**Relative Performance of Fundamental Indexation**

Table 1 and Table 2 show the return characteristics of the original Dow Jones Utility Index and alternative fundamental indices for price return from July 1961 to December 2018 and total return from July 1988 to December 2018, respectively.

Of particular note from the tables is that most of the fundamental indices in price return fail to generate excessive returns over Dow Jones Utility Average (DJUA) that are statistically indifferent from zero, whereas most total return fundamental indices manifest statistically significant outperformance over DJUA with an average t-statistic of 2.06. This seems to be due to the fact that the utility index consists mainly of stable stocks that earn profit from dividends rather than stock price rises; the average geometric return of total return indices is nearly three times higher than that of price return indices. For the same reason, most of price return indices underperformed risk-free rate during the observed period.

In the suggested ten fundamental metrics, Market Capitalisation is related to the size of firms and remaining metrics are about profitability ratio or balance sheet ratio. It is interesting that all the metrics except for Current Ratio of total return outperformed Market Capitalisation in terms of geometric return. It implies that perhaps profitability ratios are superior to firm size-related indicators, if the goal is to attain possible maximum return.

It is noticeable that ROIC is the only metric that produces statistically significant outperformance over the original indices in both price return and total return, having t-statistics of 1.78 and 2.18 for each return. Although ROIC does not render the largest Sharpe Ratio and Information Ratio for total return owing to its high volatility, ROIC has unrivaled profitability among the various indicators. The monthly geometric return of ROIC is as high as about 1.5 times of average geometric return for both price and total returns.

**Table 1 Monthly Performances of Fundamentally Weighted Price Return Indices, Jan 1964 - Dec 2018**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Ending Value of 1$ | Geometric  Return | Volatility | VS RF rate  (3M US Treasury) | | | VS Original Index | | |
| **Excess Return** | **Sharpe Ratio** | **t-Stats\*** | **Excess Return** | **Information Ratio** | **t-Stats\*** |
| DJUAPR | $ 5.14 | 0.25% | 4.14% | -0.14% | -3.31% | -0.31 | - | - | - |
| ROA  (Return on Asset) | $ 9.33 | 0.34% | 80.13% | -0.04% | -0.05% | -0.91 | -0.22% | -0.28% | -0.89 |
| ROIC  (Return on Invested Capital) | $ 37.61 | 0.55% | 7.73% | 0.16% | 2.12% | 1.32 | 0.31% | 4.80% | 1.80 |
| ROCE  (Return on Capital Employed) | $ 9.67 | 0.34% | 4.79% | -0.04% | -0.87% | 0.39 | 0.10% | 4.71% | 1.48 |
| Gross Margin | $ 5.52 | 0.26% | 4.53% | -0.13% | -2.79% | -0.13 | 0.01% | 0.66% | 0.40 |
| Profit Margin | $ 6.69 | 0.29% | 17.96% | -0.09% | -0.53% | -0.05 | 0.04% | 0.23% | 0.02 |
| EBITDA Margin | $ 5.34 | 0.25% | 4.51% | -0.13% | -2.92% | -0.16 | 0.01% | 0.34% | 0.32 |
| Current Ratio | $ 6.99 | 0.30% | 4.49% | -0.09% | -2.02% | 0.07 | 0.05% | 2.65% | 0.90 |
| Long-Term Debt to Equity Ratio | $ 10.64 | 0.36% | 32.35% | -0.02% | -0.07% | 0.18 | 0.11% | 0.35% | 0.23 |
| Market Capitalisation | $ 3.77 | 0.20% | 4.53% | -0.18% | -4.07% | -0.46 | -0.05% | -2.56% | -0.41 |
| Average | $ 10.07 | 0.31% | 16.52% | -0.07% | -1.45% | -0.01 | 0.04% | 1.21% | 0.43 |

\* One-tail critical t-statistics is 1.65

**Table 2 Monthly Performances of Fundamentally Weighted Total Return Indices, Jan 1989 - Dec 2018**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Ending Value of 1$ | Geometric  Return | Volatility | VS RF rate  (3M US Treasury) | | | VS Original Index | | |
| **Excess Return** | **Sharpe Ratio** | **t-Stats\*** | **Excess Return** | **Information Ratio** | **t-Stats\*** |
| DJUATR | $ 6.16 | 0.7497% | 4.17% | 0.51% | 12.14% | 2.70 | - | - | - |
| ROA  (Return on Asset) | $ 42.27 | 1.0455% | 49.91% | 0.81% | 1.62% | -0.46 | 0.46% | 0.93% | -0.68 |
| ROIC  (Return on Invested Capital) | $ 181.77 | 1.4557% | 9.32% | 1.21% | 13.03% | 3.11 | 1.07% | 12.78% | -0.69 |
| ROCE  (Return on Capital Employed) | $ 40.60 | 1.0342% | 4.78% | 0.79% | 16.60% | 3.58 | 0.65% | 26.65% | 3.20 |
| Gross Margin | $ 28.79 | 0.9377% | 4.45% | 0.69% | 15.60% | 3.38 | 0.55% | 27.29% | 3.11 |
| Profit Margin | $ 43.28 | 1.0521% | 23.47% | 0.81% | 3.47% | 0.80 | 0.01% | 0.03% | 0.34 |
| EBITDA Margin | $ 28.19 | 0.9318% | 4.42% | 0.69% | 15.60% | 3.38 | 0.54% | 27.36% | 3.10 |
| Operating Cash Flow Margin | $ 29.46 | 0.9442% | 4.21% | 0.70% | 16.66% | 3.55 | 0.55% | 29.43% | 3.38 |
| Current Ratio | $ 24.56 | 0.8931% | 4.44% | 0.65% | 14.65% | 3.20 | 0.51% | 25.58% | 2.34 |
| Long-Term Debt to Equity Ratio | $ 47.38 | 1.0775% | 63.36% | 0.84% | 1.33% | 0.76 | 0.33% | 0.52% | 0.59 |
| Market Capitalisation | $ 26.76 | 0.9172% | 4.19% | 0.67% | 16.10% | 3.44 | 0.52% | 29.41% | 3.23 |
| Average | $ 45.38 | 1.0035% | 16.07% | 0.76% | 11.53% | 2.50 | 0.52% | 18.00% | 1.79 |

\* One-tail critical t-statistics is 1.65

**Distribution of Fundamental Indexation**

As is shown in Table 3 and Table 4, Market Capitalisation, the only size metric has the smallest absolute value in skewness, and the third smallest absolute value in kurtosis for both price and total return. This means that return distribution of Market Capitalisation index is almost symmetrical and has thin tail, which is also in line with the low volatility of Market Capitalisation index. Most of profitability ratio and balance sheet ratio indices are more exposed to big downside risk than Market Capitalisation or the original index is.

Especially, ROA, ROIC, Profit Margin, and Long-Term Debt to Equity Ratio have extremely high absolute values for kurtosis. The fact that these metrics have fat tails in their distributions can also be seen in the maximum and minimum return data. For example, ROA index’s maximum 12-month return has reached almost 1,000% once, while its historical minimum 3-month return is as low as -7,400%.

Nevertheless, having fat tail does not necessarily make these indices bad. ROIC and Long-Term Debt to Equity Ratio have large positive values - 8.43 and 15.13 respectively for total return - as their skewness, which means we are more likely to enjoy upside potential from these indices than to suffer from downside risk. In case of ROIC, maximum return is nearly four times greater than minimum monthly return in absolute term for 1-month, 3-month, and 12-month returns. This also accords with that ROIC and Long-Term Debt to Equity Ratio are the two most profitable indices in Table 1 and 2.

**Table 3 Distribution of Fundamentally Weighted Price Return Indices, Jan 1964 - Dec 2018**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Skewness | Kurtosis | Maximum Monthly Return | Minimum Monthly Return | Maximum 3-Month Return | Minimum  3-Month Return | Maximum 12-Month Return | Minimum  12-Month Return |
| DJUAPR | -0.23 | 0.82 | 13.41% | -16.02% | 27.68% | -24.55% | 46.70% | -41.68% |
| ROA\* | -24.19 | 610.11 | 236.82% | -2018.05% | 197.14% | -7399.16% | 991.84% | -6023.88% |
| ROIC | 8.30 | 138.22 | 134.33% | -30.60% | 125.15% | -27.62% | 161.42% | -43.59% |
| ROCE | 0.26 | 2.48 | 27.47% | -17.66% | 55.88% | -28.14% | 100.79% | -41.76% |
| Gross Margin | -0.20 | 1.35 | 16.88% | -21.34% | 40.09% | -30.76% | 62.44% | -44.46% |
| Profit Margin | -8.66 | 210.60 | 149.74% | -339.18% | 677.52% | -744.87% | 670.63% | -1942.19% |
| EBITDA Margin | -0.18 | 1.19 | 16.88% | -20.12% | 37.60% | -28.96% | 56.73% | -44.46% |
| Current Ratio | -0.21 | 1.67 | 19.25% | -21.33% | 39.49% | -34.02% | 67.16% | -44.29% |
| Long-Term Debt to Equity Ratio | 13.51 | 342.39 | 697.31% | -310.06% | 1182.40% | -1255.56% | 3981.28% | -3825.06% |
| Market Capitalisation | -0.02 | 1.22 | 19.44% | -17.65% | 34.76% | -30.31% | 58.32% | -49.46% |
| Average | -1.16 | 131.00 | 133.15% | -281.20% | 241.77% | -960.39% | 619.73% | -1210.08% |

\* For ROA, the data is available from July 1963 to December 2018

**Table 4 Distribution of Fundamentally Weighted Total Return Indices, Jul 1988 - Dec 2018**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Index | Skewness | Kurtosis | Maximum Monthly Return | Minimum Monthly Return | Maximum 3-Month Return | Minimum  3-Month Return | Maximum 12-Month Return | Minimum  12-Month Return |
| DJUAPR | -0.48 | 0.55 | 12.39% | -13.33% | 30.78% | -21.63% | 51.65% | -31.80% |
| ROA | -13.86 | 244.21 | 240.86% | -856.87% | 203.06% | -3002.21% | 1000.72% | -2502.11% |
| ROIC | 8.43 | 117.26 | 134.84% | -28.59% | -26.87% | -26.87% | 194.69% | -32.58% |
| ROCE | 0.29 | 3.80 | 27.36% | -17.55% | 57.59% | -27.47% | 108.80% | -33.09% |
| Gross Margin | -0.57 | 1.98 | 15.83% | -21.26% | 40.81% | -30.14% | 67.14% | -33.25% |
| Profit Margin | -4.48 | 98.58 | 180.43% | -307.25% | 779.73% | -659.71% | 692.45% | -1736.20% |
| EBITDA Margin | -0.53 | 1.63 | 14.40% | -20.04% | 38.39% | -28.33% | 61.74% | -31.42% |
| Operating Cash Flow Margin | -0.43 | 0.68 | 13.93% | -13.00% | 33.52% | -22.70% | 52.94% | -32.84% |
| Current Ratio | -0.58 | 2.15 | 15.34% | -21.28% | 40.26% | -33.44% | 71.58% | -37.54% |
| Long-Term Debt to Equity Ratio | 15.13 | 275.71 | 1123.10% | -301.72% | 1905.34% | -1029.34% | 6389.14% | -3131.51% |
| Market Capitalisation | -0.14 | 1.14 | 19.37% | -11.18% | 35.80% | -22.07% | 63.38% | -27.70% |
| Average | 0.25 | 67.97 | 163.44% | -146.55% | 285.31% | -445.81% | 795.84% | -693.64% |