



SAS® Risk Management for Banking

A comprehensive, end-to-end solution for performing risk analysis and risk-based capital calculations for banks and other financial institutions

What does SAS® Risk Management for Banking do?

SAS Risk Management for Banking supports a bank's risk management activities by delivering functionality for all major risk types, as well as data management and reporting. The solution allows business units to calculate risk measures – e.g., market, credit and ALM – independently and separately, as well as firmwide, using models and correlated aggregation techniques. The solution's integrated risk applications can be used together, individually or in any combination, enabling you to start in one area (e.g., market risk) and then expand usage to other areas (e.g., credit risk, firmwide risk or ALM) as needed.

Why is SAS® Risk Management for Banking important?

SAS Risk Management for Banking's more advanced, integrated and scalable infrastructure is necessary for adequately protecting the bank, the financial industry, investors and other stakeholders. The solution provides a high-quality, integrated risk data infrastructure that enables banks to measure exposure and risk across all risk types and books of business. The solution also enables the distribution of incentives for consistent optimization of risk-adjusted returns throughout the organization.

For whom is SAS® Risk Management for Banking designed?

The solution is designed primarily for the chief risk officer (CRO) and associated groups of risk analysts and power users.

SAS® Risk Management for Banking is a complete, integrated and firm-wide solution for risk management in the banking sector. Based on SAS software's core functionality, the solution covers the entire spectrum of risk types – including market risk, credit and liquidity risk.

The solution also allows for interdependencies between risk types and aggregates interrelated risks on a firmwide level using state-of-the-art risk analytics that incorporate a wide range of methods and models into the solution, along with simulation capabilities.

Based on the valuation and exposure calculation of the constituent instruments, the solution lets you calculate portfolio risks with respect to different risk measures, such as value-at-risk, expected shortfall, earnings-at-risk or liquidity-at-risk. Users can also calculate economic capital for the entire bank's portfolio or at a user-defined cross-classification level, from which risk-adjusted performance measures can be derived.

Portfolio optimization capabilities lay the foundation for identifying buy/sell strategies in order to attain portfolios with better risk-return characteristics.

Key Benefits

- **Adopt an integrated risk management strategy** that meets all data, methodology and usability requirements and enables the effective distribution of key risk information across the enterprise to different user types.
- **Gain a comprehensive view of risk across risk types** by analyzing the risk/return profiles across all lines of business.
- **Customize models, analyses and reports** on an ongoing basis to adapt to changing business needs both today and in the future.
- **Support innovation** through the introduction of new risk measures and models in a fully transparent and auditable environment.
- **Extract, integrate and validate risk data from almost any source**, including market data providers, portfolio/loan accounting systems, trade capture systems, clearing systems, etc.
- **Get up and running quickly** with preconfigured models, methods and reports for market risk, credit risk, ALM and firmwide risk.
- **Achieve better investment performance** by optimizing investment strategies.
- **Take full advantage of current and future business opportunities** by reallocating capital and risk capacity.
- **Gain more control over, and ownership of, your risk data** via comprehensive data management capabilities, a banking-specific data model and prebuilt data management processes.
- **Lower your total cost of ownership** with an end-to-end solution that covers everything from data management to risk analysis to reporting.



Solution Overview

SAS Risk Management for Banking includes a banking-specific data model, prebuilt data management capabilities and reporting functionality. These applications comprise the solutions:

- SAS® Asset and Liability Management for Banking.
- SAS® Credit Risk for Banking.
- SAS® Market Risk for Banking.
- SAS® Firmwide Risk for Banking.

Risk Data Management

SAS Risk Management for Banking is an integrated risk management system that provides a banking-specific risk data model with preconfigured data flows. Existing data flows can be modified for a bank's specific conditions and data quality controls, such as rules for handling bad data, unclassified data or data not fitting the model. The solution's risk data management capabilities enable users to acquire and consolidate historical data from both internal and external sources for risk analysis and reporting. The solution also provides:

- **Risk data warehouse.** SAS Detail Data Store for banking serves as a single source of all the information for creating a risk data warehouse.
- **Advanced data quality.** Data quality tools provide the ability to eliminate or reduce data inconsistencies.
- **Third-party integration.** Supports integration with third-party applications.
- **User security.** Enables creation and amendment of user security for access, authentication and authorization.
- **Audit functionality.** Enables creation and inquiry of automatic audit trails.

Risk Reporting

Using SAS Stored Processes, users can configure their own workflows and integrate daily and ad hoc advanced risk analytics procedures into their preferred environments. For example, users can integrate their reporting and analysis workflows into their desktop environments with SAS Add-In for Microsoft Office. In addition, SAS Risk Management for Banking includes a wide array of preconfigured reports and

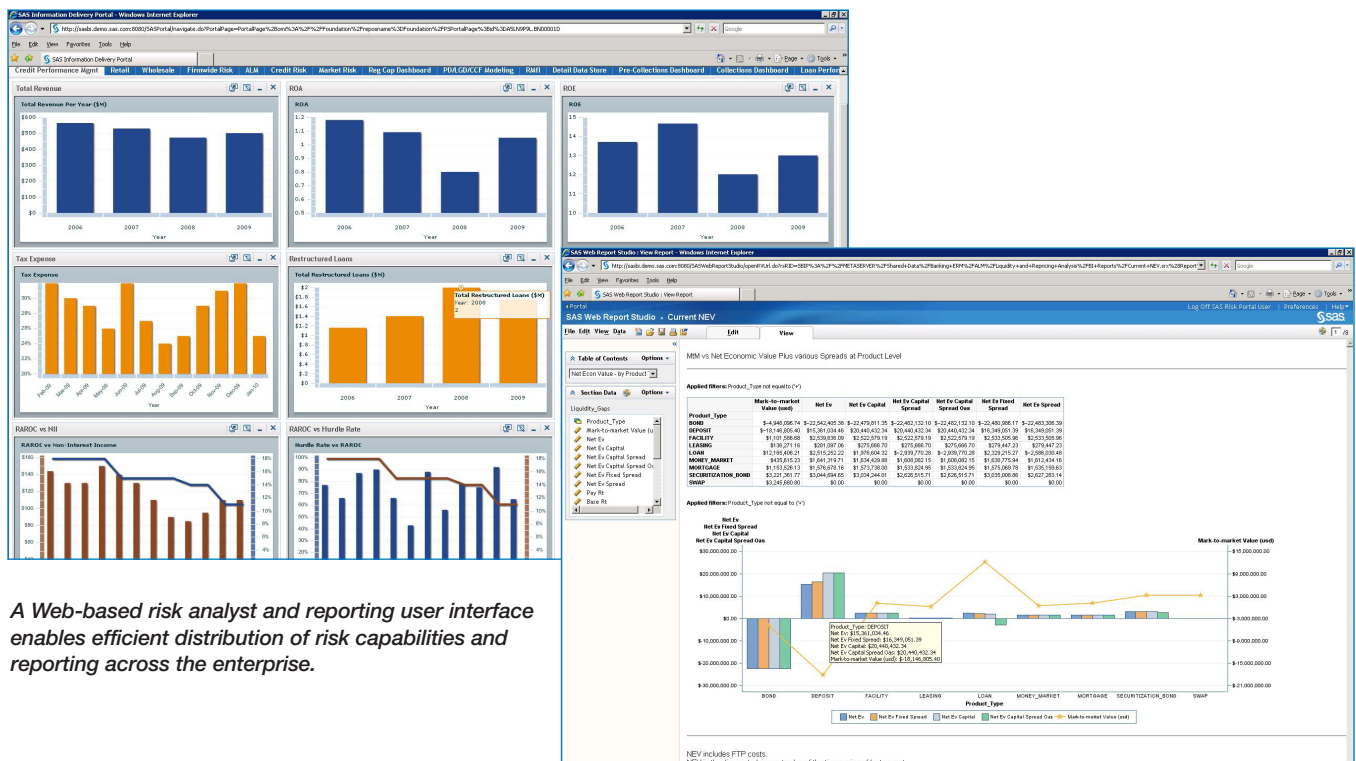
risk analysis workflows. The reporting framework includes sample reports, OLAP cubes and interactive analysis results for all solution components.

Solution Components

Asset and Liability Management

This component lets you value traditional balance-sheet instruments, such as loans and deposits, and their associated (off-balance-sheet) hedges while factoring in embedded options, such as prepayment and withdrawal, as well as credit risk, liquidity risk, etc. In addition, you can:

- **Assess fund transfer rates**, with or without risk-based spreads such as credit and liquidity spreads and option-adjusted spreads, and calculate economic value.
- **Perform advanced analysis** across risk types, including stress testing and modeling of liquidity risk, net interest income and economic value.
- **Assess the effect of hedge instruments**, and analyze optimal cash flow replication hedges.



A Web-based risk analyst and reporting user interface enables efficient distribution of risk capabilities and reporting across the enterprise.

Credit Risk Management

This component enables you to calculate and stress-test credit exposures, taking into account the effect of netting and collateral. In addition, you can:

- **Perform advanced simulation** of potential future exposure.
- **Calculate portfolio credit risk measures** using advanced portfolio credit risk models, such as actuarial models, and reduced form stochastic transition matrix models.
- **Optimize the credit portfolio** using risk/return measures.

Market Risk Management

This component enables risk analysts to value complex market instruments, including exotic derivatives; perform stress tests; and calculate VaR, expected shortfall and other risk measures using a variety of methods – e.g., historical, covariance and Monte Carlo simulation. In addition, the solution can:

- **Decompose portfolio risk** in additive risk contributions and analyze the relative importance of risk factors in determining portfolio loss.
- **Perform back tests of the VaR model** and determine the optimal portfolio by optimizing risk/return measures.

Firmwide Risk Management

This component lets you calculate the firm's aggregate risk using either correlation matrices or correlated copula aggregations of marginal risk distributions. In addition, you can:

- **Perform bottom-up firmwide risk exposure calculations**, taking into account the different risk type sensitivity of exposures, by a joint simulation of market and credit risk factors.
- **Calculate risk-based performance of the firm** based on the effect from both balance-sheet and off-balance-sheet items. Sample economic capital calculations are provided.

Key Features

Risk Data Management

- Includes a risk data model with preconfigured data flows.
- Existing data flows can be modified for customer-specific conditions and data quality controls, such as rules for handling bad data, unclassified data or data not fitting the model.
- Enables users to acquire and consolidate historical data from internal and external sources for risk analysis and reporting.
- SAS Detail Data Store for banking serves as a single source of all information for creating a risk data warehouse.
- Data quality tools enable the elimination or reduction of data inconsistencies.
- Supports integration with third-party applications.
- Enables the creation and amendment of user security for access, authentication and authorization.
- Enables the creation and inquiry of automatic audit trails.

Risk Reporting

- SAS Stored Processes let users configure their own workflows and integrate daily and ad hoc advanced risk analytics procedures into their preferred environments.
- Comes with a wide array of preconfigured reporting and risk analysis workflows.
- The report framework includes sample reports, OLAP cubes and interactive analysis results for all application components. Sample reports include:
 - Asset and liability management:
 - Funds transfer pricing (with credit and option-adjusted spreads, capital costs and expenses).
 - Funding liquidity risk (cash flow gaps in stress scenarios and simulation).
 - Interest rate (repricing) risk (repricing cash flow gaps in stress scenarios and simulations).
 - Net interest income.
 - Economic value and fair value (under stress scenarios and simulations).
 - Cash flow replication/hedge optimization.
 - Enhanced cash flow mismatch report (FSA mandated).
 - Market risk management:
 - Portfolio valuation report.
 - Market risk VaR (using simulation).
 - Market risk VaR (using delta normal approach).
 - Portfolio optimization of trading book.
 - Portfolio sensitivity report.
 - Credit risk management:
 - Current exposure.
 - Potential future exposure (under a scenario or simulation).
 - Portfolio credit risk model VaR – actuarial approach.
 - Portfolio credit risk model VaR – transition matrix-based approach.
 - Credit portfolio optimization.
 - Incremental risk charge (IRC) for rating migration/default in trading book.
 - Firmwide risk:
 - Correlated and copula aggregation of VaR.
 - Firmwide VaR, economic capital and RAROC using joint simulation.
- The SAS Risk Reporting Repository, a common reporting data model, supports the integration and reporting of enterprise risk measures as well as decomposed measures at the entity, business unit, geography or any other user-defined hierarchy.
 - Provides audit, change, archive and historization support.
 - Meet both current and future reporting requirements.

Technical Requirements

Client environment

Windows 32- and 64-bit

Server environment

- Windows 32- and 64-bit, Solaris (SPARC and x86-64), HP-UX (PA RISC and Itanium), AIX and LINUX 32- and 64-bit

Midtier

- Windows 32- and 64-bit, Solaris (SPARC and x86-64), AIX, Linux 64-bit, HP-UX Itanium.

Required/optional software

- Java, Adobe Flash Player, Web Application Server (JBoss, WebSphere, Web Logic)

Key Features (continued)

Asset and Liability Management

- Value traditional balance-sheet instruments and their associated (off balance-sheet) hedges, factoring in embedded options such as prepayment and withdrawal as well as credit risk, etc.
- Assess fund transfer rates with or without risk-based spreads, such as credit spreads, liquidity spreads, option-adjusted spreads, capital costs and allocated overhead expenses. Calculate economic value with and without such spreads.
- Perform advanced analysis across risk types, stress testing and modeling of funding liquidity risk, net interest income and economic value.
- Analyze and create optimal cash flow replication hedges.
- Calculate Basel III liquidity risk measures: liquidity coverage ratio, net stable funding ratio.
- Calculate counterbalancing capacity for liquidity hedging portfolios using assumptions on trade volumes, haircuts and repo activity.
- Enhanced modeling of deposits and facilities with separate schedules for payments and balance changes.

Credit Risk Management

- Calculate and stress test credit exposures, taking into account the effect of netting and collateral.
- Perform advanced simulation of potential future exposure.
- Calculate portfolio credit risk measures using advanced portfolio credit risk models, such as actuarial models and reduced form stochastic transition matrix models.
- Optimize the credit portfolio using risk/return measures.

Market Risk Management

- Value complex market instruments, including exotic derivatives (e.g., basket CDS/CDO, cash flow caplet/floorlet, equity swap, rainbow options).
- Perform stress tests and calculate VaR, expected shortfall and other risk measures using a variety of methods (e.g., historical, covariance and Monte Carlo simulation).
- Decompose portfolio risk in additive risk contributions, and analyze the relative importance of risk factors in determining portfolio loss.
- Perform back tests of the VaR model.
- Determine optimal portfolio by optimizing return/risk measures.

Firmwide Risk Management

- Calculate aggregate risk using either correlation matrices or correlated copula aggregations of marginal risk distributions.
- Perform bottom-up firmwide risk exposure calculations, taking into account the different risk type sensitivity of exposures, by a joint simulation of market and credit risk factors.
- Calculate risk-based performance of the firm based on the effect from balance sheet and off-balance-sheet items. Sample economic capital calculations provided.