

Dynamic Asset Allocation

Beyond Buy-And-Hold

Even during the strongest of bull markets, not every investment rises at the same rate. This range of performance among different investments has led to money managers developing strategies to dynamically allocate among a choice of investments. Here, a money manager explains his recent research into this subject.



Individuals, professionals and institutions diversify their investments over several asset classes to seek a specific return versus risk objective. An example of a

typical allocation might be 65% equities, 30% bonds and 5% money markets. Such allocations might be adjusted for investor risk tolerance and/or economic conditions, such as long-term interest rate, inflation, manufacturing capacity utilization, employment level and business cycle position. Usually, many factors are analyzed in combination to determine an asset allocation.

There are at least three approaches to asset allocation: strategic, tactical and dynamic. In strategic allocation, the investor allots a fixed percentage to several asset classes for a long period. Periodically, the portfolio is adjusted to bring it back to the original allocation weights, by selling winners and buying losers. When the return from one asset class rises,

another typically declines, which reduces overall return.

The next approach is tactical asset allocation. Here, the investor changes asset weights by large increments between a few asset classes, based on market return predictions. This can be accomplished by either shifting resources from one business sector to another, depending on business cycle knowledge (this is known as *sector rotation*), or by utilizing classical market timing, which invests in stocks in up markets and cash equivalents in down markets. Classical market timers generally use technical and/or economic indicators to move between a specific asset class and a cash equivalent.

Dynamic asset allocation is the third approach, and it is the one in which the investor shifts capital among several asset classes, depending on market conditions.

IN PREVIOUS STUDIES

The five best mutual fund newsletter portfolios tracked by *The Hulbert Financial Digest* (as of 1995) have an average yearly return of 8.5% over the eight-year period ended August 31, 1995. This compares to a Wilshire 5000 total return (price appreciation and dividends) of 10.3% annually. In 1996, Hulbert reported that only five of the 30 bond-timing newsletters beat the average buy-and-hold Shearson Lehman Hutton All-Maturities Treasury Index of 7.5% per year over the five-year period ended August 31, 1996. The highest-performing newsletter obtained a return of 9.1%. *Digest* publisher Mark Hulbert observed that about 90% of the variance in the long-term newsletter portfolio performance is due to asset allocation, whereas market timing and selection make up about 10% of the performance.

A study in 1991 found that 91.5% of the pension fund differential return could be explained by the strategic asset allocation policy. Thus, of primary importance to investor return is correct asset allocation, and individual stock or fund selection is of secondary importance. And it is best to be in asset classes that appreciate at high rates.

IN THE CURRENT STUDY

The goal of this study was to compare the performance of buy-and-hold and dynamic asset allocation

strategies for several asset classes. For the purposes of this study, dynamic asset allocation (DAA) is defined as switching the investment from one asset class to another. The performance of each asset class is examined, both individually (buy-and-hold) and combined with an alternate investment. The DAA strategy seeks to employ capital where it grows faster and hopefully loses slower (or not at all) than a competing investment would. In a down market, DAA might lose capital if the alternate investment also drops.

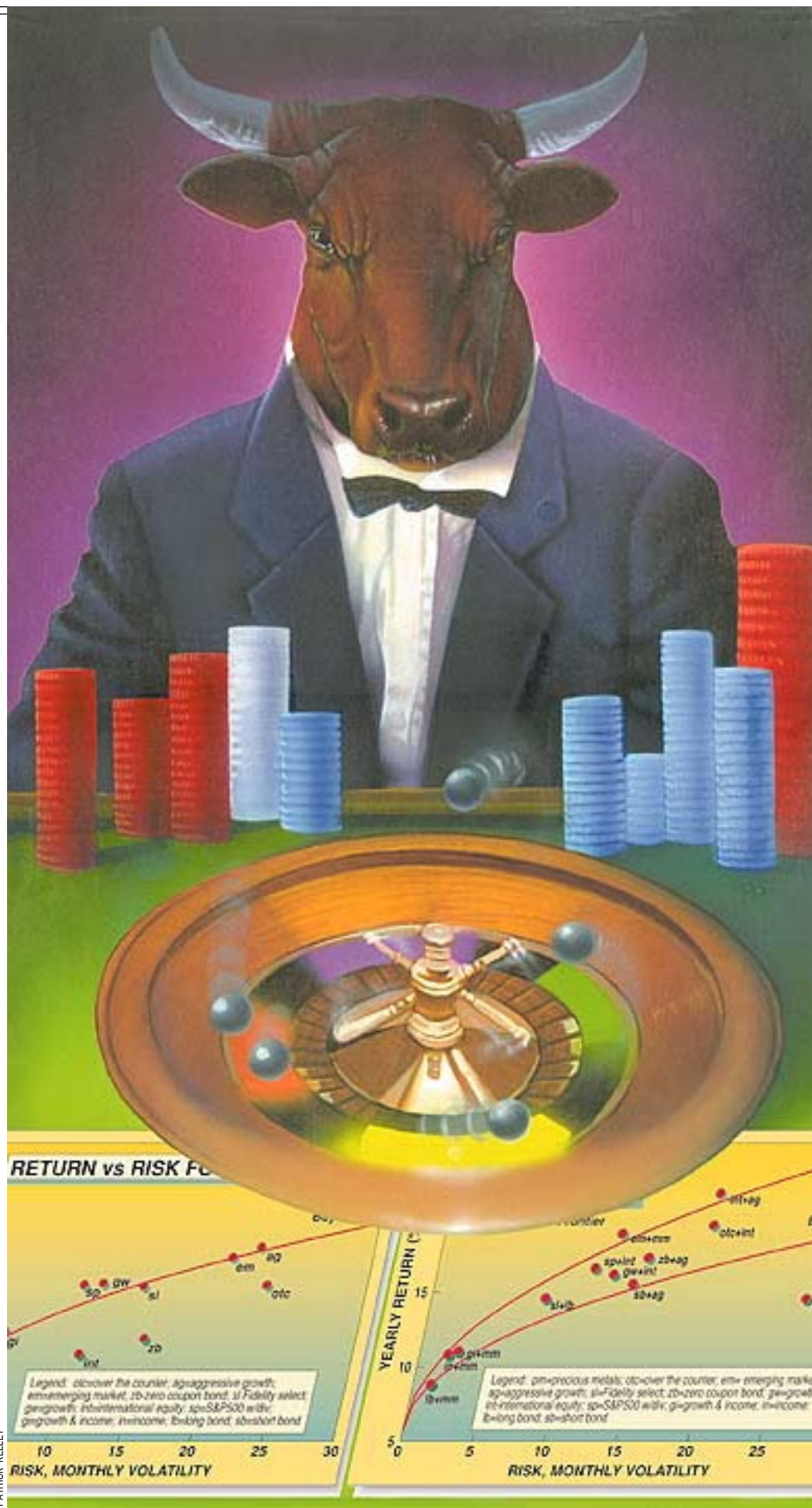
Of the several alternate investment vehicles chosen, only a few, including money market, precious metals and short-term bonds, are less likely to lose money in a down market. In addition, the returns presented here are not adjusted for inflation.

For the 13 asset classes considered, 722 mutual funds (mostly no-load funds) are grouped and averaged to obtain representative average asset classes. The number of funds in each of the asset classes studied are:

- n Precious metals (28)
- n Over the counter index, OTC (1)
- n Aggressive growth (91)
- n Emerging market (30)
- n Zero-coupon bond (6)
- n Fidelity select (35)
- n Growth (215)
- n International equity (81)
- n S&P 500 (1)
- n Growth-and-income (27)
- n Income (58)
- n Long-term bond (88)
- n Short-term bond (61).

The reference fund for the aggressive growth asset class, for example, is the average of the 91 aggressive funds. Fund family objectives are used to define the groups. From the database used, new or removed funds are considered in the geometric averaging process on a daily basis. Five alternate investment asset classes, or strategies, are examined, from low to high risk. These include:

- 1 A money market fund (Vanguard money market fund, ticker symbol VMMXX)



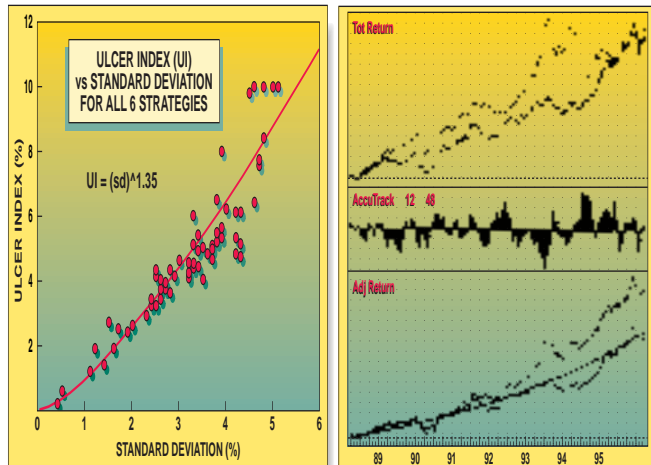


FIGURE 1: ACCUTRACK INDICATOR. Here's an example of switching with AccuTrack between aggressive growth and emerging market asset classes. The top is the aggressive growth and emerging market asset classes. The middle is the AccuTrack indicator, and the bottom graph illustrates the equity curves.

- 2 Long-term bond
- 3 S&P 500 index fund (Vanguard S&P 500 with dividends, ticker symbol VFINX)
- 4 International equity, an asset class with low correlation to the US market
- 5 Aggressive growth.

The period covered is September 30, 1988, to September 30, 1996, which covers two nominal business cycles. The study is hypothetical and uses historical data. Commissions and transaction costs are not considered, which is reasonable for no-load mutual funds. Mutual fund management fees are inherent in the fund prices used. Investment advisor management fees to actively manage the portfolios were not taken into consideration; these would reduce the reported performance.

Further, the data for the study are obtained from the FastTrack software. This database is constantly expanding, with funds being added and deleted as time goes on. The large number of funds used in most of the asset classes should help minimize the survivorship bias. This study used the FastTrack database of November 1996. The net asset values are adjusted for dividends on the x -dividend date and the reported rate of return uses closing prices the day after the switch signal.

Statistics reported include rate of return, standard deviation, Sharpe ratio†, ulcer index† and maximum drawdown† (MDD) over the eight-year period. The return and risk statistics are obtained for each of the 13 asset classes, for buy-and-hold and each of the five strategies over the entire period. For the dynamic asset allocation strategy, the investment is kept in the asset class until a signal to switch comes up, at which time the money is moved in total to an alternate asset class. In this study, only binary switches (asset class A to asset class B and back) are examined.



DYNAMIC ASSET ALLOCATION

The DAA method is based on an indicator that measures relative strength between an asset class (average of funds) and another asset class (average of funds). For the purposes of this study, I selected the

AccuTrack indicator for its effectiveness and availability in FastTrack. AccuTrack was developed to switch between two funds, depending on the relative strength difference.

The AccuTrack indicator is calculated by exponentially smoothing with a 48-period, the daily percentage net asset value change of the first asset class and the reference asset class and then subtracting the difference between the two smoothed percentage changes. Then this difference is smoothed by using a 12-day exponential moving average (EMA)† calculation.

This method chooses between two competing classes and

The DAA method is based on an indicator that measures relative strength between an asset class (average of funds) and another asset class (average of funds).

completely invests in the asset class with the higher relative strength at any given time. If successful, this method of switching should improve gains and avoid periods of loss with a reasonable number of switches — round trips — per year.

Figure 1 shows an example of switching with AccuTrack between aggressive growth and emerging market asset classes. The top, middle and bottom graphs illustrate the total return (including dividends), AccuTrack indicator and equity curves, respectively. The buy-and-hold return, for aggressive growth, is 18% per year with a monthly standard deviation of 4.7%. The increased return using this DAA method is 22.7% with a monthly standard deviation of the equity curve of 4.6% (see the lower portion of the chart). The number of switches per year is a reasonable 2.2.

When AccuTrack is positive, the investment is in aggressive growth, and when AccuTrack is negative, the investment is in emerging market mode. To avoid whipsaw trades, the indicator ignores differences less than 15% of the maximum value. Over the eight-year period, the buy-and-hold return for aggressive growth is 277% and DAA increases this to 414%.

CORRELATION OF ASSET CLASSES

Correlation coefficients are important in asset allocation as one means of quantifying statistical interrelationships. One reason for diversifying a portfolio is that selecting uncorrelated classes

CORRELATION COEFFICIENT, R-SQUARED, OF ASSET CLASSES BASED ON MONTHLY RETURNS FOR EIGHT YEARS ENDED 9/30/96

Asset Class	Money Market	Long-term Bond	SP500 w/ Div	International Equity	Aggressive Growth
Precious Metals	0.05	-0.08	-0.07	0.12	-0.03
OTC	0.09	0.35	0.78	0.35	0.97
Aggressive Growth	0.09	0.36	0.84	0.36	1.0
Emerging Market	0.05	0.29	0.51	0.56	0.56
Zero-coupon Bond	0.06	0.81	0.43	0.21	0.34
Fid Select	0.10	0.40	0.88	0.43	0.96
Growth	0.09	0.42	0.93	0.38	0.97
International Equity	0.06	0.26	0.29	1.0	0.36
SP500 w/ Div	0.06	0.41	1.0	0.29	0.84
Growth-Inc	0.08	0.48	0.95	0.44	0.88
Income	0.11	0.60	0.94	0.39	0.83
Long-Term Bond	0.33	1.0	0.42	0.26	0.36
Short-Term Bond	0.73	0.80	0.27	0.20	0.24

FIGURE 2: CORRELATION COEFFICIENTS. The correlation coefficients of 13 asset classes with each of the five alternate investment classes are listed. These coefficients are based on daily data and are computed as part of this study over the same eight-year period.

lessens the risk. Correlation coefficients of 13 asset classes with each of the five alternate investment classes are listed in Figure 2. These coefficients are based on daily data and are calculated as part of this study over the same eight-year period. Values from 1 to -1 are possible. A value of 1 means that price histories are identical, and a value of -1 means that price histories move exactly opposite to each other.

From Figure 2, one can see that money market correlations are low with 12 asset classes and about 0.73 with short-term bonds. Long-term bonds are negatively correlated with precious metals, reasonably correlated (r-squared greater than 0.75) with zero coupon and short-term bonds, and not particularly correlated with the other nine asset classes. The Standard & Poor's 500 index is also negatively correlated with precious metals and reasonably correlated with six asset classes. Aggressive growth correlation coefficients are similar to those for the S&P 500. International equity is not highly correlated with any of the asset classes.

The correlation coefficients play a role in selecting the pairing of the asset classes in dynamic allocation, as discussed later.

RETURN VERSUS RISK

Figure 3 presents the average yearly return, monthly standard deviation and number of switches per year for the 13 asset classes and the buy-and-hold and five DAA strategies evaluated. Asset class switches per year (round trips) are listed and vary from zero for buy-and-hold to 3.7 for the short-term bond asset class allocated with the S&P 500. For the buy-and-hold

RETURN, STANDARD DEVIATION, SWITCHES, AND FRACTION OF TIME INVESTED FOR 13 ASSET CLASSES AND 6 STRATEGIES

Asset Class	Buy-Hold	Money Market	Long-term Bond	SP500 w/ Div	International Equity	Aggressive Growth
	Rate return std dev	Rate return std dev switches time	Rate return std dev switches time	Rate return std dev switches time	Rate return std dev switches time	Rate return std dev switches time
Precious Metals	5.6 6.8	7.8 5. 2.6 0.50	7.8 4.8 3.2 0.46	11.9 4.6 2.6 0.38	5.3 5.1 3.0 0.42	14.7 5.1 2.9 0.37
OTC	15.5 4.8	14.2 3.8 2.7 0.67	13.6 3.6 3.0 0.61	19.3 4.2 3.0 0.48	19.6 4.3 2.9 0.56	18.5 4.7 2.0 0.38
Aggressive Growth	18.0 4.7	15.4 3.7 2.7 0.70	15.1 3.7 3. 0.66	20.6 4.2 2.1 0.56	21.7 4.3 2.0 0.61	- - - -
Emerging Market	17.3 4.5	19. 3.5 2.5 0.66	19.1 3.6 2.6 0.65	20.1 3.9 2.9 0.52	18.4 4.0 2.1 0.60	22.7 4.6 2.2 0.50
Zero-Coupon Bond	11.9 3.9	13.4 3.2 2.4 0.62	11.4 3.4 3. 0.59	15.2 3.2 2.9 0.46	13.1 3.3 2.9 0.50	17.4 3.8 2.5 0.47
Fid Select	15.4 3.8	14. 2.7 3.0 0.72	14.7 2.8 2.9 0.67	17.9 3.4 3.2 0.53	17.3 3.7 2.9 0.58	19.7 4.2 2.2 0.44
Growth	15.6 3.4	11.8 2.6 2.6 0.72	12.6 2.6 3. 0.64	16.6 3.3 3.2 0.50	16.3 3.5 2.7 0.59	17.9 4.3 2.5 0.37
International Equity	10.9 3.3	10.0 2.5 2.9 0.62	12.7 2.5 2.2 0.55	16.7 3.3 2.6 0.40	- - - -	21.7 4.3 2.0 0.39
SP500 w/Div	15.5 3.2	11.1 2.4 3.2 0.76	11.2 2.6 3.5 0.70	- - - -	16.7 3.3 2.6 0.60	20.6 4.2 2.0 0.44
Growth-Inc	12.5 2.3	11.1 1.6 2.5 0.72	10.3 1.9 3.1 0.64	13.1 2.9 3.4 0.34	14.5 3. 2.5 0.52	17.8 4.2 2.4 0.34
Income	11.6 2.0	10.9 1.4 2.6 0.71	9.7 1.7 3.1 0.66	12.7 2.8 3.5 0.33	14.6 2.7 3.0 0.51	16.7 3.9 2.9 0.35
Long-Term Bond	8.3 1.5	8.9 1.1 2.2 .63	- - - -	11.2 2.6 3.5 .30	12.7 2.5 2.2 .45	15.1 3.7 3.0 .34
Short-Term Bond	6.6 0.5	7.3 .4 1.9 0.59	8.2 1.2 2.5 0.80	10.7 2.5 3.7 0.26	11.3 2.4 2.6 0.38	15.7 3.7 2.9 0.31
Average Yearly Return, Percent	12.7%	11.9%	11.9%	15.9%	14.8%	18.2%

FIGURE 3: DAA AND BUY-AND-HOLD PERFORMANCE. Here are the average yearly return, monthly standard deviation and number of switches per year for the 13 asset classes and the buy-and-hold and five DAA strategies evaluated. Asset class switches per year (round trips) are listed and vary from zero for buy-and-hold to 3.7 for the short-term bond asset class allocated with the S&P 500.

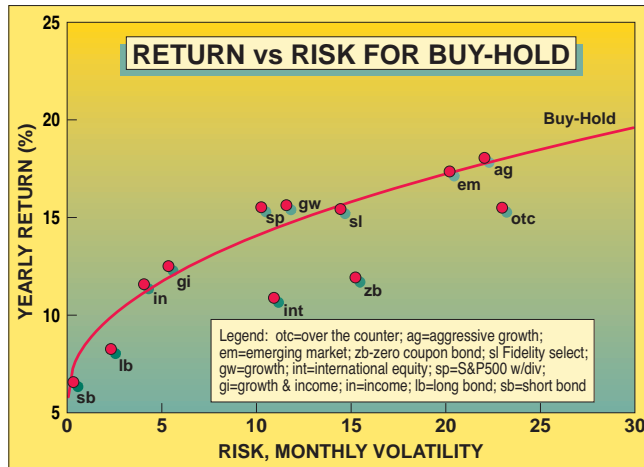


FIGURE 4: BUY-AND-HOLD RETURN VERSUS VOLATILITY. Buy-and-hold return versus volatility, which is the square of standard deviation, are presented here. Increasing risk corresponds with increasing return. An approximating line is drawn through the data, which represents the average yearly percentage return versus the monthly volatility, for the buy-and-hold strategy for each of the 13 asset classes.

strategy, the asset classes are ordered vertically from highest to lowest standard deviation from top to bottom.

An effective DAA strategy should increase return and reduce risk. Here's an example for precious metals. The buy-and-hold yearly return increases from 5.6% to 14.7% (810 basis points and 162% increase) using the DAA aggressive growth strategy. The strategy also reduces standard deviation from 6.8% to 5.1% (a 25% decrease).

A similar example using zero-coupon bonds allocated with aggressive growth increases yearly return from 11.9% to 17.4% (550 basis points and a 46% increase) with a slight reduction in standard deviation. The buy-and-hold yearly return of the emerging market asset class increases from 17.3% to a maximum of 22.7% (540 basis points) for all of the DAA strategies considered.

Using the aggressive growth asset class as the alternative investment produces the best increase in return for all but the over-the-counter (OTC) index. For example, the international equity average yearly return increases by 1,080 basis points from a buy-and-hold 10.9% to a DAA value of 21.7%.

Dynamic asset allocation can be seen in Figure 3 to increase the buy-and-hold yearly return of the average of the 13 asset classes from 12.7% to 18.2% return (550 basis points for a 43% increase) employing a simple aggressive growth strategy. The average return of all 13 asset classes and all five DAA strategies is 14.5% (180 basis points or a 14% increase over buy-and-hold). These values are obtained by averaging the buy-and-hold column and averaging all the other columns of Figure 3. The buy-and-hold return data of Figure 3 is plotted in Figure 4 in terms of volatility, which is the square of standard deviation.

As can be seen in Figure 4, as expected, increasing risk corresponds with increasing return. An approximating line is drawn through the data, which represents the average yearly percentage return versus the monthly volatility for the buy-and-hold strategy for each of the 13 asset classes. The equation

ULCER INDEX (UI), MAXIMUM DRAWDOWN (MDD), AND DATE OF MDD FOR 6 STRATEGIES

Asset Class	Buy-Hold	Money Market VMMXX	Long-term Bond	SP500 w/ Div	International Equity	Aggressive Growth
MDD date	UI MDD date	UI MDD date	UI MDD date	UI MDD date	UI MDD date	UI date
Precious Metals	23.4 11/24/92	10.0 8/13/92	10.0 10/28/92	10.0 12/19/91	10.0 11/17/92	10.0 1/22/91
OTC	8.4 33.0 10/16/90	5.4 11.8 5/13/93	4.8 11.5 5/9/94	4.8 20.3 10/11/90	5.1 19.9 9/28/90	7.6 29.2 10/11/90
Aggressive Growth	7.7 29.2 10/11/90	4.9 12.0 4/6/93	5.0 11.6 4/27/90	5.3 22.4 10/11/90	4.7 19.9 9/28/90	-
Emerging Market	9.8 29.3 3/9/95	4.0 11.2 8/6/90	4.8 15.4 7/11/94	5.6 23.2 10/11/90	6.2 23.2 9/28/90	6.4 24.5 10/11/90
Zero-Coupon Bond	8.0 21.9 11/4/94	4.2 9.4 8/11/94	5.4 15.9 11/17/94	4.5 7.3 8/24/90	4.5 17.5 8/23/90	6.5 18.6 8/24/90
Fid Select	5.2 24.0 10/16/90	3.7 8.9 9/28/92	3.6 10.8 11/23/94	4.4 19.6 10/11/90	4.7 19.1 9/27/90	6.1 26.3 10/16/90
Growth	4.9 21.2 10/11/90	3.4 8.2 4/24/90	4.0 10.3 11/23/94	4.4 20.2 10/11/90	5.0 19.8 10/11/90	6.1 23.2 10/11/90
International Equity	6.0 20.2 1/16/91	4.3 9.9 8/19/91	3.2 9.6 8/24/90	5.1 19.9 10/11/90	-	4.7 19.9 9/28/90
SP500 w/Div	4.1 19.2 10/11/90	3.2 7.9 4/24/90	3.7 9.7 4/27/90	-	5.1 19.9 10/11/90	5.3 22.4 10/11/90
Growth-Inc	2.9 12.4 10/16/90	1.8 4.8 1/10/90	2.4 7.4 4/27/90	4.1 15.9 11/7/90	4.6 16.8 11/18/90	5.3 16.7 10/16/90
Income	2.6 11.2 10/11/90	1.4 4.2 9/5/96	2.5 8.4 11/22/94	4.3 15.5 10/11/90	3.9 14.5 11/8/90	5.3 16.9 10/11/90
Long-Term Bond	2.7 10.5 11/21/94	1.2 3.9 9/12/94	-	3.7 9.7 4/27/90	3.2 9.6 8/24/90	5.0 11.6 4/27/90
Short-Term Bond	0.6 2.6 5/9/94	0.2 0.9 2/28/96	1.9 5.9 11/29/94	4.1 12.9 1/3/95	3.4 8.3 12/23/94	5.0 10.5 5/13/93

FIGURE 5: ULCER INDEX. An alternate risk parameter is used to quantify only the return fluctuations that lose money. The ulcer index is defined to be the root mean square of the return retracement (equity drawdown). Another risk quantity is MDD, which is the largest loss.

for the return, r , is:

$$r = 5.8 + 2.857V^{0.46}$$

Where:

r = Yearly return

V = Monthly volatility

The 5.8 intercept is the average money market return over the eight-year period of the study and is used as the risk-free return in the Sharpe ratio. Of the 13 asset classes evaluated, five

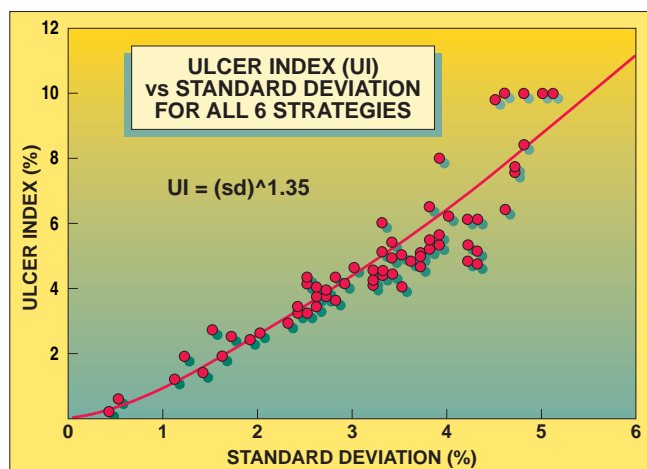


FIGURE 6: ULCER INDEX VS. STANDARD DEVIATION. It is apparent that the two risk measures are related to each other in a nonlinear manner. Thus, the more traditional measure of risk, standard deviation, will be used here.

appear to be inefficient; they are below the approximating line and provide less return than the risk implies. These include long-term bond; precious metals (off the graph with a return of 5.6% and volatility of 46); zero-coupon bond; international equity; and OTC.

An alternate risk parameter is sometimes used to quantify only the return fluctuations that lose money. This parameter is called the *ulcer index* (UI). The ulcer index is defined to be the root mean square of the return retracement (equity drawdown). Another risk quantity is MDD, which is the largest loss. The ulcer index and MDD, calculated using FastTools, are presented in Figure 5. A plot of the ulcer index versus the standard deviation can be seen in Figure 6. The data appears to scatter about the line described by:

$$UI = \sigma^{1.35}$$

Where:

UI = Ulcer index
 σ = Standard deviation

It is apparent that the two risk measures are related to each other in a nonlinear manner. Thus, the more traditional measure of risk, standard deviation, will be used here.

Many investors lose faith in a trading strategy when the MDD is too high. Examples of MDD for the buy-and-hold strategy vary from 2.6% for short-term bonds to 49% for precious metals (see the first column of Figure 5). Surprisingly, buy-and-hold maximum drawdowns of 19% or higher occur for nine of the 13 asset classes. The dates when the MDD occurs are listed. Many of the large MDDs occurred during the bear market of 1990. Dynamic asset allocation decreases maximum drawdowns compared with buy-and-hold for precious metals, OTC, aggressive growth, emerging market and zero-coupon bonds. In contrast, DAA increases maximum drawdowns for the more volatile strategies using S&P 500, international equity and

SHARPE^{*} RATIO FOR THE 6 STRATEGIES

Asset Class	Buy-Hold	Money Market	Long-term Bond	SP500 w/Div	International Equity	Aggressive Growth
Precious Metals	-0.01	0.12	0.12	0.38	-0.03	0.50
OTC	0.58	0.64	0.62	0.93	0.93	0.78
Aggressive Growth	0.75	0.75	0.73	1.02	1.07	-
Emerging Market	0.74	1.09	1.07	1.06	0.91	1.06
Zero-Coupon Bond	0.45	0.68	0.48	0.85	0.64	0.88
Fid Select	0.73	0.88	0.92	1.03	0.90	0.96
Growth	0.83	0.67	0.75	0.94	0.87	0.81
International Equity	0.45	0.48	0.80	0.95	-	1.07
SP500 w/Div	0.88	0.64	0.60	-	0.95	1.02
Growth-Inc	0.84	0.96	0.68	0.73	0.84	0.82
Income	0.83	1.05	0.66	0.71	0.94	0.81
Long-Term Bond	0.48	0.81	-	0.60	0.80	0.72
Short-Term Bond	0.46	1.08	0.58	0.56	0.66	0.77

* Sharpe ratio = $(r-5.8)/sd$, where monthly standard deviation is converted to yearly standard deviation by multiplying monthly values by square root of (12).
Average buy-and-hold Sharpe ratio is 0.62
Average of all dynamic asset allocation strategies is 0.78.

FIGURE 7: SHARPE RATIOS. The Sharpe ratios quantify excess return over a risk-free return (money market 5.8%) per unit of standard deviation. The average Sharpe ratio for buy-and-hold is 0.62 and increases to 0.78 for the average of all the DAA strategies, or a 25% increase.

aggressive growth when used with less volatile asset classes of growth-income, income, long-term bonds and short-term bonds.

Sharpe ratios are reported in Figure 7, which quantify excess return over a risk-free return (money market 5.8%) per unit of standard deviation. Comparing the Sharpe ratios of the buy-and-hold to those with a money market strategy shows that of the 13 asset classes, 10 have higher Sharpe ratios with DAA; only growth and S&P 500 strategies decrease the Sharpe ratio. Emerging market increases its buy-and-hold Sharpe ratio from 0.74 to 1.09 (47.3% increase), with DAA using a money market. Thus, the money market DAA strategy reduces the volatility for all the asset classes, increases the return for about half and increases the return per unit risk for all but two of the asset classes. The average Sharpe ratio for buy-and-hold is 0.62 and increases to 0.78 for the average of all the DAA strategies, or a 25% increase.

DAA INVESTMENT CONCEPT

One way to visualize dynamic asset allocation is to consider an initial asset allocation of, say, 5% aggressive growth, 20% emerging market, 50% S&P 500, 20% growth-and-income and 5% income. As market conditions change, AccuTrack might select a different asset class for one or more of the original asset

DYNAMIC FRONTIER PRIMARY AND ALTERNATE ASSET CLASS PAIRS FOR PREFERRED DAA STRATEGY

Primary Asset Class	Alternate Asset Class for Preferred DAA	Correlation Coefficient	Rate of Return per Year, Percent	Sharpe Ratio	MDD
Precious Metals	Aggressive Growth	-0.03	14.7	0.50	28.0
OTC	International Equity	0.35	19.6	0.93	19.9
Aggressive	International Equity	0.36	21.7	1.07	19.9
Emerging Market	Money Market	0.05	19.0	1.09	11.2
Zero-Coupon Bond	Aggressive Growth	0.34	17.4	0.88	18.6
Fid Select	Long-Term Bond	0.40	14.7	0.92	10.8
Growth	International Equity	0.38	16.3	0.87	19.9
International Equity	Aggressive Growth	0.36	21.7	1.07	19.9
SP500 w/Div	International Equity	0.29	16.7	0.95	19.9
Growth-Inc	Money Market	0.08	11.1	0.96	4.8
Income	Money Market	0.11	10.9	1.05	4.2
Long-Term Bond	Money Market	0.33	8.9	0.81	3.9
Short-Term Bond	Aggressive Growth	0.24	15.7	0.77	10.5

Assuming equal asset class weighting, average rate of return = 16 percent and average Sharpe ratio = 0.91.

FIGURE 8: PREFERRED DAA PERFORMANCE. To determine a single strategy to employ with each of the 13 asset classes, both high Sharpe ratios and low correlation coefficient combinations are selected.

allocations. For example, the aggressive growth and S&P 500 investments might be reallocated to either international equity and/or emerging market, and growth-and-income and income could all be reallocated to a money market. Thus, the portfolio would dynamically adjust between the original asset allocation and alternate asset allocations, depending on market conditions. The asset class choices may be binary as presented here, or more complex.

ON METHODOLOGY

To determine a single strategy to employ with each of the 13 asset classes, I selected both high Sharpe ratios and low correlation coefficient combinations. The resulting pairs of primary and alternate asset classes for a preferred DAA strategy are listed in Figure 8. This strategy increases buy-and-hold yearly returns from 12.7% to 16% (330 basis points or a 26% increase), and shows an increase in Sharpe ratio from 0.62 to 0.91 (a 47% increase).

Figure 8 indicates that at times five of the 13 asset classes could be in a money market, while Figure 9 shows the return versus risk for these pairings and illustrates the dynamic

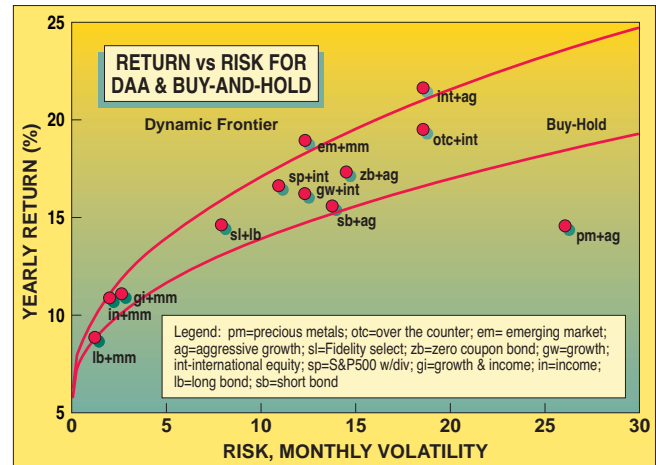
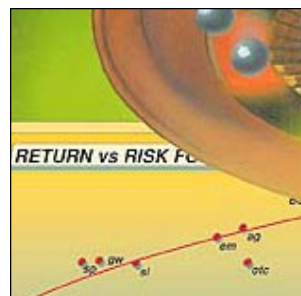


FIGURE 9: DAA RETURN VERSUS VOLATILITY. Here, the return versus risk for the pairings from Figure 7 are shown. The top line is the DAA approximate curve and the lower line is the buy-and-hold approximate curve.

frontier. To go completely into a money market at the beginning of a bear market, a market participant would need to employ a more complex DAA model than is presented here.

The dynamic frontier line has been drawn on Figure 9 to represent the higher returns obtained from the DAA process as presented. For the average asset class pairs shown, this line is about one standard deviation higher than the buy-and-hold line.

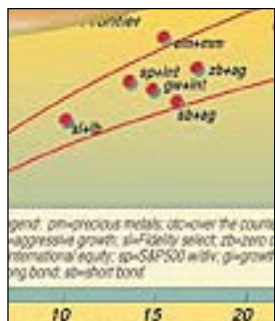


THE DYNAMIC FRONTIER

The dynamic asset allocation process seeks higher returns. Rational investors select alternate investments with the potential for increased returns or reduced losses. AccuTrack is reasonably effective in defining the better investment. The mechanism for DAA is not the same as that for modern portfolio theory† (MPT); for MPT, investments are diversified to reduce volatility through a covariance term. The risk is reduced, but there are no means of increasing return over the long run.

In the DAA process shown, an investment choice is made between a pair of competing asset classes. The essential difference between DAA and MPT is that DAA is a dynamic process that presents the opportunity to increase return, while MPT uses averaged statistics and portfolios to allocate resources across several investments at the same time. The DAA process seeks to increase gain by investing in a better asset.

For the examples I've provided here, only binary asset selection has been employed in contrast to modern portfolio theory, which combines several assets at once. As two assets are switched, the managed asset return should increase and the volatility decrease for effective DAA signals. More complex DAA strategies would include tertiary selection rules.



CONCLUSIONS

The dynamic asset allocation process adds value over the traditional buy-and-hold strategy with a reasonable two to three fund switches per year. Average asset return increases of 180 basis points or 14% and increases in the Sharpe ratio of

25% are indicated. In addition, it is clear that higher increases in return over the buy-and-hold are generally obtainable for a preferred dynamic asset allocation strategy that employs money market, international equity and aggressive growth asset classes.

Over the eight-year period I examined within the confines of this article, the dynamic asset allocation strategy increased the average buy-and-hold yearly return by 330 basis points, from 12.7% to 16% per year or 26%, and increased the Sharpe ratio from 0.62 to 0.91, or 47%. The dynamic frontier characterizes the dynamic asset allocation results, and this positive increase in yearly return certainly makes this strategy a worthwhile one to keep in mind.

Gary J. Harloff, who publishes a mutual fund newsletter called The Intelligent Fund Investor, is a principal of Harloff Inc., an SEC-registered investment advisory firm located at 26106 Tallwood Drive, North Olmsted, OH 44070. Harloff is a member of the Society of Asset Allocators and Fund Timers Inc. and wishes to acknowledge the encouragement of R. Buck Gray and Paul Terrano and the assistance of Linda Ferentchak, Peter Mauthe, John Sosnowy and Jerry Wagner.

REFERENCES

- "AccuTrack Theory of Operation," Investors FastTrack, Baton Rouge, LA 70816, 1988.
 Brinson, G.P., L. Randolph Hood and G.L. Beebower [1991].

"Determinants of portfolio performance II: An update," *Financial Analysts Journal*, May-June.

FastTools software, version 1.2, Brian B. Stocks, PO Box F, Santa Clara, CA 95055, 1996.

FastTrack, Investors FastTrack, Baton Rouge, LA 70816, 1996.

Hulbert, Mark [1996]. "Timing and selection within the bond market: Look at the record," *American Association of Individual Investors (AAII) Journal*, November.

____ [1995]. "The performance of mutual fund newsletters vs. stock newsletters," *American Association of Individual Investors (AAII) Journal*, November.

Martin, P.G., and B.D. McCann [1989]. *The Investor's Guide to Fidelity Funds*, John Wiley & Sons.

†See Traders' Glossary for definition

S&C

