Mandatory Assignment 2

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Exercise 1 and 2:

When computing the momentum we use the market capitalization as opposed to the stock price. The benefit of doing so, is that our computations are not affected by events that increase or decrease the number of outstanding stocks such as stock issuances or buybacks. If we had used the stock price in our computations as opposed to the market capitalization, such events would have artificially increased or decreased our calculated momentum.

Exercise 3:

The equal-weighted average values of the 12-month momentum (Average_Mom_12) and market capitalization (Average_mktcap) is shown in the table 1 below:

Table 1

Momentum decile	Average momentum	Average market cap
1	-61.82	376.38
2	-35.18	971.25
3	-20.36	1650.68
4	-9.18	2348.25
5	0.44	2972.50
6	10.00	3354.10
7	21.01	3457.84
8	35.78	3092.28
9	61.34	2257.36
10	208.71	1370.94

Furthermore, we present the average excess return and the CAPM alpha for the ten momentum-sorted portfolios in table 2. The excess returns are reported in the "factors_ff3_monthly" dataset and the CAPM alphas are estimated with OLS from the CAPM equation:

$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + \epsilon_{i,t}$

The null-hypothosis is that alpha is zero and the alternative hypothosis is that alpha is different from zero:

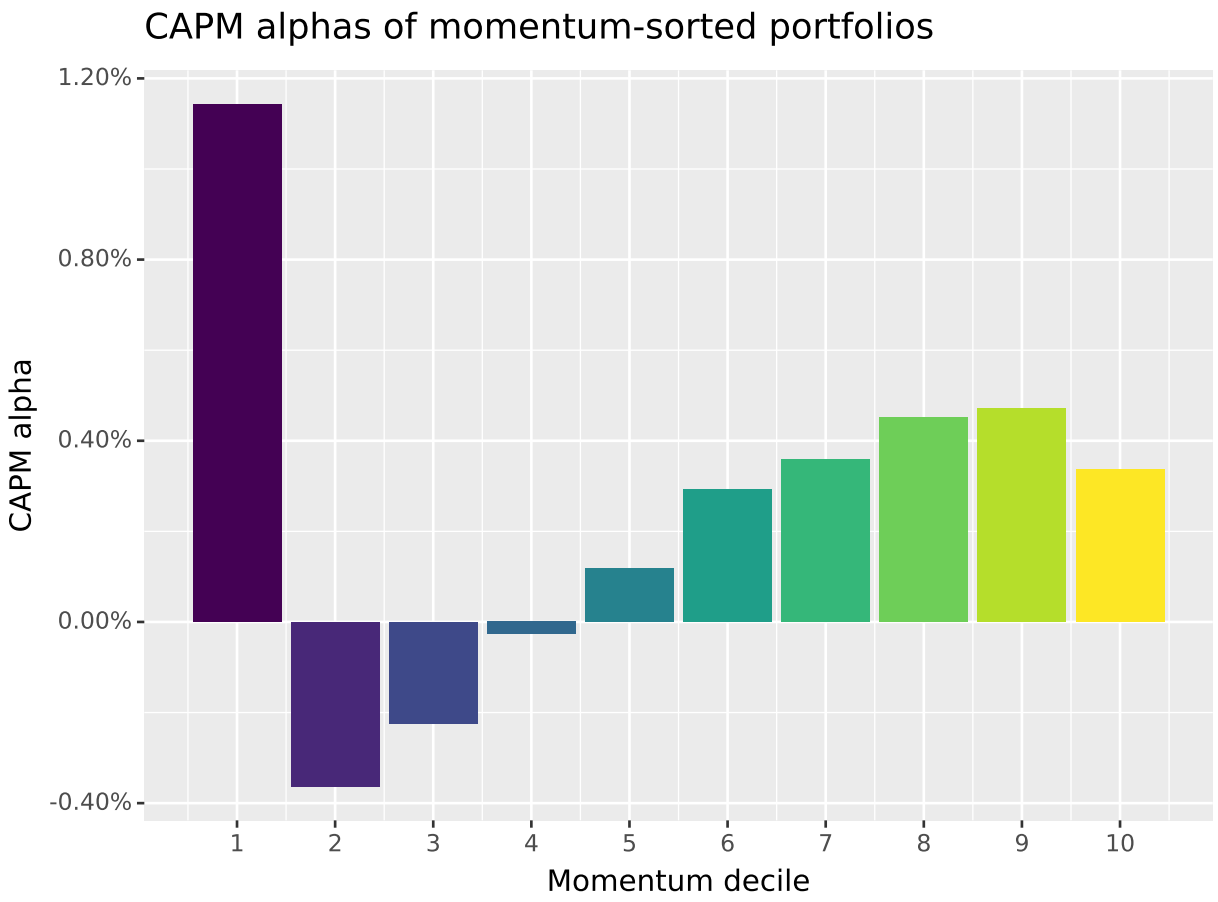
$H_0 : \alpha_i = 0$

$H_A : \alpha_i \neq 0$

Table 2

Momentum decile	Excess return	Alpha	t-statistic	p-value
1	0.0477	0.0114	18.98	0.00
2	0.0215	-0.0036	-10.57	0.00
3	0.0133	-0.0022	-8.08	0.00
4	0.0126	-0.0003	-1.09	0.27
5	0.0114	0.0012	5.35	0.00
6	0.0096	0.0029	13.57	0.00
7	0.0129	0.0036	16.43	0.00
8	0.0141	0.0045	19.34	0.00
9	0.0157	0.0047	17.72	0.00
10	0.0309	0.0034	9.19	0.00

We see from the t-statistics and p-values, that we can reject the null-hypothosis in all cases except for the portfolio of 4th decile momentum stocks. As such, alpha is significantly different from zero in all other cases. To get a better sense of the distribution of alpha accross the ten portfolios, we present the data in a graph:



We see that the lowest decile stocks offer high alphas compared to the rest of the stocks. We expected the lowest performing stocks to have a negative alpha in accordance with most of the literature. The 2nd and 3rd decile stocks are more aligned with the literature showing negative alphas and the stocks in the 5th decile and up offer positive alphas. These findings represent an imperfection in the market. In the following, we test if we can exploit this imperfection with a momentum strategy that goes long past winners and short past losers.

Specifically, we examine the alpha and beta of a portfolio that shorts the 1st decile portfolio and goes long the 10th decile portfolio. We note that this entails shorting stocks with high alpha to buy stocks with lower alpha, which seems counter-intuitive. We analyze the alpha and beta of this portfolio with t-statistics. Here our hypothesizes are:

$H_0 : \alpha = 0$

$H_A : \beta = 0$

To compute the Newey-West standard errors we must choose a bandwidth based on lags for the estimation. The choice here is rather arbitrary and not data-driven, but we choose a lag length of 12 months, since that is also the lag length of the momentum stocks. Our results are presented below:

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OLS Model:
long_short ~ 1 + mkt_excess

Coefficients:
            Estimate  Std. Error  t-Statistic  p-Value
Intercept     -0.002       0.003       -0.907    0.364
mkt_excess    -0.217       0.077       -2.805    0.005

Summary statistics:
- Number of observations: 736
- R-squared: 0.018, Adjusted R-squared: 0.017
- F-statistic: 7.866 on 1 and 734 DF, p-value: 0.005
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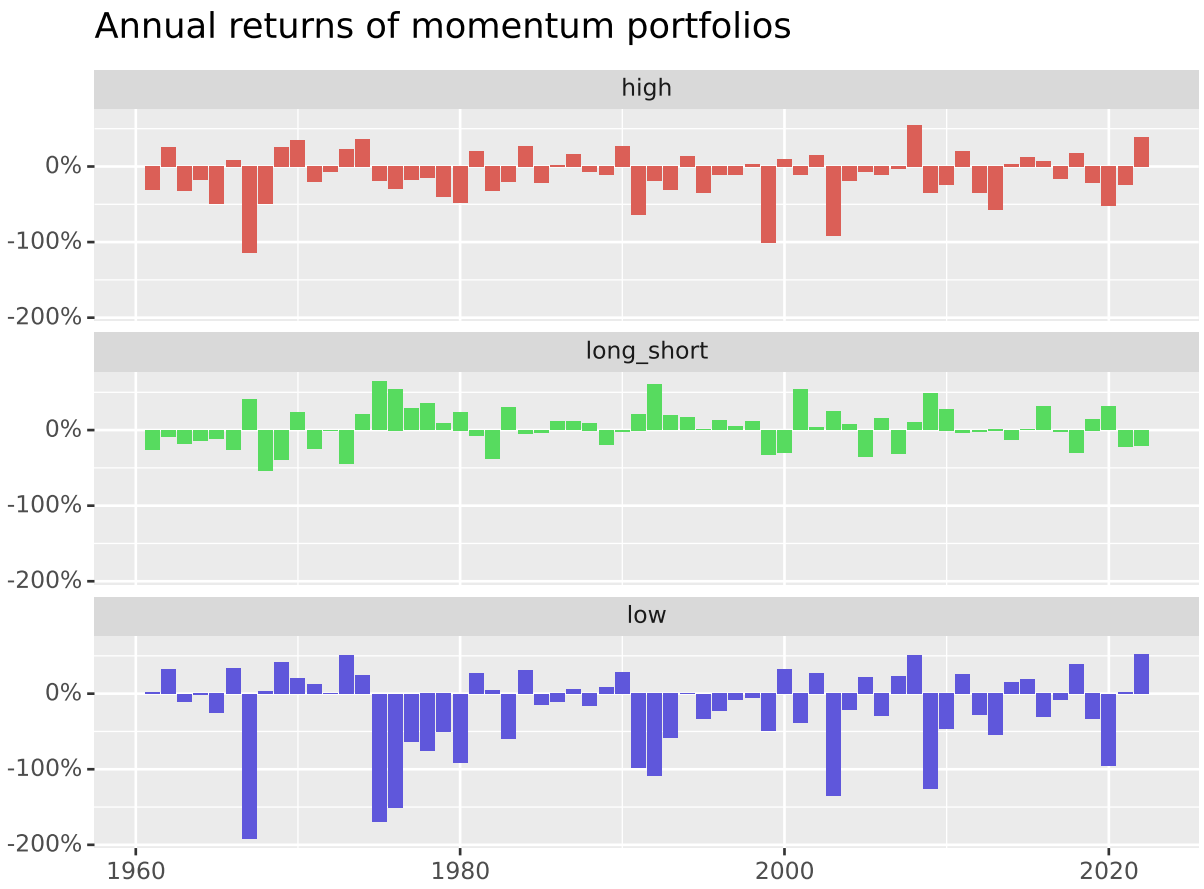
We cannot reject the null hypothesis that the returns, α, of the momentum strategy is 0. This finding is in accordance with the CAPM model, that arbitrage strategies are not possible. However, our results deviate from most literature which suggests that it is possible to obtain a positive α with the momentum strategy. The deviation in our results can be explained by the high alphas of portfolio 1, which is not usually observed.

Our results show a significant negative β, which means the momentum (long/short) portfolio is negatively correlated with the market. This type of portfolio is rare and can be used to reduce the market risk of other investments with positive betas. This type of return mimics the return of gold, which historically have a negative β.

To further our understanding of the returns of the portfolio we plot the graph below:



The graphs generally show an expected pattern with both positive and negative returns. All portfolios exhibit autocorrelation in the returns, which further the argument for a momentum portfolio. Interestingly, the momentum long/short portfolio seems to deliver the highest returns even though the two other portfolios have positive alphas.