

The Importance of the Asset Allocation Decision in Retirement Planning

Murli Rajan¹⁾, and Nabil Tamimi²⁾

¹⁾Kania School of Management, Department of Economics and Finance
University of Scranton, Scranton, PA 18510 (Murli.Rajan@uofs.edu)

²⁾Kania School of Management, Department of Operations & Information Management
University of Scranton, Scranton, PA 18510 (Nabil.Tamimi@uofs.edu)

Abstract

In this study we examine the impact of investment horizon on the terminal value of different asset allocation strategies. Our results show that contrary to what one might expect, for 5 year holding periods, the probability of capital loss is relatively small, suggesting that even for short holding periods aggressive investment in equities is still the answer. This, however, is still conditional on the equity portion of the portfolio being invested in a broadly diversified manner.

1. Introduction

The steep correction in equity valuations in recent years has resulted in a renewed interest in risk diversification and asset allocation. The financial press is replete with stories of individuals whose retirement funds were decimated because investments were heavily focused on specific sectors instead of being broadly diversified. Most investors intuitively recognize the importance of risk diversification by allocating investments across different asset classes. In fact, modern portfolio theory has long emphasized the importance of selecting assets with low correlations in order to diversify risk. However, many individual investors have learned the hard way that it is not long term equity returns that matter most, but rather the terminal value of the equity portfolio at retirement.

For investors with long investment horizons, the received wisdom is that significant allocations to equity are appropriate. The question of interest then is whether investors with relatively short horizons should also maintain significant exposures to equity investments. Recent experience would suggest that investors with short investment horizons should have relatively low exposure to equities. However, a recent study has suggested that even for short investment horizons, 100% allocation to equity may be appropriate [2]. We propose to study the question of whether short investment horizons are compatible with high allocations to equity by examining the effect on terminal portfolio value of alternate asset allocations over a holding period of five years. The portfolios are created so that they range from conservative (low allocations to equity) to aggressive (high allocations to equity).

2. Methodology

We propose to examine the importance of the asset allocation decision in retirement planning using three broad asset classes: equity, bonds, and cash. For the equity class, we use returns on the S&P 500 stock index with dividends reinvested. Bonds are proxied by the average return on long term (10+ years to maturity) Treasury bonds, while annualized yields on 3 month Treasury Bills are used for cash. We use data from 1928 to 2001 [1].

We create a series of portfolios with different proportions of investment in the three asset classes. The portfolios range from aggressive (e.g. 90% equity, 5% bonds, 5% cash) to conservative (40% equity, 50% bonds, 10% cash). We then calculate the terminal value of these various portfolios over 5-year holding periods on a rolling basis. For each portfolio, we calculate the ratio of mean terminal value to standard deviation of terminal value (a generalized information ratio). We also determine the number of times the terminal value fell below the initial investment. The results should help draw some conclusions on the link between the asset allocation decision and the terminal value of investment portfolios over short investment horizons.

3. Results

Table 1 provides summary statistics for various portfolios. For example, the first portfolio has 90% allocated to stocks, 10% to bonds, and 10% to cash, and the last portfolio has 50% allocated to stocks, 50% to bonds and 0% to cash. The standard intuition that higher equity allocation results in higher risk exposure is confirmed.

Table 1. Portfolio Summary Statistics

Allocation	90/5/5	80/10/10	70/20/10	60/30/10	50/40/10	40/50/10	50/50/0
Arithmetic Mean Return	11.31%	10.56%	9.88%	9.19%	8.51%	7.82%	8.63%
Geometric Mean Return	9.74%	9.31%	8.90%	8.45%	7.95%	7.42%	8.05%
Standard Deviation	18.13%	16.19%	14.34%	12.56%	10.89%	9.36%	11.17%

Finance textbooks emphasize the importance of using geometric mean returns over arithmetic mean return for purposes of analysis. Table 2 provides calculations of the terminal value of an initial \$1000 invested in each of the portfolios from 1928 to 2001. It is clear that reliance on arithmetic means to calculate future values will result in a significant overstatement of ending portfolio values. For example, in the case of the 90/5/5 portfolio, using arithmetic means result in an overstatement of terminal value of about 185%. In a retirement planning environment, this is a significant problem.

Table 2. Terminal Value of Initial \$1000 Investment

Allocation	90/5/5	80/10/10	70/20/10	60/30/10	50/40/10	40/50/10	50/50/0
TV Arithmetic Mean Return	2,768,842	1,682,884	1,063,430	670,069	420,989	263,722	458,594
TV Geometric Mean Return	970,495	728,069	550,023	403,598	287,664	199,122	307,659
Percentage Difference	185%	131%	93%	66%	46%	32%	49%

In Table 3 we provide calculations showing the mean terminal value of the various portfolios over rolling 5-year holding periods. For example, the mean terminal value of the 90/5/5 portfolio is \$1726.24 and the standard deviation is \$532.58. In order to get these values, we developed a series of rolling 5-year terminal values using the procedure described. That is, an initial \$1000 invested in 1928 in the 90/5/5 portfolio would have been worth \$566.70 at the end of 1932. An initial \$1000 invested in 1929 would have been worth \$589.01 at the end of 1933. Using this procedure, we obtain a series of 70 terminal values ending with the year 2001. Table 3 also indicates the number of times the terminal value of a portfolio ended below the initial investment of \$1000. The results are quite revealing, for the most aggressive portfolio, with 90/5/5 allocation, the terminal value ended below \$1000 only 7.14% of the time. For the least aggressive portfolio the terminal value ended below \$1000 only 5.71% of the time. Thus, even for a relatively short investment horizon of 5 years, the probability of capital loss is relatively small, notwithstanding the lower information ratios of the more aggressive portfolios.

Table 3. Mean Terminal Value: 5-Year Rolling Periods

Allocation	90/5/5	80/10/10	70/20/10	60/30/10	50/40/10	40/50/10	50/50/0
Mean Terminal Value	\$1726.24	\$1670.10	\$1619.84	\$1570.38	\$1521.74	\$1473.90	\$1530.74
S.D. Terminal Value	\$532.58	\$468.35	\$413.79	\$365.29	\$323.74	\$290.24	\$336.28
Information Ration (M/S.D.)	3.24	3.57	3.91	4.30	4.70	5.08	4.55
Number of Times < \$1000	5	5	4	4	4	4	4
Number of Times > \$1000	65	65	66	66	66	66	66
Percent Times < \$1000	7.14%	7.14%	5.71%	5.71%	5.71%	5.71%	5.71%

4. Conclusions

Our results are quite startling. The recent experiences of investors in the U.S. stock market combined with standard advice would suggest that investors with relatively short investment horizons should avoid aggressive equity investment. Our results show that contrary to what one might have expected, for 5 year holding periods, the probability of capital loss is relatively small, suggesting that even for short holding periods aggressive investment in equities is still the answer. This, however, is still conditional on the equity portion of the portfolio being invested in a broadly diversified manner.

References

- [1] Data is available at the Federal Reserve Board of St. Louis Website, URL: www.stls.frb.org/fred/
- [2] Swank, Peter B., Rosen, Michael A., and James W. Goebel. The Next Step: 100% Equity Allocation for Pension Plans.