FIN3080 Report   123090559

Data collection

As required, the data was downloaded ended up with 3 cvx files including these categories: Monthly Closing Price(1), Monthly Return without cash dividend reinvested(1), ROE-TTM(2) and Net assets per Share(2), which are merged through CSMAR platform and lastly stock volatility(3) during the required time and A shares options were downloaded.

Data conversion

Dates in all involved cvx files are converted to a monthly period format. And made adjustments for NAPS & ROE data by adding one month, which can make it function as the closing data at the end of quarters.

Merging according to date

The merging process connects data on stock codes and the adjusted dates, using a left join. Additionally, missing value is forward-filled for the ROE and NAPS columns within each stock code group, ensuring the data is continuous for further processing.

Extreme data removal.

The code calculates the P/B ratio of the entire data, then filters out records with extreme P/B ratios, specifically those below the 5th percentile or above the 95th percentile as required.

Problem 1

(a)

In the multiple linear regression, the dependent variable is P/B ratio, the two independent variables are ROE (return on equity) and stock volatility respectively. i represents obserations, i.e. different companies. The time range is specifically 2010Q4. The regression result is:

$P/B_i = 0.0981 + 1.6253 \times ROE_i + 8.7290 \times volatility_i + \epsilon_i$

Graph in detail as shown below.

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        |              OLS Regression Results
==============================================================================
Dep. Variable:         price_to_book   R-squared:                       0.139
Model:                           OLS   Adj. R-squared:                  0.138
Method:                Least Squares   F-statistic:                     111.0
Date:               Tue, 18 Mar 2025   Prob (F-statistic):           2.04e-45
Time:                       01:04:00   Log-Likelihood:                 -2809.8
No. Observations:               1376   AIC:                             5626.
Df Residuals:                   1373   BIC:                             5641.
Df Model:                          2
Covariance Type:           nonrobust
==============================================================================
                    coef    std err          t      P>|t|      [0.025      0.975]
------------------------------------------------------------------------------
const             0.0981      0.280      0.350      0.726      -0.452       0.648
return_on_equity  1.6253      0.405      4.011      0.000       0.830       2.420
volatility        8.7290      0.609     14.338      0.000       7.535       9.923
==============================================================================
Omnibus:                     108.176   Durbin-Watson:                   1.796
Prob(Omnibus):                 0.000   Jarque-Bera (JB):              144.855
Skew:                          0.657   Prob(JB):                     3.51e-32
Kurtosis:                      3.895   Cond. No.                         14.6
==============================================================================

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.
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Regression Result Interpretation

Intercept Coefficient (β_0): The intercept is 0.0981, but it is not statistically significant ($p > 0.05$), suggesting that when ROE and stock volatility are zero, the P/B ratio is not significantly different from zero.

ROE Coefficient (β_1): The coefficient for ROE is 1.6253, and it is highly statistically significant ($p < 0.001$). This means that for each unit increase in ROE, the P/B ratio is expected to increase by approximately 1.6253, holding stock volatility constant.

Volatility Coefficient (β_2): The coefficient for stock volatility is 8.7290, which is also highly statistically significant ($p < 0.001$). This suggests that for each unit increase in stock volatility, the P/B ratio is expected to increase by approximately 8.7290, holding ROE constant.

R-squared: The R-squared value is 0.139, which means that approximately 13.9% of the variation in the P/B ratio is explained by the model. This is a relatively low value, indicating that ROE and volatility cannot explain a large portion of the variability in the P/B ratio.

Discussion of Findings

The P/B ratio is strongly positively related to ROE, meaning that companies with higher profitability generally have higher P/B ratios. Similarly, firms with greater stock volatility also tend to have higher P/B ratios, which may be linked to a risk premium. The model's low R-squared suggests that many other factors not included may explain the P/B ratio, the P/B ratio may possibly be explained by a large number of additional factors that are not taken into account. The non-normal residuals imply that the predictions might be biased or less effective. Nonetheless, the statistically significant correlations allow us to conclude that the P/B ratio is positively associated with both stock volatility and ROE.

When a company's ROE rises, its P/B ratio increase because a strong ROE shows the company is using its assets profitably. This makes the firm more attractive to investors, pushing up its stock price relative to its book value. As a result, investors find the company more appealing, which raises the stock price in relation to its book value.

In terms of volatility, a stock with the potential for high returns may experience an increase in price as investors are willing to pay more if they believe that taking on greater risk would result in higher returns, which would raise the P/B ratio once more.

In summary, a high return on equity (ROE) gives the impression that the company is a money-making machine to investors, and some of them enjoy the excitement of a volatile stock and are prepared to place larger bets on it. These factors can both raise the P/B ratio

(b)

Manipulation

From January 2010 through December 2024, I classify corporations according on their P/B ratio from the preceding month, placing them in ten percentile bands each month. I determine each

percentile group's mean return for each month, using this average as the group's return for that particular month. After that, I calculate the average return for each of the ten groups. The graph is shown below.

Average Monthly Return by P/B Decile
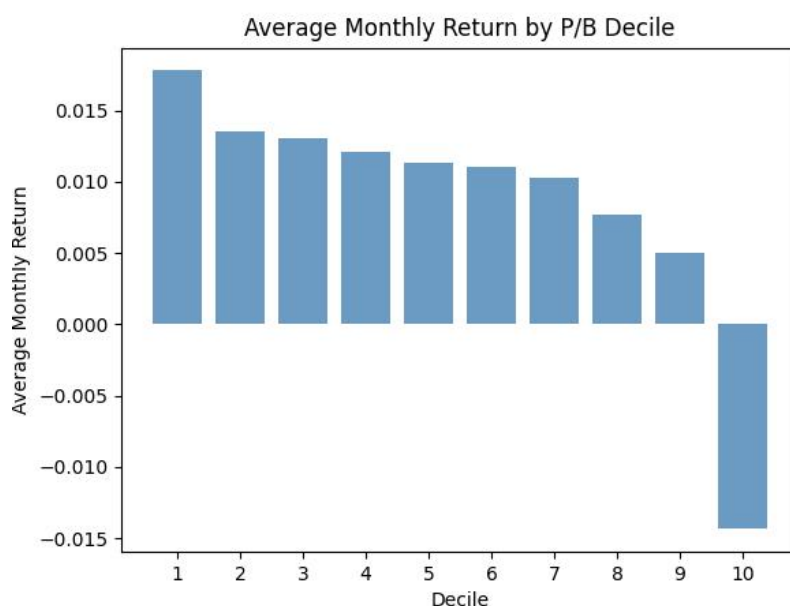
Discussion of Findings

From the chart, it can be roughly concluded that average monthly return and P/B ratio is negatively related. The analysis is as followed:

1. Why companies with low P/B ratios tend to have higher returns:

Stocks priced low relative to their book value (i.e., low P/B ratios) may result from the market underestimating these valuable firms. As the market later corrects this misvaluation, these stocks yield higher returns on average. Such companies are often value-driven and financially solid, particularly in traditional industries. Investors may see them as too mature to grow, which leads to undervaluation even though they remain strong and profitable.

2. Why companies with high P/B ratios tend to have lower or negative returns:

The market may overvalue the true worth of high P/B stocks. When this overvaluation is corrected, the returns become low or negative. These companies are generally growth-focused and asset-light, mostly in the technology sector. While some have shown strong growth, many new firms' growth is overestimated by investors, eventually leading to low returns or losses (as seen in the dot-com bubble). In the graph, Group 1 has the lowest P/B while Group 10 has the highest.