Portfolio Allocation Using Free Cash Flows and Other Methods

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Abstract

There are many ways to allocate money invested in shares of common stock within one's portfolio. The traditional and best known allocation methods are price-weighting, market capitalization-weighting, and equal-weighting. Of these three traditional allocation methods, we find that equally-weighted portfolios performed the best. More recently, attention has been focused on "fundamental weightings" which use financial statement items such as sales, total assets, net income, leverage, EBIT, and free cash flows to weight stock portfolio investments. Using a well-known set of stocks, this research provides insight into the relative advantages of using some of these alternative portfolio allocation methods. This study found that using free cash flows to weight portfolios was the only technique that outperformed equally-weighted portfolios and provided the investor with positive, statistically significant returns. It was also found that when using free cash flows to weight the portfolios, levels of free cash flows were more important that trends.

I. Introduction/Literature Review

This study explores some of the almost infinite number of methods that can be used to allocate funds invested in a stock portfolio. After briefly considering the traditional methods of valuation-weighting, price-weighting, and equal-weighting, we explore a number of promising fundamental factors that have been mentioned in the literature.

In their study of small firms, Hackel, Livnat, and Rai (1994) investigate the benefits of selecting stocks on the basis of operating and free cash flows, low financial leverage, and low free cash flow multiples (defined as price/free cash flows). They found that these stocks performed better than value-weighted, similar beta, and similar book/market value equities over a fourteen-year period. In subsequent research, they again found superior investment results for portfolios consisting of stocks with consistent free cash flows, low financial leverage, and those that were sold at low free cash flow multiples based upon a more recent four-year period (Hackel, Livnat, and Rai, 2000). Testing the robustness of this result in Finland, Jokipii and Vahamaa (2006) reached a similar conclusion.

In their research on fundamental indexation, Krueger and Wrolstad (2010) found that equal weighted portfolios outperformed the other two traditional weighting schemes of price-weighting and market capitalization-weighting. They also found that both net income and free cash flow-weighted portfolios outperformed other fundamental factors considered. Their "fundamental factor" portfolio allocation research was based upon two variables from the income statement, balance sheet, and statement of cash flows. When analyzing financial performance for portfolios allocated by the income statement's firm sales and net income, they found that the sales revenue and net income trends were more important than their actual levels. The highest average return for the two variables occurred when investment was based upon the year-to-year net income trend over the 2001 to 2010 period. From the balance sheet, they looked at financial leverage and firm size as measured by total assets. Use of both of

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these factors resulted in negative portfolio returns over the investment period. Overall, the two highest performing portfolios in their study were the ones where investment was allocated on the basis of the net income and free cash flows variables.

The popular press has also noted the value of using free cash flow in structuring portfolios. In a relatively recent article, the Dow Theory Forecasts authors concluded that "since 1992, the factor with the highest returns is price/free-cash-flow (P/FCF)" (Dow Theory Forecasts, 2005). They found that a P/FCF strategy outperforms the average stock in nearly 80% of the three-month holding periods studied. In their study, not only did stocks with low P/FCF ratios outperform other portfolios studied, but those with highest P/FCF ratios tended to underperform. Another of their conclusions was that P/FCF ratios work well for all stocks but they worked best for small-capitalization stocks.

Similar to other research relying on a priori assumptions about probabilities and data attributes, relying on previous research we make the assumption that having an above average FCF will lead to superior investment performance ((Hill, 1976), (Honohan, 1980), (Jin, Xu, and Zhou, 2008), (Mao and Sarndal, 1966)). The unique contribution of this research is the use of a fixed group of stocks that are weighted using different schemes to optimize the overall portfolio performance. The results of this research may be of particular interest to mutual fund managers that have to balance the desire to focus their investments on a goal like social responsibility or an industry with relatively few publically held companies, yet still achieve a competitive rate of return for their investors.

II. Research Methodology

Stocks issued by firms in the Dow Jones Industrial Average (DJIA) were chosen to be the sample because they comprise a well-known, stable category of companies for which complete data is available. Twenty-three of the thirty stocks in the DJIA were a component of the index for the entire 2000 to 2010 sample period. Portfolio allocations were updated on an annual basis as information from the prior year was used to form portfolios for the subsequent year.

This study uses two methods of incorporating fundamental firm information into the investment process. The primary method, and the one just mentioned, is to base portfolio allocation upon a firm's financial statement values during the prior year. More is invested in firms with higher financial statement values while firms with negative values are shorted. This will be referred to as the "Levels" method. The second allocation method bases allocation on the change in financial statement values from the preceding year. The change in the fundamental firm variable from "Year 1" to "Year 2" is the basis of portfolio allocation at the end of "Year 2" generating performance in "Year 3." This allocation approach will be referred to as the "Trends" method. For instance, the change from 1999 to 2000 is used to allocate wealth in 2001. The following year the change from 2000 to 2001 is used in the allocation of portfolio wealth for 2002. The same "trends" process is used throughout the remainder of the sample period. There are many reasons why the "Levels" and "Trends" findings may be different. For instance, a DJIA firm may consistently have high sales, resulting in a high allocation within the "Levels" portfolio and have no allocation in the trends portfolio due to its

sales stability. Funds are allocated to the seven new members of the DJIA on the first day of the year in which they joined the DJIA. Removed companies are eliminated from the sample on the same day. This revision was necessary because we had only annual Morningstar data available for this analysis. The procedure has a minimal effect upon the results since it only impacts seven of three hundred observations, or less than three percent of all observations.

For the free cash flow allocation method, we also examine the simultaneous response of stock prices. In the process, we evaluate whether stock prices adjust to insights regarding free cash flows arising from press releases, quarterly reports, and the like. Since we are using annual data, we are effectively assessing the financial advantage of allocating wealth with perfect foresight regarding simultaneous free cash flow production. Given the consistent strength of this fundamental variable, we expanded the investigation and studied how well portfolios formed on the basis of free cash flows perform across bull and bear stock market conditions, in sequential sub-periods, and contemporaneous sub-periods.

Our null hypothesis is that the specified allocation method does not provide a return that is different from zero. Given the time period studied, with the stock market recessions following the 9/11 terrorist attack and 2007/2008 financial crisis, identification of an allocation technique that resulted in a statistically-significant positive rate of return would be highly regarded and an allocation method that resulted in a statistically-significant negative returns should obviously be avoided. Given that our sample is the market portfolio, we study market-excess returns without additional adjustment for risk, which is consistent with DeBondt and Thaler's (1985) study of domestic stock prices and Jordan's (2012) study of foreign stock prices. The alternative hypothesis is that the specified allocation scheme has an impact on investor wealth, and ideally generates a positive excess rate of return. Statistical significance is measured using Student's t-statistics because of the small sample size and lack of evidence that returns are normally distributed.

III. Results

Market Performance Using Traditional Portfolio Allocation Methods

Table I exhibits the performance of the traditional allocation methods during the period studied. Our values for the DJIA performance differ slightly from the published DJIA performance because we are using annual data and the firms which are added to the Dow during a given year are assumed to be in the portfolio for the entire year. The "Dow with Dividends" column uses price-weighting for the allocation and incorporates dividends into the stock returns. The capitalization-weighting column is based on a market value (i.e., shares outstanding multiplied by share price at end of prior year) allocation. We are essentially applying the technique used in computation of the S&P 500 Index performance to the DJIA.

Table I. Return and Risk Measures of Traditional Allocation Methods

Sample Period: 2001-2010

	Price-weighted			
	Without Dividends	With Dividends	Capitalization -weighted	Equally-weighted
Average Return	-0.21%	2.64%	0.46%	4.50%
Median Return	2.47%	5.84%	4.52%	6.95%
Geometric Return	-1.63%	1.12%	-0.80%	2.50%
Standard Deviation	17.10%	17.84%	16.02%	20.63%
Coefficient of Variation	N/A	6.76	34.83	4.58
Value of $1000	$849	$1118	$923	$1280
t-statistic	0.52	0.32	0.46	0.25

*** = 0.01; ** = 0.05; * = 0.10

Comparison of the traditional allocation methods in Table I lead to the conclusion that the equal-weighted portfolio performs better than the other allocation methods. The reason for the superior performance is at least partially caused by the fact that the equal-weighted portfolio is unaffected by share price. It is not biased by the capitalization-weightings' shortcoming of overweighting over-priced companies while underweighting underpriced shares. As an investment scheme, the equal-weighted portfolio had the best risk/return performance of the three traditional methods with an average annual return of 4.50 percent. Although the equal-weighted portfolio has the highest standard deviation, its coefficient of variation (CV) is only 4.58. Neither the equal-weighted, nor the other two allocation methods provide a return which is significantly different from the null assumption of no effect on performance.

Performance Based Upon Cash Flow-Weighted Portfolios

The two fundamental cash flow weighting factors considered are cash flows from operations and free cash flows. Performances of portfolios allocated by cash flow levels and cash flow trends are presented in Table II. Results for operating cash flows are presented in the first two columns, which reveal that whether using levels or trends to allocate invested funds, operating cash flows provide results similar to each other and to the findings for the traditional allocation methods presented in Table I.

By comparison, using free cash flows to allocate the investment portfolio leads to high rates of return, high monetary gains, and statistical significance. An additional finding is that returns arising from portfolio allocation based upon free cash flow levels are higher than those from free cash flow trends. The geometric mean returns are 18.3 percent when free cash flow levels and 14.7 percent when cash flow trends are employed, which are exhibited in the third row of Table II. The high geometric mean results in the $1,000 initial investment at the end of 2000

Table II. Return, Risk, and Predictive Power of Cash Flow Statement Levels and Trends

Portfolio wealth is allocated on the basis of prior level of operating cash flow and free cash flow, plus trends in these variable from the year before to the year prior to investment.

Sample Period: 2001-2010

	Operating Cash Flows		Free Cash Flows	
	Levels	Trends	Levels	Trends
Average Return	2.8%	4.1%	31.2%	19.3%
Median Return	3.5%	2.5%	14.7%	10.7%
Geometric Return	0.1%	2.2%	18.3%	14.7%
Standard Deviation	23.5%	20.4%	74.1%	34.5%
Coefficient of Variation	8.39	4.98	2.38	1.79
Value of $1000	$1,009	$1,245	$5,354	$3,949
t-statistic	0.35	0.27	**0.09***	**0.05****

*** = 0.01; ** = 0.05; * = 0.10

reaching $5,354 by the end of 2010, a $4,354 gain! The cash flow trends-based allocation also provides a remarkable gain of $2,949.

There is a significant amount of variance in the performance of free cash flow based portfolios with the standard deviation of the levels-based portfolio reaching 74.1 percent. However, its return stream is sufficiently positive to result in a finding of statistical significance at the 0.10 level of significance. By contrast, the 34.5% standard deviation of the returns of the free cash flow trends-based portfolio is half that of the levels-based portfolio. The coefficients of variation, which measure risk per unit of return, show that the free cash flow-based allocation approach has the lowest observed values of 2.38 and 1.79. With a 0.047 t-statistic for the trends-based portfolio, we are able to conclude that the relatively high returns of this portfolio are statistically different from zero at the 0.05 level!

Strength of Free Cash Flow-Weighted Portfolios during Bull and Bull Markets

Given the statistical significance arising from using free cash flows for portfolio allocation, additional study was made of portfolio returns based upon free cash flows. The first extension is to determine if free cash flows not only provide a positive rate of return but also beat the best market surrogate. Since a key finding in Table I was the superior performance of equal-weighted portfolios, the equal-weighted portfolio is used as the market surrogate. Table III also reports excess returns that could have been achieved if the investor consistently and accurately predicted whether the market would perform well and be considered a "bull market" year or would perform poorly and be considered a "bear market" year. During the period studied, there were four bear market years (2001, 2002, 2005, and 2008) and six bull market years.

Table III. Analysis of Free Cash Flow Across Market Conditions

Market-Excess Returns Versus an Equal-weighted Benchmark

2001-2010

Portfolio Allocation Weighting Scheme:	Free Cash Flow During the Prior Year (i.e., the Level)			Change in the Free Cash Flow During the Prior Year from the Previous Year (i.e., the Trend)		
Economy:	Bear Market	Bull Markets	All Markets	Bear Markets	Bull Markets	All Markets
N	4	6	10	4	6	10
Median	6.8%	16.3%	0.2%	14.3%	1.7%	1.8%
Geometric Mean	7.1%	20.2%	14.8%	27.1%	0.9%	10.6%
Standard Deviation	21.5%	86.7%	64.4%	47.3%	14.4%	33.4%
Value of $1000 investment	$1315	$3030	$3984	$2607	$1054	$2747
t-statistic	0.23	0.12	**0.08***	**0.09***	0.39	**0.09***

*** = 0.01; ** = 0.05; * = 0.10

Market–excess returns would equal zero if the performance of free cash flow based portfolios did not vary from that of the market portfolio. As shown in Table III, the average, median and geometric mean excess returns are always positive. These return measures reach their highest median at 16.3 percent, when free cash flow levels are used during bull markets. Besides being consistently positive, the one other noticeable pattern is that free cash flow trend-based allocation provides higher returns during bear markets. It is not the level of free cash flows but change in this fundamental variable that appears to dictates performance during bear markets.

The fifth row of Table III presents the marginal dollar gains from investing in free cash flow-based portfolios. Although the highest incremental gain (i.e., $3030 - $1,000, or $2030) arises from using free cash flow levels over bull markets, there are more bull markets. On a per year basis, the bear market use of free cash flow trends adds approximately $402 during each of the four bear market years, which is 27.1 percent on a compounded basis. It is also important to note that the "All Markets" gain exceeds the gain on both the bull and bear markets portfolios in both levels and trends portfolios, due to a compounding of positive returns in bear and bull markets. The excess performance of free cash flows in both markets eliminates the need to consistently and accurately predict the existence of a bear or bull market over the coming year.

Returns in excess of the equal-weighted market portfolio, over the entire sample period, using either free cash flow levels or trends are significant at the 0.10 level, as shown in the right column of the bottom line of Table III. The only other significant portfolio is the trend-based free cash flow allocation during bear markets, which is also significant at the 0.10 level. Even this low level of significance is quite remarkable given that there are only four bear-market

observations. Apparently, the high 27.1 percent geometric return is sufficient offset the high 47.3 percent standard deviation.

Sub-period Portfolio Performance

If free cash flows are truly a valuable tool for portfolio allocation, they should be an effective allocation device regardless of the sample period. Table IV divides the ten-year sample period into two sequential five-year sub-periods. In the process we are able to assess whether free cash flow's effectiveness has changed from one five-year period to the next. The returns presented in Table IV are market-excess returns using the equal-weighting allocation method because this method of weighting DJIA members was the best choice across the traditional allocation models, which were exhibited in Table I. Statistics for the entire 2001-2010 period are included for comparison purposes.

Table IV. Free Cash Flows Based Portfolio Performance during Two Sub-periods

Returns are market-excess values after adjustment for the equally-weighted sample portfolio's performance

2001-2010

Portfolio Allocation Weighting Scheme:	Free Cash Flow During the Prior Year (i.e., the Level)			Change in the Free Cash Flow During the Prior Year from the Previous Year (i.e., the Trend)		
Time Period:	2001-2005	2006-2010	2001-2010	2001-2005	2006-2010	2001-2010
Median	-0.3%	10.0%	0.2%	10.0%	18.6%	1.8%
Geometric Mean	2.7%	20.3%	14.8%	22.0%	0.5%	10.6%
Standard Deviation	22.5%	44.4%	64.4%	45.0%	4.6%	33.4%
Value of $1000 investment	$1143	$2521	$3984	$2541	$1053	$2747
t-statistic	0.32	**0.08***	**0.08***	**0.06***	0.39	**0.09***

*** = 0.01; ** = 0.05; * = 0.10

Particular attention should be paid to the second row of Table IV, which reports that none of the geometric means are negative. Hence, portfolio allocation using free cash flows appears to have consistently provided an improvement over the returns earned on the equal-weighted portfolio. Over the first-five year period, from 2001-2005, the trend in free cash flow provided the optimal portfolio formation technique. The 22.0 percent return found in Table IV's fourth column is the largest single sub-period geometric mean return, and almost significant at the 0.05 level despite being based on only five observations.

Over the more recent period from 2006 to 2010, use of free cash flow levels resulted in the highest geometric mean return. The 20.3 percent annual gain earned investors $1521(or $304 annually) in excess of the equal-allocation scheme. Free cash flow levels-based performance was significant at the 0.10 level of significance. Relative to cash flow trends, during the half of

the entire decade with a dramatic fall and rise in stock prices, high cash flow levels apparently led to stronger performance during the subsequent year.

Concurrent Allocation Using Free Cash Flows

Free cash flows are predictive in nature because they can be used in subsequent financing of profitable projects. Stock price is assumed to be based upon future discounted dividend cash flows. Therefore, there may well be a concurrent relationship between these two variables. Following this line of reasoning, one would expect stocks issued by firms with higher cash flows in a given year to earn a positive market-excess return during the same period. Table V presents

Table V. Concurrent Return, Risk, and Descriptive Accuracy of Free Cash Flow Measures

Portfolio wealth is allocated on the basis of current level and trend in free cash flow

Returns are market-excess values after adjustment for the equally-weighted sample portfolio's performance

Sample Period: 2000-2010

	Levels	Trends
Average Return	6.1%	8.4%
Median Return	2.0%	9.0%
Geometric Return	5.1%	3.1%
Standard Deviation	14.9%	24.8%
Coefficient of Variation	2.44	2.95
Value of $1000 investment	$1725	$1783
t-statistic	**0.01***	0.14

*** = 0.01; ** = 0.05; * = 0.10

information on the simultaneous performance of stock prices and free cash flows. This portion of the study covers eleven years, one more year because a year is not lost in the process of identifying cash flow levels or trends over the prior year.

The first column of Table V reports the market-excess returns arising from weighting shares by their free cash flow level in the same year. For instance, the allocation of shares in 2000 is based upon the free cash flow performance of firms in that year. The change in free cash flow from 1999 to 2000 is used to allocate funds prior to 2000. If there is no relationship between the current year free cash flow and the stock price, the portfolio returns would mirror the return of the market and the excess would be close to zero. Findings presented in the second column are based upon a portfolio where the change in free cash flow from the prior year is used to allocate portfolio wealth. The implication of a lack of statistical significance in the second

column of Table V is that free cash flows unlock money for future investment which is not fully captured by current stock price changes.

Review of the data presented in Table V demonstrates that there is a relationship between free cash flow levels in a given year and concurrent stock price performance. Using either free cash flow levels or trends in portfolio allocation provides an average return that is more than six percent higher per year than the equal-weighted portfolio. Annual geometric mean returns are higher by at least three percent. The implication of this result is that if investors are able to invest in the beginning of each year with perfect knowledge of free cash flows during each year, they would be able to earn an extra $1725 ($2725 - $1000) using free cash flow levels. With free cash flow trends, portfolio returns are $1783 ($2783 - $1000) greater. Results reported in Table V are most comparable to the free cash flow data found in Table II. Although Table II's values are higher, such a result is not unexpected because funds may only be available for fraction of the current year reported in Table V. The free cash flow level allocation provides a return that is statistically significant at the 0.10 level of significance, which with the limited degrees of freedom is quite noteworthy.

IV. Conclusion

There are virtually an unlimited number of techniques by which one can diversify their portfolio. Popular means are exemplified by the Dow Jones Industrial Average's price-weighting, Standard & Poor's 500 capitalization-weighting, and MSCI World equally-weighted indexes. The advantages of equally-weighted indexes are that they do not rely upon current market price and that they provide the highest rate of return among the traditional methods of portfolio allocation employed in this study. An alternative to these traditional index-weighting schemes is the use of key firm fundamentals, increasing the weighting of firms with high measures on specified characteristics. We examined the investment value of basing allocations on the level and trend of two promising cash flow statement accounts.

Allocation of funds across firms in the Dow Jones Industrial Average (DJIA) on the basis of free cash flows were found to provide returns that were significantly greater than zero and superior to the equal-weighting of DJIA stocks. Although the sample size is small, the ability of free cash flow trends to be significant predictors of excess return was significant during bear markets. Though the preference varied, either the levels or trends free cash flow allocation method was significant in each five-year sub-period. Finally, there appears to be a simultaneous relationship between free cash flows and stock performance. Such a finding is consistent with the importance of free cash flows documented throughout this report. Future research, using alternative portfolios and time periods, will be able to ascertain the robustness of these results.

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