

NPL portfolios pricing based on Machine Learning techniques

FSRM Moscow

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The better the question. The better the answer.
The better the world works.

FSRM Group

Quantitative credit risk assessment

Our team

We are part of Advisory department in CIS and Eastern Europe (over 90 professionals experienced in quantitative, regulatory and technological aspects of financial risk management)

All aspects of development and implementation of quantitative credit risk models

Over 40 implemented projects for development / validation / verification of credit risk models for various business processes of financial institutions

Over 100 different clients in financial sector around the world that allows to engage international experts on any issue



Michail Tsibulevsky, FRM
Partner

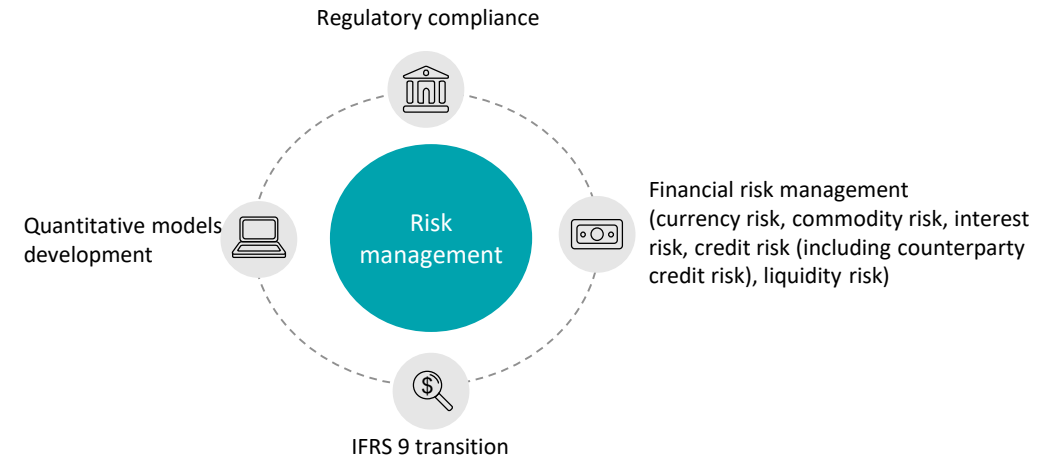
Head of FSRM in Russia and CIS



Oleg Chernyshev,
Senior Manager

Head of modeling and quantitative risk assessment

Main competencies



Our clients



Key service areas

Area		Key topics		
1	Services related to the risk management system, the requirements of the ICAAP and the Recovery Resolution Plan	ICAAP	RMF	KPI
		Recovery plan	MIS	Remuneration
2	Cybersecurity and Operational Risk Services	Cyber security	KRI	
		RCSA	Controls	
3	Services related to the optimization of business processes of the bank	Three lines of defense	EWS	
		Process mining	Collection	
4	Services related to IFRS 9	Provisions	Back-testing	
		Optimization		
5	Services related to predictive analytics, machine learning methods and quantitative risk assessment methodology	Models	Machine learning	
		Validation	AML	PD LGD
6	Services related to the assessment of market risks, liquidity risks and approaches to fair value estimation	CVA DVA	FTP	VaR
		ALM	Fair value	
7	Services related to IT, data quality and risk management automation	Business requirements	Data	
		Test scenarios		

Project overview

Current situation



- The company's business is based on the brands of two collection agencies with total portfolio of overdue debts of more than 800 bn rubles
- Company has a model which is used for portfolio management and making strategic decisions when purchasing overdue debts portfolios
- Current model for portfolio valuation is constantly being improved, but it has some limitations:
 - It can be applied only to historical data
 - It cannot take into account operational changes and impact of business initiatives
 - It does not allow to use expert judgments when evaluating portfolios
 - It requires improved accuracy of estimates
- Application of existing model for valuation of portfolios with poor quality data and, as a result, for making decisions about business expansion is questionable

Goals and objectives



Goals:

- Improve current model accuracy

Objectives:

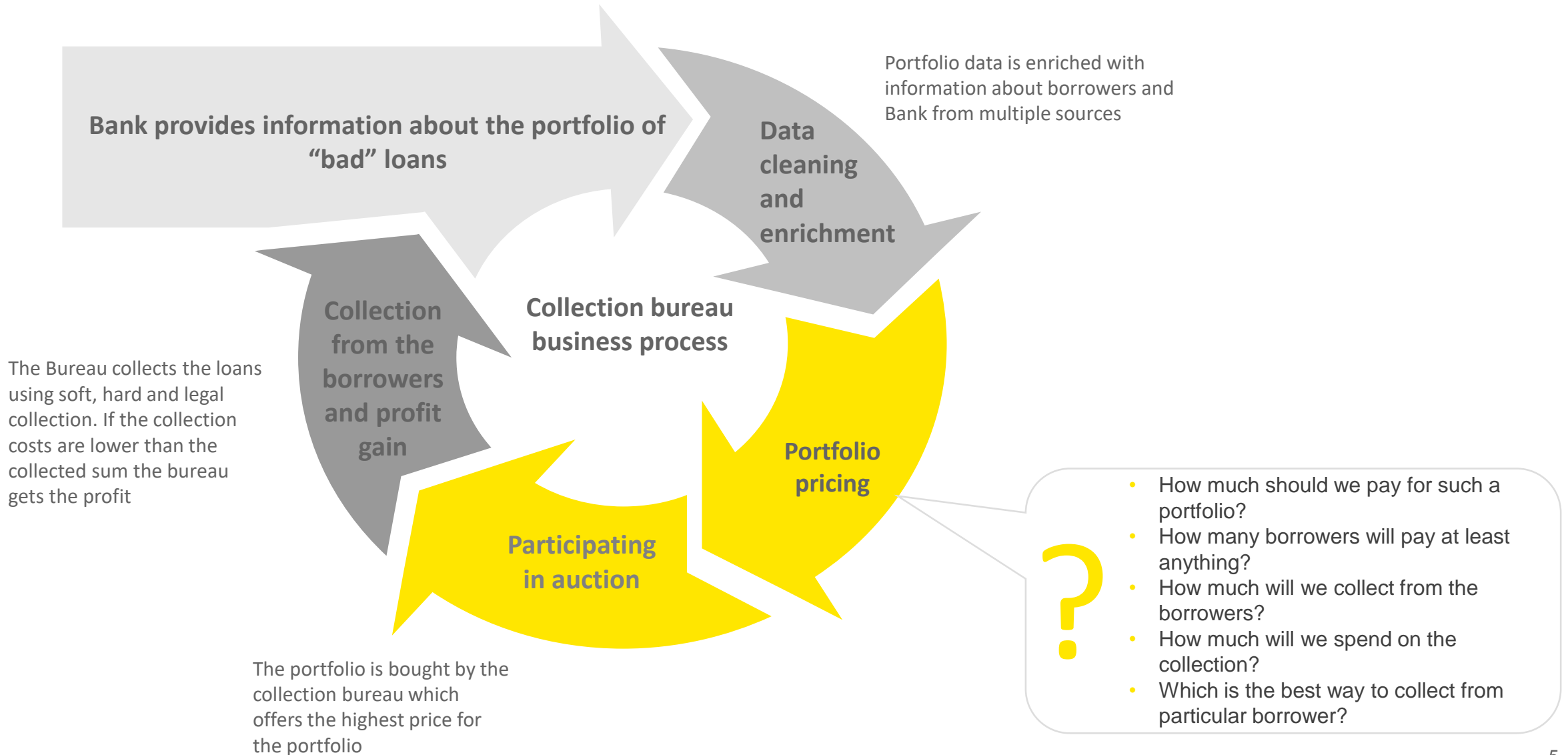
- Internal data analysis and advanced model development using machine learning tools
- Development of the model satisfying the following requirements:
 - Confidence interval estimation
 - Consideration of all available data, macroeconomic indicators and operational improvements, interpolation of missing data
 - Possibility for expert adjustments
 - External data consideration
- Back-testing of the model results on the overdue debts portfolios purchased in 2017
- Preparation of technical report on developed model, model documentation and presentation for users and company owners

Results



- Model estimates absolute collection sum
- Model estimates absolute costs
- Model determines confidence interval for collection sum
- Model meets the following:
 - More accurate estimates compared to the current model
 - Larger portion of portfolios with low and medium risk
 - Estimated confidence interval covers 95% of cases

Model description



Data enrichment

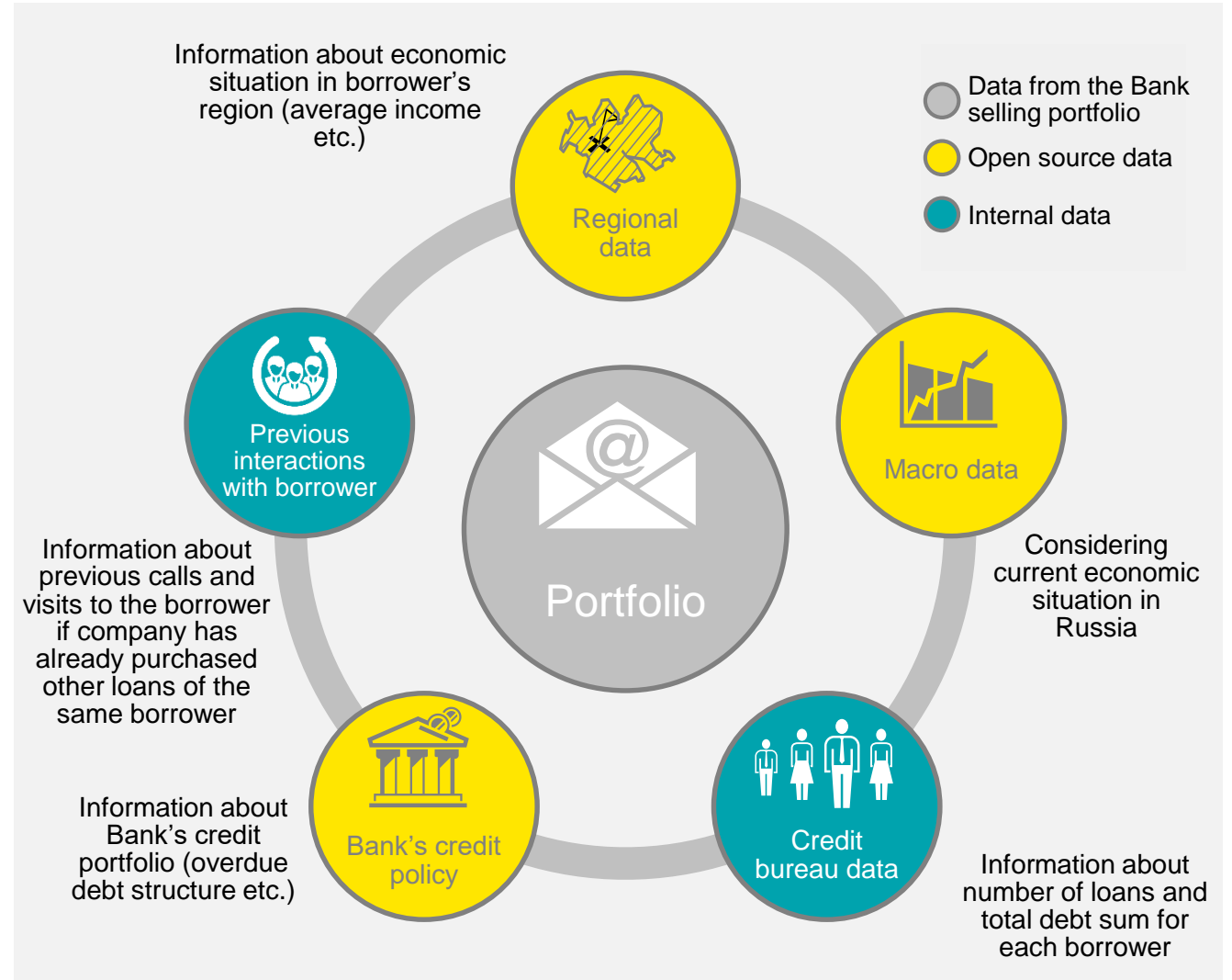
Both open-source and company's internal information on borrowers can be used for dataset enrichment

Data enrichment of the dataset allows to optimize the following processes



Borrowers prioritization (by the probability of response), determination of the most risky borrowers

Development of individual collection strategy for each borrower



Key challenges



Characteristics of portfolios purchased from different banks are heterogeneous



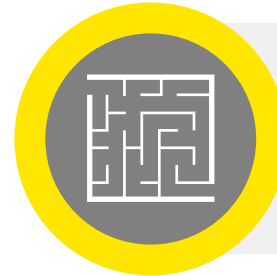
Data in portfolios are different for each bank.



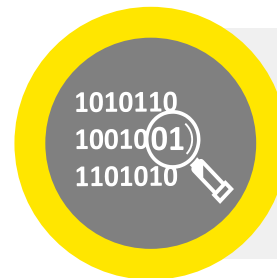
Portfolios from new banks can be purchased



New collection strategies evolved.

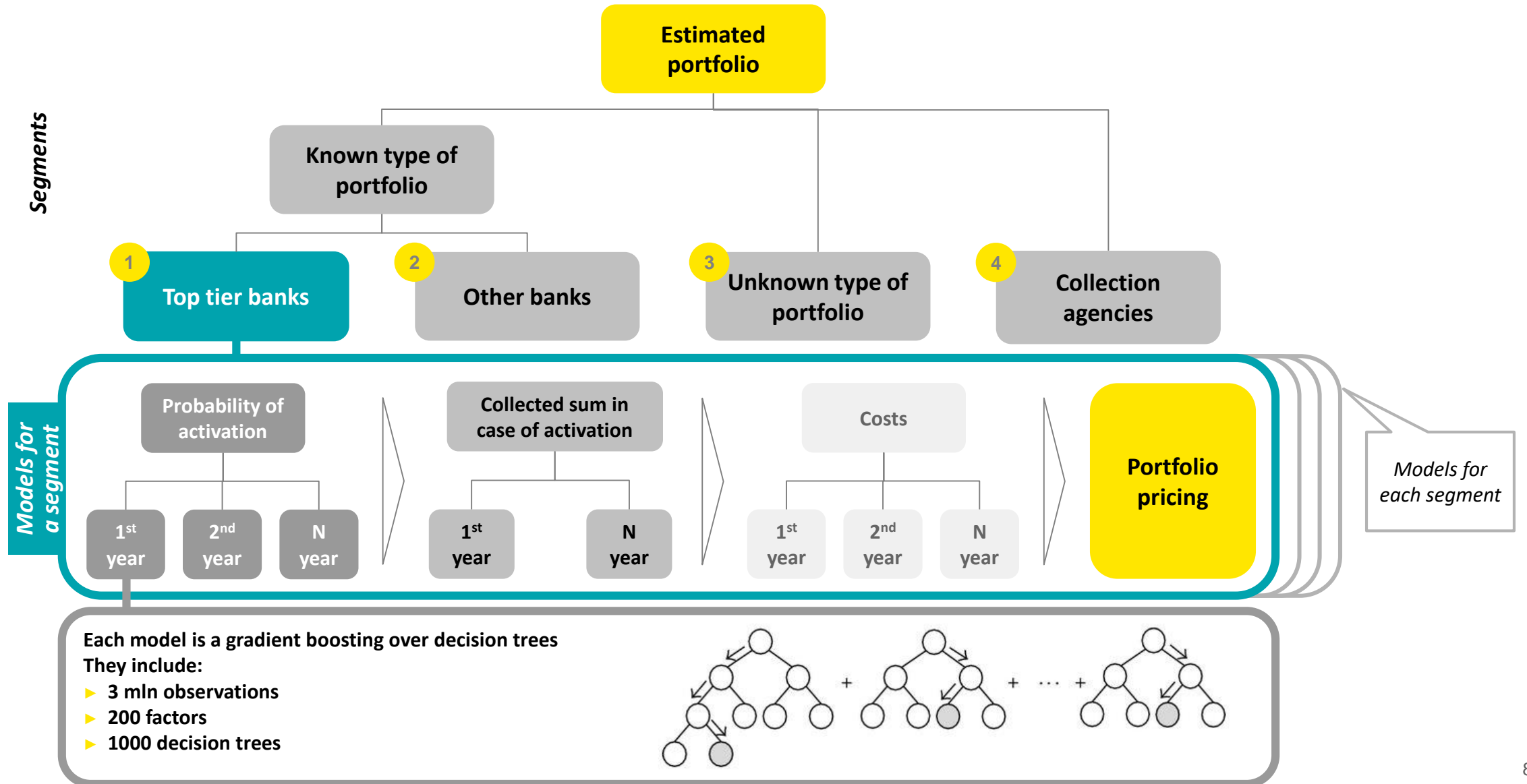


Transitions between strategies changed



Data formats in internal database changed

Illustrative model structure



Project results (1 / 2)

Processed Data



Train and test sample included

3 mln loans

Number of factor used for the model development counted

200 factors

Model factors



The developed model takes into Account macroeconomic forecasts as well as the external data describing the credit policy of the Bank selling the portfolio

Model Architecture



Model architecture was developed in accordance with the target segments of the collection bureau and it included

26 models

Model Algorithm

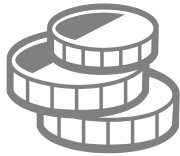


The main algorithm for Forecasting of portfolio collection and costs was

Gradient tree boosting

Project results (2 / 2)

Collection strategy determination



Optimal collection strategy

is automatically determined by the model for each loan based on detailed analysis of collection sum and costs

User interface



User-friendly

application

was developed for model estimation and portfolio price evaluation

Model integration



Model is fully integrated with internal database and company's business processes