

Assignment 2: Estimating Betas

MOEC0550 Empirical Finance (S)

Spring Semester 2021

1 Introduction

The purpose of this assignment is to estimate Betas and then, in a next step, to predict them. In addition, it is examined whether the Beta is a better risk measure compared to the standard deviation. As in the first assignment, we again choose the SMI as the benchmark index to reflect the Swiss stock market.

You will find all the necessary information and the data for the empirical part of this assignment in the folder "Assignment 2" on OLAT.

Deadline All deliverables, which are defined more distinctively in Section 2, have to be turned in on OLAT by Friday 9th April 2021 at 21:00 the latest. Ensure that you submit the deliverables before the deadline, since late reports will receive a grade of 1.

2 Deliverables

You hand in your work by uploading it on OLAT with the following two documents attached:

- **R Code:** Turn in the R-Script including all your calculations and relevant comments for the code. The file should be named as followed: "groupname_assignment2.R"
- **Report:** The report provides answers **to the questions** asked in the problem set on a **maximum of five DIN A4 pages** without the cover page nor tables/graphs and should be handed in as a PDF. Please put your tables/graphs in the appendix. Structure the report with subtitles according to the questions in the problem set. Use 11pt font size at least. Please make sure that you note the names and Matrikel-Nr. of all members of your group on the cover page. The file should be named as followed: "groupname_assignment2.pdf"

3 Data

On OLAT you will find five different data sets, each of which contains monthly data from 30. June 1988 to 29. December 2017 and 26. February 2021 respectively.

- A2_dataset_01.txt
This data set contains the historical monthly prices of all stocks that have been part of the SMI over the observation period. In order to approximately replicate the SMI, the values of the stocks that were not in the SMI at a certain point in time have been set to "NA", so that these will not affect the calculations.
- A2_dataset_02.txt
This data set contains the interest rates of Swiss government bonds with different maturities from 1 to 30 years. Please note that although the data here is provided on a monthly basis, the interest rates are the annual interest rates.
- A2_dataset_03.txt
The A2_dataset_03.txt data set contains the historical monthly prices of the SMI Index and the SMI Total Return Index. You should use this data set to calculate the market return, which is needed for the regression in order to estimate the Betas.
- A2_dataset_04.txt
This data set contains the historical daily total prices of all stocks that have been part of the SMI over the observation period from 30. June 1988 to 29. December 2017. In order to approximately replicate the SMI, the values of the stocks that were not in the SMI at a certain point in time have been set to "NA", so that these will not affect the calculations.
- A2_dataset_05.txt
To avoid having to re-estimate all the betas for the last question, you will find already estimated Betas from 29.04.1994 to 29.12.2017 in this data set. They have been estimated on a daily basis as recommended in the lecture.

4 Controls and Hints

Below you find sample solutions for certain values to check your work progress and make sure that you are on the right track:

Question 1	Estimated Beta Credit Suisse	2.043206
Question 2	Predicted Beta Credit Suisse	2.022033

5 Problems

5.1 Estimating Betas

The first objective is to estimate the Betas for the four companies Adecco (in the dataset called: "Adecco"), Credit Suisse ("Credit_Suisse_Group"), LafargeHolcim ("LafargeHolcim") and Swisscom ("Swisscom"). In order to do this, you can use the textbook recipe from the lecture, where the Betas are estimated based on the monthly returns over the last 60 months (i.e. use data from 31.03.2016 to 26.02.2021). You should use the following data sets:

- "A2_dataset_01.txt"
- "A2_dataset_02.txt"
- "A2_dataset_03.txt"

Before estimating the Betas, answer the following questions:

1. What is the purpose of the Beta? I.e. what does the Beta say?
2. Based on the business of the stocks, **argue** whether the Beta should be greater or smaller than 1.
3. Revisit the estimation technique described in the R code (big four slides 20-24, R code lines 500 - 582). In particular, consider the risk-free rate used in the R code. Is this correct? If not please explain what should be done to improve?

Let's estimate the Betas. For this purpose, please fill in the following table:

Company	Beta	Alpha	R2	Res. Std. Dev.	Std. Err. Beta	Std. Err. Alpha
Adecco						
Credit Suisse						
LafargeHolcim						
Swisscom						

4. If you take a look at the estimated Betas, are they in line with your expectations?
5. How good are your estimates? Report the t-value of each Beta.
6. Looking at the R2, how can it be interpreted? Calculate and report the adjusted beta by applying the simple 2/3 and 1/3 rule. (i.e. use 1/3 as the Bloomberg AF)
7. For this part of the exercise us the "A2_dataset_05.txt" file and **only** data from 2. July 2007 to 31. March 2009. Report the average Beta for your four companies. Which company appears to exhibit the largest change in Beta estimates? What do you think is the reason for this?

5.2 Predicting Betas

After the Betas have been estimated, the next step is to predict Betas.

1. While it was sufficient for the previous task to calculate only the Beta as of the end of the data set, for this task the Betas have to be calculated on a rolling basis (start estimating the Betas for each stock as soon as there's price data available). However, still use the monthly returns over a rolling 60 months estimation window and fill in the following table:

Company	\hat{a}	\hat{b}	β_t	Forecast β_{t-1}
Adecco				
Credit Suisse				
LafargeHolcim				
Swisscom				

2. How can the \hat{a} and the \hat{b} be interpreted? What does a high \hat{b} imply?

5.3 Beta as risk measure

In the risk and return part of the lecture we showed you how different investments would have developed if they had been divided into five different portfolios based on their standard deviation as of $t-1$. We observed that the standard deviation may not be a good measure of risk. Therefore, this task is about repeating this "experiment", but this time using Betas as a risk measure. Instead of the Betas you calculated, use the Betas from the dataset:

- "A2_dataset_05.txt"

Since the betas are given on a daily basis, you should also use the following price data:

- "A2_dataset_04.txt"

Repeat the experiment:

1. Report the mean return and the mean standard deviation of the five portfolios.
2. Plot all the five portfolios and interpret graphically if the Beta is a more appropriate risk measure.
3. In this question we have asked you to evaluate the profitability of a trading strategy based on estimated Betas. How could you improve the Betas in order to improve the strategy?

5.4

Suggestions for improvement of this exercise?