

Recent stock market volatility: Extraordinary or 'ordinary'?

Research commentary

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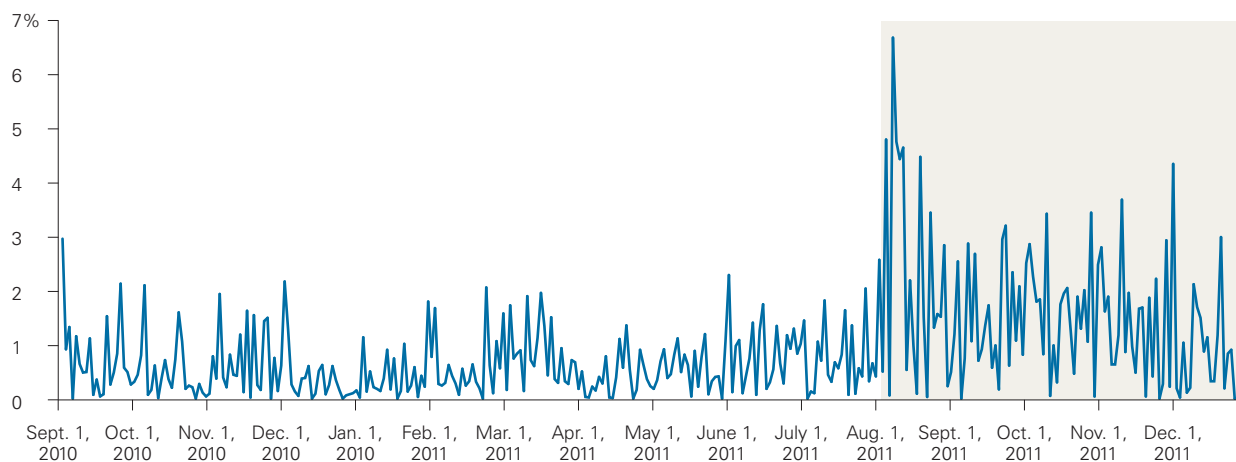
Executive summary. This commentary updates an analysis published in September 2011 and extends the data through year-end 2011. Indeed, the volatility in global equity markets since late summer 2011 continues to attract widespread media and investor attention. Much of the commentary has focused on perceived causes for the volatility—such as the growth of hedge funds, high-frequency trading, quantitative investment programs, and vehicles such as exchange-traded funds (ETFs), specifically, leveraged and inverse ETFs. Little focus, meanwhile, has been placed on the global macro environment, which faces the continuing Eurozone debt crisis; the prospect of a slowing global economy; political brinkmanship in Washington, D.C., including the failure of the supercommittee created by the U.S. Congress to help reduce the national debt; and the rating downgrade of U.S. Treasury bonds from their AAA status by Standard & Poor's in early August 2011. As shown in **Figure 1**, on page 2, a pronounced spike in volatility occurred following the downgrade, and volatility has remained elevated relative to the months preceding it.

Authors

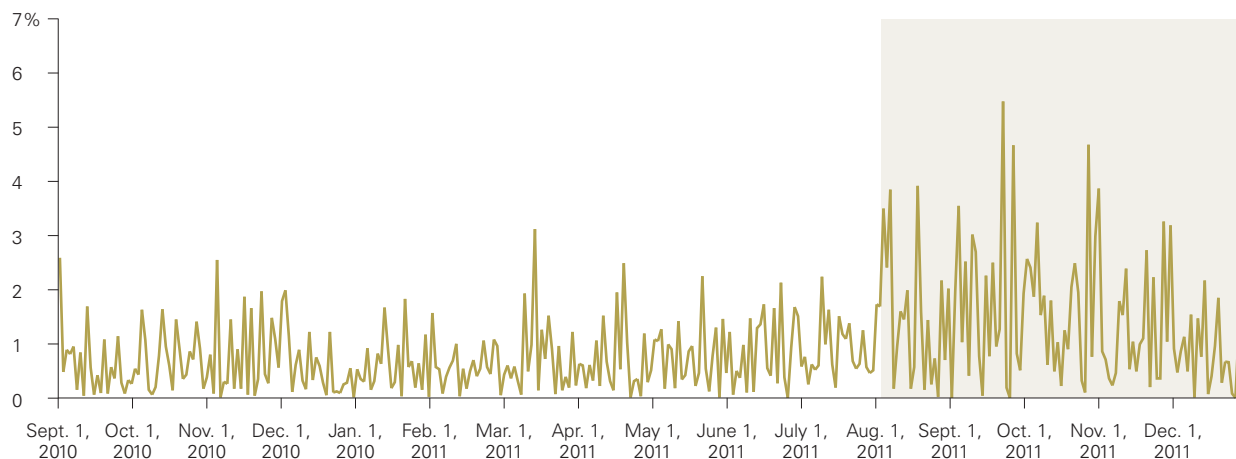
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Figure 1. Daily volatility of equity indexes: September 1, 2010–December 31, 2011

Daily percentage change in price of S&P 500 Index



Daily percentage change in price of MSCI All Country World ex USA Index



Note: Volatility measured by absolute change in closing prices from one day to the next.

Source: Thomson Reuters Datastream.

Notes on risk: All investments are subject to risk. Foreign investing involves additional risks, including currency fluctuations and political uncertainty. Investments in bond funds are subject to interest rate, credit, and inflation risk. U.S. government backing of Treasury or agency securities applies only to the underlying securities and does not prevent share-price fluctuations. Unlike stocks and bonds, U.S. Treasury bills are guaranteed as to the timely payment of principal and interest. Diversification does not ensure a profit or protect against a loss in a declining market. There is no guarantee that any particular asset allocation will meet your investment objectives or provide you with a given level of income. Past performance is no guarantee of future returns. The performance of an index is not an exact representation of any particular investment, as you cannot invest directly in an index.

Figure 2. Standard deviation of S&P Index returns for selected periods

Periods	Annual	Quarterly	Monthly	Daily
1929–December 31, 1999	19.36%	11.65%	5.67%	1.13%
2000–December 31, 2011	19.05	9.02	4.71	1.38

Notes: Data based on the price return for the S&P 500 Index. All data through December 31, 2011.

Sources: Vanguard calculations, based on data from Bloomberg and Thomson Reuters Datastream.

Although much of the focus has been on the near-term rise in volatility, some in the investment community may contend that the decade of the 2000s has experienced abnormally high and extended volatility when compared with longer-term history. To be sure, the 2000s have so far witnessed two severe bear markets and an extreme level of volatility and risk during the global financial crisis, yet it's important to note that between 2003 and 2007, stock market volatility and risk aversion were at all-time lows historically. And when we compared the first decade of the 2000s and 2011 with long-term history, it's clear that the data do not support the theory. In fact, **Figure 2** shows that volatility since 2000 has been on a par with the long-term averages (i.e., 1929–1999).

Are market participants to blame?

It can be difficult and dangerous to cite causation, but many still blame the spike in volatility on a shift in market participants. A primary focus of the investment community has been that of the potential impact of ETFs and, in particular, of leveraged and inverse ETFs.¹ Although ETFs would appear to be a likely suspect due to their growing size and popularity as investment tools, ETFs (including leveraged and inverse ETFs) were clearly not a new phenomenon in the second half of 2011. ETFs have been an important force for much of the 2000s, and yet, as stated, volatility

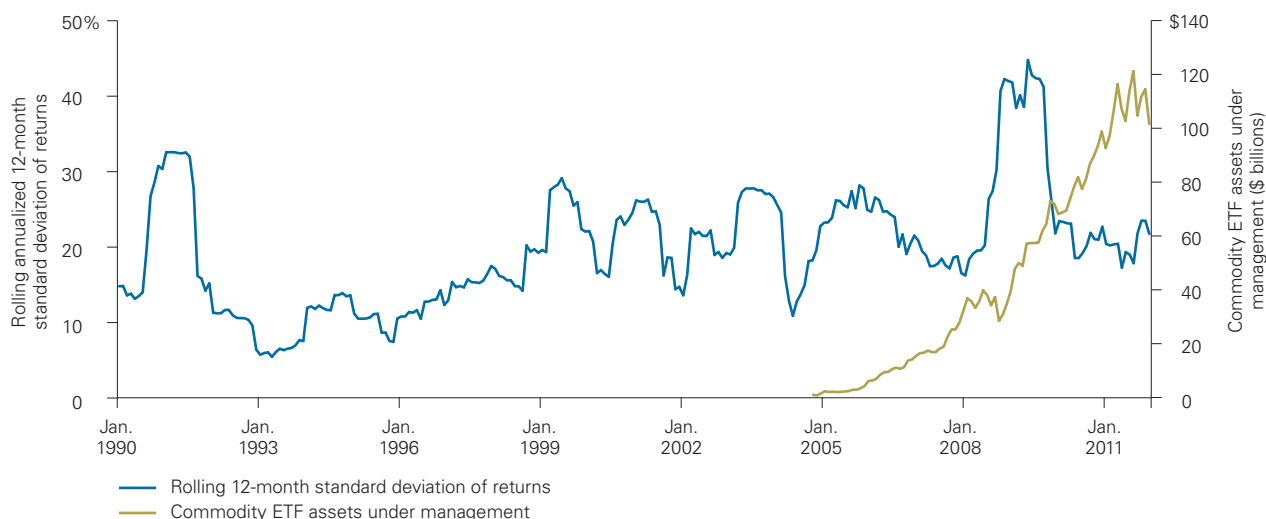
between 2003 and 2007 (as well as for the first half of 2011) was historically low. If the elevated volatility in 2011 were the result of these factors, we would expect to see a systematic upward shift in the volatility level over time. Instead, volatility remained stable and low following the global financial crisis in 2009–2010 and then spiked considerably in conjunction with the emergence of new significant global macro dislocations in August 2011.

Figure 3, on page 4, takes up another example, one focusing on commodities, which are an asset class that had no ETFs before the 2000s. Since 2004, however, assets in commodity-linked ETFs have surpassed \$100 billion. Because these assets most likely represent new investors, if ETFs were a cause for increased volatility, commodities are certainly one area where we would expect to see a systemic change.² **Figure 3** indicates that since 1990 (the first year energy futures were traded), volatility in commodities has averaged about 20% annually. In addition, volatility has not trended upward (or downward), despite the introduction and subsequent rapid growth of commodity-linked ETFs during the 2000s. The volatility spike in 2008–2009 was again related to the global financial crisis and the rapid appreciation and subsequent depreciation in the price of oil and other commodities, and was unconnected to the growth in commodity-linked ETFs.

1 Nadig (2011) detailed how the data, and operational realities of leveraged and inverse ETFs, do not support the popular claims of causation.

2 We say the cash flows and assets under management most likely represent new investors because commodities have historically been difficult to access and are now widely available via ETFs. Whereas assets in equity or fixed income ETFs are probably owned by investors already invested in those asset classes who elected to use an alternative vehicle to implement their strategy, the introduction of commodity ETFs opened the door to a new asset class for many investors who shifted out of other assets and into commodities.

Figure 3. Volatility in commodities appears unrelated to asset growth in commodity ETFs



Note: Data as of December 31, 2011.

Sources: Morningstar, Inc., and Thomson Reuters Datastream. Commodities represented by S&P Goldman Sachs Commodity Index. Data on assets under management provided by Morningstar.

Other explanations for decade of volatility

One reason for the higher perceived volatility over the last decade relates to U.S. equity valuations. As **Figure 4** shows, since the technology bubble, spikes in volatility have generally coincided with periods of valuations that, in hindsight, were elevated. Since 1926, the average cyclically adjusted price/earnings (P/E) ratio for U.S. stocks has been 17.3x earnings, according to data from economist Robert J. Shiller (see sources to Figure 4). During the tech-driven bull market of the 1990s, market P/E ratios exceeded the historical average by a significant margin. When combined with some notable events of the later 1990s such as the Asian currency crisis, Russia's debt default, and the downfall of Long-Term Capital Management, it's not surprising that volatility in the equity markets increased. Similarly, throughout the first decade of the 2000s, valuations remained elevated versus the long-term average. Considering the global financial crisis, it's again no surprise that volatility spiked. It's important to note, however,

that over the course of the 1990s and 2000s, volatility was not consistently high. In fact, it cycled between periods of being extremely low—such as the early 1990s or mid-2000s—to being very high—such as the bear markets in 2000–2002 and 2008.

To further examine the volatility experienced during and after the global financial crisis, we turn to relative economic uncertainty. **Figure 5** illustrates a variation of an analysis by Davis, Aliaga-Díaz, and Patterson (2011) comparing volatility experienced in the U.S. capital markets with that in the U.S. economy since 1970. Although the 1970s saw a significant link between economic and equity market volatility, there was only modest correlation between the two during the so-called great moderation of the 1980s and 1990s. More recently, as Figure 5 shows, both economic and equity market volatility have spiked and remained elevated as a result of the recession and global financial crisis.

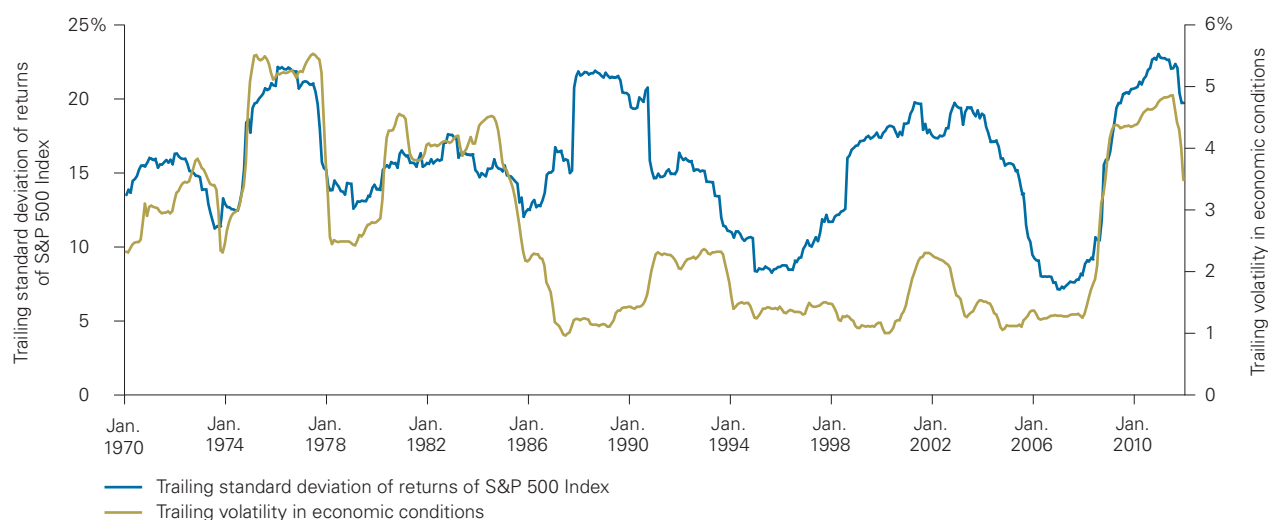
Figure 4. Relationship between equity market valuations and volatility



Notes: The cyclically adjusted P/E covers the period December 31, 1990, through December 31, 2011. The standard deviation calculation covers the 12 months ended January 31, 1991, through the 12 months ended December 31, 2011. The x-axis shows the dates associated with the P/E ratio. Because we are calculating the standard deviation for the 12 months following a given P/E ratio, we aligned the standard deviation for the 12 months ended January 31, 1991 with the initial P/E ratio as of January 31, 1990. As a result, the line denoting the standard deviation of returns ends before the right-hand y-axis, since we do not yet have volatility statistics for the year 2012.

Sources: Vanguard, Standard & Poor's, and Robert J. Shiller website (<http://www.econ.yale.edu/~shiller/>).

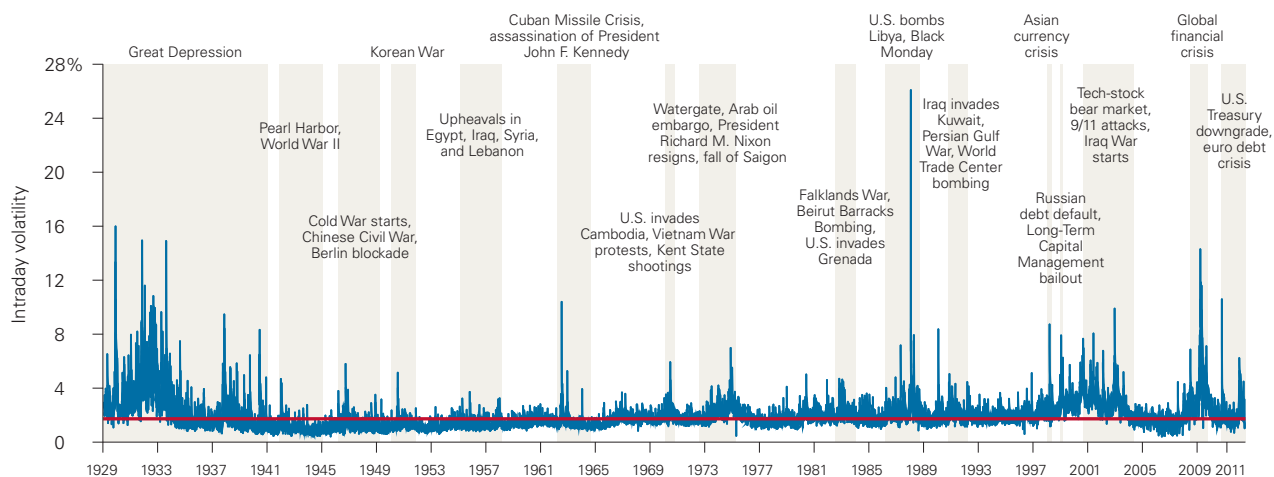
Figure 5. Relationship between equity market volatility and economic volatility



Notes: "Volatility in economic conditions" is defined here as the annualized rolling standard deviation over 36 months through December 31, 2011, in the Federal Reserve Bank of Philadelphia's Aruoba-Diebold-Scotti Business Conditions Index, which is designed to track real business conditions at high frequency. The index's underlying (seasonally adjusted) economic indicators (weekly initial jobless claims, monthly payroll employment, industrial production, personal income less transfer payments, manufacturing and trade sales, and quarterly real gross domestic product) blend high- and low-frequency information and stock and flow data. Volatility in the S&P 500 Index is defined here as the annualized rolling standard deviation over the 36 months through December 31, 2011, in the price returns of the index.

Sources: Vanguard calculations, using data from Federal Reserve Bank of Philadelphia and Thomson Reuters Datastream.

Figure 6. Intraday volatility of Dow Jones Industrial Average: 1929–December 31, 2011



Notes: Intraday volatility is calculated as daily range of trading prices (high–low/open) for the Dow Jones Industrial Average.

Sources: Vanguard calculations, using data from Yahoo! Finance.

A historical perspective

Although the volatility shown earlier in Figure 1 appears extraordinary relative to the calm of the preceding periods, Figures 2, 4, and 5 have demonstrated that there are reasonable causes for the higher volatility. In fact, we would argue that the levels of volatility today are “ordinary” relative to the volatility of other periods characterized by major global macro economic events. Figure 6 provides a long-term look at the intraday volatility of the Dow Jones Industrial Average. We have superimposed on the chart a timeline of notable historical events. Given this perspective, it’s clear that volatility tends to cluster around such periods. As a result, our position is that volatility in equities, although painful to many investors, should not be viewed as unexpected when global-macro uncertainty is present and there is widespread repricing of risk. Thus, in Vanguard’s view, to cast the current environment as a “new paradigm” of volatility is misleading.

In addition to providing perspective for current market volatility, it’s important to consider the experience of long-term investors. Figure 7 records the number of days stocks moved up or down by various percentage bands, as well as the performance of two other hypothetical balanced stock/bond portfolios allocated as follows: first, 80% equity/20% fixed income; and, second, 40% equity/60% fixed income. Note that in 2008 and 2011 stocks experienced markedly more volatility than the two more conservatively allocated portfolios. Given that most investors adhere to a balanced, diversified approach, these more conservative portfolios are likely more representative of actual investors’ experience than the more aggressive equity-only portfolio. For those investors employing sound diversification strategies, the benefits of mitigating realized volatility have been clear.

Figure 7. Volatility of stocks versus balanced portfolios at various return thresholds: 2006–2011

Number of days up or down by threshold levels

	1% to <2%	2% to <3%	3% to <4%	4% to <5%	5% or more
100% equity					
All	295	95	32	18	15
2006	22	2	0	0	0
2007	46	8	0	0	0
2008	58	26	12	10	12
2009	65	26	8	4	2
2010	47	14	4	1	0
2011	57	19	8	3	1

80% equity/20% fixed income

All	253	58	21	7	5
2006	14	0	0	0	0
2007	40	1	0	0	0
2008	52	18	13	4	5
2009	62	16	4	2	0
2010	38	8	1	0	0
2011	47	15	3	1	0

40% equity/60% fixed income

All	60	7	0	0	0
2006	1	0	0	0	0
2007	1	0	0	0	0
2008	26	6	0	0	0
2009	17	1	0	0	0
2010	4	0	0	0	0
2011	11	0	0	0	0

Notes: This hypothetical illustration does not represent returns on any particular investment, as you cannot invest directly in an index. Portfolios are rebalanced on an annual basis. Equities represented by 70% S&P 500 Index/30% MSCI All Country World Index ex USA; fixed income represented by Barclays Capital U.S. Aggregate Bond Index. We used total returns for this analysis to more closely approximate investors' experience.

Sources: Vanguard calculations, using data provided by Thomson Reuters Datastream and Barclays Capital.

Balance and diversity can help to reduce volatility

Whether one considers the recent period of market volatility extraordinary or simply ordinary—that is, compared to events of similar perceived gravity—the bottom line is that investors with balanced, diversified portfolios have faced much less aggregate volatility than the headlines would suggest. Going forward, it's unknown whether the volatility will stay elevated, spike again, or decrease. What we do know is that previous periods of excess volatility have clustered around global macro events, and that, during those periods, portfolios that included allocations to less risky assets such as bonds and/or cash tended to ride out the storm much more smoothly.

We also know that realized volatility is a critical factor in the equity risk premium (ERP)—that is, the extra return demanded by investors for investing in stocks instead of less risky assets such as bonds or cash. Indeed, periods of heightened volatility or risk can actually increase the forward ERP. Fortunately, according to data from Morningstar, most investors are not solely invested in equities, but instead have a mixture of assets that prevents them from being fully exposed to sudden stock market volatility.³ So, although we understand that these can be unsettling times for investors, those who have determined an appropriate asset allocation, who employ broad diversification, and who rebalance as necessary are in a better position to weather this period of uncertainty, as well as the inevitable market dislocations to come.

References

Davis, Joseph, Roger Aliaga-Díaz, and Andrew J. Patterson, 2011. *Asset Allocation in a Low-Yield and Volatile Environment*. Valley Forge, Pa.: The Vanguard Group.

Nadig, Dave, 2011. Leveraged/Inverse ETFs: Not Wagging the Dog. Index Universe (October 17); available at www.indexuniverse.com/sections/features/10049-leveragedinverse-etfs-not-wagging-the-dog.html.

3 As of December 31, 2010, industry assets in mutual funds and ETFs were allocated 51% to equities, 24% to fixed income (taxable as well as tax-exempt), and 23% to money markets.



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