Model Development and Validation

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2025

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Adequate Model design with suitable parameterisation and validation is important, to ensure operational processes work effectively and strategic objectives are achieved. Any risks resulting from unsuitable models can lead to financial loss, and decline in profitability in competive markets. Additionally, heighened regulatory scrutiny and capital charges and may erode positions of trust for regulated industries and businesses.

Our services provide the right support for Model development endeavours, with coverage of multiple model building techniques in the areas of Credit Risk, Portfolio Risk, Stress Testing and System and Process Analysis.

Our capacity helps in guiding the stages of model developments, namely model building, model testing, model coding (prototypical) and documentations. For assisting out customers in guiding and deliving end-to-end projects, our skilled team members rely on suitable in-depth expertise to enable knowledge transfer and project delivery.

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Development of Credit Risk Models

Availability of performing credit risk models matters for financial institutions. Input of performing credit risk models is required are required for calculations of economic capital and regulatory capital, borrower selection, loan monitoring, credit portfolio management, loan provisioning under IFRS9.

Objectives

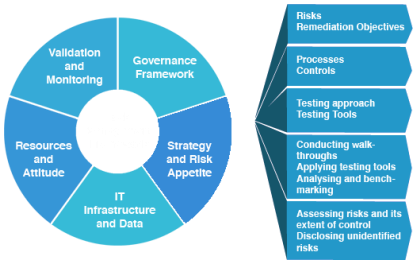
Development of Behaviour Credit, Basel IRB and IFRS9 Credit models

Validation of Credit Risk models .

Design and development of Portfolio Credit models.

Design of monitoring frameworks and prototypical implementation.

Planning and Conceptualizing combines multiple perspectives viz. industry and regulatory standards, data sources, purpose of model, model design champion versus challenger.



Contact us for more information!

Boosting of Credit Risk Models

Statistically performing and accurate credit risk models are not designed for optimal profitability. Single-name credit risk model are built to perform in terms of discrimination and prediction accuracy, but lack to optimize for profitabiliy.

Objectives	
Boosting the performance of credit models such as Probability of Default (PD), Scoring and Loss given Default (LGD) model. Indentifying how to enhance profitabiliy of Credit models. Enhancing the prediction accuracy and discriminatory power of PD and LGD models. Increasing the models capacity to discrimanate between 'bads' and 'goods' (discriminatory power).	*Data sources should be identified for supply of new credit drivers can impact beneficially.* *Feature engineering can be to creatively applied to enhance effectiveness of predictors.* *ML techniques play an important role in challenging established model design concepts.* *Profit dimension factored in for credit risk models enhances the usefulness of established models.*

• Machine Learning for boosting Credit Risk models

Feature engineering models can be based on various methods, including decision trees, boosted trees, and deep learning. When comparing ML models with tradional regression models differences in terms of interpretabiliy and prediction accuracy are obvious.

	Interpretabiliy	Accuracy
Regression (e.g. logistic)	Good	Medium
Decision Tree	Very Good	Good
Boosted Tree	Poor	Very Good
Deep Learning	Poor	Very Good

• Feature engineering used for boosting Credit Risk models

Feature engineering is a term that stands for deriving features from data to identify and add new predictor variables to enhance the model performance. An established routine approach used in credit modelling is coarse classifying whereby robustness of model outcome can be increased, and non-monotonic relationships (between variable and target) can be smoothed and removed. Moreover, unwanted behaviour of ratios that occur when either numerator or denominator values cross the zero threshold can be avoided by an appropriate ratio transformation. Below we list few feature engineering techniques that are commonly applied.

Contact us for more information!

In summary, feature engineering is a data transformation method that can enhance both, model interpretabiliy and model performance.

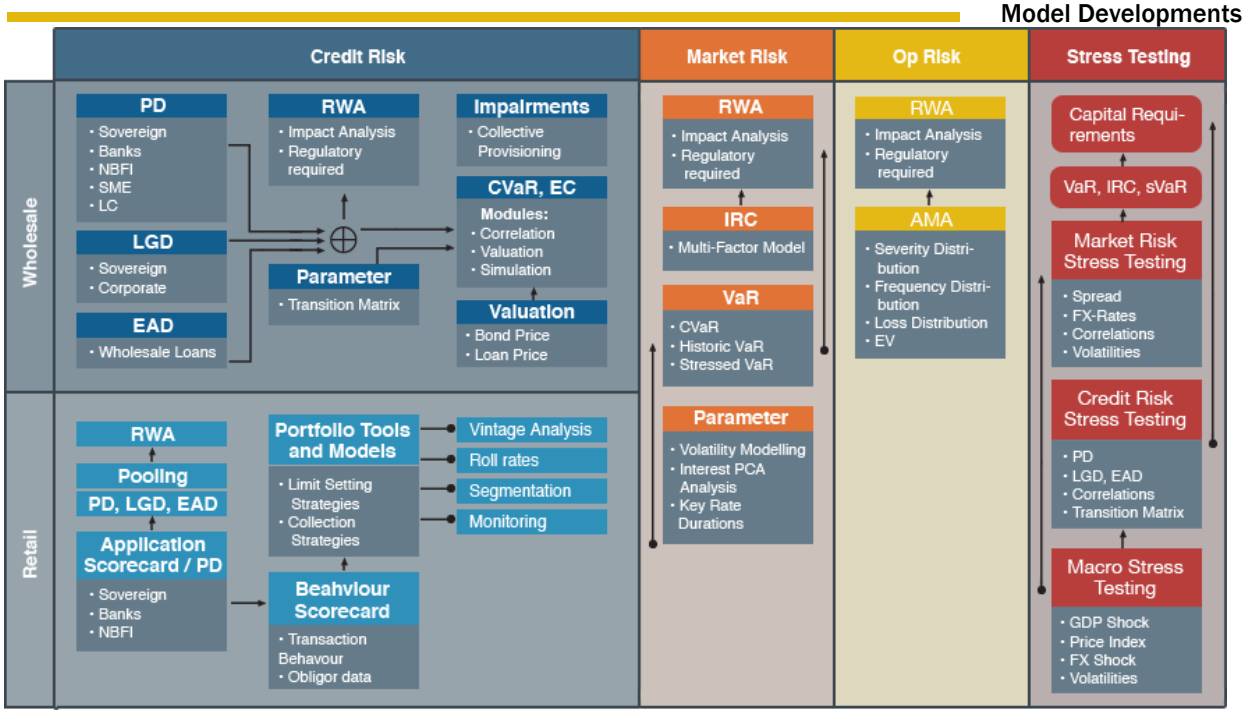
- ## Importance of Benchmarking for boosting Credit Risk models

Benchmarking is an important validation activitiy, wich compares the performance of the targeted model (champion) to a chosen reference model (challenger). The benchmarking can focus on any credit measure, including scores, ratings, PD, LGD. Benchmarking sources are differentiated in terms of external versus internal benchmarks. External benchmarks should be scrutinized for quality and portfolio composition: for example, rating agency benchmarks are typically inaccurate for timely predition of default and may be based on portfolios not representative for internal purposes. Considering benchmarks for PD and LGD, different calculation definition (identification of event, weighting schemes) and approaches (TTC vs. PIT) may invalidate the use of external benchmarks upfront.

The Hong Kong monetary authority introduced the rationale for internal benchmarking credit model in 2006:

> Where a relevant external benchmark is not available, and institution should develop an internal benchmarks. For example, to benchmark a [developed] model, an organization might employ internal reviewers to re-rate a sample of credit on an expert-judgement basis. *NB: The internal benchmark can of course be of statistical nature and based on different modelling techniques e.g. AIML.*

Development of Financial Risk Models


Credit Risk
Market Risk
Op Risk
Stress Testing
Wholesale
PD
• Sovereign
• Banks
• NBFI
• SME
• LC
LGD
• Sovereign
• Corporate
EAD
• Wholesale Loans
RWA
• Impact Analysis
• Regulatory required
Parameter
• Transition Matrix
Impairments
• Collective Provisioning
CVaR, EC
Modules:
• Correlation
• Valuation
• Simulation
Valuation
• Bond Price
• Loan Price
RWA
• Impact Analysis
• Regulatory required
IRC
• Multi-Factor Model
VaR
• CVaR
• Historic VaR
• Stressed VaR
Parameter
• Volatility Modelling
• Interest PCA Analysis
• Key Rate Durations
RWA
• Impact Analysis
• Regulatory required
AMA
• Severity Distribution
• Frequency Distribution
• Loss Distribution
• EV
Capital Requirements
VaR, IRC, sVaR
Market Risk Stress Testing
• Spread
• FX-Rates
• Correlations
• Volatilities
Credit Risk Stress Testing
• PD
• LGD, EAD
• Correlations
• Transition Matrix
Macro Stress Testing
• GDP Shock
• Price Index
• FX Shock
• Volatilities
Retail
RWA
Pooling
PD, LGD, EAD
Application Scorecard / PD
• Sovereign
• Banks
• NBFI
Portfolio Tools and Models
• Limit Setting Strategies
• Collection Strategies
Beahviour Scorecard
• Transaction Behavour
• Obligor data
Vintage Analysis
Roll rates
Segmentation
Monitoring

The Model Development Plan

As part of the planning and conceptualizaton phase, relevant information is gathered and the objectives, timings and scope are determined. Our effective model development planning captures the relevant:

1. Evaluating the risk level.
2. Understanding the business model.
3. Engaging the stakeholders and tracing the key points of contact.
4. Developing a risk profile.
5. Considering external factors and emerging risks.
6. Identifying internal risks even those overlooked.
7. Assessing inherent and residual risks accounted for in test plans.