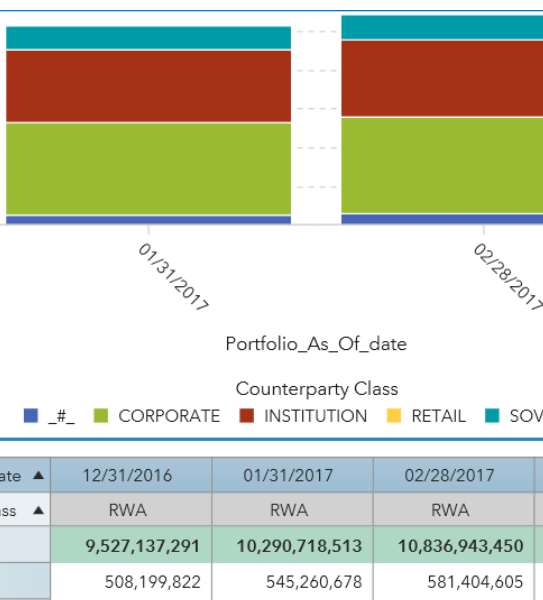


# SAS® Regulatory Risk Management

Proactively manage enterprise regulatory risk with an integrated framework



## What does SAS® Regulatory Risk Management do?

It provides a data-driven approach to the implementation of the Basel II and Basel III Capital Accord and Capital Requirements Directives (CRD) for all three credit risk approaches: standardized, internal ratings-based (IRB) foundation and IRB advanced. SAS Regulatory Risk Management offers a transparent framework that delivers integrated data aggregation, analytics and reporting capabilities and provides an open, flexible and extensible means of measuring and managing regulatory risk in a constantly changing regulatory environment.

## Why is SAS® Regulatory Risk Management important?

It facilitates regulatory compliance by providing a standard workflow to calculate regulatory capital for credit and credit valuation adjustment (CVA) risk in a data-driven, configurable and extensible manner.

## For whom is SAS® Regulatory Risk Management designed?

The solution is used by risk analysts, compliance officers, CROs and compliance teams who coordinate regulatory credit risk management activities across their organizations. This includes project managers responsible for Basel II and III programs within their banks and directors who oversee retail and corporate credit functions and participate in a bank's credit review and approval processes.

Banks in Europe, Asia and the Americas need to calculate and report regulatory risk capital based on the Basel III capital norms published by the Basel Committee for Banking Supervision (BCBS). Along with the Capital Requirement Directive IV (CRD IV) in the European Union, banking regulators in other jurisdictions are following suit.

All regulators that follow the Basel regulatory approaches as best practices require a regular independent review of their overall risk management processes. This involves ensuring consistent, timely and reliable data; assessing the integrity of risks provided by a bank's internal systems; and validating any significant change in the risk measurement process, among other things.

SAS Regulatory Risk Management enables banks to manage the complexities of regulatory capital calculation and reporting processes, including submission to respective regulators in an integrated and reliable enterprise framework. Along with SAS Risk and Finance Workbench and optional content reporting packages, this solution provides a full workflow for regulatory report submission cycles.

## Benefits

- Grow with future analytics and regulatory requirements.** Because future regulations may allow for applying economic capital models to calculate regulatory capital for credit risk, the SAS data model and powerful risk engine enable nonregulatory risk analytics in the same framework as regulatory calculations. You can take your initial investment to a whole new level - without the need for additional full modules.
  - Take advantage of self-service reporting.** Risk analysts can respond quickly to inquiries from their CRO, management and regulators. Using SAS, a bank can implement a risk framework that preserves a business unit's autonomy while enabling the parent bank to roll up risk reports into an integrated, aggregated and group-wide view.
  - Provide transparency throughout the process.** Our solution doesn't use any hidden system files or black-box models, thus providing transparency throughout the process. With the SAS Infrastructure
- for Risk Management platform, all data and intermediate steps of calculations can be archived, accessed, audited and validated in the future for supervisory and internal review requirements.**
  - Ease integration and customization.** For almost 40 years, SAS technology has been designed to easily integrate with other financial institutional systems. Capabilities built into the solution include components that integrate with most databases and metadata that follow the Open Metadata Standard.
  - Increase productivity and reduce the data management burden on IT.** Data from your bank's operating systems is typically structured for specific data models, requiring data preparation, data cleansing, data quality checks and data loading. The interactive, point-and-click SAS Data Management environment and integrated metadata reduce the need for custom coding, testing and maintenance, which increases business users' productivity and reduces the burden on IT staff.

## Solution Overview

Providing preconfigured risk measure calculations for regulatory credit risk measurement and management, SAS Regulatory Risk Management offers an industry-leading data model for banking along with data integration and data quality tools. It enables you to store bankwide portfolio and counterparty data for all historical time points, show data lineage, and ensure

portfolio completeness and accuracy before regulatory calculations are run.

SAS Regulatory Risk Management is integrated with other SAS solutions, such as SAS Credit Scoring, making information easier to reuse so your enterprise risk function adds value to your overall organizational performance management.

Components include an integrated data model for all risks, a detailed data store for

banking with quality data controls, prebuilt ETL flows for a range of risk applications and highly configurable job flows that run on a high-performance, in-memory processing platform. SAS Visual Analytics and a regulatory reporting framework complete the package. This approach allows you to:

- Seamlessly integrate your credit scoring/internal rating system with Pillar 1 capital calculations for credit risk.
- Integrate SAS Data Management and SAS/ACCESS® technologies.
- Use other SAS solution components for regulatory reporting workflows and internal reporting.

All components are built on a common technology platform, so they work together in an open, configurable, auditable and highly adaptable manner. With this solution, you can:

- Define data validation, cleansing, reconciliation and threshold rules for any combination of hierarchies and classifications.
- Define business rules for data cleansing, validation and transformations - all managed from a single data environment.
- Use the SAS solution framework for achieving other credit risk objectives - using existing assets and applications as you migrate toward an integrated, centralized risk environment.
- Capitalize on the flexibility of the underlying risk engine to grow and anticipate future requirements and regulatory changes.

Approach Category (STD/IRB)	Reg Exposure Class	Adjusted EAD in RWA calculation	RWA	RWA_SECURED	RWA_UNSECURED
Total		14,575,248,710	13,071,739,613	136,951,639	12,934,787,974
STD	Exposures to corporates	6,341,174,240	4,956,703,503	924,935	4,955,778,568
	Exposures to institutions	3,446,585,528	2,900,335,392	36,755,093	2,863,580,300
	Exposures in default	1,206,511,185	1,749,096,760	1,024,572	1,748,072,188
	Exposures to central governments or central banks	819,264,475	688,291,845	0	688,291,845
	Exposures to multilateral development banks	382,000,000	264,560,000	0	264,560,000
	Exposures to regional governments or local authorities	435,306,910	245,537,112	3,400	245,533,712
	Exposures to public sector entities	404,300,000	196,810,000	60,000,000	136,810,000
	Exposures to institutions and corporates with a short-term credit assessment	71,948,647	57,374,422	0	57,374,422
	Other items	120,000,000	44,000,000	0	44,000,000
	Exposures to retail	31,461,340	7,390,471	885,551	6,504,916
	Exposures secured by mortgages on immovable property	24,903,837	7,138,151	7,138,151	0
	Exposures in the form of units or				

Figure 1: SAS Visual Analytics reports let you drill down into exposure at default (EAD) and risk-weighted asset (RWA) results up to the exposure class and subclass (or any other level).

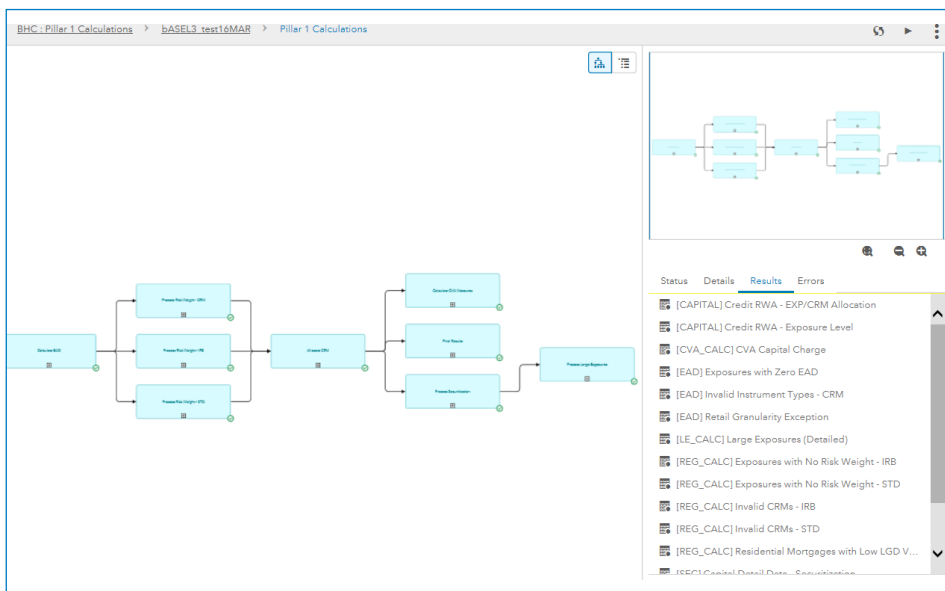


Figure 2: Pillar 1 calculation job flow in the SAS Infrastructure for Risk Management platform. A full visual trace of all processing and each processing node is fully documented.

## Capabilities

### Regulatory calculations and an extensible workflow

SAS Regulatory Risk Management provides predefined analytical methodologies so you are fully supported for the Basel II and Basel III Capital Accord and CRD4 for all three credit risk approaches (standardized, IRB foundation and IRB advanced). This includes the calculation of risk-weighted assets, credit risk mitigation, parameter

estimation, stress testing, reporting (Common Reporting Framework - COREP), audit trails, transparency and documentation.

A standardized workflow calculates regulatory capital in a data-driven, configurable and extensible manner. You get ready-to-use configurations, including European CRD I (Basel II) and European CRD IV (Basel III), but you also have the ability to add local regulatory variants.

### Banking-specific, prebuilt data model and risk model repository

SAS Regulatory Risk Management is integrated with SAS Detail Data Store for banking to provide an efficient, accurate and transparent process for delivering regulatory credit risk measures. This is a comprehensive, banking-specific data model that supports risk management, customer intelligence and compliance solutions from SAS.

The SAS Regulatory Risk Management data mart is populated from the SAS Detail Data Store by applying hundreds of predefined SAS data transformation routines, which are all part of the solution.

### Data management included - all in a single package

Consistent, accurate and reliable data is critical for achieving best practices in credit risk management. SAS Regulatory Risk Management uses all the power, scalability and data management functionality of SAS Data Management to meet these requirements.

Users can efficiently manage vast quantities of data from across the enterprise, including loan capture systems, trading systems, risk factor quotes, collateral management systems, loan decision systems, parameters from spreadsheets and more.

Default capabilities provide easy integration with any RDBMS, including Teradata, Oracle and DB2. SAS also provides a wide range of data integration via SAS/ACCESS software to relational databases, data warehouse appliances, PC files, XML and packaged applications. In addition, SAS subscribes to

## Key Features

### Risk-weighted assets (RWA) and capital calculations support

- Credit RWA: banking book and securitization.
- Coverage for all exposure classes under standardized or internal-ratings based (IRB) approaches, including added support for:
  - Standardized approach: covered bonds, treatment for EEA member.
  - IRB approach: large FI/unregulated FI, correlation (R) multiplier.
  - IRB securitization: new resecuritization RW; BB- and below; 1,250% RW instead of deduction.
- Credit RWA for counterparty credit risk:
  - CCR EAD and RWA calculation for derivative exposures.
  - CCR counterparty valuation adjustment (CVA) capital charge.
- Large exposures.
  - Large exposure reporting on European Banking Authority (EBA) templates.
  - Large exposure capital charge for breaches of the large exposure threshold.
- Parameter-driven regulatory calculations.
- All parameters presented in the Basel II framework customizable through specific regulatory parameter data sets:
  - Standardized approach risk weights.
  - Supervisory loss given default (LGD).
  - Credit conversion factor (CCF) parameters.
  - Haircuts and others.
- Ability to set up to support local discretion requirements.

### Wide array of preconfigured reporting

- EU regulatory reports are based on EBA templates. Report frameworks supported include COREP, FINREP, Asset Encumbrance (AE), Funding Plan (FP) and Supervisory Benchmark Portfolio (SPB). The COREP - Own Funds-Credit Risk, CVA and LE report templates are fully integrated with Pillar 1 calculations.
- Internal risk management report templates and historical comparison reports.
- Regulatory reports are routed through internal approvers.
- Fully configurable report approval workflow.

all accepted industry open standards; if there is adherence to the same standards, integration and sharing are possible.

The SAS Infrastructure for Risk Management platform stores analysis input data and output for every execution run, thus offering audit and historization capabilities. The solution adheres to common data modeling standards and maps tables for integrating external sources and hierarchies. It also supports aggregated risk measures, as well as decomposed measures at the entity, business unit, geography or any other user-defined levels, including nonadditive at-risk measures through configurable drill-down variables (cross-classifications) powered by SAS Visual Analytics.

### Preconfigured templates for reporting and easier regulatory disclosure

SAS Regulatory Risk Management provides support for the latest European (EBA ITS) regulatory report templates. The flexible reporting framework also supports other reporting regimes, along with a report validation feature to apply regulatory validation rules before submission.

With SAS Visual Analytics, this solution offers a full range of reporting capabilities. SAS Visual Analytics lets you present regulatory credit risk measures at aggregated and lowest-grain levels so that regulatory analysts can answer questions on risk

concentration and contribution. The web-based interface lets users view all of the input and configuration data, execute flows, create credit risk reports and easily interact with SAS Visual Analytics reports.

SAS Regulatory Risk Management also fully supports the regulatory report submission process. SAS Risk and Finance Workbench is used to perform the tasks that are involved in a typical regulatory report submission cycle:

- Orchestrate job flows for regulatory calculations and preparation of regulatory reporting data.
- Create report packages for submission.
- Generate Microsoft Excel, HTML and XBRL versions of the report based on a regulator-supplied data point model.
- Run validation rules (typically, regulatory validation rules) and provide notification of validation failures.
- Enable users to manually add cell-level data or override cell-level data.
- Generate the submission XBRL instances.

In addition, for regulatory reports, users can drill down any cell in the reports to exposure level.

**TO LEARN MORE »**

To learn more about SAS Regulatory Risk Management, download white papers, view screenshots and see other related material, please visit [sas.com/risk](http://sas.com/risk)

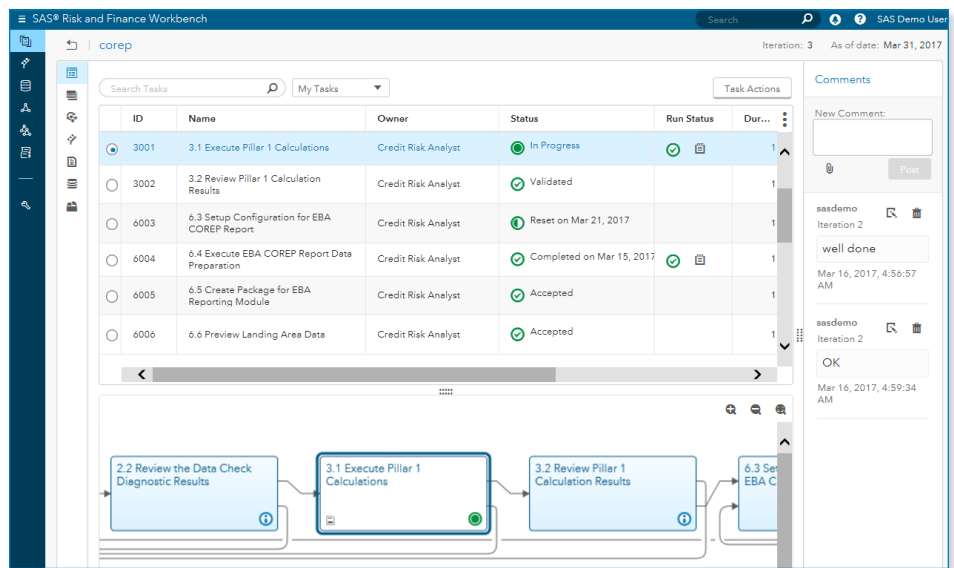


Figure 3: SAS Risk and Finance Workbench process templates support the entire regulatory report submission cycle.

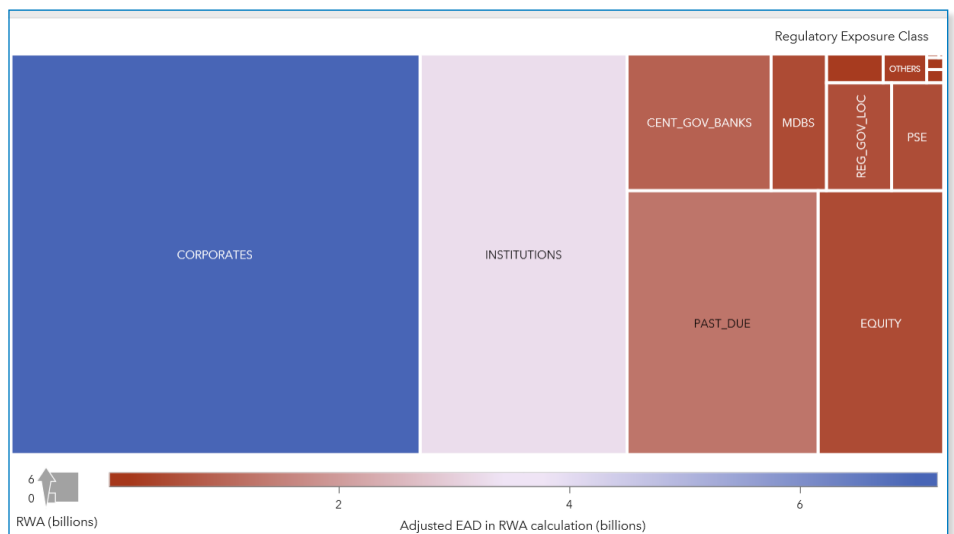


Figure 4: Use integrated visual analytics to analyze credit risk measures and risk-weighted assets of exposures and concentrations.

To contact your local SAS office, please visit: [sas.com/offices](http://sas.com/offices)

