# Does Complexity Imply Value?
# AAII Value Strategies from 1963 to 2013[1]

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ABSTRACT

We compare the performance of 13 value investing screens used by practitioners against a simple model based on buying stocks with the lowest enterprise multiple. Our sample of value investing screens underperform the simple lowest enterprise multiple strategy. The one exception is the Piotroski F-Score screen, which has similar performance relative to the enterprise multiple strategy. Overall, the evidence suggests that simple value investing models can perform just as well as, if not better than, more complex value investing models.

JEL Classification: G10, G12, G14

Key words: AAII, value investing, anomalies.

In the academic literature, value investing is characterized as buying stocks that have a low price relative to a measure of earnings or asset value. For example, Fama and French (1992) utilize low price to book ratios as a way to identify "value" stocks. Nonetheless, practitioners invest in multiple "value" strategies that go beyond simply buying low price to book stocks. For example, Warren Buffett, the most famous value investor of our time, advocates that the "buy cheap stocks" investing mantra originally preached by his Benjamin Graham has evolved over time. Buffett has an evolutionary view on value investing: "It's far better to buy a wonderful company at a fair price than a fair company at a wonderful price.[2]" Buffett's implication is that investors can't solely focus on price, but also need to think about the quality of a firm (See Frazini, Kabiller, and Pedersen (2013) for a discussion).

To assess alternative views on value investing that go beyond simply buying low price to book stocks, we analyze and compare 13 stock screens labeled as "Value" on the American Association for Individual Investors (AAII) website.[3] We compare the performance of the value strategies followed by AAII investors to a simple "low-price" value strategy between 1963 and 2013. We use EBITDA/TEV as our simple low-price value strategy, which has been shown in Gray and Vogel (2012) and Loughran and Wellman (2011) to be the top-performing valuation metric. We find that more complex value strategies on AAII, on average, underperform the simple EBITDA/TEV ratio. However, the "Piotroski High F-Score Screen (FSCORE)," which is a close approximation to the strategy outlined in Piotroski (2000) and Piotroski and So (2012),

[2] http://www.berkshirehathaway.com/letters/1989.html.
[3] AAII is an organization dedicated to improving individual investor performance via education, information, and research. The organization has been around since 1978 and has over 150,000 members.

has similar performance.

For mid and large-cap firms, an annually rebalanced equal-weight portfolio of FSCORE firms earns 16.74% a year, a 0.70 Sharpe Ratio, and a 0.332% monthly 4-factor alpha. These results are similar for a simple EBITDA/TEV value stock screen, which earns 16.52% a year, a 0.65 Sharpe Ratio, and a 0.370% monthly 4-factor alpha. Overall, the evidence suggests that simple value models can perform just as well, if not better, than more complex value models.

The remainder of the paper is organized as follows: Section 1 describes our data; Section 2 presents the results; Section 3 concludes.

## 1. Data

Our data sample includes all firms on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX), and NASDAQ with the required data on CRSP and Compustat. The data extend over the time period from July 1, 1963 until December 31, 2013. The sample includes firms with ordinary common equity on CRSP and eliminates all REITS, ADRS, and closed-end funds. AAA historical yields are from Goyal and Welch (2008). Thomson Reuters institutional (13f) holdings database is used for institutional holdings data. CRSP delisting return data is incorporated into the sample using the technique of Beaver, McNichols, and Price (2007). As per the evidence in Beaver, McNichols, and Price (2007), the choice of delisting algorithm might be marginal when assessing market returns, but using their more comprehensive delisting

algorithm is very important in the context of assessing extreme value stocks.[4]

To be included in the sample, all firms must have a non-zero market value of equity as of June 30th of year *t*. Firm fundamentals are based on December 31st of year *t-1* (for firms with fiscal year ends between January 1st and March 31st we use year *t* fundamentals; for firms with fiscal year ends after March 31st we use year *t-1* fundamentals). Book to Market is computed on June 30th each year using the book value methodology from Fama and French (2000) and the market capitalization on June 30th. All firms with negative book values are eliminated from the sample.

The tests are focused on all mid and large-cap stocks, defined as stocks with a market capitalization on June 30th above the NYSE 40th percentile for market capitalization each year. This approach is similar to that undertaken by Fama and French (2008) and seeks to achieve the same goal: determine if the empirical results are applicable to the broader universe of stocks and are robust to size and liquidity effects. Our choice to focus on more liquid firms means that our conclusions may not be applicable to small illiquid firms.[5] When a particular screen generates zero stocks that meet the specified criteria, we plug in the mid-large cap universe return for that month. We also include the Standard and Poor's 500 equal-weight total return index as a benchmark to compare the equal-weighted value strategies under investigation.

The baseline universe for all screens is described above. Listed below are the value

[4] We additionally use the Beaver, McNichols and Price (2007) code to link CRSP and Compustat. They find that many delistings can be excluded because the effective date range in the Compustat/CRSP merged database often ends before the security is delisted.

[5] Because our results are focused on a different universe of securities, the evidence we present can sometimes differ drastically from the results presented on the AAII website.

strategies outlined on the AAII website and their corresponding strategy-specific parameters that are applied on the baseline universe:

1. **Fundamental Rule of Thumb (FRT).** This screen excludes ADRs, financials, and real estate firms. Passing firms need to have their total liabilities to total assets ratio less than or equal to the universe's median ratio. The fundamental rule of thumb is constructed by adding earnings yield, retained earnings to book value, and dividend yield. Earnings yield is earnings per share divided by the price of the common stock. Retained earnings to book value is earnings per share minus dividends per share divided by book value per share. Dividend yield is dividend per share divided by the price of the common stock. Final results are top 50 companies with highest fundamental rule of thumb values.

2. **Graham Enterprising Screen (GR_ES).** This strategy is loosely based on Ben Graham writings. Criteria are as follows: price to earnings ratio's rank is less than or equal to $10^{th}$ percentile (lowest 10% of the universe); current ratio is greater than or equal to 1.5; long-term debt to working capital is between 0 and 1.1; EPS in each of the last five years have been positive; EPS of last fiscal year (and trailing 12 months) is greater than EPS from five years ago; company has paid a dividend over the last 12 months; price-to-book ratio is less than or equal to 1.2.

3. **Graham Defensive Utility (GR_D_U).** This screen only includes companies in the

utility sector. Criteria are as follows: long-term debt-to-equity ratio of the last fiscal year is less than 2; EPS in each of the last seven fiscal years have been positive; seven years EPS geometric growth rate is greater than 3%; a dividend has been paid in the last seven fiscal years; price-to-earnings ratio (using average of past 3 year earnings) is less than or equal to the inverse of the AAA yield plus 2; the product of the price-to-earnings ratio multiplied by the price-to-book ratio is less than or equal to 1.5 times the inverse of the AAA yield plus 2.

4. **Graham Defensive Non-Utility (GR_D_NU).** This screen excludes companies in utility sector. Criteria are as follows: long-term debt-to-equity ratio of the last fiscal year is less than 2; long-term debt to working capital is between 0 and 1.1, exclusive; EPS in each of the last seven fiscal years have been positive; seven years EPS geometric growth rate is greater than 3%; dividend has been paid in the current year and in each of the last seven fiscal years; price-to-earnings ratio (using average of past 3 year earnings) is less than or equal to the inverse of the AAA yield plus 2; the product of the price-to-earnings ratio multiplied by the price-to-book ratio is less than or equal to 1.5 times the inverse of the AAA yield plus 2.

5. **Graham Enterprising Investor Revised (GR_E_I).** This screening is slight revision of the Graham Enterprising Screen. Criteria are as follows: price to earnings ratio's rank is less than or equal to $25^{th}$ percentile (lowest 25% of the universe); current ratio is

greater than or equal to 1.5; long-term debt to working capital is less than 1.1; EPS in each of the last five years have been positive; EPS of the last fiscal year (and trailing 12 months) is greater than EPS from five years ago; company has paid a dividend over the last 12 months; price-to-book ratio is less than or equal to 1.2.

6. **Magic Formula (MF).** This screen seeks to find the best combination of value and quality. The screen excludes financial and utility companies. First, companies need to have return on capital greater than 25% (return on capital is calculated from earnings before interests and taxes divided by total tangible capital). Finally, the screen selects 30 stocks with the highest earnings yield (earnings yield is EBIT divided by enterprise value).

7. **Dogs of the Dow 10 (DOW 10).** This screen only includes Dow Jones industrial average composite companies. The screen only includes the 10 highest dividend yielding stocks.

8. **Dogs of the Dow 5 (DOW 5).** This screen only includes Dow Jones industrial average composite companies. The screen only includes the 5 highest dividend yielding stocks.

9. **Cash Rich Firms (CRF).** This screen excludes financial, utility and real estate firms. Criteria are as follows: EPS of the last fiscal year is positive; stock price is higher than

$5.00; total liabilities to total assets ratio of the last fiscal year is less than the industry's median ratio; long-term debt to total capital ratio of the last fiscal year is less than the industry's median ratio; cash to price is greater than 20; cash per share is at least 20% of the stock price; net cash (cash after current liabilities) to price is greater than 20; net cash per share is at least 20% of the stock price.

10. **Piotroski High F-Score (FSCORE).** This screen is based on the methodology in Piotroski and So (2012). Their methodology involves computing 9 signals. Of the nine financial performance signals, four of the signals are based on profitability; three are based on changes in financial leverage and liquidity; and two are based on operational efficiency. Firms need to be in the top 20% of the universe based on book to market to be included. Firms also need to score an 8 or a 9 on the Piotroski 9 point scale.

11. **Price to Free Cash Flow (PFCF).** Financial and real estate companies are excluded. Criteria are as follows: free cash flow per share of each of the last five fiscal years has been positive; price to free cash flow per share ratio is lower than the industry's median ratio; price to free cash flow per share ratio is lower than the company's five year average ratio. Final companies are those 30 companies with the lowest price-to-free cash flow per share ratio.

12. **Weiss Blue Chip Dividend Yield (WEISS).** Real estate companies are excluded.

Criteria are as follows: dividends have been paid in each of the last seven fiscal years; dividends have been increased at least three times and have never been decreased in the last seven fiscal years; numbers of share outstanding in the last fiscal year is greater than or equal to five millions; institutional ownership is greater than 50%; EPS have increased at least four times over the last seven fiscal years; current dividend yield is within 10% of the seven year average dividend yield; current ratio of last fiscal year is greater than or equal to 2; for utility companies the dividend payout ratio of the last fiscal year is less than or equal to 0.85; for non-utility companies, the long-term debt to equity ratio of the last fiscal year is less than or equal to 0.5 and the dividend payout ratio of the last fiscal year is less than or equal to 0.5.

13. **O'Shaughnessy Value Screen (O'SH_V).** Utility companies are excluded. Criteria are as follows: the market capitalization is greater than the average market capitalization of the universe; the numbers of shares outstanding from the last fiscal year is greater than the average of the universe; cash flow per share of the last fiscal year is greater than the average of the universe; total sales of the last fiscal year is greater than 1.5 times the average of the universe. Final companies are those 50 companies with the highest dividend yield.

14. **EBITDA/TEV (EBITDA/TEV).** All financial firms are excluded. Similar to the Loughran and Wellman (2011), we compute Total Enterprise Value (TEV) as Market

Capitalization + Short-term Debt + Long-term Debt + Preferred Stock Value – Cash and Short-term Investments. Earnings before interest and taxes and depreciation and amortization (EBITDA) is computed as Operating Income Before Depreciation + Non-operating Income. The simple value strategy involves selecting the top decile of firms ranked on EBITDA/TEV (enterprise multiple).

## 2. Results: Comparing Different Value Strategies

### *2.1 Summary Statistics*

Table 1 presents information on portfolio construction for each of the value strategies analyzed. The AAII screening methodology leads to highly variable portfolio size statistics. For example, the Fundamental Rule of Thumb (FRT) portfolio typically has 50 stocks at all times; however, the Graham Defensive Non-Utility (GR_D_NU) strategy has a range of 0 to 135 firms in the portfolio. Eight of the 13 AAII screens generate portfolios with a median size below 15 firms. We present the results on portfolio size because it highlights an often overlooked aspect of screen-based strategies: they can create highly concentrated portfolios. Alternatively, the simple value strategy of selecting the top decile of enterprise multiple firms (EBITDA/TEV) has a mean (median) of 96 (92) firms in the portfolio.

Table 2 shows the Pearson correlation coefficients for the monthly return series on all value strategies analyzed. Many of the strategies are highly correlated, which is intuitive given the "value" nature of the strategies examined. The high correlations also suggest that creating combination value portfolios would have limited benefits.

Table 3 presents our core performance results. To assess risk-adjusted performance, we control for four factors: MKT (excess value-weighted market index return), SMB (small minus big), HML (high book-to-market minus low book-to-market), and MOM (high momentum minus low momentum).[6] Alpha estimates are positive and significant for MF, FSCORE, PFCF and EBITDA/TEV, suggesting that there are average excess returns associated with these strategies that cannot be explained by the 4-factor model. All other value strategies exhibit no alpha, or value-add, after controlling for known exposures. Important to note, the S&P 500 equal-weight index also exhibits a positive alpha, despite the fact it is considered a "passive" portfolio. This result reflects the fact that factor models are not a perfect assessment tool.

Because alpha estimates are not perfect, we also present common performance statistics and risk metrics in Table 3. Sharpe ratios suggest that GR_D_NU, MF, FSCORE, PFCF and EBITDA/TEV all outperform a passive equal-weight index. Among the best performing value strategies, FSCORE and EBITDA/TEV are the strongest, with Sharpe ratios of 0.70 and 0.65, respectively. Sortino ratios, which do a better job capturing a strategy's ability to limit downside volatility, highlight the strength of the FRT, FSCORE, PFCF and EBITDA/TEV strategies, which have Sortino ratios of 0.99, 1.01, 0.85, and 0.89, respectively.

The collective performance statistics suggests that amongst complex value strategies, the FSCORE strategy is the best performing strategy. However, relative to a simple cheap stock screen like EBITDA/TEV, we cannot crown a "king of value strategies," because the performance of FSCORE relative to EBITDA/TEV is similar.

[6] See Fama and French (1993) and Carhart (1997). Factors obtained from Ken French's website http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_librar y.html,

Figures 1 through 4 show the performance of four strategies: EBITDA/TEV, FSCORE, PFCF, and SP500 EW. From an invested growth perspective (Figure 1), FSCORE outperforms the other 3 strategies. Figure 2 plots the five-year rolling CAGRs and shows that on average EBITDA/TEV outperforms after 1992, while FSCORE outperforms between 1973 and 1992. Figure 3 examines the performance during different market cycles. EBITDA/TEV outperforms in four of the six bull markets, with the exceptions being from June 1970 to January 1973 and January 1982 to December 1984. In bear markets, there is no clear "winner" amongst the four strategies. Finally, Figure 4 highlights the maximum drawdown as well as maximum drawdowns for monthly holding periods, annual holding periods, and 3-year holding periods. FSCORE has the lowest maximum drawdown, 12-month and 36-month drawdown; however the maximum drawdowns are still extreme (around 50% loss) and cannot prevent an investor from losing a large portion of their capital.

*2.2 Robustness Tests*

A common critique of historically successful strategies is that they have been known to outperform for many years and have therefore been "arbitraged" away (McLean and Pontiff (2014)). For example, several studies show that the dividend yield is no longer an effective measure to predict future returns (Boudoukh et al. (2007)). To address this concern, as well as the concern that our core results are driven by a particular time period, we break our sample period into 3 sub-periods: July 1, 1963 to December 31, 1980; January 1, 1981 to December 31, 1996; and January 1, 1997 to December 31, 2013.

Table 4 presents our sub-period analysis. The first observation is that value strategy

outperformance is not driven by a specific sub-period. The top-performing value strategies, FSCORE and EBITDA/TEV, show strong performance in all sub-periods relative to the S&P 500 equal-weight benchmark and relative to other value strategies. In the first period (Table 4, Panel A), EBITDA/TEV and FSCORE are essentially tied for the best performance. For the second period (Table 4, Panel B), FRT, DOW10, FSCORE, and EBITDA/TEV all have strong risk-adjusted performance (examining Sharpe ratios), but the top performing strategy is arguably FSCORE. Finally, for the third period (Table 4, Panel C), there are a group of strategies with similar Sharpe ratios: FRT, GR_D_U, GR_D_NU, MF, FSCORE, and EBITDA/TEV. If we defer to absolute performance (compound annual growth rates) as the tie-breaker, GR_D_NU, MF, and EBITDA/TEV all have strong performance with CAGRs of at least 15% a year. Overall, there isn't a strategy that outperforms in every category all the time, but FSCORE and EBITDA/TEV have the best average performance across sub-samples.

## 3. Conclusion

How investors express a "value" investment philosophy is highly varied. Some value investors focus solely on simple price metrics (i.e., Ben Graham approach), while others look at some combination of a value metric coupled with a quality metric (i.e., Warren Buffett approach). The goal of this paper is to help settle the anecdotal debates among value investors by empirically assessing which value strategies have historically performed the best. For the more complex value strategies, defined as those strategies that go beyond screening on a simple valuation metric, the Piotroski High F-Score strategy performs the best. Surprisingly, the best

performing simple value strategy (EBITDA/TEV) and the best performing complex value strategy are about the same. Overall, the evidence suggests that simple value models can perform just as well, if not better, than more complex value models.

There are important caveats to our conclusion. First, our analysis is limited to larger securities and the conclusions may not apply to micro-cap or small-cap securities. Second, our analysis is limited to the value strategies described on the AAII website, so the scope of our conclusions regarding complexity is limited to the models actually investigated. For example, the complex value-based strategy outlined in Gray and Carlisle (2012) is shown to be superior to simple price-based screening strategies. Nonetheless, our basic assessment is that a complex system that adds little value over a simple system should be avoided if the performance is similar. Only when complexity can be shown to improve performance by a substantial amount should we consider transitioning to a complex system.

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**Figure 1:** Invested Growth from July 1, 1963 through December 31, 2013 (Log Scale)

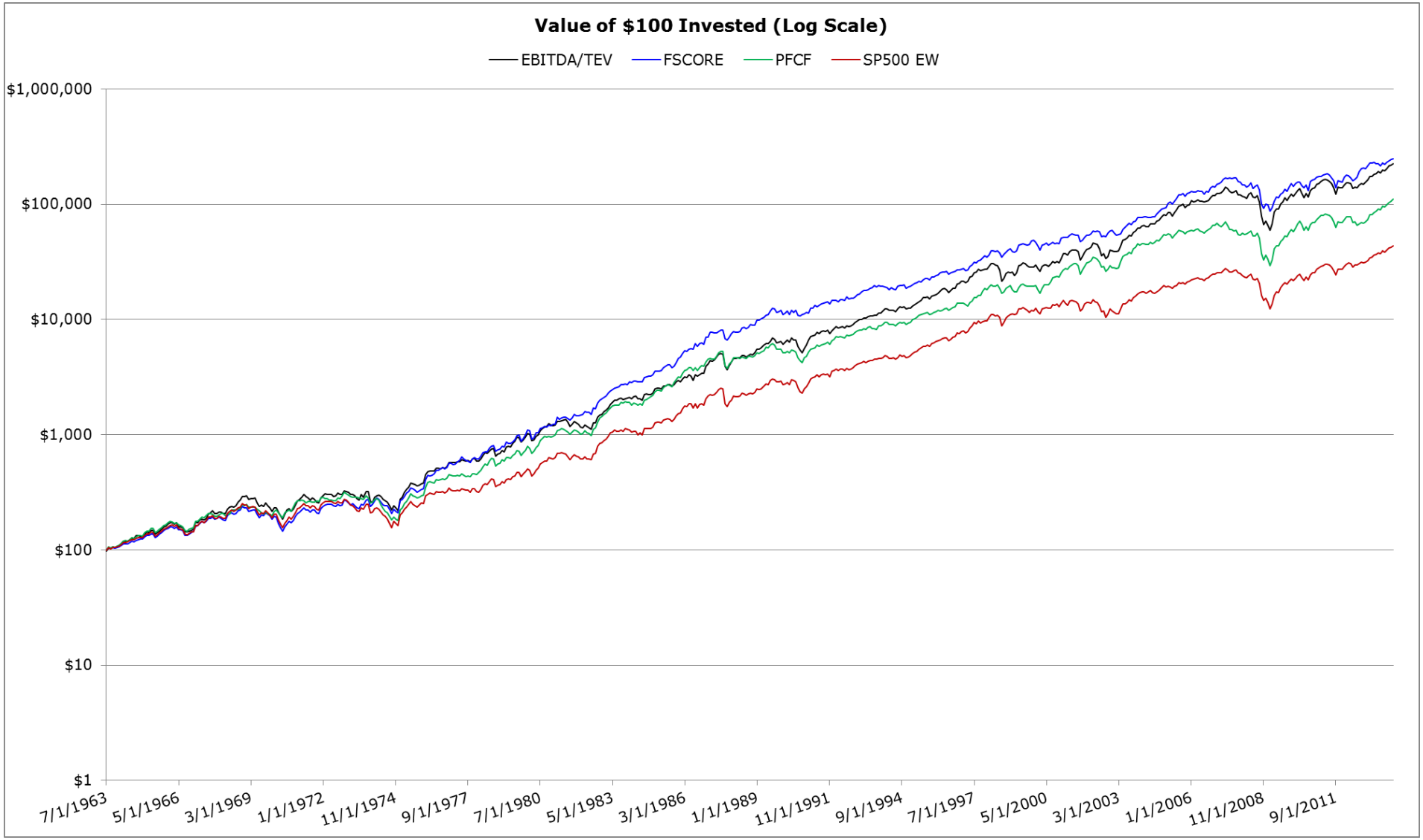


**Figure 2:** 5-Year Rolling Compound Annual Growth Rates from July 1, 1963 through December 31, 2013

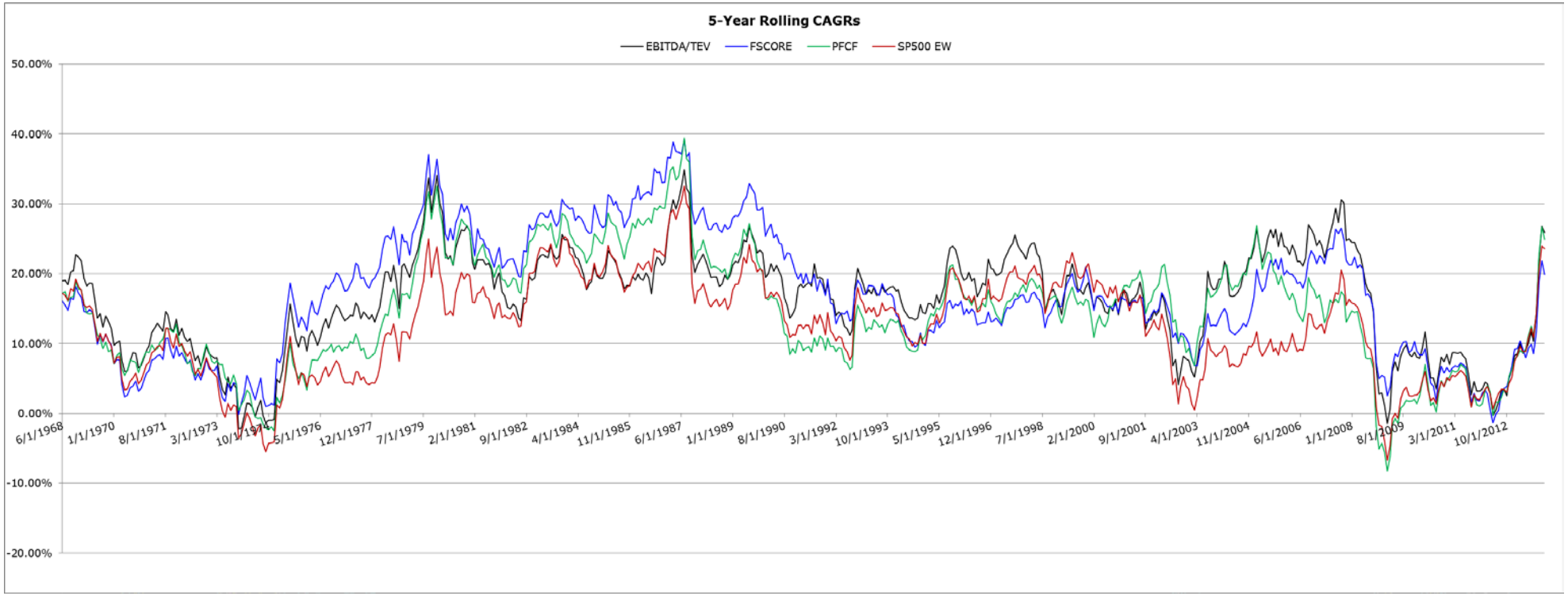


**Figure 3:** Market Cycle Performance from July 1, 1963 through December 31, 2013

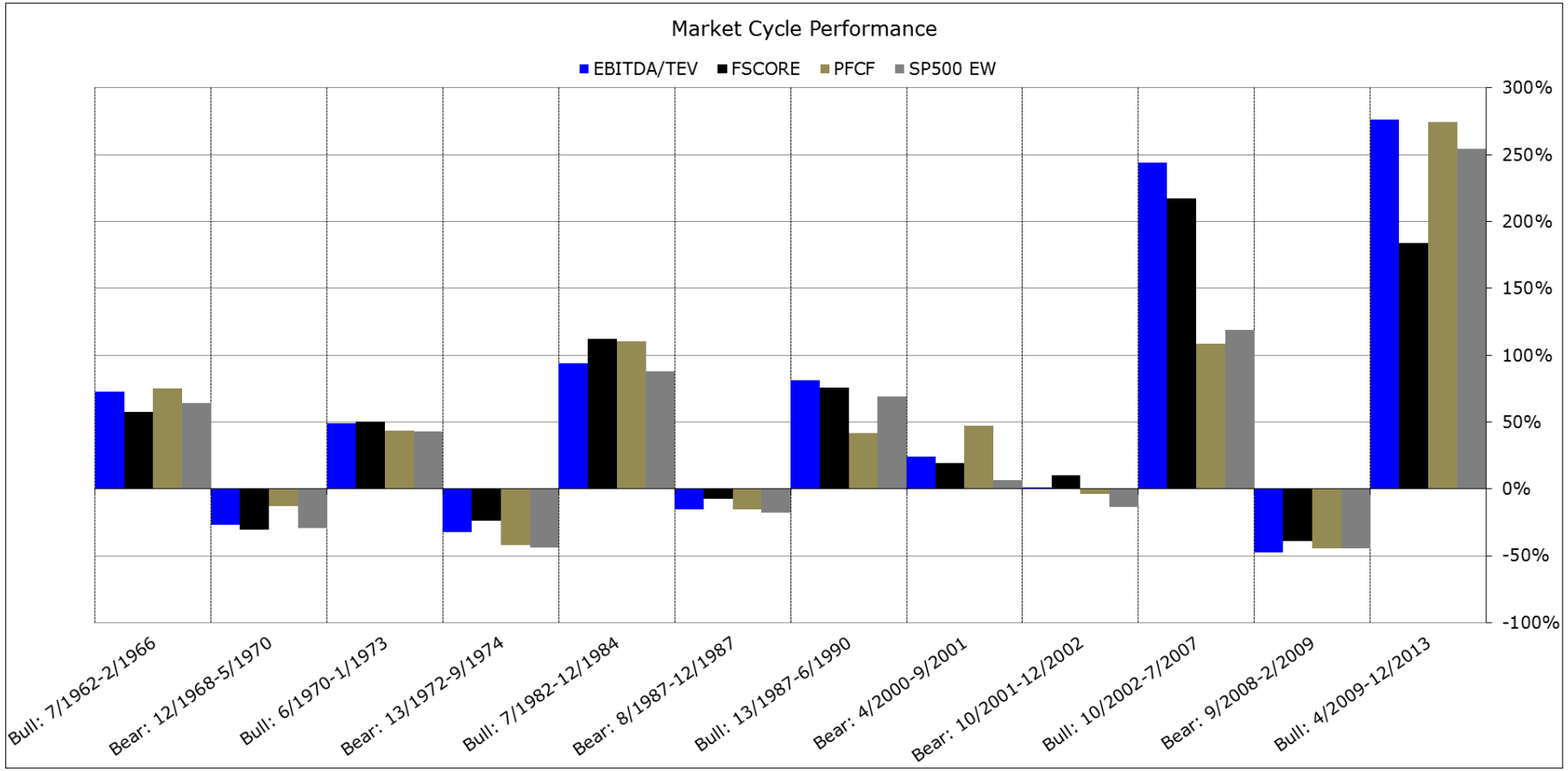
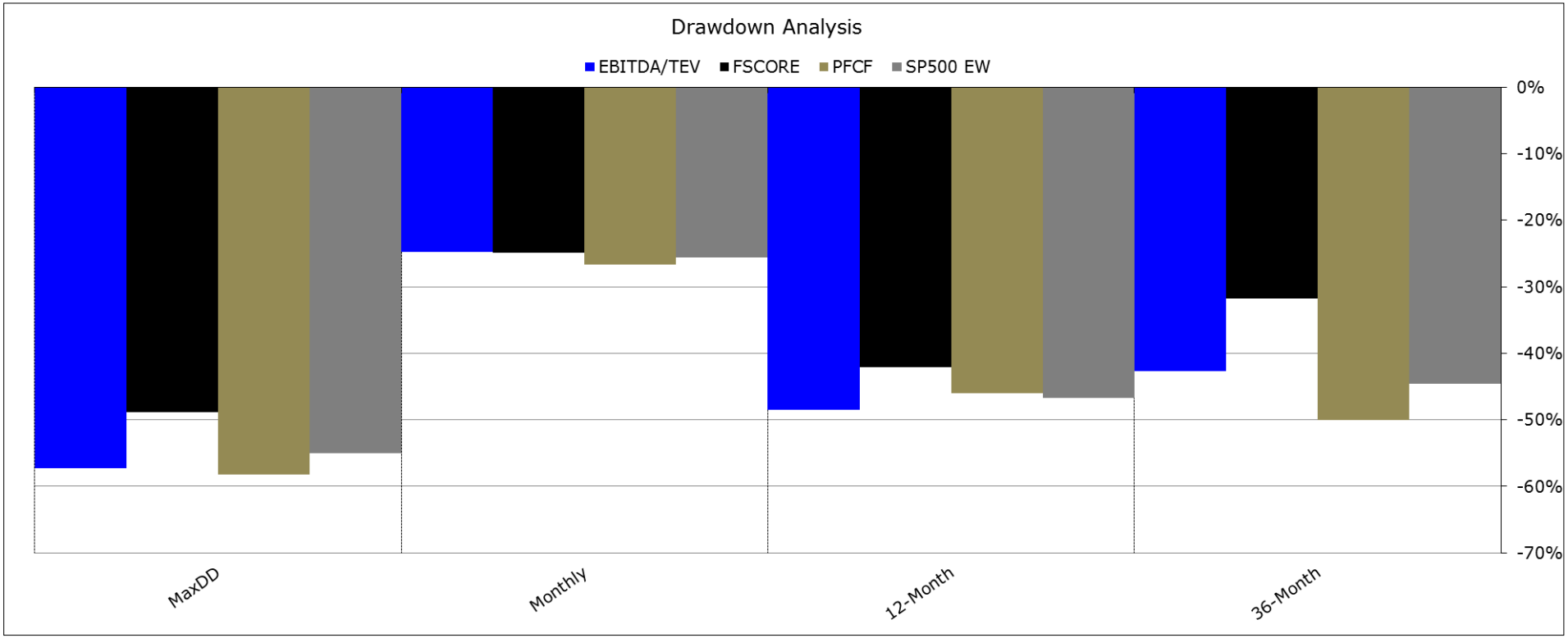


**Figure 4:** Drawdown Analysis from July 1, 1963 through December 31, 2013



## Table 1: Number of Firms in each Portfolio

This table reports summary statistics related to the number of firms in each portfolio per month over the time period from 7/1/63 through 12/31/13. We tabulate the mean, median, standard deviation (STD), minimum (MIN), 25% percentile (Q1), 75% percentile (Q3), and maximum (MAX).

| | MEAN | MEDIAN | STD | MIN | Q1 | Q3 | MAX |
|---|---|---|---|---|---|---|---|
| FRT | 50 | 50 | 0.6069 | 45 | 50 | 50 | 50 |
| GR_ES | 6 | 2 | 7.1760 | 0 | 1 | 11 | 23 |
| GR_D_U | 25 | 21 | 18.6863 | 3 | 9 | 37 | 75 |
| GR_D_NU | 27 | 10 | 34.7223 | 0 | 4 | 35 | 135 |
| GR_E_I | 14 | 4 | 18.0372 | 0 | 1 | 21 | 57 |
| MF | 26 | 29 | 4.9732 | 14 | 23 | 30 | 30 |
| DOW 10 | 10 | 10 | 0.1464 | 9 | 10 | 10 | 10 |
| DOW 5 | 5 | 5 | 0.1001 | 4 | 5 | 5 | 5 |
| CRF | 2 | 0 | 2.4254 | 0 | 0 | 3 | 9 |
| FSCORE | 13 | 14 | 9.0832 | 0 | 7 | 20 | 33 |
| PFCF | 30 | 30 | 0.7631 | 24 | 30 | 30 | 30 |
| WEISS | 10 | 10 | 10.0785 | 0 | 0 | 14 | 40 |
| O'SH_V | 42 | 49 | 14.4438 | 2 | 41 | 50 | 50 |
| EBITDA | 96 | 92 | 22.4545 | 53 | 87 | 105 | 175 |

## Table 2: Correlation between Value Strategies

Pearson correlation coefficients are calculated for the monthly return series on all value strategies. Correlation coefficients over .8 are in bold.

| | FRT | GR_ES | GR_D_U | GR_D_NU | GR_E_I | MF | DOW 10 | DOW 5 | CRF | FSCORE | PFCF | WEISS | O'SH_V | EBITDA | SP500 EW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| FRT | **1.0000** | | | | | | | | | | | | | | |
| GR_ES | 0.5604 | **1.0000** | | | | | | | | | | | | | |
| GR_D_U | **0.8349** | 0.3821 | **1.0000** | | | | | | | | | | | | |
| GR_D_NU | 0.6253 | 0.6319 | 0.4877 | **1.0000** | | | | | | | | | | | |
| GR_E_I | 0.5752 | **0.8813** | 0.4088 | 0.6947 | **1.0000** | | | | | | | | | | |
| MF | 0.6770 | 0.6792 | 0.4964 | **0.8067** | 0.6946 | **1.0000** | | | | | | | | | |
| DOW 10 | 0.6901 | 0.6310 | 0.5560 | 0.6904 | 0.6601 | 0.7449 | **1.0000** | | | | | | | | |
| DOW 5 | 0.6269 | 0.5827 | 0.5027 | 0.6340 | 0.6150 | 0.6847 | **0.9361** | **1.0000** | | | | | | | |
| CRF | 0.5749 | 0.5864 | 0.4414 | 0.6710 | 0.5937 | 0.7601 | 0.6354 | 0.5780 | **1.0000** | | | | | | |
| FSCORE | 0.7809 | 0.6485 | 0.6025 | 0.7542 | 0.6825 | **0.8012** | 0.7361 | 0.6713 | 0.7293 | **1.0000** | | | | | |
| PFCF | 0.7515 | 0.6871 | 0.6153 | 0.7667 | 0.7195 | **0.8507** | 0.7611 | 0.7097 | 0.7292 | **0.8141** | **1.0000** | | | | |
| WEISS | 0.7017 | 0.6583 | 0.5707 | **0.8132** | 0.6942 | **0.8474** | 0.7710 | 0.7072 | 0.7363 | **0.8256** | **0.8307** | **1.0000** | | | |
| O'SH_V | 0.6764 | 0.5986 | 0.5464 | 0.6815 | 0.6208 | 0.7554 | 0.7843 | 0.7076 | 0.6868 | 0.7436 | 0.7675 | 0.7840 | **1.0000** | | |
| EBITDA | 0.7399 | 0.7434 | 0.5553 | **0.8167** | 0.7637 | **0.9289** | **0.8160** | 0.7491 | 0.7705 | **0.8678** | **0.8941** | **0.8799** | **0.8114** | **1.0000** | |
| SP500 EW | 0.7626 | 0.7165 | 0.6062 | **0.8229** | 0.7362 | **0.9059** | **0.8539** | 0.7799 | **0.8101** | **0.8695** | **0.8961** | **0.9143** | **0.8513** | **0.9474** | **1.0000** |

## Table 3: Performance Statistics July 1, 1963 through December 31, 2013

This table reports calendar-time portfolio regression alphas and return statistics for portfolios of firms with market capitalization above the NYSE 40th percentile for market value of equity on June 30th of year *t*. We calculate monthly returns to the portfolios and run regressions of the excess returns against the four-factor model. Average alphas are in monthly percent, p-values are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. Portfolios for each strategy are rebalanced each year on July 1st and are held from July 1st of year *t* until June 30th of year *t+1*. Regression p-values use robust standard errors as computed in Davidson and MacKinnon (1993, pg. 553). CAGR is compound annual growth rate, volatility is annualized standard deviation, annualized Sharpe ratios are calculated as average monthly return less treasury bills divided by monthly return standard deviations, downside deviation is the annualized standard deviation of monthly observations below 0, annualized Sortino ratios are calculated as average monthly return less a 5%/12 minimum acceptable monthly return divided by downside deviation.

| | FRT | GR_ES | GR_D_U | GR_D_NU | GR_E_I | MF | DOW 10 | DOW 5 | CRF | FSCORE | PFCF | WEISS | O'SH_V | EBITDA /TEV | SP500 EW |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Alpha | 0.136 | 0.048 | 0.035 | 0.241 | 0.132 | **0.386** | 0.065 | -0.039 | 0.072 | **0.332** | **0.256** | -0.003 | 0.153 | **0.370** | **0.134** |
| | 0.156 | 0.846 | 0.789 | 0.113 | 0.519 | *0.001* | 0.555 | 0.815 | 0.689 | *0.003* | *0.015* | 0.980 | 0.267 | *0.000* | *0.003* |
| MKT | **0.687** | **1.141** | **0.631** | **0.993** | **1.091** | **1.066** | **0.983** | **1.087** | **1.115** | **0.953** | **0.965** | **0.997** | **1.079** | **1.065** | **1.079** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| SMB | 0.059 | **0.490** | **-0.167** | **0.351** | **0.439** | **0.446** | -0.061 | 0.022 | 0.200 | **0.167** | **0.217** | **0.148** | **-0.254** | **0.331** | **0.136** |
| | 0.121 | *0.000* | *0.000* | *0.000* | *0.001* | *0.000* | 0.136 | 0.740 | 0.097 | *0.000* | *0.000* | *0.028* | *0.000* | *0.000* | *0.000* |
| HML | **0.575** | **0.510** | **0.493** | **0.420** | **0.541** | **0.278** | **0.523** | **0.671** | 0.083 | **0.521** | **0.528** | **0.276** | **0.326** | **0.471** | **0.283** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | 0.373 | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| MOM | -0.071 | **-0.327** | 0.036 | **-0.112** | **-0.228** | **-0.282** | **-0.156** | **-0.184** | **-0.246** | -0.061 | **-0.168** | **-0.093** | **-0.175** | **-0.216** | **-0.137** |
| | *0.011* | *0.008* | 0.322 | *0.006* | *0.005* | *0.000* | *0.000* | *0.000* | *0.000* | 0.057 | *0.000* | *0.022* | *0.000* | *0.000* | *0.000* |
| CAGR | 12.76% | 10.12% | 10.79% | 14.70% | 12.52% | 15.02% | 11.66% | 10.89% | 9.17% | 16.74% | 14.88% | 10.78% | 11.36% | 16.52% | 12.80% |
| Volatility | 13.23% | 27.60% | 13.47% | 20.27% | 25.17% | 20.99% | 17.04% | 20.98% | 23.15% | 17.16% | 17.57% | 17.70% | 18.43% | 18.82% | 17.35% |
| Sharpe Ratio | 0.600 | 0.308 | 0.460 | 0.537 | 0.398 | 0.539 | 0.443 | 0.363 | 0.281 | 0.702 | 0.598 | 0.388 | 0.409 | 0.647 | 0.497 |
| Downside Deviation | 8.04% | 19.46% | 8.41% | 14.01% | 17.21% | 15.25% | 12.27% | 14.84% | 16.07% | 11.91% | 12.34% | 12.20% | 13.65% | 13.66% | 12.11% |
| Sortino Ratio | 0.986 | 0.437 | 0.735 | 0.775 | 0.582 | 0.742 | 0.615 | 0.512 | 0.404 | 1.010 | 0.850 | 0.562 | 0.551 | 0.890 | 0.712 |

## Table 4: Performance Statistics by Sub-Period

This table reports calendar-time portfolio regression alphas and return statistics for portfolios of firms with market capitalization above the NYSE 40th percentile for market value of equity on June 30th of year *t*. We calculate monthly returns to the portfolios and run regressions of the excess returns against the four-factor model. Average alphas are in monthly percent, p-values are shown below the coefficient estimates, and 5% statistical significance is indicated in bold. Portfolios for each strategy are rebalanced each year on July 1st and are held from July 1st of year *t* until June 30th of year *t+1*. Regression p-values use robust standard errors as computed in Davidson and MacKinnon (1993, pg. 553). CAGR is compound annual growth rate, volatility is annualized standard deviation, annualized Sharpe ratios are calculated as average monthly return less treasury bills divided by monthly return standard deviations, downside deviation is the annualized standard deviation of monthly observations below 0, annualized Sortino ratios are calculated as average monthly return less a 5%/12 minimum acceptable monthly return divided by downside deviation.

| Panel A: 7/1/1963 – 12/31/1980 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FRT | GR_ES | GR_D_U | GR_D_NU | GR_E_I | MF | DOW 10 | DOW 5 | CRF | FSCORE | PFCF | WEISS | O'SH_V | EBITDA /TEV | SP500 EW |
| Alpha | 0.097 | 0.154 | 0.003 | **0.261** | 0.045 | 0.089 | 0.034 | 0.027 | 0.090 | **0.259** | 0.224 | 0.077 | 0.133 | **0.331** | 0.089 |
| | 0.492 | 0.430 | 0.987 | *0.039* | 0.771 | 0.550 | 0.831 | 0.913 | 0.124 | *0.046* | 0.201 | 0.143 | 0.151 | *0.001* | 0.131 |
| MKT | **0.729** | **1.065** | **0.783** | **1.065** | **1.084** | **0.962** | **0.962** | **1.084** | **1.075** | **1.013** | **0.891** | **1.036** | **0.990** | **1.024** | **1.038** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| SMB | **0.159** | **0.604** | **-0.170** | **0.373** | **0.440** | **0.617** | 0.038 | 0.101 | **0.379** | **0.349** | **0.188** | **0.292** | **-0.175** | **0.414** | **0.289** |
| | *0.001* | *0.000* | *0.008* | *0.000* | *0.000* | *0.000* | 0.557 | 0.326 | *0.000* | *0.000* | *0.002* | *0.000* | *0.000* | *0.000* | *0.000* |
| HML | **0.620** | **0.562** | **0.335** | **0.346** | **0.486** | **0.310** | **0.559** | **0.742** | **0.065** | **0.435** | **0.557** | **0.120** | **0.116** | **0.445** | **0.259** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.021* | *0.000* | *0.000* | *0.000* | *0.004* | *0.000* | *0.000* |
| MOM | **-0.237** | **-0.275** | **-0.167** | **-0.207** | **-0.205** | **-0.250** | **-0.162** | **-0.172** | **-0.040** | -0.037 | -0.072 | **-0.087** | **-0.096** | **-0.141** | **-0.107** |
| | *0.000* | *0.000* | *0.003* | *0.000* | *0.000* | *0.000* | *0.000* | *0.006* | *0.038* | 0.369 | 0.164 | *0.000* | *0.004* | *0.000* | *0.000* |
| CAGR | 9.86% | 12.24% | 6.34% | 12.73% | 10.79% | 10.68% | 9.46% | 10.29% | 11.39% | 15.24% | 13.77% | 10.44% | 8.51% | 15.31% | 11.04% |
| Volatility | 14.39% | 22.72% | 14.34% | 19.50% | 20.75% | 20.37% | 16.25% | 19.97% | 18.93% | 18.29% | 16.51% | 17.72% | 14.69% | 18.69% | 17.61% |
| Sharpe Ratio | 0.322 | 0.366 | 0.096 | 0.417 | 0.319 | 0.316 | 0.282 | 0.299 | 0.360 | 0.553 | 0.515 | 0.323 | 0.236 | 0.549 | 0.355 |
| Downside Deviation | 7.34% | 13.36% | 8.14% | 12.30% | 13.10% | 12.18% | 9.59% | 10.06% | 12.19% | 11.22% | 8.98% | 11.42% | 9.02% | 11.83% | 10.78% |
| Sortino Ratio | 0.739 | 0.682 | 0.266 | 0.725 | 0.566 | 0.593 | 0.560 | 0.672 | 0.624 | 0.972 | 1.035 | 0.571 | 0.472 | 0.933 | 0.653 |

## Table 4: Performance Statistics by Sub-Period (Continued)

| Panel B: 1/1/1981 – 12/31/1996 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | FRT | GR_ES | GR_D_U | GR_D_NU | GR_E_I | MF | DOW 10 | DOW 5 | CRF | FSCORE | PFCF | WEISS | O'SH_V | EBITDA /TEV | SP500 EW |
| Alpha | 0.136 | -0.038 | -0.075 | 0.030 | 0.202 | **0.432** | 0.266 | 0.295 | -0.363 | **0.351** | 0.242 | 0.063 | 0.036 | **0.437** | 0.094 |
| | 0.497 | 0.931 | 0.724 | 0.913 | 0.598 | *0.041* | 0.142 | 0.274 | 0.175 | *0.045* | 0.075 | 0.767 | 0.619 | *0.000* | 0.096 |
| MKT | **0.628** | **1.138** | **0.600** | **0.968** | **1.089** | **1.110** | **1.034** | **1.121** | **1.052** | **0.913** | **0.988** | **1.016** | **1.047** | **1.033** | **1.120** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| SMB | **-0.278** | 0.181 | **-0.345** | **0.331** | **0.485** | **0.445** | 0.021 | 0.169 | **0.461** | 0.002 | **0.276** | **0.159** | **-0.230** | **0.251** | **0.145** |
| | *0.001* | 0.247 | *0.000* | *0.003* | *0.000* | *0.000* | 0.806 | 0.188 | *0.000* | 0.983 | *0.000* | 0.051 | *0.000* | *0.000* | *0.000* |
| HML | **0.461** | **0.419** | **0.474** | 0.099 | **0.430** | 0.035 | **0.426** | **0.402** | 0.067 | **0.433** | **0.231** | -0.126 | **0.201** | **0.195** | **0.128** |
| | *0.000* | *0.014* | *0.000* | 0.291 | *0.006* | 0.705 | *0.000* | *0.000* | 0.544 | *0.000* | *0.000* | 0.208 | *0.000* | *0.000* | *0.000* |
| MOM | 0.078 | 0.122 | 0.134 | 0.093 | 0.120 | **-0.228** | **-0.151** | **-0.193** | -0.025 | -0.044 | **-0.130** | **-0.165** | **-0.067** | **-0.295** | **-0.091** |
| | 0.236 | 0.447 | 0.053 | 0.268 | 0.280 | *0.002* | *0.013* | *0.022* | 0.785 | 0.476 | *0.007* | *0.027* | *0.012* | *0.000* | *0.000* |
| CAGR | 17.68% | 17.66% | 15.10% | 15.73% | 20.81% | 18.77% | 20.07% | 19.91% | 9.49% | 21.52% | 18.14% | 12.69% | 16.47% | 19.36% | 16.83% |
| Volatility | 11.28% | 23.64% | 11.60% | 17.88% | 22.51% | 18.84% | 15.45% | 19.22% | 19.84% | 14.22% | 15.09% | 17.68% | 14.65% | 15.53% | 16.19% |
| Sharpe Ratio | 0.907 | 0.521 | 0.692 | 0.535 | 0.657 | 0.657 | 0.832 | 0.696 | 0.216 | 0.974 | 0.740 | 0.386 | 0.658 | 0.789 | 0.630 |
| Downside Deviation | 6.82% | 14.99% | 6.62% | 13.59% | 15.31% | 14.99% | 12.00% | 14.01% | 13.62% | 9.43% | 11.76% | 12.91% | 10.24% | 11.75% | 12.24% |
| Sortino Ratio | 1.761 | 0.941 | 1.482 | 0.834 | 1.082 | 0.945 | 1.220 | 1.082 | 0.446 | 1.658 | 1.101 | 0.667 | 1.115 | 1.194 | 0.979 |
| Panel C: 1/1/1997 – 12/31/2013 | | | | | | | | | | | | | | | |
| | FRT | GR_ES | GR_D_U | GR_D_NU | GR_E_I | MF | DOW 10 | DOW 5 | CRF | FSCORE | PFCF | WEISS | O'SH_V | EBITDA /TEV | SP500 EW |
| Alpha | 0.257 | -0.286 | 0.367 | 0.567 | 0.026 | **0.627** | -0.068 | -0.316 | 0.217 | 0.423 | 0.297 | 0.090 | 0.225 | **0.424** | **0.206** |
| | 0.100 | 0.580 | 0.134 | 0.102 | 0.955 | *0.012* | 0.755 | 0.331 | 0.616 | 0.078 | 0.143 | 0.670 | 0.520 | *0.016* | *0.011* |
| MKT | **0.658** | **1.085** | **0.515** | **0.861** | **1.005** | **1.039** | **0.926** | **1.002** | **1.107** | **0.862** | **0.947** | **0.849** | **1.108** | **1.062** | **1.014** |
| | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| SMB | 0.067 | **0.611** | **-0.136** | **0.363** | 0.503 | **0.375** | -0.157 | -0.081 | 0.005 | 0.091 | **0.295** | 0.080 | **-0.226** | **0.336** | 0.055 |
| | 0.112 | *0.039* | *0.038* | *0.005* | 0.065 | *0.000* | 0.052 | 0.541 | 0.981 | 0.181 | *0.000* | 0.418 | *0.001* | *0.000* | 0.068 |
| HML | **0.542** | 0.499 | **0.561** | **0.600** | **0.632** | **0.355** | **0.524** | **0.732** | 0.049 | **0.537** | **0.692** | **0.517** | **0.514** | **0.599** | **0.341** |
| | *0.000* | 0.080 | *0.000* | *0.000* | *0.001* | *0.000* | *0.000* | *0.000* | 0.770 | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* | *0.000* |
| MOM | -0.042 | **-0.483** | 0.073 | **-0.145** | **-0.344** | **-0.301** | **-0.163** | **-0.202** | **-0.370** | **-0.089** | **-0.223** | **-0.103** | **-0.221** | **-0.224** | **-0.168** |
| | 0.245 | *0.012* | 0.173 | *0.024* | *0.005* | *0.000* | *0.005* | *0.012* | *0.001* | *0.049* | *0.000* | *0.046* | *0.001* | *0.000* | *0.000* |
| CAGR | 11.27% | 1.46% | 11.48% | 15.81% | 6.92% | 16.12% | 6.43% | 3.60% | 6.64% | 13.92% | 13.01% | 9.37% | 9.65% | 15.14% | 10.92% |
| Volatility | 13.66% | 34.76% | 14.13% | 23.05% | 31.04% | 23.44% | 19.06% | 23.37% | 29.28% | 18.47% | 20.59% | 17.77% | 24.22% | 21.66% | 18.16% |
| Sharpe Ratio | 0.672 | 0.148 | 0.668 | 0.648 | 0.292 | 0.655 | 0.295 | 0.166 | 0.282 | 0.668 | 0.581 | 0.455 | 0.403 | 0.650 | 0.529 |
| Downside Deviation | 9.52% | 26.04% | 9.99% | 15.64% | 20.89% | 18.31% | 14.69% | 19.10% | 20.19% | 14.03% | 15.39% | 12.44% | 18.73% | 16.52% | 13.37% |
| Sortino Ratio | 0.698 | 0.100 | 0.692 | 0.794 | 0.312 | 0.701 | 0.211 | 0.071 | 0.284 | 0.700 | 0.613 | 0.447 | 0.386 | 0.699 | 0.529 |