Understanding and Harnessing the Volatility Risk Premium

The Volatility Risk Premium (VRP) has gained popularity among institutional investors in recent years. Nevertheless, being a concept framed in the derivatives securities space, it is not as well understood as other risk factors such as value, momentum, and size. In this whitepaper, we provide a brief introduction to VRP in a Q&A format, highlighting its outstanding risk-adjusted performance, diversification benefits, and protection against large drawdowns.

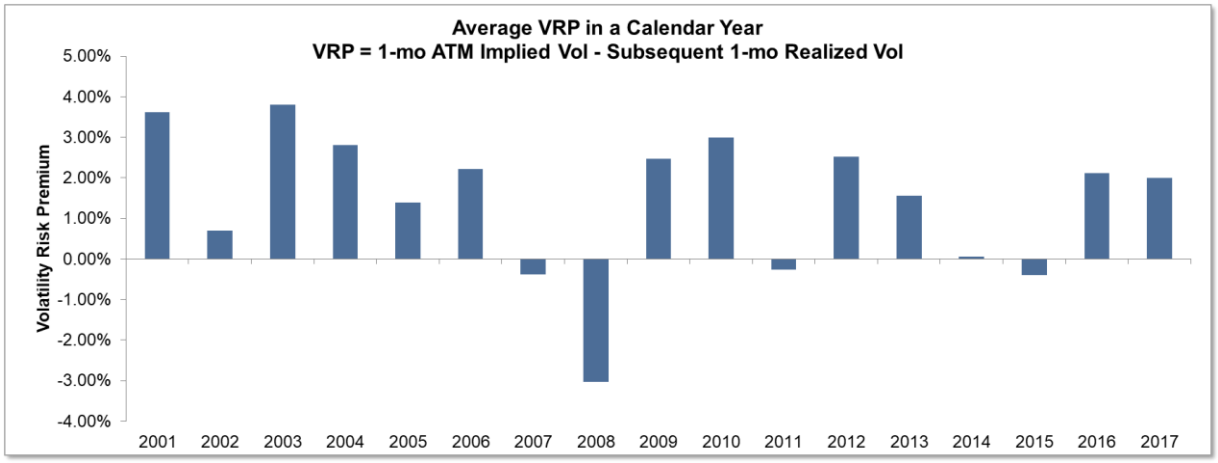
What is Volatility Risk Premium?

The VRP can be characterized by the spread between the implied volatility of an at-the-money (ATM) option and the subsequent realized volatility of the underlying asset.

Implied volatility is the value inserted into the Black-Scholes formula that produces an option price equal to that which is observed in the market. In other words, implied volatility is a transformation of the observed option price. Realized volatility, on the other hand, is measured as the empirical standard deviation of returns on the underlying asset over a certain period of time. In the context of VRP, the measure of realized volatility of interest is the standard deviation of observed close-to-close daily returns over the life of a given option.

Let's consider a one-month ATM put option, that is, the strike is set to equal the current spot price of the underlying asset. Such a put option protects the buyer from any downside movement in the spot price from its current level. Implied volatility, through its relation to the market price of the put, reflects the cost of this protection (how much a buyer is willing to pay for this protection). Subsequent realized volatility measures the actual uncertainty of returns experienced during the life of the option. The benefit of having a put option in place is associated with this realized uncertainty. By comparing implied and subsequent realized volatility over time we can observe the cost/benefit tradeoff (after the fact) of holding such an option.

Historically VRP, measured by the spread between the one-month ATM implied volatility and the subsequent one-month realized volatility, was on average 1.42% and has been positive more than 75% of the time. This suggests that option sellers have been able to achieve excess returns by collecting VRP.



Source: Markit, Bloomberg and RJA analysis. Data period: January 2001 – October 2017. Reliable volatility surface data is available to RJA during this period. If the VIX Index is used to proxy implied volatility, VRP was 4.23% on average since January 1990 (the inception of the VIX Index). It is important to note that using the VIX Index as a proxy for implied volatility tends to yield a higher VRP, because the VIX methodology inherently has a bias towards lower strike options which typically have a higher implied volatility than ATM options.

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What are the benefits of VRP?

In the discussion below, we use the Cboe S&P 500 PutWrite (PUT) Index[1] to study the returns generated by VRP in the S&P 500. The PUT Index is a systematic option-selling strategy which sells one-month ATM S&P 500 Index put options on a monthly basis. The construction of the PUT Index implies that returns have embedded in them a component due to the VRP. Since at-the-money options have an ex-ante beta of approximately 0.5, the excess return due to the VRP alone can be measured via:

$$VRP = (r_{PUT} - r_f) - 0.5 \times (r_{S\&P\ 500\ Total\ Return} - r_f)$$

Total Return Performance Statistics, 6/1986 – 9/2017

	PUT	S&P 500	VRP
CAGR	10.07%	10.11%	3.05%
Standard Deviation	9.93%	14.93%	5.52%
Sharpe	0.69	0.46	0.55

Source: Cboe and RJA analysis. All statistics are annualized.

Now compare the risk-return profile of the above VRP excess return with that of the US equity market as well as for the three most popular alternative risk factors: size, value, and momentum[2].

- **VRP provides outstanding risk-adjusted returns**, as evidenced by the Sharpe ratio. Risk-adjusted returns reflect the long-run efficiency of a strategy. From June 1986 to September 2017, VRP outperformed the market, size, value, and momentum risk premia on a risk-adjusted basis. It is interesting to note that while VRP generated the third highest return, it is the notably lower standard deviation that drives the comparative superior risk-adjusted performance of this strategy.

Performance Statistics, 6/1986 – 9/2017

	VRP	Market - Rf	Size	Value	Momentum
CAGR	3.05%	6.62%	0.24%	2.23%	4.59%
Standard Deviation	5.52%	15.28%	10.91%	10.16%	16.02%
Sharpe Ratio	0.55	0.43	0.02	0.22	0.29

Source: Cboe, Kenneth French Data Library and RJA analysis. The equity market, size, value, and momentum risk premium portfolios are defined following Fama & French's methodology as zero-cost portfolios. All statistics are annualized.

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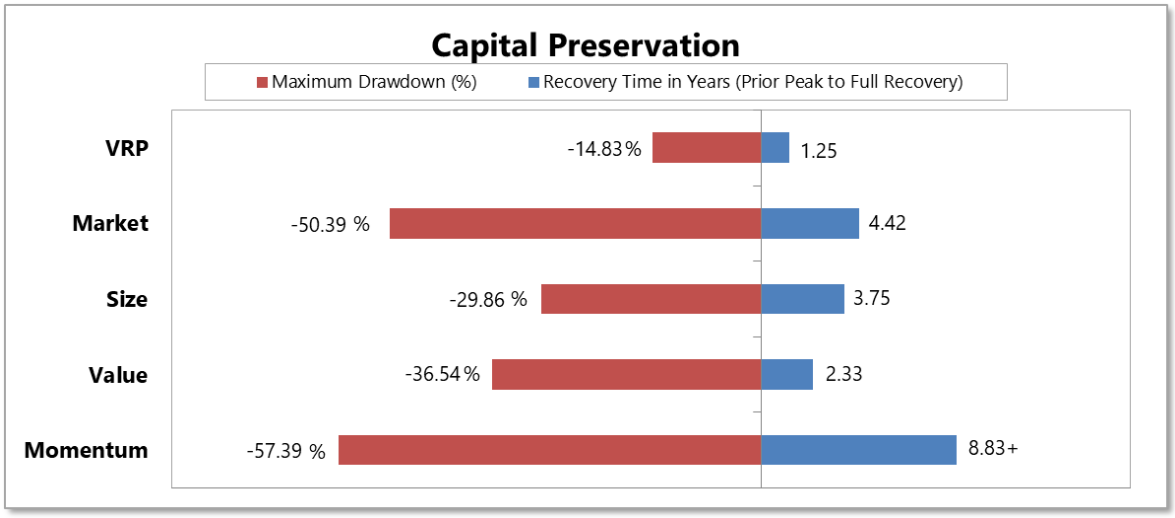
[1] Please refer to www.cboe.com/PUT. The inception date of the PUT Index is 6/30/1986.
[2] The US equity market and the alternative risk factors are defined as in Fama & French [1993] and Fama & French [2012]. The US equity market, which represents the broad equity market portfolio, has a correlation of 0.988 with S&P 500 Total Return Index.

- **VRP protects investors in bear markets.** Capital preservation during major corrections is as important as the long-term efficiency of their portfolio. From June 1986 to September 2017, VRP experienced the lowest maximum drawdown when compared to the broad market, size, value, and momentum factors. This smaller maximum drawdown facilitated a much shorter time under water from its high-water mark.



Source: Cboe, Kenneth French Data Library and RJA analysis. To measure the maximum drawdown and recovery time, the risk-free rate is added to the returns of each factor portfolio. Doing so reflects the returns on a portfolio with capital commitment (as opposed to zero-cost). As of 9/30/2017, the momentum factor has not yet fully recovered from its maximum drawdown.

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- **VRP offers diversification benefits.** By investing in strategies with low correlations to each other, investors can achieve higher returns relative to a less diversified portfolio for the same level of risk. From June 1986 to September 2017, VRP had a correlation of less than 0.2 with the broad equity market, size, value, and momentum factors. This suggests that VRP is a strong candidate for a diversifying strategy to improve efficiency.

Correlation between risk factors, 6/1986 – 9/2017

	VRP	Market - Rf	Size	Value	Momentum
VRP	1.00				
Market - Rf	0.16	1.00			
Size	0.13	0.22	1.00		
Value	0.09	-0.21	-0.26	1.00	
Momentum	-0.04	-0.19	0.05	-0.20	1.00

Source: Cboe, Kenneth French Data Library and RJA analysis. The equity market, size, value, and momentum risk premium portfolios are defined following Fama & French's methodology as zero-cost portfolios. All statistics are annualized.

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- **VRP is an under-utilized source of return.** Option-writing strategies, which collect VRP systematically, have gained popularity in recent years. Nevertheless, they still are not as widely adopted as smart beta strategies which capture risk premia associated with other risk factors. Institutional option-writing strategies in aggregate have an AUM of approximately $25 billion[3], whereas there is more than $700 billion invested in smart beta ETFs (according to FTSE-Russell, 6/30/2017).

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Which asset class does VRP belong to?

There are several asset classes where we see institutional investors harvesting VRP.

- **Option writing**: some institutional investors have a designated asset class to house VRP strategies.
- **Hedged equity / stabilized equity / low-beta equity / low-vol equity**: strategies that harvest VRP via option-writing (such as the Cboe PUT Index) have exposure to the underlying equity market. They usually have an equity beta smaller than 1, depending on the strike and expiration of the options used. Consequently, some investors incorporate option-selling strategies as low-beta equity with VRP enhancement.
- **Hedge funds / diversifying strategies**: some investors allocate to VRP strategies in these buckets based on diversification benefits.
- **Public Equity:** the beta of option-writing strategies can be customized by dynamically incorporating stocks or ETFs, and/or taking on leverage. For example, strategies such as the Cboe PUT Index are typically fully collateralized. The margin requirement for short option positions, though, is usually substantially lower (requiring less than full collateralization). Therefore, it is feasible to incorporate equity securities, futures, and/or leverage into such strategies in order to achieve a desired beta profile. Some institutional investors utilize VRP strategies with a beta close to 1 in their public equity allocation.

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[3] Source: eVestment and RJA analysis. As of 9/30/2017. The list of strategies included in the analysis is not exhaustive.

More questions?

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