“A tactical asset allocation strategy that exploits variations in VIX”

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A tactical asset allocation strategy that exploits variations in VIX

Abstract

Buy and hold strategies make staying disciplined difficult for investors, especially given the variability of returns for different asset classes/strategies during divergent market conditions. Market timing strategies, on the other hand, present significant theoretical benefits, but in reality these benefits are difficult to obtain. Tactical asset allocation, where limited deviations from the strategic allocation are allowed permits the portfolio manager to take advantage of market conditions fits between these two extremes. The authors correlate daily returns for each of eighteen separate asset classes typically used in diversified institutional portfolios and daily closing values of the VIX (the ticker symbol for the Chicago Board Options Exchange Volatility Index). This information is used to select those classes whose returns are most responsive to the level of the VIX. Portfolio allocations for eight selected asset classes are revised depending on the level of the VIX at the daily close of the market. The portfolio is rebalanced on the business day following the day the VIX hits the trigger value. The VIX tactical allocation overlay yields an increase in return over the buy and hold portfolio of approximately 38 basis points. The authors conclude that the tactical asset allocation strategy based on the level of VIX provides a higher return than the neutral buy and hold allocation with a higher Sharpe ratio and lower volatility.

Keywords: tactical overlay, VIX, portfolio strategy.
JEL Classification: G11, G19.

Introduction

One of the closely held tenets of the investing is to determine long-term goals, to choose an asset allocation strategy, which enables the portfolio to meet those goals, and, then, to revisit and revise the allocation periodically, if necessary. The efficient frontier for the portfolio is generated from a selection of asset classes using historical information on long-term returns for each class, systematic risk of the portfolio and covariance of returns between asset classes. Investors, then, decide on an asset mix, which is appropriate to their risk tolerance, investment needs and planning horizon. This approach is referred to as strategic asset allocation in which the investor sets target allocations, then, periodically rebalances the portfolio as investment returns cause the portfolio composition drift from the original allocation percentages. The strategy is also sometimes referred to as "buy and hold", as opposed to an active trading approach, although a true buy and hold strategy would not rebalance. Of course, the target returns and allocations may change over time as the investor's goals and need change, and as the time horizon for major events (e.g., retirement and college funding) changes, which is why a periodic review of the investment philosophy and strategy are important. Practitioners of this strategy believe that trading in and out of positions in response to short term movements in the market increases costs and reduces returns, thereby undermining an investor's long-term objectives.

Investors may use tactical asset allocation to continually adjust the portfolio composition to take advantage of changing and expected market conditions. As conditions change, relative values, or at least perceived relative values, of various asset classes, change and the asset mix is adjusted accordingly. Sector rotation and market timing strategies are common examples, although a strategy can be based on any market characteristic that the analyst deems useful. This paper develops a tactical overlay strategy based on the value of the VIX index (the ticker symbol for the Chicago Board Options Exchange Volatility Index).

Tactical asset allocation allows for a range of percentages in each asset class, typically weighted by market value (e.g., US equities equal 40-60% of the portfolio). These represent the minimum and maximum acceptable percentages for a particular asset class and permit the portfolio manager to take advantage of market conditions within these parameters. As a result, some form of market timing is possible since an asset class allocation can move to the higher or lower end of the range depending on the correlation of each asset class return with volatility.

In general, the efficient-market hypothesis implies that tactical asset allocation cannot increase risk-adjusted returns, since market prices very rapidly reflect new information and securities are already efficiently priced. Weak-form efficiency does allow for the possibility that excess profits can be realized if over- or undervalued securities or asset classes can be identified.

In a truly efficient market, excess returns from these tactical strategies would not be possible, since prices very rapidly reflect new information. However, many investors believe that inefficiencies in the

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market persist and can be profitably exploited. Although much academic research concludes that it is impossible to time the market (e.g., Brinson et al., 1986), most active traders believe strongly in market timing. What we know for certain is that it is very difficult to be consistently successful at market timing over the long-run.

While the strategic and the tactical allocation strategies represent significantly different approaches to portfolio management, a hybrid approach using both may be beneficial. During periods of heightened market volatility, earmarking a portion of the portfolio to take advantage of correlations between market volatility and asset class returns may both lower volatility and increase returns. This more active approach is considered a tactical asset overlay within a strategic asset allocation framework.

This paper develops a tactical asset overlay designed to reduce portfolio risk when market risk increases due to increased market volatility and to increase portfolio risk when volatility is reduced. To measure the efficacy of the strategy, we examine returns, standard deviation of returns and Sharpe ratios for portfolios, which rebalance according to the level of the VIX.

For practical purposes, exploiting inefficiencies can only be accomplished after costs are included. "Frictionless" market assumptions would not be useful in a real world strategy, so we are mindful of these costs. Although transaction costs are presently low, portfolio rebalancing also results in tax liabilities, as unrealized gains become realized, and long-term capital gains are exchanged for short-term gains. This paper leaves the examination of transactions costs and tax liabilities for future research.

Investment philosophy may also represent a constraint. Because investors typically invest for the long-term with an investment policy statement that determines target asset allocations, major shifts in the asset allocation are generally not permissible. Policy constraints, therefore, preclude strategies that require large bets in either direction.

With these constraints in mind, we developed a tactical strategy with a top-down approach that would complement a well diversified portfolio with a long-term orientation. The rest of the paper is organized as follows: in section 1, we review prior research on asset class returns given different levels of VIX. Section 2 develops and explains our strategy. Section 3 provides the data description, while section 4 documents the results. Final section offers conclusions.

1. Literature review

Market timing and its potential profits have been an allure for investors since the dawn of investing. In Shilling (1992) illustrates the benefits of market timing and the improved return by being out of equities in bear markets. Bauer and Dahlquist (2001) point out that an initial investment of $10,000 optimally timed in and out of U.S. large capitalization stocks and T-Bills from 1990-99 would have returned an annualized rate of 26.6%; however, they go on to conclude that in order to profit from market timing, an investor would have to have accurately predict market movements approximately 66% of the time.

Other articles dating back to Sharpe (1975) discuss the problems associated with market timing. Chua (1987), Droms (1989), Kester (1990) and other researchers further analyze the difficulties, including when you consider transaction costs. Jeffrey (1984) discusses the folly of market timing especially for institutional investors with fiduciary responsibilities.

As a result of these problems, many investors have adopted the "buy and hold" strategy. However, somewhere between market timing and buy and hold lie strategies based on market conditions, where tactical asset allocation is used to rebalance the exposure to various asset classes. Philips et al. (1996) explain the nature and benefits of tactical asset allocation strategies.

French et al. (1987) showed that the risk premium for equities was positively correlated with the predicted level of volatility, which, in turn, produced a strong negative correlation with unexpected changes in market volatility and excess returns. Such market volatility increases the volatility of potential returns and, therefore, risk.

The idea of a volatility index was first developed by Brenner and Galai (1989). Whaley (1993) introduced the VIX as a reliable estimate of short-term market volatility, which could be used as a standard for hedging market risk volatility in portfolios. Cippolini et al. (2007) documented the efficacy of using the VIX as a signal for stock direction. Engle (1982) and Bollerslev (1986) illustrated the clustering behavior of volatility and its resulting predictability. Further research by Munenzon (2010) exhibited the very different return and risk characteristics associated with traditional asset classes given different VIX states. Munenzon (2010) demonstrated that correlations among alternative investment strategies are unstable, producing outsized benefits in times of heightened market risk. In addition, many of the assets and strategies that are desired during periods heightened market volatility are the assets investors should minimize to enhance returns when markets are good.

Copeland and Copeland (1999) developed a strategy that over weighted value stocks and underweighted

growth stocks when expected volatility measured, as the VIX index increased. The weightings reversed when expected volatility decreased, since lower volatility signaled a rise in confidence for the future, which favors growth stocks. Boscaljon, Filbeck and Zhao (2011) examined this strategy with the 2003 revision of the VIX index. Both studies found that excess returns could be earned using the strategy, although Boscaljon et al. found the effect only for longer holding periods. The tactical strategy presented in this paper makes relatively small reallocations to asset classes, which are selected by the correlations between the asset class returns and level of the VIX index. Bouchy et al. (2012) show that volatility harvesting, judicious rebalancing of a diversified, equal weighted equity portfolio, both manage risk, as well as enhance long-term returns.

The need for tactical asset allocation is most evident during periods of heightened market volatility. Investor anxiety increases during these periods, which increases the chance that they will divest their holdings. Unfortunately, these emotions, which lead to jumping in and out of the market are generally alarge mistake for most investors. A tactical strategy that reduces portfolio risk during more volatile times should allow investors to experience less anxiety and be more likely to remain strategically invested.

2. Methodology

To assess market risk we used the CBOE volatility index or theVIX index. It is the most widely watched statistic to measure market volatility (risk) and designed to measure near-term volatility. The VIX index is an index of the 30-day implied volatility, as indicated by the prices of SPX option contracts. Implied volatility rises when the relative prices of options increase. In contrast, volatility falls when the relative prices of options decline. The daily change in the VIX index is an indication of how aggressively SPX option contracts are being purchased or sold, which, in turn, gives some indication of investors' market expectations.

Using daily data from January 1, 2002 to December 31, 2014, we found that the VIX moved in the opposite direction of the S&P 500 slightly more than 80% of the time and had a correlation coefficient of -0.53, supporting the negative correlation between volatility and stock returns found by others.

Throughout the period covered by the data, the VIX has traded in a range between 20 and 30 approximately 85% of the time. A price below 20 was assumed to imply complacency in the market and that investors have become bullish, while a value greater than 30 indicates a high level of risk and investor apprehension. We chose these values as trigger points for implementing our strategy the VIX had a mean of 20.0877 and a standard deviation of 9.2691 over the period covered by our data. We note that risk is not symmetrical, since the VIX was equal to or greater 30 for approximately 12% of the 4,990 observations, while less than or equal to 10 only for only 0.08%. We examined how returns in each asset class varied when the VIX trades below and above this normal range.

To ensure diversification, the portfolio remained invested in traditional and alternative asset classes throughout the study regardless of the level of the VIX. Only the weightings of selected asset classes were changed. To maintain fiduciary responsibility, large shifts in asset class weights are not appropriate. Therefore, only limited rebalancing in a few asset classes was allowed.

Before creating a tactical asset allocation strategy to exploit the varying risk and return characteristics between asset classes and the level of the VIX, we developed the following rules. These were necessary if the approach was to be replicable:

- The process must be clearly defined and transparent.
- The neutral portfolio must be well diversified to start with.
- Data must be supported by a clear economic rationale.
- There would have to be long-term evidence of positive returns under different market environments.

The portfolio consisted of a number of asset classes/strategies commonly used by investors to broadly diversify portfolios. The list includes traditional asset classes, as well as a number of alternative real return and absolute return strategies. Table 1 (see Appendix) shows the investment classes and weights used when the VIX is equal to or greater than 30, greater than or equal to 20, but less than 30, and less than 20. The data we used were as follows: mortgaged backed securities, short-term bonds, treasury inflation protected securities, commodities, high yield bonds, real estate, emerging market bonds, market neutral strategies, long/short equities, international developed large cap stocks, international developed small cap stocks, emerging market equities, managed futures, US large cap stocks, US small cap stocks, US mid-cap stocks, infrastructure, and global macro strategies. These asset classes and their neutral weightings are typical for a large, well diversified portfolio.

The tactical asset allocation strategy was developed to profit from the different return characteristics shown in Table 1. The objective was to exploit the differences in the correlation between the level of

the VIX and the asset class returns exhibited by some asset classes when VIX is above 30 or below 20. For example, the global macro strategies asset class exhibits positive correlation to the VIX when VIX is below 20, but negative correlation when it is above 30. Many other asset classes exhibit a similar relationship.

The neutral portfolio allocations derived from an actual balanced growth model, which roughly translates into an overall allocation of 60% growth – 40% fixed income. The tactical overlay strategy allocates less weight to the more volatile asset classes during low volatility periods with a corresponding reduction in overall risk. During periods of high volatility we reduced overall risk with a corresponding reduction in the more volatile assets. All asset class allocations are shown in Table 2 (see Appendix).

The split between growth and fixed income is straight forward for the traditional asset classes. However, the classification of the alternative asset classes and strategies is more complex and is open to interpretation. For this paper, we included the typical real asset and their returns (commodities, real estate, and global infrastructure) in the growth category. We also categorized most absolute return strategies (managed futures, market neutral, and long/short equity) in the growth category. The only exception was global macro because of its considerable exposure to short-term bonds.

For many investors, the investment policy statement provides a target allocation between growth and fixed income assets, thereby restricting the ability to trade in and out of stocks and moving the money into bonds or cash. We recognized this constraint when we developed our strategy and limit the size of tactical shifts and not violate the original growth/fixed income allocation. With this constraint, as well as diversification and transaction costs in mind, changes in allocations were small in magnitude and restricted to seven of eighteen asset classes.

Of the fixed income assets/strategies, high yield bonds, as you would expect, showed the highest negative sensitivity in returns based on heightened levels of the VIX. Conversely, GNMAs showed the best hedging benefits against risk among this asset class when VIX is elevated, since returns bear a direct relationship with the VIX. In the growth category, the most volatile investments tended to be the assets/strategies that exhibited the highest negative sensitivity in returns based on heightened VIX levels. These were commodities, REITS, international small cap stocks, global infrastructure, and long/short equities. Managed futures, however, exhibited the best hedging characteristics with a slight increase in return, as the VIX increased.

Operationally, the portfolio was rebalanced to the appropriate allocations, if necessary, based on the level of the VIX at closing on the prior trading day. The strategy was back tested from January 1, 2002 – December 31, 2014. This time frame encompasses large market downturns, as well as strong upturns. Minor asset class returns varied significantly, as usual, with no class exhibiting superior returns throughout the study.

3. Data

Daily closing price and VIX data were collected from January 2, 2002 through December 31, 2014 using Morningstar Direct software. Actual closing prices for the traditional and real return assets were used to calculate daily returns. Where these prices were not available, we used the appropriate market index as a proxy. Weekends and holidays were treated as days with zero returns. The portfolio held the neutral allocations when VIX ended the day between 20 and 30 and was rebalanced on a daily basis. Annual returns are the arithmetic average of the daily returns. Standard deviations were also calculated using daily returns. Table 3 (see Appendix) shows the annual returns and standard deviations for the two different portfolio allocations based on the value of the VIX shown in Table 2.

For the alternative assets, determining the best benchmark is an industry wide challenge, since these asset classes typically are highly customized. For managed futures, we used the SG CTA Trend Sub Index (formerly Newedge CTA Trend Sub-Index). The SG CTA Trend Sub-Index is a subset of the SG CTA Index, and follows traders of trend following methodologies. The SG CTA Index is equally weighted, calculates the daily rate of return for a pool of CTAs selected from the larger managers that are open to new investment[1]. For global macro, we used the Credit Suisse Global Macro Replication Index. The Credit Suisse Global Macro Replication Index captures the risk/return characteristics of the Credit Suisse/Tremont Global Macro Hedge Fund Index. The Credit Suisse/Tremont Hedge Fund Index is broadly diversified, encompassing 490 funds (September 2008) across ten style-based sectors, and somewhat representative of the entire hedge fund industry. The construction of these indices is fully transparent, with unbiased, rules-based selection criteria and published constituents[2]. For market neutral, we used the Morningstar Neutral Benchmark and for long/short equity, we used the Morningstar MSCI Long Bias North Amer-

[1] SG (Newedge) CTA Trend Sub-Index – Barclay Hedge; www.barclayhedge.com/…ge_Trend_Following_Index.html.

[2] CreditSuisse/Tremont Hedge Fund Index; http://www.hedgeindex.com/hedgeindex/documents/Broad_Index_Factsheet.pdf.

ica Benchmark. The Morningstar Benchmarks consists of peer groups based on the Morningstar Institutional Categories and specialized investment groupings based on fund attributes. Benchmarks contain constituents from Open End, Closed End, Variable Annuities Underlying, and Exchange Traded Fund universes[3].

4. Empirical results

With this particular portfolio and time period, we found that this strategy of reweighting resulted in an average increase of 37 basis points for the VIX weighted portfolio compared to the neutral weighted portfolio. Annual returns, means and standard deviations for both portfolios appear in Table 3. Differences between the VIX weighted portfolio and the neutral portfolio are shown in Table 4 (see Appendix). The VIX weighted portfolio showed a higher return in all years except 2009.

On a risk adjusted basis, the VIX weighted portfolio also showed better results. Over the 2002 through 2014 period, the Sharpe ratio for the VIX weighted portfolio was 0.70209 compared to 0.64603 for the neutral portfolio. These results are shown in Table 5 (see Appendix). The VIX weighted portfolio outperformed the neutral portfolio in ten of the 13 years examined.

When the entire 2002-2014 period is considered, the VIX weighted portfolio had an average return 10.7% higher and a Sharpe ratio approximately 8.7% higher than the neutral portfolio. While the percentages are impressive, the absolute amounts are small, but the results indicate that there may be potential to improve portfolio performance significantly with the VIX weighted tactical overlay strategy.

Conclusions

This paper develops a practical tactical asset allocation strategy that produces higher returns and lower risk by exploiting variations in market risk indicated by VIX. The data show that the tactical asset allocation strategy of rebalancing a limited number of asset classes based on level of the VIX can reduce risk, improve returns, and provide better risk adjusted returns, even for a well diversified portfolio. By reducing holdings of the more volatile assets during the riskier periods and placing those dollars in a portfolio hedge and viceversa during periods of lower volatility, we reduced instability and provided better performance – higher returns, lower standard deviation, and better risk adjusted returns in terms of the Sharpe ratio.

For our tests, we used indices to represent commonly used asset classes and strategies to build a diversified portfolio. Daily pricing for the asset classes/strategies was obtained via Morningstar Direct software for the period of study from 2002 – 2014. The results show that it is possible to build an effective strategy based on signals provided by the level of VIX.

As the research indicates, this tactical asset allocation strategy can add value. Asset classes and strategies act differently under different market risk environments and VIX can be used as a proxy for market risk. The strategy maintains proper diversification while rebalancing by using a limited number of asset classes and can provide better long-term returns with lower risk than the buy and hold strategy.

The trigger points for rebalancing were determined by the standard deviation of the VIX and rebalancing when tie index moved roughly one standard deviation above the mean on the upside. On the downside, rebalancing occurred when the index fell below the mean. While asset classes chosen for rebalancing were based on the correlation between the asset class returns and the level of the VIX, the amount of rebalancing was essentially arbitrary and determined by the investment manager responsible for the portfolio. Further research needs to explore optimizing the strategy with respect to both the level of the VIX that triggers the rebalancing, as well as the size of the adjustments to the allocations. Optimization would also include the consideration of transactions costs.

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Appendix

Table 1. Asset class returns vs the VIX

Security	Asset class	VIX below 20	VIX above 30	Difference
Barclays GNMA 15 Year	Mortgage Backed Securities	1.15%	2.69%	-1.54%
Barclays Government/Credit 1-5 Year	Short-Term Bonds	1.14%	1.35%	-0.21%
Barclays US Treasury US TIPS	Treasury Inflation Protected Securities	4.84%	3.89%	0.95%
Bloomberg Commodity	Commodities	-1.57%	-10.71%	9.14%
Citi HY Market TR	High Yield Bonds	2.43%	-6.70%	9.13%
FTSE NAREIT All Equity REITs	Real Estate	2.76%	-8.14%	10.90%
JPM EMBI Global Diversified	Emerging Market Bonds	1.77%	2.30%	-0.53%
Morningstar Market Neutral	Market Neutral Strategies	0.74%	-1.41%	2.14%
Morningstar MSCI Long Bias N America	Long/Short Equities	3.84%	-13.25%	17.09%
MSCI EAFE	International Developed Large Cap Equities	0.25%	-8.08%	8.33%
MSCI EAFE Small Cap	International Developed Small Cap Equities	1.88%	-10.12%	11.99%
MSCI EM	Emerging Market Equities	3.34%	-3.87%	7.21%
SG Trend	Managed Futures	1.87%	1.93%	-0.07%
Russell 1000	US Large Cap Equities	0.49%	0.34%	0.15%
Russell 2000	US Small Cap Equities	-0.23%	-6.28%	6.05%
Russell Mid Cap	US Mid Cap Equities	1.19%	-1.87%	3.05%
S&P Global Infrastructure	Infrastructure	4.47%	-5.50%	9.97%
Credit Suisse Global Macro	Global Macro Strategies	1.34%	-2.92%	4.26%

Table 2. Asset allocation vs the VIX

	Weight (%)	Weight (%)	Weight (%)
	Neutral	VIX Below 20	VIX Above 30
Barclays GNMA 15 Year	3.00	0.00	6.00
Barclays Government/Credit 1-5 Year	20.80	20.80	20.80
Barclays US Treasury US TIPS	1.40	1.40	1.40
Bloomberg Commodity	3.00	3.00	2.00
Citi HY Market TR	4.20	7.20	1.20
FTSE NAREIT All Equity REITs	3.00	3.00	2.00
JPM EMBI Global Diversified	6.50	6.50	6.50
Morningstar Market Neutral	6.00	6.00	6.00
Morningstar MSCI Long Bias N America	3.90	4.90	1.90
MSCI EAFE	3.00	3.00	3.00
MSCI EAFE Small Cap	4.20	4.20	2.20
MSCI EM	3.90	3.90	3.90
SG Trend	3.00	0.00	10.00
Russell 1000	21.50	21.50	21.50
Russell 2000	1.20	1.20	1.20
Russell Mid Cap	5.40	5.40	5.40
S&P Global Infrastructure	3.00	5.00	2.00
Credit Suisse Global Macro	3.00	3.00	3.00

Table 3. Annual return statistics

	Observations	Neutral portfolio			VIX portfolio		
		Mean	Standard deviation	t-statistic	Mean	Standard deviation	t-statistic
2002	363	-0.01408	0.02784	-9.6376	-0.00407	0.02088	-3.7163
2003	365	0.09701	0.07332	25.2761	0.10065	0.07541	25.5899
2004	366	0.03692	0.02967	23.8037	0.04064	0.03159	24.60780
2005	365	0.02671	0.03057	16.6922	0.20921	0.03313	17.9261
2006	365	0.05623	0.03367	31.9073	.04937	.02743	34.3873
2007	365	0.04937	0.02743	34.3873	0.0542	0.02738	35.1891
2008	366	-0.07689	0.09083	-16.1944	-.06776	0.07884	-16.4425
2009	365	0.08989	0.10605	16.1948	0.08238	.0.09868	15.9488
2010	365	0.03905	0.04098	18.2053	.04372	.042254	19.6330
2011	365	0.01136	0.02563	8.4712	0.01707	0.02293	14.2224
2012	366	.06380	.02636	46.3043	0.07031	0.02972	45.2675
2013	365	0.05931	0.02745	41.2755	.063046	.02988	40.3107
2014	365	.03445	.02254	29.2013	0.03628	0.02240	30.9363
	Average	0.03495			0.03846		

Table 4. Difference in returns and standard deviations, VIX minus neutral

	Mean	Standard deviation
2002	0.01001	-0.00696
2003	0.00364	0.00182
2004	0.00372	0.00193
2005	0.00250	0.00056
2006	0.00406	0.00219
2007	0.00106	-0.00005
2008	0.00913	-0.01199
2009	-0.00751	-0.00737
2010	0.00467	0.00156
2011	0.00570	-0.00270
2012	0.00651	0.00336
2013	0.00374	0.00243
2014	0.00182	-0.00014
Average	0.00377	-0.00118

Table 5. Difference in Sharpe Ratio, VIX minus Neutral

	Neutral portfolio	VIX portfolio	Difference N - V
2002	-1.10131	-0.98889	-0.11242
2003	1.18254	1.20236	-0.01982
2004	0.083050	0.89773	-0.06724
2005	-0.11097	-0.02865	-0.08231
2006	0.28080	0.37681	-0.09601
2007	0.10723	0.14597	-0.03874
2008	-1.02099	-1.06049	0.03949
2009	0.83495	0.882122	0.01383
2010	0.92118	0.99709	-0.07590
2011	0.43169	0.73134	-0.29965
2012	2.40138	2.34932	0.05206
2013	2.13638	2.08788	0.04849
2014	1.50495	1.59559	-0.09064
Average	0.64602	0.70209	-0.05607