Dynamic Asset Allocation

By Rex P. Macey, CIMA®, CFA®

I n the aftermath of the bear market of 2008, clients and investment advisors have inquired about approaches that protect portfolio values against broad market declines. This article compares a dynamic asset allocation (DAA) strategy with conventional static allocations. The concept of a dynamic approach is not new.[1] At its roots are options pricing theory developed in the 1970s and work done by Fisher Black and others. The thesis is that a dynamic strategy offers return and risk characteristics that many investors should prefer to the strategies that are industry standard today.

The Status Quo

The industry standard approach to strategic allocation is a relatively constant mix of risky and safe assets (e.g., 60-percent stocks, 40-percent bonds). Although some might refer to these as "buy and hold," they are more correctly described as "constant mix." A constant mix (CM) approach assumes rebalancing either periodically or when the mix deviates from target by some percentage. A true buy and hold (e.g., initially 60/40, then let it run) does not trade.

Interestingly, a buy and hold will outperform a constant mix if the market moves up or down as long as it does so in a linear (nonvolatile) path. In a volatile market, constant mix can win. The important point here is that asset allocation strategies are path-dependent. One approach is not going to dominate in all markets. It's assumed that DAA will outperform CM on some paths, such as prolonged bull and bear markets. Given that most investors have a stronger aversion to losses than preference for gains, DAA strategies should be preferred because they offer more upside and less downside.

Dynamic Asset Allocation

The DAA approach described here is simple.[2] It involves no complex equations as options-based strategies do. It does require a high degree of portfolio monitoring. The concept is to have two portfolios, one "risky" (e.g., S&P 500) and one "safe" (e.g., Treasury bills or a municipal bond fund). As the risky portfolio outperforms the safe portfolio, one assumes more risk. One takes less risk as the risky portfolio underperforms the safe portfolio. An illustration shows how this works. Assume the following:

Initial portfolio value = $1 million

Risky portfolio: an S&P 500 Index fund (but this could as easily be a portfolio of risky assets including international stocks implemented with exchange-traded funds (ETFs) or other liquid instruments)

Safe portfolio: A fixed income mutual fund (though this could be a Treasury bill of a particular date, which would mean that the program would offer a targeted level of downside protection)

Floor: The assets in the total portfolio (risky + safe) are not to fall below 85 percent of the portfolio value if it had initially been invested in the safe portfolio. In this case the initial value of the floor is $850,000.

The allocation between the risky and safe portfolios is determined by the equation: $e = mc$, where

Exposure: e = amount invested in the risky portfolio

Multiplier: m = value to multiply cushion by to arrive at exposure

Cushion: c = the difference between the total portfolio value and the floor.

The multiplier is critical. The higher the multiplier the greater the exposure to risky assets, which provides a higher expected return and greater risk that the floor will be violated. A multiplier of 4 allows the risky asset to fall 25 percent ($1/m$) relative to the safe before breaking through the floor. For example, starting with $60 in the risky asset, a loss of 25 percent will bring the value to $45, which when added to a $40 safe position, puts the portfolio value at the floor of $85.

We've used 4 because the S&P 500 has not fallen more than 25 percent in a day. It could do so in the future, which is why there cannot be assurance that a floor will hold. The question that follows is: "Which strategy, DAA or CM, will perform better if there's such a large decline?" The answer depends. If the risky portfolio had performed well before the decline, then the DAA strategy would have a higher allocation to the risky asset and would underperform. If the risky portfolio had performed poorly before the decline, the DAA would have a lower allocation and would perform better.

The combination of the multiplier of 4 and the floor of 85 percent of the initial value were chosen so that the initial allocation would be 60-percent risky/40-percent bonds. A comparison of this strategy will be made with a 60-percent stock/40-percent bond constant mix approach.

The initial cushion is the initial value ($1 million) less the floor ($850,000), which is $150,000. The initial investment into the risky portfolio is $600,000, equal to the multiplier of 4 times the cushion. The remaining $400,000 is invested into the safe portfolio.

Thereafter, the total portfolio value, the floor, and the cushion, are

monitored on a daily basis so that the allocation between the risky and safe portfolios can be adjusted according to the $e = mc$ formula. As the risky portfolio outperforms the safe, the cushion will increase and the allocation to the risky asset will increase. As the risky asset underperforms, the allocation to the safe will be increased.

In practice one may set a buffer to avoid nuisance trades. For example, one might avoid trading if the transaction is less than 2.5 percent of the portfolio. In addition, it is common to limit the exposure to the risky portfolio to 100 percent, but this is not necessary if leverage is allowed.

DAA is extremely flexible in the choice of the risky and safe portfolios. The important consideration is that one can monitor and shift among the portfolios (discussed later in the Implementation section). In place of the concept of risky/safe one could use active and benchmark. For example, an actively managed equity portfolio could be the risky portfolio and the S&P 500 could be the safe. The floor could be 95 percent of the S&P 500. Such a program would provide some protection against underperforming the S&P 500 by more than 5 percent. DAA would be useful for a pension plan where the cushion was defined as the difference between the asset values and the liabilities.

Insurance or Protection?

The ability to provide protection depends on the ability to trade between the two portfolios frequently. Ideally, one would be able to monitor and trade continuously and security prices would be continuous (no jumps). Such properties allow one to exit the risky portfolio and get into the safe portfolio before one violates the floor.

In practice, a dynamic strategy can violate the floor. That is the reason that this article avoids the term "insurance." If the portfolio drops by more than the cushion, the floor is violated. In our example, the exposure to the

risky portfolio is 4 times the cushion. If the risky portfolio drops by ¼ ($1/m$ in general) without rebalancing, the floor is violated. Because there is nothing to prevent such a move, there is no insurance. All we can say is that dynamic strategies provide pretty good protection, not insurance. They work in smoothly functioning markets.

Hitting the Floor

If the risky portfolio performs worse than the safe, the portfolio hits the floor and the cushion is zero. In this scenario the portfolio is allocated entirely to the safe portfolio. While this protects the floor, the portfolio will not participate in future appreciation of the risky portfolio. In contrast, a portfolio following a CM strategy may fall through the floor, but it will have exposure to the risky asset should it recover. This weakness may not be as unattractive in practice as it sounds.

If the decline is a slow bear market (e.g., 2008, not October 1987), a DAA strategy that hits the floor will probably have a greater value than a CM strategy. Imagine DAA and CM that begin with 60 percent allocated to risky and 40 percent to safe. If the risky portfolio immediately drops by 25 percent, both will have the same value because they began with the same allocation.

Now consider these portfolios with the same initial conditions but the risky asset declines day after day. The DAA approach will be selling from the risky portfolio as the cushion is eroded while the CM strategy is buying risky assets as they decline. In this particular scenario, the DAA will have a significantly higher portfolio value than the CM by the time the floor is hit. At that point, an investor could reset the parameters of the DAA strategy, say establish a lower floor, and reallocate something to risky assets. While the portfolio would then risk falling below the original floor, it would have more assets than a CM strategy and the opportunity to participate in future upside. We emphasize that one

should consider the characteristics of a DAA strategy versus a CM approach and avoid portfolio insurance aspects.

Description of Back-Test/ Historical Analysis

This back-test is designed to demonstrate how a dynamic strategy compares against a constant mix strategy in various environments. To make this test realistic and meaningful, we needed daily data for an extended period of time. We wanted periods including dramatic falls such as October 19, 1987, when stocks fell 20 percent; bear markets such as 2008; and bull markets. We chose to use the Vanguard S&P 500 fund for the risky portfolio and the Vanguard Intermediate Term Tax Exempt fund. Both of these funds have long histories. The Vanguard Intermediate Term Tax Exempt fund was chosen to represent the performance of a conservatively managed tax-exempt portfolio. A 60-percent equity/40-percent fixed constant mix is the benchmark.

The benchmark is used to establish the floor. Given a 60/40 benchmark, and a multiplier of 4 (based on a worst case 25-percent immediate drop in the market), the floor was established at 85 percent of the safe portfolio. Eighty-five percent was chosen so that the dynamic portfolio initially would have the same allocation as the benchmark. The math is that $4 \times (1 - 0.85) = 60\%$. In other words, to arrive at a 60-percent allocation to the risky portfolio we need a 15-percent cushion given a multiplier of 4. To get a 15-percent cushion, our floor needs to be 85 percent of the safe portfolio. The 60/40 mix was chosen for its common usage but is somewhat arbitrary. If we had established a different benchmark, say 40-percent equity and 60-percent bonds, the floor would have been 90 percent of the safe portfolio. The higher the floor, the more conservative the benchmark should be.

The analysis uses data going back to late 1982, ends in June 2009, and focuses on five-year rolling periods,

allowing the inclusion of 1987 at the beginning and end of the periods. We assume a 0.25-percent transaction cost for both transactions involving the risky and safe assets. Thus if 3 percent is moved from the risky to the safe, then the portfolio will be charged 0.25 percent of 6 percent. A tolerance of 2.5 percent means that no transactions occur until more than 2.5 percent needs to be moved from one portfolio to the other.

## Summary Results of Back-Test/ Historical Analysis

Eighty-seven five-year periods were analyzed. The first was January 1982 through December 1987. Then the earliest three months were dropped and three months added to the end, so the second period was April 1983 through March 1988. The final period was July 2004 through June 2009.

Table 1 provides an interesting comparison between the results of a DAA strategy and a CM strategy. In terms of typical returns, the strategies are comparable. The arithmetic averages of the five-year annual returns favor DAA (10.1 versus 9.5). However, the median favors the CM (10.7 versus 9.9). The inconsistency here is because of skewness. The DAA has more positive skewness with a higher maximum five-year return (26.7 versus 18.8) and a similar minimum five-year return (–0.7 versus –1.4). However, the protection provided by DAA over CM is evident in the Return to Minimum Value statistic. This is the return from the start of the period to the lowest subsequent portfolio value. It is not annualized. The portfolio value starts at $1 million. If the lowest value it reaches in the next five years is $900,000, the return to minimum value is –10 percent. As these data show, within one five-year period a CM investor lost 24.3 percent. This was within the five years from October 2000 to September 2005, a period in which the return to minimum value was –6.6 percent for DAA. The worst experience

TABLE 1: SUMMARY OF 5-YEAR RESULTS (85% FLOOR, 60% RISKY/40% SAFE)

(n=87)	DAA	CM
Average Annual Return	10.1%	9.5%
Median Annual Return	9.9%	10.7%
Avg. Return to Min. Value	–3.8%	–6.0%
Worst Return to Min. Value	–17.6%	–24.3%
Worst 5 Yr Annual Return	–0.7%	–1.4%
Max 5 Yr Annual Return	26.7%	18.8%

FIGURE 1: ROLLING 5-YEAR RESULTS
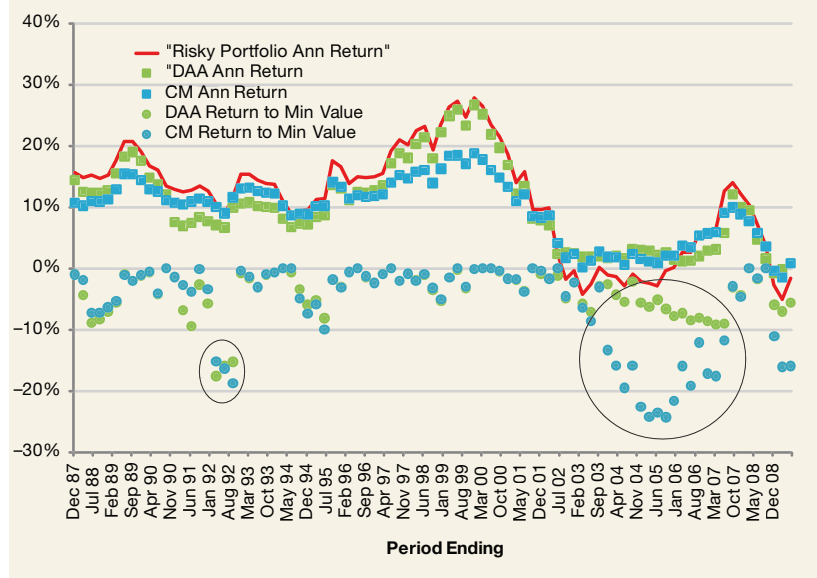
for the DAA investor of –17.6 came within the April 1987 to March 1992 period when the corresponding statistic for the CM investor was –15.2.

It's worth mentioning that the floor of the DAA strategy was never violated. Also, the DAA strategy produced higher returns in 55 percent of the 87 periods.

Figure 1 illustrates the central theme that DAA offers similar gain with less pain in bear markets like 2008.

Each square represents a five-year return. The red line is the return of the risky portfolio (S&P 500 Index fund). Generally, DAA and CM offer similar average returns. CM did a bit better in the early 1990s. DAA captured much more of the market return in the bull market of the late 1990s.

More interesting is the pain felt by investors measured by the return to the minimum value represented by the circles. In a five-year period that begins with a sudden decline like 1987, investors in both strategies feel similar levels of pain (left oval). In an orderly bear market, (e.g., 2008) despite it being more severe, investors in DAA feel significantly less pain (right circle).

This back-test supports the view that DAA reduces the steep declines while capturing a similar overall return.

DAA for Other Allocations

The DAA floor can be adjusted to construct portfolios similar to other constant mixes. For example, a 90-percent floor will create an initial allocation of 40-percent risky/60-percent safe similar to our

TABLE 2: SUMMARY OF 5-YEAR RESULTS (75% FLOOR)

(n=87)	DAA	100% Risky	80% Risky
Average Annual Return	10.9%	11.4%	10.5%
Median Annual Return	12.2%	12.9%	11.8%
Avg. Return to Min. Value	−6.6%	−11.8%	−8.9%
Worst Return to Min. Value	−22.4%	−46.4%	−36.3%
Worst 5-Yr Annual Return	−2.6%	−5.0%	−3.3%
Max 5-Yr Annual Return	27.8%	27.8%	23.4%

TABLE 3: DAA VS. CM IN VARIOUS MARKET ENVIRONMENTS

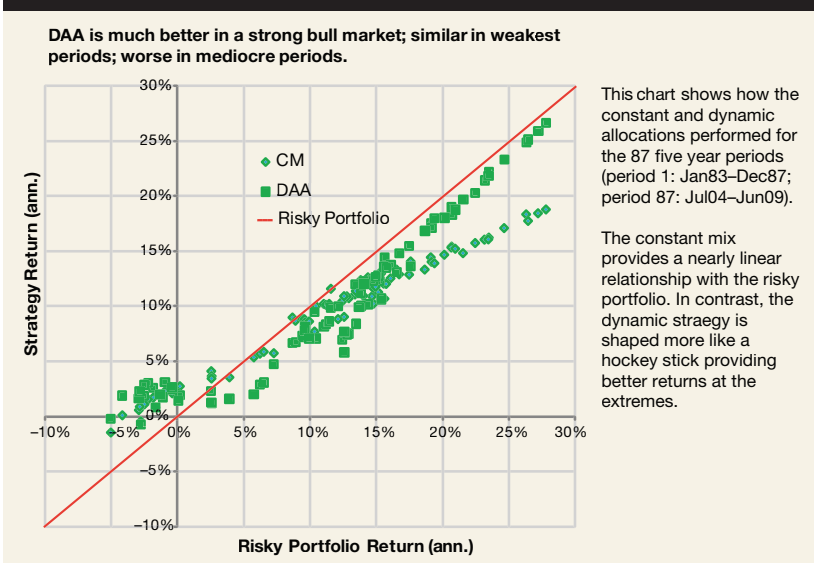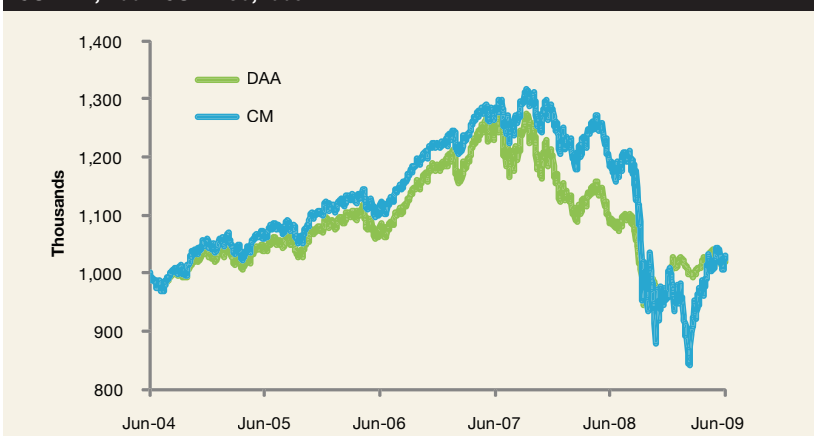| Market/Path	Favored Strategy
Prolonged bull or bear market	DAA
Volatile sideways market	CM
No movement sideways market	Neither
Sharp reversal after prolonged bull or bear market	CM

FIGURE 2: ANALYSIS OF 5-YEAR PERIODS

DAA is much better in a strong bull market; similar in weakest periods; worse in mediocre periods.

Legend: CM, DAA, Risky Portfolio

Y-axis: Strategy Return (ann.)
X-axis: Risky Portfolio Return (ann.)

This chart shows how the constant and dynamic allocations performed for the 87 five year periods (period 1: Jan83–Dec87; period 87: Jul04–Jun09).

The constant mix provides a nearly linear relationship with the risky portfolio. In contrast, the dynamic straegy is shaped more like a hockey stick providing better returns at the extremes.

FIGURE 3: VALUE OF $1-MILLION INVESTMENT IN DAA AND CM, JUNE 1, 2004–JUNE 30,2009

Legend: DAA, CM

Y-axis: Thousands

non-fully diversified conservative mix. Because conservative allocations already have high exposures to safe assets, DAA provides little additional protection.

In contrast, the back-test for DAA compares especially favorably with CM strategies on the aggressive end of the spectrum. We consider a DAA strategy with a 75-percent floor. The initial investment is assumed to be 100 percent to the risky asset. In comparison we show both a 100-percent risky and an 80-percent risky/20-percent safe portfolio.

Back-tests suggest that aggressive implementation of DAA, which begin with 100 percent allocated to the risky asset, outperformed the constant mix strategy of 80-percent risky and 20-percent safe in every performance measure shown. The comparison with 100-percent equity is less clear. The downside risk is considerably less, but there is some sacrifice of return.

Effects of Market Environment

DAA and CM will have dramatically different returns. This should be obvious from the fact that a DAA allocation can range from 0–100-percent risky. Table 3 shows which approach is favored in a few market environments.

Figure 2 shows the results of the 87 five-year periods using the 85-percent floor compared with the constant mix of 60-percent risky and 40-percent safe. There can be substantial differences in the returns.

Given that average returns over five years can differ dramatically, there will be subperiods of substantially different performance. Figure 3 illustrates this point. It shows the value of a $1-million investment in both DAA and CM from July 1, 2004, through June 30, 2009. The annual returns for both strategies are 0.8 percent. In contrast to these coincidentally identical five-year returns, the last two quarters produced far different returns. In the first quarter of 2009, DAA outperformed by more than 700 basis points. In the next quarter, it

underperformed by more than 800 basis points. Investors need to be educated that such differences will occur.

Taxes–A Comment

DAA can be expected to have higher turnover than a CM strategy, although this is not always the case. However, higher turnover does not necessarily translate into higher taxes. Capital gains taxes are driven by the realization of profits, not losses. DAA buys on the way up and sells on the way down. If the market goes up and then down, then one will buy high and sell low, generating a loss, assuming the safe portfolio's value is stable. Thus if the market goes up and returns to its starting point, then a DAA investor can realize a loss. The point is that, despite higher turnover, DAA returns may not be adversely affected on an after-tax basis.

Implementation

Even if DAA is good on paper, the question remains whether it can be implemented as part of an investment platform. A system must monitor the values of the risky and safe portfolios daily, calculate the cushion and the target values, and determine the appropriate trades considering tolerances (i.e., do not trade if the transactions are less than 2.5 percent of the portfolio), and limits (i.e., do not allow the risky portfolio to exceed 100 percent). The safe portfolio is likely to be a bond portfolio, which may contain relatively difficult-to-trade bonds such as municipals. As such, a single liquid security such as a money market, bond ETF, or open-end fund would be identified for trading between the risky and safe portfolios. Trading would need to be automated. Reporting would include alerts notifying appropriate persons when the allocation to the security for trading within the safe portfolio fell below a threshold so that this liquidity source could be replenished. Another would identify portfolios that were close to or in violation of the floor.

Summary

This analysis has consciously avoided standard deviation as a measure of risk, which may be appropriate when comparing investments with symmetric distributions. In this case, while CM strategies are somewhat symmetric, DAA strategies have truncated left tails and longer right tails. These are attractive properties given that investors generally prefer larger upsides and are averse to downside returns. It's fair to say that given that DAA and CM have similar average returns, investors should prefer DAA due to its lower downside and higher upside (it has a similar average return because it does worse in choppy sideways markets). **I&W**

Rex P. Macey, CIMA®, CFA®, is chief investment officer at Wilmington Trust in Atlanta, GA. He is chair of the Investment & Wealth Monitor *advisory board. He earned a BA in mathematics from Vanderbilt University and an MBA from Kenan-Flagler Business School at the University of North Carolina at Chapel Hill. Contact him at rmacey@wilmingtontrust.com.*

Endnotes

1   See Fischer Black and Robert C. Jones, 1987, Simplifying Portfolio Insurance, *Journal of Portfolio Management* (fall): 48–50; and Andre Perold and William Sharpe, 1995, Dynamic Strategies for Asset Allocation. *Financial Analysts Journal* (January–February): 149–160.

2   The strategy described is commonly known as constant proportion portfolio insurance (CPPI), but I cannot bring myself to use the i-word because there is no guarantee and the level of protection is not strong enough to warrant the use of that word.

See page 49 for a link to the online CE quiz.