**Hempel Wealth Management**

**Top 50 Portfolio - Ongoing Research**

# Summary:

Academic Factor models have explained individual stock outperformance since the 1960s. In the research since, roughly 500 factors have been documented that explain individual stock outperformance. Given the plethora of factors, choosing the best factors that one might be include in a model is an open challenge. As a result, there are two schools of thought on how to approach this challenge. Zhang vs. Fama and French.

The research can be summarized as follows:

* Zhang factor models outperform Fama French models.
  + 2014: Zhang q-model outperforms Fama French 3-factor.
  + 2015: Fama French copies Zhang to create Fama French 5-factor model.
  + Zhang q-model still outperforms as the Fama–French 5-factor model as the FF-5 shows no explanatory power for the momentum factor.
  + 2018: Fama French copies Zhang to create Fama French 6-factor model by reluctantly adding momentum.
  + “The Fama–French 6-factor model is largely comparable with the *q*-factor model.”
  + 2021: Zhang released improved “augmented q-model” with Expected Growth factor. The new q5 model has improved results across most categories vs. the original q-factor.
  + Zhang q5 model outperforms Fama French 6-factor model.
  + However, the Fama–French 6-factor model does a better job than the q5 model in explaining the composite Value anomalies, which is on average 0.7% per month (t = 3.47).
* Fama French Value Factor needs to be based on current market price.
* The Investment Factor may or may not replace the Value factor, depending on your perspective.
* Fama-French find Profitability factor that is based on cash profitability is superior to one based on operating profitability.
* Zhang finds that the Investment factor explains Value and Momentum simultaneously, even though Asness finds that Value and Momentum are negatively correlated.
* Zhang finds that the Momentum factor is explained by adding Expected Growth; Momentum is a combination of Profitability and Expected Growth

## Key Points

* Zhang Investment Factor may replace the Value factor, yet q5 model can not explain value anomalies in aggregate.
* FF does not believe in momentum; Zhang can explain momentum via Profitability and Expected Growth

However, many investors — such as individuals, pension funds and mutual funds — are constrained in the leverage that they can take, and therefore overweight riskier securities instead. This behavior of tilting toward volatility suggests high-beta assets require lower risk-adjusted returns than low-beta assets.

# The Scorecard:

**Equity outperformance vs. other asset classes**

Each year Professor Damodaran at New York University updates the annual returns for stocks, bonds, real estate and cash going back to 1928. To put it bluntly, stocks have drastically outperformed other investment asset classes over the last 100 years.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **Value of $100 invested at start of 1928 in …** | | | | | |
|  | **S&P 500** | **Cash** | **10-year US Treasury Bonds** | **Corporate Bonds** | **Real Estate** | **Gold** |
| Jan 1928 | $100 | $100 | $100 | $100 | $100 | $100 |
| Dec 2022 | $624,530 | $2,180 | $7,010 | $46,380 | $5,120 | $8,870 |

Source: https://pages.stern.nyu.edu/~adamodar/New\_Home\_Page/datafile/histretSP.html

**Investment Manager Score Card**

Each year, Standard and Poor’s updates their [SPIVA Scorecard](https://www.spglobal.com/spdji/en/documents/spiva/spiva-us-mid-year-2022.pdf) which measures investment funds against their index benchmarks. Looking specifically at Large Cap Funds vs. the S&P 500: over the last 3-years, 85.88% of funds have failed to outperform the index; over the last 20-years, 95.22% of funds have failed to outperform the index.

If you randomly choose a Large Cap Stock fund, you have less than a 1 in 20 shot at outperforming the stock market. Digging deeper into the data the news gets worse. If you are into higher returns with Large-Cap Growth Funds, your odds of beating the growth index are 1 in 100.

# History of Factor Research:

Harry Markowitz introduced Modern portfolio theory in a 1952 essay, for which he was later awarded a Nobel Prize. His researched was based on the concept of “risk averse” investors, meaning that given two portfolios with the same expected return, investors will prefer the less risky one. Therefore, the goal for an investor would be to construct a portfolio comprising different parts (assets), that when added together generates high returns and lower risk (volatility) than their individual elements. Ultimately, the “efficient frontier” is a theoretical portfolio with the perfect combination to maximizes expected return/risk.

Since the development of the first asset pricing model, academic research has attempted to explain stock returns. In 1961, the Capital Asset Pricing Model (CAPM) was released and used a single-factor, beta (stock volatility), to explain stock returns. The CAPM model suggested that higher volatility stocks should have a higher expected rate of return, otherwise a rational investor wouldn’t invest. In the 60 years since CAPMs introduction, current academic evidence now shows the opposite, higher volatility stocks underperform once other variables are held constant.

From CAPM, academic researched moved to the Fama-French three-factor model (volatility, size and value), then to the Carhart four-factor model (which added momentum), then to the q-factor model (volatility, size, investment, and profitability), and then to the Fama-French five-factor (which added value to the q-factor model) and then to six-factor models (which added value and momentum to the q-factor model).

The search for truth in academic research is amazing and incredibly useful for helping us better understand the complex world in which we live. In Finance, economists continue to advance our understanding of how markets work and how prices are set. While the search for truth is sometimes messy, the results have undeniably changed the world.

## Overview of popular factors

### Value

Value is perhaps the most famous factor, is the tendency for relatively cheap stocks to outperform relatively expensive stocks over time. This factor has been around for almost a century, beginning with the “father of value investing,” Columbia Professor Benjamin Graham. His ground-breaking works “Security Analysis” (1934) and “The Intelligent Investor” (1949) laid the groundwork for the value investing philosophy.

### Quality

Quality/profitability is the observation that investing in highly profitable stocks tend to significantly outperform companies of lower profitability. The academic work on the profitability premium comes from Novy-Marx and his 2013 paper, “The Other Side of Value: The Gross Profitability Premium.” He found that from 1962 to 2010, the most profitable firm’s stock gained of 0.31% more per month more than the least profitable firms.

In addition, Novy-Marx found that Value + Quality resulted in a dramatic increase in performance compared to value-only strategies; between July 1963 and December 2010 (the sample period), a combined strategy of gross profit and value never generated a losing five-year return.

### Volatility

The low volatility factor is the empirical observation that “defensive” stocks (low-volatility, low-risk) have delivered both higher absolute returns and higher risk-adjusted returns compared to aggressive, high-volatility, high-risk stocks.

### Momentum

Time-series momentum is using a security’s own historical price performance to dictate investments. Momentum is perhaps the oldest and most successful investment style in the hedge fund industry.

### Small Size

One of the oldest and most persuasive arguments in the stock market is that small stocks outperform large stocks. To quote Cliff Asness Ph.D., billionaire, and founder of AQR Capital, “There Is No Size Effect”

## The History of Factor Research

### Discovery of Market Risk:

In the 1960s, academic models advanced with the introduction of the Capital Asset Pricing Model. The approach incorporated market volatility to explain the volatility in an individual stocks. The research was highly influential, led to widespread adoption of the CAPM and is still taught to CFP students today. William Sharpe would go on to receive Nobel Prize along with Markowitz.

### Discovery of Value & Size:

In 1993, the Fama-French 3-factor model was released and was a significant improvement on the single-factor CAPM. Fama-French added two new variables, Size and Value, after the observation that small caps and stocks with a high book-to-market ratio (Value) tended to outperform the market. The Fama-French 3-factor model explained over 90% of the diversified portfolios returns, compared with the 70% explanatory power of the CAPM. Eugene Fama would ultimately be widely recognized as the "father of modern finance" for his work on Efficient Market Theory and would later win the 2013 Nobel Prize.

**Fama French 3-factor: *Volatility + [Small] Size + Value***

### Discovery of Momentum:

In 1997, Mark Carhart added Momentum to the Fama–French three-factor model. Defining Momentum as the difference in return from the highest performing stocks from the return of the lowest.

**Carhart 4-factor: Fama-French 3-factor *+ Momentum***

### Discovery of Profitability and Investment. Value is eliminated:

In 2015, Hou, Xue, and Zhang, published the q-factor mode, a new four-factor model that completely threw out Value and, in its place, added Profitability and Investment.

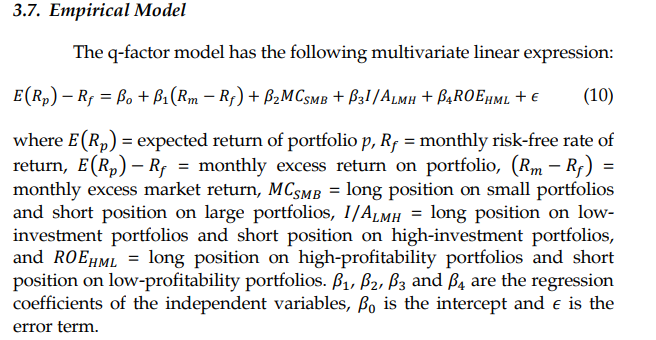
**q-factor: *Volatility + Size + Profitability + Investment***

**Investment Factor Replaces Value**

The Investment factor measured how much a firm invests relative to its total assets, finding more investment meant lower expected returns). It is interesting to note the value factor is redundant in the presence of the investment factor.

**Profitability**

The Profitability Factor measured the difference in return between firms with high return-on-equity and low return-on-equity, finding high profitability firms tend to have higher returns. The research suggests highly profitable firms are able to generate more cash flows, have better access to financing, and are less risky.



### Size doesn’t matter after all:

In 2015, after the discovery of profitability and investment, Fama and French extended their original 3-factor model incorporate the latest research and released their 5-factor model.

In doing so, they found the value factor becomes redundant and suggest dropping the value factor if the objective is to measure regression intercepts, but retaining all five factors if the portfolios possess size, value, profitability, and investment premiums.

However, from 1963-2013 in the US market, adding Profitability & Investment also makes the Size factor redundant, since the size returns are completely explained by the other four factors (most notably Investment factor which has a 0.7 correlation with Size).

**Fama French 5-factor: *Volatility + [Small] Size + Value + Profitability + Investment***

### Rediscovery of Momentum:

In 2018, Fama and French extended their 5-factor model by reluctantly adding the momentum factor, discovered by Carhart over twenty years earlier.

**Fama French 6-factor: Fama-French 5-factor *+ Momentum***

### Discovery of Expected Growth:

In 2021, Zhang, et al, published an updated q-factor model by adding a “expected investment growth” variable. As a result, the q5 model “substantially outperforms the Fama-French six-factor model.”

**q5 model: Volatility + Size + Quality + Investment + Expected Investment Growth**

# Two Competing Factor Models

In 2015, Zhang and team took on the Gods of Finance when they published the q-factor model. It was a direct challenge to Eugene Fama and Ken French, with Fama widely recognized as the "father of modern finance" for his work on Efficient Market Theory and two years earlier won the 2013 Nobel Prize.

The intellectual challenge set off a dust storm in the world of Factor research. The (2015) q-factor model was significantly better than (1993) the Fama French 3-factor and the (1997) 4-factor model. Fama and French quickly published a 5-factor rebuttal in 2015, by copying Zhang’s two new factors. Unfortunately, the new Fama French 5-factor model was still lagging vs. the q-factor model, which forced Fama French to reluctantly publish again with (2018) Fama-French 6-factor model.

In a head-to-head factor test matchup, the (2015) q-factor model compared well against the (2018) Fama-French 6-factor model.

To make matters worse for the Nobel laureate, Zhang and team published an updated q-factor model in 2021 with the discovery of a new factor, “expected investment growth”.

As a result, the q5 model “substantially outperforms the Fama-French six-factor model.”

## Fama French 6-Factor model

### “A five-factor asset pricing model”: Fama French (2015)

Abstract:

“A five-factor model directed at capturing the size, value, profitability, and investment patterns in average [stock returns](https://www.sciencedirect.com/topics/economics-econometrics-and-finance/capital-market-returns) performs better than the three-factor model of Fama and French (FF, 1993).”

**Fama-French 5-factor:** Stock Return = Market + Small Size + Value + Profitability + Conservative Investment

Where:

* *Market* is the market return in excess of the risk-free rate
* Size is SMBt (small minus big)
* Value is HMLt (high minus low book-to-market equity)
* Profitability is RMWOt (robust minus weak)
* Investment factor is CMAt (conservative minus aggressive)

**Interesting Findings:** With the addition of profitability and investment factors, the value factor of the FF three-factor model becomes redundant for describing average returns in the sample we examine.”

### “Our Model Goes to Six and Saves Value from Redundancy Along the Way”: AQR (Dec 2014)

Cliff Asness (Eugene Fama protégée) starts with Fama and French’s Five-Factor model and seek to improve it. Their goal is to create a model that forecasts the best returning stocks, rather than a model that best forecasts all stock movements.

**Fixing Value:** Fama-French rebalance in June with data, both fundamental and market, from the prior December. While that is fine with fundamental data reported via a delayed earnings release, the stock price data is 6 months old. Asness crazy thought was to use current market prices. In doing so, the Value Factor regains significance and has negative correlation with the successful momentum factor.

**Improving Momentum & Losing Investment:** “However, for reasons we don’t find convincing, [Fama French 5] leaves out momentum.” If you fix the Value factor then the Momentum Factor result is even stronger, as a matter of fact the strongest of all factors we test, and the value factor, is easily resurrected. However, in doing so, the Investment factor is lost. “Thus we’re still back at a Five Factor Model, just a better one, in our opinion.”

**AQR Model:** Value + Profitability + Momentum + Investment? + Defensive/Low-Risk/Low-Beta? + Carry?

**Interesting Findings:** By using the Value factor with current market price, improves Value and Momentum results.

### “Choosing Factors”: Fama French (2018)

Fama-French add momentum to the five-factor model because of popular demand but do so reluctantly, as they fail to see the theoretical justification. They show that the results “are not surprising (the six-factor model wins)”.

**Fama-French 6-factor:** Market + Small Size + Value + Profitability + Conservative Investment + Momentum

Where:

* *Market* is the market return in excess of the risk-free rate
* Size is SMBt (small minus big)
* Value is HMLt (high minus low book-to-market equity)
* Profitability is RMWOt (robust minus weak)
* Investment factor is CMAt (conservative minus aggressive)
* Momentum factor is UMDt (up minus down)

**Interesting Findings:** Use a Profitability factor that is based on cash profitability rather than operating profitability.

## Zhang q5 factor model

### “Digesting Anomalies: An Investment Approach”: Zhang, et al (2015)

Abstract:

“An empirical q-factor model consisting of the market factor, a size factor, an investment factor, and a profitability factor largely summarizes the cross section of average stock returns. A comprehensive examination of nearly 80 anomalies reveals that about one-half of the anomalies are insignificant in the broad cross section. More importantly, with a few exceptions, the q-factor model's performance is at least comparable to, and in many cases better than that of the Fama-French (1993) 3-factor model and the Carhart (1997) 4-factor model in capturing the remaining significant anomalies.”

**q-model:** Market + Size + High Profitability + Conservative Investment

### “An Augmented q-factor Model with Expected Growth”: Zhang, et al (2021)

Abstract:

In the investment theory, firms with high expected investment growth earn higher expected returns than firms with low expected investment growth, holding investment and expected profitability constant. Building on cross-sectional growth forecasts with Tobin’s q, operating cash flows, and change in return on equity as predictors, an expected growth factor earns an average premium of 0.84% per month (t = 10.27) in the 1967–2018 sample. The q5 model, … outperforms the Fama–French six-factor model.

Adding the Expected Growth Factor improved on the q-factor model substantially, the q5 model was the best performing model among all the factor models tested. “an expected growth factor earns an average premium of 0.84% per month”

Where Expected Investment Growth is calculated from the log of Tobin’s q; cash flow measured by Cop; Change in Return on Equity measured by dRoe.

**q5 model**: Market + Size + High Profitability + Conservative Investment + Expected Growth Factor

# Deep Dive into the 146-page Factor Research Paper: “Replicating Anomalies”

Disclaimer: The following section contains passages directly from the research paper to keep close to the source materials insights.

Hou, Xue and Zhang conducted a gigantic replication of the entire anomalies literature by compiling the largest-to-date data library with 447 anomaly variables in a study named “Replicating Anomalies” by Hou, Xue, & Zhang (2017).

This included 57 variables on momentum, 68 variables on value-versus-growth, 38 variables from investment, 79 variables on profitability, 103 variables on intangibles, and 102 variables on trading frictions categories, using a common set of procedures. They results found indicate widespread statistical p-hacking in the anomalies literature.

Out of 447 anomalies, 64% are insignificant at the standard 5% level; imposing a t-value of 3 cutoff, rather than the standard t-test of 1.96, raised the number of insignificant anomalies further to 85%:

* **161 anomalies are Significant at the 95% confidence level with a t-test ≥ 1.96**
  + 37 significant Momentum anomalies
  + 31 significant Value-versus-growth
  + 27 significant Investment anomalies
  + 33 significant Profitability anomalies
  + 26 significant Intangibles anomalies
  + 7 significant Trading frictions anomalies. 93% were insignificant.
* **67 anomalies are Very Significant with more than 99% confidence (t-test ≥ 3)** by imposing a cutoff t-value of 3, instead of the conventional 95% level.
  + 9 very significant in Momentum category
  + 6 very significant in Value vs. Growth category:
  + 7 very significant in Investment category
  + 9 very significant in Profitability category
  + 11 very significant in Intangibles category
  + 4 very significant in Trading Frictions category
* Applying the q-factor model to explain the 161 significant anomalies, left **46 unexplained alphas with significance (and 11 anomalies with t-test ≥ 3**).

## 46 Unexplained Anomalies using the q-factor model:

**The returns of the 46 unexplained anomalies with the q-factor model:**

Combining all 46 q-anomalies leads to an average return spread of 1.66% per month (t = 10.28).

The average monthly return of high-minus-low deciles:

* Momentum category: 1.1%
* Value vs. Growth category: 0.6%
* Investment category: 0.6%
* Profitability category: 0.71%
* Intangibles category: 1.08%
* Trading Frictions category: 0.14%

Curiously, combining the four friction variables destroys their forecasting power. In contrast, the low correlations among intangibles imply independent forecasting power for individual intangible anomalies, and taking the average rankings aggregates over the signals to produce a high average return spread.

**Factor Correlations within Category:**

Except for intangibles, anomalies within each category tend to be positively correlated and are generally large.

* Value correlation within category: 0.42
* Trading frictions correlation within category: 0.42
* Profitability correlation within category: 0.39
* Investment category correlation within category: 0.32
* Momentum correlation within category: 0.13
* Intangibles correlation within category: 0.07

**Factor Correlation across Categories:**

Correlations across factor categories are close to zero. Notability, zero correlation between momentum & value, momentum & intangible, and momentum & trading frictions.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Value | Investment | Profitability | Intangible | Trading |
| Momentum | 0.00 | 0.01 | 0.05 | 0.00 | 0.02 |
| Value | - | 0.08 | 0.05 | 0.01 | -0.01 |
| Investment |  | - | 0.07 | 0.02 | 0.01 |
| Profitability |  |  | - | 0.02 |  |
| Intangible |  |  |  | - | 0.02 |

## Technical Notes:

* The sample data is from January 1967 to December 2014, a time period of 576 Months. Financial firms and firms with negative book equity are excluded.
* For monthly sorted portfolios involving quarterly accounting data other than earnings, they impose a four-month lag between the fiscal quarter end and subsequent stock returns. Unlike earnings, other quarterly items are typically not available upon earnings announcement dates. Many firms announce their earnings for a given quarter through a press release, and then file SEC reports several weeks later.
* Many studies also equal-weight portfolio returns. They instead use value-weights. First, value-weights more accurately reflect the wealth effect experienced by investors, as emphasized by Fama (1998). Second, Fama and French (2008) document that microcaps are influential in equal-weighted returns. Microcaps are stocks with the market equity below the 20th percentile of NYSE stocks. Microcaps are on average only 3% of the market value of the NYSE-Amex-NASDAQ universe, but account for about 60% of the total number of stocks.

## Select Momentum Anomalies

### Background

Momentum is using a security’s own historical price performance to dictate investments. While momentum is perhaps the oldest and most successful investment style in the hedge fund industry, it also has been widely studied in academia and proved to be a robust and statistically significant driver of performance.

While there were **37 significant momentum anomalies** in the paper, we are only going to analyze a handful in greater detail. Primarily those with very high t-tests or high average returns

* Cumulative abnormal stock returns around earnings announcements
* Revisions in Analyst Earnings Forecasts
* Price Momentum over Six- and 11-month Returns.
* Industry Momentum
* Analysts’ forecast change
* Number of Quarters with Consecutive Earnings Increases
* 52 Week High
* Residual Momentum – Returns unexplained by Fama French 3-Factor model

### Cumulative abnormal stock returns around earnings announcements

We calculate cumulative abnormal stock return (Abr) around the latest quarterly earnings announcement date (Compustat quarterly item RDQ) (Chan, Jegadeesh, and Lakonishok 1996)):

Schematic

Description automatically generated with medium confidence

in which rid is stock i’s return on day d (with the earnings announced on day 0) and rmd is the market index return. We cumulate returns until one (trading) day after the announcement date to account for the one-day-delayed reaction to earnings news. rmd is the value-weighted market return for the Abr deciles with NYSE breakpoints and value-weighted returns, but is the equal-weighted market return with all-but-micro breakpoints and equal-weighted returns.

At the beginning of each month t, we split all stocks into deciles based on their most recent past Abr. For a firm to enter our portfolio formation, we require the end of the fiscal quarter that corresponds to its most recent Abr to be within six months prior to the portfolio formation. We do so to exclude stale information on earnings. To avoid potentially erroneous records, we also require the earnings announcement date to be after the corresponding fiscal quarter end. Monthly decile returns are calculated for the current month t (Abr1), and, separately, from month t to t+ 5 (Abr6) and from month t to t + 11 (Abr12). The deciles are rebalanced monthly. The six-month holding period for Abr6 means that for a given decile in each month there exist six sub-deciles, each of which is initiated in a different month in the prior six-month period. We take the simple average of the sub-decile returns as the monthly return of the Abr6 decile. Because quarterly earnings announcement dates are largely unavailable before 1972, the Abr portfolios start in January 1972.

Abr1 = One Month Holding Period 0.74% average monthly return with 5.85 t-statistic

Abr6 = Six Month Holding Period 0.30 % average monthly return with 3.24 t-statistic

Abr12 = Twelve Month Holding Period0.22% average monthly return with 2.84 t-statistic

### Revisions in Analyst Earnings Forecasts

The high-minus-low deciles on revisions in analysts’ earnings forecasts (Re) earn 0.54% (t = 2.49) and 0.28% (t = 1.47, Table 3) at the 6- and 12-month, which are lower than the buy-and-hold returns of 7.7% and 9.7% over the same horizons reported in Chan et al., respectively.

### Prior 6-month and 11-month Returns

**Summary:** the q-factor ROE variable significantly explains momentum forecasting ability over the past 6 and 11 month periods

The Jegadeesh-Titman (1993) momentum anomaly fares well in our replication. The highminus-low deciles on prior six-month returns (R6) earn on average 0.82% (t = 3.49) and 0.55% (t = 2.9) at the 6- and 12-month, respectively.

For the high-minus-low deciles on prior 6-month returns (R6 ) at the 1-, 6-, and 12-month, the q-factor alphas are −0.04%, 0.24%, and 0.16% per month (t = −0.1, 0.78, and 0.75), respectively. The Roe factor is the main source of the model’s performance. In particular, the high-minus-low R6 decile at the 6-month has a Roe-factor loading of 0.99 (t = 5.33), and its investment-factor loading is tiny, −0.01 (t = −0.04)

**Zhang Statistical Results: Significant**

R61 = Prior Six-month Returns, One Month Holding Period 0.74% average monthly return with 2.41 t-statistic

R66 = Prior Six-month Returns, Six Month Holding Period 0.71 % average monthly return with 2.62 t-statistic

R111 = Prior 11-month Returns, One Month Holding Period 0.89% average monthly return with 2.67 t-statistic

**Zhang Statistical Results: Insignificant**

R612 = Prior Six-month Returns, Twelve Month Holding Period0.25% average monthly return

R116 = Prior 11-month Returns, Six Month Holding Period 0.41 % average monthly return

R1112 = Prior 11-month Returns, Twelve Month Holding Period-0.14% average monthly

### Industry Momentum

Hou, Xue and Zhang started with the FF 49-industry classifications. Excluding financial firms from the sample leaves 45 industries. At the beginning of each month t, they sort industries based on their prior six-month value-weighted returns from t−6 to t−1. Following Moskowitz and Grinblatt (1999), they do not skip month t − 1. they form nine portfolios (9 × 5 = 45), each of which contains five different industries. They define the return of a given portfolio as the simple average of the five industry returns within the portfolio. They calculate portfolio returns for the nine portfolios for the current month t (Im1), from month t to t + 5 (Im6), and from month t to t + 11 (Im12). The portfolios are rebalanced at the beginning of t + 1. The holding period that is longer than one month as in, for instance, Im6, means that for a given portfolio in each month there exist six subportfolios, each of which is initiated in a different month in the prior six-month period. They take the simple average of the subportfolio returns as the monthly return of the Im6 portfolio.

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 6- and 12-month periods.**

Im1 = One Month Holding Period 0.67% average monthly return with 2.74 t-statistic

Im6 = Six Month Holding Period 0.60% average monthly return with 3.08 t-statistic

Im12 = Twelve Month Holding Period0.64% average monthly return with 3.71 t-statistic

### Changes in Analyst Earnings Forecasts

Following Hawkins, Chamberlin, and Daniel (1984), we define dEf ≡ (fit−1 − fit−2)/(0.5 |fit−1| + 0.5 |fit−2|), in which fit−1 is the consensus mean forecast (IBES unadjusted file, item MEANEST) issued in month t − 1 for firm i’s current fiscal year earnings (fiscal period indicator = 1). We require earnings forecasts to be denominated in US dollars (currency code = USD). We also adjust for any stock splits between months t−2 and t−1 when constructing dEf. At the beginning of each month t, we sort stocks into deciles on the prior month dEf, and calculate returns for the current month t (dEf1), from month t to t + 5 (dEf6), and from month t to t + 11 (dEf12). The deciles are rebalanced at the beginning of month t + 1. The holding period longer than one month as in, for instance, dEf6, means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We take the simple average of the subdecile returns as the monthly return of the dEf6 decile. Because analyst forecast data start in January 1976, the dEf portfolios start in March 1976.

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1- and 6-month periods. Significant at 12-month.**

dEf1= One Month Holding Period 1.03% average monthly return with 4.65 t-statistic

dEf6= Six Month Holding Period 0.58% average monthly return with 3.23 t-statistic

dEf12= Twelve Month Holding Period0.35% average monthly return with 2.45 t-statistic

### The Number of Quarters with Consecutive Earnings Increase

Hou, Xue and Zhang followed Barth, Elliott, and Finn (1999) and Green, Hand, and Zhang (2013) in measuring Nei as the number of consecutive quarters (up to eight quarters) with an increase in earnings (Compustat quarterly item IBQ) over the same quarter in the prior year. At the beginning of each month t, they sort stocks into nine portfolios (with Nei = 0, 1, 2, . . . , 7, and 8, respectively) based on their most recent past Nei.

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1- and 6-month period.**

Nei1 = One Month Holding Period 0.37% average monthly return with 3.31 t-statistic

Nei6 = Six Month Holding Period 0.22% average monthly return with 2.03 t-statistic

Nei12= Twelve Month Holding Period **Not Statistically Significant**

### 52 Week High

At the beginning of each month t, we split stocks into deciles based on 52w, which is the ratio of its split-adjusted price per share at the end of month t − 1 to its highest (daily) split-adjusted price per share during the 12-month period ending on the last day of month t − 1. Monthly decile returns are calculated for the current month t (52w1), from month t to t + 5 (**52w6**), and from month t to t + 11 (52w12), and the deciles are rebalanced at the beginning of month t + 1. The holding period longer than one month as in 52w6 means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We take the simple average of the subdecile returns as the monthly return of the 52w6 decile. Because a disproportionately large number of stocks can reach the 52-week high at the same time and have 52w equal to one, we use only 52w smaller than one to form the portfolio breakpoints. Doing so helps avoid missing portfolio observations

**Zhang Statistical Results: Significant at the 95% confident at 6-month**

52w6 = Six Month Holding Period 0.57% average monthly return with 2.02 t-statistic\

### Residual Momentum Six-month

We split all stocks into deciles at the beginning of each month t based on their prior six-month average residual returns from month t − 7 to t − 2 scaled by their standard deviation over the same period. Skipping month t − 1, we calculate monthly decile returns for month t (ε61), from month t to t + 5 (ε66), and from month t to t + 11 (ε612). Residual returns are estimated each month for all stocks over the prior 36 months from month t−36 to month t−1 from **regressing stock excess returns on the Fama-French three factors**. To reduce the noisiness of the estimation, we require returns to be available for all prior 36 months. All the deciles are rebalanced at the beginning of month t + 1. The holding period that is longer than 1 month as in ε66 means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six-month period. We take the simple average of the subdecile returns as the monthly return of the ε66 decile.

Blitz, Huij, and Martens (2011)

Based on six-month average returns from month t − 7 to t − 2 scaled by their standard deviation over the same period. Skipping month t – 1

**Zhang Statistical Results: Very Significant (t-test ≥ 3)) more than 99% confident at 6- and 12-month period.**

ε61= One Month Holding Period **Not Statistically Significant**

ε66 = Six Month Holding Period 0.49% average monthly return with 3.86 t-statistic

ε612= Twelve Month Holding Period 0.39% average monthly return with 3.92 t-statistic

### Residual Momentum Eleven-month

We split all stocks into deciles at the beginning of each month t based on their prior six-month average residual returns from month t − 7 to t − 2 scaled by their standard deviation over the same period. Skipping month t − 1, we calculate monthly decile returns for month t (ε111), from month t to t + 5 (ε116), and from month t to t + 11 (ε1112). Residual returns are estimated each month for all stocks over the prior 36 months from month t−36 to month t−1 from **regressing stock excess returns on the Fama-French three factors**. To reduce the noisiness of the estimation, we require returns to be available for all prior 36 months. All the deciles are rebalanced at the beginning of month t + 1. The holding period that is longer than 1 month as in ε116 means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six-month period. We take the simple average of the subdecile returns as the monthly return of the ε116 decile.

based on their prior 11-month residual returns from month t−12 to t−2 scaled by their standard deviation over the same period. Skipping month t−1

**Zhang Statistical Results: Very Significant (t-test ≥ 3)more than 99% confident at 1- and 6-month period.**

ε111= One Month Holding Period 0.67% average monthly return with 3.91 t-statistic

ε116 = Six Month Holding Period 0.55% average monthly return with 3.94 t-statistic

ε1112= Twelve Month Holding Period0.36% average monthly return with 2.96 t-statistic

## Select Value Anomalies

### Background

Value is perhaps the most famous factor, is the tendency for relatively cheap stocks to outperform relatively expensive stocks over time. This factor has been around for almost a century, beginning with the “father of value investing,” Columbia Professor Benjamin Graham. His ground-breaking works “Security Analysis” (1934) and “The Intelligent Investor” (1949) laid the groundwork for the value investing philosophy.

While there were **31 significant value-versus-growth anomalies** in the paper, we are only going to analyze a handful in greater detail. Primarily those with very high t-tests or high average returns

* Earnings to Price
* Cash flow-to-price
* Enterprise Multiple
* Sales to Price

### Earnings to Price = Income before Extraordinary Items / Market Cap

The academic work on Earnings to Price comes from comes from Basu (1983)

Epq , which is income before extraordinary items (Compustat quarterly item IBQ) divided by the market equity (from CRSP) at the end of month t − 1.

Reuters/Refinitiv Fields: TR.F.INCBEFDISCOPSEXORDITEMS / TR. CompanyMarketCap

[Firms with negative EPS are excluded]

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1- and 6-month period.**

Epq1 = One Month Holding Period 0.98% average monthly return with 5.08 t-statistic

Epq6 = Six Month Holding Period 0.65% average monthly return with 3.69 t-statistic

Epq12 = 12 Month Holding Period 0.49% average monthly return with 2.93 t-statistic

### Cash flow-to-price

Lakonishok, Shleifer, and Vishny (1994)

At the beginning of each month t, we split stocks into deciles based on quarterly cash flow-to-price, Cpq , which is cash flows for the latest fiscal quarter ending at least four months ago divided by the market equity (from CRSP) at the end of month t − 1. Quarterly cash flows are income before extraordinary items (Compustat quarterly item IBQ) plus depreciation (item DPQ). For firms with more than one share class, we merge the market equity for all share classes before computing Cpq . Firms with non-positive cash flows are excluded. We calculate decile returns for the current month t (Epq1), from month t to t + 5 (Epq6), and from month t to t + 11 (Epq12), and the deciles are rebalanced at the beginning of month t + 1. The holding period longer than one month as in, for instance, Epq6, means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We take the simple average of the subdecile returns as the monthly return of the Epq6 decile.

**Zhang Statistical Results: Significant at the 95% confidence level across all 3 holding periods.**

Cpq1 = One Month Holding Period 0.69% average monthly return with 3.25 t-statistic

Cpq6 = Six Month Holding Period 0.55% average monthly return with 2.77 t-statistic

Cpq12 = 12 Month Holding Period 0.45% average monthly return with 2.44 t-statistic

### Enterprise Multiple = (Operating Profit – Total Depreciation) / EV

Enterprise Multiple (Operating Profit / Enterprise Value) is very similar to EBIT to Enterprise Value. The primary difference being EBIT does not remove deprecation from COGS. EBIT to Enterprise Value metric was popularized by Joel Greenblatt, in his work “The Little Book That Beats The Market.” The academic work on Enterprise Multiple comes from Loughran and Wellman (2011).

Reuters/Refinitiv Fields: (TR.F.OPPROFBEFNONRECURINCEXPN - TR.F.DEPRDEPLAMORTTOT) / TR.EV

[Firms with negative EPS are excluded]

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1-month period.**

Emq1 = One Month Holding Period 0.81% average monthly return with 3.67 t-statistic

Emq6 = Six Month Holding Period 0.53% average monthly return with 2.57 t-statistic

Emq12 = 12 Month Holding Period 0.53% average monthly return with 2.62 t-statistic

### Sales to Price = Total Revenue / Market Cap

This metric was popularized by Jim O’Shaughnessy in his book “What Works on Wall Street” originally published in 1997.

Reuters/Refinitiv Fields: (TR.F.TOTREVENUE) / TR.CompanyMarketCap

**Zhang Statistical Results: Significant at the 95% confidence level across all 3 holding periods.**

SPq1 = One Month Holding Period 0.61% average monthly return with 2.39 t-statistic

SPq6 = Six Month Holding Period 0.58% average monthly return with 2.43 t-statistic

SPq12 = 12 Month Holding Period 0.55% average monthly return with 2.49 t-statistic

## Select Investment Anomalies

### Background

Poulsen provides the latest contribution to the literature in his November 2018 paper. His data sample covers the period July 1970 through June 2016, and almost 15,000 firms. Following is a summary of his findings:

Average excess returns decrease with asset growth, and the effect is more pronounced for small firms.

The q-factor model finds that firms with lower investment-to-assets ratios tend to have higher expected returns. In addition, the Investment factor makes the Value factor redundant in the q-factor model.

While there were **27 significant investment anomalies** in the paper, we are only going to analyze a handful in greater detail. Primarily those with very high t-tests or high average returns

* Tbd
* Tbd
* Tbd
* tbd

## Select Profitability (Quality) Anomalies

Quality/profitability is the observation that investing in highly profitable stocks tend to significantly outperform companies of lower profitability. The academic work on the profitability premium comes from Novy-Marx and his 2013 paper, “The Other Side of Value: The Gross Profitability Premium.” He found that from 1962 to 2010, the most profitable firm’s stock gained of 0.31% more per month more than the least profitable firms.

In addition, Novy-Marx found that Value + Quality resulted in a dramatic increase in performance compared to value-only strategies; between July 1963 and December 2010 (the sample period), a combined strategy of gross profit and value never generated a losing five-year return.

While the academic literature is relatively recent, Quality has been used by investors long before the academic publication. For a famous example, Warren Buffett’s investing success can be significantly attributed to combination of Value + Quality.

While there were **33 significant profitability anomalies** in the paper, we are only going to analyze a handful in greater detail. Primarily those with very high t-tests or high average returns

* Gross Profitability
* Return on Equity
* Change in ROE
* Cash based Operating Profitability

### Gross Profitability (Novy-Marx) = Gross Profit / Total Assets

The academic work from Novy-Marx and his 2013 paper, “The Other Side of Value: The Gross Profitability Premium.”

Reuters/Refinitiv Fields: TR.F.GROSSPROFINDPROPTOT/ TR.F.TOTASSETS

**Statistical Results: Significant at the 95% confidence level**

Gpa = Annual rebalance 0.38% average monthly return with 2.62 t-statistic

### Gross Profitability Lagged = Gross Profit / Lagged Total Assets

Reuters/Refinitiv Fields: TR.F.GROSSPROFINDPROPTOT/ TR.F.TOTASSETS, Period=FQ-1

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1-month period.**

Glaq1 = One Month Holding Period 0.51% average monthly return with 3.40 t-statistic

Glaq6 = Six Month Holding Period 0.34% average monthly return with 2.43 t-statistic

Glaq6 = Twelve Month Holding Period 0.29% average monthly return with 2.12 t-statistic

### Return on Equity (Conventional) = Net Income to Common Shares / Shareholder Equity

Reuters/Refinitiv Fields: TR.F.INCAVAILTOCOMSHR / TR.F.TotShHoldEq

**Zhang Statistical Results: Not Rated**

### Return on Equity (Zhang) = Income before Extraordinary Items / Lagged Shareholder Equity

Reuters/Refinitiv Fields: TR.F.INCBEFDISCOPSEXORDITEMS / TR.F.TotShHoldEq, Period=FQ-1

The academic work on Operating Income / Lagged Shareholder Equity comes from Hou, Xue, and Zhang 2015.

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1-month period.**

Roe1 = One Month Holding Period 0.69% average monthly return with 3.07 t-statistic

Roe6 = Six Month Holding Period **Not Statistically Significant**

Roe12 = Twelve Month Holding Period **Not Statistically Significant**

### Change In ROE (Conventional) = ROE / ROE from 4 quarters ago (last year)

The four-quarter-change in Roe controls for seasonality, and likely better captures the underlying economic profitability than ROE itself.

**Zhang Statistical Results:** Not Rated

### Change In ROE (Zhang) = ROE / ROE from 4 quarters ago (last year)

The four-quarter-change in Roe controls for seasonality, and likely better captures the underlying economic profitability than Roe ROE

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident at 1- and 6-month period.**

dRoe1 = One Month Holding Period 0.76% average monthly return with 5.43 t-statistic

dRoe6 = Six Month Holding Period 0.39% average monthly return with 3.28 t-statistic

dRoe12 = Twelve Month Holding Period 0.27% average monthly return with 2.57 t-statistic

### Cash-based Operating Profitability

Following Ball, Gerakos, Linnainmaa, and Nikolaev (2016), they measured cash-based operating profitability, Cop, as total revenue (Compustat annual item REVT) minus cost of goods sold (item COGS), minus selling, general, and administrative expenses (item XSGA), plus research and development expenditures (item XRD, zero if missing), minus change in accounts receivable (item RECT), minus change in inventory (item INVT), minus change in prepaid expenses (item XPP), plus change in deferred revenue (item DRC plus item DRLT), plus change in trade accounts payable (item AP), and plus change in accrued expenses (item XACC), all scaled by book assets

**Zhang Statistical Results: Very Significant (t-test ≥ 3) more than 99% confident**

Cop = Annual rebalance 0.63% average monthly return with 3.44 t-statistic

### Cash-based Operating Profits-to-lagged Assets

Quarterly cash-based operating profits-to-lagged assets, Cla, is quarterly total revenue (Compustat quarterly item REVTQ) minus cost of goods sold (item COGSQ), minus selling, general, and administrative expenses (item XSGAQ), plus research and development expenditures (item XRDQ, zero if missing), minus change in accounts receivable (item RECTQ), minus change in inventory (item INVTQ), plus change in deferred revenue (item DRCQ plus item DRLTQ), and plus change in trade accounts payable (item APQ), all scaled by one-quarter-lagged book assets (item ATQ). All changes are quarterly changes in balance sheet items and they set missing changes to zero. At the beginning of each month t, they split stocks on Claq for the fiscal quarter ending at least four months ago. Monthly decile returns are calculated for month t (Claq1), from month t to t + 5 (Claq6), and from month t to t + 11 (Claq12). The deciles are rebalanced at the beginning of t + 1. The holding period longer than one month as in Claq6 means that for a given decile in each month there exist six subdeciles, each initiated in a different month in the prior six months. They took the simple average of the subdecile returns as the monthly return of the Claq6 decile. For sufficient data coverage, the Claq portfolios start in January 1976.

**Zhang Statistical Results: Very Significant (t-test ≥ 3)more than 99% confident**

Cla= Annual rebalance 0.53% average monthly return with 3.02 t-statistic

Claq1= One Month Holding Period 0.49% average monthly return with 3.02 t-statistic

Claq6 = Six Month Holding Period 0.48% average monthly return with 3.45 t-statistic

Claq12 = Twelve Month Holding Period 0.47% average monthly return with 3.57 t-statistic

## Select Intangible Anomalies

### R&D Expense to market

At the beginning of each month t, we split stocks into deciles based on quarterly R&D-to-market, Rdmq , which is quarterly R&D expense (Compustat quarterly item XRDQ) for the fiscal quarter ending at least four months ago scaled by the market equity (from CRSP) at the end of t − 1. For firms with more than one share class, we merge the market equity for all share classes before computing Rdmq. **We keep only firms with positive R&D expenses.**

We calculate decile returns for the current month t (Rdmq1), from month t to t + 5 (Rdmq6), and from month t to t + 11 (Rdmq12), and the deciles are rebalanced at the beginning of month t + 1. The holding period longer than one month as in, for instance, Rdmq6, means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We take the simple average of the subdecile returns as the monthly return of the Rdmq6 decile. Because the quarterly R&D data start in late 1989, the Rdmq portfolios start in January 1990.

**Zhang Statistical Results: Significant at the 95% confidence level across all 4 holding periods.**

Rdm = Annual June rebalance 0.68% average monthly return with 2.58 t-statistic

Rdmq1 = One Month Holding Period 1.19% average monthly return with 2.93 t-statistic

Rdmq6 = Six Month Holding Period 0.83% average monthly return with 2.12 t-statistic

Rdmq12 = Twelve Month Holding Period 0.83% average monthly return with 2.32 t-statistic

### Operating Leverage

At the beginning of each month t, we split stocks into deciles based on quarterly operating leverage, Olq , which is quarterly operating costs divided by assets (Compustat quarterly item ATQ) for the fiscal quarter ending at least four months ago. Operating costs are the cost of goods sold (item COGSQ) plus selling, general, and administrative expenses (item XSGAQ). We calculate decile returns for the current month t (Olq1), from month t to t + 5 (Olq6), and from month t to t + 11 (Olq12), and the deciles are rebalanced at the beginning of month t + 1. The holding period longer than one month as in, for instance, Olq6, means that for a given decile in each month there exist six subdeciles, each of which is initiated in a different month in the prior six months. We take the simple average of the subdecile returns as the monthly return of the Olq6 decile. For sufficient data coverage, the Olq portfolios start in January 1972.**Zhang Statistical Results: Significant at the 95% confidence level across all 4 holding periods.**

Ol = Annual June rebalance 0.46 % average monthly return with 2.70 t-statistic

Ol q1 = One Month Holding Period 0.49 % average monthly return with 2.52 t-statistic

Ol q6 = Six Month Holding Period 0.49 % average monthly return with 2.58 t-statistic

Olq12 = Twelve Month Holding Period 0.49% average monthly return with 2.73 t-statistic

## Select Trading Frictions

### Low Volatility / Low Beta Factor by Frazzini-Pedersen (2014)

“Our evidence replicates the Frazzini-Pedersen results that high beta stocks do not earn significantly higher average returns than low beta stocks.” In particular, the high-minus-low Frazzini-Pedersen beta deciles earn around −0.2% per month at the 1-, 6-, and 12-month, and are all within one standard error from zero.

β FP1= One Month Holding Period -0.22% monthly return with -0.65 **Not Significant** t-statistic

β FP6 = Six Month Holding Period -0.23 monthly return with -0.72 **Not Significant** t-statistic

β FP12 = Twelve Month Holding Period -0.18 monthly return with -0.57 **Not Significant** t-statistic

# Results of Factor Investing:

Below we will follow Chris Cain’s career beginning when he was a Quantitative Researcher at Connors Research and ending this year, after he joined Bloomberg Intelligence. In 2020, he won the CMT Associations Dow Award for the best research paper. From there he was hired by Bloomberg to develop their quant models on the Bloomberg Terminal. In December 2022, Bloomberg Intelligence research team published an improved model of Chris’ original work. Both the original and improved model use the four factors Value + Quality + Momentum + Low Volatility, skipping the size factor.

### Disclosure:

The following results are hypothetical and are NOT an indicator of future results and do NOT represent returns that any investor actually attained. Indexes are unmanaged, do not reflect management or trading fees, and one cannot invest directly in an index.

### The CMT Association 2020 Dow Award Winning Paper “Quantamental”

Author: Christopher Cain, CMT & Others Published 2020

Chart, line chart

Description automatically generated

Source: <https://cmtassociation.org/wp-content/uploads/2020/03/Cain-and-Connors-2020-Dow-Award-1.pdf>

**Investment Data**

All historical tests will cover the **time period of January 2003 to September 2019**. Data and analytics are provided by Quantopian.com. The universe for all tests run is Quantopian’s “Q500US” universe, which contains the 500 most liquid US stocks based on trailing 200-day average dollar volume. This universe is reconstituted each month, avoiding survivorship bias.

**Rules**

* Rank stocks 1-500, based on the quality, value and low volatility factors, and take the top 50.
* Filter for the best 20 stocks based on momentum.
* Rebalance every month.

**Combining Two Factors: Value + Quality**

Value + Quality is the classic Warren Buffett portfolio; it shouldn’t be a great surprise to see outperformance.

|  |  |  |
| --- | --- | --- |
| Jan 2003 – Sept 2019 | **S&P 500** | **Value + Quality** |
| Annual Return | 9.6% | 11.3% |
| Cumulative Returns | 365.4% | 498.8% |
| Annual Volatility | 17.8% | 21.9% |
| Sharpe Ratio | 0.61 | 0.60 |
| Max Drawdown | -55.2% | -64.6% |

**Combining Three Factors: Value + Quality + Low Volatility**

Adding a screening factor for Low Volatility stocks does not materially increase returns but does materially reduces the drawdown vs. the 2 Factor Model.

|  |  |  |  |
| --- | --- | --- | --- |
| Jan 2003 – Sept 2019 | **S&P 500** | **Value + Quality** | **Value + Quality + Low Volatility** |
| Annual Return | 9.6% | 11.3% | 11.9% |
| Cumulative Returns | 365.4% | 498.8% | 557.5% |
| Annual Volatility | 17.8% | 21.9% | 14.5% |
| Sharpe Ratio | 0.61 | 0.60 | 0.85 |
| Max Drawdown | -55.2% | -64.6% | -40.3% |

**Combining Five Factors: Value + Quality + Low Volatility + Momentum + S&P 500 Risk Management**

Adding a Momentum factor that screens for stocks showing recent price gains, and a Market Risk Management rule that invests in bonds instead of stocks if S&P 500 is below 100-day moving average, results in increased returns and reduced drawdown, leaving an impressive Sharpe ratio of risk-adjusted returns.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Jan 2003 – Sept 2019 | **S&P 500** | **Value + Quality** | **Value + Quality + Low Volatility** | **+ Momentum & S&P 500 Risk Management** |
| Annual Return | 9.6% | 11.3% | 11.9% | 13.30% |
| Cumulative Returns | 365.4% | 498.8% | 557.5% | 701.40% |
| Annual Volatility | 17.8% | 21.9% | 14.5% | 12.00% |
| Sharpe Ratio | 0.61 | 0.60 | 0.85 | 1.10 |
| Max Drawdown | -55.2% | -64.6% | -40.3% | -23.00% |

**Factors Used:**

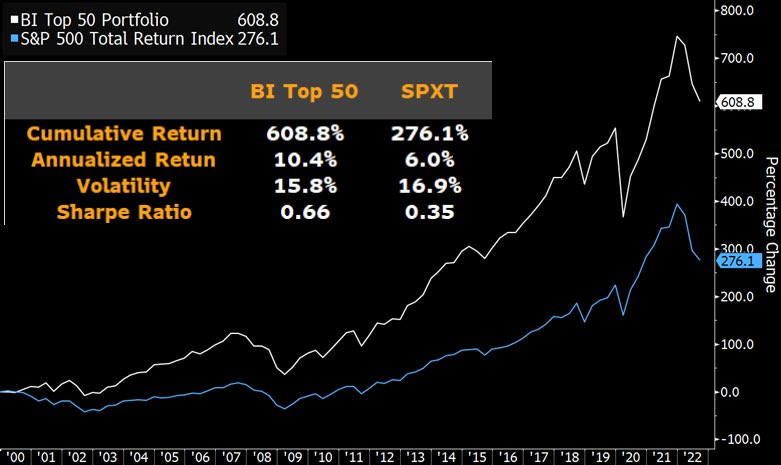
* Value: Earnings Before Interest and Taxes / Enterprise Value
* Quality: Return on Invested Capital
* Low Volatility: 100-Day Lookback
* Momentum: 6-Month Return, ignoring the most recent month

**Summary**:

Unfortunately, this analysis can no longer be repeated since Quantopian.com has shut down, but taken at face value, the model produces a 37.5% annualized improvement over 15+ years vs. the S&P 500 with considerably less risk. In simpler terms, a theoretical $250k would have grown to $1.1M with the S&P 500 and $2.0M in the model over the 15+ years.

### Bloomberg MVP Portfolio: Double the Return of the Index with Less Risk

Author: Christopher Cain, CMT & Others. Released: December 2022



Source: <https://twitter.com/GinaMartinAdams/status/1598431923294150656?cxt=HHwWgIC9mbHX4q4sAAAA>

**Investment Data:**

S&P 500 index constituents since January 2000 until September 2022, categorized by Sector.

**Rules:**

* Create four scores for all stocks in the S&P 500 index -- momentum, value, volatility, and profitability -- sector neutralize and equally weight each factor to derive overall rankings and select only the top 50 stocks for the portfolio.
* Rebalance every Quarter.

**Results:**

The Bloomberg MVP model generated a 10.4% annualized return from January 2000 to September 2022 vs. 6% for the S&P 500 total return index with lower annualized volatility.

The Factors used in the Bloomberg MVP model are not explicitly stated but inferred as follows:

* Value: Likely Sales-to-Price

Source: “The average Ebitda/Price of MVPs (0.12) is about equal to that of an S&P 500 stock (0.11), but sales-to-price is discounted by about 0.3 standard deviations.”

* Quality: Likely ROE

Source: “average ROE is about 1.4x higher than that of a typical S&P 500 stock, and ROIC 1.2x greater.

* Low Volatility: Likely 6 Month/126 Day Lookback

Source: Interpreted from a Bloomberg Chart showing difference between 6mo and 12mo volatility lookback. Additionally, academic research is stronger with the 6-month time horizon.

* Momentum: 6-Month Return, ignoring the most recent two weeks

Source: Stated by Michael Casper, Chris Cain’s colleague on January 13, 2023

**Summary**:

Taken at face value, the Bloomberg MVP model produces a 73.3% annualized improvement over 20+ years vs. the S&P 500 with considerably less risk. In simpler terms, a theoretical $250k would have grown to $0.9M with the S&P 500 and $1.8M in the model over the 20+ years.

# Results of Investment Models

### AQR

adsflkjasdflkajdf

### Quantamentals: Cain, et al (2020)

Based on the Fama French perspective

High Stock Return = Low Volatility + High Value + High Profitability + High Momentum

Where:

* Value: Earnings Before Interest and Taxes / Enterprise Value
* Quality: Return on Invested Capital
* Low Volatility: 100-Day Lookback
* Momentum: 6-Month Return, ignoring the most recent month. It is unclear if Cain is using a total of 6 months of returns (starting 7 months ago, ending 1 month ago) or 5 months of returns (starting 6 months ago, ending 1 month ago)

### Bloomberg Top 50: Cain, et al (2022)

Based on the Fama French perspective

High Stock Return = Low Volatility + High Value + High Profitability + High Momentum + Sector Balanced

Where:

* Value: Likely Sales-to-Price
* Quality: Likely ROE
* Low Volatility: Likely 6 Month / 126 Day Lookback
* Momentum: 6-Month Return, ignoring the most recent two weeks

# Hempel Wealth Management Top 50 Portfolio

### Hempel Wealth Top 50 - Candidate 1:

Based on the Fama French perspective, replicating the Bloomberg/Cain Model

**HW candidate 1:** High Stock Return = Low Volatility + High Value + High Profitability + High Momentum + Sector Balanced

### Hempel Wealth Top 50 - Candidate 2:

Based on the Fama French perspective, replicating the Bloomberg/Cain Model, but using Zhang definition of Profitability

**HW candidate 2:** High Stock Return = Low Volatility + High Value {FF} + High Profitability {Zhang}+ High Momentum + Sector Balanced

### Hempel Wealth Top 50 - Candidate 3:

Based on the Fama French perspective, replicating the Bloomberg/Cain Model, but using a combination of Factors definition

**HW candidate 3:** High Stock Return = Low Volatility + High Value {multi-sub-factor} + High Profitability {multi-sub-factor} + High Momentum + Sector Balanced

### Hempel Wealth Top 50 - Candidate 4

Zhang’s latest research q-factor perspective, meaning dropping Value and adding investment factor in its place.

**HW candidate 4:** High Stock Return = Market + Size + Profitability + Conservative Investment + Expected Growth Factor

### Hempel Wealth Top 50 - Candidate 5:

Zhang’s latest research q-factor perspective, meaning dropping Value and adding investment factor in its place. Sector neutralized.

**HW candidate 5:** High Stock Return = Market + Size + Profitability + Conservative Investment + Expected Growth Factor + Sector Balanced

Over the past month, I have built a prototype Top 50 Portfolio that has been able to reproduce significant market outperformance from January 2015 to January 2023 using the rules described above in the Bloomberg MVP Portfolio. The results are mind blowing.

**Successes & Roadblocks**

I do not have a Bloomberg Terminal subscription, as they cost $30,000 per year, instead I have a subscription to Refinitiv, one of Bloomberg’s chief competitors, that has provided the data on all the stocks in the S&P 500 since January 1, 2000, along with their price history and financials.

The Bloomberg MVP model also uses Sector information (Tech, Utilities, Energy, etc.) to maintain an equal exposure to the index, meaning the Bloomberg MVP Model does not swing from 100% utilities to 100% tech when it rebalances. Unfortunately, the historical Sector information from S&P costs $8,000. A Director at S&P Global is looking at if they can give me a discount for being a small firm, but it didn’t appear likely. As a workaround, I have been able to obtain Sector data going back to January 2015.

**Question: How much back-testing is enough?**

While back tested portfolios are interesting, what really matters is actual investment returns. Before I spend another month and thousands of dollars to recreate research that has already been done, it is important to reflect on where we stand.

We know there is rigorous academic research is at the foundation of the results. The underlying analysis on value investing has been studied and revised for nearly 100 years. The authors of the Fama-French models, described earlier, have won Nobel Prizes for their work.

We know combining different metrics for each Value, Quality, Volatility and Momentum result in similar investment results, i.e. outperforming the market. We know from looking at the research that there are dozens of data points for each one of the factors that pass rigorous statistical significance and have resulted in material investment outperformance.

**Question: Why don’t other people do this?**

In short, they do. Momentum and trend following is synonymous with the CTA industry, a category of hedge funds. Warren Buffett has performed similar work for 75 years and plenty of people have studied his investment style.

## Top 50 Portfolio Final Thoughts

This investment strategy would be ideal for retirement accounts:

* Gains (losses) would not be subject to realized tax gains (losses) when the portfolio rebalances.
* Potential for above market returns without needing to use leverage.

In taxable brokerage accounts, the investment strategy could be:

* Leveraged or deleveraged to desired risk level.
* Combined with other investment strategies, such as risk parity, or volatility trading.
* Modified for longer periods before rebalancing for Long-Term Capital Gain tax treatment.

Strategy could also be combined with other Hempel Wealth research on economic cycles and recession timing.

# Future Work

Incorporate q5 model An Augmented q-Factor Model

# Sources:

### q-factor Model

K Hou, C Xue, L Zhang 2015

Digesting anomalies: an investment approach

<https://doi.org/10.1093/rfs/hhu068>

### Fama-French 5 model

A five-factor asset pricing model

Eugene F. Fama a, Kenneth. French

https://www.sciencedirect.com/science/article/abs/pii/S0304405X14002323

### Fama-French 6 model

Choosing factors

Eugene F. Fama a, Kenneth. French

https://www.sciencedirect.com/science/article/abs/pii/S0304405X18300515

CFA summary of Fama-French 6 model

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AQR

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# Appendix:

### Definitions:

Book Value

= Shareholder Equity

= Total Assets – Total Liabilities

Market Equity

= Market Capitalization

Operating Profit

= EBIT

= Operating Profit before Non-Recurring Income/Expense

=Total Revenue – Operating Expenses

EBIT Actual

in general (Pre-Tax income + Interest expense – interest capitalized)

COGS

= Cost of Goods Sold (only applicable to companies that sell a goods. This primarily excludes Financial Services (Insurance, Banks)

Zhang “Income before Extraordinary Items”

= Net Income After Tax

= “Income before Discontinued Operations and Extraordinary Items”

= “income before extraordinary items”

= “Quarterly earnings are income before extraordinary items”

### Income Statement Summary:

**Total Revenue**

minus [Operating Expenses: Cost of Operating Revenue + Selling, General & Administrative Expenses]

= Operating Profit

**Operating Profit**

minus Non-Operating Expenses (including Interest Expense/Income)

minus Non-Recurring Income/Expense

= Pre-Tax Income

**Pre-Tax Income**

minus Taxes

= Net Income After Tax

**Net Income After Tax**

minus Extraordinary Activities (after tax)

= Net Income

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