COURSE OUTLINE

BUSINESS KNOWLEDGE SERIES

Credit Risk Modeling

OVERVIEW

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In this course, students 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 insights, 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.

Outline:

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
- standard approach versus IRB approaches for credit risk

- PD versus LGD versus EAD
- expected loss versus unexpected loss
- the Merton/Vasicek model

Sampling and Data Preprocessing

- selecting the sample
- types of variables
- missing values (imputation schemes)
- outlier detection and treatment (box plots, z-scores, truncation, etc.)
- exploratory data analysis
- categorization (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

- 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 matrices
- rating philosophy (Point-in-Time versus Through-the-Cycle)
- mobility metrics
- PD calibration
- scorecard alignment and implementation

Developing LGD and EAD Models

- 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
- default weighted versus exposure weighted versus time 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,)
- backtesting model calibration using the binomial, Vasicek, and chi-squared tests
- 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 LDP
- sampling approaches (undersampling versus oversampling)
- likelihood approaches
- calibration for 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
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Neural Networks (only included in classroom version)

- background
- the multilayer perceptron (MLP)
- transfer functions
- data preprocessing
- weight learning
- overfitting
- architecture selection
- opening the black box
- using MLPs in credit risk modeling
- Self Organizing Maps (SOMs)
- using SOMs in credit risk modeling

Survival Analysis (only included in classroom version)

- survival analysis for credit scoring
- basic concepts
- censoring
- time-varying covariates
- survival distributions
- Kaplan-Meier analysis
- parametric survival analysis
- proportional hazards regression
- discrete survival analysis
- evaluating survival analysis models
- competing risks
- mixture cure modeling