# Executive Summary


## Problem

Within the scope of the university seminar *Advance Portfolio Management Game*, a computer-based simulation of the financial market is used. This simulation was newly developed at the beginning of 2019 by the IT team of the Department of Banking and Finance (DBF) of the University of Zurich. The main objective of this thesis is to further implement this simulation and enhance a bootstrapping model that constructs a financial reality based on an application of an economic scenario upon historical data.

Economic forecasts are vital in the financial world since most investment decisions are often based on them. The forecasts usually contain information on macroeconomic factors and their expected future development. It is crucial for an investor to understand how these macroeconomic factors interact with the financial market. Hence, an introductory section provides, a brief overview of how macroeconomic factors can influence the financial market. As a preliminary work for the bootstrap model, the macroeconomic data is revised and a consistent set of time-series is created. The technical part includes the programming and description of the bootstrap model, that simulates the data. Further, a manual is included, that provides the game master with some guidance concerning all the relevant decisions he can make. The thesis concludes with possible limitations and further implementations of the model.

## Method

The simulation developed in this thesis, uses an alteration of the bootstrap method. The idea is to draw smaller sample-sets (blocks) from the main sample and use them for the generation of future data. The simulation was implemented in three modules programmed in Python. The first module revises the macroeconomic data to make it consistent. In particular, the data is converted into monthly time-series with the same start and end dates. The second module is used to determine the historical data that later will be used for the bootstrapping. It takes the desired scenario as an input, quantifies it, and searches the database for suitable data-blocks. The output of this module is a list of timestamps (dates) that determine the blocks to be bootstrapped. This was undoubtedly one of the biggest challenges of the thesis. After determining the blocks, the resampling module can be called. This module performs the bootstrap on the data, by randomly merging the detected blocks. The generated data is then returned to the main simulation.

## Results

The output of the programmed model is, as already mentioned, a set of dataframes containing bootstrapped data for all the macroeconomic and financial factors included in the game. Furthermore, the data generated is assigned to a specific scenario defined by the game master. In addition, a game master manual was created that provides the game master with useful information on all the relevant decisions.

### Evaluation

The main objective of the thesis was achieved. Once the constructed modules have been integrated into the Portfolio Management Game, the game master will be able to enter a scenario and then, the generated data move accordingly. Whether this scenario can be clearly depicted in the outcome of the simulation or not, has yet to be tested. Ideally, this will become visible when the integration of the constructed modules in the game is completed. A small extension of the Python modules was, however, created to perform simple tests and suggest some sample scenarios for the game master. Finally, a number of further implementations that could enrich the simulation and thus the Portfolio Management Game are examined. Possible implementations could be the integration of additional data or further improvement of the programmed bootstrap model to achieve an, even more, realistic model.