Using Economic Value Added as a Portfolio Separation Criterion

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This paper explores whether economic value added (EVA) can be used to generate two portfolios with statistically different cumulative returns. The analysis is done using a portfolio separation test that examines the statistical significance of the regression coefficient generated when the cumulative returns from one portfolio are regressed against the cumulative returns from the other portfolio. We conclude EVA does provide economically useful information that can be used to forecast portfolio separation. Specifically, forming portfolios based on higher and lower values of EVA divided by the average book value of debt and equity from a buy list yields portfolios with cumulative returns that are statistically different.

Introduction

Given a particular buy list of stocks, it would be useful to ascertain if one portfolio formed as a subset of the buy list should be expected to outperform another subset portfolio. In other words, is there an economic, financial, or accounting criterion that will allow the buy list to be separated into well-performing versus poorly performing portfolios? Following Cary et al. (2004), we call the process of differentiating between portfolios that are expected to perform well from a buy list and portfolios that are expected to perform poorly from the same list a portfolio separation test.

The difficulty, of course, lies in finding an economic, financial, or accounting criterion that results in successful portfolio separation. De Bondt and Thaler (1987) form winner and loser portfolios based on stock performance over the previous five years. They find that the loser portfolios outperform the winner portfolios over the next three years. Chopra, Lakonishok, and Ritter (1992) find similar reversal results

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where poorly (well) performing stocks in one period tend to outperform (underperform) in following periods.

Several studies, including Stewart (1994) and Lehn and Makhija (1996), find that there is a positive correlation between market value added (MVA) and stock price performance. MVA is the difference between the market value of a company and the capital contributed by both stockholders and bondholders. A positive MVA shows that firm management has generated wealth for the firm's shareholders over the life of the firm. Noting the positive correlation between MVA and stock price, Cary et al. (2004) hypothesize that portfolios that are selected based on changes in MVA over the course of a year can be used to separate higher and lower performing portfolios. Testing this hypothesis empirically, they find that ranking their buy list by the change in MVA as a percentage of market capitalization successfully separates portfolios formed from the top 100 (the winner portfolio) and bottom 100 (the loser portfolio) stocks in the buy list. They find that winner portfolios outperform loser portfolios. In addition, Cary et al. (2004) test to see if the difference in cumulative returns between the winner and loser portfolios is statistically significant, and they find that it is.

Testing to see if the cumulative difference in returns between the two portfolios is statistically significant is an important extension of current practice. In Cary et al. (2004) it shows that MVA is an economically useful criterion for portfolio separation. This is an interesting finding, but it raises the question of whether other criteria can be used in a portfolio separation test and if another criterion can do a better job of portfolio separation than MVA. Therefore, this paper uses the methodology developed in Cary et al. (2004) and extends their work by looking at economic value added (EVA) rather than MVA as a portfolio separation criterion. We also extend the work in Cary et al. (2004) by including data from the bear market from 2000 through 2002. The Cary et al. (2004) data come from the primarily bull market period of 1990 to 1999.

Theoretical Background

Obviously, MVA is not the only criterion that can be used to test for portfolio separation. But the success of MVA when used for portfolio separation suggests that a criterion similar to MVA also might be effective (or perhaps even more effective) as a portfolio separator. Theoretically, MVA is equal to the present value of the yearly EVA that a firm is expected to generate. Given that MVA can be used for portfolio separation, the close theoretical relationship between MVA and EVA suggests that EVA also might be an effective criterion for portfolio separation.

EVA was developed and promoted by the consulting firm Stern Stewart & Co. Stewart (1991) gives a detailed description of the theoretical underpinnings of EVA and also shows many examples of how to estimate EVA empirically. Dierks (1997) also does a good job of showing how to calculate EVA in practice. For the purposes

of this paper, however, it is sufficient to understand that EVA measures residual income after accounting for the firm's cost of both debt and equity capital. EVA is calculated by subtracting the firm's cost of capital times total capital employed from its net operating profit after taxes (NOPAT).[1]

Over the course of the 1990s, EVA became increasingly popular as a tool to measure corporate financial performance and as a component of executive compensation plans. The increased popularity led to a great deal of research on EVA over the past fifteen years or so. One stream of the research addresses the usefulness of EVA in aligning management and shareholder interests. Examples of papers in this area include Brossy and Balkcom (1994), McConville (1994), Ochsner (1995), Birchard (1994), Bennett (1995), and Ehrbar (1999). All of these papers support the idea that EVA should be used as a measurement for executive performance pay.

Proponents of EVA also argue that there is a positive correlation between EVA and stock performance. Empirical results from both Lehn and Makhija (1996) and O'Byrne (1997) support the notion that stock prices react positively when companies are generating high levels of EVA every year. In addition, papers such as Birchard (1996) and Davies (1996) provide anecdotal evidence that stock prices rise when companies implement EVA as a management tool.

The intent of this paper is to look for another portfolio separation criterion. The close theoretical relationship between MVA and EVA, and the research showing a positive correlation between stock price and EVA, suggest that EVA may be an effective portfolio separation criterion. Therefore, this paper uses the methodology developed in Cary et al. (2004) to look at economic value added (EVA) as a portfolio separation criterion.

Methodology

Our work extends Cary et al. (2004) by using EVA rather than MVA as a portfolio separation criterion. Our analysis is also an extension of their work because our data set contains a bear market period (2000–2002), while their data set only covered the bull market of 1990–1999. This is important because their conclusion that MVA is useful as portfolio separation criterion is not as robust as it could be, given that their data set does not contain a bear market period.

Following Cary et al. (2004), we use the U.S. 1000 (*Fortune*'s annual list of the top 1000 publicly traded firms, ranked by revenue) as our buy list. Stern Stewart & Co. takes the U.S. 1000 and generates a proprietary MVA and EVA ranking database called the Stern Stewart's Performance 1000 Database. This database comes in the form of an Excel file that includes 20 years of historical data for MVA, EVA, NOPAT, return on capital, cost of capital, industry classification, and ticker symbol,

[1]Critics point out that book values used in EVA calculations are highly sensitive to dates of mergers and acquisitions. We do not think these types of issues with EVA impact the portfolio separation testing done in this paper.

as well as a trademarked variable called Future Growth Value™ (FGV). We use this database as our source for the U.S. 1000 firms' EVA for the years 1995 through 2004.

We use the Stern Stewart database to look at firms' EVA performance for each year from 1995 through 2005. Each firm's EVA is divided by its average book value of long-term debt and equity. This is done in order to adjust for size effects on EVA. The resulting variable is called eva2cap. We select the 100 top and bottom performers (the firms with 100 best and 100 worst eva2cap results) from each of the ten years and form portfolios (called eva2caphigh and eva2caplow) with them.

We also examine two other EVA-related variables as possible portfolio separation criteria. The second variable is the average of eva2cap over the prior three years. We call this variable eva3yravg. The final variable is the percentage change in eva2cap in the past year. This is called evadelta. We identify the 100 best and worst performers of eva3yravg and evadelta for each of the ten years and form portfolios (called eva3yravghigh and eva3yravglow and evadeltahigh and evadeltalow).

We balance each portfolio equally (60 portfolios; ten years high and low for eva2cap, eva3yravg, and evadelta), weighting each stock component at approximately one percent of its total portfolio dollar value. We use July 15 of the year following the calendar year from which the portfolios were drawn as the start date for performance measurement. July 15 is used because most publicly traded firms are on an earnings cycle with a quarter that ends in June. Using July 15 rather than June 15 minimizes the noise in the analysis because it is past the end of the quarter for most firms.

The six equally weighted portfolios based on calendar year 1995 EVA are assigned a start date of July 15, 1996. Each portfolio's daily (and cumulative) returns are calculated until July 14, 1997. Assuming an initial portfolio value of $1, each portfolio's cumulative return is used to calculate a dollar value for the portfolio as of July 14, 1997. The resulting dollar values then are invested into the six portfolios based on calendar year 1996 EVA and assigned a start date of July 15, 1997. The portfolio return then is determined for the subsequent year. A similar procedure is followed for the remaining eight years in order to determine the cumulative return (and portfolio dollar value) for each of the six portfolios over the sample period.

A key feature of the Cary et al. (2004) analysis is testing to see if there is a statistically significant difference between two portfolios. Two portfolios selected from a given population using an economic criterion without economically significant information would be expected to have similar returns over a particular time period. If the selection criterion has economic significance, however, the portfolios should perform differently. Therefore, in order to test for portfolio separation using EVA as the economic criterion, we start with the null hypothesis that there is no difference in the cumulative returns between the two portfolios. In other words, the null hypothe-

sis is that there is no portfolio separation. This null hypothesis can be tested using the following regression.

$$\text{eva2caphigh} = \beta\ \text{eva2caplow} + \varepsilon \quad (1)$$

The null hypothesis says that $\beta \leq 1$ while the alternate hypothesis says that $\beta > 1$. The t-statistic to test for portfolio separation therefore is computed as $(\beta-1)/\text{S.E.}$ where S.E. is the standard error of the regression coefficient.

Results

The cumulative returns for the eva2cap, eva3yravg, and evadelta portfolios along with the Schwab 1000 are shown in Figures 1, 2, and 3 respectively. These returns are compared to the Schwab 1000 rather than the Fortune 1000 because no index tracks the Fortune 1000 directly. The returns of the Schwab 1000 and the Fortune 1000 should be similar even though the Schwab 1000 is based on market capitalization and the Fortune 1000 is based on revenue because market capitalization is correlated closely with revenue. For example, a comparison of the Schwab 1000 and the Fortune 500 over the past four years has an R-squared of 97 percent.

Figure 1: Cumulative Wealth of eva2caphigh, eva2caplow and Schwab 1000 Index Portfolios

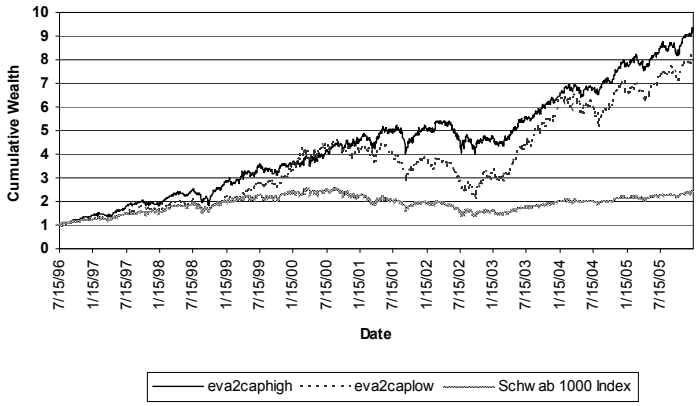


Figure 1 shows that the eva2caphigh portfolio outperforms the eva2caplow portfolio over the time period from July 1996 to July 2005. In addition, both the eva2caphigh and eva2caplow portfolios outperform the Schwab 1000. The fact that the eva2caplow portfolio outperforms the Schwab 1000 is surprising at first glance. This result, however, is most likely due to the methodology used to construct our eva2caphigh and eva2caplow portfolios. We equally weight all 100 stocks in our portfolios rather than weighting them on revenue or market capitalization. Therefore, the smaller stocks in the portfolios (which generally have higher betas) will tend to

boost the returns on the portfolios compared to the market capitalization-weighted index.

Figures 2 and 3 show the cumulative return results for variables eva3yravg and evadelta. The cumulative return results for these two variables are not as clear-cut as the results for eva2cap. The eva3yravghigh and evadeltahigh portfolios outperform their respective bottom portfolios from July 1996 until about July 2003. From about July 2003 until January 2006, however, the eva3yravglow and evadeltalow portfolios outperform their respective top portfolios—the end result is that the bottom portfolios outperform the top portfolios over the entire time period of July 1996 to January 2006.

Figure 2: Cumulative Wealth of eva3yravghigh, eva3yravglow and Schwab 1000 Index Portfolios

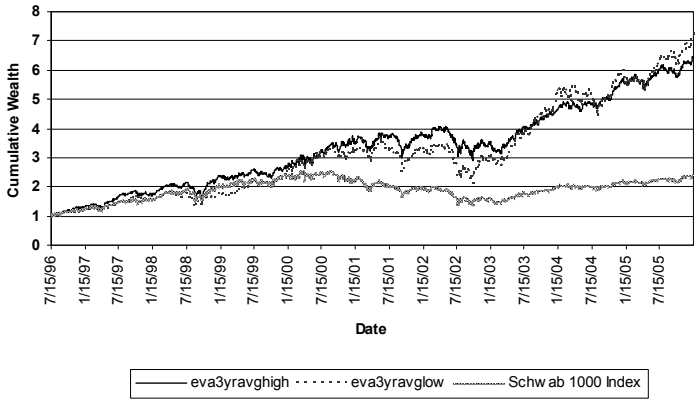
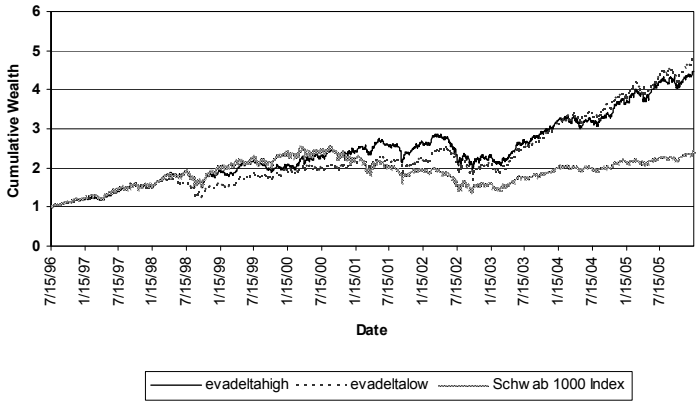


Figure 3: Cumulative Wealth of evadeltahigh, evadeltalow and Schwab 1000 Index Portfolios



It is not clear why the bottom portfolios outperform the top portfolios over the last two years of the sample. It may be that the constructed variables eva3yravg and evadelta do not contain sufficient economic content to consistently differentiate cumulative return between portfolios. Given that the main focus of this paper is to test for statistically significant portfolio separation rather than overall portfolio cumulative return, however, a better explanation of the outperformance of the bottom eva3yravg and evadelta portfolios over the last two years of the sample period is left for further research.

As noted earlier, the important extension of current practice in Cary et al. (2004) is testing to see if cumulative returns from two different portfolios are significantly different. Therefore we test to see if there is a statistically significant difference between the top and bottom portfolios for variables eva2cap, eva3yravg, and evadelta. These regressions are done using cumulative daily returns. Results are shown in Table 1.

Table 1—Portfolio Separation Test Regression Results

	eva2cap	eva3yravg	evadelta
Observations	2480	2480	2480
Intercept	0.40985	0.61752	0.41411
Standard Error	0.02350	0.01103	0.00845
β Coefficient	1.08962	0.86449	0.87834
Standard Error	0.00563	0.00312	0.00343
t-stat = (β - 1) / S.E.	15.89**	- 43.32**	- 35.41**

** Significant at the 1 percent level

Table 1 shows that the t-statistic associated with the beta coefficient in all three regressions is significant at the one percent level. Therefore, we reject the null hypothesis that there is no portfolio separation and conclude that all three of the EVA-related variables (eva2cap, eva3yravg, and evadelta) provide economically useful information that can be used for portfolio separation.

These are interesting results, but an economic variable that tells us that one portfolio will outperform another is not very useful if we do not know which portfolio will outperform the other. Therefore, even though Table 1 shows that eva3yravg and evadelta yield portfolio separation, the fact that there is portfolio separation is not useful because Figures 2 and 3 show the unexpected result that the eva3yravglow and evadeltalow portfolios outperform their respective top portfolios over the sample period. Not knowing which portfolio is going to outperform the other limits the usefulness of eva3yravg and evadelta as portfolio separation criteria.

But the variable eva2cap does not suffer from this problem. Table 1 shows that eva2cap can be used as a portfolio separation criterion, and Figure 1 shows that the eva2caphigh portfolio outperforms the eva2caplow portfolio. Therefore, our main result is that the EVA-related variable eva2cap (which is a firm's EVA divided by the firm's average book value of long-term debt and equity) provides economically

useful information that can be used to separate a higher performing and a lower performing portfolio from a buy list.

Eva2cap Robustness Checks

The previous analysis shows that eva2cap can be used as a portfolio separation criterion, but further exploration of the robustness of this result is warranted. For example, the conclusion that eva2cap works as a portfolio separation criterion is based on analysis of the 1996 through year-end 2005 timeframe as a whole. But is that conclusion robust to specific market conditions? In other words, does eva2cap work as a portfolio separation criterion during bull and bear markets specifically? To examine this question, we ran the analysis for distinct bull and bear market periods.

The stock market enjoyed an historic bull market from 1996 through 1999, but the good times ended shortly after the turn of the century with the S&P 500 peaking in March of 2000. The subsequent decline in prices sent that index down just over 10 percent (all returns on a price change basis) for the full year 2000. The index fell about 13 percent in 2001 and roughly 23 percent in 2002, with the low point for the cycle occurring in October 2002. The market recovered in 2003, with the S&P 500 gaining over 26 percent that year. Given this history, we use July 1996 through year-end 1999 as a bull market period and July 2000 to December 2002 as a bear market period and examine the performance of the eva2cap as a portfolio separation criterion for these bull and bear markets. The results are shown in Figures 4 and 5.

Figure 4: Cumulative Wealth of eva2caphigh and eva2caplow - Bull Market

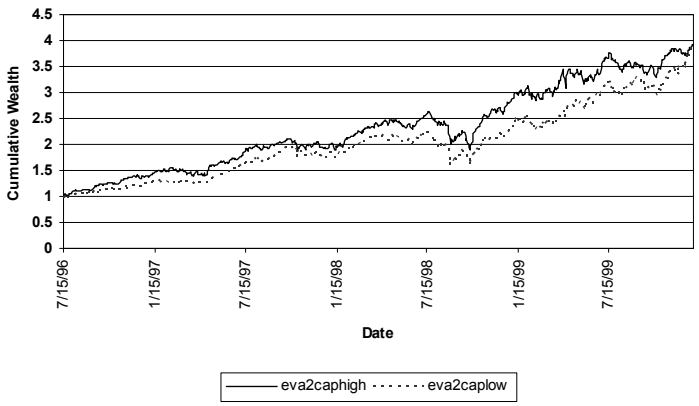


Figure 4 shows the results for the bull market period of July 1996 to year-end 1999. The figure shows that the eva2caphigh portfolio outperforms the eva2caplow portfolio throughout the bull market, and statistical testing for portfolio separation

using equation 1 (results shown in Table 2) confirms the portfolio separation. One aspect of Figure 4 is puzzling. In the last few months of 1999 the eva2caplow portfolio outperforms the eva2caphigh portfolio, and the overall performance of the two portfolios is almost identical at the end of the year. One possible explanation for this phenomenon is that it is a reflection of the impending market top that occurs in 2000.

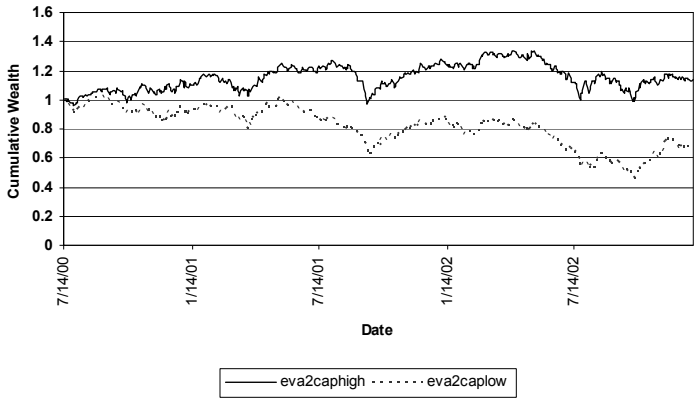
Table 2—Additional Portfolio Separation Test Regression Results

	Bull Market	Bear Market	mva2caphigh versus eva2caphigh	mva2caplow versus eva2caplow
Observations	905	663	2480	2480
Intercept	0.00779	1.12135	-0.82377	0.84453
Standard Error	0.01333	0.02129	0.06223	0.02767
β Coefficient	1.14431	0.03918	1.61849	0.85979
Standard Error	0.00624	0.02569	0.01602	0.00588
t-stat = (β - 1) / S.E.	23.13**	- 37.39**	38.61**	- 23.84**

** Significant at the 1 percent level

Figure 5 shows the results for the bear market period of July 2000 to year-end 2002. This figure shows that the eva2caphigh portfolio clearly and substantially outperforms the eva2caplow portfolio during this bear market. The large difference in performance is due to the fact that the eva2caphigh portfolio retains its value during mid-2002 while the eva2caplow portfolio suffers a severe decline. As in the bull market case, Table 2 shows statistical evidence of portfolio separation during the bear market. The results from Figures 4 and 5 suggest that eva2cap is a more effective portfolio separation criterion during bear markets than it is during bull markets.

Figure 5: Cumulative Wealth of eva2caphigh and eva2caplow - Bear Market



We also check the robustness of the eva2cap portfolio separation criterion result by changing the frequency of portfolio rebalancing. The original procedure uses

annual rebalancing. Many professional investors typically hold their investments for time periods longer than one year. Therefore, we ran the eva2caphigh versus eva2caplow portfolio separation analysis for the 1996 through 2005 time period with rebalancing occurring every three years and every five years rather than annually. The results (not shown) are similar to the eva3yravg and evadelta results presented earlier. There is statistical evidence of portfolio separation using both three and five year rebalancing periods, but in each case the eva2caplow portfolio actually outperforms the eva2caphigh portfolio. As with the eva3yravg and evadelta results, it is not very useful to know there is portfolio separation without knowing which portfolio will outperform. Our conclusion is that using eva2cap as a portfolio separation criterion is not robust to rebalancing periods longer than one year.

EVA Versus MVA as a Portfolio Separation Criterion

Cary et al. (2004) found that MVA is useful as a portfolio separation criterion, and this paper finds that EVA also can be used for portfolio separation. Therefore, a natural question is, which is better? To investigate this question, we compared the performance of the eva2caphigh portfolio against the mva2caphigh portfolio and the eva2caplow portfolio against the mva2caplow portfolio. Results are shown in Figures 6 and 7.

Figure 6: Cumulative Wealth of mva2caphigh and eva2caphigh

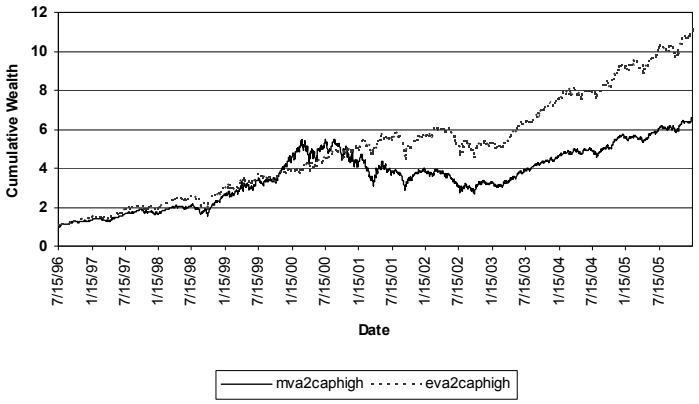
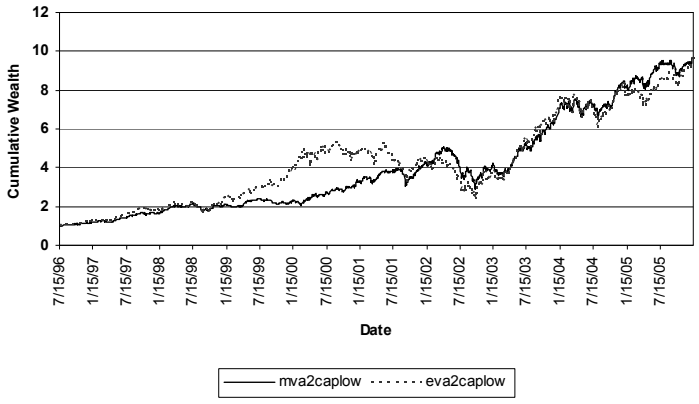


Figure 6 shows that the eva2caphigh portfolio outperforms the mva2caphigh portfolio over most of the sample period. From about January 1999 until September 2000, however, the mva2caphigh portfolio outperforms. Table 2 shows that the performance of the two portfolios is statistically different. Figure 7 shows that the eva2caplow portfolio outperforms the mva2caplow portfolio from July 1996 until September 2001; after September 2001 the two portfolios have roughly equal per-

formance. Again, Table 2 shows that there is a statistically significant performance difference between the two portfolios. Taken together, the results in Figures 6 and 7 suggest that EVA may be a better portfolio separation criterion than MVA. However, the claim that EVA is a better portfolio separation criterion than MVA cannot be made with certainty because Figures 6 and 7 show that there are periods where MVA outperforms EVA.

Figure 7: Cumulative Wealth of mva2caplow and eva2caplow



The Profitability Question

The results of this analysis show that EVA can be used to produce statistically significant portfolio separation. This is a nice result but a more practical question is whether EVA and the methodology in this paper can be used to produce financially significant results. One possible way to profit from the statistically significant portfolio separation between the eva2caphigh and eva2caplow portfolios would be to buy the eva2caphigh portfolio while at the same time shorting the eva2caplow portfolio. The portfolio separation result suggests that this would be a profitable strategy.

We tested this strategy as follows: A portfolio is assumed to have a starting value of one. The return in year one from shorting the eva2caplow portfolio is subtracted from the return generated by the eva2caphigh portfolio (assuming both are positive) and the net return is used to calculate the incremental increase to the portfolio value at the end of year one. This ending overall value then is rebalanced between the high and low portfolios and becomes the starting value for year two. The net return from the long/short strategy in year two is used to calculate the increase or decrease in the portfolio values during year two, and then they are rebalanced again. This procedure is repeated for each year of the study.

The periodic rebalancing is necessary to maintain approximate equality between the long and short positions. Otherwise, at some point the aggregate portfolio would be primarily a long, or a short, position which doesn't permit a fair comparison between the two. Such rebalancing allows an apples-to-apples comparison when comparing alternative sets of successive portfolios. Such rebalancing is necessary when implementing a long/short market-neutral portfolio in real life in order to maintain market neutrality; otherwise, the portfolio would be tilted in favor of one side or another and lose neutrality.

Unfortunately, the results of the long eva2caphigh and short eva2caplow strategy do not make money during our study period. From July 15, 1996 to July 15, 2005, the cumulative return for this strategy is a loss of 6.7 percent even without subtracting transactions costs. A close examination of Figure 1 explains this unexpected and disappointing result. The basic problem is that the eva2caplow portfolio outperforms the eva2caphigh portfolio in some years even though there is portfolio separation over the entire time period. For example, Figure 1 shows a dramatic rise in eva2caplow from July 1999 until July 2000, while there is only a modest increase in eva2caphigh over the same time period. A similar result occurs from July 2002 to July 2003. Because we rebalance the total values of the long and short portfolios annually, these large increases in the shorted portfolio dramatically reduce the returns to the long/short strategy and produce a net loss over the entire time period.

Conclusion

Cary et al. (2004) show that market value added (MVA) provides economically useful information that can be used to form two portfolios from a buy list with statistically different cumulative returns. Using the technique developed in that paper, we test to see if economic value added (EVA) also can be used to generate two portfolios with statistically different cumulative returns. We conclude EVA does provide economically useful information that can be used to forecast portfolio separation. Specifically, forming portfolios based on higher and lower values of EVA divided by the average book value of debt and equity from a buy list yields portfolios with cumulative returns that are statistically different. We also find that EVA can be used as a portfolio separation criterion during bull and bear markets.

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