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Volatility in Perspective

Volatility, one measure of risk, should be a consideration when evaluating any investment. Understanding and comparing volatility over time and across indexes provides historical context when assessing an investment's risk.

What Is Volatility?

As a measure of risk, volatility refers to the amount of fluctuation in the returns of a financial instrument or index. An investment is said to have high volatility if its value fluctuates widely. Consider an investment with a relatively low annual volatility of 10% and a long-term expected return of 5%: about 70% of the time its annual returns would range between +15% and -5%. Compare this to another investment with a relatively high volatility of 30% and a long-term expected return of 15%. The range of returns for the more volatile investment would be much wider—ranging from +45% to -15%.

Volatility is generally expressed as a percentage figure that is annualized. Volatility measures are historical and can change significantly over time.

Why Does Volatility Matter?

The volatility of returns is a key dimension of investment risk. Higher volatility investments may have a higher risk of loss; however, investors typically expect higher returns from them over time.

Investors should compare the volatility characteristics, as well as the return prospects, for any investment or portfolio. The higher the volatility, the wider the range of fluctuations in return—both positive and negative—the investor is likely to experience. Many investors target a level of volatility for their investments based on their tolerance for losses.

In addition, investors should monitor the volatility of their investments as market environments change. Those who are aware of the volatility ranges for a particular index over time can better assess how much their related investment returns may vary under changing market conditions.

Inside: Market Volatility over Time

A chart compares recent and historical volatility for 39 broad and sector indexes.

Measuring Volatility

Typically, volatility is calculated using **standard deviation**. Standard deviation is a statistical measure that captures the range, or variability, of returns around a mean (average) return.

Volatility can be measured using many different units of time. The chart on the next page shows index volatility measures based on the following time periods:

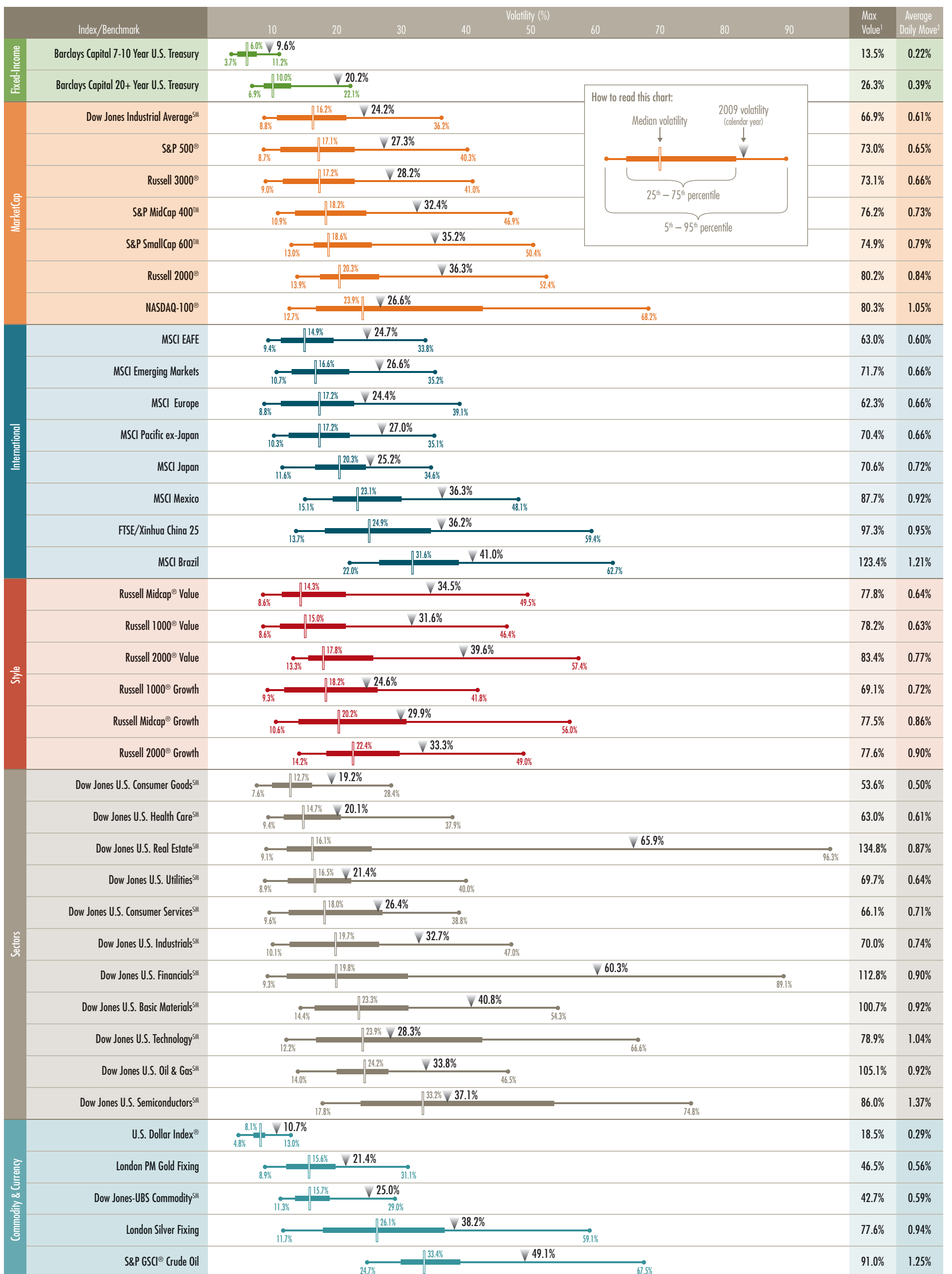
- **Daily return interval** – We used a daily return interval because ETFs, and especially daily leveraged and inverse ETFs, are commonly used by tactical investors with short time horizons.
- **Measurement period** – As a representative holding period for shorter-term investors, we used rolling 90-day periods. Using rolling periods expands the number of data observations and provides perspective on the “typical volatility range” for an index. It also shows how volatility changes over time.
- **10-year historical time frame** – We looked at 10 years of historical volatility data for the indexes. This time frame was sufficiently long to include a range of different economic and market environments, and represented a time frame for which most index data was available.

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Index Volatility Measures: 2000-2009

This chart includes historical volatility measures for 39 broad and sector indexes over a 10-year period (2000-2009). We measured volatility using daily index returns over rolling 90-calendar day periods. See page 1 for more information about volatility measures.



¹ Represents the highest volatility calculated for any 90-calendar day period over the 10 years. ² Represents the average daily price move (up or down) for the index from 2000 to 2009.

For illustrative purposes only. Historical volatility does not predict future volatility. Volatility is not an indication of performance.

Source: ProFunds Group Investment Analytics. Data source: Bloomberg. Volatility is calculated using rolling 90-calendar day periods (each including about 62 trading days) from 2000 to 2009. Daily return data was not available for certain indexes as of 12/31/1999. These indexes (and the date on which their daily return data starts) include: Dow Jones U.S. Sector Indexes (2/14/2000), FTSE/Xinhua China 25 (3/16/2001), Russell 2000 Growth (3/19/2000), Russell 2000 Value (3/19/2000). Results for other indexes will differ. Funds that track an index may have different volatility than the index.

The Impact of Volatility on Leveraged and Inverse Fund Returns

Most leveraged and inverse funds are designed to provide a multiple (e.g., +2x or -2x) of the daily returns of an underlying index, before fees and expenses. Many investors use daily leveraged and inverse funds tactically, seeking short-term profits on index dips and spikes. Others hold these funds for longer periods, aiming to hedge their portfolios or profit from longer-term trends.

Over time, the returns of these funds may be greater than or less than the index return times the fund multiple (the “target return”) for the same period. Investors should understand how index volatility can impact the returns of leveraged and inverse funds over time:

- When index returns are trending, and volatility is low, leveraged and inverse funds can outperform the target return. For example, a +2x fund can have more than a +2x gain when its index trends up, or lose less than twice the index return when the index trends down.
- When index returns are highly volatile, leveraged and inverse fund returns can significantly underperform the target return. In some circumstances, realized returns can even move in an opposite direction to the target return.

Generally, the greater the volatility of the underlying index, the greater the chance that the return of a leveraged or inverse fund will deviate from the target return over time. Other factors to consider include:

- The longer the time horizon, the more likely the fund return will diverge from the target return
- The higher the leverage level (e.g., +2x, +3x), the sooner the fund return will diverge from the target return
- A leveraged inverse fund (e.g., -2x or -3x) will diverge from the target return sooner than a long leveraged fund (e.g., +2x, +3x) for the same index

How Leverage Magnifies the Effects of Volatility

Leverage magnifies the effects of volatility, resulting in gains or losses that occur much faster and to a greater degree.

Compare an investor in an unleveraged fund and another in a +2x leveraged fund tracking the same index, each starting with an investment of \$100.

The index returns 10% on day one and -10% on the next. After the two days, the unleveraged investment is worth \$99, for a return of -1%. The leveraged investment is worth \$96, more than doubling the loss of the unleveraged fund.

	+1x investment return	+2x investment return
Day 1 Return	+10%	+20%
Day 2 Return	-10%	-20%
Total Return	-1%	-4%

This example shows extreme hypothetical index movements for illustrative purposes only. Actual index movements can be meaningfully different. Example does not reflect investment fees and expenses or taxes, which would lower the results shown.

Leveraged and inverse ProShares ETFs and ProFunds seek returns that are a multiple or inverse multiple (e.g., +2x or -2x) of the return of an index or other benchmark (target) **for a single day**. Due to the compounding of daily returns, the returns of these funds over periods other than one day will likely differ in amount and possibly direction from the target return for the same period. Investors should monitor leveraged and inverse fund holdings consistent with their strategies, as frequently as daily. Leveraged and inverse funds entail certain risks, including, in some or all cases, aggressive investment techniques (futures contracts, options, forward contracts, swap agreements and similar instruments), imperfect benchmark correlation, leverage and market price variance, all of which can increase volatility and decrease performance. For more on correlation, leverage and other risks, please read the prospectus.

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