

March 2018 Newsletter

Dear Investor,

The Global Volatility Summit (“GVS”) brings together volatility and tail hedge managers, institutional investors, thought-provoking speakers, and other industry experts to discuss the volatility markets and the roles volatility strategies can play in institutional investment portfolios. The GVS aims to keep investors updated on the volatility markets throughout the year, and educated on innovations within the space.

WallachBeth has provided the latest piece in the GVS newsletter series.

Cheers,
Global Volatility Summit

Event

The ninth annual Global Volatility Summit (“GVS”) is scheduled for Wednesday, March 14th, 2018 at Chelsea Piers in New York City. Alongside our featured volatility managers, we are excited to announce the addition of a Quantitative and CTA manager panel, featuring prominent portfolio managers in the space to share their views on the volatility markets and resulting impact on these strategies.

2018 MANAGER PARTICIPANTS

36 South Capital Advisors
Argentière Capital
Artemis Capital Management
BlueMountain Capital
Capstone Investment Advisors
Capula Investment Management
Dominicé & Co
III Capital Management
Ionic Capital Management
JD Capital
Man AHL
Parallax Investment Advisors
Pine River Capital Management
True Partner

2017 Event Recap

The 8th annual GVS featured fifteen volatility and tail hedge managers and hosted senior investment representatives from the largest global pensions, sovereign wealth funds, endowments, foundations, and insurance companies. The 2017 keynote speakers were the Founder of The Huffington Post, Ariana Huffington, and Bestselling Author, Daniel Gilbert.

Profit from Behavioral Biases in Volatility and Asset Allocation Decisions

Behavioral Finance Challenges Traditional Finance with Major Implications

Traditional finance theory assumes decisions are made by rational, efficient, unbiased processors of information that evaluate the entire opportunity set for expected return versus risk, while also seeking to maximize some conventional utility function. While this framework produces simple and elegant theoretical results, in reality there is recognition that facts about the equity market, cross-section of average returns, the behavior of market participants, the decisions of investment committees, and the observed limits to arbitrage can't be explained by traditional finance.

In contrast, behavioral finance is based on the assumption that market participants have behavioral biases that cause them to make decisions that are not fully "rational." Furthermore, the behavioral finance theory insists that investors are inefficient, unbiased information processors, and do not properly evaluate the entire opportunity set. This theory challenges conventional utility functions that are based on expected return and risk aversion. It proposes that when making decisions, we evaluate outcomes based on some subjective reference point such as where we bought an asset and that we are loss averse. In effect, risk is increased when investors endure losses and when experiencing gains, investors try to protect those gains by being more risk averse.

If the behavioral finance theory is proven correct and there are limits to arbitrage, than the following implications would be validated:

- There will be persistent security mispricings and risk premia
- Time variation in risk premia **will be** directly correlated to recent experiences of market participants, especially in terms of volatility
 - For example, Cliff Asness [2000] conducted a study which demonstrates how the relative yield of stocks versus bonds is well explained by their relative volatility (which reflects personal experiences of market participants), this result is quite robust with respect to look back period
- Active managers can beat the market by using a strategy based on the source of mispricing

Let's Focus on Relevant Behavioral Biases

Behavioral finance literature is vast and describes many biases. How to profit by recognizing specific biases, and how these biases are relevant to volatility and allocation to options strategies, is the focus moving forward.

The following are the core biases for discussion:

- **Investor Sentiment:** The effect of local peaks and troughs and its impact on the percentage of traders bullish on subsequent returns
- **Availability Bias:** Overstating the probability of an event based on easily recalled information or recent experiences
- **Frame Dependence:** How information presented affects decisions
- **Mental Accounting:** Viewing portfolios or wealth in separate buckets/mental compartments, while ignoring fungibility and correlation
- **Herding:** Choosing popular strategies (such as buy/writes, and out-of-the-money puts rolled at common intervals) without considering the entire opportunity set. For example, people naturally choose a full restaurant for dinner instead of an empty one

- **Representativeness Bias:** Assessing the probability of an event, or gain/loss, based on superficial characteristics or similar experiences. For example, you see a pattern in random historical data and extrapolate it to future events
- **Errors Made by Investment Committees:** Many decisions are made because they are either safe and conventional, or “feel good” and “seem good” given recent performance
- **Limits to Arbitrage, Segmentation, and Constrained Investors:** Traditional finance assumes comparable risks are always priced similarly, and if not, arbitrage will bring pricing into alignment. In actuality, there are limits to arbitrage for behavioral and non-behavioral reasons. These reasons include: persistent security mispricing due to a lack of fairly-priced close substitutes, fundamental risks from hedging, high costs to establish or maintain the arbitrage, high costs for the ability to short, and the inability to maintain a position due to margin calls, drawdowns, or institutional policy settings. For example, because investors are constrained, instruments in one segment result in greater returns with less risk versus another segment

Investor Sentiment: Don't Underestimate its Impact on the VIX

There is a substantial body of behavioral finance literature that shows subsequent returns for growth stocks are low when sentiment is high. Surveys of VIX traders show that VIX sentiment, as measured by “percent bullish,” is an important driver of subsequent VIX changes.

For many options strategies, the change in implied volatility, from entry point to the next observation where the strategy is rebalanced, is an important determinant of success. The change in spot VIX between two points is often used as a proxy for the change of implied volatility in SPX. This represents the increase, or decrease, in the cost required to re-establish a constant gamma, across strikes centered at the new level of SPX. The change in VIX between such points is thought to be influenced by the overall trend in volatility, mean reversion, and the VIX premium to historical SPX volatility. However, especially in recent months, VIX *sentiment* at the initial point can be an even better predictor. The table below shows how initial point sentiment was the biggest influence on VIX changes, dominating both mean reversion and historically compared premium.

Date	VIX	Impact of Sentiment on VIX Movement			SPX 22-day Hist. Vol	Premium VIX-Hist. Vol
		Change from Last Observation	5 Day Rate of Change	Sentiment % Bullish		
11/15/17	13.13		34.30%	33%	5.25	7.88
12/4/17	11.68	-1.45	18.40%	31%	6.56	5.12
12/11/17	9.34	-2.34	-20.00%	25%	6.76	2.58
1/3/18	9.15	-0.19	-10.70%	28%	6.4	2.75
1/8/18	9.52	0.37	-13.80%	12%	6.33	3.19
1/18/18	12.22	2.7	24.40%	13%	6.83	5.39
VIX Change Correlation			-71%	-92%		-60%

Source: Bloomberg LP, WallachBeth Capital LLC

The chart reveals how the VIX changed and responded to sentiment by either staying the same or declining. Specifically, on 11/15/17, sentiment was toward the upper end of its recent trading range at 33%, after the VIX rose from a 9 handle to 13.13, despite a very high VIX premium to historical. The VIX proceeded to decline to 9.15 on

1/3/18, with sentiment not declining much or even rising at each intermediate observation. The relatively high sentiment did not allow for much of a VIX bounce, even from the low level on 1/3/18 where it was at a 2.75 premium to historical. After sentiment collapsed to the bottom end of its range at 12% on 1/8/18 (with bullish traders “capitulating”), the chart reflected a meaningful bounce to 12.22 on 1/18/18. Sentiment did not increase much on this bounce and this set up a huge VIX super-spike to the 50 area in February.

While this is a very small sample, it roughly estimates the correlation of the VIX change to the next observation with its 5-day rate of change (to measure mean reversion), the initial level of trader sentiment, and the initial VIX premium to its 22 trading day historical volatility. The initial level of trader sentiment has the most negative correlation coefficient at -92%, versus only -71% for the 5-day rate of change, and -60% for the VIX premium to historical. It can be concluded that sentiment, along with positioning, is a major determinant of point-to-point VIX changes. These factors have as significant an impact as both mean reversion and premium to historical volume. This does not however, mean that all sentiment measures are predictive or useful in practice. For example, the sentiment of newsletter writers does not predict returns, rather past returns predict the sentiment of the writers.

Availability Bias: A Sector’s Implied Volatility is Re-Priced on a Relative Basis by a Risk Event

The relative level of an S&P Sector Implied Volatility versus SPX Implied Volatility, which is measured by their volatility ratio, tends to trade in a certain range. When a sector has a recent risk event this experience can re-price the subsequent volatility ratio for months or even years. An example of this availability bias can be seen in the 3 month 100% at-the-money 3-month implied volatility ratio of XLE/SPX as shown in the graph below. After the oil/energy bust of 2014-2015, the volatility ratio oscillated around a significantly higher mean.



Source: Bloomberg LP

Frame Dependence and Mental Accounting

Frame Dependence and Mental Accounting hurt portfolio construction methodologies in 2016 and 2017. Investors compartmentalized how to take an exposure, such as a broad equity exposure or limiting downside risk, as opposed to considering a different frame of reference.

Example 1: Consider a choice between the following:

1. A long diversified equity portfolio (perhaps with a defensive or value bias) OR
2. A portfolio with a small weight (20%) in bearish VIX option trades and a large weight (80%) in safe fixed income

In 2017, portfolio (2) was dominant in a variety of scenarios including: unchanged markets due to a greater positive carry, deep market selloffs where the 20% allocation to bearish VIX trades has limited liability, and various convexity characteristics. Smart/nimble accounts took advantage while many underperformed with portfolio (1).

Example 2: The cost of hedging, such as an SPX collar or a VIX tail hedge, is viewed as prohibitive. In reality, higher costs are incurred when trying to collar losses through dynamic risk reduction or using an outside manager that is implicitly providing such strategies at a higher cost.

Herding: Low Volatility versus High Beta

Investors collectively jump prematurely into popular strategies creating crowded exposures. This may create bad timing in the market or suboptimal portfolios which is reflected in the examples below.

Example 1: There is evidence that investors over-weight and under-weight equity factors that are popular in their portfolios at bad times. Two such equity factors are “low volatility” and “high beta” segments of the S&P 500 stock universe. These factors are popular and have ETFs named SPLV (“low volatility”) and SPHB (“high beta”) whose relative performance is shown below:



Source: Bloomberg LP

Notice how investors had a “herd mentality” to over-weight low volatility in 2015 sending it to very high relative levels by H1 2016, just before it crashed. Similarly, most were overweight “high beta” at the beginning of 2018, just before the February crash.

Example 2: When allocating to options strategies, many investors herd into the most popular, widely known strategies such as buy/writes and strategies that track the BXM (CBOE S&P 500 Buywrite Monthly Index). This leads to Investors failing to consider the full opportunity set of strategies that may outperform in given environments or over a full equity cycle. Inconsistent with many allocators strong desire for diversification by asset class and smart-beta factor, they often fail to diversify and commonly select only a few strategies that work in some scenarios (such as gradually rising and range-bound markets). Investors often do not consider that other strategies can reduce equity beta while taking advantage of options pricing. Thus creating better at-the-money gamma and tail risk profiles crucial in markets with larger monthly price swings. When combined, they reduce risk through lower correlation and diversification.

The table below compares the annualized return, volatility, and Sharpe ratio of BXM versus a diversified portfolio of strategies based on CBOE indices and AGG (iShares Core U.S. Aggregate Bond ETF) since 2007. This period has a full equity cycle, including; the 2008 bust, the early recovery, trended bull markets of various velocity, choppy corrections in 2011 and 2015/2016, and range-bound markets. The CBOE option strategy indices chosen are long positions in 32.5% VXTH (CBOE VIX Tail Hedge Index), 32.5% RXM (CBOE S&P 500 Risk Reversal Index), and a short position of -30% in BFLY (CBOE S&P 500 Iron Butterfly Index). VXTH and RXM collectively have a total 65% SPX total return index exposure. The BFLY has a maximum 5% theoretical loss each month and the AGG allocation is 30%. This makes the weights sum to 100% maximum balanced market exposure (70% SPX and 30% bonds) as opposed to a theoretical maximum 100% SPX exposure within BXM. All of the strategies have a higher Sharpe ratio over the cycle. VXTH is helped by periodic VIX spikes with high beta of VIX to SPX. RXM benefits from put skew and its favorable exposure on a small move down and large move up. The short butterfly profits when SPX moves sharply in either direction. The portfolio effect of all of them combined produces: 1.51% extra annualized return, an enormous 5.49% decrease in annualized volatility, and an increase in the Sharpe ratio of 0.36. However, such a portfolio is rarely even considered due to the behavioral bias.

PERFORMANCE OF STRATEGIES SINCE JANUARY 2007					
Ticker	Strategy	% Of Portfolio	Annualized Return	Annualized Volatility	Sharpe Ratio (rf=0)
BXM	CBOE S&P 500 Buy/Write Monthly	100%	4.64%	14.55%	0.32
vs BALANCED LOW VOLATILITY PORTFOLIO					
VXTH	CBOE VIX Tail Hedged Index	32.5%	7.17%	17.17%	0.42
RXM	CBOE S&P 500 Risk Reversal	32.5%	5.21%	12.10%	0.43
AGG	I-Shares Core US Aggregate Bond Index	30%	3.92%	5.06%	0.77
BFLY	CBOE S&P 500 Iron Butterfly	-30%	-2.50%	11.42%	-0.22
BALANCED PORTFOLIO SAME NOTIONAL			6.15%	9.06%	0.68
<i>Advantage vs. BXM</i>			<i>1.51%</i>	<i>-5.49%</i>	<i>0.36</i>
BALANCED PORTFOLIO SAME VOLATILITY			9.88%	14.55%	0.68
<i>Advantage vs. BXM</i>			<i>5.24%</i>		<i>0.36</i>

Source: Bloomberg LP

Representativeness Bias

Investors are prone to making general perceptions based on commonly accepted ways of investing in the market or thinking about an asset or firm.

Example 1: An assessment based on a superficial characteristic or similar experience can be as simple as thinking “GE is a good company” or “I will not sell it on the way down” (although, for example, Enron was also considered a “good company”). In options strategies and asset allocation, it can be a case of thinking that “smart beta” is perceived as a good strategy versus simply using index options. For example, many allocators have growth versus value (or the opposite) tilts in their portfolios through equity long/short strategies, smart beta ETFs, and outside managers. They choose these types of portfolios rather than simply trading two liquid options on common indices against each other in a pair trade, which cost much less and requires less capital usage.

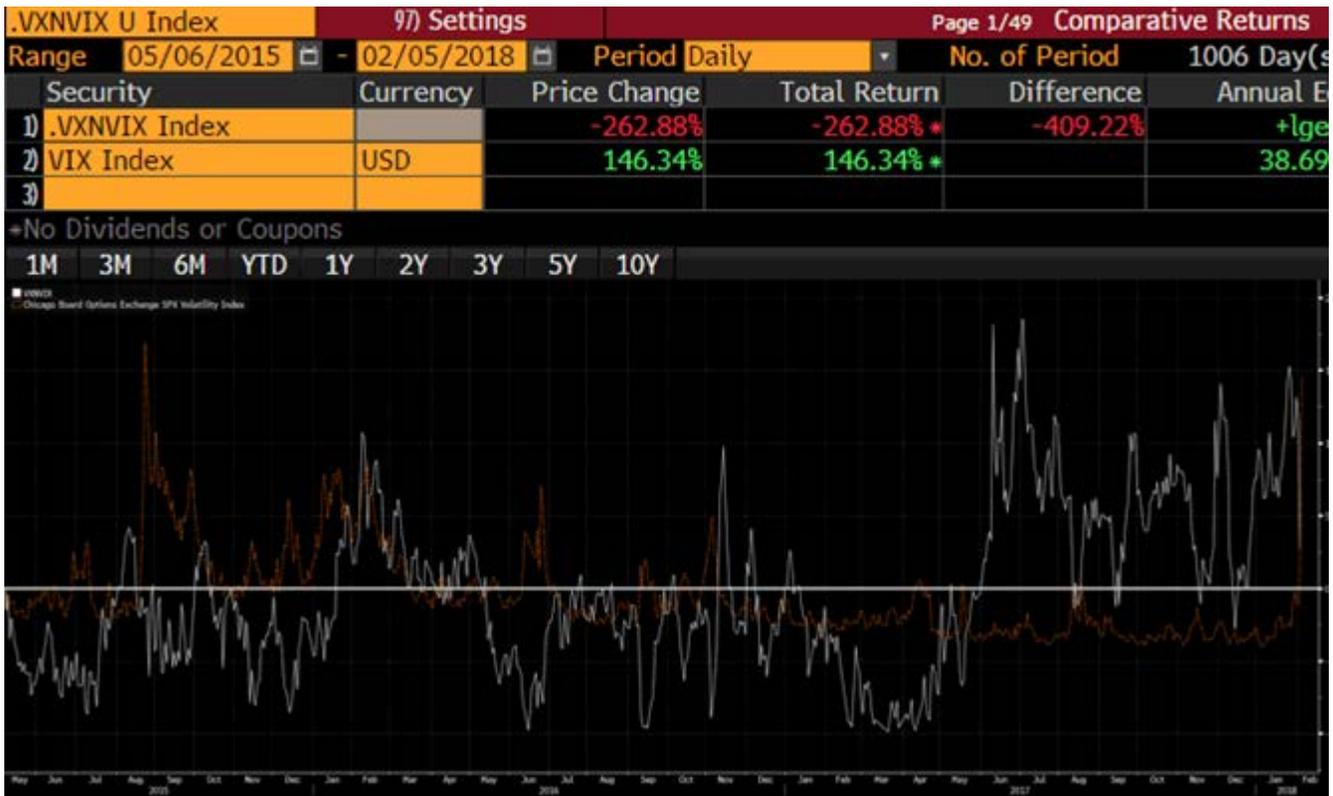
The graph below shows that the performance of NDX/SPX pair trade has been very similar to the performance of S&P growth (IVW ETF) vs. S&P value (IVE ETF), but requires a smaller position due to its higher volatility. Also, it is a more effective way to express the same view.



Source: Bloomberg LP

An NDX/SPX outperformance trade can be implemented by buying (1) NDX call vs. selling SPX call or (2) selling NDX put vs. buying SPX put. An additional advantage is that the trades can be conditional on market direction. For example, trade (1) extinguishes itself in the case that both SPX and NDX sell off hard, whereas trade (2) extinguishes itself in the case that both NDX and SPX rally.

Note that alternative growth/value implementations do not have this asymmetry. The trade also allows taking advantage of the pricing of the VXN-VIX spread, as shown below, along with VIX. VXN tends to cheapen vs. the VIX when VIX is pushed higher by greater demand for listed VIX derivatives in a volatility spike. VXN richens vs. VIX when VIX stays low.

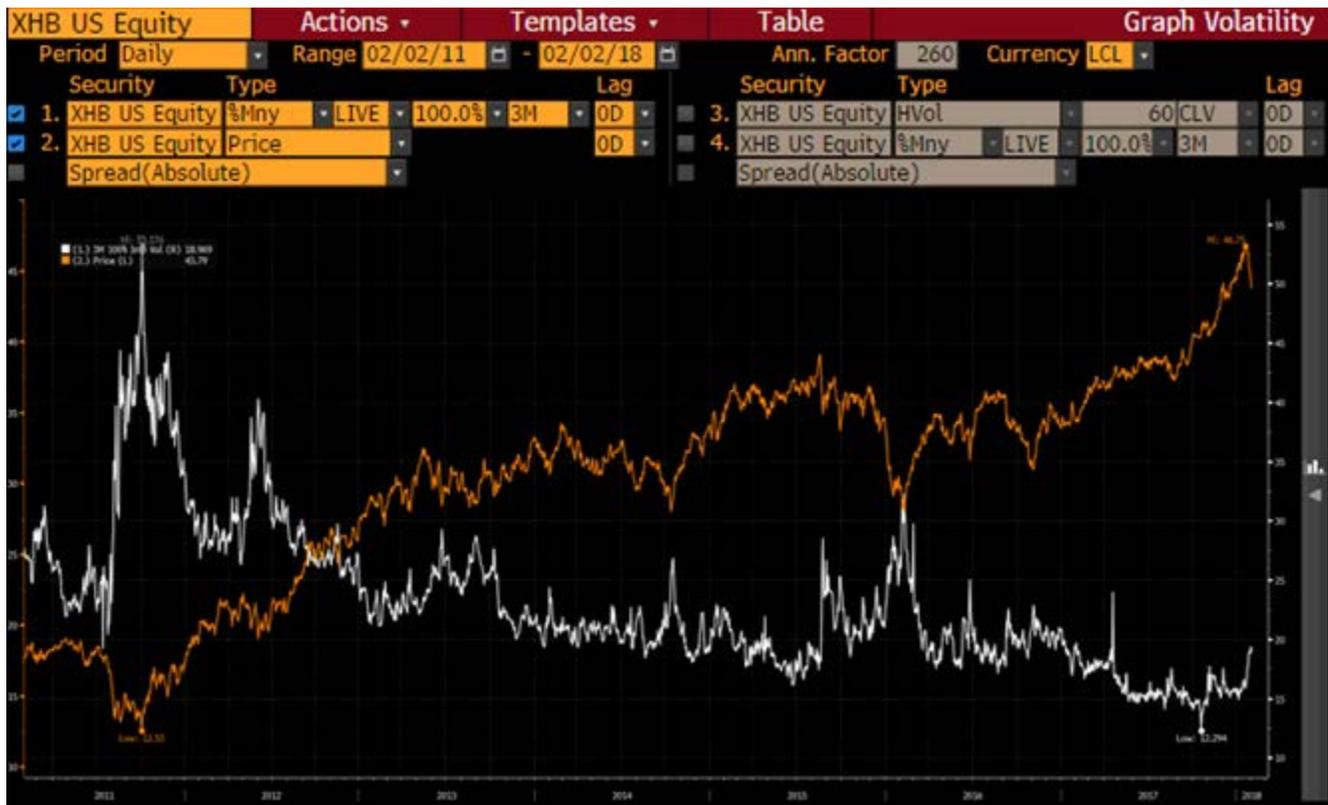


Source: Bloomberg LP

We have observed the same behavioral biases in how large portfolios are rebalanced with strategies that incur large transaction costs in spread. These portfolios suffer significant next-day reversion, yet are selected to trade at month or quarter end.

Example 2: Arguably the most painful bubble experience for Americans in this century has been in real estate. Subprime mortgages were the pin that burst the home ownership dream for many and triggered a global debt crisis that has yet to be completely resolved. Regulators and investors continued to overestimate probability of a housing bust based on the 2008 experience. ETF investors were under-positioned and options volatility overestimated the risk of a big decline. The graph below shows XHB (SPDR S&P Homebuilders ETF) 3-month 100% ATM implied volatility versus XHB price.

Note the implied volatility continued to spike sharply on any pullback with a fresh memory of 2008. It did not decline to prior levels until the huge bull market of 2017 which changed the behavioral perception of this downside risk.



Source: Bloomberg LP

Errors Made by Investment Committees

Almost half of the decision making process of fiduciaries can be characterized behaviorally as:

- Comfortable decisions that are safe, conventional, and reduce risk of regret so that the committee can “sleep well” or
- “Seems good” evaluations such as firing managers or strategies with poor performance and hiring those with good recent performance. A 20-year study showed plan sponsors would have done better keeping the under-performing manager/strategy.

Recently, investment committees have decided not to hedge their equity and bond exposures, for the cost of naive hedging (purchasing out-of-the money puts) has proven onerous in the bull market. Investment committees have only considered writing short-term calls against their portfolios or allocating to external “hedged equity” strategies that are also long equities and long some form of out-of-the-money put.

Limits to Arbitrage, Segmentation, and Constrained Investors

As a result of the limits to arbitrage, instrument segmentation may allow additional return with less risk due to investor constraints. This is demonstrated through various cash management products (ways to lend money short-term) which are available today.

Among the alternatives are:

- Short duration fixed income instruments

- Money Market Funds
- Accounts at clearing firms
- Short duration fixed income ETFs
- Box trades in options such as SPX
- Reverse/Conversions in ETFs and equities
- Single Stock Futures calendar spreads

We have found some of these cash management products offer higher yields with shorter duration and much less credit risk due to behavioral biases and limits to arbitrage. For example, the SPX box trade below can be viewed as a synthetic ultra-short duration cash management instrument using SPX options.

Buy the SPX March 1000 call to sell the 1000 put
Sell the SPX March 2000 call to buy the 2000 put
<u>Net pay 997.25 points to receive 1000 when options cash settle</u>
Make 28 bps for 46 day simple interest annualized 2.19%

Source: WallachBeth Capital LLC

It is important to note that the box is very favorable when compared to much longer duration ETFs (usual more than 2 years at this time) with industrial and financial credit risk. In the above example, the box has virtually no credit risk and all OCC exposure. It is similar to a T-bill or other discount money market instruments.

Conclusion

Traditional finance theory lays the foundation for economic academia; however, in actuality these theories may be fundamentally flawed. Reasons behind inconsistencies can be explained through behavioral finance, or the “human element” which challenges these widely accepted principles. The following are important major takeaways to consider after analyzing behavioral biases:

- Behavioral biases are real and challenge traditional finance theory
- Investor sentiment is important, especially for the VIX
- Take frame dependence out of portfolio construction and look at different methods and products to get total up and down capture and portfolio convexity
- Avoid herding, question the assumptions and alternatives
- Use other options strategies and combinations of strategies
- Don’t assume bull markets always have the same outcome and don’t look for the same sectors or problems to reemerge. When excessively focusing on these factors investor tends to overprice volatility or the probability of downside risk
- Don’t assume anything is “good” because it is institutionally acceptable
- Reign in investment committee bias
 - Don’t be a constrained investor – take advantage of limits to arbitrage and get the highest yield for less duration and virtually no credit risk

To discuss this or other portfolio strategies, please contact Ilya Feygin, Managing Director and Senior Strategist, at 646.699.7750 or at ifeygin@wallachbeth.com.

Sources for tables: Bloomberg LP and WallachBeth Capital LLC



Strategist Consulting (SCOUT)

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