It is Time to Be Smarter about Low Vol

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Introduction

The popularity of low volatility investing has increased dramatically as a result of strong performance and greater accessibility. With this popularity have arisen some concerns regarding the potential for overcrowding and the formation of a bubble in the investment style. These concerns are legitimate and the recent sharp sell-off of low volatility ETFs may indicate that the popularity of the strategy has peaked.[1] However, not all low-volatility products are the same and some have not experienced this sell-off. Different low volatility strategies can have similar volatility characteristics and yet have very different portfolio profiles, and what causes these differences is portfolio construction. We believe that thoughtful portfolio construction leads to better low volatility portfolios.

PanAgora's portfolio construction methodology differs significantly from mainstream methodologies in both of the primary components of portfolio construction: asset selection and asset weighting. These differences can lead to large differences in performance. In this brief note, we focus on year to date 2016 performance since there has been significant performance dispersion across different low volatility strategies over this period. To understand this dispersion and how our methodology adds value, we compare the performance of three strategies: the S&P 500 Index (S&P500), the S&P 500 Low Volatility ETF (SPLV), and the PanAgora Risk Parity S&P 500 Low Volatility portfolio (RPLV).

Strategy comparison

The SPLV portfolio construction methodology is publically available, but in short, it invests in the 100 least volatile companies in the S&P 500 Index and it weights these stocks by inverse volatility. In other words, only low-volatility stocks get into the portfolio and those with the lowest volatilities get the largest weights in the portfolio. Volatility decides both the asset selection and the asset weighting, with no other considerations.

The goal of the RPLV portfolio construction process is to gain persistent exposure to low volatility stocks while building a diversified portfolio that avoids unintended risk concentrations, such as sector concentrations or unintended factor exposures (e.g. momentum). Factor exposure and diversification are important for both steps of the portfolio construction process. In the asset selection step, stocks are chosen for both their low volatility and their ability to diversify the portfolio, in contrast to the SPLV approach which uses only volatility. In the asset weighting step, we balance risk across sectors and

[1] [1]"The Air Has Come Out of One of 2016's Most Popular Trades: Low vol 'til you bawl." http://www.bloomberg.com/news/articles/2016-11-17/the-air-has-come-out-of-one-of-2016-s-most-popular-trades

stocks in an effort to avoid all risk concentrations and thus arrive at the most diversified portfolio of the selected low volatility stocks. This contrasts with the SPLV methodology which uses only volatility to weight the assets and can result in significant risk concentrations. Both steps are important for generating a portfolio that is different from the mainstream SPLV portfolio. In the asset selection step, choosing stocks based on low volatility yields a portfolio with the desired exposure and by incorporating the additional criteria of diversification we also pick stocks from diversifying sectors. In the asset weighting step, our Risk Parity portfolio construction process aims to ensure that the portfolio does not have risk concentrations, which includes concentrations to any individual sector, stock or unintended factor, such as momentum.

PanAgora has been managing its live Risk Parity Low Volatility S&P 500 portfolio since March of 2013. The following table compares the performance since March 2013 for the three strategies being discussed.

Table 1: Performance comparison March 2013 through November 2016

12/31/2015-11/30/2016	S&P500	SPLV	RPLV
Performance (gross)	12.81	11.55	16.32

Past performance is not a guarantee of futures results. Performance is shown as supplemental to the GIPS disclosures included at the end of this document.

Table 1 illustrates that this has been a period of strong performance in the S&P 500 Index. Low volatility portfolios are expected to underperform the index in periods of strong, positive performance and SPLV has underperformed the S&P500, but only slightly making this a very strong period for low volatility investing as well. RPLV has outperformed both the S&P500 and SPLV portfolios. A large portion of this outperformance has come in 2016 and is therefore the reason for our focus on this year in the remainder of this note.

Table 2: Performance comparison January 2016 through November 2016

12/31/2015-11/30/2016	S&P500	SPLV	RPLV
Performance (gross)	9.79	7.58	21.65

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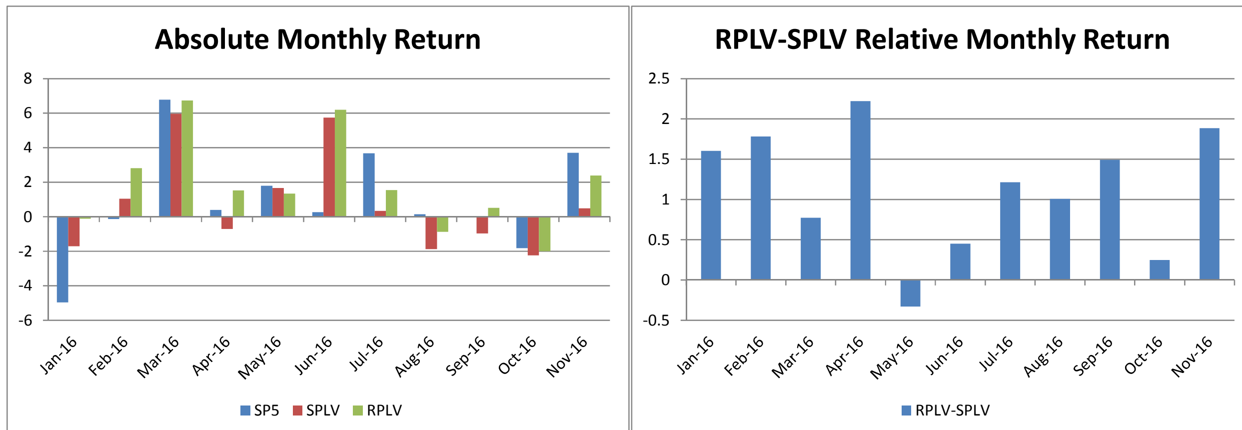
Table 2 above illustrates the year to date performance for all three strategies through 11/30/2016. There is a large difference in performance between the strategies with SPLV underperforming the S&P500 and RPLV outperforming both. This period has been interesting for low volatility investing. Generally speaking, there was strong outperformance of low volatility investing in the beginning of the year and strong underperformance more recently. However, RPLV has largely been able to maintain its outperformance, which is directly attributable to the two components of our portfolio construction methodology, asset selection that includes both volatility and diversification, and asset weighting that reduces risk concentrations.

Table 3 below has two panels of monthly performance. The first shows the absolute return of each strategy for every month. The second panel shows the relative return of RPLV – SPLV for each month. In the second panel, it is notable that RPLV has outperformed SPLV in 10 of 11 months this year. Each period of outperformance can be attributed to different aspects of the RPLV portfolio construction methodology.

Table 3: Month by month performance. Panel A: absolute performance of three strategies (S&P500, SPLV, and RPLV). Panel B: relative performance of RPLV – SPLV



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Monthly attribution

Attribution can help identify what is driving the differences in these two approaches to low volatility investing. In this section, we identify periods where different aspects of our portfolio construction process added value relative to SPLV. Specifically, we discuss three examples of value-added due to 1) asset selection which yields portfolios with broader sector representation, 2) asset weighting which spreads risk across sectors, and 3) asset weighting which also avoids unintended factor concentrations.

The following comments on attribution compare RPLV to SPLV for several specific months:

January – February 2016: Value-added from Asset Weighting -- spreading risk across sectors

The S&P 500 Index had a negative overall return in this period which is an environment in which low volatility stocks are expected to outperform, and RPLV outperformed both S&P500 and SPLV. The principal driver of the outperformance of RPLV in this two month period was the allocation to the Materials sector. The Materials sector outperformed other sectors during this period and RPLV had an 8.2% average allocation to this sector whereas SPLV had an average allocation 2.2%. The larger allocation of RPLV to the Materials sector is a direct result of our process's aim to balance risk across all sectors. No other sector had such a significant contribution to value-added performance during this period.

April 2016: Value-added from Asset Selection -- broader sector representation

This month also was interesting because the S&P 500 Index had a positive return and low volatility stocks are not expected to outperform in up markets; however, RPLV outperformed both of the other portfolios. In April, the Energy sector outperformed other sectors due to a rebound in oil prices. The RPLV portfolio had a 9.96% allocation to the Energy sector whereas the SPLV had a 0% allocation. Our allocation to the Energy sector was a direct result of our asset selection step. In this month there were no Energy stocks with volatility low enough to make it into the SPLV portfolio, but because our asset selection also incorporates a diversification consideration, our portfolio construction process found Energy stocks with moderately low volatility that helped diversify the portfolio.

August – September 2016: Value-added from Asset Weighting -- avoiding unintended factor concentrations

In addition to sector attributions, we consider risk factor attributions in order to understand how much of performance can be explained by unintended exposures to other risk factors. Since our process seeks to diversify all risk concentrations, it also naturally diversifies risk concentrations in unintended risk factors. It has been widely noted that there was increased cross-sectional correlation between low volatility and momentum in this period. Because the SPLV methodology considers only a stock's volatility, unsurprisingly it had a strong momentum exposure, with greater allocations to high momentum stocks than to low momentum stocks. For example, in this period SPLV had a 0% allocation to the lowest decile of momentum stocks. By contrast RPLV, which aims to reduce any risk concentration, had an average weight of 5.35% to the lowest decile of momentum stocks. This allocation added value in both August and September.

November: Value-added from Asset Selection -- broader sector representation

November was a very difficult month for low-volatility stocks. The primary reason was the strong underperformance of the Utilities sector. Since RPLV aims to spread risk equally across sectors, the portfolio maintained a lower weight to Utilities and was thus able to add value relative to SPLV in November. RPLV had a 13% weight to Utility stocks whereas SPLV had a 23% weight.

Conclusion

Low volatility investing has garnered a lot of attention recently, first due to the strategy's performance in the beginning of the year and then due to its underperformance more recently. We find that the recent pullback is largely due to the unnecessary buildup of risk concentrations in the standard low volatility portfolios. However, these risk concentrations can be avoided with thoughtful portfolio construction. PanAgora's Risk Parity Low Volatility portfolio has the expected low volatility characteristic, but achieves this through a portfolio construction process that produces a much more diversified portfolio. The portfolio's low volatility characteristic yields higher participation when low volatility investing pays off, and the portfolio's diversification helps avoid losses when low volatility investing does not pay off. It is not time to flee low-volatility investing; it is time to do it properly!

Disclosures

Legal Disclosures

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Index Descriptions

The Standard & Poor's 500, often abbreviated as the S&P 500, or just "the S&P", is an American stock market index based on the market capitalizations of 500 large companies having common stock listed on the NYSE or NASDAQ. The S&P 500 index components and their weightings are determined by S&P Dow Jones Indices.

The S&P 500 Low Volatility Index measures the performance of the 100 least volatile stocks in the S&P 500 based on their historical volatility. The index is designed to serve as a benchmark for low volatility investing in the US stock market.

Broad-based securities indices are unmanaged and are not subject to fees and expenses typically associated with managed accounts or investment funds. Investments cannot be made directly in an index.

Diversified Risk U.S. Equity Low Volatility Composite
Composite: Diversified Risk US Equity Low Volatility (As of 12/31/15)
Benchmark 1: S&P 500 Low Volatility Index
Benchmark 2: S&P 500 Index

	One Year Performance - Benchmark 1			Internal Dispersion		External Dispersion - Benchmark 1			
Year	Composite Gross of Fees Return (%)	Composite Net of Fees Return (%)	Index Return (%)	High (%)*	Low (%)*	3 Yr. Composite Return (%)***	3 Yr. Composite Standard Deviation***	3 Yr. Index Return (%)***	3 Yr. Index Standard Deviation***
2015	6.19	5.89	4.34	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2014	19.07	18.77	17.49	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2013**	14.61	14.36	14.53	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

	One Year Performance - Benchmark 2			Internal Dispersion		External Dispersion - Benchmark 2			
Year	Gross of Fees	Net of Fees	Return (%)	High (%)*	Low (%)*	Return (%)***	Standard	Return (%)***	Standard
2015	6.19	5.89	1.38	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2014	19.07	18.77	13.69	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
2013**	14.61	14.36	24.18	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.

	Assets Under Management				
Year	Composite Assets ($Millions)	Percentage of Firm Assets (%)	Number of Accounts	Firm Assets ($Millions)	Non-fee paying and/or Proprietary Assets (%)
2015	$2.13	0.01	1	$38,361	100.00
2014	$2.18	0.01	1	$37,953	100.00
2013**	$2.03	0.01	1	$39,533	100.00

*High/Low Returns have not been provided for composites with less than two accounts in the composite for the entire year.
**Period from March 1, 2013 to December 31, 2013 is not annualized.
***Three year returns and standard deviations have not been provided for composites with fewer than 36 months of monthly returns

Firm Overview

PanAgora Asset Management, Inc. (the "Firm") claims compliance with the Global Investment Performance Standards ("GIPS®") and has prepared and presented this report in compliance with the GIPS Standards. PanAgora Asset Management, Inc. has been independently verified for the periods 1993-2014. The verification reports are available upon request. Verification assesses whether (1) the firm has complied with all the composite construction requirements of the GIPS standards on a firm-wide basis and (2) the firm's policies and procedures are designed to calculate and present performance in compliance with the GIPS standards. Verification does not ensure the accuracy of any specific composite presentation.

For the purposes of compliance with GIPS, the Firm is defined as a broad based investment management organization that provides investment services to institutions through separately managed accounts, pooled funds and mutual funds. The Firm is an independent investment advisor registered under the Investment Advisers Act of 1940 specializing in quantitative investment strategies and includes all assets under management.

Composition of Composite

The accounts within the PanAgora Diversified Risk U.S. Equity Low Volatility Composite seek to generate returns over time that are similar to those of the performance benchmark by balancing risk exposures within a portfolio of stocks that generally exhibit lower volatility than the broader market. Other portfolios constructed with targeted exposures such as low volatility often result in concentrated positions that can result in unwarranted volatility and larger draw-downs. By avoiding these concentrated risk exposures PanAgora expects that its Diversified Risk U.S. Equity Low Volatility Strategy will deliver more stable returns, lower portfolio volatility, and better downside protection over time. There can be no assurance this objective will be achieved. The Composite is comprised of all discretionary institutional accounts managed by the Firm in this investment style. The creation and inception date for the Composite was March 1, 2013. There is a minimum of $2 million in assets for inclusion in this Composite.

New portfolios are included in a GIPS composite beginning with the first complete month of performance in the strategy. Terminated portfolios are included through the final full month of management. Composites may include portfolios with certain existing investment restrictions that the Company believes do not materially impact the investment strategy.

A list of composite descriptions is available upon request.

Calculation of Composite

A composite's monthly return is computed by asset weighting the portfolio returns within the composite, using the beginning of period market values. The quarterly return of a composite is computed by geometrically linking the returns of each month within the calendar quarter. The annual return of a composite is computed by geometrically linking the returns of each quarter within the calendar year.

Investments held by all portfolios are valued on a trade-date basis using accrual accounting. Individual portfolio returns are calculated using the daily time-weighted rate of return (TWRR) methodology. Performance is expressed in U.S. dollars. Policies for valuing portfolios, calculating performance, and preparing compliant presentations are available upon request.

Returns are net of foreign withholding taxes on dividends, interest, and capital gains. Equity benchmark returns assume dividends are reinvested monthly. MSCI benchmarks are presented net after withholding taxes by applying the maximum rate applicable to non-resident institutional investors who do not benefit from double taxation treaties. Returns from other benchmark providers are presented gross of any tax withholding.

Index Disclosure

Benchmark 1: The S&P 500 Low Volatility Index measures performance of the 100 least volatile stocks in the S&P 500.

Benchmark 2: The S&P 500 Index includes 500 leading companies in leading industries of the U.S. economy, capturing 75% coverage of U.S. equities.

Benchmarks are generally taken from published sources and may have different calculation methodologies, pricing times, and foreign exchange sources from the Composite. The effect of those differences is deemed to be immaterial. The securities holdings of the composite may differ materially from those of the index used for comparative purposes. Indexes are unmanaged and do not incur expenses. You cannot invest directly in an index.

Gross and Net of Fees Disclosure

Gross of Fee returns are net of transaction costs but do not include the deduction of management fees and other expenses that may be incurred in managing an investment account. A portfolio’s return will be reduced by management and other fees. The impact of management fees can be material. Investment returns are reduced by advisory fees as in the following example: Over a five year period, if a $100 portfolio had an annual return of 10%, it would grow to $161.05. The net compounded effect of a 30 basis point annual investment management fee (without custody charges) would total $2.18 and result in a portfolio value of $158.87.

Net of Fee Return results are calculated as the Gross of Fee Returns minus a model fee equal to the highest standard Separate Account Management Fee and includes a performance fee incentive, if applicable that a client invested in this strategy would have paid during the performance period.

Fee Schedule

The below is the standard fee schedule based on the market value of an account’s assets under management and stated on an annual basis. Separate account fees are for investment management services only. Custodial fees, which are not charged to an account, are not included in the Net of Fee Returns.

Separate Account Management:

Initial $50 million	0.30 of 1%
Next $50 million	0.25 of 1%
Over $100 million	0.20 of 1%

The minimum annual fee is $100,000.

This fee schedule has been prepared for informational purposes for the purpose of the Firm’s global compliance with GIPS and should not be construed as an offer or solicitation. Actual fees may vary by client.

Past Performance is not a guarantee of future performance. No assurance can be given as to future performance.