

A timely look at the potential benefits of low volatility equity



Allocating to low volatility equity

2019 was a year of strong performance across asset classes. Equities, government bonds, investment grade and high yield credit, real assets, oil, gold, and the U.S. dollar have all delivered significant positive returns last year. If a surging U.S. stock market, despite negligible earnings growth, and ten years of recovery since the Financial Crisis make you uneasy about future downside risk and potential portfolio volatility, you're in thoughtful company. Today, investors face pressure to meet optimistic return objectives influenced by assumptions that the current return environment will persist. So future investment returns could surprise unprepared portfolios with undesired outcomes.

A strategic allocation to low-volatility equities could help to prepare portfolios for such a future. Low volatility equities' potential de-risking and efficiency-enhancing effects can help achieve market-like returns at 60-70% of market risk over a full market cycle. The best time to de-risk a portfolio is when equity markets are highly valued, and uncertainty lurks. Portfolios with low volatility equity allocations may provide long term return benefits along with short term volatility dampening — and possibly less unpleasant downside surprises. We will now explore this idea in several contexts throughout the following thought piece from BMO Global Asset Management.

Overview

The discovery of low volatility equities as a principal anomaly in asset pricing could not have been made by greater contributors to modern finance.¹ In 1972, Fischer Black posited that if leverage was difficult to obtain, the relationship between risk and return in equities would appear flatter than otherwise,² and in 1992, Eugene Fama and Kenneth French concluded that after accounting for size and value factors in stock returns, lower-beta equities performed similarly to their higher-beta counterparts.³

¹ For a detailed definition of the low volatility anomaly and its discovery, see Corris, David, Hans, Jason, Kaufman, Jay, and Ramos, Ernesto. 2013. "Finding opportunities through the low-volatility anomaly." <http://bmogamviewpoints.com/wpcontent/uploads/2014/08/BMOGAM-Low-VolatilityPaper.pdf>

² Black, Fischer, Michael C. Jensen and Myron Scholes. 1972. "The Capital Asset Pricing Model: Some Empirical tests," in *Studies in the Theory of Capital Markets*, Michael C. Jensen, ed. New York: Praeger, pp. 79-121.

³ Fama, Eugene and French, Kenneth, 1992. "The Cross-Section of Expected Stock Returns," *Journal of Finance*, American Finance Association, vol. 47(2), pages 427-465, June.

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Over the last 15 years, further research and implementation demonstrated that low volatility equities regardless of sector or geography could provide competitive returns to broad equities with lower risk, suggesting that investors can replace existing equity exposure in a portfolio without sacrificing return potential. However, the use of low volatility equities has been dominated of late by investors seeking shorter-term defensive exposure. While potentially effective in de-risking portfolios, low volatility equities can also strategically enhance three types of investment portfolios:

- Long-only total return portfolios comprised exclusively of public markets investments,
- Public markets portfolios managed relative to liabilities, and
- Total return portfolios comprised of public and private markets investments

Key characteristics of low volatility equities for allocators

The investment characteristics of low volatility equities depend on how they are defined. There are a significant number of active managers that offer low or managed volatility strategies, but few have sufficiently long track records and fewer have levels of realized volatility significantly lower than broad equity market benchmarks. A principal reason for this is that many managers benchmark their active low volatility strategies to publicly available low volatility equity indexes. The most popular indexes, in turn, either define volatility as a single historical measure⁴ or constrain the security, sector or country weights to deviate less from parent indexes than lower volatility mixes.⁵ In order to identify and analyze low volatility characteristics, we have created a rules-based simulation of a less constrained global low volatility strategy with a history dating back to 1997.⁶ Over this time period, these low volatility equities have shown three key characteristics that make them attractive to capital allocators:

1. Strong risk-reward By virtue of their lower risk and competitive returns, low volatility global equities have historically provided high Sharpe Ratios as shown in Exhibit 1. As one might expect, low volatility equities have shown the lowest measured standard deviation of any standard risk factor during the previous 22 years. Although not the highest-returning factor (that distinction belongs to momentum equities), low volatility equities have been competitive with other factor returns, particularly on geometric or compound returns that are impacted by volatility. The result is the richest reward for risk in public equities.



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Exhibit 1: Global low volatility performance vs. MSCI ACWI factors, 1997-2019

	Global low vol	ACWI Index	ACWI Index factors					
			Growth	Dividend yield	Momentum	Quality	Size	Value
Geometric mean (%)	9.2	6.2	6.7	7.4	10.3	8.8	7.6	5.9
Arithmetic mean (%)	9.5	7.4	8.1	8.5	11.6	9.7	9.0	7.1
Standard deviation (%)	8.4	15.4	16.1	14.9	16.2	13.8	17.1	15.6
Sharpe Ratio	0.83	0.26	0.28	0.35	0.50	0.47	0.34	0.24

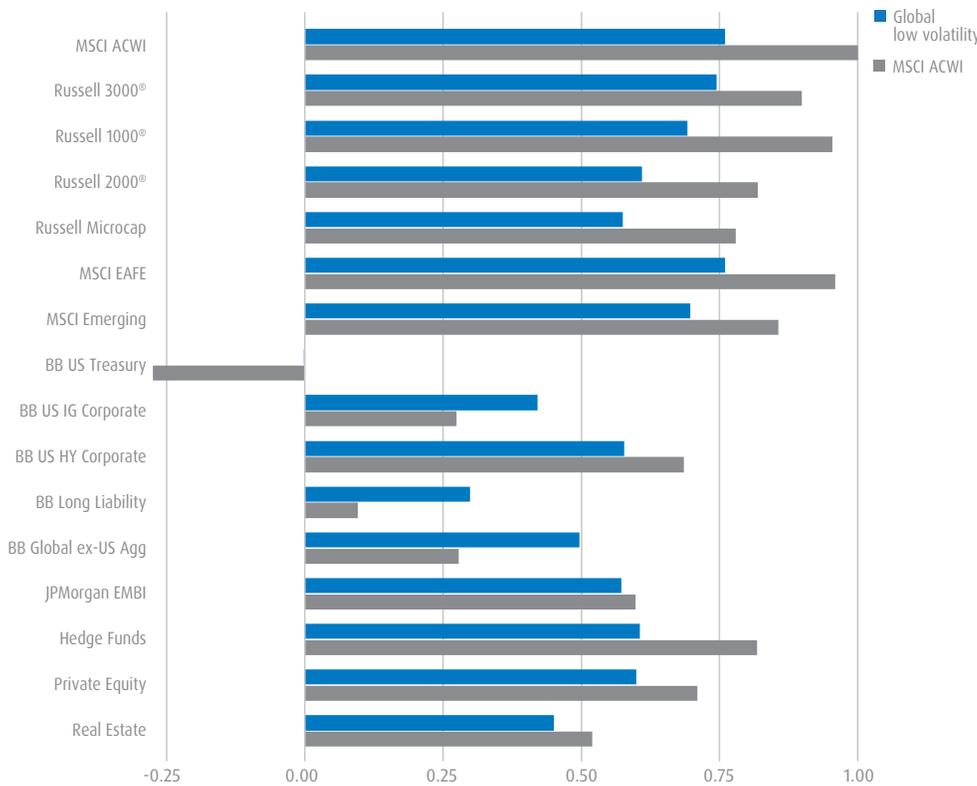
⁴ The Standard & Poor's Low Volatility indexes are comprised of the securities from a parent index with the lowest trailing 12-month daily price volatility. See https://us.spindices.com/documents/methodologies/methodology-sp-low-volatility-indices.pdf?force_download=true

⁵ MSCI Minimum Volatility equity indexes are constrained to the MSCI parent indexes according to the following: https://www.msci.com/eqb/methodology/meth_docs/MSCI_Minimum_Volatility_Methodology_Sep2017.pdf

⁶ Global Low Volatility index (GLV index) reflects the performance characteristics of a minimum variance strategy applied to large, mid, and small cap equities across both developed and emerging market countries. GLV index is constructed and rebalanced monthly by applying a minimum variance optimization to the global universe of securities while constraining turnover at 4%/month, maximum absolute position weights at 2.5%, maximum absolute country weights, and maximum absolute sector exposures at 25%. GLV Index returns are net of estimated transaction costs.

2. Diversification qualities Low volatility global equities have also shown lower correlation to other risky assets than the broad stock market, as shown in Exhibit 2. This is also the case when comparing low volatility correlations to standard equity categories to the correlations of other equity risk factors with the same categories. The diversification advantage also extends to less liquid alternative assets like private equity and direct real estate, provided those illiquid assets' returns are adjusted for serial correlation and lags in the (illiquid) time series. Conversely, lower variability in low volatility stock returns results in higher correlations with fixed income assets and especially liability proxies. This makes low volatility equities a more effective component in portfolios that measure risk relative to liabilities, and suggests that on the margin, low volatility equities can replace more than just equities in a total return portfolio.

Exhibit 2: Global low volatility monthly* correlations with major asset classes, 1997-2019

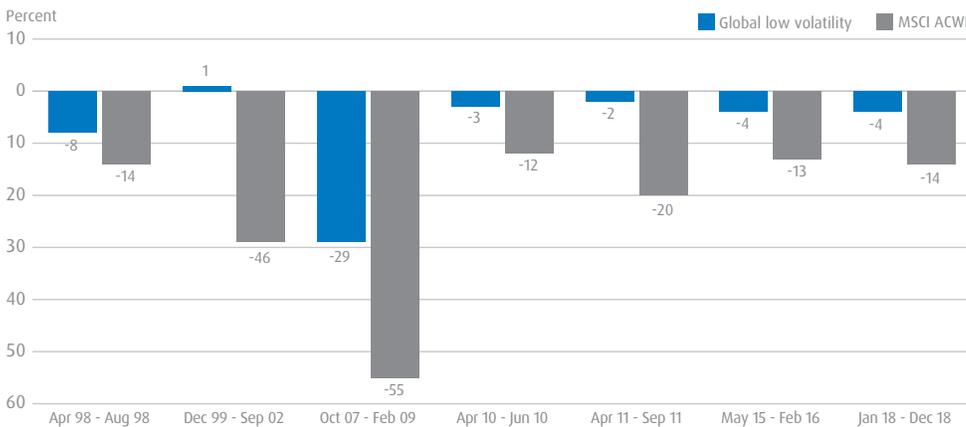


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* Private Equity and Real Estate are quarterly calculations. Hedge Funds are an average of HFRI Equity Hedge and Event Driven indexes.

3. Strong downside risk protection As one would expect given the quality profile of low volatility global equities, every significant stock market decline since 1997 has seen low volatility less affected by the broad market decline as in Exhibit 3. The most successful period occurred in the wake of the technology bubble in the early 2000s, when low volatility equity rose slightly while the broad market plunged precipitously. In more recent down markets since the popularization of low volatility equities (since 2010), the low volatility decline has been less than a third of broader market declines. Risk reduction from low volatility has been present when needed most—in contrast to many other assets whose risk characteristics change in periods of high stress.

Exhibit 3: Performance of global low volatility equity in declining markets



Allocating to low volatility equities: case studies

Global low volatility equities have a role to play in a variety of investor portfolios, but to provide more specific guidance, a set of comparable asset class returns and an analytical framework are required.

We have chosen recognized publicly available benchmark indexes as representative of the major asset classes commonly used by investors and calculated the returns, volatilities, and cross-asset correlations from historical returns since the hypothetical Global Low Volatility strategy’s inception of 1997. Historical results make consistent parameters for optimization but can lead to unrealistic or concentrated portfolios.

Optimizations help identify the combinations of assets most likely to achieve the greatest reward for risk, given the definition of risk. For the liquid and illiquid total return portfolios, that measure of risk is, respectively, monthly and quarterly standard deviation of total returns. For the liability-relative portfolio, risk is specified as the standard deviation of return relative to liabilities, a commonly used generic U.S. pension liability index. Although optimizations of point estimates are not fully descriptive of a range of potential outcomes, they do offer a transparent communication of a single representative allocation and the roles of assets relative to one another. Constraints are applied in optimizations in which certain assets display overwhelming dominance in allocations.

Since low volatility equities exhibit the characteristics described earlier, they are featured prominently in the unconstrained liquid asset optimizations. The addition of illiquid assets requires selective constraints because of illiquids’ comparatively high Sharpe Ratios.

Case study: 60/40 public market allocations

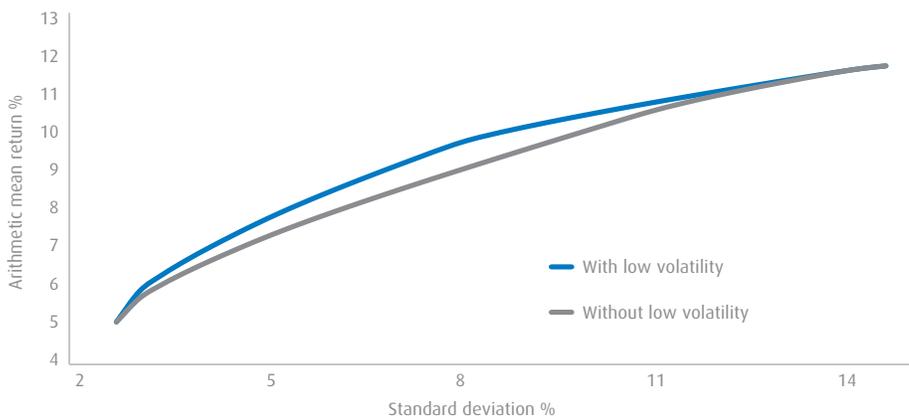
A large number of investors continue to rely upon liquid, public market investments to provide for benefit payments or liquidity needs in retirement. These investments have often been characterized in portfolio analyses by their total returns and the volatility of those returns. The results of unconstrained mean-variance optimizations — one with a specific allocation to low volatility global equities and another with additions to major regional equity asset categories — using monthly returns and risks are shown in Exhibits 4 and 5.



Global low volatility equities have a role to play in a variety of investor portfolios, but to provide more specific guidance, a set of comparable asset class returns and an analytical framework are required.

In Exhibit 4, the marginal benefit of including specific allocations to low volatility equities is evident: The efficient frontier with low volatility equities offers superior expected return-risk combinations than the frontier without. But the impact of low volatility appears influential for lower-risk portfolios and more muted for higher-risk portfolios. Although global low volatility correlations are lower with fixed income assets that populate lower-risk portfolios, the historical risk of global low volatility equities is low enough that they tend to be the equity asset of choice for allocations of moderate risk and less. Other equities are influential at higher levels of risk that low volatility global equities simply cannot reach without the use of leverage.

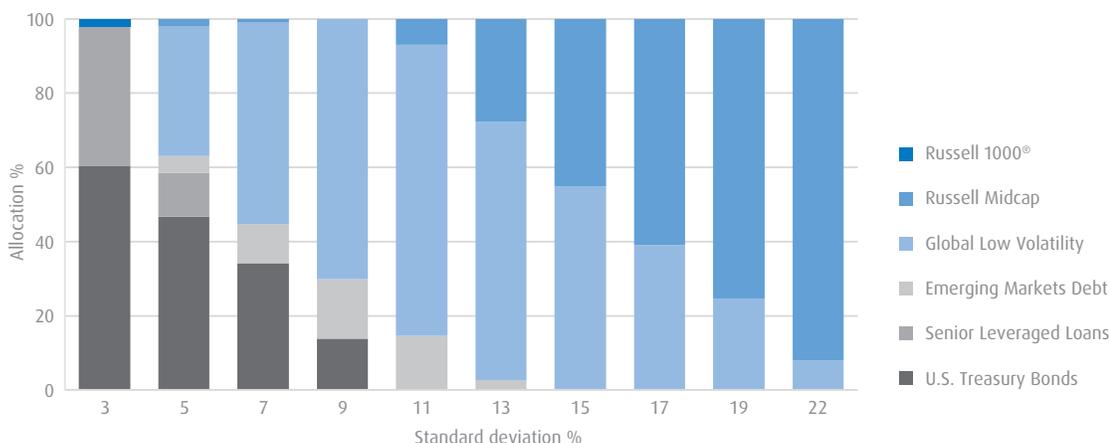
Exhibit 4: Efficient frontier of MVO optimization, with and without global low volatility, 1997 to present return history



In an unconstrained optimization of historical mean (return) and variance (volatility), the lower risk and correspondingly high Sharpe Ratio of low volatility equities makes them very attractive.

Exhibit 5 provides some allocation detail for a typical set of liquid asset classes. U.S. Treasuries benefit as the lowest-risk asset from declining interest rates over the period, and senior loans and emerging debt represent the most successful credit assets. As expected, in an unconstrained optimization of historical mean (return) and variance (volatility), the lower risk and correspondingly high Sharpe Ratio of low volatility equities makes them very attractive. This attractiveness is enhanced by the lower correlations of low volatility to riskier asset classes in equities and credit. The peak efficient allocation to low volatility equities is close to 80% of a total portfolio, as it comes to dominate broad U.S. equities in combinations with credit and non-U.S. assets. This domination would persist if liquid equities were classified by generic factor exposures as in Exhibit 1. U.S. equities are preferred over non-U.S. because of both superior local currency performance and a rising U.S. dollar over the period; within the U.S., midcap outperforms large cap with less risk than small cap.

Exhibit 5: Ten unconstrained efficient allocations with global low volatility, 1997 to present return history



Continued

A prudent investor would likely choose a more diversified mix of assets, especially with broader representation by region, capitalization size, maturity and credit. More representative asset allocations including and excluding low volatility equities are shown in Exhibit 6, with actual performance results at the bottom of the table. A more modest one-third allocation to low volatility global equities mirrored by a similar allocation U.S. and non-U.S. equity asset classes results in similar realized returns to a portfolio without a specific allocation to low volatility equities, but at three-quarters of the risk. The downside risk of the portfolio with low volatility equities has been almost half of one without. Risk-adjusted returns for conventional portfolios of public fixed income and equities have clearly been enhanced by low volatility equity allocations.

Exhibit 6: Sample mid-risk total return portfolios with and without global low volatility equities

	1997 to present results	
	Without global low volatility	With global low volatility
Russell 1000® (%)	30.0	10.0
Russell 2000® (%)	5.0	3.0
Russell Microcap (%)	5.0	2.0
Global low volatility (%)	0.0	33.0
MSCI EAFE (%)	13.0	8.0
MSCI Emerging Markets (%)	7.0	4.0
BB US Treasuries (%)	15.0	15.0
BB US IG Corporates (%)	5.0	5.0
BB US HY Corporates (%)	10.0	10.0
S&P/LSTA Bank Loans (%)	5.0	5.0
JPM EM Debt (%)	5.0	5.0
Geometric mean (%)	7.2	7.6
Arithmetic mean (%)	7.7	7.9
Standard deviation (%)	10.6	7.9
Sharpe Ratio	0.52	0.72
CVaR @ 95% (%)	-6.7	-3.8



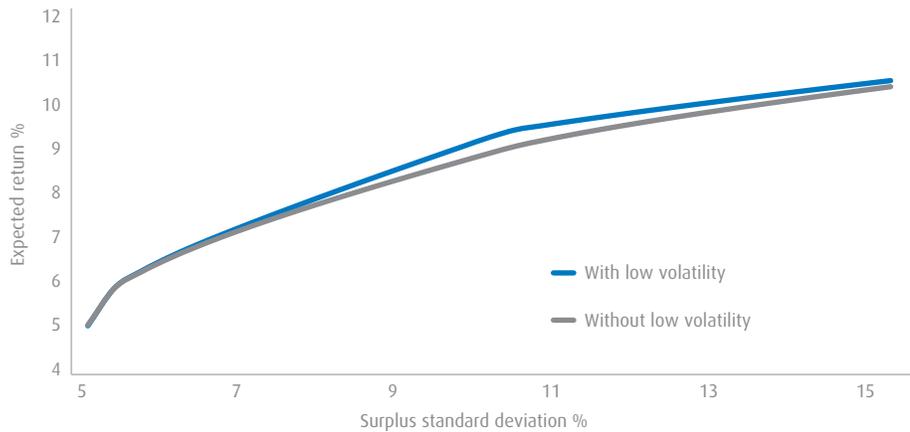
Risk-adjusted returns for conventional portfolios of public fixed income and equities have clearly been enhanced by low volatility equity allocations.

Case study: Liability-relative allocations

Once solely the practice of insurance companies, defined benefit plan sponsors have increasingly managed their assets relative to plan liabilities since the passage of the Pension Protection Act of 2006. Given that most plans are less than fully funded, allocations have typically combined liability-hedging components of longer-dated rate and credit exposure (implemented via physical bonds or derivatives exposure) with a portion of the overall assets dedicated to generating return in order to improve plan funded status.

In this case, asset class historical risks and returns are used to generate asset allocations providing efficient combinations of return and risk relative to liabilities. Liabilities are characterized by the Bloomberg Barclays Long Liability Index, a publicly available index of long credit instruments mimicking a typical U.S. pension liability. Plan funded status (of assets relative to liabilities) is assumed to be 85%, the current average figure for defined benefit plans of companies included in the Milliman 100 PFI Index.⁷ An unconstrained optimization results in allocations including low volatility equities that provide marginally greater return for risk relative to liabilities in Exhibit 7.

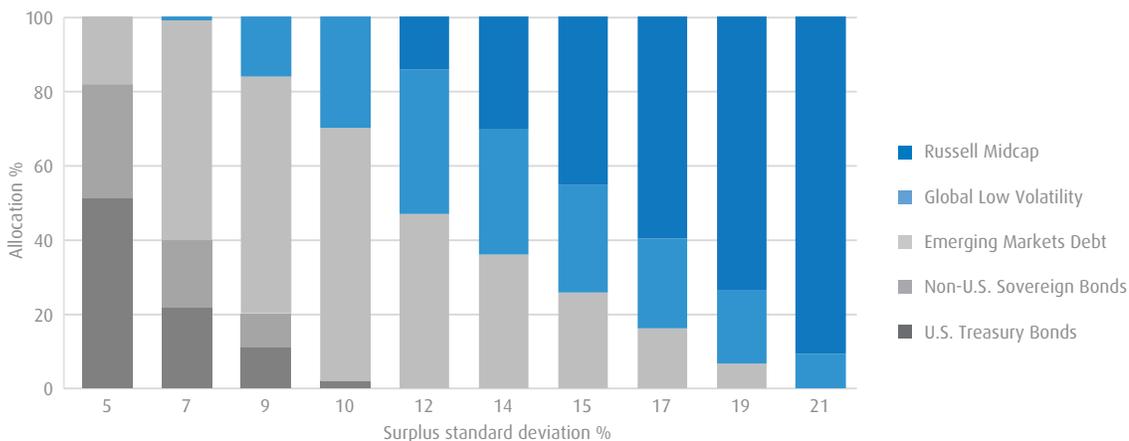
Exhibit 7: Efficient frontier of surplus optimization, with and without global low volatility



The higher correlation of low volatility equities to liabilities (relative to those of other equities) and their low absolute volatility combine to make a more attractive implementation of equity exposure than other factors, sizes or styles for all but the highest levels of risk.

The composition of allocations optimally weighing return against standard deviation to liabilities indicates the superiority of low volatility equities to other categories of U.S. equities in Exhibit 8. Even with the historical advantages of emerging debt with credit-heavy liabilities and U.S. midcap equities for returns in the set of optimized asset classes, as much as a 40% U.S. low volatility equity allocation is identified as optimal at moderate to high levels of risk. The higher correlation of low volatility equities to liabilities (relative to those of other equities) and their low absolute volatility combine to make a more attractive implementation of equity exposure than other factors, sizes or styles for all but the highest levels of risk. This risk reduction allows for greater exposure to credit risk (here in the form of emerging debt) than would otherwise be observed.

Exhibit 8: Ten efficient liability-relative portfolios with global low volatility equity



⁷ For the latest PFI figures and a description of the Milliman methodology, please see <https://us.milliman.com/PFI/>

Continued

Results shown in Exhibit 9 confirm the impact of allocating half of a U.S. equity allocation to low volatility equities in combination with a variety of other assets in a return-generating portfolio. Returns here are again similar for allocations avoiding and featuring low volatility equities, with historical risks of plan assets relative to liabilities much lower when low volatility equities are included. Low volatility equities help to mitigate the volatility of plan funded status more than other categories of equities, decreasing the likelihood of company contributions to the plan during risky asset selloffs while helping make full funding more achievable.

Exhibit 9: Sample liability-relative portfolio with and without global low volatility equity

	1997 to present results (%)	
	Without global low volatility	With global low volatility
Russell 1000®	23.0	10.0
Russell 2000®	4.0	2.0
Russell Midcap	3.0	2.0
Global low volatility	0.0	25.0
MSCI EAFE	13.0	7.0
MSCI Emerging Markets	7.0	4.0
BB US Treasuries	10.0	15.0
BB US IG Corporates	10.0	10.0
BB US HY Corporates	10.0	8.0
S&P/LSTA Bank Loans	5.0	4.0
JPM EM Debt	15.0	13.0
Geometric mean	7.2	7.5
Arithmetic mean	7.7	7.8
Standard deviation to liabilities	13.6	10.5



Low volatility equities help to mitigate the volatility of plan funded status more than other categories of equities, decreasing the likelihood of company contributions to the plan during risky asset selloffs while helping make full funding more achievable.

Case study: Allocations including alternative or private market assets

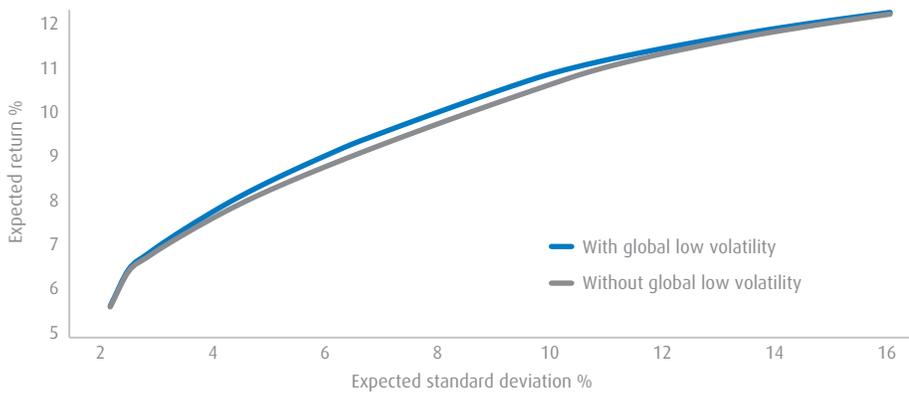
Illiquid private market investments have long been popular among endowments, foundations, and family offices, who have longer time horizons and less urgent short-term demands for capital. But other investors have increasingly looked to incorporate alternative and illiquid assets because of their potential for value-added and efficient use of leverage, extra compensation for illiquidity, and low measured volatilities. Low volatility equities play a greater role in allocations in which alternative or illiquid assets are included but contribute less than in liquid asset-only allocations.

The use of historical returns adds complications to the evaluation of liquid with illiquid assets. First, illiquid assets appear to show lower risk and lower correlations to all assets because their prices are not marked-to-market as frequently as those in public markets. We ‘unsmooth’ quarterly returns using an established technique that adjusts for serial correlation and lags in returns.⁸ Second, illiquid assets cannot easily be reallocated, but a key assumption in optimizations of annualized point estimates is that all assets can be reallocated annually. Multi-period optimization addresses this mismatch but is beyond the scope of this paper, so optimization constraints will substitute.

⁸ Geltner, D. M. (1993). “Estimating Market Values from Appraised Values Without Assuming an Efficient Market,” *Journal of Real Estate Research* 8, 325-345.

Even with adjustments for the first complication, private equity, natural resources, and MLP energy investments realize higher individual Sharpe Ratios greater than other assets. In unconstrained optimizations, alternative and illiquid assets therefore dominate, especially private equity. Microcap equities and listed infrastructure also receive significant allocations. Therefore, the impact of low volatility equities is observable if allocations to private equities and natural resources are constrained to maximums of 20%; we constrain MLPs as well for good measure.

Exhibit 10: Efficient frontier with illiquid alternatives, with and without global low volatility equity



Even with adjustments for the first complication, private equity, natural resources, and MLP energy investments realize higher individual Sharpe Ratios greater than other assets.

Even with those constraints, the spectrum of alternative assets is featured in the Exhibit 11 efficient allocations. Hedge Funds are represented at lower levels of risk, energy and natural resources at moderate, infrastructure at higher, and private equity at almost all risk levels (but most effectively at higher risk without constraints). The 20% private equity constraint therefore allows for a diverse set of public market risk assets to be included. Of these, U.S. Treasuries and emerging markets debt illustrate the role of rates and credit at lower risk levels, while up to 30% low volatility global equities are effectively combined with U.S. midcap and microcap equities to provide return and liquidity.

Exhibit 11: Ten efficient illiquid alternatives portfolio allocations with global low volatility equities

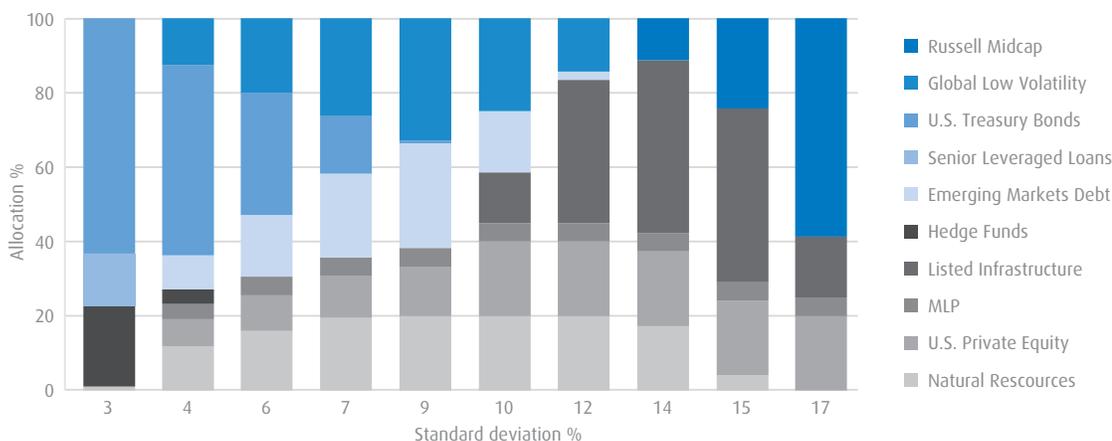


Exhibit 12 illustrates the performance of the 2018 NACUBO allocation⁹ and that allocation with 20% carved out of liquid assets to low volatility global equities. Even using unsmoothed illiquid asset returns (unlike in the optimizations), low volatility allocations result in lower portfolio risk and allow for heavier allocations to U.S. small-caps, microcaps, and energy investments that result in advantageous return results as well. The consideration of multiple investment regimes could highlight the likely benefits of global low volatility equities in preserving portfolio value and providing liquidity for reallocation in moments of market stress. These applications will be explored in future work.

Exhibit 12: 2018 NACUBO^{**} allocation with and without global low volatility equities

	1997 to present results ^{***}	
	Without min volatility	With min volatility
Russell 1000 [®] (%)	16.0	5.0
Russell 2000 [®] (%)	0.0	2.0
Russell US Microcap (%)	0.0	2.0
Global low volatility (%)	0.0	20.0
MSCI EAFE (%)	12.0	5.0
MSCI Emerging Markets (%)	8.0	3.0
BB US Treasuries (%)	4.0	7.0
BB US IG Corporates (%)	2.0	2.0
BB US HY Corporates (%)	3.0 ****	3.0
Private Equity (%)	12.0	12.0
Venture Capital (%)	8.0	8.0
Market Alternatives (%)	20.0	20.0
Direct Real Estate (%)	5.0	5.0
Energy/Resources (%)	6.0	6.0
Cash (%)	4.0	0.0
Geometric mean (%)	8.95	9.41
Arithmetic mean (%)	9.40	9.71
Standard deviation (%)	9.53	7.77
Sharpe Ratio	0.753	0.964

** NACUBO All Institutions dollar-weighted average, 2018

*** Illiquid asset returns not unsmoothed for serial correlation, do not have lags removed as in the optimizations

**** Includes 1% distressed



The consideration of multiple investment regimes could highlight the likely benefits of low volatility global equities in preserving portfolio value and providing liquidity for reallocation in moments of market stress.

⁹ The NACUBO (National Association of College and University Business Officers) All Institutions dollar weighted average allocation detail is the most widely followed representation of endowment and foundation assets in the United States and available at <https://www.nacubo.org/Research/2019/Public-NTSE-Tables>.

Summary

Low volatility equities represent a rare opportunity available in liquid capital markets to provide competitive risk-adjusted returns by systematically mitigating losses while participating meaningfully in upside returns. They also have three characteristics that make them desirable for allocators of total return portfolios with or without illiquid alternatives: Competitive returns versus broad equities, low levels of volatility and drawdown, and low correlations with other credit and equity assets. Low volatility equities can also help improve liability-relative portfolios because of their lower risk and higher correlation to liabilities than other return-generating assets.

It is exciting that the early research identifying low volatility equity as an anomaly has been fulfilled by superior historical results. Those results have also been durable in more recent periods in which low volatility has increasingly been implemented by investors. The greatest impact from low volatility equities on investor portfolios is seen when their security, sector, and country weights are untethered from parent indexes and they pursue the lowest volatility levels prudent diversification will allow.



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