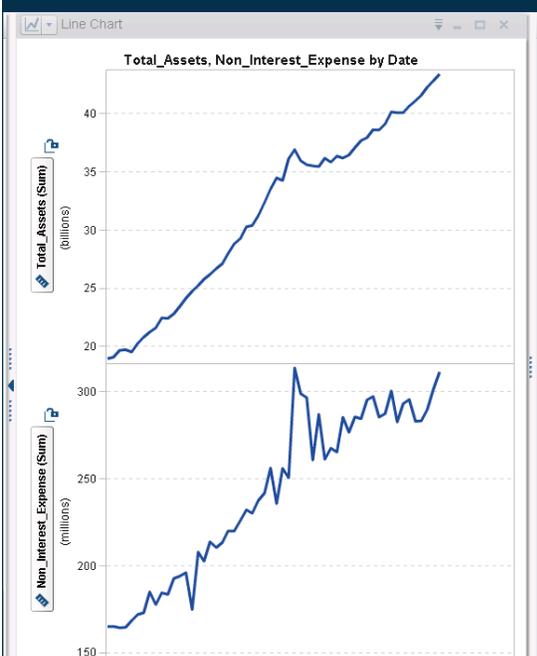


SAS® Risk Modeling Workbench

Establish a controlled modeling process to support stress testing requirements



What does SAS® Risk Modeling Workbench do?

SAS Risk Modeling Workbench enables banks to establish a structured modeling process and support quantitative analysts who need to develop models for stress testing purposes with better transparency, governance and documentation.

Why is SAS® Risk Modeling Workbench important?

Requirements such as enterprise stress testing require banks to continuously develop and refine models. To support stress testing, the types of models that banks must create come in many different forms with an end result being a capital plan to present to regulators. The development of all types of models requires significant flexibility, collaboration and documentation, which is difficult to accomplish using legacy systems and processes.

For whom is SAS® Risk Modeling Workbench designed?

Designed for chief risk officers, model developers and quantitative analysts, SAS Risk Modeling Workbench is intended for banks that want to establish a controlled modeling process that will stand up to regulatory scrutiny.

Supervisory expectations of stress testing continue to evolve and put ever-increasing demands on banks. Banks must now provide a comprehensive inventory of models for the projection of losses, revenues, expenses, balances and RWAs to regulatory authorities with evidence of strong governance and internal controls.

Maximizing the efficiency of compliance requires developing models and maintaining sets of models in an accurate, structured and auditable fashion. However, specification, estimation and calculation of hundreds or thousands of models is a complex undertaking - especially in an IT environment with legacy systems and processes that are often fragmented and lack the flexibility to develop new models as requirements change.

Because the risk management process often requires the creation of complex quantitative models, banks need software that not only

accommodates the development of many types of models, but also enables transparency and documentation within the process.

SAS Risk Modeling Workbench makes it possible for banks to establish a transparent and controlled enterprise-level modeling process. The solution provides a visual environment in which quantitative analysts can create and calibrate the various models needed for stress testing, and linkages between data sources and models can be easily visualized and explained.

The SAS Risk Modeling Workbench is a component of the SAS Stress Testing suite that also includes SAS Risk and Finance Workbench and SAS Model Implementation Platform for a comprehensive framework to implement best practices in risk management, stress testing and capital planning.

Benefits

- Develop, validate and calibrate risk models in a controlled and collaborative environment.
- Define models, store model parameters and fully integrate with model execution and stress testing workflow.*
- Seamlessly integrate between model development, model execution and process governance.
- Visualize flows between data and models to make complex sets of models easy to explain.
- Integrate between models, macroeconomic data and scenarios.
- Quickly generate user-defined model validation statistics.
- Select variables and test for relevance.
- Improve modeling process transparency.

* When integrated with other products of the SAS Stress Testing suite.

Capabilities

Integration within the SAS® Stress Testing suite

The SAS Stress Testing suite provides orchestration and transparency of the entire stress testing process across all types of risk, including market, credit and liquidity risk.

SAS Risk Modeling Workbench serves as the model development environment within the suite. It seamlessly integrates with other components, particularly the SAS Model

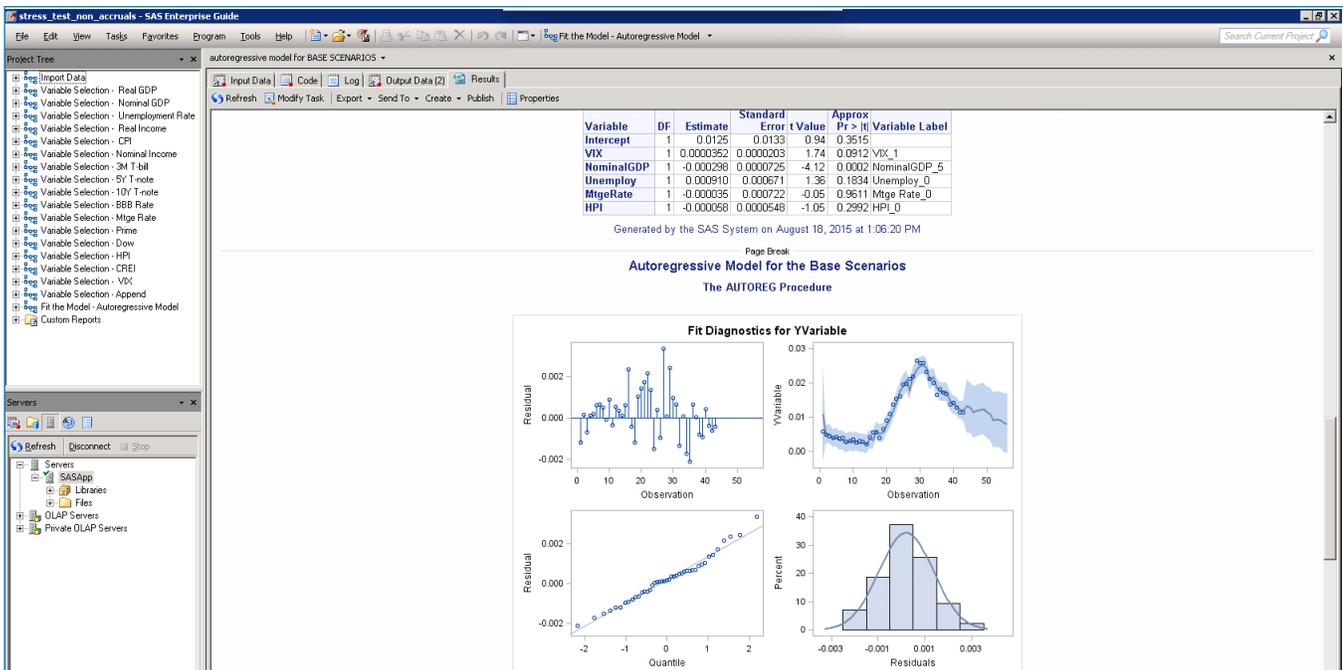
Implementation Platform and the SAS Risk and Finance Workbench, to comprehensively address the requirements of an end-to-end enterprise stress testing process.

The modeling component is a visual environment in which quantitative analysts can develop and calibrate the various models needed for stress testing. Models can be developed in a server-based environment that facilitates collaboration between modelers. And the flow of models including data transformations and intermediate steps can be visualized and documented.

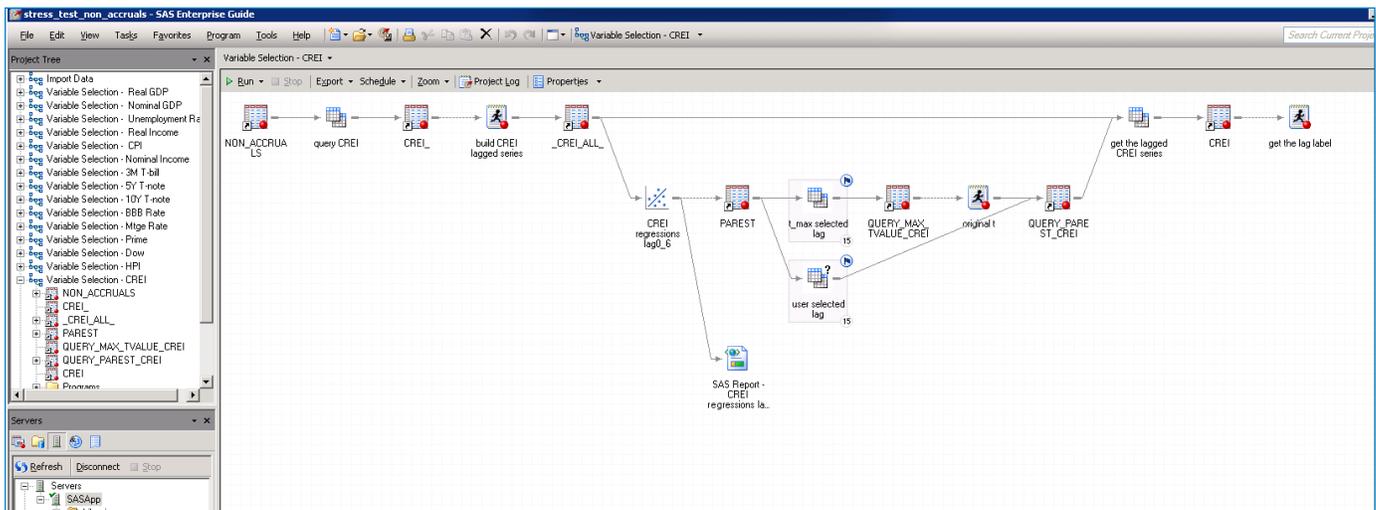
Extensive model support

Using the SAS Risk Modeling Workbench, quantitative analysts can develop all types of models required for stress testing. In a single environment, models can be developed for:

- PPNR.
- NII.
- Loss forecasts.
- Capital.
- Forecasting.
- Monte Carlo simulation.
- Regression-based models.



Generate fit statistics for models using macroeconomic variables interactively to facilitate the evaluation of models used in stress testing.



Develop models for stress testing in an interactive environment that makes it easy to visualize flows between models, macroeconomic data and scenarios.

It also enables analysts to link revenue models (PPNR/NII) with loss models and capital models in order to create a comprehensive capital plan.

A single environment for model development, calibration and validation

SAS offers a centralized model development environment that supports all types of models needed for stress testing, avoiding the need to spend effort integrating disparate model development environments.

By streamlining the model development process in a single environment, SAS enables quantitative analysts to develop, calibrate and validate all models needed for stress testing as well as visually explore the results of these models.

This central model development environment is integrated with other technology components related to model execution and process orchestration within the stress testing process.

Enhanced model development capabilities

The SAS Risk Modeling Workbench enables analysts to create, test and document quantitative risk models to meet business and regulatory requirements in areas such as stress testing and capital management. The solution provides:

- The ability to specify linkages between different models.
- Process flow.
- Refining and variable selection.
- Model design.
- Time-series forecasting.
- Documentation.

And for exploratory analysis and reporting, SAS provides the ability to study trends and correlations of key macroeconomic variables as well as PPNR data and relations to macro factors.

Key Features

Integration across the SAS® Stress Testing suite

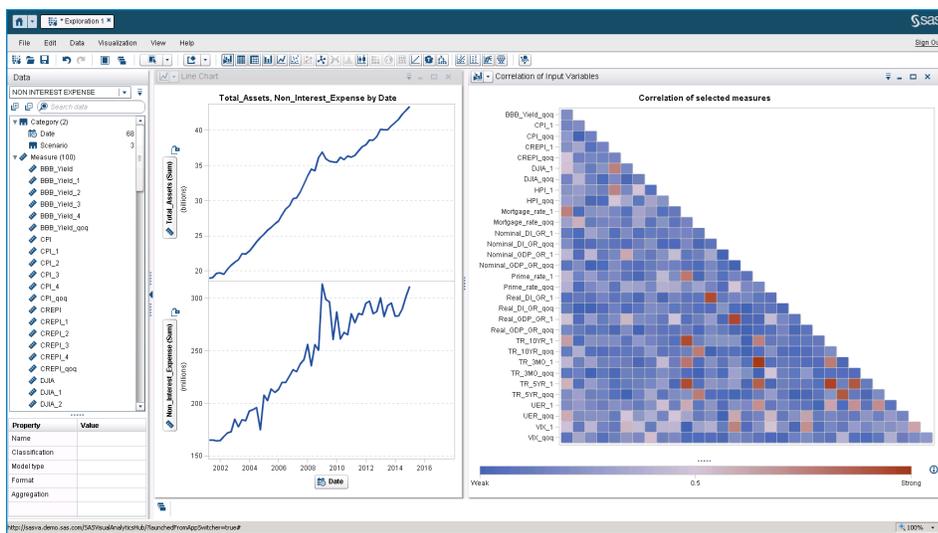
- Server-based, visual development environment with increased performance, easy collaboration and governance.
- Integrated model development environment for stress testing.
- Full modeling capabilities of SAS analytical platform.
- Seamless integration with Microsoft Office tools.
- Centralized storage of fitted models and documentation.

Streamlined model development

- Visual user interface for linking data and models.
- Support for different modeling methodologies needed for stress testing:
 - PPNR / NII models.
 - Loss forecasting models.
 - Macroeconomic forecasts.
 - Capital models.
- Variable selection and transformation.

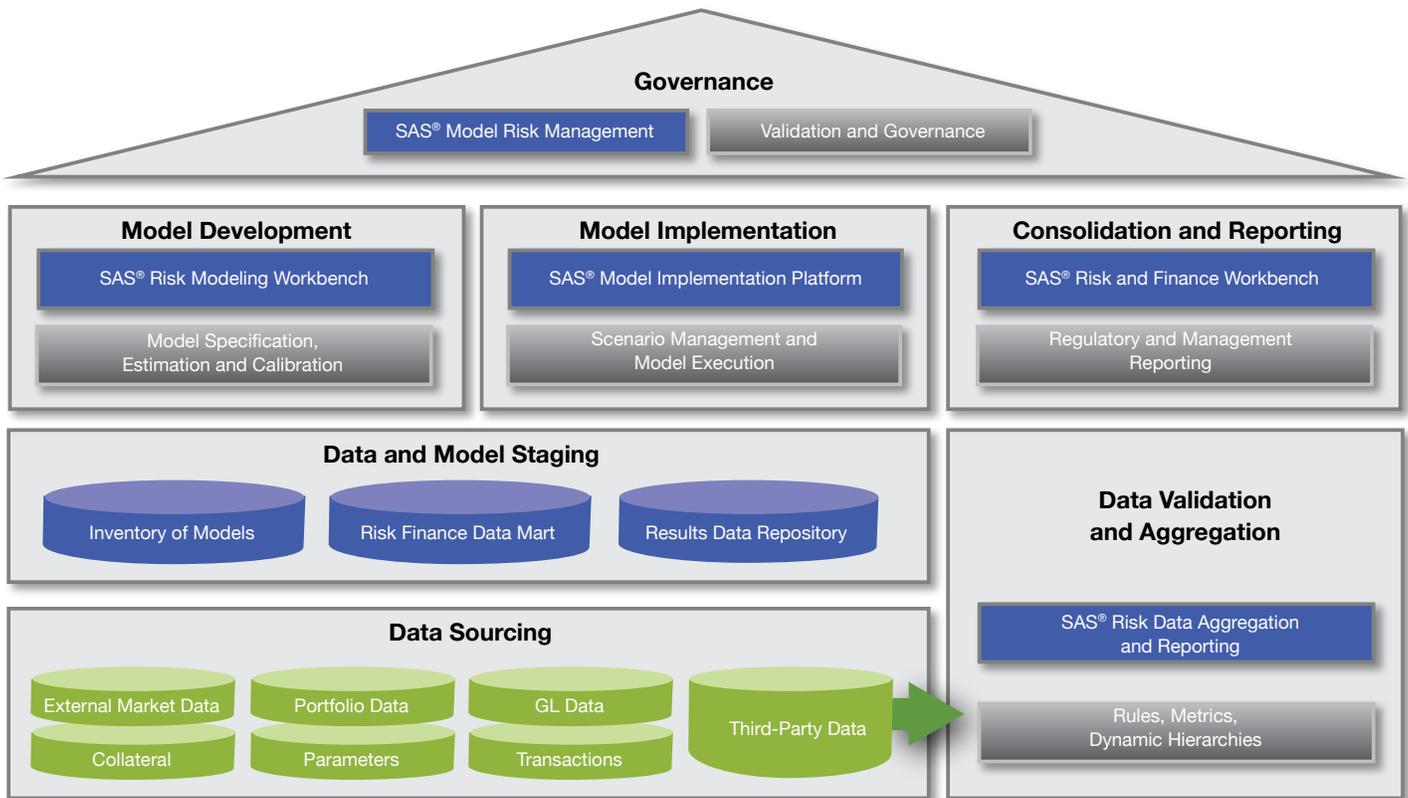
Enhanced model development

- Modeling workflow that encompasses:
 - Data import.
 - Exploration and analysis.
 - Variable selection.
 - Model development and validation.
- Model transparency.
- Model storage.
- Optional institution's inventory of models.



When used with SAS® Visual Analytics Explorer*, you can visualize trends and correlations among risk factors to make the variable selection process more efficient.

*SAS® Visual Analytics Explorer is not included in the SAS Risk Modeling Workbench, but can be purchased separately.



The SAS Model Implementation Platform is integrated in a modular approach with the other components of the SAS Stress Testing suite to enable end-to-end governance and transparency of the entire process from model development to reporting.

Integrated model development

Our solution offers integration between models, macroeconomic data and scenarios. The types of models supported include:

- Loss models.
- PPNR/NII models.
- Macroeconomic forecasts.
- Capital models.

Visualization of model dependencies

Analysts can better document model flows and dependencies as well as develop and calibrate risk models in a visual environment. Through the interface, the visual flows show linkages between different models and data sources. The visual development environment illustrates:

- Model flows.
- Dependencies between models.
- Linkages between models and data sources.

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