Portfolio Rebalancing to Overcome Behavioral Mistakes in Investing

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Abstract

The negative impact of emotion-driven investing upon long-term wealth can be devastating. This article examines the benefits of portfolio rebalancing to help investors achieve their investment goals and avoid the most common investment mistakes. The results of this study, based on a 20-year investment horizon, support a minimum of 45% percent allocation to stocks, with annual portfolio rebalancing. The performance from disciplined annual rebalancing is shown to be a superior investment approach

Keywords: Investment performance, portfolio rebalancing, behavioral finance

Introduction

Individuals and institutional investors often allow emotions to drive their investing behavior. Investors tend to follow the market or current popular investing trends, allowing emotions to override rational investment fundamentals. The negative impact of emotion-driven investing upon long-term wealth can be devastating. This article examines the benefits of a portfolio rebalancing strategy that can be used to help investors achieve their investment goals and avoid the most common investment mistakes.

Emotion-Driven Investment Decision Making

The area of research that examines the issues related to investor psychology is known as behavioral finance. Behavioral finance examines human actions which affect investment performance at virtually every level for individuals and professional institutional investors. Many costly investment errors caused by human behavior form the background for common investment strategies recommended by financial advisors: dollar-cost averaging (Statman, 1995) and the "let it ride" approach that builds on the expected benefit of time diversification (Fisher and Statman, 1999). Dollar-cost averaging and the let-it-ride strategies are often recommended by financial advisors to help clients avoid some investment mistakes caused by their emotions. For example, research reveals that internet trading leads to costly overconfidence (Odean and Barber, 1999) and that overconfident investors trade too much, negatively impacting investment performance (Barber and Odean, 2000).

Behavioral issues clearly impact the volatility of the stock market and the long-term results for many investors. In particular, making investment decisions to follow the crowd is a major behavioral barrier to optimal investment performance.

Herd Mentality: Following the Investment Crowd

Investors tend to buy as the market is rising, more specifically after the market has already risen sharply. Human nature encourages individuals to move more money into the market as fashion dictates that investing is the "in" thing to do because gains have occurred. The justification may be based on a short, or even a long history of exceptional returns. People tend to move money into the market after prices have risen demonstrably. Not only individual investors follow the crowd. The herd mentality of professional and institutional investors is clearly documented (Nofsinger and Sias, 1999). The forces that encourage following the crowd on the part of institutional investors are based in the investment environment, itself. Fund managers and investors in those funds use index benchmarks to evaluate their performance. While benchmarking is clearly an appropriate method for comparative analysis, the use of benchmarks leads institutional investors to deviate only minimally from their benchmarks.

Unfortunately, this process can lead to institutionalized mediocrity, lost investment opportunities, and lower wealth accumulation for clients.

Regret Aversion: Emotion Impacts Decisions

Human nature encourages investors to act to correct a regrettable decision, to exert some level of control (Presson and Benassi, 1996). Many investors sell a stock or a mutual fund after recent losses. People often move money out of the market after prices have fallen, in an attempt to take control of the investment process. The underlying question is: at what point does this action take place? Compounding the problem is the desire to avoid realizing a loss, which the investor will regret. This regret aversion can lead to poor investment decisions. Using an investment in a home as an example, an individual whose home has fallen in value is rarely interested in selling the home and realizing that sizeable loss. The same idea applies to stocks. The problem examined in stock investing is known as the disposition effect: the tendency to hold losers too long and the tendency to sell winners too early (Shefrin and Statman, 1985). A decision to sell that losing stock after it falls 20%, instead of waiting until it drops 60%, can protect portfolio value. When an investor sells at a loss "breaking point," he has capitulated. Having lost money, the fear of regret often keeps investors out of the market for a considerable timeframe, thus missing the investment opportunities of buying when the market is down. Having sustained a stock market loss, instinct tells individuals that to continue the battle is the least desired course of action. Of course, these periods of depressed prices often present the greatest buying opportunities. The natural human response to stress does not help when the time is right to put money back into the market. Human behavior tends to delay reentry until after substantial gains in the market have already occurred.

Mental Accounting: Ignoring The Big Picture

Investors also tend to place their investments into separate mental accounts, performing a type of mental accounting (Thaler, 1980). This is one reason people hold onto losing investments too long. In the house-selling example, the homeowner would have to enter a loss into that real estate investment's mental account. Considering the possible size of the accounting entry, the homeowner is reluctant to liquidate the losing investment. It is difficult to consider this impact as merely part of a portfolio of assets. Levin (1998) found strong evidence of mental accounting related to consumption expenditures in years around retirement.

Placing an investment in a separate mental account allows it to be evaluated more easily when necessary. Mental accounting can derail investors from the goal of wealth creation. It may also lead investors to buy or sell assets based on their individual short-term performance, not based on how their long-term performance contributes to the overall portfolio growth and wealth accumulation.

Wealth increases or decreases with the value of the overall investment portfolio. Modern portfolio theory indicates that it is not the stand alone risk (as measured by variance) of an asset that is important to portfolio risk. It is the manner in which the individual asset interacts with the rest of the portfolio that is important. It is difficult for mental accounting techniques to encompass more the sophisticated measures of risk, such as correlation, covariance, and beta, which are central to modern portfolio theory (Kroll, Levy, and Rapoport, 1988).

Evaluating Investment Returns

To exhibit the shortcomings of investor behavior, a simple example indicates the potential problems with the way humans address complex and volatile investment information. In TABLE 1 below, a 4 period investment horizon is examined with a beginning portfolio allocation of 65% in equity, 30% in bonds, and 5% in cash. In that first year, returns are 20% on the equity, -5% on the bonds, and 3% on cash. In the top panel, the investor sticks to the original allocation of 65/30/5 (with rebalancing each year) and lets the investment ride for the next 3 years. In the bottom panel, the investor has a very natural reaction and decides to reallocate the funds from bonds into equity for a 95%/0%/5% portfolio allocation then the investor maintains the investment (with rebalancing) for the next 3 years. The 3-year return on the stocks is 6.04% and 6% for the bonds. An investor would likely be pleased to have earned the higher returns by allocating more to the stocks. (Investors should consider risk at the portfolio level.) In addition, the 3-year arithmetic average return for your 95% stock portfolio is 7.37% versus 6.89% for the portfolio that held to the 65%/30% allocation.

TABLE 1: Rebalanced Portfolios

	All Years:	$	1	$	2	$	3	$	4	$
Stock	65%	65	20%	78	20%	87.09	20%	100.11	-17.2	79.40
Bond	30%	30	-5%	28.5	6%	35.50	6%	40.81	6%	46.91
Cash	5%	5	3%	5.15	3%	5.75	3%	6.61	3%	7.60
Portfolio		100	11.65	111.65	14.95	128.34	14.95	147.53	-9.23	133.91

	After Yr 1:	$	1	$	2	$	3	$	4	$
Stock	95%	65	20%	78	20%	127.28	20%	151.66	-17.2	124.68
Bond	0%	30	-5%	28.5	6%	0	6%		6%	0
Cash	5%	5	3%	5.15	3%	5.75	3%	6.85	3%	8.16
Portfolio			11.65	111.65	19.15	133.03	19.15	158.51	-15	132.84

Finally, note that the managed portfolio outperformed the comparison portfolio for 2 of the 3 years. (All results are the same regardless of the ordering of the 3 years of equity returns). Unfortunately, while an investor may be pleased by the comparative performance, he actually ends up with less money. Based on

a $100,000 investment, the managed portfolio will have $132,844, while the comparison portfolio will have $133,912. Rebalanced portfolios with higher allocations to assets with higher arithmetic average returns do not ensure greater ending portfolio values for investors.

In TABLE 2, a comparison portfolio that avoids the extra effort of rebalancing is presented. For example, 95% of the $111,650 in the portfolio after year 1 is allocated to stocks. This results in $106,068, which grows at 20%, yielding the next year's $127,281. Then without rebalancing, subsequent values of $152,737 results from the 20% gain and the final $126,466 after the 17.2% loss. Once again, a higher average annual return (7.32% versus 6.72%) is achieved for the managed portfolio and this portfolio performs better in 2 of the 3 years after the original reallocation. This superior arithmetic average return does not translate into greater wealth. The managed portfolio will now have only $132,566.67 as opposed to $132,572.50 for the 4 year investment time period (in addition, recall that the rebalanced portfolio ended at $133,912). Non-rebalanced portfolios with lower allocations to higher arithmetic average return assets may generate higher ending portfolio values.

TABLE 2: Non-rebalanced Portfolios

		$	1	$	2	$	3	$	4	$
Stock	65%	65	20%	78	20%	93.6	20%	112.32	-17.2	93.00
Bond	30%	30	-5%	28.5	6%	30.21	6%	32.02	6%	33.94
Cash	5%	5	3%	5.15	3%	5.30	3%	5.46	3%	5.63
Portfolio		100	11.65	111.65	15.6	129.12	16.0	149.81	-11.5	132.57

	After Yr 1:	$	1	$	2	$	3	$	4	$
Stock	95%	65	20%	78	20%	127.28	20%	152.74	-17.2	126.47
Bond	0%	30	-5%	28.5	6%	0	6%	0	6%	0
Cash	5%	5	3%	5.15	3%	5.75	3%	5.92	3%	6.10
Portfolio			11.65	111.65	19.15	133.03	19.27	158.66	-16.4	132.56

The problem with mental accounting methods is that the results from individual categories, even when made in comparison to other categories, may lead to making wealth reducing decisions. An investor may even think she is doing better, while in fact she is not!

Human nature leads investors to buy high and sell low, despite the painfully simple advice to do just the opposite. Unfortunately, human nature does not prepare investors to make the tough decisions that contribute to positive long-term investing outcomes.

When applied to a portfolio, the use of geometric returns accounts for rebalancing of the portfolio at the end of each period. This is an important attribute, because using the geometric return calculation over several years will not give a proper estimate of ending value for a portfolio that is not rebalanced at the end of each year.

A unifying structure exists in the geometric returns methodology. In addition to giving a method to directly calculate the ending value of an investment

from annualized returns, it also accounts for the period-ending rebalancing that may protect portfolio investment returns over the long haul. Thus, this "technical" superiority may have practical importance. In the following section, this proposition and the impact of portfolio rebalancing using historical data are examined.

Personal Portfolio Performance with Rebalancing

Here, the return performance of two styles of investing is investigated. One is a "chase portfolio," which is the approach of chasing the returns of the previous year's best return segment. While this is a decidedly risky approach to investing, the idea that risk and expected return are positively correlated may convince some investors to follow this strategy. The other style is one of rebalancing the portfolio to some predetermined weights among stocks, bonds, and cash (t-bills). It is generally asserted that investors can establish their proper allocation to the three asset classes according to their level of risk aversion and investment time horizon.

Data Analysis

Returns from 1926 to 2007 on three asset classes: large company stocks, long-term corporate bonds, and treasury bills, all from the Ibbotson data (Ibbotson, 2008) are the focus of this analysis. Summary statistics reveal that stocks (t-bills) provided the highest (lowest) average annual return and the highest (lowest) standard deviation of the three asset classes. The bond returns have about the same correlation with the stock and t-bill returns (19.14% and 19.77%), while the stock and t-bill returns are slightly negatively correlated (-2.35%). The chase portfolio will entail moving 100% of the available investment funds to the asset class with the highest previous year return. The other portfolios will contain weights varying from 100% in stocks to 100% in long-term bonds. All portfolios between the 100% extremes are constructed with a 5% allocation to t-bills and at 5% increments for the stocks and bonds. Approximately ninety percent of investors own cash types of investments, such as t-bills or money market accounts. The desired percentage for cash depends on the need for liquidity, risk tolerance, investment horizon, and other factors (Davis, 2004).

Portfolio Performance

The annual return summary for the chase and rebalanced portfolios is given in TABLE 3. The highest returns are for the 100% stock portfolio (12.27%), however, the stock-only portfolio also had the highest standard deviation (20.09%). Furthermore, the results for the chase portfolio (8.96% average return and 13.94% standard deviation) are clearly weaker than for the 65% stock/30%bond/5%t-bill portfolio (10.01% return and 13.78% standard deviation). Other measures of interest confirm the greater dispersion for the 100% stock

portfolio, even relative to the chase portfolio. Also, as can be seen in Table 3, the 15% stock portfolio does better in protecting wealth than does the 100% bond portfolio, with a worst performance of -7.93% versus -8.09%.

TABLE 3: Annual return summary

	Annualized Return	Avg. Annual Return	Std. Deviation	Min	Max	Yrs >0 (n=81)	End Value Begin $1000
Chase	8.11%	8.96%	13.94	-35.63%	43.61%	61	$552,567
100/0/0	10.35	12.27	20.09	-43.34%	53.99%	58	$2,908,734
95/0/5	10.11	11.84	19.08	-41.12%	51.31%	58	$2,449,185
85/10/5	9.82	11.23	17.26	-36.97%	46.94%	60	$1,979,115
75/20/5	9.49	10.62	15.48	-32.82%	42.58%	61	$1,549,208
65/30/5	9.12	10.01	13.78	-28.67%	38.22%	61	$1,175,451
55/40/5	8.71	9.39	12.71	-24.52%	33.86%	62	$864,807
45/50/5	8.26	8.78	10.70	-20.37%	31.44%	64	$617,055
35/60/5	7.76	8.17	9.45	-16.23%	33.56%	66	$426,978
25/70/5	7.23	7.56	8.49	-12.08%	35.67%	66	$286,464
15/80/5	6.67	6.95	7.95	-7.93%	37.79%	68	$186,271
5/90/5	6.06	6.33	7.91	-7.38%	39.90%	67	$117,323
0/100/0	5.83	6.15	8.47	-8.09%	42.56%	64	$98,561

Chase portfolio: Annually allocate 100% to asset class with highest previous year return
Other portfolios are 100% Stock, ten rebalanced portfolios with Stock/Bond/T-bill allocations, 100% Bond.

Of course, few investors have an 81 year investment horizon and few should be overly concerned with yearly results, although it is often difficult to resist the temptation to manage the portfolio allocations. In examining a more realistic set of results, the analysis continues with 20-year investment horizons. The results are given in TABLE 4. The results provided for each portfolio are for 62 observations of 20-year investments, with rebalancing occurring at the start of each year. The first observation for each portfolio is from 1926 to 1945 and the last observation is from 1988 to 2007 (Ibbotson, 2008).

TABLE 4: 20-year holding period summary

	Average 20-year Return	Standard Deviation 20-year Returns	Min	Max	HPs higher return (of 62)	Avg. End: Begin $1000	Min. End: Begin $1000	Max. End: Begin $1000
Chase	7.87%	2.48%	2.84%	12.58%		$5,002	$1,750	$10,702
100/0/0	11.50%	3.43%	3.11%	17.87%	58	$10,360	$1,844	$26,816
95/0/5	11.20%	3.25%	3.16%	17.36%	58	$9,675	$1,862	$24,575
85/10/5	10.74%	2.98%	3.59%	16.71%	58	$8,723	$2,024	$21,973
75/20/5	10.24%	2.76%	3.95%	16.04%	59	$7,863	$2,169	$19,583
65/30/5	9.71%	2.60%	4.24%	15.35%	56	$7,087	$2,293	$17,396
55/40/5	9.16%	2.51%	4.46%	14.66%	52	$6,387	$2,394	$15,424
45/50/5	8.57%	2.51%	4.62%	13.97%	47	$5,754	$2,469	$13,683
35/60/5	7.96%	2.57%	4.42%	13.28%	32	$5,182	$2,375	$12,098
25/70/5	7.31%	2.71%	3.91%	12.80%	26	$4,664	$2,154	$11,128
15/80/5	6.64%	2.91%	3.37%	12.44%	23	$4,195	$1,940	$10,425
5/90/5	5.93%	3.16%	2.10%	12.05%	18	$3,769	$1,515	$9,730
0/100/0	5.63%	3.36%	1.34%	12.13%	14	$3,639	$1,305	$9,867

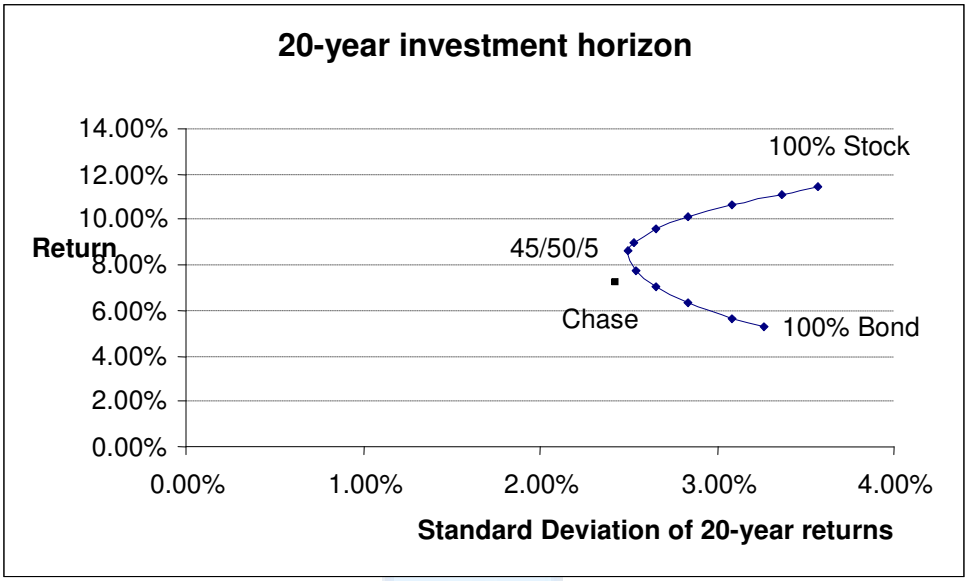
Summary statistics for a Chase Portfolio and rebalanced portfolios with Stock/Bond/T-Bill allocations. HPs higher return (of 62) indicates the number of 20-year Holding Periods with returns higher than for the Chase Portfolio

The 100% stock portfolio shows the highest average 20-year return (11.50%), combined with the greatest standard deviation in the returns (3.43%). Although average returns continually decrease with the stock allocation, the standard deviation does not. All portfolios provide a positive return for every 20-year investment period. The lowest standard deviation is at the 45% stock allocation (2.506%), so it seems unreasonable to allocate more than 50% to bonds, because investors assure lower returns with higher risk. For the chase portfolio, it seems that the lower standard deviation (2.48%) ensures lower returns. Evidence includes the lower minimum 20-year return, lower maximum 20-year return, and lower average 20-year return than for the 45% stock allocation portfolio. Additionally, for any allocation of 45% or more to stocks, the rebalanced portfolio outperforms the chase portfolio in at least 47 of the 62 20-year investment periods. The portfolio with 75% in stocks beat the chase portfolio in 59 of 62 20-year holding periods. 75% in stocks seems much “safer” in this regard. Investors with the greatest risk aversion over a 20-year horizon would have best invested 45% in stocks, resulting in a worst-case performance of a relatively solid 4.62% over a 20-year period. This allocation to stocks is higher than many would suspect for risk minimization.

EXHIBIT 1 shows an efficient frontier for these asset allocations over the overlapping 20-year investment horizons. The results for the chase portfolio are not encouraging, with little variation in the lower than desired 20-year horizon

returns. The chase portfolio is dominated by the rebalanced portfolio efficient set, assuming any positive risk-free rate.

Exhibit 1: Efficient Frontier for Overlapping 20-Year Investment Horizon Returns



Summary and Conclusions

Simple examples show mental accounting techniques that ignore the correlations in returns between asset classes can lead to difficulty in assessing investment returns. It is shown that rebalanced portfolios with larger allocations to assets with higher arithmetic average returns do not ensure greater ending portfolio values. Furthermore, non-rebalanced portfolios with lower allocations to higher arithmetic average return assets can produce higher ending portfolio values.

Analysis of historical returns shows that for a 20-year investment horizon, an investor would clearly want to allocate at least 45% to stocks, with 55% in stocks potentially appealing to those same investors. An allocation of 65% stocks provided the highest return for the risk of the rebalancing allocations. Based upon these historical results, investors with a 20-year investment horizon should invest at least 45% of the three-asset class portfolio in stocks. Allocations up to 100% are valid, depending upon the level of risk the investor is willing to take. These historical results should be of great interest to investors who may be attracted to the bond market which has recently provided superior returns. Chasing bond returns right now may prove very detrimental to an investor's wealth accumulation. Based on numerous results in this paper, the 65% stock portfolio appears to give a good starting point for the discussion of optimal asset allocation. Annual portfolio rebalancing appears to help investors achieve investment goals and overcome behavioral mistakes in investing.

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