

FIE401 - Second assignment

Is momentum priced in the Norwegian stock market?

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Overview

Research question: Is momentum priced in the Norwegian stock market?

In this assignment, you will investigate if momentum is priced in the Oslo stock market. In other words, do stocks that are exposed to a momentum risk factor earn a higher/lower expected return.

In this assignment, you are going to estimate the momentum risk of different sets of portfolios, sorted on size or book-to-market. Subsequently, you are going to estimate the associated momentum risk premium (how much extra return does an investor demand for exposure to momentum). You will be introduced to and use an approach known as Fama-MacBeth (1973) regression.

Formalities

This assignment will be handed out on 6.10.2022 at 17:00 and has to be submitted no later than the 13.10.2022 at 14:00. Submit your commented coding file (file extension: “.R”) and a pdf file (file extension: “.pdf”) including the numerical results and answers to questions posted.

Please comment your code shortly so that a reader can reconstruct your thinking. You do not need to explain the used functions. You do not need to describe your coding in the pdf file. Please keep your answers very brief.

On Canvas, you will find a guideline of how to make good tables. Note that in the last lecture of this course, we will cover the subject of how to present research in detail.

After submission, the assignments will be randomly redistributed. Read your peer’s work carefully and compare your solution to theirs. There are many different approaches to code the same exercise, so let’s learn from each other. You do not need to provide comments and there is no deadline. From experience, I would encourage you to look at the approach by your peers. They will use different functions and different approaches.

In order to make it easy for us to allocate individual assignment submission as well as peer review to groups, please follow following file name structure. For the assignment submission: “Assignment2_group_XX.R/pdf”. “XX” indicates the group number that submitted the assignment.

Please do not include any personal information such as name, student number, etc. in the submitted files.

Note that in order to complete the assignment, you need to submit your own work as well as complete the peer review. Both aspects will be reviewed.

Work together in groups of four.

Submit your assignment even if you do not finish all tasks. For a pass, 50% has to be correct. I would stress that discussion, interpretation, and presentation of results is equally important to implementing code.

Note that some concepts are introduced for first time in this assignment. Please use online resources actively.

We touched on almost all functions you have to use to solve this assignment. If you are unsure how to use a function, either use R's own documentation (type `?command`) or use www.stackoverflow.com. We encourage you to code this assignment yourselves, and not to use purpose-made solutions or packages as provided on the internet.

Before starting to code, try to separate the task into smaller pieces.

Data provided for this assignment

All data can be found on Bernt Arne Ødegaard's webpage: <https://ba-odegaard.no>. Please download following data:

- Returns of 10 portfolios sorted on size: https://ba-odegaard.no/financial_data/ose_asset_pricing_data/equity_size_portfolios_monthly_vw.txt
- Returns of 10 portfolios sorted on BM: https://ba-odegaard.no/financial_data/ose_asset_pricing_data/book_market_portfolios_monthly_vw.txt
- Pricing factors including momentum (UMD): https://ba-odegaard.no/financial_data/ose_asset_pricing_data/pricing_factors_monthly.txt

Note that you can load the data straight into R from the corresponding url. Just use `read.csv(url)`.

If you are unsure how portfolios are constructed, etc. I would recommend using the resources Bernt provides on his webpage.

Tasks

- Download the data and investigate.
- Fama-MacBeth regression (1973) first state regression: Computing the exposure of each portfolio to the momentum factor: For each size portfolio p compute its exposure to the momentum factor UMD by regressing portfolio return on the momentum factor, and save the beta $\hat{\beta}_p$ (Note the subscript p indicates that you have an estimated beta for each individual portfolio.). You do not need to save the intercept. Hence, this step should result in having 10 exposures to the momentum factor ($\hat{\beta}_p$) for each of the 10 size portfolios from 10 individual regressions.

$$\forall p : return_{p,t} = \alpha_p + \beta_p UMD_t + u_{p,t}$$

Note, that I provide a coding hint on how to use loops and save regression coefficients at the end of the assignment.

- Plot the exposure of each individual size portfolio on the x-axis against the average return over the period on the y-axis. Does exposure to liquidity explain differences in return? Does the sign of the relationship (positive/negative) correspond to the logic outlined in the beginning of the assignment?
- Fama-MacBeth regression (1973) second state regression: For each month in the sample, run a cross-sectional regression of the returns of the size portfolio in this month, on the exposure of the momentum factor from the previous steps ($\hat{\beta}_p$). For each month, save the gamma $\hat{\gamma}_t$ (Note the subscript t indicates that you have an estimated gamma for each time period.). Again, you do not need to save the intercept. This step will result in a time series of regression coefficients $\hat{\gamma}_t$.

$$\forall t : return_{p,t} = \alpha_t + \gamma_t \hat{\beta}_p + u_t$$

- Take the coefficients from the previous step $\hat{\gamma}_t$ and test whether the average is positive and statistically different from zero. You can achieve this by regressing $\hat{\gamma}_t$ only on a constant: $\hat{\gamma}_t = \alpha + u_t$. If yes, this implies that stocks with a higher exposure to momentum on average have a higher return. Do you find the relationship as hypothesized in the beginning of the assignment?

- Repeat the same analysis for the 10 book-to-market portfolios.
- PDF report, interpretation and additional questions
 - Make sure that your pdf starts with a **short and consise** abstract presenting your analysis (as you would in your Master thesis).
 - Present and discuss the plot.
 - In writing, discuss your regression results briefly (5-10 sentences). Make sure that you discuss statistic as well as economic significance. Regarding the latter, argue whether or not the detected effects are meaningful.
 - Answer following questions in detail
 - * Which bias might you be concerned about in this analysis, and how would it affect your results?
 - * Why don't you find the same results for portfolios sorted on book-to-market as for size? Remember, both portfolios are constructed from the same set of stocks.

Coding hint

In two tasks of this assignment, you are asked to run sequential regressions and save the coefficients. Here I provide a general **pseudo-code** of how this can be done.

```
# object to save 5 coefficients
coef.vec <- rep(NA, 5)

# iteration
for(i in ...){
  # construct relevant data
  rel.data <- ...

  # regression
  fit <- lm(..., data = rel.data)

  # save coefficient
  coef.vec[i] <- fit$coefficient[...]
}
```

Note, feel free to use more elegant and faster coding approaches.