



20 YEARS OF LOW-VOLATILITY EQUITIES: A BRIEF PERFORMANCE SURVEY

JUNE 2017

SINCE 1998, IN DEVELOPED AND EMERGING MARKETS, LOWER-VOLATILITY STOCKS HAVE OUTPERFORMED HIGHER-volatility stocks, while exhibiting lower total risk. These stocks have tended to outperform cap-weighted benchmarks in falling markets, and to underperform those benchmarks in rising markets. Eliminating in this way the equity market's "high highs and low lows," while exploiting a general and pervasive mispricing of risk, has allowed low-volatility stocks over time to earn market returns (or better) on average, with materially lower risk.

To study the 20-year performance history of low-volatility equities around the world, we formed hypothetical low-beta portfolios within 4 stock universes: developed markets, emerging markets, developed non-U.S., and the U.S.¹ In each market, we used 60-month (5-year) rolling estimates of beta to form equal-capitalization quintiles of stocks on beta.² We then capitalization weighted the lowest-beta quintile, and we reviewed cumulative 12-month performance histories of these hypothetical low-volatility portfolios in rising and falling markets. For all stocks and markets, we measured returns in USD; we used the U.S. 1-month T-bill rate as the risk-free rate (in CAPM beta estimation); and we estimated stock betas against the relevant cap-weighted market aggregate (developed markets, emerging markets, developed non-U.S., or the U.S.). Our stock return data is from the S&P BMI database.³

Our findings directly reflect the CAPM betas of the stocks we study: we find that lower-beta equities have tended to realize negative active returns in strongly rising markets, and that they have tended to realize positive active returns in falling markets. There is some degree of variation from year to year, but the broad contours of performance are strongly consistent with the stocks' lower betas. Regarding recent performance, we observe nothing atypical about the most recent 12 months, ending April 2017, relative to historical patterns.

Figure 1 plots cumulative benchmark-relative performance for the hypothetical U.S. low-volatility portfolio, in rising (blue bars, left side) and falling (gray

bars, right side) markets. Performance histories are for the 12 months ending in April of each year 1999-2017. (April 2017 is the latest observation in our dataset.) There are 19 full, 12-month periods between April 1998 and April 2017, of which 6 were periods in which the aggregate U.S. market realized negative returns, while in the remaining years the aggregate U.S. market realized positive returns. Active returns for the low-volatility portfolio in the most recent 12 month period, ending in April 2017, is highlighted in green.

Patterns in Figure 1 are consistent with the low-beta characteristic of the hypothetical portfolio. In quickly rising markets (blue bars), the tendency is toward underperformance, although, in no case does the low-beta portfolio realize negative absolute returns. Underperformance for the most recent 12-month period, ending April 2017, is in the middle of the historical distribution. In contrast, the tendency in falling markets (gray bars) is for outperformance.

We conducted similar analyses for developed markets, developed markets excluding the U.S., and emerging markets, and we found broadly consistent patterns. Figures 2, 3, and 4 present results for, respectively, developed markets, developed markets excluding the U.S., and emerging markets, for the same 1998-2017 time period.

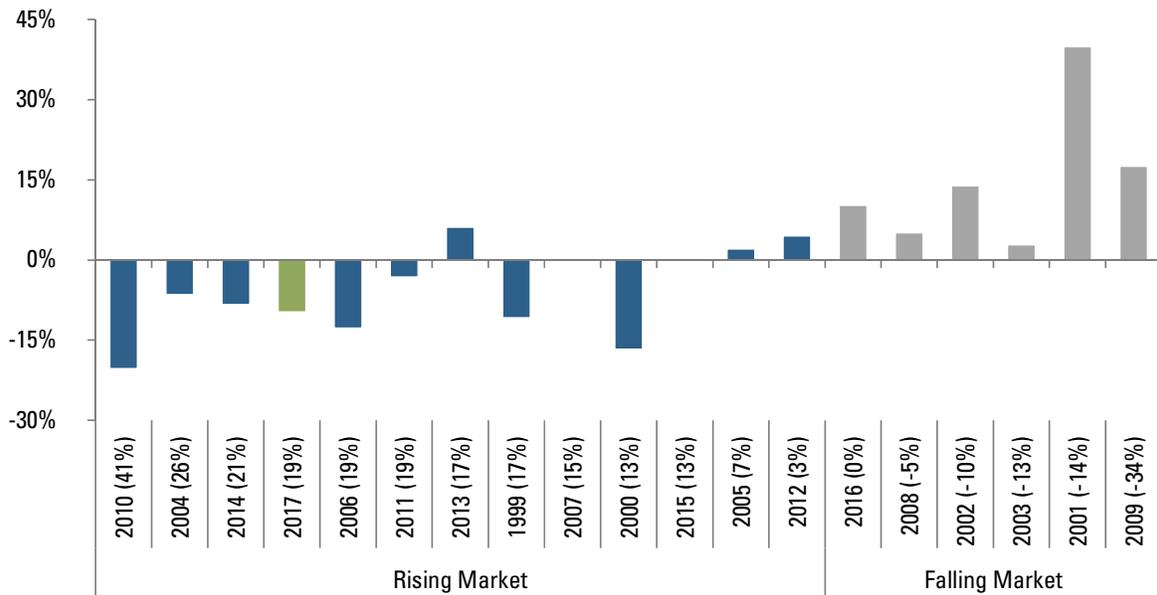
¹ For illustrative purposes only. These exhibits are not intended to represent investment returns generated by actual portfolios. They do not represent actual trading or actual accounts. Results do not reflect management fees, transaction costs, other implementation costs or their potential impact. Hypothetical results are not indicative of actual future results. Every investment program has the opportunity for loss as well as profit.

² We use 60 monthly returns for stability (each month, 59 of 60 estimation data points are the same as for the prior month, so beta estimates do not change too rapidly) and for consistency with prior research in the academic literature. See, e.g., Baker *et al.*, "Benchmarks as Limits to Arbitrage: Understanding the Low-Volatility Anomaly," *Financial Analysts Journal* 67 (1), 40-54, and citations therein.

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FIGURE 1

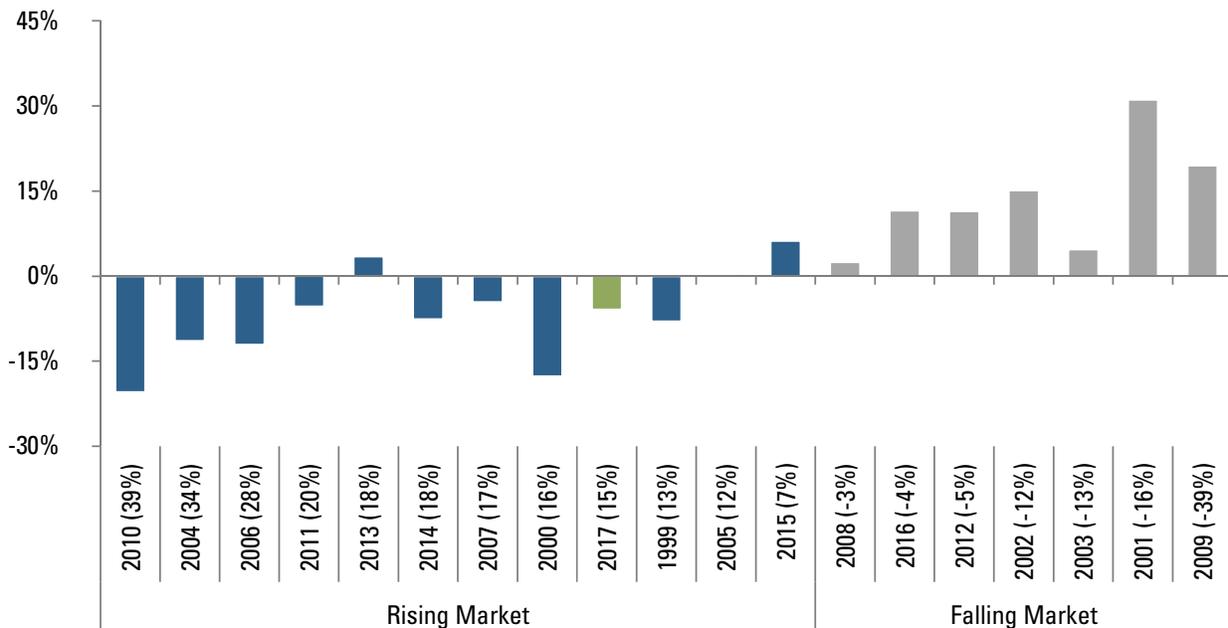
U.S. 1998-2017, cumulative 12-month active returns for a hypothetical portfolio of low-beta stocks. Figure 1 presents cumulative active returns (versus the aggregate U.S. market) for 12-month periods ending in April, ordered by the cumulative return of the aggregate U.S. market in each of the 12-month periods. Bars are labeled with the ending year of the corresponding 12 months, and with the total return of the U.S. aggregate market over that year. Hypothetical returns are for the cap-weighted average of the lowest (equal-cap) quintile on beta, where betas are estimated using 60-month (5-year) rolling estimation windows, where the aggregate market is the cap-weighted average return of all U.S. stocks, and where the risk-free rate is the 1-month U.S. Treasury bill.



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FIGURE 2

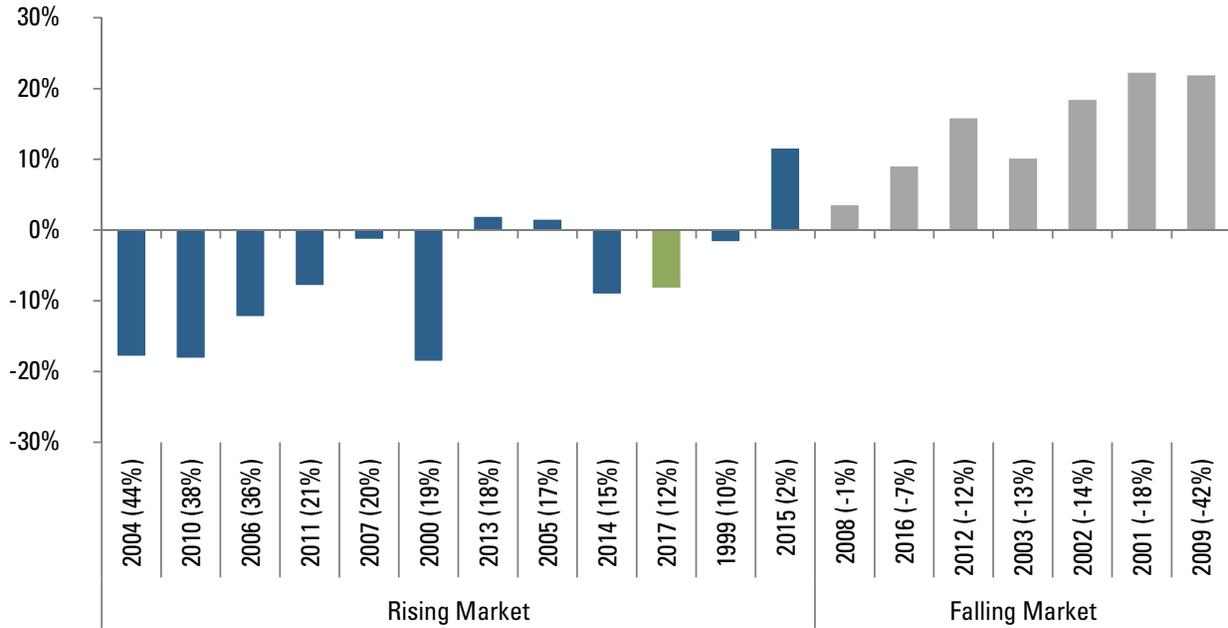
Developed markets 1998-2017, cumulative 12-month active returns for a hypothetical portfolio of low-beta stocks. Figure 2 presents cumulative active returns (versus the cap-weighted aggregation of all developed markets) for 12-month periods ending in April, ordered by the cumulative return of the aggregate developed market. Bars are labeled with the ending year of the corresponding 12 months, and with the total return of the aggregate developed market over that year. Hypothetical returns are for the cap-weighted average of the lowest (equal-cap) quintile on beta, where betas are estimated using 60-month (5-year) rolling estimation windows, where the aggregate market is the cap-weighted average USD return of all developed market stocks, and where the risk-free rate is the 1-month U.S. Treasury bill.



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FIGURE 3

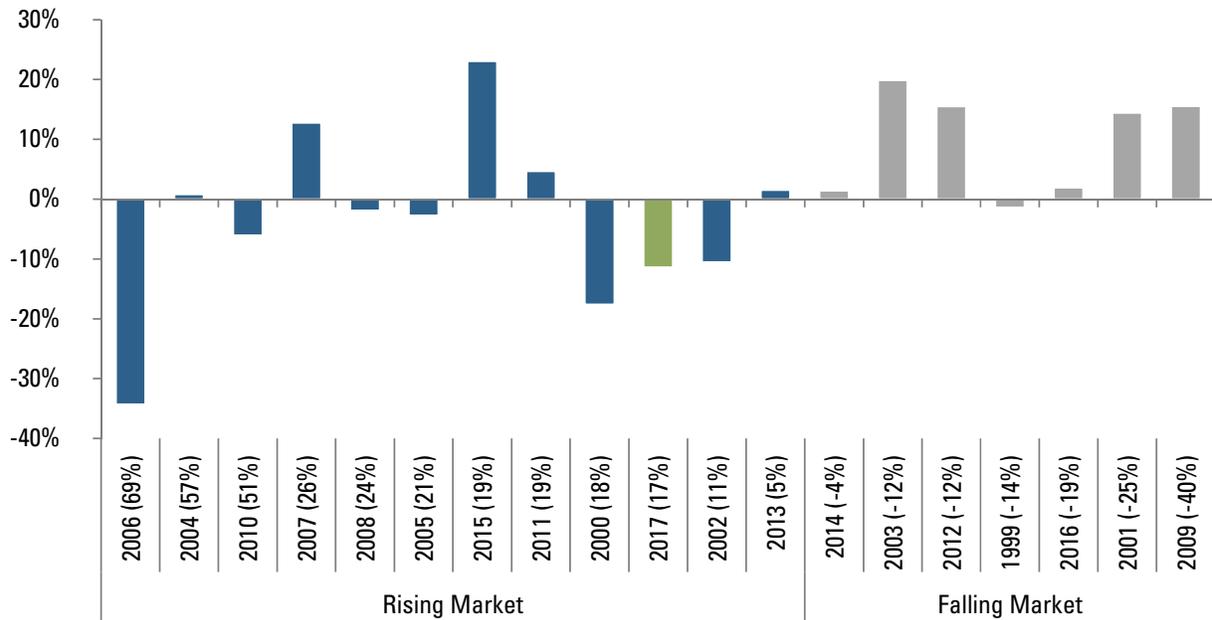
Developed markets excluding the U.S. 1998-2017, cumulative 12-month active returns for a hypothetical portfolio of low-beta stocks. Figure 3 presents cumulative active returns (versus the cap-weighted aggregation of all developed markets excluding the U.S.) for 12-month periods ending in April, ordered by the cumulative return of the aggregate developed market (ex-U.S.). Bars are labeled with the ending year of the corresponding 12 months, and with the total return of the aggregate developed market (ex-U.S.) over that year. Hypothetical returns are for the cap-weighted average of the lowest (equal-cap) quintile on beta, where betas are estimated using 60-month (5-year) rolling estimation windows, where the aggregate market is the cap-weighted average USD return of all developed market stocks outside the U.S., and where the risk-free rate is the 1-month U.S. Treasury bill.



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FIGURE 4

Emerging markets 1998-2017, cumulative 12-month active returns for a hypothetical portfolio of low-beta stocks. Figure 4 presents cumulative active returns (versus the cap-weighted aggregation of all emerging markets) for 12-month periods ending in April, ordered by the cumulative return of the aggregate emerging market. Bars are labeled with the ending year of the corresponding 12 months, and with the total return of the aggregate emerging market over that year. Hypothetical returns are for the cap-weighted average of the lowest (equal-cap) quintile on beta, where betas are estimated using 60-month (5-year) rolling estimation windows, where the aggregate market is the cap-weighted average USD return of all emerging market stocks, and where the risk-free rate is the 1-month U.S. Treasury bill.



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The picture across all markets is consistent. Over shorter time periods, such as our 12-month cumulations, lower-beta stocks earn returns generally consistent with their betas. In quickly rising markets they tend to realize some, but not all, of the aggregate market's positive returns, while in falling markets they tend to realize some, but not all, of the aggregate market's negative returns. (Outside the scope of this brief survey, in gently rising markets lower-beta stocks tend to earn returns similar to market aggregates.)

Over longer horizons, lower-beta stocks have tended to earn cumulative returns similar to, or even higher than, market aggregates, reflecting both the improved compounding of lower-volatility return streams, and the general mispricing of risk in equity markets. Their lower total volatility is attributable to attenuating the "high highs and low lows" of the broader equity markets, by outperforming in falling markets and underperforming in rising markets.

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