Lion's Den 2021

Prepayment models in the context of climate risk

Task description

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do your thing

Introduction

Kinga has been working for ING since 2014. Until December 2020, she worked in the Market Risk Management Department at ING Bank Śląski, dealing with areas like risk transfer system and IRRBB reporting. She is currently on the internship at ALM Model Development in RiskHub at ING Tech Poland, and will work as a Financial Risk Expert from July 2021 at ING Tech Poland.

In her free time, she likes baking cakes and spending time actively in open air.

Marcin is working in Risk Modelling Area at ING Tech Poland. He has been working for ING Group since 2012 – for 4 years in Market Risk Management Area (ALM) and for 4 years in Credit Risk Modelling Area. Marcin is a laureate of the BANRISK - The Stanford Game competition, which is a simulation game about financial management of a bank. Marcin took part in Lion's Den Challenge twice as a modelling mentor.

In his free time he plays in board games, builds and program robots from Lego and visits Escape Rooms.

Both Kinga and Marcin are currently part of ALM Model Development in RiskHub at ING Tech Poland. The main goal of their team is to model the Interest Rate Risk in Banking Book (IRRBB).

THE WHY?
Explanation and description of the main task

THE TASK: Prepayment models in the context of climate risk

Agenda:

Business background

Participant's package

What do we expect regarding your delivery

Useful hints and tips ;)

Business background

Welcome in the Lion`s Republic!

- Our Bank wants to address the risk of customer behaviors and hedge itself against changes in net interest income in case of potential loan prepayments.

- Current methods are quit simple: constant prepayment rate (CPR) and no prepayment rate. But we believe that you will figure out something better! **This is the reason why we invited you and ask for your help!**

- Your task is simple – create **the prepayment model** and convince us that it is the best model (ever).

Climate Risk environment

- Government of the Lion`s Republic decided to introduce **some policies aimed at protecting natural environment of the country.**

- Maybe some **special offer in order to promote „green mortgages"** will be introduced?

- Could it impact performance of our client's model?
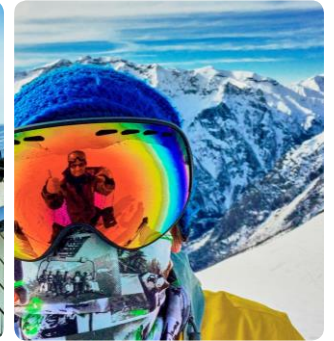
Participant's package

What will you get from us?

- Description of the task – the most important information regarding **what we expect you to deliver.**

- Description of data – what information you will find in each of the columns of the database.

- Task data – three spreadsheets with databases.

- Use case – paste your modelled cash flows in this file.

Databases

- „In-sample" data spreadsheet - basic data on the loan granted and the borrower. **Use this data to build your model.**

- „Out-of-sample" data spreadsheet - basic data on the loan granted and the borrower, **except** the information of prepaid amount. **Use this data to forecast future prepayments based on your model.**

- „Macro" spreadsheet – macroeconomic data which you can use when building the model.
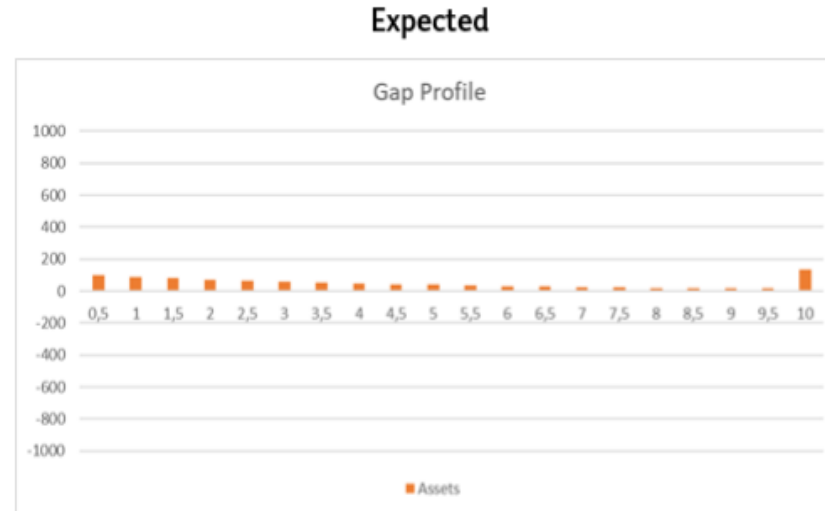
Use case file

- In this file provide the modelled cash flows for the whole period of analysis.

- Two evaluation metrics will be calculated automatically: RMSE and GAP analysis.

- Do not rely only on the metrics from Excel but think about your own methods of evaluation as well!

- Adjusted RMSE – evaluation measure of the differences between values predicted by a model and the values observed.

$$Adj. RMSE = \sqrt{\frac{\sum_{n=1}^{N} Vol_n \cdot (RPR_n - MPR_n)^2}{\sum_{n=1}^{N} Vol_n}}$$

Use case file

- Gap analysis – simplified impact analysis on future NII result:
  - Provided prepayments will be used to hedge future cash flows.
  - Only difference between model proposed by you and real cash flows are considered: we skip the rebalancing during analyzed period.
  - Any mismatches are assumed to be hedge in 1M.
  - Gap analysis is calculated only one year ahead.

Contractual

Expected

Use case file

Type of sample	Date	Modelled prepayment
	2016-01-31	1 785 795
	2016-02-29	1 763 501
	2016-03-31	1 740 965
	2016-04-30	1 718 383
	2016-05-31	1 695 709
	2016-06-30	1 672 847
	2016-07-31	1 649 929
	2016-08-31	1 627 066
	2016-09-30	1 604 252
	2016-10-31	1 581 589
	2016-11-30	1 558 873
	2016-12-31	1 536 247
	2017-01-31	1 513 775
	2017-02-28	1 491 396
	2017-03-31	1 469 206
	2017-04-30	1 447 066
	2017-05-31	1 425 233
	2017-06-30	1 403 610
	2017-07-31	1 382 238
	2017-08-31	1 361 188
	2017-09-30	1 340 562
	2017-10-31	1 320 281
	2017-11-30	1 300 384
	2017-12-31	1 280 844
	2018-01-31	1 261 753

Adjusted RMSE	Your Model	CPR	No Model
In-sample	1,69%	1,01%	2,02%
Out-of-sample	2,62%	1,16%	3,11%

Please fill in with your model results

GAP analysis - impact on P&L	Your Model	CPR	No Model
+- 100 bps	311 241,75 zł	120 694,48 zł	369 154,02 zł
+- 200 bps	622 483,50 zł	241 388,95 zł	738 308,03 zł

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What do we expect regarding your delivery

Your delivery

You can use **any software and tools** that suit you and that you like working with. During the first day of competition **you have 8h** for building the model and preparing the following output:

- Word/pdf document with **descriptive part.**

- **"Use Case" file.**

- Your code should be attached as appendix into descriptive part or send as a separate file (Jupiter notebooks, Excel files etc).

Descriptive part – prepayment model

- Present the **whole process of analysis step by step.**

- Describe **general understanding of the data**, any **transformations** and **assumptions** made, **modelling choices**, and **final results**.

- Remember that the **modelling process** is especially important for us. Thus, share with us **all of your thoughts and ideas!**

- You need to convince us that **your model is the best** and **brings us the biggest value.**

Use case

- Please provide only one file with the **final model.**

- You can model prepayment us you want but for the purpose of this exercise you need to **aggregate your all results per each month**.

- Your results **will be also evaluate** -the lowest are the results **of P&L impact in GAP** analysis, **adjusted RMSE**, the higher score you get.

- Please remember that you **should not rely only** on the metrics from Excel but think about your own methods of evaluation as well.
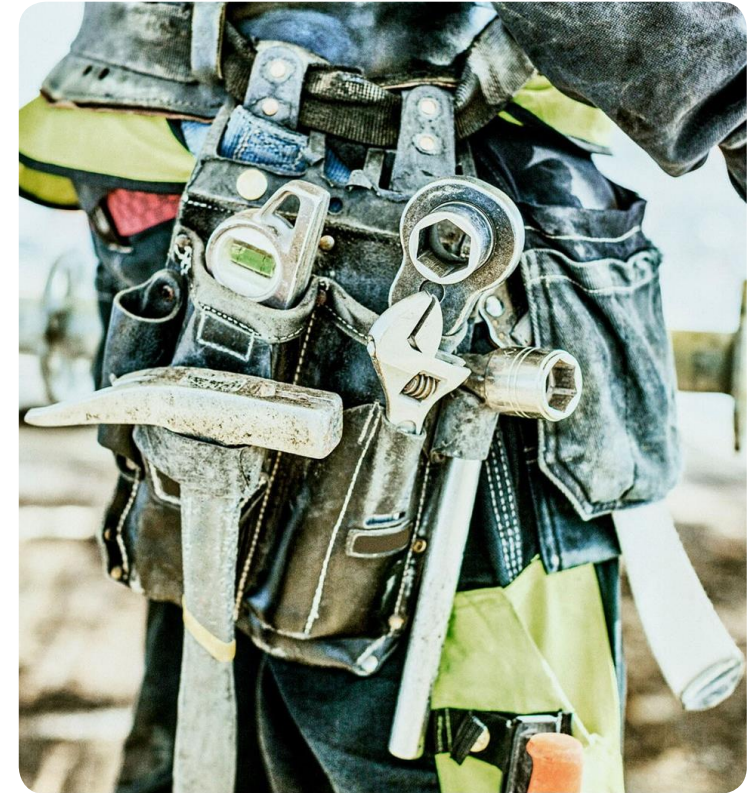
Descriptive part – climate risk

- Don't forget about **climate risk** and **rumors** that we already told you!

- What do you think? Could it impact performance of your client's model?

- How potentially **climate risk, rumors** that we told, could be included in your model?

- How we can approach it in the future, what challenges you see for banks with relation to this topic?

- It could **be treated as a separate task**, but this explanation should also **be included in the descriptive part** and **in your presentation during second day of Lion's Den event.**

- Answering for above questions could **give you additional points** (**20% of the total score** regarding today's task and will be also important during tomorrow pitches).

Remember!

- Your task is about **modelling of client behavior risk**, so **the prepayments** that you will provide together with description of your modelling process **is the main goal - 80% of the total score of today's task.**

- However, remember that we also ask you to **cover climate risk**! It should be also included in descriptive part and send today. It can give you **20% of the total score of today's task**

- Please remember **you have 8h for modelling and descriptive part**. Time for **preparing pitches will be tomorrow.**

- Based on the materials provided by you, we will **select the best 6 teams**, which will have the opportunity to present their results to jury on the second day of Lion's Den ING Risk Modelling Challenge.

- The **total score** of **whole competition** consist of:
  - 50% – today's task (80% modelling process 20% climate risk task)
  - 50% – tomorrow's pitch

Useful hints and tips

Few hints

You only have 8 hours and a lot of work to do, so plan your time carefully.

Remember to present your way of thinking, brainstorming effects, etc.

If you have any questions or doubts you can always ask mentors!

Be smart and divide your time and tasks within the team wisely.