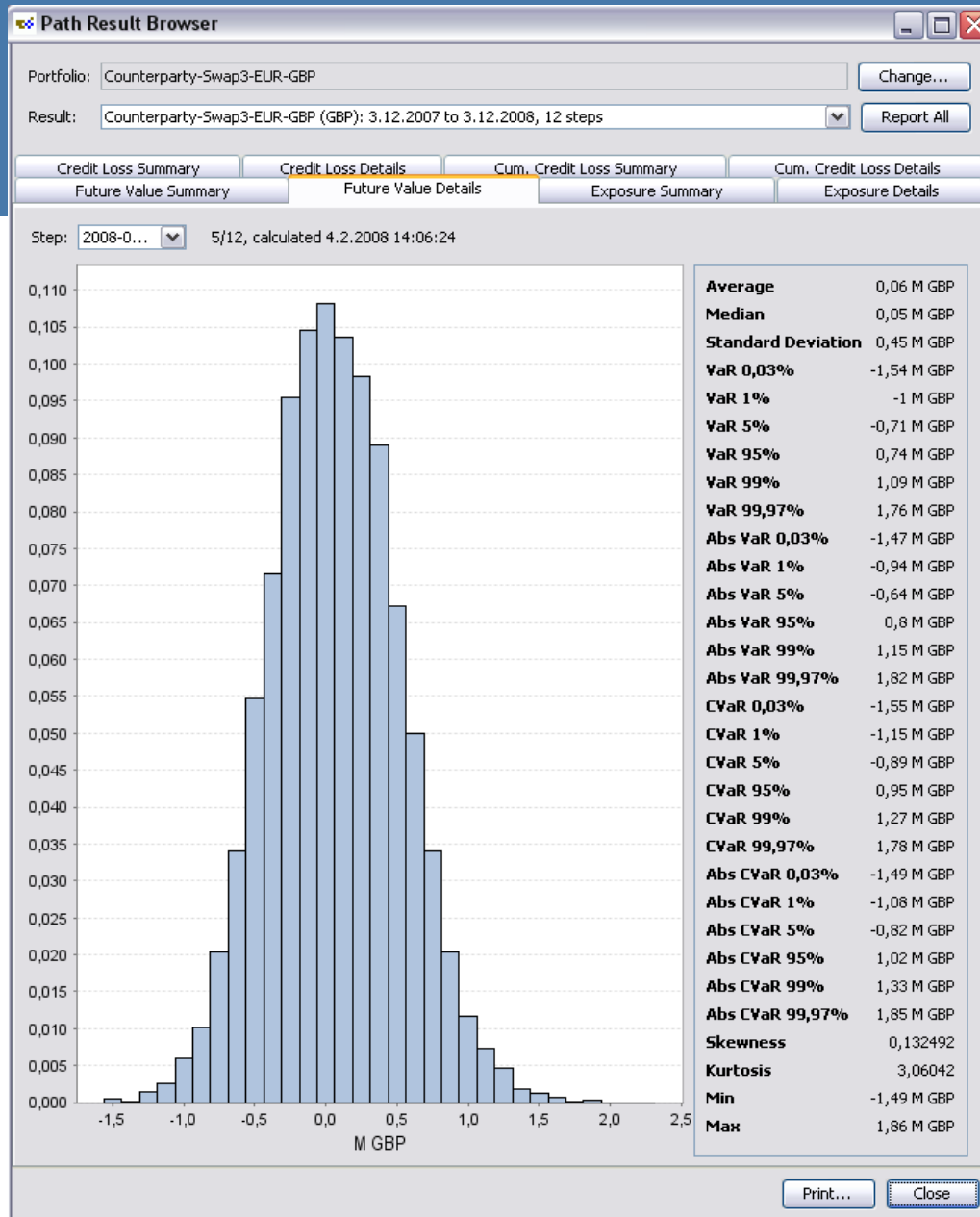
**R/V is one of the most powerful, sophisticated and proven risk management systems available today and supports the largest banks, asset management, insurance companies and hedge funds in their journey from Risk Control to Enterprise-wide Capital Management**

- + Enterprise Risk Management and Analyses**
- + Enterprise-wide Capital Management**
- + Valuation Analyses**
- + Risk-based Product Pricing**
- + Comprehensive Asset Liability Management**
- + Corporate Development and Reporting**
- + Covers needs of risk managers, product controllers, from management to external reporting**
- + Both full Economic Capital and Regulatory Capital calculations for every exposure**
- + Very scalable grid platform**
- + Deployment options supporting single / multiple (remote) operations across multiple legal entities**

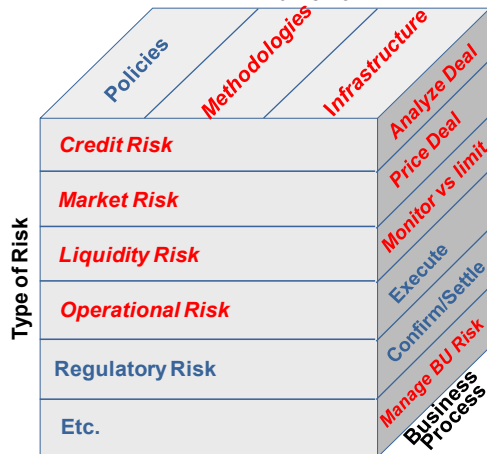
## Introduction

R/V is a fully integrated, yet modular system platform for enterprise risk management and analyses, covering all risk dimensions – Credit, Market, Operational, Liquidity, etc. It has wide functional coverage - from risk/return analyses and reporting to on-line decision support, and is also used in the areas of Capital Management, Valuation Analyses, Risk-based Product Pricing, ALM, and Corporate Development & Reporting (e.g. Rating Outlook Analysis)

It has sophisticated 'path simulation' and stress testing capabilities for integrated risk analyses, and supports fully advanced Basel II approaches including other Pillar II 'Residual' risks. Also easily supported are near-real-time pre-deal limit checking (after powerful simulations), and 'Alpha' testing of counterparty credit risk in trading book derivatives positions.



## Framework



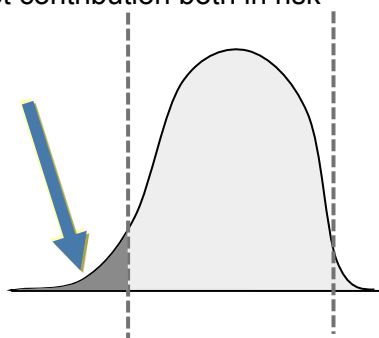
## R/V Platform's Simulation Capabilities

The system supports one-step and path Monte Carlo and historical simulation techniques, advanced stress tests and scenario analyses, VaR type and 'Coherent' risk measures and other tools and analytics. The calculation engine is capable of dealing with very large Monte Carlo simulation and other elaborate analysis tasks. Simulation problems with thousands of risk factors have been processed in actual customer cases using the system. R/V can handle complex default relationships inherent in some derivatives, e.g. Collateralized Obligations (CDOs).

It fully supports integrated risk situations in which, for example, both default events and rating migration events must be simulated. There is no limitation on instruments covered, beyond the current 157 instrument family/type pricing library. The workings of the solution are not dependent on conversion to cash flow equivalents, but also include their risk-adjusted discount rates adjusted for both general and specific risks.

## Stress Testing

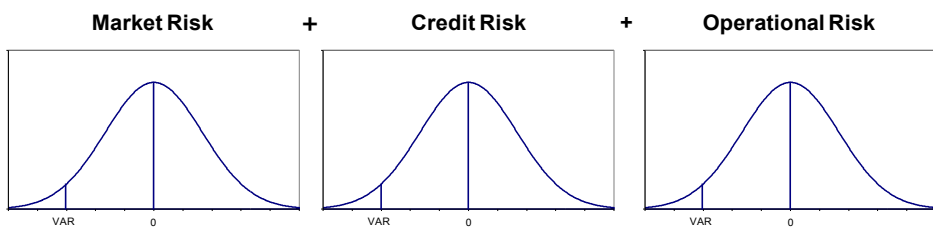
VaR measures cannot capture the effect of truly extreme, sudden and dramatic changes, but are good for “fair weather sailing”. So Stress Testing is an important feature to simulate abrupt changes in, e.g. market liquidity, well outside the normal range of observations. R/V has three different options for Stress Testing: Sensitivity Analysis for simple changes; Scenario Analysis for larger, or more complex changes with one or more risk factors; Contribution Analysis through advanced simulations, with or without a particular exposure - be it a sub-portfolio, or, say, a hedge either in place or being evaluated. Contribution Analysis will help to determine the net contribution both in risk and risk/return.



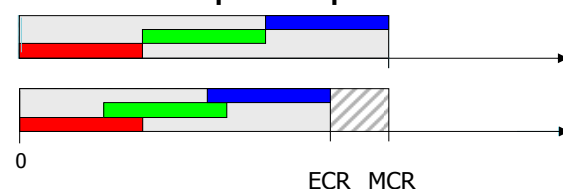
## Integrated Risk Management



R/V has an integrated approach to risk management across Market, Credit and Operational risk that provides for the complex interaction of these different risk factors. Modular and potentially very different applications within R/V perform simultaneously and independently of each other. However, analyses of these applications are based on the same simulations and market/estimate/transaction data, and applications share the same pricing and valuation rules. The outcome is integrated risk analyses incorporating inter-dependent risks.



## Economic Capital vs. Minimum Capital Requirements



## Deutsche Asset Management Case Study

Deutsche Asset Management (DeAM) use the system for both client reporting and internal applications. The application is designed for reporting to large institutional customers, which give customized mandates to DeAM. These require performance reporting with widely varying benchmarks.

The flexibility of the system allows reporting of any kind of mandates both in risk/performance terms and relative to benchmarks. Performance can also be attributed to different risk factors. DeAM investment managers can use R/V Platform for planning and monitoring their strategies, and targeting new clients by being able to analyze their portfolios through a rapid take-on, and then recommend reallocations.

## Full Basel II Compliance Support

With its powerful simulation capabilities, full product support and integrated risk management approach, R/V supports fully both Basel I and advanced Basel II approaches (Pillar I and II).

**Market Risk:** R/V supports Internal Models Approach, and the intersection of Market Risk and Credit Risk in the Trading Book and both one-step and path simulation analytics.

**Credit Risk:** R/V supports Advanced IRB with full path Monte Carlo simulation. Counterparty credit risk variables are simulated as time-paths, with netting and credit risk mitigation enabled. Both actual positions and collateral are dealt with in a powerful way enabling generation of distributions for Loss Given Default (LGD) and Minimum Capital Requirement (MCR) and enabling supporting cross-product margining.

**Operational Risk:** R/V supports both Advanced Internal Measurement Approach (IMA) and Loss Distribution Approach (LDA). The path simulator simulates events of operational risk and loss/profit outcomes for each cell of the business line – loss type matrix.

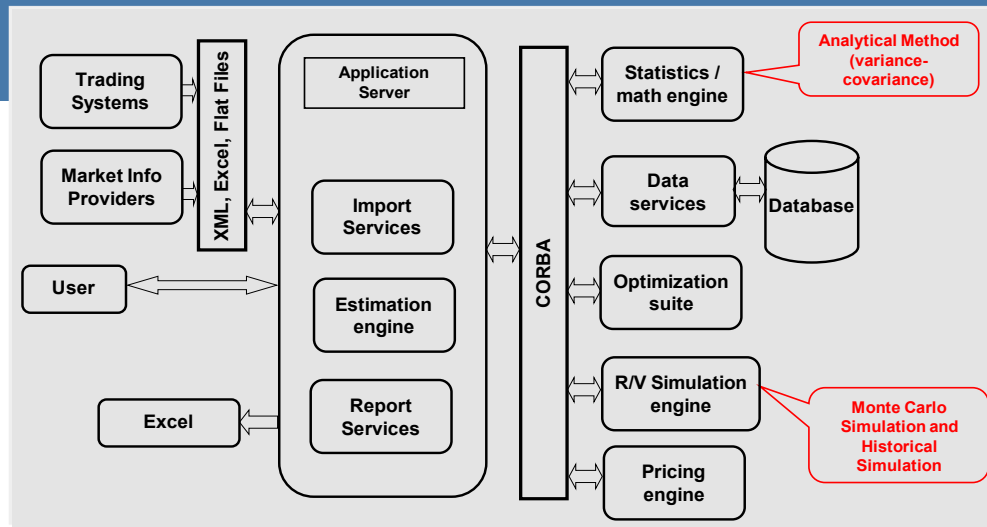
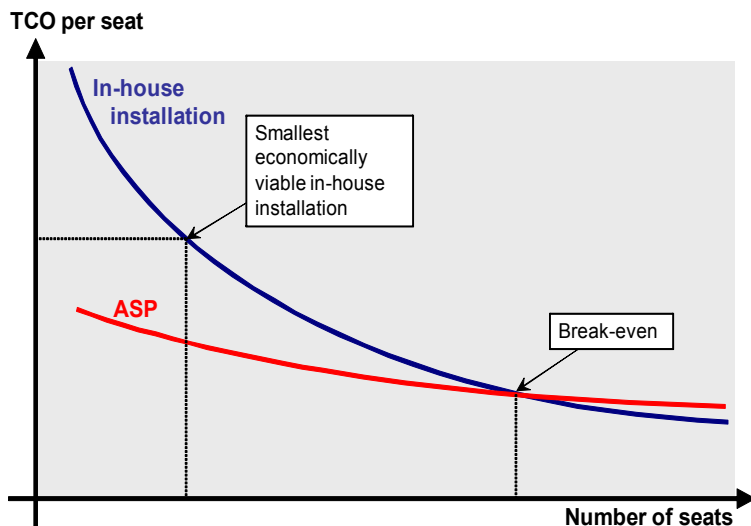
Other Pillar II '**Residual**' risks: one Finnish bank has already applied to its regulator for Basel II Pillar II accreditation, solely using R/V Platform as its risk calculation and reporting engine.

## ASP Delivery and Flexible Delivery Options

The platform offers the customer substantial cost savings through Application Service Provider [ASP] delivery. With R/V's flexible design, the ASP model can also easily be applied internally within a geographically distributed customer. R/V can also be distributed to the degree desired between locations in different time zones, while retaining centralized overview.

For example, satellite offices in other provinces of China could deploy only a terminal and printer at the remote site. This maintains central financial control of the data, maintains central IT control and reduces operational risk.

With R/V's flexible delivery options, transition from an outsourced ASP to running all or part in-house is straightforward.



## Powerful Scalable Performance

Analyses across the banking book and trading book require intensive numerical processing. Yet R/V's distributed computing architecture and hardware configurations are capable of delivering near-real-time performance even in largest of simulations and analyses. The architecture is fully scalable with appropriate commodity hardware added according to need. User interfaces support multiple simultaneous users of multiple different applications.

## Importing Statistical Data

Simulation calculations typically require many statistical parameter estimates as inputs. Such estimates can be imported into R/V Platform from other applications, databases or estimation services. Estimates (e.g. yield and futures curves) can also be generated in R/V Platform's own Estimation Server, which has a browser interface, and is linked with real-time information services such as Reuters and Bloomberg.

## Technical Platforms

R/V runs on MS Windows or Linux/Unix. Calculation server and respective components are implemented with C++. User interfaces are implemented with Java. Database independent.