

FIN3080 Assignment2 Report

Data processing

Downloading data

First, I downloaded 6 different csv files, they separately contain:

1. Monthly Closing Price, Monthly Return
2. Net Asset per Share
3. Return on Equity - TTM
4. Return Volatility at 2010/12/31

Data processing

1. For data that contains two types (A, B), I always chose A-type to exclude parent statements.
2. For data that is recorded quarterly, I transfer the date to 'xxxxQy'. 'xxxx' means the year it represents; y means the quarter it represents. (e.g., 2010/6/30 will be transferred to 2010Q2.)
3. To easily calculate the P/B ratio, I delayed the EPS and the Net asset per share by ONE quarter to satisfy the equation given in the hint. (The data showed in the tut is different from the data needed in the assignment document)
4. For the monthly data, I transferred each month to the corresponding quarter.
5. Use 'Stock Code' and 'quarter' to merge all the csv files.
6. Calculate the P/B ratio, and create a new column to save it.
7. Calculate the 5th percentile and the 95th percentile and use them to filter out the data that meets the conditions. (detailed data are shown in the csv file)

the 5th percentile for P/B ratio: 0.6986791612583341

the 95th percentile for P/B ratio: 10.12699936583177

Problem 1

Process

Filter out the data of Dec 2010 and save them as a new csv file. Then use the Linear

Regression function in sk-learn to fit the model. Here is the result of the model.

$$P/B_i = \alpha + \beta_1 ROE_i + \beta_2 Stock\ Volatility_i + \epsilon_i$$

R² value: 0.15183643389014345

Mean Squared Error (MSE) on training data: 3.6082398703050584

Coefficients: [1.77670334 9.06030235]

Intercept: -0.05662466980458447

Then the fitted model will be

$$P/B_i = -0.05662 + 1.77670 \cdot ROE_i + 9.06030 \cdot Stock\ Volatility_i + \epsilon_i$$

Findings

α : It is very close to zero, so this term may be ignored in most of the time. The P/B Ratio will be negative when ROE and Stock Volatility are both zero, the P/B Ratio will be negative. It may be because that when the company has no return, it is a bad company, and it may be wiser to invest in a risk-free asset. So, the price of the stock may be negative and the P/B Ratio is also negative. However, it is still not a good estimation since someone may focus on the bright future of some non-profit-making companies, and the price of these companies are not negative.

β_1 : The coefficient for ROE is about 1.77. It means that when the ROE increases 1 unit the P/B Ratio will increase about 1.77 unit. This is the same with our sense, since a higher ROE means better earning ability, and will lead to higher price.

β_2 : The coefficient for Stock Volatility is about 9.06. In our common sense, this is very wired since higher volatility means higher variance which means not steady return. In my opinion, higher volatility also means that the company is highly noticed by people. So, the short-term investors tend to invest in these stocks and may lead to higher prices. Another guess is that when the companies are growing swiftly, the stock volatilities will also be higher. So, a higher

stock volatility represents that the company has a larger growing future, which drives the price and the P/B Ratio to be high.

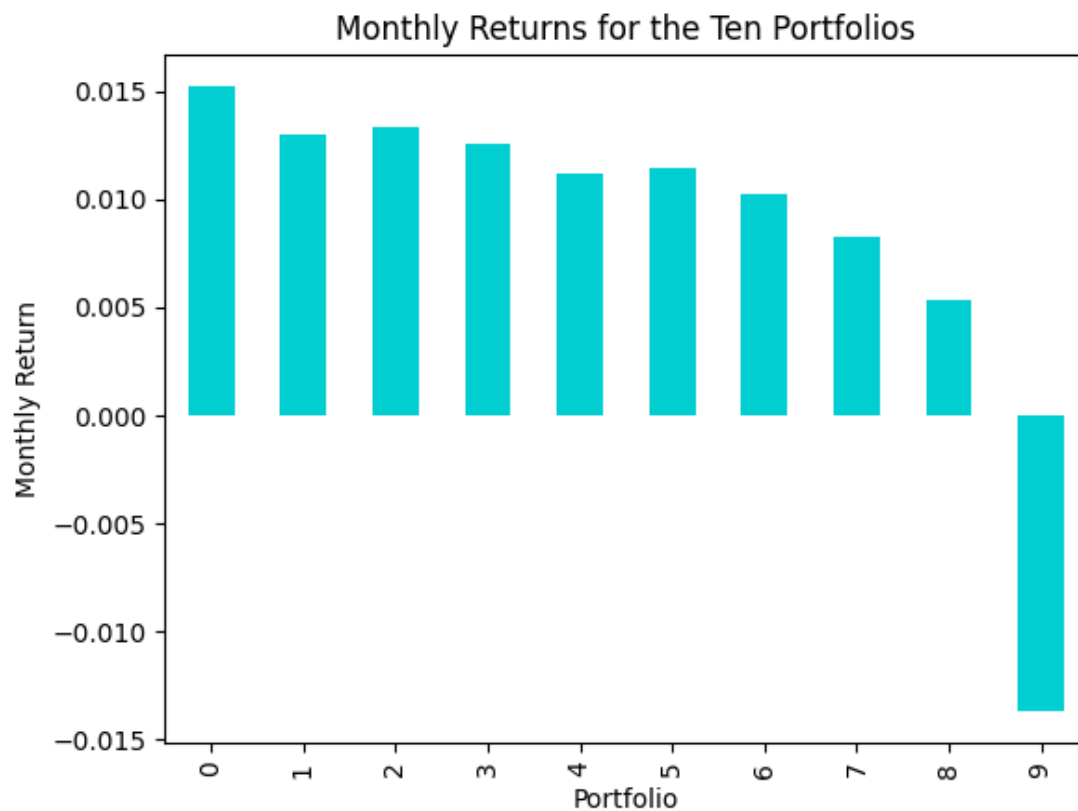
R^2 : R^2 is about 0.15, although it may look poor in the physics field, it represents a good estimation in the finance area. It means there is a strong correlation between P/B Ratio and ROE and stock volatility.

Problem2

Process

1. Shift the P/B Ratio by one unit to match the P/B Ratio last month with the current month's stock return.
2. Sort the data by P/B Ratio and divide companies into 10 portfolios and calculate the return for each portfolio every month.
3. Calculate the average return for each portfolio from Jan. 2010 to Dec. 2023.

Figure



The P/B Ratio last month of portfolio 0-9 is increasing, which means portfolio 0 has the lowest P/B Ratio last month and portfolio 9 has the highest.

Findings

1. There is a noticeable trend of decreasing returns from Portfolio 0 to Portfolio 9. This implies that a lower P/B Ratio last month tend to give a higher return next month. This may because a lower P/B Ratio may imply that the company is undervalued, and the companies in the portfolio with lower P/B Ratio tend to give a relatively higher return. What's more the companies with higher P/B Ratio tends to be highly overvalued and its price is at a high position now, so its potential growth will be low and its return will also be low or even negative.
2. The portfolio with the highest P/B Ratio last month is the only portfolio that has a negative return, this might because that there are still some outliers in the portfolio that its price falls

rapidly, resulting a large negative return. These stocks influence the whole portfolios' return.