



SAS® FORUM
PORTUGAL 2016

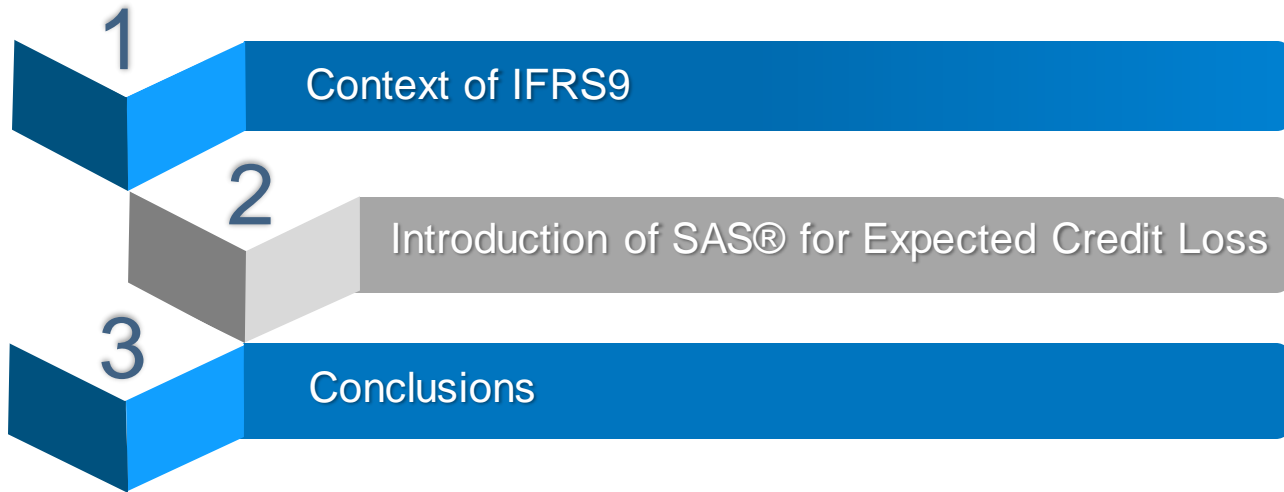
Bem Vindos

Stress Tests e IFRS9

Manuel Fortes

Sr. Business Solutions Manager

AGENDA



- Lessons learned from the Financial Crisis
 - “Provisions for Credit Risk were ‘Too Little’, and booked ‘Too Late’.
- Impact on risk and finance
 - IFRS 9 introduces the Expected Credit Loss (ECL) approach that covers also future losses.
E.g. under IFRS 9, change in the rating triggers a change in the impairment even without any historical non-performance evidence
- Forward Looking instead of backward looking:
 - **IFRS 9 IMPAIRMENT** regulation requires to look forward and calculate provisions based on several macro-economic scenarios, and not any longer on pure historical information.



IFRS 9 OVERVIEW

NEW REQUIREMENTS / NEW CHALLENGES

Data Collection

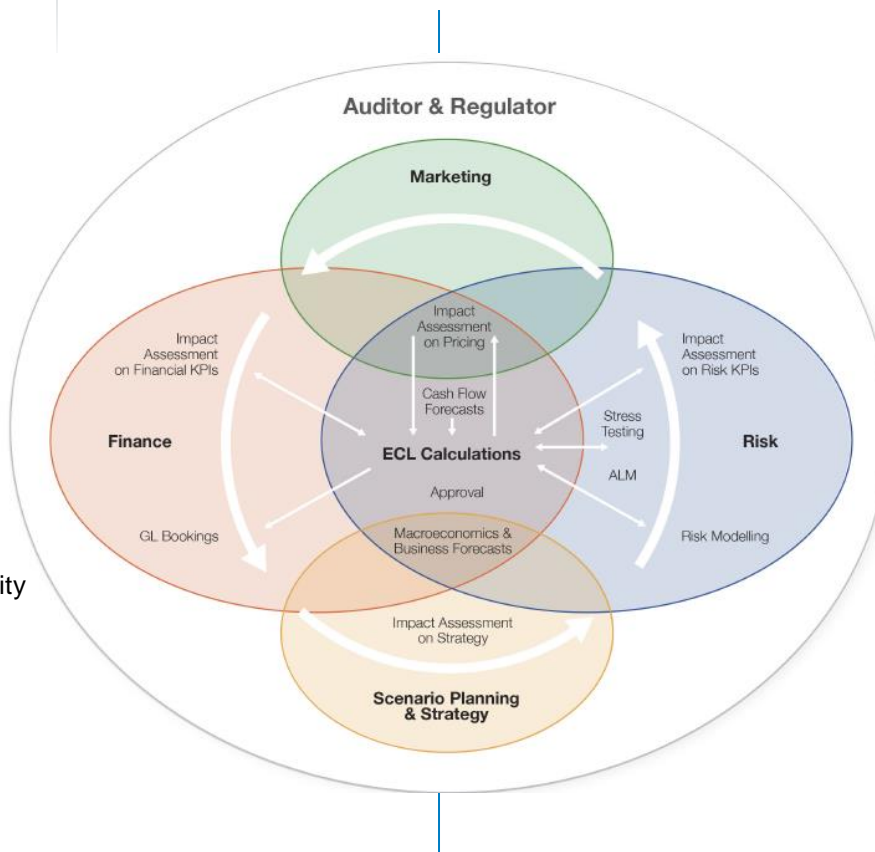
New Information
Individual Account Level
Forecasts / Historical
Segmentation
Individual Asset Level

= **Massive Amount Data**
= **More Granular Data**

Forward Looking Calculations

Financial Impact
Increased Measurement complexity
Additional Data Collection
More Risk Models

= **New Analytical Models**



Governance

Documentation
Governance
Change Control
Regulatory Capital forecast
Model Management

= **New Control Framework**

Audit Preparation

One of the most challenging areas of an IFRS 9 implementation will be aligning the banks interpretation with what is deemed acceptable by the auditor and regulator.

= **Risk and Finance Integration**

1. Data environment

- Leverage on unique source for all Data requirements
- 1 x extraction, adjustment, validation, reconciliation

2. Modeling environment

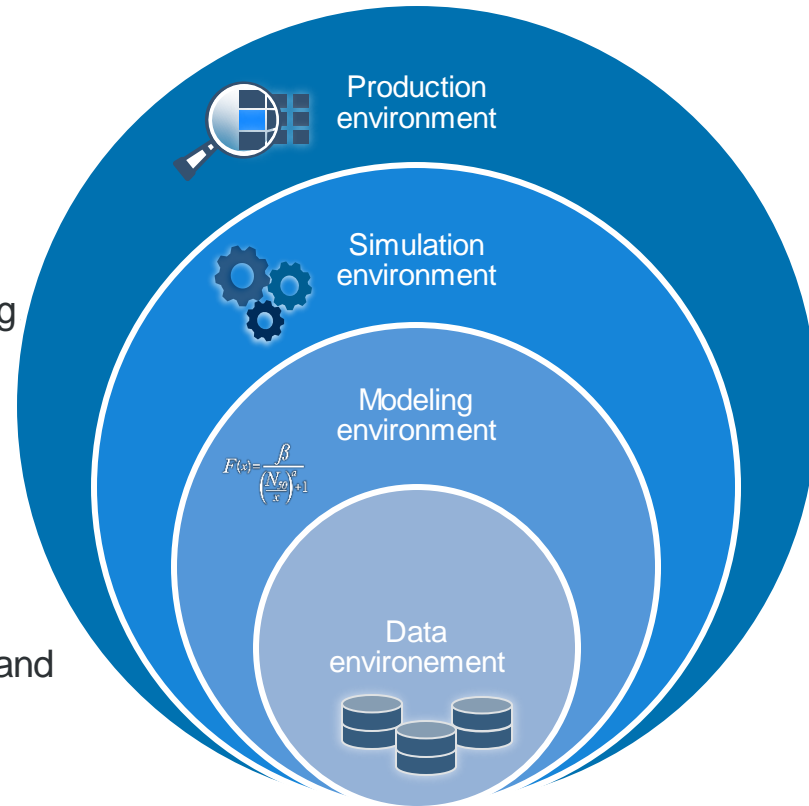
- Model Specification, Estimation, Calibration, Backtesting
Governance

3. Simulation / Exploration environment

- Scenario Management, Model & Scenario Execution,
Impact Analysis

4. Production environment

- Controlled environment to execute selected scenarios, and
Delivery of management and regulatory reporting



SAS® FOR EXPECTED CREDIT LOSS

SIMULATION ENVIRONMENT



Models
PD, LGD, EAD

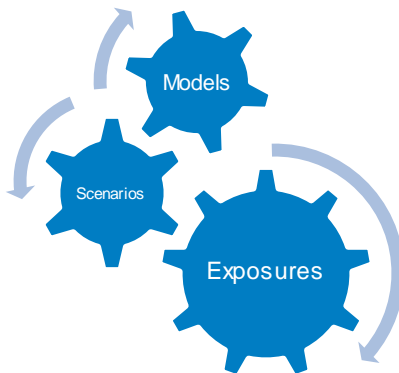


Portfolio Data



Economic Scenarios

Mapping of models to portfolios and scenarios



Create different scenarios for determining SICR, Expert Rules, pooling

High Performance Risk



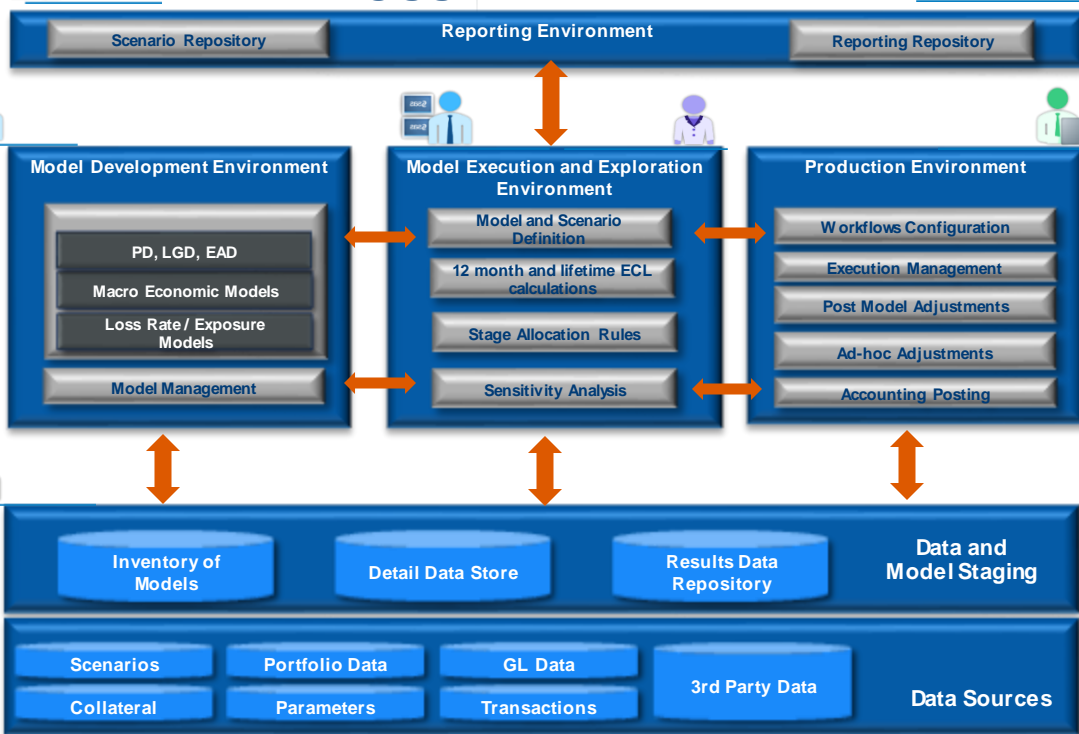
Impact analysis in real time by business users



High Performance Risk generates the code executed by the production environment

SAS® FOR EXPECTED CREDIT LOSS

PROCESS VIEW



IFRS9 processes introduce significant complexity and uncertainty:

- Required enhancements to existing credit risk models
- Potential hit to income and capital; increased volatility to earnings
- Coordination of work efforts in a highly controlled transparent environment
- **12X per year – 3 days to complete!**

Dedicated work environments are required for:

- Development
- Implementation
- Execution
- Review and Challenge



Risk Management



Credit



Finance / Accounting



Technology

SAS® FOR EXPECTED CREDIT LOSS

A SINGLE WEB-BASED HUB FOR ALL BUSINESS APPLICATIONS

- Browse
- Shortcut
- Collection
- Risk and Finance Workbench - Gov...
- Allowance Modeling Engine
- Business Rules Engine
- Allowance Projections and S...
- Allowance Reporting IFRS9/...
- Administrator

Links

- [FASB CECL guidance](#)
- [IFRS9 Regulations](#)
- [OFSI - IFRS9 Guidance](#)

IFRS9 Reports

/Shared Data/a_IFRS9 demonstration/Reports/IFRS9 Reports

- [SASBank IFRS 9 Dashboard - E...](#) SAS report (2G)
- [SASBank Official Inputs](#) SAS report (2G)
- [SASBank Official Outputs](#) SAS report (2G)
- [SASBank ECL contribution ba...](#) Risk exploration
- [SASBank ECL contribution ac...](#) Risk exploration

CECL Reports

/Shared Data/a_CECL demonstration/Report/CECL Reports

- [SASBank Official Inputs - CECL](#) SAS report (2G)
- [SASBank Official Outputs - CE...](#) SAS report (2G)
- [CECL Baseline Scenario Result...](#) Risk exploration
- [CECL All Scenario Results - W...](#) Risk exploration

Bank POC and Other Reports

/Shared Data/BankPOC/Bank POC and Other Reports

- [SASBank POC Comparison re...](#) SAS report (2G)
- [Portfolio exploration](#) Visual exploration

SAS® FOR EXPECTED CREDIT LOSS

SIMULATION ENVIRONMENT: IMPAIRMENT MODELING

The new SAS Components allow to the business users an easier way to **interact with any type of analytic model**:

- **Easy integration** of external models (R, Python, ...), easy integration of existing systems
- Import and Export **scenarios**
- Trigger detailed calculation and aggregate results – quick refresh for **iterative simulation**
- Cutting-edge technology on model execution (**in-memory, grid parallel processing**)
- **Adhoc scenario** runs & explorations
- **Slice and dice** portfolios and test assumptions

The screenshot displays the SAS Model Implementation Platform interface. At the top, there are six main components: Risk and Finance Workbench - Gov..., Allowance Modeling Engine, Business Rules Engine, Allowance Projections and S..., Allowance Reporting IFRS9/..., and Administrator. Below these is the 'Run Portfolio' configuration screen. It includes fields for Name, Source risk cube, Portfolio data, Economic data, Interval, Number of horizons, and Run as of date. There is also a 'Model group mapping' section with a table for Product and Model Group, and a 'Run Portfolio Instances' table at the bottom.

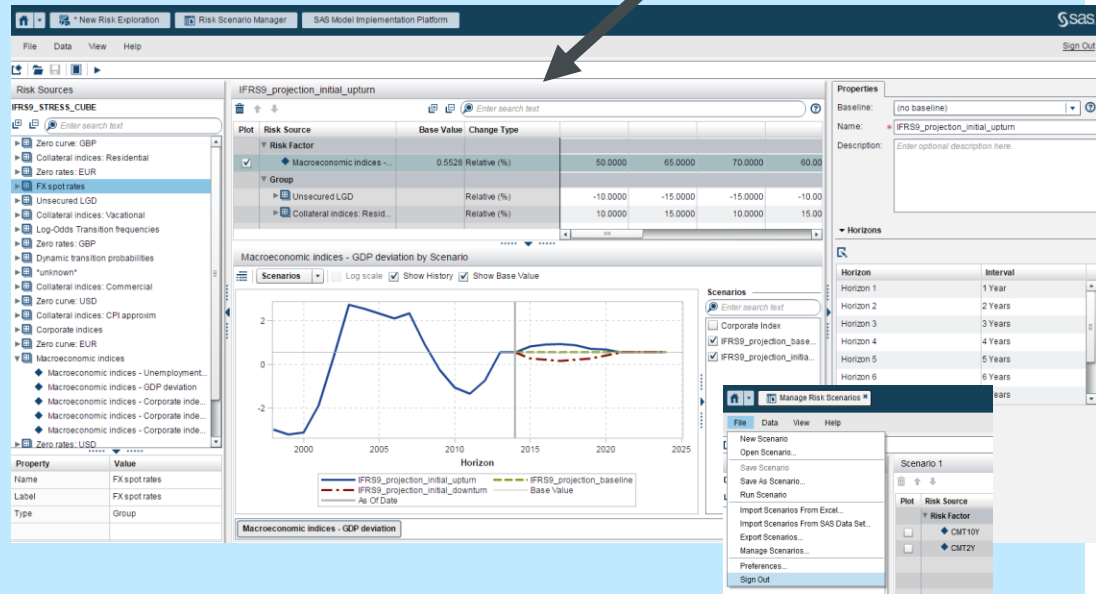
Name	Model Group Mapping	Portfolio Data	Economic Data	Run as of Date	Status	Results	Created By	Completed
aa	SCB_Test	portfolio_mip	scenarios_mip	Aug 01 2015	Completed		SAS Demo...	Oct 21 2015 03:29 AM
scb_new_model	SCB_Test	portfolio_mip	scenarios_mip	Aug 01 2015	Completed		SAS Demo...	Oct 20 2015 11:18 PM
IFRS_scb2	IFRS9 Mapping fo...	portfolio_mip	scenarios_mip	Aug 01 2015	Completed		SAS Demo...	Oct 20 2015 03:14 AM
IFRS9_scb1	IFRS9 Mapping fo...	portfolio_mip	scenarios_mip	Aug 01 2015	Completed		SAS Demo...	Oct 19 2015 09:51 PM
IFRS_test_models2	NEW	portfolio_mip	scenarios_mip	Aug 01 2015	Completed		SAS Demo...	Oct 18 2015 11:40 PM



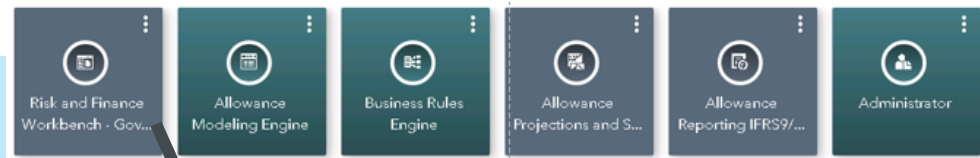
Support wide range of analysis and simulations

- Open and run scenarios
- Edit&Create scenarios
- Scenario library
- Import and Export scenarios
- Loan Level Calculations
 - Scenario based execution
- Results review

Increasing amount of data and frequency of computation require powerful risk engine with high performance capabilities



- Workflow to coordinate tasks and people interaction, approve results and adjustments
- Leverage worksheets to review results
- Generate audit report on adjustments
- Prepare Journal to GL
- Report on results



Monthly Production Run and Workflow

Coordination of Sign-Offs and Documentation

ID	Name	Assignee	Status	Completion Date
0100	1. Kick-Off Meeting		Completed	Dec 15, 2015
0210	2.1. Is all input data refreshed and in place?	Risk Analyst	Completed	Dec 15, 2015
0220	2.2. Are all approved models in place ready to be executed?	Economic Analyst	Completed	Dec 15, 2015
0230	2.3. Is all scenario data approved and in place?	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0300	3. Modeling	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0400	4. Prepare Rules	Stress Testing Workbench Administrator	Approved	
0500	5. Simulation	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0600	6. Promote Rules	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0700	7. Promote Model to Production	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0800	8.0. Refresh Data	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0810	8.1. Run ECL Calculation	Stress Testing Workbench Administrator	Completed	Dec 16, 2015
0820	8.2. Load Individual Assessment	Stress Testing Workbench Administrator	Completed	Dec 15, 2015
0821	8.2.1. Review Individual Assessment Group A	Stress Testing Workbench Administrator	Approved	
0822	8.2.2. Review Individual Assessment Group B	Stress Testing Workbench Administrator	Approved	

SAS Demo User
Iteration 1
reconciliation report signed off for data load on new ECL monthly calculations
Dec 28, 2015, 7:35:48 AM
[Calculation and flow for IFRS 9.xlsx](#)

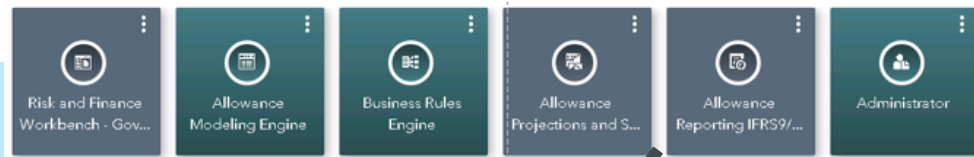
SAS Demo User
Iteration 1
Mortgage reconciliation reports attached - minor glitch one segment did not load. Will re-run later
Dec 28, 2015, 12:55:57 PM
[IFRS 9 reconciliation report RMO.xlsx](#)

Management Reporting

- Analyze impacts
- Compare portfolios
- View evolution
- Highlight outliers
- Determine influential parameters

External Reporting

- IFRS7
 - A.1 Credit Quality Analysis
 - A.2 Collateral Held / Credit Enhancements A.3 Repossessed Assets
 - A.4 Credit Risk Concentrations
- B.1 Reconciliation of Impairment Loss + Carry Amounts).
- Finrep
 - Potential impact in more than 4000 data point
 - 46 templates are being propose to change
 - ECL engine needs to be ready to deliver the right data feeds



EXPECTED BENEFITS

BUILDING A SUSTAINABLE IFRS 9 PRODUCTION PROCESS

Issue

SAS Offers...

Benefit

Tight timeline for compliance

**Open Modular
Architecture**

- Supports integration of existing models
- Adaptable to current processes
- Maximize reuse

Principle-based standards are subject to changing interpretations

**Centralized Model
Library**

- Quickly swap models and run ad hoc scenarios and sensitivity tests
- Ensures development and production remain in sync over time

Loan-level cash flows and lifetime loss projections are process intensive

**In-Memory Parallel
Processing**

- Fast computing power
- Fully scalable and cost efficient
- On-the-fly aggregations and exposure-level drill downs

Process must withstand heightened governance and audit expectations

**Controlled
Environment**

- Transparent model inventory
- Auditable workflow collaboration
- Integrated Risk and Finance processes

**Sustainable
and
Defendable
IFRS 9
Production
Process**

Obrigado



Stress Tests e IFRS9

Manuel Fortes

Sr Business Solution Manager