# Earnings Momentum & Quality Strategy (EMQ)

Quantitative Portfolio Management

**By: Group 4**

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# Underlying Economic Concept of the EMQ Strategy

# Economic Underpinning

- **Market participants are slow to react to new data that is being digested**
  - When new information is made public, there is a delay of incorporation into the market
  - Mispricing exists in the interim while information is digested and participants slowly update their expectations and long-term projections of asset value.

- **“Post-Earnings Drift”**
  - Tendency of a stock’s price to continue moving in the direction of an earnings surprise over an extended period following the earnings announcement.
  - If a company reports earnings that exceed or fall short of market expectations, the stock price may continue to drift in the same direction for a certain period after the announcement.
  - **Due to:**
    - **Delayed Market Reactions:** Investors may take time to fully digest the implications of the earnings surprise.
    - **Behavioral Biases:** Market participants may exhibit behavioral biases, such as overreaction or underreaction to new information, contributing to the continuation of the price trend
- **This is behavior-driven, not risk based:**
  - Due to market participants’ anchored expectations

# Mispricing from Behavioral Biases

- **Disposition effect**
  - Investors too eager to sell stocks that have appreciated in value so prices will underreact to earnings due to excessive selling, but then slowly drift upwards over time

  - If bad earnings are released, prices will drop, but prices will underreact since investors have a tendency to hold on to their losses, but then will drift downward overtime

  - **Key characteristics:**
    - **Reluctance to Realize Losses:** Investors delay selling losing investments, even when it might be rational to cut losses and reallocate capital. This behavior is driven by a desire to avoid realizing losses and the associated emotional pain.

    - **Quick Realization of Gains:** Investors tend to sell winning investments quickly to "lock in" gains. This behavior is driven by a desire to secure profits and avoid the risk of subsequent losses, even if holding onto the investment might be a rational decision.

# Strategy: Earnings Growth + Quality

- **Strategy based on mispricing from behavioral biases**
- **Adapted from 'profitability anomaly'[1]**
  - **Momentum** drives a large portion of 'sticky behavior'
  - **Quality** component will determine whether the movement is due to economic reasons or behavioral tendencies
- **Main reason the strategy could generate alpha:**
  - Investors are slow to incorporate new information into long-term projections of asset value.
  - Disposition effect and post-earnings stock drift

- Long stocks that have positive earnings growth by a significant margin indicating a very strong beat, and short stocks that have negative earnings growth by a significant margin indicating a very big miss.

- Utilize quality factors to assess if the stocks chosen based on this signal actually should be added to the portfolio.

[1]Bouchaud, Kruger, Landier, Thesmar; 2022; Sticky Expectations and the Profitability Anomaly

# Building the EMQ Strategy

# Earnings Momentum

- **Research has shown that earnings momentum have higher returns and lower volatility than pricing momentum, utilizing two main factors[2]**
  - **SUE:** Most recent year-over-year change in earnings per share
  - **CAR3:** Cumulative 3-day abnormal returns

- **SUE incorporates past performance signals[2]**
  - The correlation between past performance and SUE is higher than that of CAR3
  - Past performance may signal value in certain markets
  - Where fundamentals are difficult to quantify, past performance signals innovations

- **As a result, for the strategy, SUE was the basis for the calculation of the momentum portion**

- **Returns modeled using:** Earnings per share (basic) excluding extraordinary items (EPSPXQ)

- **SUE Calculation:**

$$SUE = \frac{earnings\ surprise}{standard\ dev.of\ earnings\ surprise} = \frac{EPS - \mathbb{E}(EPS)}{\sigma\left(EPS - \mathbb{E}(EPS)\right)}$$

- **Calculation for signal, which is then ranked:**

$$Strategy_{momentum} = \frac{EPSPXQ_t - EPSPXQ_{t-1}}{EPSPXQ_{t-1}}$$

[2] Novy-Marx, 2014, Fundamentally, Momentum is Fundamental Momentum

# Quality of Earnings

- Research suggests that stocks with high quality marks tend to earn high risk adjusted returns. To enhance our earnings momentum strategy we targeted companies with earnings growth that also have “Quality” earnings.
- We leveraged the Global Factor Data Documentation definitions to build the Quality Minus Junk - Profit signal. The signal consists of:
  - **Gross Profit over Total Assets** ((REVT - COGS) / AT)
  - **Net Income over Book Equity** (NI / BE)
  - **Net Income over Total Assets** (NI / AT)
  - **Operating Cash Flows over Total Assets** (OANCF / AT)
  - **Gross Profit Margin** ((REVT - COGS) / REVT)
  - **Operating Accruals over Total Assets** ((NI - OANCF) / AT)
- We standardized each of the metrics before summing each Z-Score to create a Profit Score which we then standardized into our final Profit Z-Score for use as a signal.

# Profit Z-Score

# Python Implementation

- **Creating Signal 1**
  - Earnings Growth
    - Calculate percentage change in EPS utilizing the epspx variable and then rank values
    - Larger values will be more heavily weighted in the portfolio

```
if _STRATEGY_NAME == 'EMQ':

    # Signal 1 : Rank Momentum
    # Sort data
    df_full.sort_values(['permno', 'ldate'], ascending = [True, True], inplace = True)

    #create a mask
    mask = df_full['epspx'] != df_full.groupby('ticker')['epspx'].shift(12)

    #Calculate the percentage change using the mask
    df_full['percentage_change'] =
    df_full.groupby('ticker')['epspx'].pct_change().where(mask).groupby(df_full['ticker']).ffill()*100

    df_full['signal_1'] = df_full['percentage_change']

    #Rank based on signal
    df_full['signal_1'] = qpm.rank(df_full, var_name = 'signal_1')
```

# Python Implementation

- **Creating Signal 2**
  - Quality
    - Profitability (EMQ) = Profit_zscore
    - Safety (EMQ+S) = Profit_zscore + Safety_zscore

**EMQ:**

```
# Signal 2 : Rank Quality - Profitability Only
df_full['signal_2'] = qpm.rank(df_full, var_name = 'profit_zscore')
```

**EMQ+S:**

```
# Signal 2 : Rank Quality
df_full['quality_signal'] = (df_full['profit_zscore'] + df_full['safety_zscore'])/2

df_full['signal_2'] = qpm.rank(df_full, var_name = 'quality_signal')
```

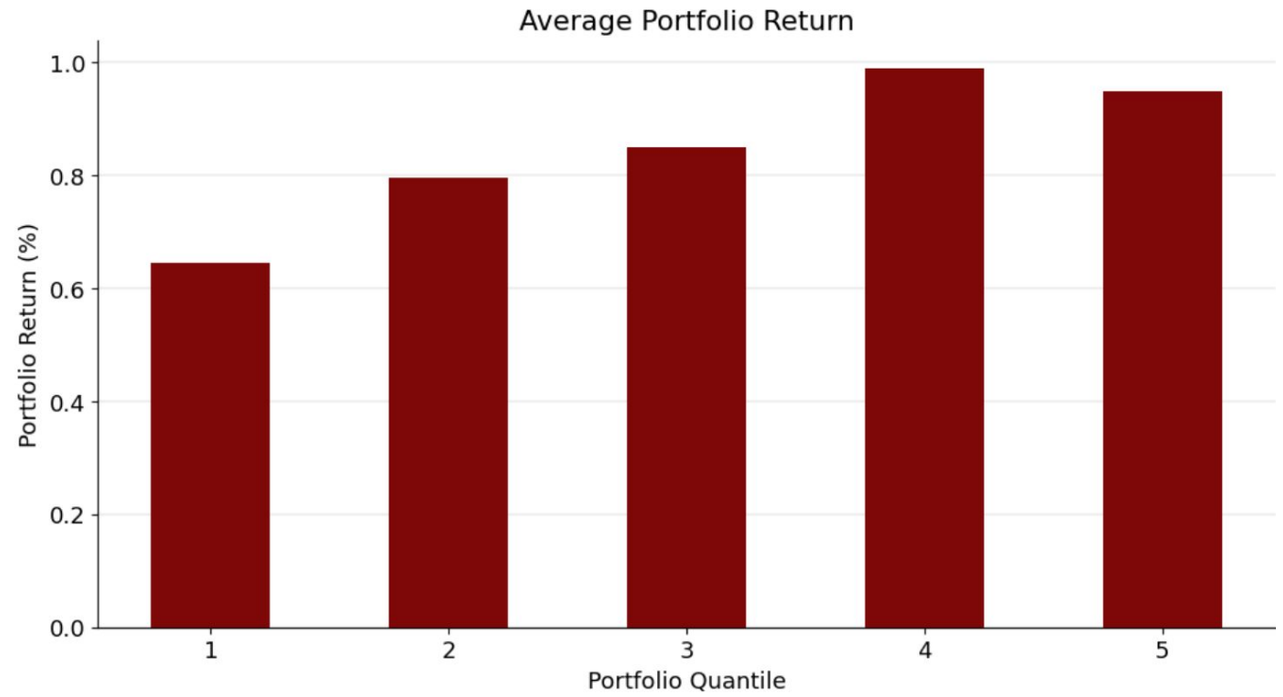
  - Combining the two signals into one:

```
# Final Signal: Combine the two signals
df_full['signal'] = ((df_full['signal_1'] + df_full['signal_2'])/2)
```

# Results of the EMQ Strategy

# EMQ: Average & Long-Only Return

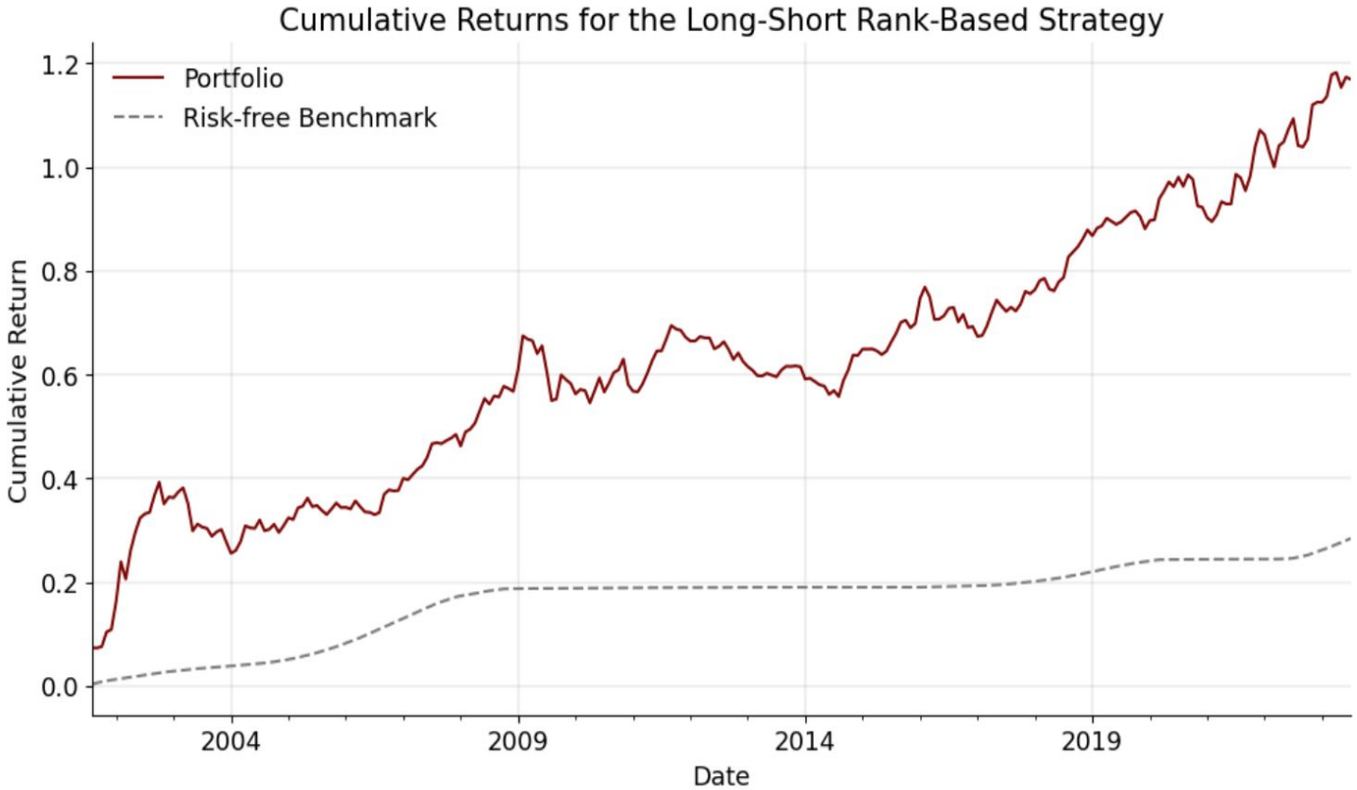
Overall performance appears strong, but generally follows the path of the market return subject to similar volatility and drawdowns.



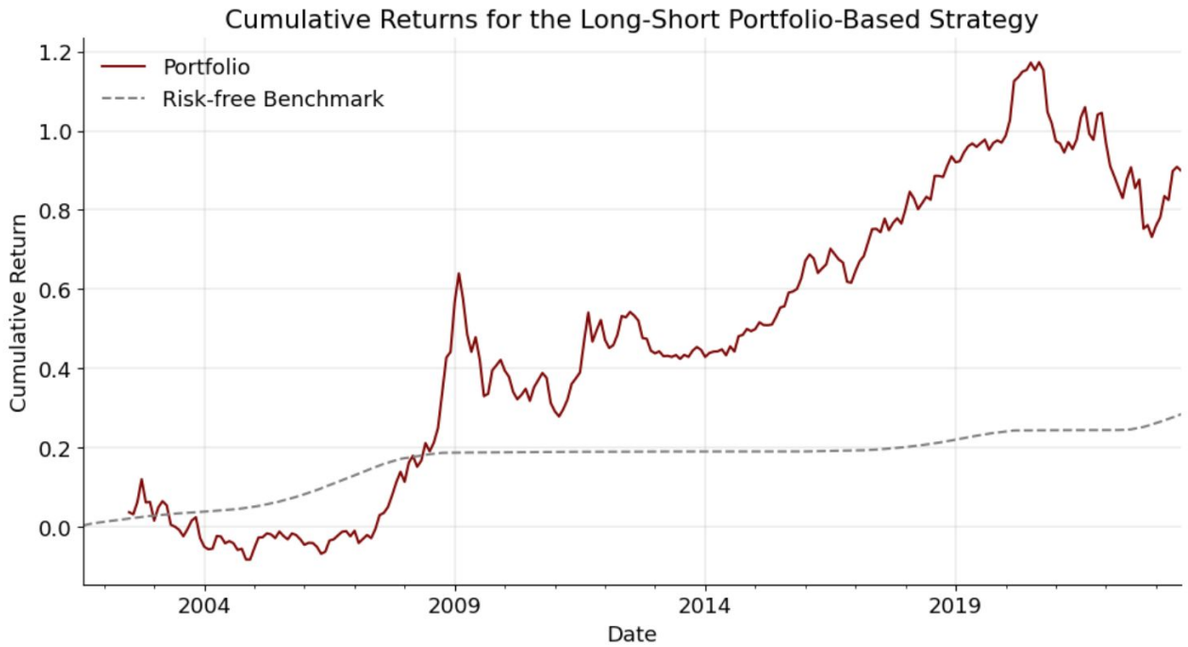


Clear pattern moving from left to right. Portfolio 4 and 5 have similar return, but step downs for the other portfolios.

# EMQ: Long–Short Rank/Portfolio Based




Performance including long-short is strong for both rank and value weighted portfolio construction. Excess returns appears to be largely due to short-side.



# EMQ: Factor Regressions

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| const | 0.0055*** | 0.0002 | 0.0035*** | 0.0046*** | 0.0006 | 0.0031*** |
| | (0.0019) | (0.0010) | (0.0012) | (0.0014) | (0.0005) | (0.0011) |
| mktrf | -0.3130*** | 1.1626*** | -0.1247*** | -0.2096*** | 1.0382*** | -0.0717*** |
| | (0.0414) | (0.0224) | (0.0263) | (0.0326) | (0.0114) | (0.0261) |
| hml | | | | -0.5888*** | 0.0394** | -0.1731*** |
| | | | | (0.0456) | (0.0159) | (0.0365) |
| smb | | | | -0.2134*** | 0.5677*** | -0.1693*** |
| | | | | (0.0585) | (0.0205) | (0.0468) |
| R-squared | 0.1853 | 0.9148 | 0.0819 | 0.5683 | 0.9811 | 0.2308 |
| R-squared Adj. | 0.1821 | 0.9145 | 0.0782 | 0.5631 | 0.9809 | 0.2215 |
| N | 253 | 253 | 253 | 253 | 253 | 253 |
| R2 | 0.19 | 0.91 | 0.08 | 0.57 | 0.98 | 0.23 |

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ CAPM Model
(2): Long-Only Rank Weights ~ CAPM Model
(3): Long-Short Rank Weights ~ CAPM Model
(4): Long-Short Value Weights ~ 3-Factor Fama French Model
(5): Long-Only Rank Weights ~ 3-Factor Fama French Model
(6): Long-Short Rank Weights ~ 3-Factor Fama French Model
Annualized Information Ratios:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Alpha | 0.066 | 0.002 | 0.042 | 0.055 | 0.007 | 0.038 |
| Std(resid) | 0.102 | 0.055 | 0.065 | 0.074 | 0.026 | 0.059 |
| Information Ratio | 0.650 | 0.040 | 0.644 | 0.740 | 0.262 | 0.635 |

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| const | 0.0032** | 0.0004 | 0.0011 | 0.0031** | 0.0005 | 0.0011 |
| | (0.0013) | (0.0005) | (0.0009) | (0.0013) | (0.0005) | (0.0009) |
| mktrf | -0.1899*** | 1.0395*** | -0.0352 | -0.1740*** | 1.0217*** | -0.0288 |
| | (0.0300) | (0.0115) | (0.0217) | (0.0317) | (0.0117) | (0.0230) |
| hml | -0.5598*** | 0.0529*** | -0.2289*** | -0.5404*** | 0.0311 | -0.2210*** |
| | (0.0511) | (0.0195) | (0.0369) | (0.0526) | (0.0194) | (0.0382) |
| smb | -0.0909 | 0.5830*** | -0.0097 | -0.0932* | 0.5856*** | -0.0106 |
| | (0.0565) | (0.0216) | (0.0408) | (0.0564) | (0.0208) | (0.0409) |
| rmw | 0.4456*** | 0.0607** | 0.5332*** | 0.4310*** | 0.0771*** | 0.5273*** |
| | (0.0655) | (0.0250) | (0.0473) | (0.0660) | (0.0243) | (0.0478) |
| cma | -0.2091*** | -0.0547* | -0.0033 | -0.2192*** | -0.0433 | -0.0074 |
| | (0.0782) | (0.0299) | (0.0565) | (0.0783) | (0.0289) | (0.0568) |
| umd | | | | 0.0455 | -0.0511*** | 0.0184 |
| | | | | (0.0304) | (0.0112) | (0.0220) |
| R-squared | 0.6542 | 0.9819 | 0.4974 | 0.6573 | 0.9834 | 0.4988 |
| R-squared Adj. | 0.6472 | 0.9816 | 0.4872 | 0.6489 | 0.9829 | 0.4866 |
| N | 253 | 253 | 253 | 253 | 253 | 253 |
| R2 | 0.65 | 0.98 | 0.50 | 0.66 | 0.98 | 0.50 |

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ 5-Factor Fama French Model
(2): Long-Only Rank Weights ~ 5-Factor Fama French Model
(3): Long-Short Rank Weights ~ 5-Factor Fama French Model
(4): Long-Short Value Weights ~ 6-Factor Fama French Model
(5): Long-Only Rank Weights ~ 6-Factor Fama French Model
(6): Long-Short Rank Weights ~ 6-Factor Fama French Model
Annualized Information Ratios:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Alpha | 0.038 | 0.005 | 0.014 | 0.038 | 0.006 | 0.013 |
| Std(resid) | 0.066 | 0.025 | 0.048 | 0.066 | 0.024 | 0.048 |
| Information Ratio | 0.580 | 0.199 | 0.283 | 0.573 | 0.236 | 0.278 |

# Factor Regression Key Findings

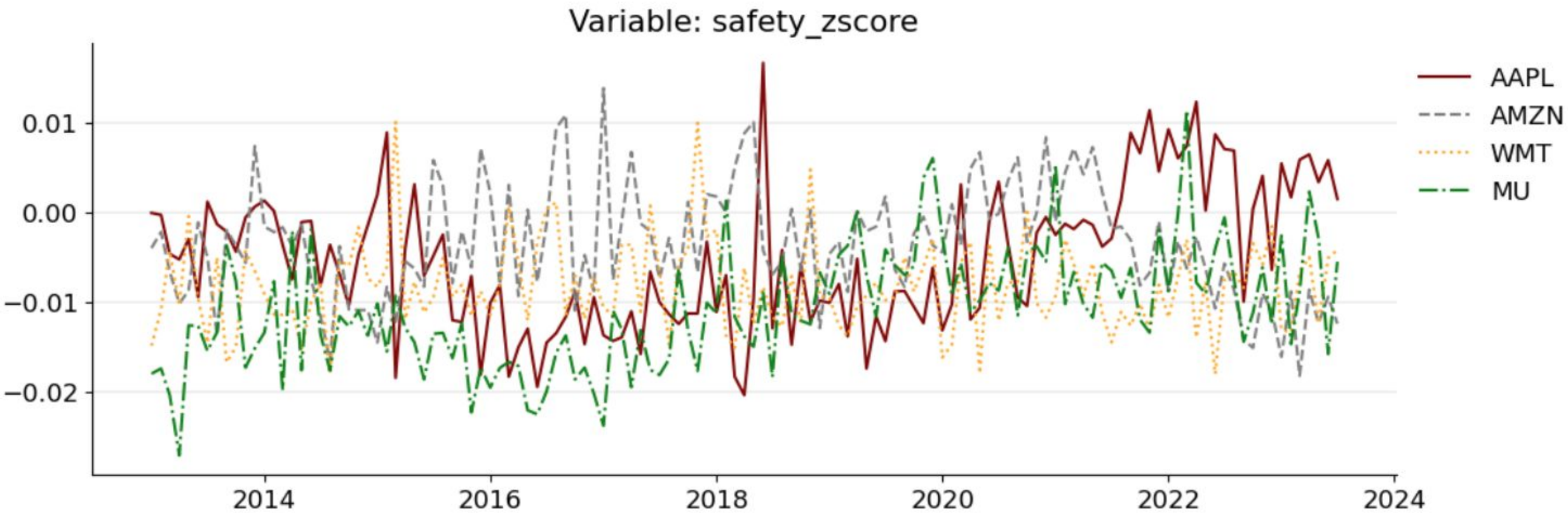
- **3-Factor Model:**
  - All alphas positive; Statistically significant for Long-Short
  - Highest alpha = Long-Short Value Weights - CAPM Model
    - 6.6% Annualized
  - All betas are statistically significant
    - HML = Negative = Tilted towards growth
    - SMB = Negative = Titled towards large cap
  - R-squared = .98 (Long-Only Rank Weights)

- **6-Factor Model:**
  - All alphas positive; Statistically significant for Long-Short Value Weights
  - Highest alpha = Long-Short Value Weights
    - 3.8% Annualized
  - Almost all betas are statistically significant
    - RMW = Positive = Titled towards profitable companies
    - HML = Negative = Tilted towards growth
    - SMB = Negative = Titled towards large cap
    - Momentum = Positive (Negative correlation with value)
  - R-squared = .98 (Long-Only Rank Weights)

# Earnings Momentum Quality + Safety (EMQ+S)

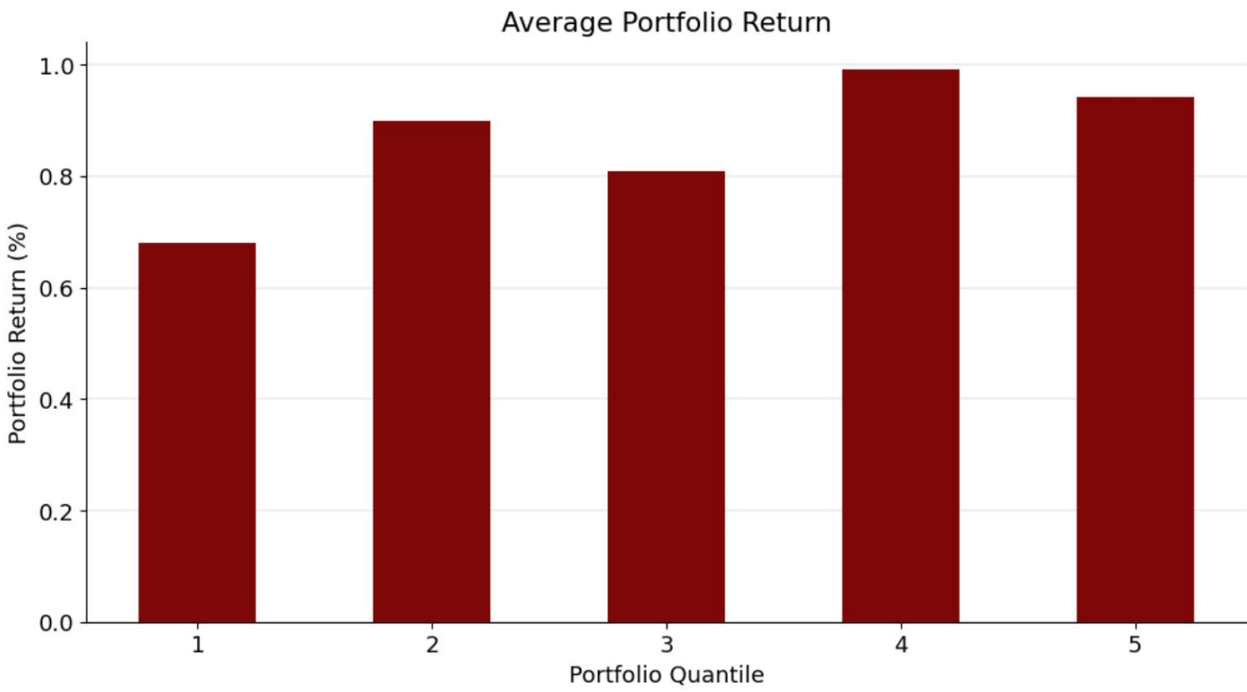
- To further refine our strategy we added a “Safety” signal.
- Safety in our case was made up of five subcomponents:
  - Betting Against Beta
  - Debt over Total Assets
  - Ohlson's O-Score
  - Altman’s Z-Score
  - Volatility of Return On Equity
- We calculated each of these metrics and then standardized by taking the Z-Score before summing the components. We then standardized the summed Z-Scores to arrive at a final Safety Z-Score which was averaged with the Profitability Z-Score and then each company was ranked based on this final output.

# Safety Z-Score



# EMQ+S: Average & Long-Only Return

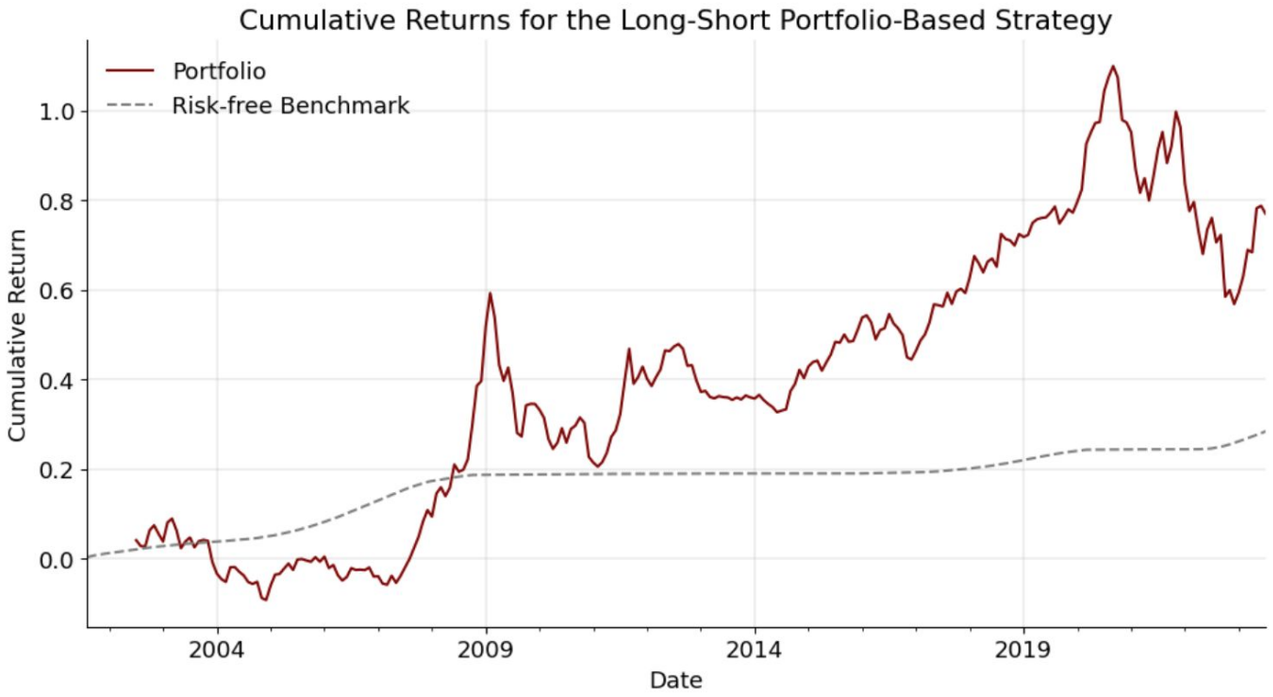
Less of a pattern between portfolio returns, we see that this strategy seems to follow the market pretty closely.





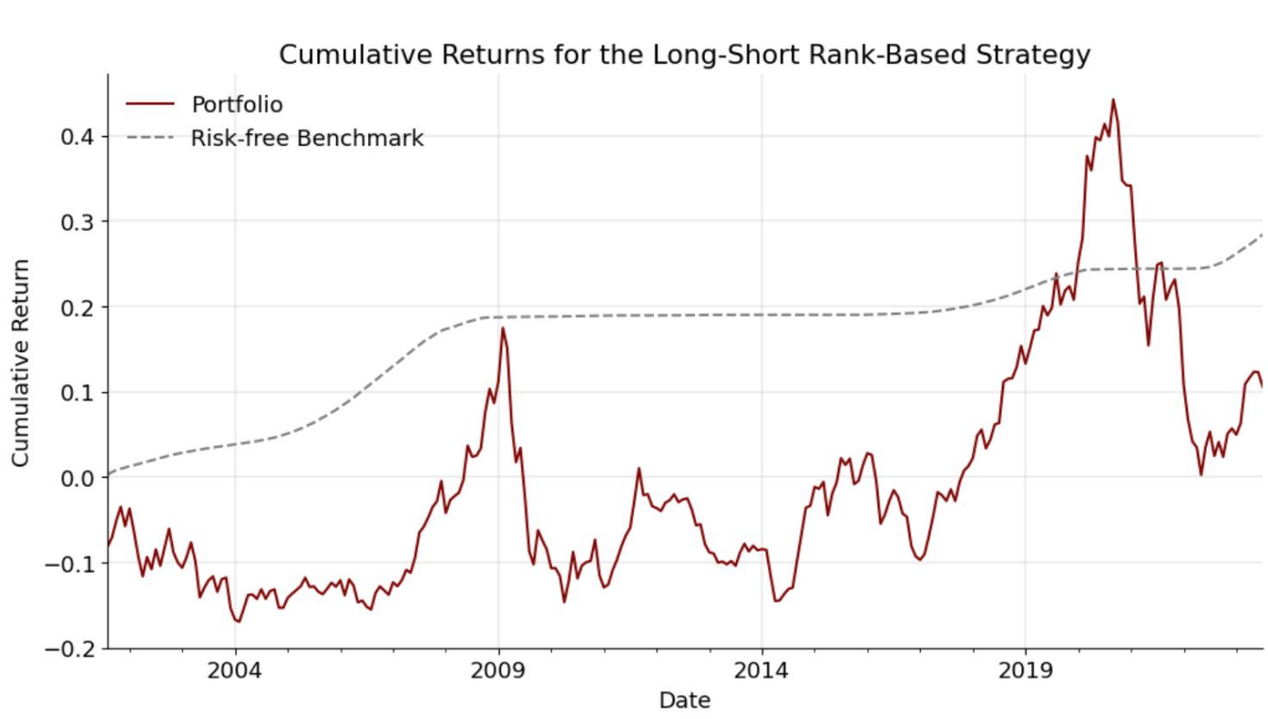
Our safety signal doesn't appear to add additional value to our strategy as we had expected.

# EMQ+S: Long–Short Rank/Portfolio Based




Better performance in the Long-Short Value weighted portfolio construction.

Based on the results it would appear that much of the performance comes from shorting and the value weighted performance suggests the market cap of stocks is relevant to the performance.



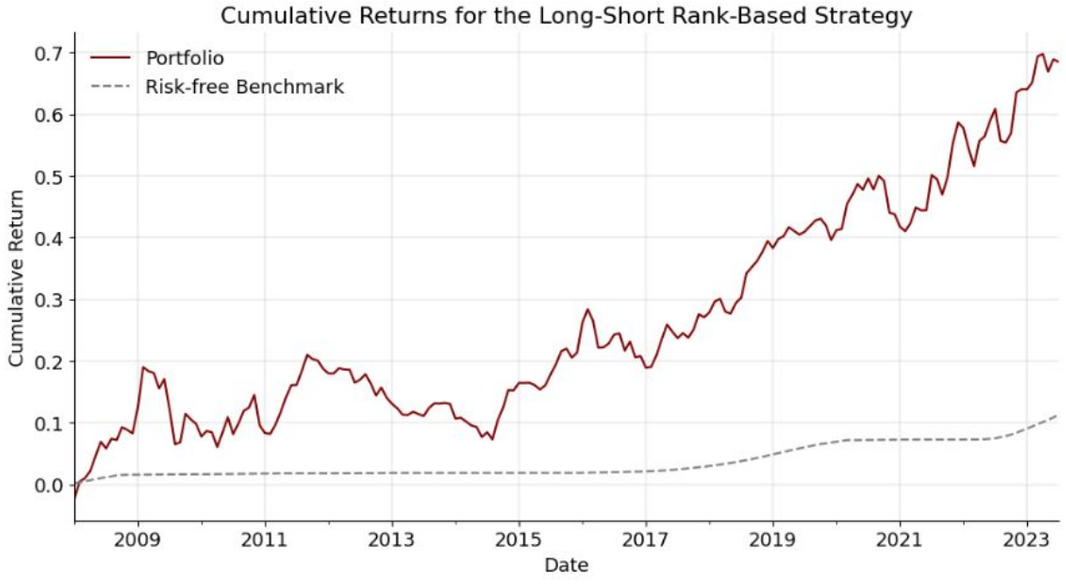
# EMQ+S: Factor Regressions

```
------------------------------------------------------------
> Running Factor Regressions: Table 1  - 3 Fama-French Factors
------------------------------------------------------------

============================================================================
                  (1)       (2)       (3)       (4)       (5)       (6)
----------------------------------------------------------------------------
const          0.0047**  -0.0003   0.0017    0.0035***  0.0000    0.0010
               (0.0021)  (0.0010)  (0.0014)  (0.0013)   (0.0004)  (0.0009)
mktrf          -0.2638*** 1.1413*** -0.2092*** -0.1498*** 1.0191*** -0.1470***
               (0.0460)  (0.0217)  (0.0311)  (0.0308)   (0.0095)  (0.0217)
hml                                          -0.7851*** -0.0517*** -0.5357***
                                             (0.0430)   (0.0132)  (0.0304)
smb                                          -0.1725*** 0.5996*** -0.0443
                                             (0.0553)   (0.0170)  (0.0390)
R-squared      0.1158    0.9170    0.1528    0.6614     0.9864    0.6465
R-squared Adj. 0.1123    0.9166    0.1494    0.6573     0.9863    0.6422
N              253       253       253       253        253       253
R2             0.12      0.92      0.15      0.66       0.99      0.65
============================================================================
Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ CAPM Model
(2): Long-Only Rank Weights ~ CAPM Model
(3): Long-Short Rank Weights ~ CAPM Model
(4): Long-Short Value Weights ~ 3-Factor Fama French Model
(5): Long-Only Rank Weights ~ 3-Factor Fama French Model
(6): Long-Short Rank Weights ~ 3-Factor Fama French Model
Annualized Information Ratios:
                      1      2      3      4      5      6
Alpha             0.056 -0.003  0.021  0.042  0.000  0.012
Std(resid)        0.113  0.053  0.076  0.070  0.022  0.049
Information Ratio 0.498 -0.058  0.273  0.599  0.009  0.234
```

```
------------------------------------------------------------------
> Running Factor Regressions: Table 2  - 5 Fama-French Factors + Momentum
------------------------------------------------------------------

============================================================================================
                  (1)       (2)       (3)       (4)       (5)       (6)
--------------------------------------------------------------------------------------------
const          0.0027**  0.0002    0.0005    0.0026**  0.0003    0.0003
               (0.0013)  (0.0004)  (0.0009)  (0.0013)  (0.0004)  (0.0008)
mktrf          -0.1392*** 1.0133*** -0.1394*** -0.1153*** 1.0080*** -0.0831***
               (0.0298)  (0.0096)  (0.0217)  (0.0314)  (0.0101)  (0.0205)
hml            -0.7476*** -0.0230  -0.5304*** -0.7183*** -0.0294*  -0.4615***
               (0.0508)  (0.0163)  (0.0371)  (0.0520)  (0.0168)  (0.0339)
smb            -0.0935*  0.5860*** -0.0007   -0.0969*  0.5868*** -0.0087
               (0.0562)  (0.0180)  (0.0410)  (0.0557)  (0.0180)  (0.0364)
rmw            0.2970*** -0.0330   0.1564***  0.2750*** -0.0282   0.1047**
               (0.0651)  (0.0209)  (0.0474)  (0.0652)  (0.0211)  (0.0426)
cma            -0.1890** -0.0687*** -0.0600   -0.2042*** -0.0654*** -0.0957*
               (0.0777)  (0.0250)  (0.0567)  (0.0774)  (0.0250)  (0.0505)
umd                                          0.0684**  -0.0149   0.1612***
                                             (0.0300)  (0.0097)  (0.0196)
R-squared      0.6995    0.9869    0.6648    0.7058    0.9870    0.7373
R-squared Adj. 0.6934    0.9866    0.6581    0.6986    0.9867    0.7309
N              253       253       253       253       253       253
R2             0.70      0.99      0.66      0.71      0.99      0.74
============================================================================================
Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ 5-Factor Fama French Model
(2): Long-Only Rank Weights ~ 5-Factor Fama French Model
(3): Long-Short Rank Weights ~ 5-Factor Fama French Model
(4): Long-Short Value Weights ~ 6-Factor Fama French Model
(5): Long-Only Rank Weights ~ 6-Factor Fama French Model
(6): Long-Short Rank Weights ~ 6-Factor Fama French Model
Annualized Information Ratios:
                      1      2      3      4      5      6
Alpha             0.032  0.003  0.006  0.031  0.003  0.003
Std(resid)        0.066  0.021  0.048  0.065  0.021  0.042
Information Ratio 0.484  0.139  0.116  0.474  0.149  0.078
```

# Sensitivity Analysis

# EMQ Partial Results & 6-factor regression

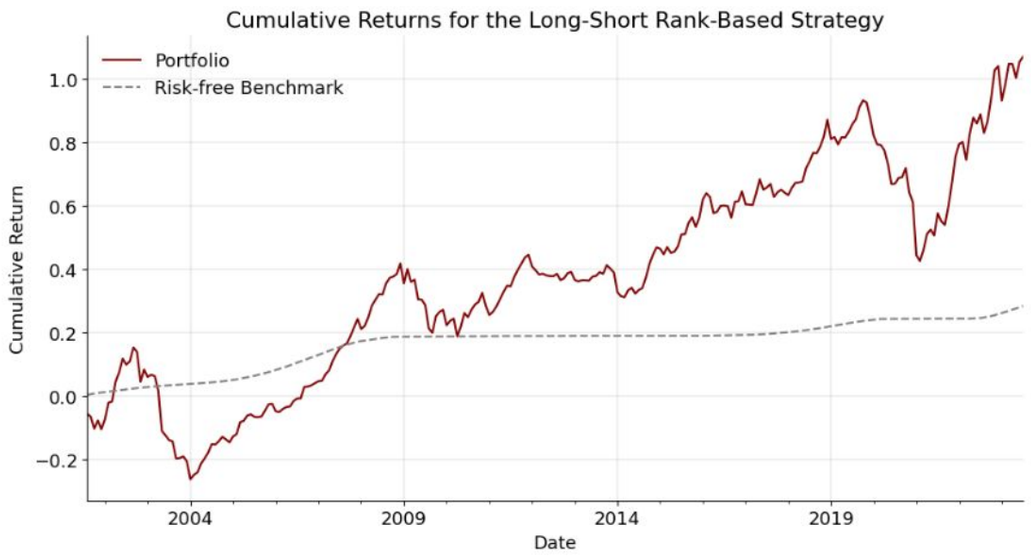

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| const | 0.0041*** | 0.0002 | 0.0016 | 0.0042*** | 0.0001 | 0.0016 |
| | (0.0015) | (0.0006) | (0.0011) | (0.0015) | (0.0006) | (0.0011) |
| mktrf | -0.2556*** | 1.0287*** | -0.0705*** | -0.2382*** | 1.0128*** | -0.0636** |
| | (0.0327) | (0.0136) | (0.0243) | (0.0335) | (0.0132) | (0.0251) |
| hml | -0.4766*** | 0.0702*** | -0.1581*** | -0.4360*** | 0.0329 | -0.1420*** |
| | (0.0558) | (0.0231) | (0.0414) | (0.0587) | (0.0232) | (0.0440) |
| smb | -0.0511 | 0.5893*** | -0.0179 | -0.0352 | 0.5748*** | -0.0116 |
| | (0.0637) | (0.0264) | (0.0473) | (0.0636) | (0.0251) | (0.0476) |
| rmw | 0.6444*** | 0.1114*** | 0.6522*** | 0.6539*** | 0.1027*** | 0.6560*** |
| | (0.0785) | (0.0325) | (0.0583) | (0.0780) | (0.0308) | (0.0584) |
| cma | -0.4156*** | -0.0905** | -0.1214* | -0.4637*** | -0.0464 | -0.1405** |
| | (0.0899) | (0.0373) | (0.0668) | (0.0922) | (0.0364) | (0.0690) |
| umd | | | | 0.0720** | -0.0660*** | 0.0286 |
| | | | | (0.0352) | (0.0139) | (0.0263) |
| R-squared | 0.7312 | 0.9827 | 0.5606 | 0.7375 | 0.9847 | 0.5636 |
| R-squared Adj. | 0.7235 | 0.9822 | 0.5481 | 0.7284 | 0.9841 | 0.5485 |
| N | 181 | 181 | 181 | 181 | 181 | 181 |
| R2 | 0.73 | 0.98 | 0.56 | 0.74 | 0.98 | 0.56 |

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ 5-Factor Fama French Model
(2): Long-Only Rank Weights ~ 5-Factor Fama French Model
(3): Long-Short Rank Weights ~ 5-Factor Fama French Model
(4): Long-Short Value Weights ~ 6-Factor Fama French Model
(5): Long-Only Rank Weights ~ 6-Factor Fama French Model
(6): Long-Short Rank Weights ~ 6-Factor Fama French Model
Annualized Information Ratios:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Alpha | 0.049 | 0.002 | 0.019 | 0.050 | 0.001 | 0.019 |
| Std(resid) | 0.064 | 0.026 | 0.047 | 0.063 | 0.025 | 0.047 |
| Information Ratio | 0.773 | 0.070 | 0.394 | 0.792 | 0.050 | 0.400 |

**Limit the sample to start at 2008-01-01 instead of 2001-01-01**

# With Micro Caps Results & 6-factor regression


| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| const | 0.0030** | 0.0019*** | 0.0012 | 0.0029** | 0.0021*** | 0.0010 |
| | (0.0013) | (0.0007) | (0.0016) | (0.0013) | (0.0006) | (0.0016) |
| mktrf | -0.1972*** | 1.0034*** | -0.0211 | -0.1814*** | 0.9581*** | 0.0287 |
| | (0.0308) | (0.0172) | (0.0389) | (0.0326) | (0.0161) | (0.0402) |
| hml | -0.5834*** | 0.1041*** | 0.1069 | -0.5640*** | 0.0487* | 0.1678** |
| | (0.0526) | (0.0293) | (0.0663) | (0.0541) | (0.0267) | (0.0667) |
| smb | -0.1134* | 0.7356*** | -0.1587** | -0.1157** | 0.7421*** | -0.1658** |
| | (0.0581) | (0.0324) | (0.0732) | (0.0580) | (0.0287) | (0.0715) |
| rmw | 0.4717*** | -0.1063*** | 0.9126*** | 0.4572*** | -0.0647* | 0.8669*** |
| | (0.0673) | (0.0376) | (0.0848) | (0.0679) | (0.0335) | (0.0836) |
| cma | -0.1794** | -0.0425 | -0.0675 | -0.1895** | -0.0137 | -0.0991 |
| | (0.0804) | (0.0449) | (0.1014) | (0.0805) | (0.0398) | (0.0992) |
| umd | | | | 0.0453 | -0.1296*** | 0.1424*** |
| | | | | (0.0312) | (0.0154) | (0.0385) |
| R-squared | 0.6594 | 0.9635 | 0.4265 | 0.6623 | 0.9716 | 0.4568 |
| R-squared Adj. | 0.6525 | 0.9628 | 0.4149 | 0.6540 | 0.9710 | 0.4435 |
| N | 253 | 253 | 253 | 253 | 253 | 253 |
| R2 | 0.66 | 0.96 | 0.43 | 0.66 | 0.97 | 0.46 |

Standard errors in parentheses.
* p<.1, ** p<.05, ***p<.01
(1): Long-Short Value Weights ~ 5-Factor Fama French Model
(2): Long-Only Rank Weights ~ 5-Factor Fama French Model
(3): Long-Short Rank Weights ~ 5-Factor Fama French Model
(4): Long-Short Value Weights ~ 6-Factor Fama French Model
(5): Long-Only Rank Weights ~ 6-Factor Fama French Model
(6): Long-Short Rank Weights ~ 6-Factor Fama French Model
Annualized Information Ratios:

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| Alpha | 0.035 | 0.023 | 0.014 | 0.035 | 0.025 | 0.012 |
| Std(resid) | 0.068 | 0.038 | 0.086 | 0.068 | 0.033 | 0.084 |
| Information Ratio | 0.520 | 0.602 | 0.161 | 0.513 | 0.736 | 0.142 |

**Full sample but with micro caps**

# Next Steps for Strategy Development

# Further Research opportunities

- **Utilize analysts' earnings expectations each quarter to determine the portfolio based off significant earnings beats/misses each quarter**
  - Re-balance quarterly vs. Yearly

- **Incorporate revenue (revt) variable into the strategy**
  - Calculate the percentage change in both the EPS(epspx) and Revenue(revt) and if both are positive by a significant margin, then weight those stocks more heavily in the portfolio

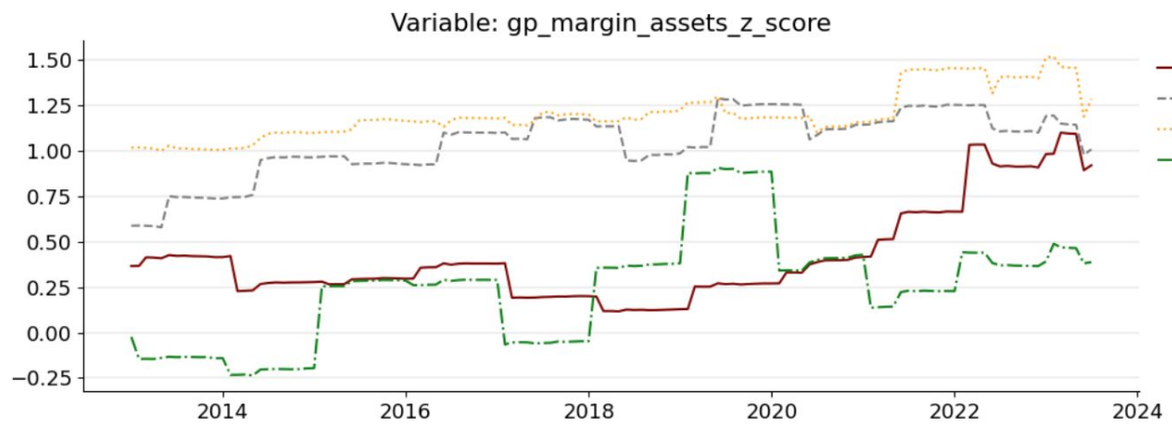
- **Expand the quality factor**
  - Inclusion of third element of quality "Growth"
  - Modifications to Safety to eliminate noise / volatility

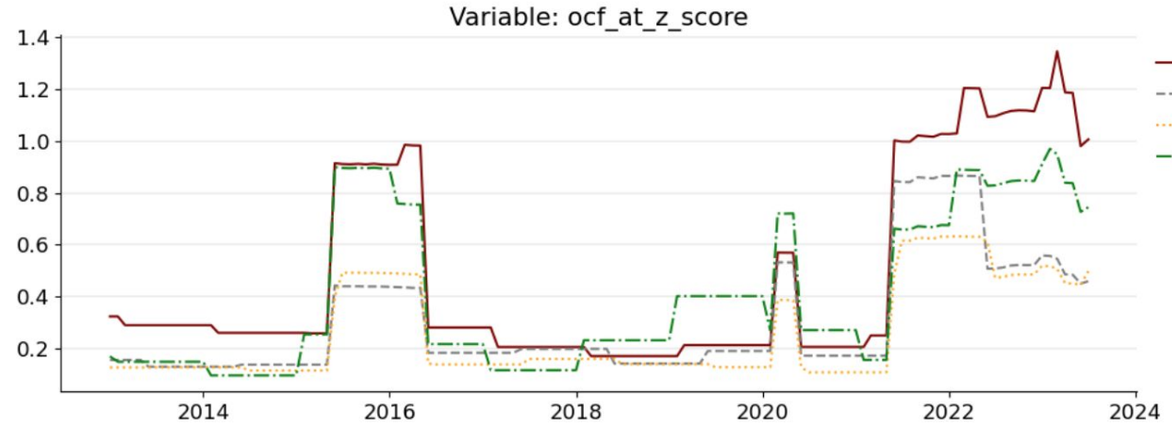
# References

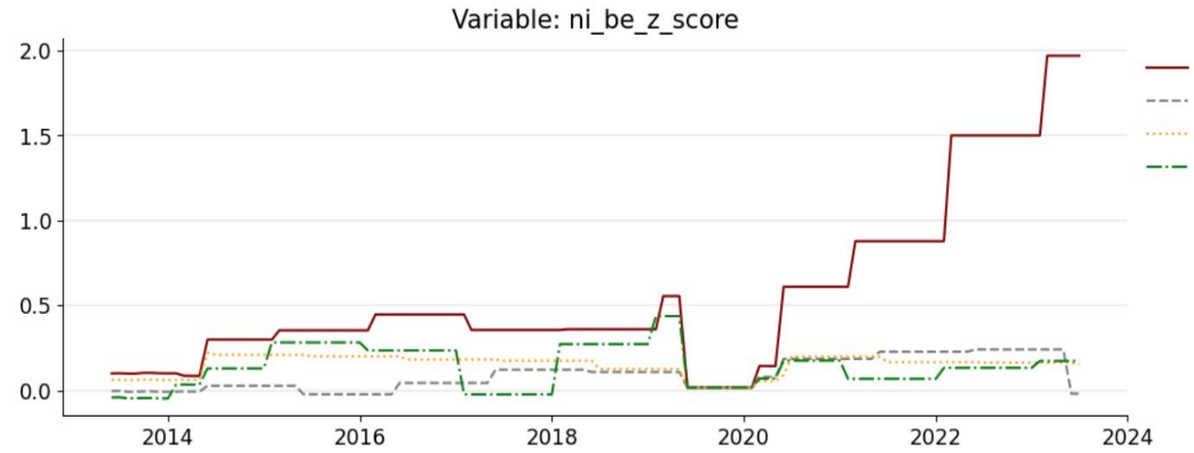

- **QPM…**
- **https://mysimon.rochester.edu/novy-marx/research/FMFM.pdf**
- **https://link.springer.com/article/10.1007/s11142-018-9470-2**
- Jensen, T. I., Kelly, B. T., & Pedersen, L. H. (2022). Is There A Replication Crisis In Finance? Journal of Finance, Forthcoming.

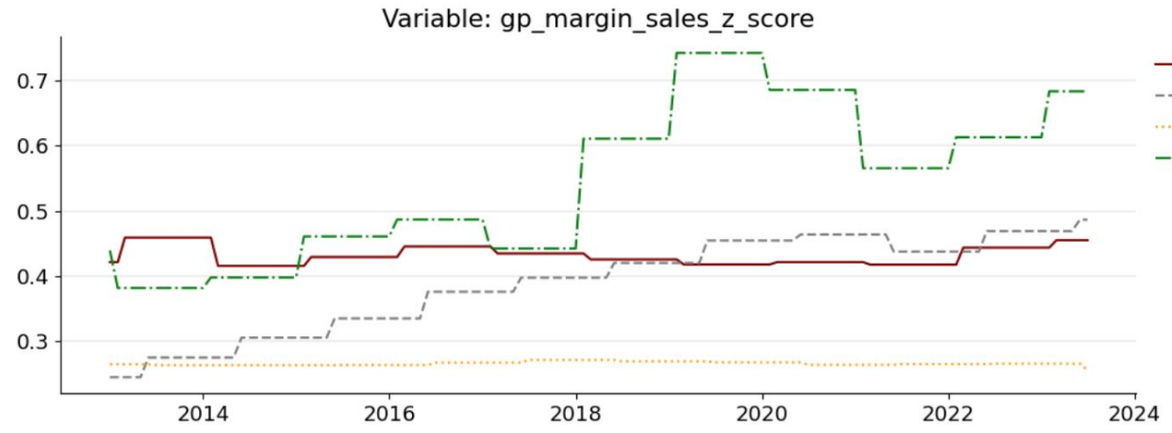
# Appendix

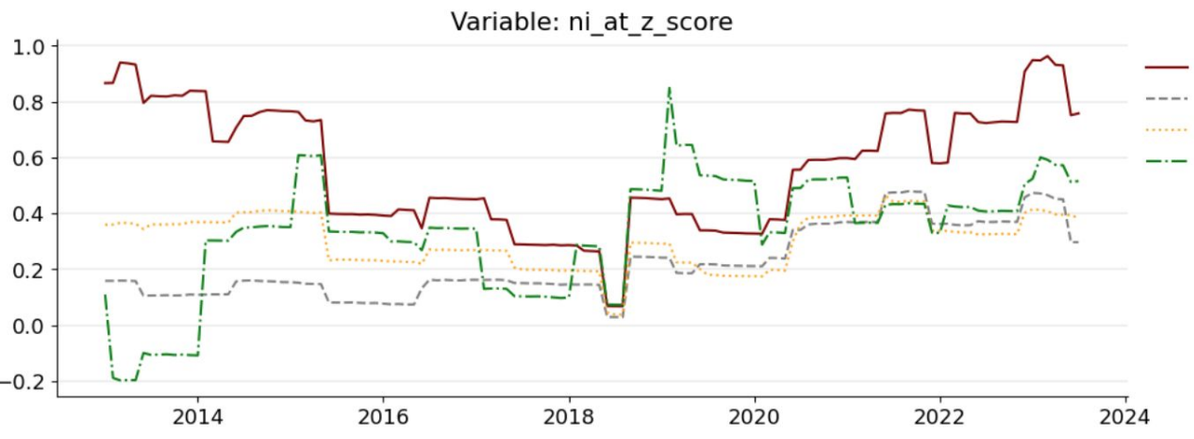
# Profitability Z-Score Components

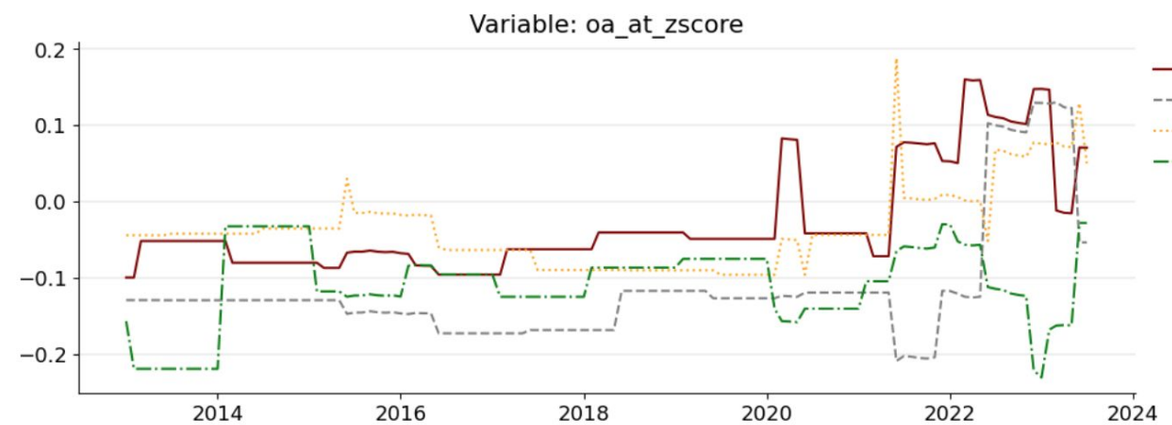


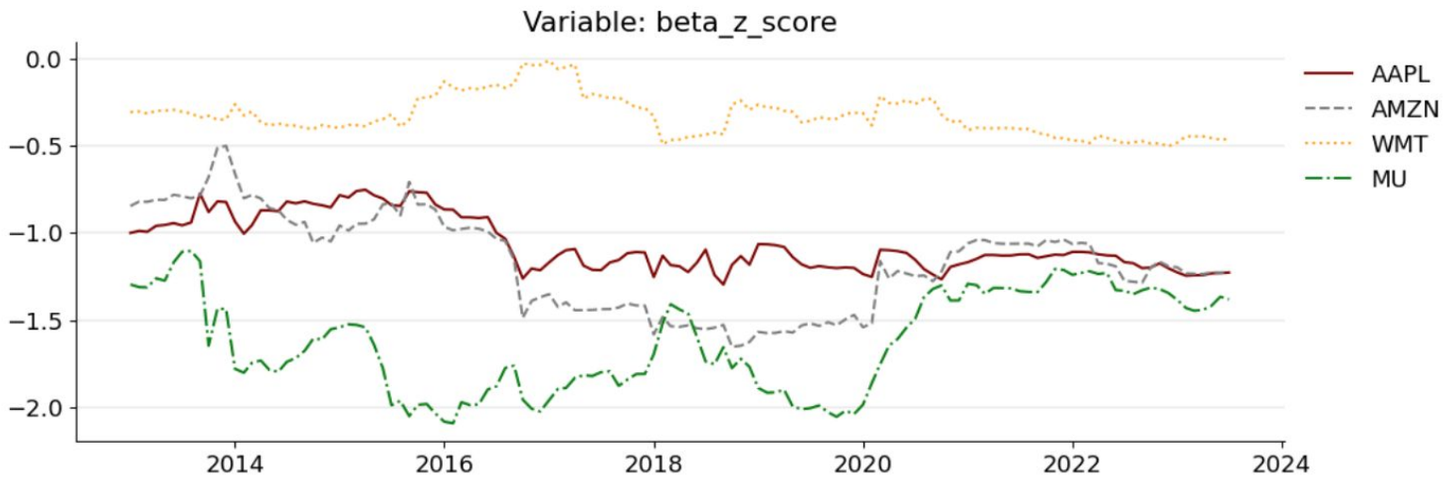



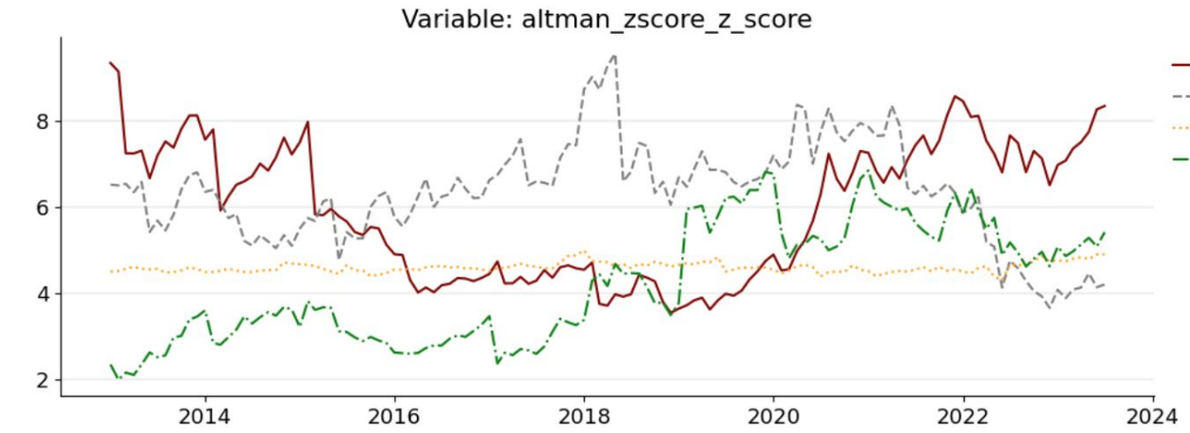



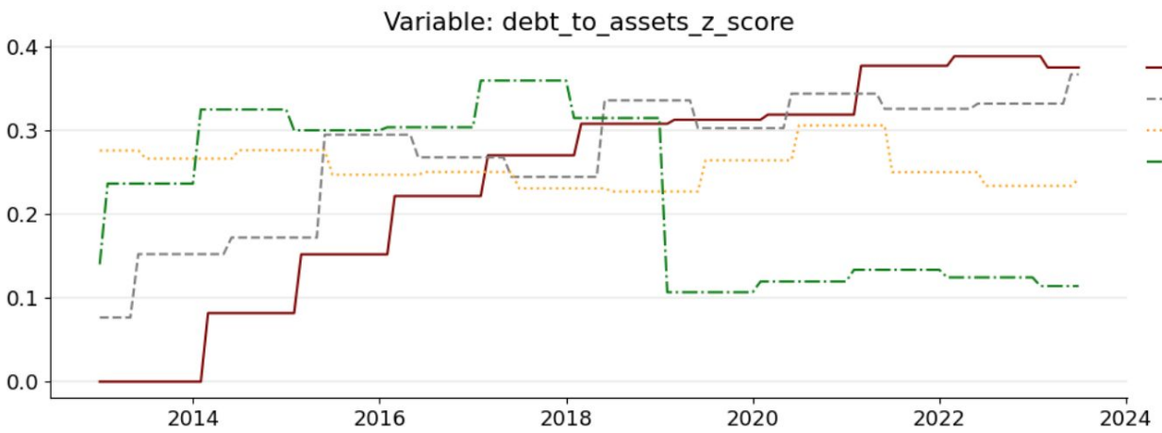



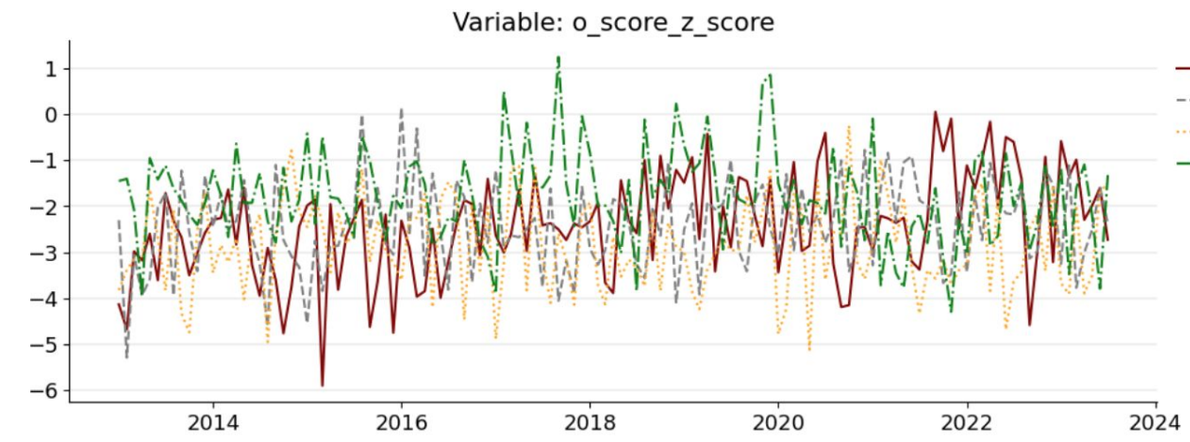



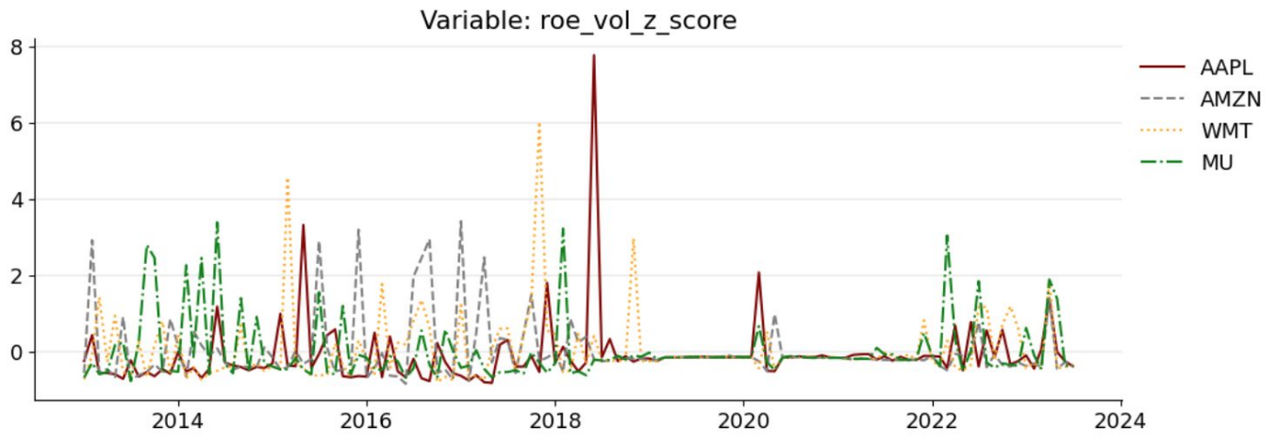
# Safety Z-Score Components



| Slide(s) | Description | Assigned person |
|---|---|---|
| 1-2 | Title | Justin |
| 3-5 | Economic underpinning | Justin |
| 6-7 | Momentum | Katie |
| 8-9 | Quality | Nathan |
| 10-11 | Implementation | Lauren |
| 12-13 | EMQ long-only | Katie |
| 14 | EMQ long-short | Justin |
| 15-16 | EMQ regressions | Justin |
| 17-18 | Intro to EMQ+S | Nathan |
| 19 | EMQ+S long-only | Katie |
| 20 | EMQ+S long-short | Nathan |
| 21 | EMQ+S regressions | Nathan |
| 22-24 | Sensitivity analysis | Katie |
| 25-26 | Next steps | Justin |