# Assignment 5: Herfindahl index (HI)

## Background:

The Herfindahl index (HI) test is commonly used to assess the concentration of exposures or clients within rating grades. In risk modeling we want to ensure that exposures or clients are meaningfully distributed among the rating grades and that no single rating grade dominates the portfolio.

For this assignment, you will evaluate the concentration in the current portfolio from two perspectives:

1. Exposure-based HI – measures concentration based on granted amounts
2. Client-based HI - measures concentration based on the number of clients

## Data:

- Snapshots of all clients at the beginning and end of the observation date (observation date, client identifiers, exposure amounts, default information, segmentation information, model information, …). The test is executed **at beginning** of observation period.
- The observations used for this test are only the ones that are part of the **validation sample**.

## Task:

Calculate the Herfindahl index for the relevant portfolio both in terms of clients and exposure. The following formula is used:

$$\mathrm{HI} = 1 + \log\left(\frac{\mathrm{CV}^2 + 1}{\mathrm{K}}\right) / \log(\mathrm{K})$$

where CV is the coefficient of variation that is equal to:

$$\mathrm{CV} = \sqrt{K \sum_{i=1}^{K} \left(R_i - \frac{1}{K}\right)^2}$$

## Where:

- $K$ is the number of rating grades for non-defaulted exposures/clients
- $R_i$ is the relative frequency of rating grade i at the beginning of the relevant observation period

The results should look like:

| Herfindahl index (concentration of customers) | Herfindahl index (concentration of exposures) |
|---|---|
| | |

## Presentation:

- Teams of 2-3 people are recommended.
- Prepare for 10 minutes speech per team. Find a way to present of all this in a business way – short, crisp and non-technical language.
- Interpret the results:
  - How concentrated is the portfolio?
  - Is there a significant difference between customer-based and exposure-based HI?
    Why might exposure-based concentration differ from customer-based concentration?
  - What are the potential implications for credit risk modeling?
- Try to visualize the underlying data in a way that would be insightful for the business.