GLOBAL FOCUS CAPITAL LLC
INSIGHT THAT MATTERS

That Free Rebalancing Dessert Can Be Costly!

Rebalancing is a topic held near and dear to the heart of many investment advisors and often forms a key building block of what the advisor perceives as his or held value add. If diversification is viewed as a free lunch then **rebalancing is often viewed as free dessert**.

Unfortunately while the benefits of true diversification stand the test of time the same cannot be said about rebalancing especially when done in a highly automated way such as frequently seen in many robo-advisor offerings.

What do we mean by rebalancing?

There are many reasons why investment advisors intentionally shift the weights of their portfolio components over time. The manager may have a changed view on future expected returns or they may deem a certain investment to now possess an unacceptable level of risk and thus wish to cut back on the exposure. Others may wish to more closely track a commercial index and do a wholesale portfolio rebalance to minimize deviations from benchmark weights.

In general there are two basic underlying motivations for rebalancing. The first is **informational** – the weighting structure of the portfolio is consciously changed to reflect an updated perspective on forward-looking estimates of return and/or risk.

The second basic motivation for rebalancing is purely driven by an automated rule that is agnostic to changing views on capital market risk and return conditions. The rebalancing rule is followed religiously regardless of the capital market environment.

This second form of rebalancing and the focus of this note we refer to as a **constant mix strategy**. Constant mix strategies take their cue solely from relative asset price changes over a chosen period of time and seek to bring portfolio weights back to a set of pre-defined time-invariant weights.

Let's look at what rebalancing means in the context of the typical 60% stocks/40% bonds portfolio.

If stocks and bonds deliver the same return over a period of time then the portfolio will at the end of the period still exhibit the same proportional allocations. However, if one asset class out-performs then the asset mix will drift and at the end of the period the weights will no longer be 60/40.

The outperforming asset class will now represent a larger fraction of the total portfolio. In a **constant mix rebalancing program** a portion of the out-performing asset class will need to be trimmed back to its intended target weight. The cash generated from the sale will then be invested in the under-performing asset class up to its target weight.

In contrast a "Sleeping Beauty" investor using a buy and hold approach does nothing. The portfolio weights drift up and down depending on the relative performance of the asset classes.

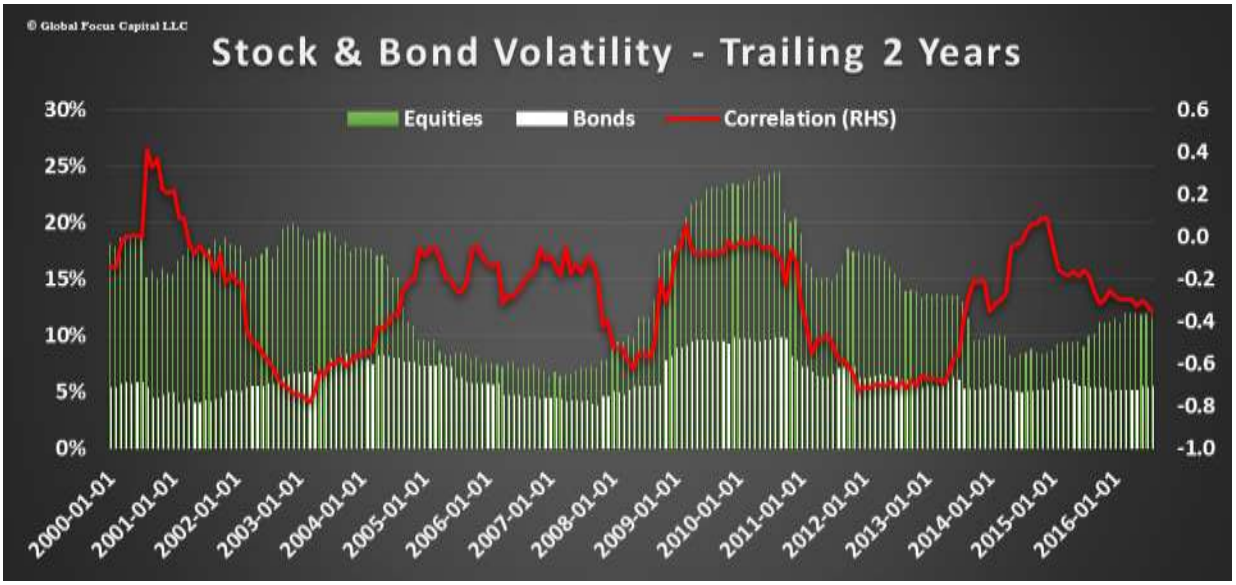
Over long periods of time and especially after large asset class performance differentials the ending period portfolio weights can bear little resemblance to the original formulation.

Not only do the asset class weights change as relative asset class returns differ over time but so does the risk profile of the overall portfolio. If asset class volatilities and correlations do not change over time (a highly unrealistic assumption but bear with us) then the constant mix 60/40 strategy exhibits the same overall risk profile over time.

However, if capital market volatility and correlation patterns change over time we could observe fairly dramatic changes in the risk profile of the overall 60/40 portfolio. For example, if the correlation between stocks and bonds increases then the overall portfolio volatility would increase.

To give you a sense of how dramatic these changes can be we plot stock and bond trailing 2 year volatilities and correlations from 2000 forward (using monthly returns). Let's start with correlations (red line). They are mostly negative but occasionally drift into positive territory, but they move around quite a bit over time.

Next, let's look at stock market volatility (green bars). The fluctuations over time can be quite extreme with the period 2005-2007 exhibiting low volatility and the period of 2009-2011 being fairly volatile. A similar pattern is shown by bonds (white bars) albeit at a more subdued level.



What does this all mean to the risk profile of a portfolio that is rebalanced to 60% stocks and 40% bonds at the end of each month?

While many advisors and their clients derive comfort from a rebalancing strategy to pre-defined weights the overall risk profile of the end portfolio is anything but static.

In fact, **over the 2000 to 2016 period the volatility of the constant mix 60/40 strategy has fluctuated between 4 and 15%.** The implications for the possible range of return outcomes for such a strategy are clearly quite extreme - rebalancing itself will not guard against fairly dramatic changes to portfolio volatility.

Also worth mentioning is that in most instances the risk profile of the ending period portfolio will look significantly different from that of the original portfolio. In the case of the 2000 to 2016 period the 60/40 mix starts off with a portfolio volatility close to 11% and by August of 2016 the portfolio carried a 6.7% volatility.

Post Financial Crisis volatility has been subdued across asset classes, but as the Federal Reserve starts normalizing interest rates to levels more commensurate with economic growth we would expect to see capital market volatility trend up to more historically consistent (higher) levels .

Why are many automatic constant mix rebalancing strategies viewed as a free dessert?

Constant mix strategies trim relative winners and top up relative losers. Assuming fairly priced asset classes at the beginning of the period a constant mix rebalancing approach can be construed as a value-oriented strategy buying up cheap assets and selling expensive assets.

The working assumption is that capital market forces will correct relative asset class mis-pricings. Under this scenario markets are constantly displaying mean-reverting behavior. Asset classes that go up must come down and vice versa. Kind of a rollercoaster of relative performance.

Rebalancing programs will pick up nickels and dimes by selling relatively expensive assets and investing the proceeds into relatively cheap securities. Transaction costs and short-term capital gain taxes will be incurred but according to proponents of such rebalancing programs, such costs will be offset by gains in portfolio values and as a side benefit – the icing on the cake - a reduction in portfolio risk. Risk in this context is frequently equated with downside volatility as valuation changes are viewed as the primary cause of mean reversion in asset prices.

The idea of buying low and selling high is alluring and under a mean reverting type of market a constant mix strategy would deliver on the promise. But **the romantic notion of mean reverting markets often fades away as real capital market behavior with all of its flaws sets in**.

Do real capital markets behave in the idealized mean reverting manner necessary for constant mix strategies to shine? Capital markets are ever changing as asset class fundamentals, risk characteristics and investor demand fluctuate for perfectly sensible as well as irrational reasons. Capital markets are constantly calibrating supply and demand conditions and over short-term intervals changes in investor sentiment tend to overpower fundamentals.

There is also a lot of both academic as well as practitioner research on time series momentum. In general the conclusion is that over intermediate time frames such as 12 to 24 months there are trends in asset class performance. Mean reversion as a concept has been thought of more as a 3 to 5 year concept but over the typical time periods used in rebalancing programs (monthly or quarterly) the evidence is more consistent with trends in asset class prices.

Apart from taking advantage of mean reversion patterns in asset class performance how does rebalancing really work? In a recent paper titled Rebalancing Risk, Granger, Greenig, Harvey, Rattray and Zou derive analytical formulas as well as provide empirical evidence on the behavior of constant mix strategies versus an approach that allows asset class weights to drift depending on relative performance.

In the paper they neatly decompose the performance drivers of the constant mix strategy. What they show is that the constant mix strategy can be decomposed as follows:

Constant Mix Portfolio

=

Buy & Hold Portfolio

+

Selling Put and Call Options on Relative Asset Performance

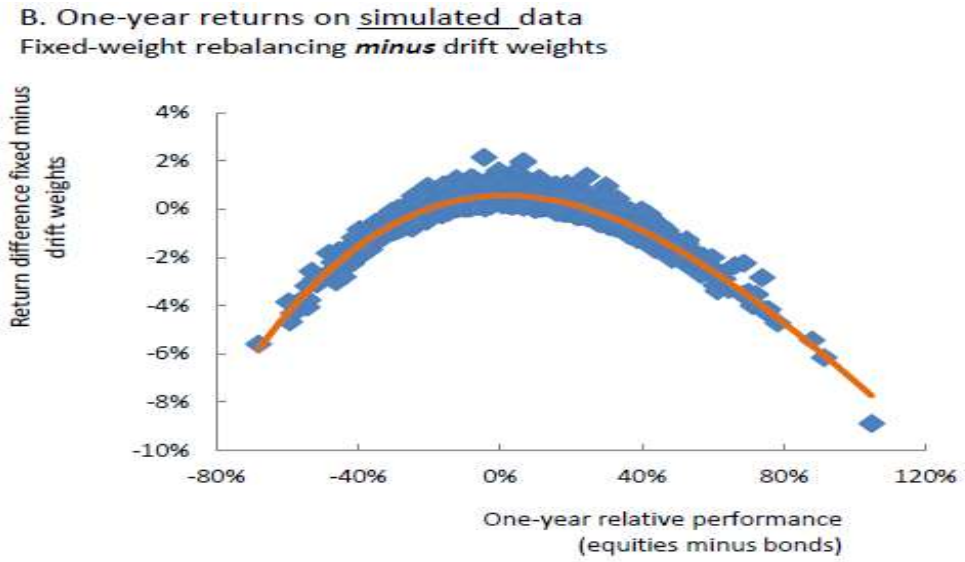
By evaluating the constant mix strategy in relation to buy and hold it becomes clear that the former strategy by implicitly selling puts and calls on the relative performance of assets carries option related payoffs and thus altered risk and reward characteristics.

The constant mix strategy carries **negative convexity** meaning that it outperforms when asset class return divergences are small by collecting the premium received for selling the puts and calls on the underlying portfolio.

However, when asset return divergences are large the selling of puts and calls results in losses and the buy and hold portfolio out-performs. In extreme cases when one asset class significantly lags the rest of the portfolio such as in a stock market crash the negative convexity of the strategy can magnify the drawdown.

Another way to think of the constant mix strategy is to put yourself in the shoes of the investor selling puts and calls. When volatility rises holders of the options will benefit and commensurately sellers of options will see an economic loss. That is why the constant mix rebalancing approach is often described as a **short volatility** strategy.

The authors of Rebalancing Risk conduct a set of empirical and simulation exercises using US stocka and bond data. We show their results below using simulated data.



Source: Reuters, Man calculations. Date range: January 1990 to February 2014. Monthly rebalancing.

The chart clearly shows that **constant mix portfolios exhibit small positive returns when relative asset class performance (stocks versus bonds in this example) do not perform too differently from each other**.

However, **when there are large differences in asset returns the tendency is to exhibit losses relative to buy and hold portfolios**. The losses are magnified during periods of extreme relative performance.

The basic prerequisite for constant mix strategies to out-perform buy and hold strategies are reversals in asset class performance. From a risk perspective, constant mix strategies add an element of risk as the approach involves additional option related features. **Justifying the use of a constant mix approach by implying risk reduction benefits is theoretically and empirically unfounded.**

If you are not easily convinced by conceptual arguments let's go to the tape and see how these strategies would have worked on real world portfolios. We will use actual return data from 2000 forward on a number of asset classes to empirically examine the performance of constant mix rebalancing strategies versus the more mundane buy and hold approach.

First take a look at the underlying data. We present the ten asset classes that we use in our multi-asset class strategies at Global Focus Capital LLC.

The first row of the data presents the total return by asset class from Dec 1999 to August 2016. US large cap stocks as proxied by the S&P 500 are up 104% over this period. US small caps are up almost double at 201%. The best performing asset class are REITS – up over 6X. The worst, even below cash, are commodities. Commodities are up only 21% in total over this time period.

	US LCAP	US SCAP	INTL EQ	EM EQ	RE	COM	US BD	INTL BD	EM BD	CASH
Return 2000-2016	104%	201%	56%	164%	619%	21%	180%	99%	340%	40%
Return 2000-2008	-28%	11%	-12%	42%	110%	67%	103%	73%	112%	37%
Return 2009-2016	183%	171%	76%	85%	243%	-28%	38%	15%	108%	2%
Monthly Volatility	15%	20%	17%	23%	22%	17%	6%	8%	9%	1%

Significant return variability is seen in our sample. Breaking up the sample into Pre (second row) and Post (third row) Financial Crisis highlights the incredibly divergent performance of major asset classes. The volatility of asset classes over the whole time period (last row) are also indicative of the wide dispersion in asset class returns.

A really interesting and important aspect of capital market behavior since 2000 has been the stellar performance of US bonds (we use the 10- year maturity US Treasury). US bonds were up 180% over the period, vastly outdistancing US large cap stocks. The annualized volatility stood at 6% over this time period.

Emerging Market Bonds (EM BD) are also worth a mention. The asset class is up over 340% over the 2000-2016 period. This is over 2X the performance of EM equities. In contrast to other asset classes the Pre and Post Financial Crisis performance of the asset class is fairly similar.

Our analysis compares the performance of constant mix strategies in relation to buy and hold approaches. The data above constitutes the raw material used in our examination of rebalancing strategies.

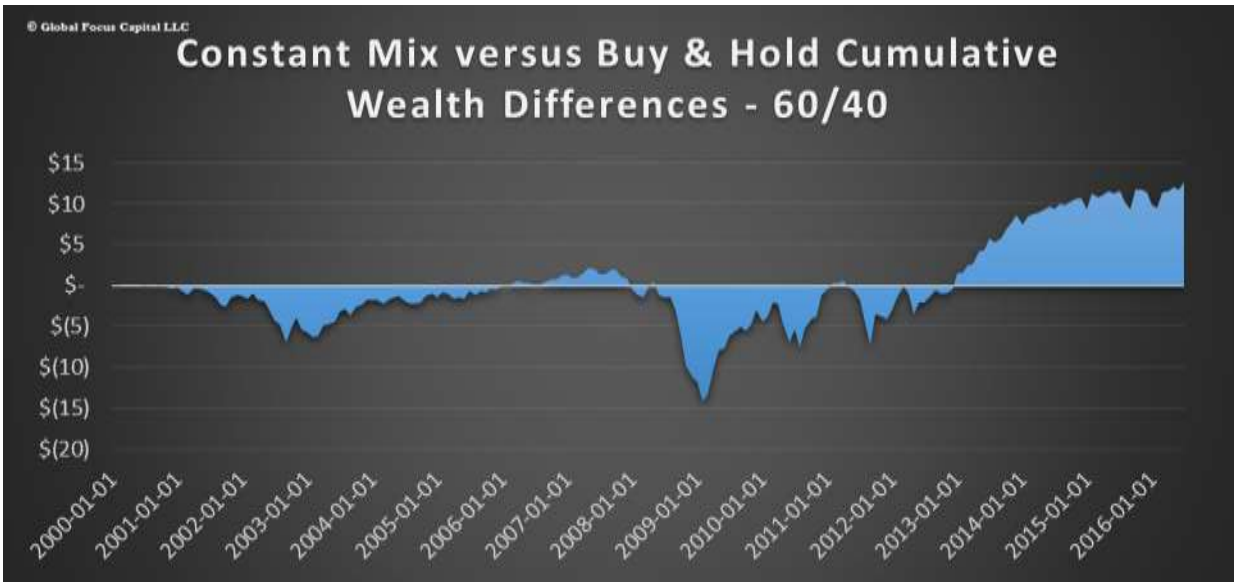
We rebalance on a monthly basis and abstract from trading and tax costs associated with the strategies. Suffice it to say that constant mix strategies can sometimes result in heavy portfolio turnover and an unwelcome tax bill.

We present the cumulative performance difference between the constant mix and buy and hold portfolios. As with any other type of analysis the starting point and ending points are highly influential so we also show rolling 12 month results. **An upward sloping line equates to constant mix outperformance versus buy and hold.**

We also measure the beta and volatility of the strategies versus a 60/40 portfolio. By definition the constant mix approach has a beta of one while the beta of the buy and hold will depend on the drift in asset class weights. We show all results in relation to the constant mix strategy.

Finally we show the turnover required by the constant mix strategy to remain on target. Periods of large asset class return differences will require more trading activity to bring back the weights to the desired target.

Let's start simple by looking at the basic 60/40 portfolio. We use the S&P 500 to represent equities and the 10 year US Treasury to represent bonds. The cumulative wealth differences between a constant mix and a buy and hold portfolio are shown below.



Buy and hold dominated monthly constant mix rebalancing up to 2012 and since then the reverse has been true for an investor forming his/her portfolio at the end of 1999. Over the entire period the

constant mix investor would have come ahead by over $10 based on a $100 investment at portfolio formation.

The next chart looks at the trailing 12 month performance of the constant mix versus the buy and hold portfolio (the blue bars) based on a starting set of weights as of December 1999. Values greater than zero correspond to an outperformance of the constant mix strategy.

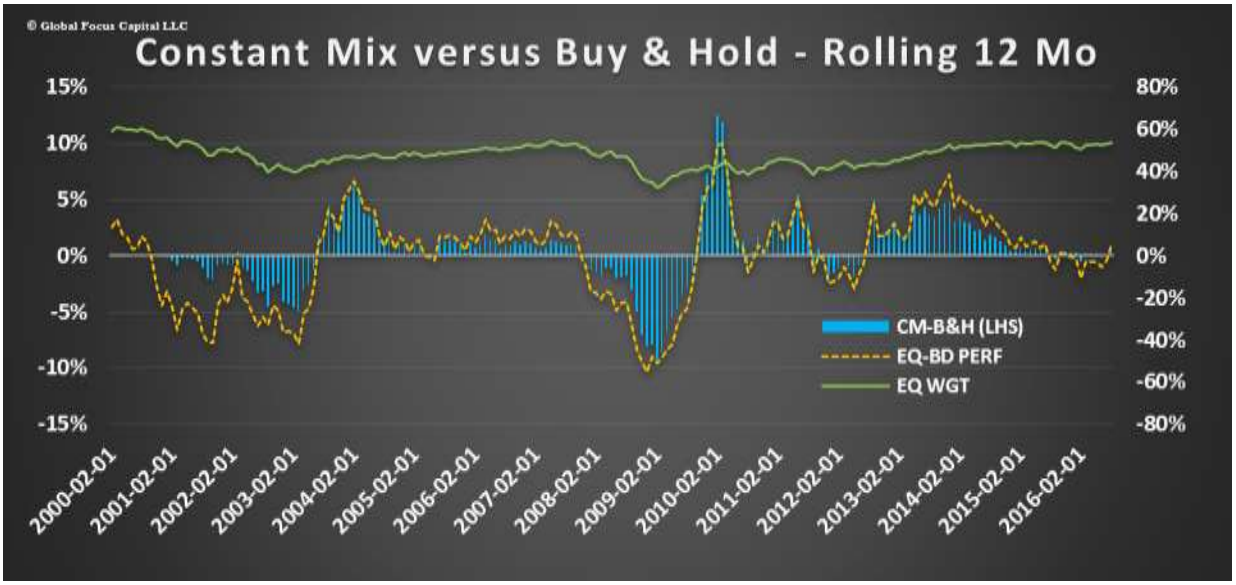
We also show on the right hand side axis the rolling 12 month relative performance advantage of stocks versus bonds (dotted yellow line). This line moves in tandem with the excess performance of the constant mix rebalanced portfolios.

Periods where equities outperform bonds by a large margin are associated with constant mix out-performance. The constant mix strategies under-perform buy and hold when bonds vastly outperform equities such as during the 2008 Financial Crisis.

This result is driven by both the magnitude of the relative returns but also by the drift in the equity weight (green line) since 2000. For example, by early 2009 the equity weight of the buy and hold strategy had sunk to its all-time low of 31% and thus when the equity market started recovering in April of 2009 the buy and hold approach lagged the constant mix strategy by a lot.

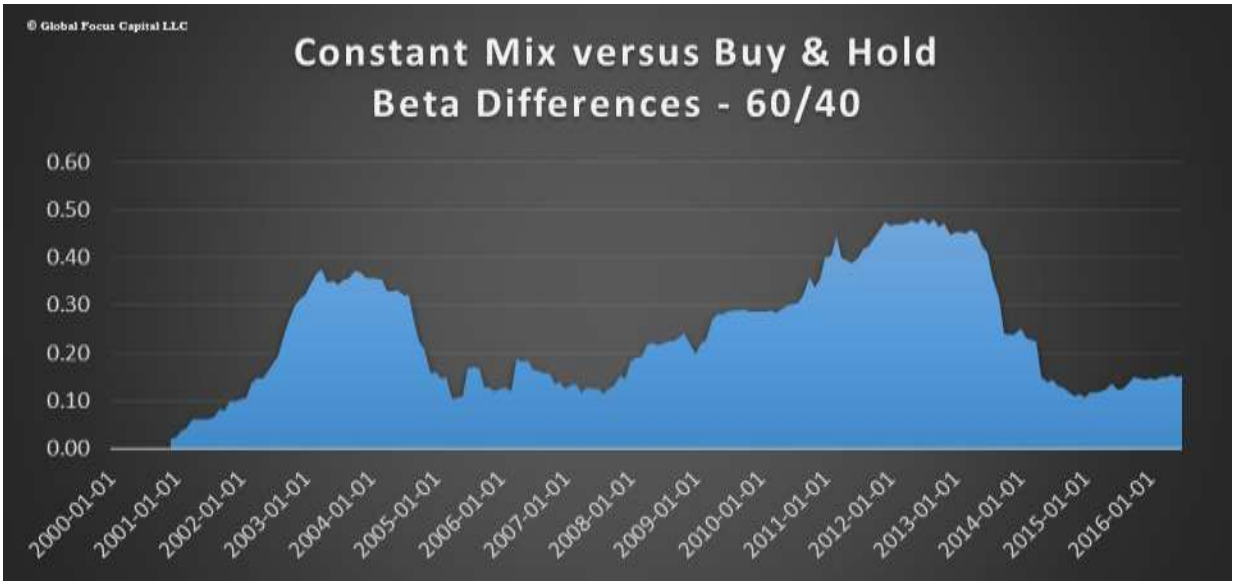
If we had started our buy and hold at a different point in time the results would have been different.

The key point to understand is that different forms of market behavior lead to different outcomes with neither constant mix rebalancing or buy and hold dominating in terms of wealth creation.



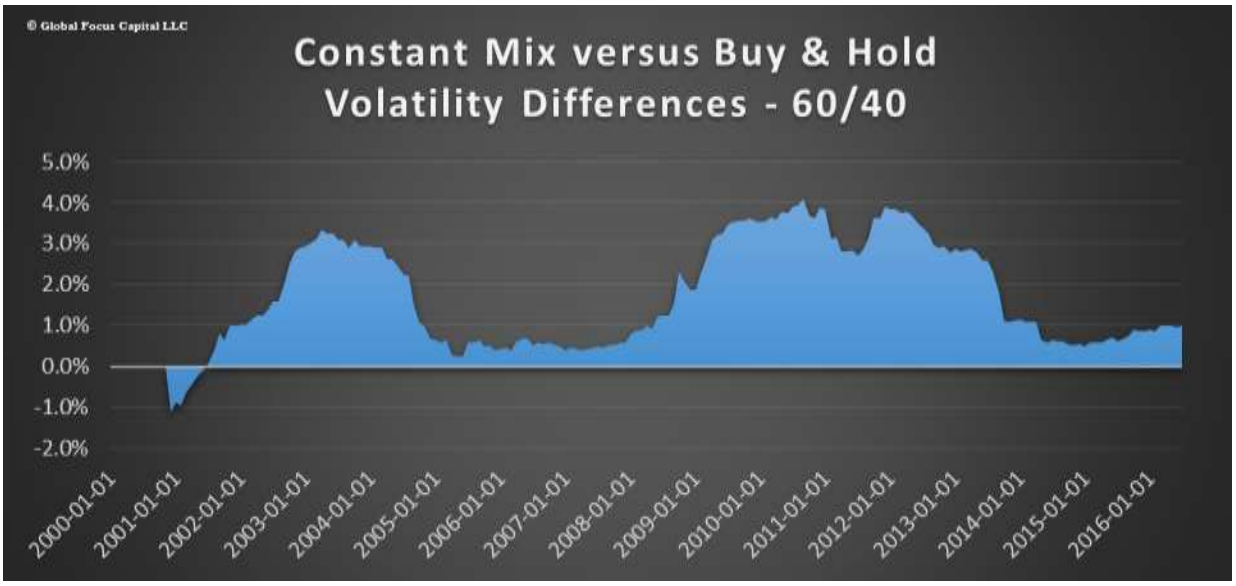
Did constant mix rebalancing lower the risk of the portfolio? We looked at both the trailing 24 month beta of the strategies as well as their return volatility. The rebalanced strategies actually incurred higher levels of both beta as well as volatility.

What happened? The buy and hold portfolio by virtue of its downward drift in the equity weight (see green line in previous chart) was turning over time into a lower risk portfolio.



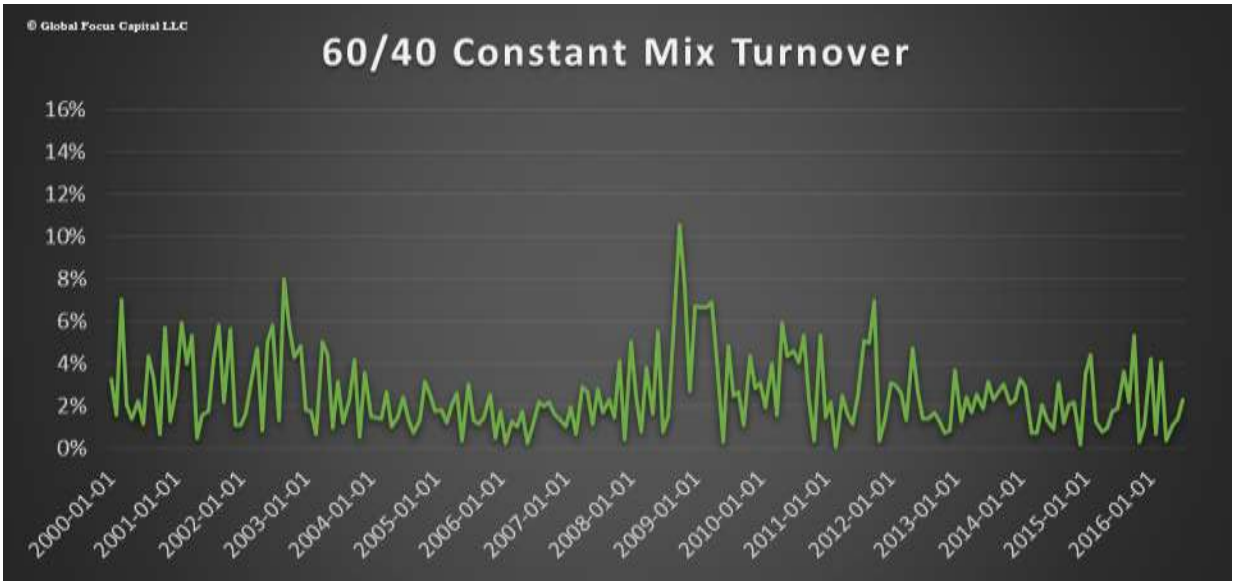
In terms of beta the constant mix rebalanced strategy had at times significantly higher levels of market exposure. The highest point occurred during the 2012/2013 period.

In terms of portfolio volatility only during a very short period in 2001 did the rebalanced strategy exhibit lower levels of return dispersion.



How much turnover would have been necessary to implement a monthly rebalance of a 60/40 portfolio?

On average, over the 2000 to 2016 period the monthly turnover amounted to 2.6% with a high of 10% occurring in October 2008.



If the investor did nothing how much weight drift would there be over the 2000 to 2016 period?

The table below summarizes the time series evolution of the buy and hold portfolio weights. A 60/40 portfolio formed in December 1999, if untouched, would have ended up with an equity weight of 53.5% due to the under-performance of US stocks relative to bonds over this time period.

That does not seem like much drift but the interim period did involve significant variability with the equity weight reaching a low of 32.3% in February 2009.

STRATEGY		60/40								
WEIGHTS	US LCAP	US SCAP	INTL EQ	EM EQ	RE	COM	US BD	INTL BD	EM BD	CASH
STARTING	60.0%	0.0%	0.0%	0.0%	0.0%	0.0%	40.0%	0.0%	0.0%	0.0%
ENDING	53.5%	0.0%	0.0%	0.0%	0.0%	0.0%	46.5%	0.0%	0.0%	0.0%
AVERAGE	47.8%	0.0%	0.0%	0.0%	0.0%	0.0%	52.2%	0.0%	0.0%	0.0%
MIN	32.3%	0.0%	0.0%	0.0%	0.0%	0.0%	39.2%	0.0%	0.0%	0.0%
MAX	60.8%	0.0%	0.0%	0.0%	0.0%	0.0%	67.7%	0.0%	0.0%	0.0%

Can we tell something about when the constant mix rebalancing strategy worked better?

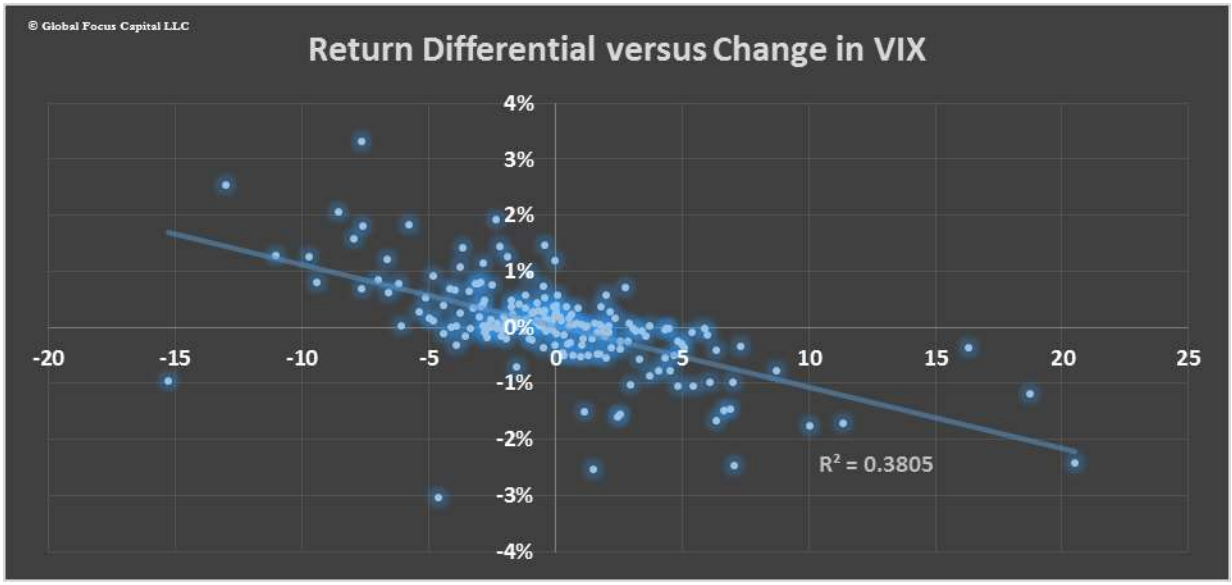
As we discussed previously the fundamental difference between the constant mix and the buy and hold portfolios is the option payoff created by the selling of puts and calls on the relative asset class returns.

Changes in volatility often play a critical role in determining the profitability of such option-related strategies. If you are a seller of volatility such as in a constant mix strategy you want asset class volatility to come down. However, when volatility spikes up the constant mix rebalance program will experience a loss relative to the buy and hold portfolio.

In the chart below we plot the difference in monthly returns between the constant mix and buy and hold portfolios versus the VIX, a measure of short-term stock market volatility. What we see clearly is that when the VIX comes down from one month to the next the constant mix strategy has a tendency to win out relative to the buy and hold portfolio (top left quadrant).

The relationship between changes in the level of stock market volatility and the spread in return for the two types of portfolios is negative. **The constant mix strategy will be expected to outperform the buy and hold when VIX levels come down aggressively.**

In our analysis we also looked at changes in implied volatility of bond returns and found that while the relationship was negative as with stock market volatility the relationship was statistically weak. In 60/40 portfolios we usually expect equities to contribute more than 85% of the total risk making changes in stock market risk of much greater importance than changes in bond volatility.



What would happen if we went beyond the simple 60/40 portfolio and analyzed a multi-asset class portfolio? Would the research lead to different conclusions?

The short answer is no. The analysis is slightly more complex but the basic requirement that a constant mix strategy needs mean reversion in asset class returns to outperform a buy and hold approach remains valid.

The nature of the option strategy selling calls and puts (short straddle) involves a larger number of assets but the basic concept is unchanged.

We analyze a multi-asset class portfolio where each asset class at inception is weighted equally. Such a weighting structure is referred to as 1/N where N corresponds to the number of asset classes.

We use ten asset classes – US Large Cap, US Small Cap, International Equity, EM Equity, US Bonds, International Bonds, EM Bonds, Commodities, Real Estate and Cash. Every asset class begins with a weight of 10% as of December 1999.

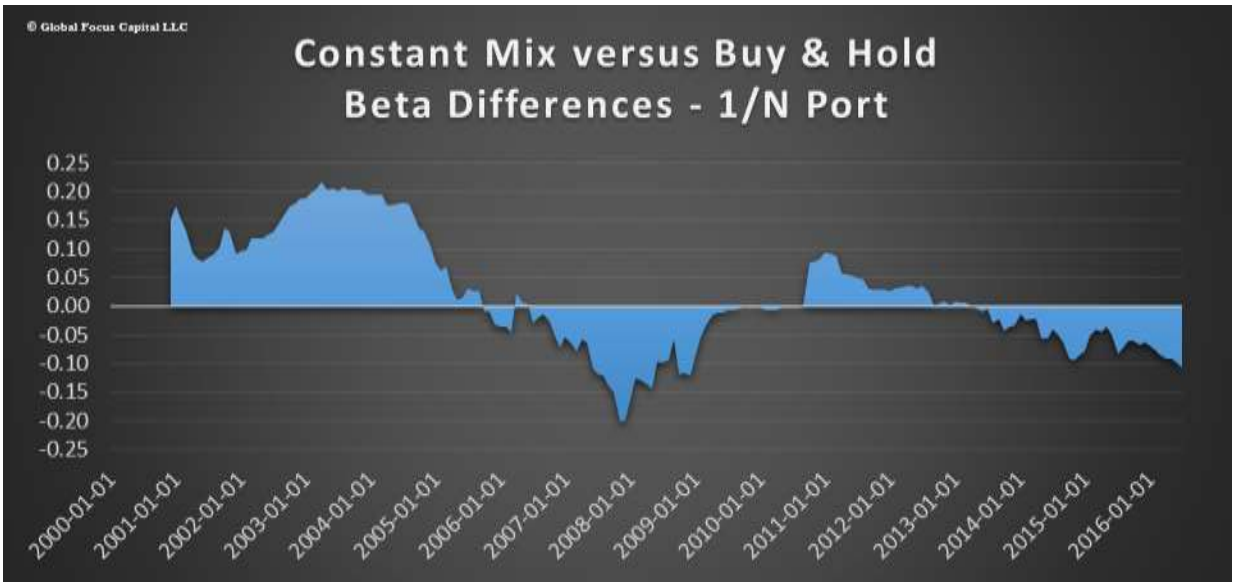
In the constant mix strategy we rebalance the portfolio monthly to the original 10% weights. No transaction costs or taxes are included in our performance numbers.

As with the previous analysis we look at the difference in returns between a constant mix rebalancing approach and a buy and hold portfolio over the 2000 to 2016 period.

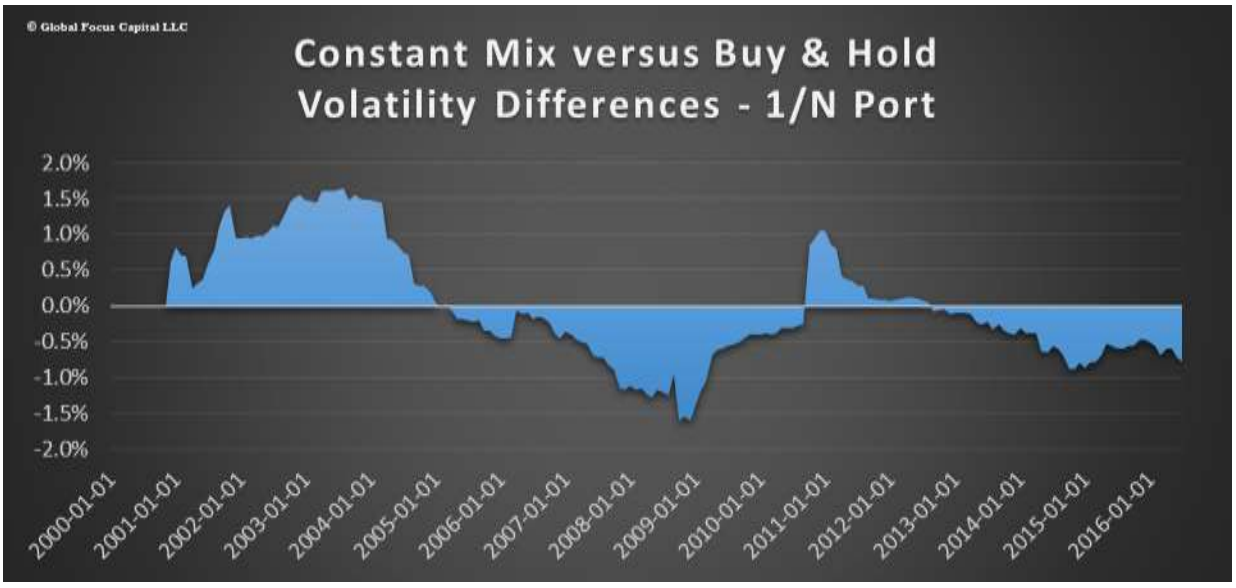
The chart below highlights that as with the previous analysis **no one approach dominates in terms of wealth creation.**

Buy and hold dominates Pre-Financial Crisis while constant mix rebalancing approaches dominate from 2009 to 2014. In the last couple of years buy and hold has reasserted itself.

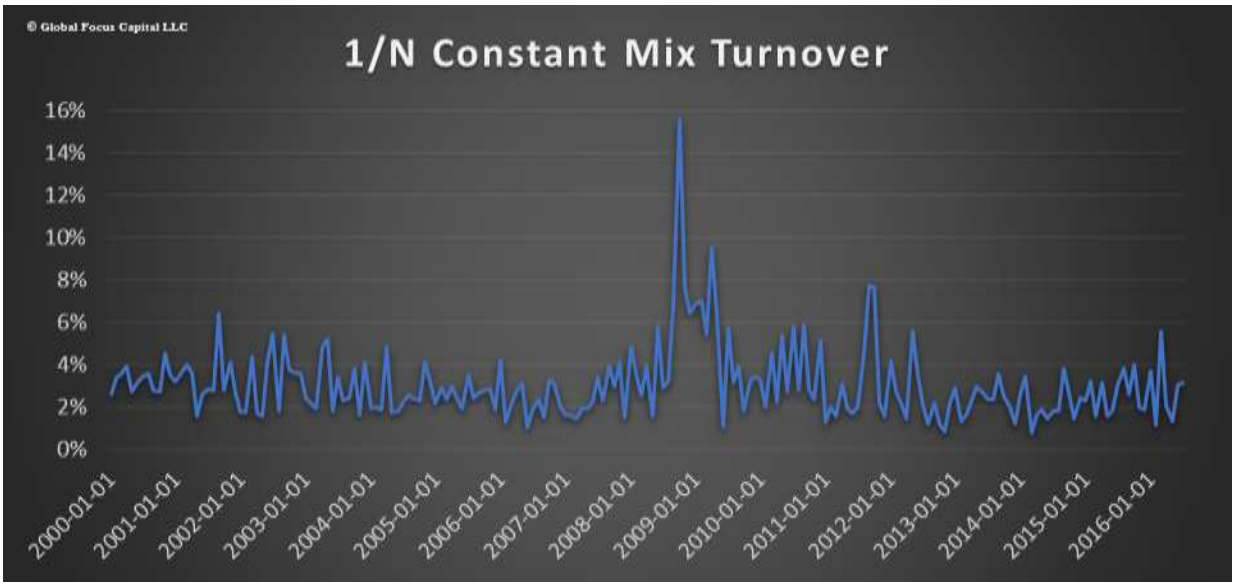
Moreover, **no one approach dominates the other in terms of risk**. For example, when looking at the beta of the strategy the constant mix approach carried more exposure from 2000 to 2005. Since then the pendulum has swung toward lower risk with an occasional upward burst (2011-2012).



The record for the constant mix rebalance approach in terms of portfolio volatility is likewise mixed. Sometimes the portfolio carries more risk than the buy and hold (early part of our sample) and at other times it carries less volatility.



One disadvantage of adding more asset classes to the mix when executing a constant mix rebalance involves the higher level of trading activity required. The average monthly turnover is over 3% with a high of 16% in October 2008.



On a more positive note, while more trading is required with more asset classes in the mix a flatter weighting structure such as 1/N results in less asset weight drift.

Only in the case of asset classes with extreme return behavior such as REITS and EM Debt in our sample do we see ending weights (August 2016) that would make most investors cringe. REITS have an ending weight of 24% while EM Debt has an ending portfolio weight of 16%. Both positions would have probably been trimmed long ago by investors, but in general we were surprised by the relatively stickiness of the positions.

STRATEGY		1/N								
WEIGHTS	US LCAP	US SCAP	INTL EQ	EM EQ	RE	COM	US BD	INTL BD	EM BD	CASH
STARTING	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
ENDING	7.5%	11.0%	5.9%	9.5%	24.2%	4.0%	9.8%	7.2%	16.0%	4.9%
AVERAGE	6.4%	9.1%	6.8%	10.1%	17.0%	9.9%	10.5%	9.1%	13.6%	7.5%
MIN	4.6%	6.6%	5.3%	5.4%	9.6%	4.0%	7.8%	6.7%	10.2%	4.9%
MAX	10.3%	11.7%	10.2%	15.2%	25.0%	15.4%	14.5%	12.3%	16.7%	11.3%

Is there another sensible way to rebalance a multi-asset portfolio?

Conceptually the clearest alternative to either a constant mix rebalancing approach or doing nothing as in a buy and hold portfolio is an informationally driven process.

An **informationally driven rebalancing** approach relies on forward looking expectations for either asset class returns and /or risks. As we previously observed asset class returns and volatility/correlation characteristics are constantly evolving. We also showed how even a static 60/40 portfolio exhibited widely fluctuating risk characteristics over time.

Some managers may simply rebalance their asset class weights to bring back the risk profile of the portfolio back to target. An extreme form of this are risk parity strategies seeking equal risk contributions from its constituent asset holdings.

Another probably more common reason for managers to rebalance their holdings is a changed outlook for expected asset class returns. For example, the recent BREXIT vote has been interpreted by most strategists as a negative for future UK equity and bond returns. It may not turn out that way, but most portfolio managers sharing this perspective would have lowered their weighting to UK assets.

Our approach at Global Focus Capital LLC relies on an informationally driven integrated approach to multi-asset class investing combining our views on forward looking asset class returns and risks. Changing expected returns as well as risks are weighted in our portfolio construction approach in relation to the expected costs of rebalancing.

The expected costs of rebalancing are transaction related and in the case of non-exempt investors taxes. These costs are fairly well defined while the expected return potential and risks of strategies are subject to imprecision and forecast error.

Trading off these costs and risks versus potential benefits (shifting more weight toward asset classes with improved return to risk profiles) is the basis of our approach which we deem as superior to an automated form of rebalancing such as constant mix or a do nothing buy and hold approach.

Sincerely,

Eric J. Weigel

Managing Partner, Global Focus Capital LLC

Feel free to contact us at Global Focus Capital LLC (mailto:eweigel@gf-cap.com or visit our website at http://gf-cap.com to find out more about our asset management strategies, consulting/OCIO solutions, and research subscriptions.