Volatility – Ubiquitous, Yet Evasive?

by Eben Maré, Portfolio Manager, Stanlib

I n this article we discuss aspects of asset class volatility. We look specifically at the VIX index and some of its properties – VIX has become very popular in the media of late, especially with low historical levels being printed. We try to understand its implications.

What is volatility?

Volatility is a statistical measure of the dispersion of asset returns. High volatility levels would typically imply a large spread (or distribution) of potential asset returns when compared to an asset with low volatility.

In essence, volatility is the standard deviation of asset returns measured over some period and typically annualised for comparative purposes.

What are the drivers of volatility?

By definition, volatility is a function of asset behaviour; hence any factor impacting on asset-moves would impact volatility. The following factors would typically impact our views on volatility (note the list is not exhaustive):

1. The economic cycle. Volatility is cyclical – decreases in the unemployment rate in the USA, for example, have been linked to lower equity market volatility.
2. Uncertainty about the economic environment. There has been a lot of academic study of the disjoint between asset volatility and volatility of economic fundamentals – assets are frequently much more volatile than underlying economic fundamentals would justify. It has been demonstrated that periods of lower inflation, for example, have been linked to lower asset volatility.
3. Financial stresses. Recent events such as the 2008 credit crunch and the 2011 European debt situation provide examples of significant asset volatility as a consequence of dysfunctional market dynamics.
4. Valuations. High equity multiples and low bond yields, for example, increase the effective duration of the assets thereby increasing the sensitivity of assets to news-flows which in turn serve to create volatile behaviour.
5. Regulations and policy interventions. Regulations and central bank monetary policies have a direct consequence on asset class volatility – in recent times volatility has been dampened as a consequence of so-called forward guidance and asset purchases by central banks.

What is the difference between realised and implied volatility?

Realised volatility is typically calculated by looking at the standard deviation of historical asset returns over some period. Implied volatility would typically refer to a volatility level implied from the value of a derivative security, such as an option, by making use of an option pricing formula (such as the Black-Scholes option pricing methodology, for example). Market participants like to think that there is some informational content in implied volatility, i.e., a forecast of volatility which could be experienced during the lifetime of the derivative security.

We would frequently look at the difference between the realised and implied volatility to make an assessment of the amount of uncertainty present in the market.

Why do I care?

In modern finance we associate risk with the volatility of an asset's returns. We would use volatility to aid the estimation of risk premiums and provide an indication of risk appetite for investment decisions. High volatility would typically be associated with high uncertainty and would, in principle, demand higher returns to compensate for the perception of higher risk.

If we use USD/ZAR as a currency example, it has frequently been noted that managers are typically less concerned about the absolute level of the currency than the volatility of currency moves as stability provides more budgeting accuracy.

So where does VIX feature?

In an attempt to create a benchmark index for stock market volatility, the Chicago Board Options Exchange (CBOE) introduced the CBOE Volatility Index (VIX) in 1993. VIX measures the 30-day expected volatility of the S&P500 index as implied by the options market. This index rapidly gained traction as the pre-eminent barometer for gauging equity market volatility in the industry.

In Figure 1 we show the S&P500 equity index (LHS) vs. VIX (RHS). It is important to note the inverse relationship between VIX and S&P500 returns, e.g., during times of market bearishness, the VIX would rally.

We also indicate so-called 'low volatility regimes' in Figure 1. (These are identified on the basis of a two-state Markov regime-based model with the high-probability low-volatility regimes being shaded.) It is evident from the graph that the bull runs are typically associated with lower VIX levels.

Why is VIX popular and how is it used?

The media commonly refers to VIX as a 'fear gauge' – strictly speaking, this is wrong; VIX measures the market's expectation of future volatility. As can be seen from Figure 1, there are periods of excessive nervousness and bearishness in the market during which the VIX would typically rally, hence the association of the index as a 'fear gauge'.

It is also important to realise that VIX is not a predictor of market direction. In Figure 2 we indicate the absolute change in the

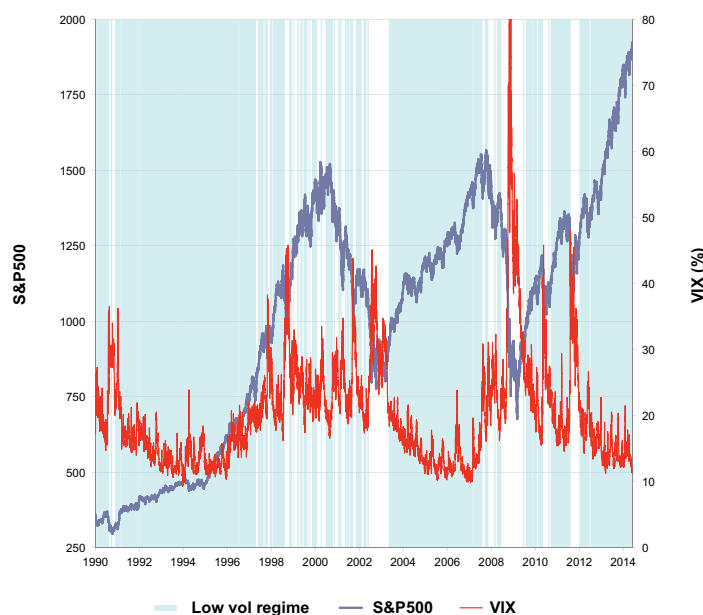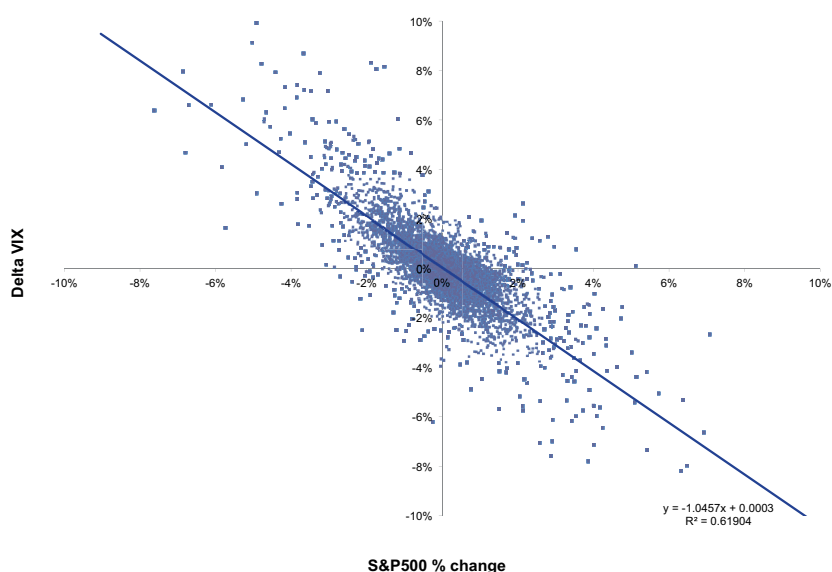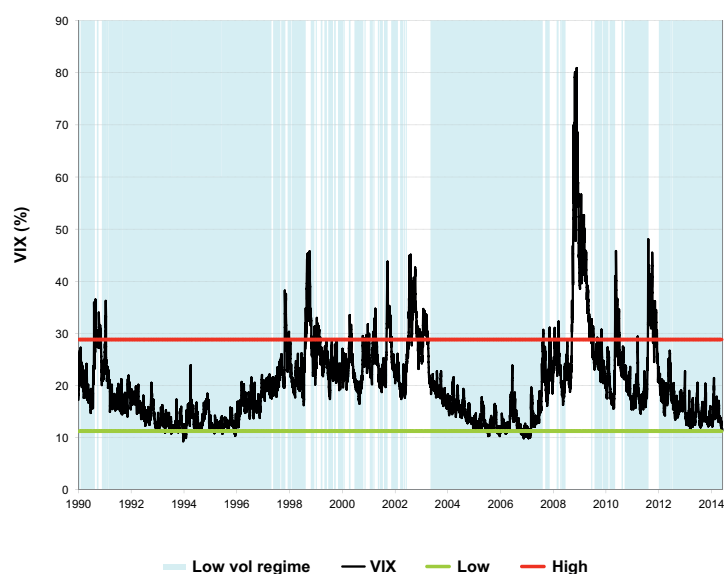### Fig 1 – S&P500 vs. VIX and indications of low volatility regime

Fig 2 – Daily S&P500 return changes vs. VIX movements

$$y = -1.0457x + 0.0003$$
$$R^2 = 0.61904$$

It is important to realise that VIX is not a predictor of market direction.

Fig 3 – VIX and Low/High S&P volatility regimes

VIX have been developed – these include options and futures on VIX as well as exchange traded notes (so-called ETNs) referencing VIX. In fact, these contracts have shown exponential increases in volumes traded over the last couple of years, the fastest growth ever experienced by the exchange on any derivative product! Investors could trade futures on VIX to take a directional view on future VIX levels. Investors can also buy options on VIX, essentially trading the volatility of VIX.

What are the important points to remember?

1. Realised volatility is a consequence of asset moves.
2. Implied volatility can be used to indicate risk appetite.
3. VIX is the equity market's barometer of 30 day expected volatility.
4. Excessive moves in the VIX are indicative of 'true' market shocks.
5. Volatility appears to revert to some mean level – this is typically dependent on different regimes, see Figure 3. Low levels of VIX, for example, are not an indicator that we will mean-revert to higher levels; higher volatility levels will be influenced by risk events and macro-economic fundamentals.
6. Volatility is regime-dependent, see Figure 3, for example. These regimes are typically a function of fundamental underlying economic conditions. ■

level of the VIX vs. percentage change in the S&P500 index on a daily basis.

There is ample evidence, though, that asset returns tend to experience so-called volatility clustering'; this means that periods of large changes in asset values (of either sign) tend to be followed by similar periods of large changes. In essence, the market looks at VIX to forecast these periods of higher or lower asset volatilities.

in excess of this amount would therefore be 'excess fear' at any point in time.

The behaviour of the VIX vs the market described above tends to suggest a diversification benefit attained by holding volatility based investments in a portfolio containing stocks. To satisfy the needs of investors seeking protection against so-called 'tail-risks' following the 2008 credit crunch, a variety of products to trade the

How does VIX behave relative to the S&P500?

As is evident from Figure 2, in a declining equity market there is a tendency for VIX to increase. Why?

Investors tend to buy options for protection against drops in the market. During times of nervousness the demand for protection would increase. This demand for options will be translated into higher levels of the VIX. The converse holds for rising markets.

One can use Figure 2 to understand if there is some panic or fear in the market. As 'predicted' by the regression, the VIX should rise by approximately 1% for a negative 1% change in the S&P500. Any changes in VIX

Eben Maré
Portfolio Manager, Stanlib

Eben has been a portfolio manager at Stanlib for the last six years; his focus area is absolute return funds. His career in the financial markets spans the last 25 years during which he has held senior positions in quantitative analytics, risk management and derivatives trading. He also holds a position as Associate Professor in Mathematics and Applied Mathematics at the University of Pretoria. He trained as a scientist and holds a Ph.D. in Applied Mathematics.