In this course, learners learn how to develop credit risk models in the context of the recent Basel II and Basel III guidelines. The course provides a sound mix of both theoretical and technical insight, as well as practical implementation details. These are illustrated by several real-life case studies and exercises.

Learn how to:
• develop probability of default (PD), loss given default (LGD), and exposure at default (EAD) models
• validate, backtest, and benchmark credit risk models
• stress test credit risk models
• develop credit risk models for low default portfolios
• use new and advanced techniques for improved credit risk modeling.

Who should attend:
Anyone who is involved in building credit risk models, or is responsible for monitoring the behavior and performance of credit risk models.

Prerequisites:
Before attending this course, you should have business expertise in credit risk and a basic understanding of statistical classification methods. Previous SAS® software and SAS® Enterprise Miner™ experience is helpful but not necessary.

Course contents:
Introduction to Credit Scoring
• application scoring, behavioral scoring, and dynamic scoring
• credit bureaus
• bankruptcy prediction models
• expert models
• credit ratings and rating agencies.

Review of Basel I, Basel II and Basel III
• Regulatory versus Economic capital
• Basel I, Basel II, and Basel III regulations

SAS® SOLUTIONS – COURSE OVERVIEW

Duration
3 days

Delivery
Classroom

Course code
BB4C71

Online registration
www.sas.com/uk/education/courses/bb4c71.html

UK CONTACT INFORMATION
www.sas.com/uk/education
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Sampling and Data Preprocessing
• selecting the sample
• types of variables
• missing values (imputation schemes)
• outlier detection and treatment (box plots, z-scores, truncations, etc.)
• exploratory data analysis
• categorisation (chi-squared analysis, odds plots, etc.)
• weight of evidence (WOE) coding and information value (IV)
• segmentation
• reject inference (hard cut-off augmentation, parceling, etc.).

Developing PD Models for Basel II
• basic concepts of classification
• classification techniques: logistic regression, decision trees, linear programming, k-nearest neighbor, cumulative logistic regression
• input selection methods, such as filters, forward/backward/stepwise regression, and p-values
• setting the cut-off (strategy curve, marginal good-bad rates)
• measuring scorecard performance
• splitting up the data: single sample, holdout sample, cross-validation
• performance metrics, such as ROC curve, CAP curve, and KS-statistic
• defining ratings
• migration metrics
• PD calibration
• scorecard alignment and implementation.
Developing LGD and EAD Models for Basel II

- modeling loss given default (LGD)
- defining LGD, using market approach and work-out approach
- choosing the workout period
- dealing with incomplete workouts
- setting the discount factor
- calculating indirect costs
- drivers of LGD
- modeling LGD
- modeling LGD using segmentation (expert based versus regression trees)
- modeling LGD using linear regression
- shaping the Beta distribution for LGD
- modeling LGD using two stage models
- measuring performance of LGD models
- defining LGD ratings
- calibrating LGD
- time weighted versus default weighted versus exposure weighted LGD
- economic downturn LGD
- modeling exposure at default (EAD): estimating credit conversion factors (CCF)
- defining CCF
- cohort/fixed time horizon/momentum approach for CCF
- risk drivers for CCF
- modeling CCF using segmentation and regression approaches
- CAP curves for LGD and CCF
- correlations between PD, LGD, and EAD
- calculating expected loss (EL).

Validation, Backtesting, and Stress Testing

- validating PD, LGD, and EAD models
- quantitative versus qualitative validation
- backtesting for PD, LGD, and EAD
- backtesting model stability (system stability index)
- backtesting model discrimination (ROC, CAP, overrides, etc.)
- traffic light indicator approach
- backtesting action plans
- through-the-cycle (TTC) versus point-in-time (PIT) validation
- benchmarking
- internal versus external benchmarking
- Kendall's tau and Kruskal's gamma for benchmarking
- use testing
- data quality
- documentation
- corporate governance and management oversight.

Low Default Portfolios (LDPs)

- definition of low default portfolios
- undersampling versus oversampling
- likelihood approaches to LDPs
- rating mapping approaches to LDPs.

Stress Testing for PD, LGD, and EAD Models

- overview of stress testing regulation
- sensitivity analysis
- scenario analysis (historical versus hypothetical)
- examples from industry
- Pillar 1 versus Pillar 2 stress testing
- macro-economic stress testing.

New Techniques to Develop PD, LGD, and EAD Models

- review of traditional techniques for scorecard development
- neural networks: the neuron model, multilayer perceptrons (MLPs), training an MLP
- opening up the neural network black box
- two-stage models
- support vector machines: the SVM classification model and building scorecards using SVMs (short)
- case study: using logistic regression and support vector machines to develop a country rating system

Survival Analysis for Credit Risk Modeling

- example applications (predicting time to default, time to early repayment, etc.)
- the censoring problem
- survival curves versus hazard curves
- Kaplan Meier analysis
- parametric survival analysis
- proportional hazards regression.

Software addressed:

This course addresses the following software product:

- SAS Enterprise Miner.