INVESTING IN VOLATILE TIMES: A DYNAMIC APPROACH TO ASSET ALLOCATION

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Introduction

Setting an asset allocation policy is, for most investors, the central decision when building a long-term investment program. The recent experience of extreme volatility in markets, however, has raised significant questions about the best way to pursue asset allocation.

The precipitous market drop during the Credit Crisis of 2008 and the equally dramatic subsequent rebound exposed the shortcomings of static, equity-centric asset allocation policies such as the traditional 60/40 stock/bond mix and the private equity-focused "endowment model". First, as correlations of risky assets converged portfolios dominated by equity (both liquid and illiquid) and other growth-oriented assets such as credit and commodities (including hedge funds with embedded exposures to those markets, or "beta"), showed that they were "one-bet portfolios". Second, in the midst of highly volatile markets, many plan sponsors found themselves unable to adjust portfolio positioning, initially to mitigate fast-rising risks and then to take advantage of once-in-a-generation opportunities for excess return available in severely dislocated market segments such as credit.

As we assess the current prospective environment of low expected asset returns and amplified risks, we believe it is important for investors to consider a more dynamic approach to asset allocation. Such an effort should be undertaken seeking both to manage risks as well as to generate additional return. In this paper, we lay out a framework for dynamic asset allocation, one we have used at NEPC for a number of years. The key components of this process include: 1) More frequent review and adjustment of asset allocation using market-driven assumptions; 2) Incorporating an Opportunistic component into asset allocation policy; and, 3) Delegating a portion of assets to flexible strategies such as global asset allocation and global macro.

A DYNAMIC APPROACH TO ASSET ALLOCATION REPRESENTS AN OPPORTUNITY FOR LONG-TERM INVESTMENT PROGRAMS TO INCREASE RETURN AND MANAGE RISK MORE EFFECTIVELY

The Importance of Dynamic Asset Allocation

At NEPC we believe there are opportunities to add value to investment programs at every step in the investment process. By focusing on a more dynamic approach to asset allocation, investors can more closely align their scarcest resources – staff and committee time – on those decisions that will have the greatest impact on their overall program. In prior papers we have described our risk-focused approach to asset allocation, as well as our views on the most effective methods for structuring programs at the investment strategy level (please see Bibliography). Effective asset allocation, however, does not stop with the risk-budgeting process.

The traditional approach is to review asset allocation on a periodic basis, perhaps every three years, using assumptions of asset class returns, risks, and correlations derived from long-term historic averages forecast over a 10-, 20-, or even 30-year horizon. Using mean-variance analysis, a

strategic portfolio is then identified that has a median expected outcome matching the target return with the lowest associated level of risk. Once this strategic asset allocation is set, the various asset categories are filled with investment managers using a "style-box" approach to manager strategy. Allocations are periodically rebalanced to targets, often according to strict rules and within relatively tight bands. The endowment model applies a similar long-term approach to asset allocation, with heavier weightings in alternative asset strategies such as private equity, real assets, and hedge funds.

THE RECENT EXPERIENCE OF EXTREME VOLATILITY IN MARKETS HAS RAISED SIGNIFICANT QUESTIONS ABOUT THE BEST WAY TO PURSUE ASSET ALLOCATION

Such approaches to asset allocation assume that relationships among investment categories are relatively stable over time; that valuations, risks, and correlations do not change significantly. Yet the reality of markets, as the events of the last four years remind us, is quite different. In fact, the structure of the global investment landscape is changing constantly. Investors' most recent experience highlights the rapidly shifting nature of markets and the importance of becoming more dynamic.

Incorporating Dynamism into Asset Allocation

NEPC believes that it is important to incorporate dynamic asset allocation into investment programs by: 1) More frequent review and adjustment of asset allocation using market-driven assumptions; 2) Incorporating an Opportunistic component into asset allocation policy; and, 3) Delegating a portion of assets to flexible strategies such as global asset allocation and global macro. A description of each of these approaches follows.

A More Dynamic Annual Asset Allocation Process

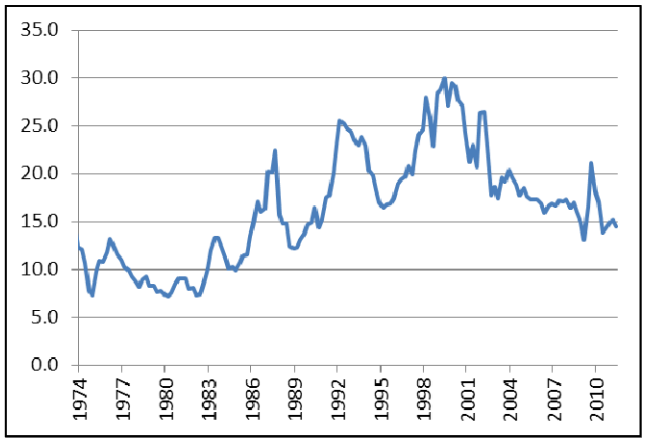
The experience of the last several years has provided ample evidence of the dynamism of markets, and serves as a constant reminder of the instability of key relationships driving asset class behavior. Below, we highlight the variability of critical inputs to the asset allocation process.

Valuation

Asset class valuations change through time as investors assess the overall economic environment and future prospects. Equity market valuations can be assessed by looking at indicators such as price-to-earnings (P/E) and price-to-book ratios, the relationship of stock market earnings and dividends to bond yields, replacement value of equities, and so forth. The valuation of bond markets can be assessed by considering indicators such as real yield over inflation and credit spreads over Treasuries. Even with an alternative asset category such as commodities, investors can gain a sense of relative value and attractiveness by comparing spot prices to forward commodity price curves.

Figure 1 shows the changing valuation of US large company stocks using the P/E ratio over the last 40 years. The significant variation in this factor over time can be explained in part by fundamentals, but also by investor fear and greed, i.e., overreaction to market environments. These changing valuation relationships should be reflected in forecasts of asset class return expectations, and should inform asset allocation decisions on a shorter time horizon than the traditional "set it and forget it" approach.

Figure 1 – S&P 500 Trailing Price/Earnings Ratio



Source: Bloomberg

Risk

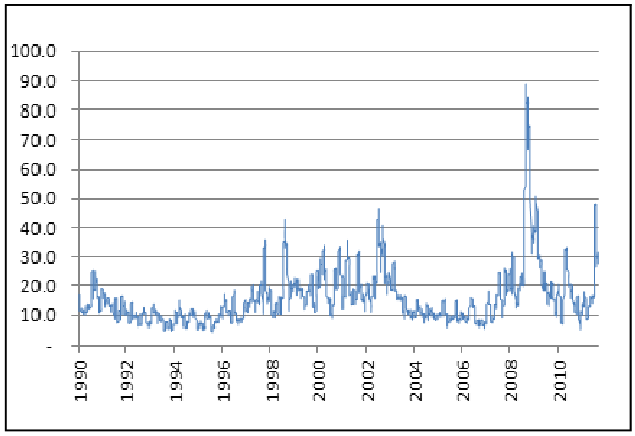
Just as market valuations vary through time, risk is not static over market cycles. There are many definitions of risk in markets – volatility, liquidity risk, counterparty risk, systemic risk, and so on.

The most commonly cited risk measure is volatility; and while this measurement has shortcomings

such as assuming normal distributions and valuing downside and upside risk equally, it is easily observable in the marketplace. Figure 2 shows annualized monthly volatility in the stock market since 1990. Over this time period, the average volatility was 16.1%, although for the five years running up to 2008 it was a docile 12.5%. Entering 2008, it was easy to underestimate the volatility of equities as part of a program's asset allocation assumptions and, as a result, allocate more heavily to risky asset classes on the eve of a major market downturn. A more dynamic approach, one that adjusted the forecasts of market volatility to incorporate higher expected risk after a low risk period and moderated projected risk after a high risk period would have led investors to reduce risk going into the crisis and then be able to seek higher risk and return assets coming out of the crisis.

It is also important to recognize that volatility is only one measure of risk. Investment program sponsors should think carefully about how to measure and forecast risk most effectively in their portfolios while monitoring multiple risk indicators to gain an understanding of how risk is changing in the current environment.

Figure 2 – S&P 500 Volatility (realized forward one month)



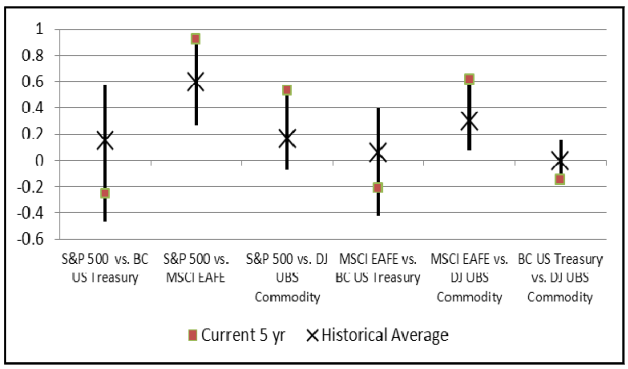
Source: Bloomberg

Correlation

The traditional approach to asset allocation assumes stable correlations of returns among asset classes. Just as with valuation and risk, however, correlations also change through time. Figure 3 shows the relationship of correlations among major asset classes.

This illustration highlights how these relationships can change dramatically over market cycles; often diversification benefits are reduced at the worst time. In the Credit Crisis, for example, risky assets appeared to move in sympathy – that is, their correlations moved to the high end of the historical range. The exception to this phenomenon was US Treasuries, which experienced negative correlations with risky assets. As a result, in this highly volatile environment, a traditional portfolio turned out to be anything but diversified. Adjusting correlations to reflect current market conditions (for example, increasing expected correlations in a higher-volatility environment), rather than always assuming long-term averages, is an important component of pursuing a more dynamic asset allocation approach.

Figure 3 – Major Asset Class Correlations Over Time



Source: Bloomberg (Equities since 1975, Treasuries since 1987, Commodities since 1996)

NEPC's Annual Asset Allocation Process

At NEPC, we forecast asset class return, risk, and correlation over a five-to-seven year horizon using current and forward market pricing of key valuation relationships and drivers of returns, observed and implied risk, and expectations of correlations going forward. While long-term historical relationships inform our views, they are not the primary drivers of our forecasts. We also incorporate the informed judgment of our seasoned senior professionals in developing our projections. Our resulting annual market return forecasts tend to be more variable than those based primarily on historical relationships and forecast over longer time horizons. Importantly, we also prepare scenarios for high and low economic growth, inflation, and interest rates to help clients understand how their portfolios may behave in extreme market conditions, as well as their program's sensitivity to these key factors.

Figure 4 shows our five- to seven-year forecasted geometric returns for major asset categories from

Figure 4 – NEPC Expected Returns

Expected Return					
Asset Class	**2007**	**2008**	**2009**	**2010**	**2011**
Cash	4.00%	4.00%	3.00%	2.00%	2.00%
Core Bonds	5.00%	5.00%	5.50%	3.75%	3.00%
TIPS	4.75%	4.75%	6.00%	3.50%	2.25%
High-Yield Bonds	6.25%	6.75%	11.00%	8.00%	6.25%
Global Bonds (Unhedged)	4.00%	4.00%	4.25%	3.25%	1.75%
Emerging Market Debt	6.25%	6.80%	8.00%	6.50%	5.25%
U.S. Large Cap Equities	8.50%	8.50%	9.25%	7.75%	7.00%
U.S. Small/Mid Cap Equities	8.75%	8.75%	9.50%	8.00%	7.00%
Int'l Equities (Unhedged)	8.75%	9.00%	9.75%	8.00%	7.00%
Emerging Int'l Equities	9.75%	9.50%	10.50%	9.50%	9.00%
Commodities	5.00%	5.00%	5.50%	4.75%	4.50%

Source: NEPC (5 -7 year forecast horizon)

2007 to 2011. An example of the importance of annual updating of forecasts based on market-driven factors can be seen in the change in expected return from US equity and high yield bonds from 2008 through 2010. In each case our forecasts progressed from muted expected returns followed by a significant increase after the Credit Crisis, and then a fall-off after the strong rally of 2009.

Our risk forecasts use current market pricing and draw on investor-driven indicators such as volatility indices (e.g., VIX) and other "fear indicators" being priced in the marketplace. At times of extreme sentiment, we also apply judgment to create more normalized risk estimates. Likewise, our assumed correlations put greater emphasis on recent experience and do not assume greater diversification than is on offer from the marketplace.

Combining these elements led us to advise clients to reduce risk in portfolios going into the Credit Crisis, followed by a re-risking of portfolios in 2009 and a moderation of that risk in 2010.

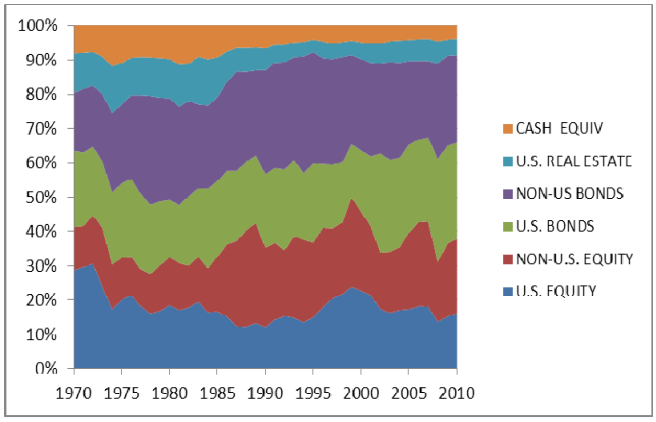
A Note on the Dynamics of the Global Market Opportunity Set

A key tenet of the capital asset pricing model is that the global market basket represents the most efficient long-term portfolio as defined by expected return per unit of risk, or Sharpe Ratio. Within this model, investors' asset allocations should deviate from that portfolio only to pursue higher return or to reduce risk. The traditional approach to asset allocation, described above, assumes that the composition of the market portfolio is static, whereas in reality it is constantly changing. Figure 5 shows the varying composition of the global market portfolio over the last 40 years. Focusing on US equity (the single largest component of most US institutional investment programs) the exhibit shows that this asset category has ranged from 30% of the global capital markets in the early 1970s to a low of 12% in 1990. In the most recent decade, US equity as a percent of the global market portfolio has ranged from the high teens to the low twenties.

A naïve approach to asset allocation following the capital asset pricing model would use these weights as a starting point for asset allocation each year. While we believe that additional considerations of valuation, risk, and correlations should come into play when setting asset allocation, as described above, we acknowledge that it is important to be cognizant of the global market composition when establishing asset allocation targets. Maintaining a static weight to US equity, for example, while disregarding its evolving weight in the global market portfolio indicates that the investor is actually making an active but unintentional bet.[1]

Furthermore, the structure of markets is constantly evolving. New investment categories regu-

Figure 5 – The Evolution of the Global Market Portfolio



Source: UBS Global Asset Management

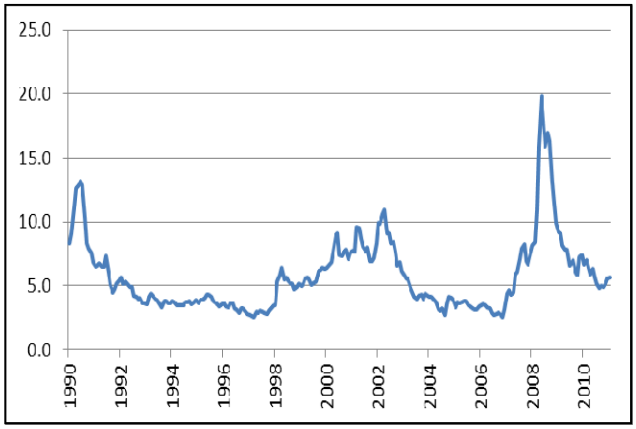
[1] Sharpe, William F., "Adaptive Asset Allocation Policies", Financial Analysts Journal, May/June 2010

larly become available to investors through the opening of new markets, disintermediation, financial engineering, and changes in the regulatory environment. In the 1980s, US investors built portfolios primarily of domestic large-company stocks and investment grade bonds (at that time Treasuries and corporates), but by the 2000s investors were routinely incorporating global asset classes and a panoply of alternative investments. More recently, new strategies such as bank loans and local currency emerging market debt have become common tools available to institutional investors as well as important potential sources of return and/or diversification. We believe it is important to assess new market segments and strategies for inclusion in a program's investment universe on an ongoing basis, and to create the latitude to pursue these newer categories as they grow and attract assets.

Opportunistic Investing

Occasionally markets dislocate and valuation moves to extremes – away from any semblance of fair value. Examples of such dislocations include the technology bubble of the late 1990s and the credit market sell-off in 2008. As a representation of the most recent experience in the credit markets, Figure 6 shows the yield spread of below -investment-grade bonds compared to Treasuries since 1990. In late 2008, spreads blew out to record levels, more than two standard deviations from the historical average. At that point, high yield bonds were being priced as if more than half the issues in the market would default and there would be lower-than-historical recovery levels on defaulted issues – a more disastrous outcome than experienced in the Great Depression. While

Figure 6 – High Yield Bond Spread (yield-to-worst) versus Treasuries



Source: Bloomberg

it was possible that the period from 2009 and beyond could have been worse than the 1930s for buyers of credit issues, it was more likely that investors had over-reacted to the Credit Crisis. For investors with the ability to dynamically shift their asset allocation, such radical extremes in valuation, which can persist for several years, represent opportunities to reduce risk (Tech Bubble) or harvest additional return (Credit Crisis). Dislocations can also present opportunities to exploit changing market dynamics and participation. For example, the departure of traditional providers of liquidity during the Credit Crisis created potential excess returns in its aftermath for those able and willing to lock up capital in liquidity-provision strategies.

IN 2008, WE RECOMMENDED THAT CLIENTS ALLOCATE 5%-10% OF THEIR ASSETS TO CREDIT STRATEGIES, FUNDED WITH A REDUCTION IN EQUITY EXPOSURE

At NEPC, we first took advantage of such a dislocation in 2002 when we recommended that clients tactically increase allocations to high yield bonds after that sector sold-off in the wake of the bursting of the tech bubble and the Enron/ WorldCom scandals. More recently, to take advantage of the Credit Crisis NEPC sent a letter in the spring of 2008 to all of our clients entitled, "When Opportunity Knocks". We recommended that clients create a new Opportunistic category in their strategic asset allocation policies to invest in the severely dislocated global credit markets, as well as in other opportunities that may present themselves in the future. We recommended that clients allocate 5%-10% of their assets to credit strategies, funded with a reduction in equity exposure. This is an example of NEPC's approach to opportunistic investing.

For most long-term portfolios, we believe that some form of opportunistic investing is appropriate, although we recognize that taking advantage of near-term opportunities can be outside the traditional asset allocation process. We also understand that outsized opportunities do not always exist in global markets. Therefore we recommend that funds establish an Opportunistic category with a maximum allocation of 10% and a target allocation of 0%. We recommend that allocations in this category be made with a time horizon of one-to-three years. They should be made

to asset classes that are large enough and at sufficient extremes in valuation that price movements can have a meaningful impact on a fund's risk and return profile. Also, the opportunity must be actionable in terms of investment vehicles and strategies, as well as within an investor's normal decision-making process.

In framing the specific opportunity arising during the Credit Crisis, we indicated to clients: 1) the likely horizon for the investment would be two-to-three years; 2) it would be hard to follow exhaustive due diligence procedures to evaluate the new credit-oriented investment strategies coming to market; 3) it would be difficult to make "apples-to-apples" comparisons of these products so diversification by strategy was important; and, 4) the opportunity may improve after the initial investment (e.g., prices may continue to fall before they rise). We identified, evaluated, and vetted an array of credit products across the liquidity and expected return spectrum from bank loan, convertible, high yield, and multi-sector liquid credit strategies to credit-oriented hedge funds and longer lock-up distressed vehicles. In Figure 7 we show the returns from mid-2008 to mid-2010 of three credit benchmarks representative of the liquid strategies pursued by clients as well as common equity benchmarks. The exhibit demonstrates that an allocation to credit strategies added value relative to stocks with less downside throughout the period.

The recovery in credit markets beginning in 2009 was remarkably rapid. Through our annual asset allocation forecasting process, as described above, by early 2010 we identified that liquid credit sectors had appreciated to nearly fair value. As a result, in the first half of 2010 we recommended that clients exit the liquid credit allocations in their Opportunistic portfolios.

Figure 7 – Credit Versus Stocks; Returns July 2008 – June 2010

Index	2nd Half 2008	2009	1st Half 2010	Total Period
Barclays US Credit	-3%	16%	6%	**19%**
Barclays High Yield	-25%	58%	5%	**24%**
S&P LSTA Lev Loan	-28%	45%	3%	**12%**
S&P 500	-29%	19%	-7%	**-16%**
MSCI EAFE	-36%	29%	-13%	**-27%**

Source: Bloomberg

Since 2010, the opportunity in the credit markets has evolved toward a longer-term distressed cycle. Going forward, in the increasingly complex global investing environment, we believe that it is important for investors to have an Opportunistic component of their asset allocation policy to be able to take advantage of such market dislocations.

MARKET PRICES FLUCTUATE CONSTANTLY. MOST SHORT-TERM CHANGES REPRESENT "NOISE" AND DO NOT REPRESENT RE-ALLOCATION OPPORTUNITIES FOR INSTITUTIONAL INVESTORS

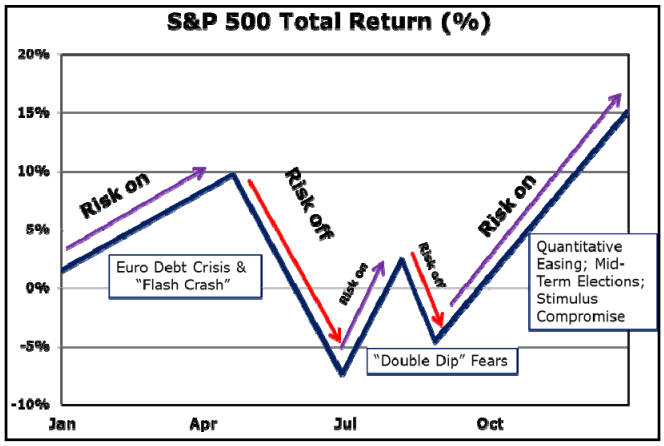
Incorporating Flexible Strategies such as Global Asset Allocation or Global Macro

Market prices fluctuate constantly. Most short-term changes represent "noise" and do not represent re-allocation opportunities for institutional investors. Often, however, markets move away from fair-value sufficiently for active managers to be able to pursue profitable trades. These trading opportunities are shorter-term in horizon and may occur in smaller market segments than what is required to pursue an allocation based on the Opportunistic approach described above; nevertheless, they can represent real chances to capture excess return or mitigate risk in an investment program.

The Macro-Driven Nature of Markets

For the last four years, markets for risky assets have tended to move in unison, driven by major macro-economic factors. Examples include the collapse of major financial institutions in 2008, the massive stimulus programs that began to take effect in 2009, and the European debt crisis and implementation of additional stimulus in the US in 2010. Figure 8 shows the ebb and flow of these events through calendar year 2010, and their impact on the US stock market. In this climate, cross-correlations among securities rose as the over-

Figure 8 – Macro-Driven Markets - 2010



Source: Bloomberg, NEPC

all flow of capital mattered more than differentiation among securities. This "risk on/risk off" market environment has continued into 2011 and, with policymakers being forced to make politically challenging decisions to address global imbalances, appears likely to continue for some time.

When markets are being driven by such top-down forces, active managers focused exclusively on security selection struggle to add value and overall investment program performance is driven by aggregate levels of risk exposure and allocations among risky asset classes. Programs that are not positioned to adjust to changes in the overall environment, either at the total program level or by incorporating managers with the ability to adjust their portfolios across asset categories and markets, will be at a distinct disadvantage.

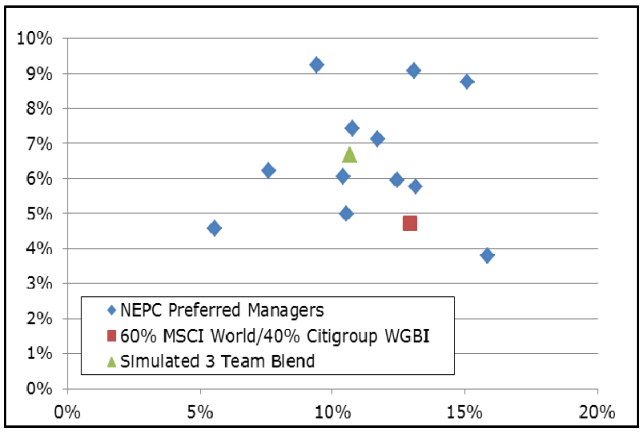
PROGRAMS THAT ARE NOT POSITIONED TO ADJUST TO CHANGES IN THE OVERALL ENVIRONMENT WILL BE AT A DISTINCT DISADVANTAGE

Global Asset Allocation and Global Macro Strategies

It is often said, "It's impossible to time the market." We agree that the vast majority of investors (including ourselves) do not have the investment experience, tools, and decision-making framework to pursue true tactical asset allocation. A small number of investment management firms, however, have been able to add value (by increasing return, reducing risk, or both) through a combination of building more efficient starting portfolios and then shifting assets among markets based on shorter-term trading opportunities. These strategies include global asset allocation, risk parity, and global macro.

Figure 9 shows the risk and return of NEPC's Preferred global asset allocation and risk parity strategies over the five years ending June 30, 2011. Nearly all of the managers represented (11 of 12) have provided superior performance relative to a passive 60/40 blended stock/bond benchmark. In our work with clients, we often recommend a "team" of managers in this category, each applying different approaches to these strategies. The green triangle in Figure 9 represents the median outcome of a simulation of three-manager teams. Over this time period the incorporation of such global flexible strategies has added significant value not only by increasing performance, but also by moderating risk over a passive allocation to stocks and bonds. Furthermore, these strategies, particularly those pursued by global macro managers, have historically demonstrated additional positive diversification benefits such as low or negative correlation to other risky strategies in times of market stress and positively skewed return patterns.

Figure 9 – NEPC Preferred GAA Strategies—Return and Risk



Source: NEPC (five years ending 6/30/2011)

Our recommendation that clients include a component of global flexible strategies in their investment structure is also consistent with an overall theme of loosening constraints on managers (i.e., departing from "style box" thinking) who have demonstrated strong active management skill. Such an approach can be implemented more broadly across investment programs with global equity managers, "go-anywhere" fixed income managers, and hedge fund strategies with broad opportunity sets and limited restrictions. By incorporating these types of strategies, investors can seek to take advantage of as many sources of

excess return as possible while ensuring that there are components of their program that are able to respond to global macro events to seek additional return, mitigate risk, or both.

Implementing Dynamic Asset Allocation

In order to implement a more dynamic approach to asset allocation, investment programs can take the specific steps described above. This may require some changes to program governance such as an expedited committee decision-making process, delegating specific authorities to staff, or structural changes to include opportunistic and global flexible components of the strategic asset allocation. From a rebalancing standpoint, broadening policy bands can be an important part of allowing for more dynamic asset allocation, as well as ensuring that rebalancing is less "mechanistic" and more flexible to allow for adjusting allocations based on changing market relationships.

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In rebalancing discussions, investors should consider the impact of transaction costs compared to the relative valuation of the affected categories. For those programs that are able to employ derivatives, working with a derivatives overlay manager can provide the flexibility to implement a more dynamic approach to asset allocation quickly and efficiently while minimizing the impact on underlying portfolios. For those programs that are not able to employ a dedicated derivatives overlay manager, implementing a more dynamic approach to asset allocation can be facilitated through the use of index vehicles for a portion of the portfolio.

Applications of Dynamic Asset Allocation: Liability-Driven Investing

An important application of dynamic allocation strategies among NEPC clients is in the area of liability-driven investing (LDI) for corporate pension plans. In the last several years, many pension plans have faced low funded statuses due to bad markets combined with low interest rates as mark-to-market accounting rules were implemented (the "perfect storm"). Restoring funded status has to result from some combination of contributions, higher interest rates, returns of risky assets, and excess returns from active management. Some programs are establishing planned stages of liability-hedging at progressive levels of funding status, or creating a "glide path" toward a fully hedged or near-fully hedged position. While a typical glide path might specify a calendar-based increase in the size of the liability-hedge (essentially dollar-cost averaging), we have worked with many clients to implement dynamic strategies that respond to market movements.

For example, increased funded status can be "captured" dynamically using rules based on the cause of any improvement, such as:

- If funded status improvement came from the performance of risky assets, reduce the allocation to risky assets along the glide path;
- If the improvement came from higher interest rates, increase liability-hedging assets;
- If the improvement came from outperformance of Treasuries in the hedging portfolio relative to the corporate credit-based liability (i.e., credit spread widening), trade into long corporates; and/or, If the improvement came from contributions, consider putting the additional assets entirely in liability-hedging assets.

By using these sorts of dynamic rules, many NEPC corporate pension clients have been able to protect funded status even as interest rates have generally declined. The high volatility environment for both interest rates and risky assets has allowed a dynamic approach to glide path management to capture short-term improvements in funded status.

Conclusion

A dynamic approach to asset allocation represents an opportunity for long-term investment programs to increase return and manage risk more effectively. We believe that by more frequently reviewing and adjusting asset allocation, incorporating opportunistic investing, and employing flexible strategies such as global asset allocation and global macro managers, investment programs can pursue these important objectives without engaging in short-term "market timing". A

more dynamic approach to asset allocation also can serve to focus investment committees and program staff on important, but often overlooked, drivers of risk and return for investment programs.

In the challenging current global investment environment characterized by muted expected capital market returns and outsized potential risks, we believe it is critical for investors to employ every possible tool in the investment toolbox. As markets continue to evolve, we expect that dynamic asset allocation will become an increasingly important component of investment program oversight. At NEPC, we remain committed to working with our clients to add value at each step in their investment process – including a heightened focus on implementing a dynamic approach to asset allocation.

The author thanks his colleagues Chris Levell, Mike Manning, Tim McCusker, John Minahan, and Mario Tate for their extensive input into and review of this paper.

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