Can Volatility Predict Returns?

July 2016

When investing in stocks, understanding the volatility of their returns can be an important ingredient to help investors maintain a disciplined approach. People invest their capital hoping to earn a rate of return above that of just holding cash, and there is ample evidence that capital markets have rewarded disciplined investors. For example, **Exhibit 1** illustrates what investing $1 in 1926 into various asset classes would have translated to through the end of 2015. Nevertheless, returns can be negative for days, months, and even years. After such episodes, investors are frequently exposed to stories exclaiming what may cause the next financial crisis.

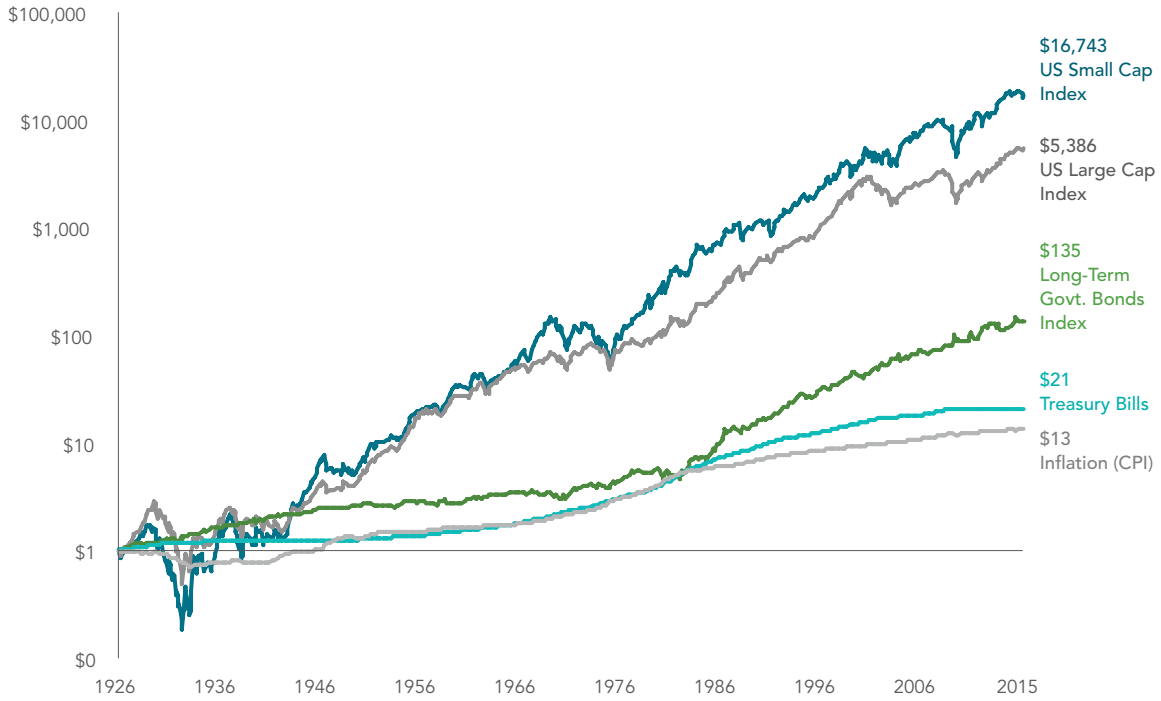
When volatility spikes, remaining disciplined can be even more challenging as pundits are quick to link volatility to any number of impending "crises" and to predict that short-term returns will be poor. Based on these predications, their advice for investors is often "sell now" to avoid these poor returns. But as Professor Eugene Fama points out, "The onset of high volatility should be associated with price declines that increase expected returns going forward (to compensate investors for the higher volatility)."[1] That is, volatility often increases *after* a price decline, which may increase expected returns. So these pundits may be reflecting on what has already occurred, not what will occur.

Do recent stock market volatility levels have statistically reliable information about future stock returns? We can examine historical data to see if there have been statistically reliable differences in average returns or equity premiums between more volatile and less volatile markets, if a strategy that attempts to avoid equities in times of high volatility adds value over a market portfolio, and if there is any relation between current volatility and subsequent returns.

A simple way to see if stock market volatility and returns are related is to look at average returns across different market environments. In **Exhibit 2**, we take monthly returns for the US equity market (represented by the Fama/French US Total Market Index) and break them up based on the previous month's standard deviation (computed using daily stock market returns). Average returns in months when the previous month had higher volatility (75th percentile or above) were slightly higher than when the previous month had lower volatility (25th percentile or below). This conforms with the intuition presented by Fama.

1. Eugene Fama and Kenneth French, "Q&A: Timing Volatility," Fama/French Forum, December 19, 2008, *www.dimensional.com/famafrench/questions-answers/qa-timing-volatility.aspx*.

Exhibit 1: Monthly Growth of Wealth ($1), 1926–2015



Past performance is no guarantee of future results. Indices are not available for direct investment. Their performance does not reflect the expenses associated with the management of an actual portfolio. See Index Definitions in the Appendix for more information. US Small Cap Index is the CRSP 6–10 Index; US Large Cap Index is the S&P 500 Index; Long-Term Government Bonds Index is 20-year US government bonds; Treasury Bills are One-Month US Treasury bills; Inflation is the Consumer Price Index. CRSP data provided by the Center for Research in Security Prices, University of Chicago. Bonds, T-bills, and inflation data provided by Morningstar.

But, because stock returns have been noisy, these differences in average returns have not been reliably different from zero. In other words, at a glance there does not seem to be an economically meaningful difference in average equity returns based on the volatility of the prior month.

Exhibit 2 demonstrates that average stock market returns appear similar across various levels of market volatility. Is the equity premium (the return over US Treasury bills, or "T-bills") also similar across different levels of volatility? **Exhibit 3** shows the average monthly returns

Exhibit 2: US Equity Market, *January 1927–April 2016*

	Average Monthly Returns	Average Volatility in Prior Month
Low Volatility	0.98	1.95
High Volatility	1.01	7.75

Past performance is no guarantee of future results. Indices are not available for direct investment; therefore, their performance does not reflect the expenses associated with the management of an actual portfolio. US Equity Market is the Fama/French US Total Market Index. Data provided by Fama/French.

Exhibit 3: Average Monthly Returns, *January 1927–April 2016*

	US Equity Market	T-bills
All Months	0.92	0.28
Months after High Vol. Month	1.01	0.21
Excluding Months after High Vol. Month	0.90	0.30

Past performance is no guarantee of future results. Indices are not available for direct investment; therefore, their performance does not reflect the expenses associated with the management of an actual portfolio. US Equity Market is the Fama/French US Total Market Index. Data provided by Fama/French. US Treasury Bills data provided by Morningstar.

for the US equity market and T-bills from January 1927 through April 2016. The full sample is further broken out into average returns for months following a "high volatility" month (75th percentile or above) and the remaining months.

We see that the average monthly equity premium has been higher after high volatility months. Nevertheless, the difference with all other months is not reliably different from zero—meaning we cannot reliably say that the premium is higher or lower after months with high volatility.[2] These results suggest it is unlikely we can learn anything about this month's equity premium based on last month's volatility.

What if we had a trading strategy that attempted to avoid investing in equities when volatility was high? How would such a strategy perform relative to the market? **Exhibit 4** shows returns and standard deviations for the US equity market, T-bills, and a hypothetical trading strategy that bails out of equities and invests in T-bills when the previous month's volatility was high—a strategy that "flies to safety." If the previous month's volatility was high (75th percentile or above), the strategy invests in T-bills. If the previous month's volatility was not high, the strategy invests in US equities.

This makes sense because the fly to safety strategy is invested in T-bills one quarter of the time, so we would expect it to have a lower volatility. However, this lower volatility came with lower returns, as the fly to safety strategy had an annualized return of 8.22%, compared to 9.75% for US equities. A strategy investing 75% in the market and 25% in T-bills would have performed similarly to the fly to safety strategy, as illustrated in the last column of Exhibit 4.

Consistent with the analysis presented thus far, **Exhibit 5** shows the randomness of the relation between recent volatility and future returns. The relation between them looks "flat." That is, recent volatility does not indicate if future returns will be "high" and does not indicate if future returns will be "low." This is confirmed through regression analysis, which further indicates there has been no reliable relation between recent volatility and future returns.

What can we take away from this analysis? Put simply, we can expect volatility when investing in stocks. There is considerable academic evidence that an investment strategy attempting to forecast short-term price movements is unlikely to be successful. Forecasting short-term stock market performance based on current volatility is no different. We believe that developing an asset allocation to match up with your desired risk tolerance and investment objectives, and staying disciplined and rebalancing in all market environments, remains an effective way to pursue your long-term investment goals.

Exhibit 4: Performance, *January 1927–April 2016*

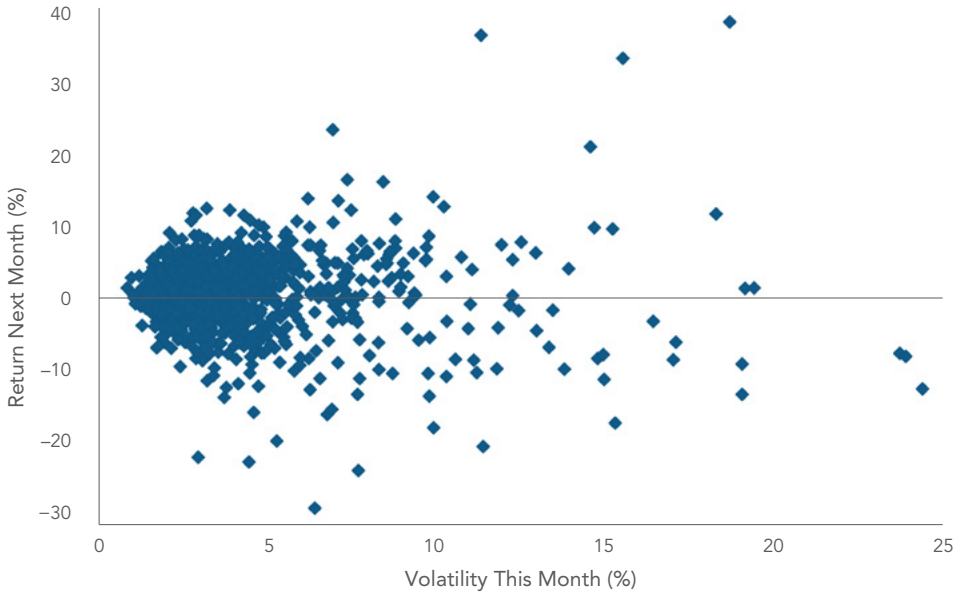
	US Equity Market	T-bills	Hypothetical "Fly to Safety" Strategy	75% US Equity Market/25% T-bills
Average Monthly Return (%)	0.92	0.28	0.72	0.76
Annualized Compound Return (%)	9.75	3.41	8.22	8.49
Annualized Standard Deviation (%)	18.66	0.88	12.21	14.00

The Hypothetical "Fly to Safety" Strategy invests in T-bills if the previous month's volatility was high (75th percentile or above). If the previous month's volatility was not high, the strategy invests in US equities. Past performance is no guarantee of future results. Indices are not available for direct investment; therefore, their performance does not reflect the expenses associated with the management of an actual portfolio. US Equity Market is the Fama/French US Total Market Index. Data provided by Fama/French. US Treasury Bills data provided by Morningstar.

Over the period from January 1927 through April 2016, the volatility of the "fly to safety" strategy, as measured by its standard deviation, was lower than the volatility of the US equity market (12.21% vs. 18.66% annualized).

2. The t-statistic for the difference in equity premium between months after high volatility and non-high volatility is 0.70. Normally, a t-statistic of at least 2 is necessary to reliably say that the result is different from zero.

Exhibit 5: US Equity Market Volatility This Month vs. Return Next Month



US Equity Market is the Fama/French US Total Market Index. Data provided by Fama/French.

APPENDIX

Glossary

Equity premiums: The excess return expected, or realized, from owning stocks over bonds. Realized equity premiums are typically measured by the difference of return from a broad stock market index and government-issued bonds considered to represent a risk-free rate of return.

Standard deviation: A measurement of historical return volatility for a security or portfolio. A volatile stock with large differences over time from its historical average return would tend to have a high standard deviation.

Regression analysis: A statistical process for estimating the strength of the relationship between one variable, such as a portfolio's return, and one or more other variables, such as that portfolio's exposure to market premiums.

Index Definitions

Fama/French US Total Market Index: Value-weight return of all CRSP firms incorporated in the US and listed on the NYSE, AMEX, or NASDAQ that have a CRSP share code of 10 or 11 at the beginning of month *t*, good shares and price data at the beginning of *t*, and good return data for *t*.