Problem 0

All the data are downloaded from CSMAR as required. Then keep the records that belong to SSE - SZSE A share market.

Problem 1

First construct lagged market capitalization by using `shift` function. Then monthly divide stocks into ten groups based on their market capitalization from last month using `qcut` function. Thus we formulate ten up-to-date portfolios. Calculate the monthly returns for each of the ten portfolios from January 2001 to December 2024. Then calculate the cross-time average return of each portfolio. Shown as below:

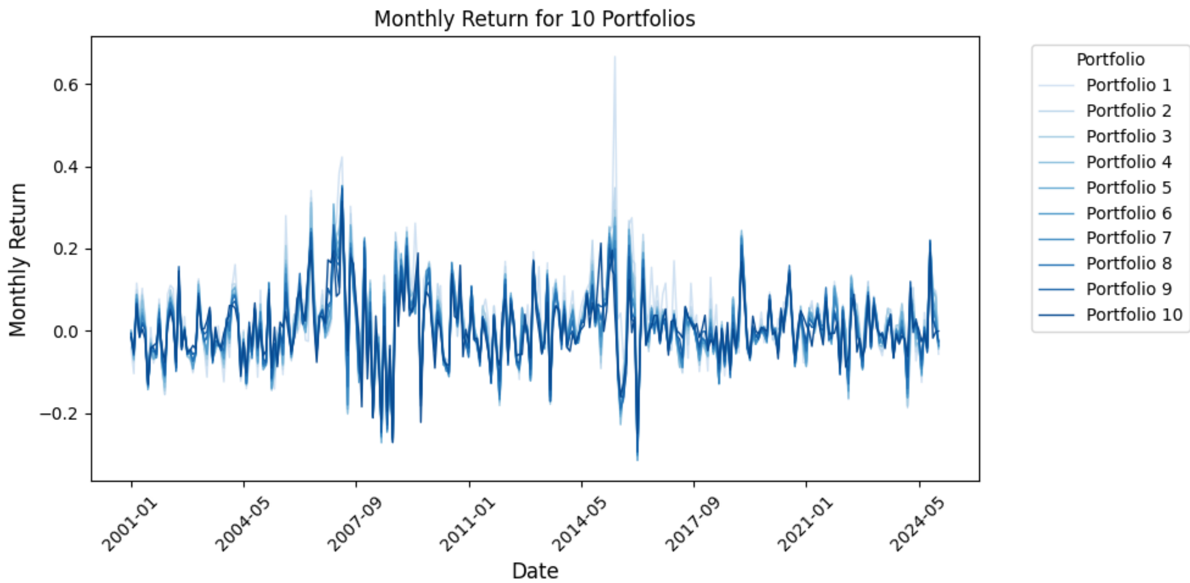

Figure 1: Monthly Return for 10 Portfolios

Table 1: Average Monthly Return for 10 Portfolios

Portfolio	1	2	3	4	5	6	7	8	9	10
Return	0.0276	0.0176	0.0146	0.0119	0.0097	0.0086	0.0083	0.0073	0.0072	0.0070

Now for each of the 10 portfolios, we do following regression:

$$Portfolio\,Return_{i,t} = \alpha + \beta_1 Market\,Risk_t + \beta_2 BM\,Ratio_t + \epsilon_i$$

The regression result is shown as below:

Table 2: Regression Results for 10 Portfolios

Portfolio	α	β_1	β_2	β_1 p-value	β_2 p-value	R-Squared	Obs
1	0.0250	1.0212	-1.0998	0.0	0.0	0.599	288
2	0.0146	1.0273	-0.9232	0.0	0.0	0.699	288
3	0.0113	1.0330	-0.8389	0.0	0.0	0.727	288
4	0.0084	1.0567	-0.7535	0.0	0.0	0.754	288
5	0.0062	1.0383	-0.7268	0.0	0.0	0.756	288
6	0.0051	1.0418	-0.7183	0.0	0.0	0.789	288
7	0.0044	1.0605	-0.6085	0.0	0.0	0.818	288
8	0.0033	1.0540	-0.5515	0.0	0.0	0.849	288
9	0.0030	1.0483	-0.4187	0.0	0.0	0.879	288
10	0.0019	1.0507	-0.0346	0.0	0.3	0.950	288

Discussion of Findings

1. **Market Risk Sensitivity**. All portfolios exhibit high sensitivity to market risk considering low β_1 p-value with β_1 coefficient close to 1.03. Therefore the portfolios largely track the broader market movements. Since there is no evident variation in β_1 coefficient across size-sorted portfolios, we can conclude the market risk exposure is size-invariant in A-share mainboard stocks.

2. **Book-to-Market Ratio Effect**. All portfolios exhibit strong negative sensitivity to BM-Ratio considering low β_2 p-value. However, the effect weakens as the size grows since β_2 coefficient diminishes from -1.1 to -0.03 across 10 portfolios. This indicates that in A-share market, growth stocks with low BM tend to outperform value stocks with high BM, especially among small or mid-size firms. The investors may have preference for growth narratives or speculative trading in smaller stocks. Here also notice that in Fama-French's findings, value stocks can outperform growth stocks, which contradict with our results. This may be explained by two reasons. On the one hand, retail investors dominate the market. They may prefer growth stocks driven by "stories and concepts" and speculation. On the other hand, considering industrial policy, government-backed industries like semiconductors and photovoltaics continue to attract capital inflow even with low BM ratios.

3. **Declining Trend of Alpha**. From the table, we observe that α coefficient decreases as the size grows. Small-cap portfolios like 1-3 generate significant positive alpha. This may be contributed by illiquidity premium and high volatility which can attract investors. Large-cap portfolios like 8-10 show near-zero alpha. This comply with efficient pricing for liquid, mature stocks.

4. **Model Fit**. From the table, we observe that R-squared increases as the size grows. Thus we can conclude larger firms' returns are better explained by market risk and BM ratio due to its maturity. Yet smaller firms have lower R-Squared, reflecting higher idiosyncratic risk.

5. **Practical Implications**. Investors need to make trade-off between positive alpha and high idiosyncratic risk; The BM ratio's predictive power is very limited when firm size gets large.