

Has Credit Vol Decoupled from Spreads?

Price volatility is a better risk indicator

- **Relationship between credit volatility and spreads has broken down** — Using CDX IG as an example, we find that after September 2012, the traditionally high volatility/spread correlation drops from 85% to 10%. In contrast, the correlation between CDX IG spreads and equity volatility has remained meaningful.
- **Price volatility is a better risk indicator** — In contrast to the spread volatility quoted in volatility markets, the equivalent price volatility exhibits better sensitivity and much stronger correlation to credit spread moves. We find that this relationship persists for recent (post September 2012) data.
- **Credit spreads are currently tight relative to price volatility** — A simple regression model using the past 1 year of spread/price volatility data indicates that index spreads are too low compared to both 1M and 3M price volatility levels.
- **We recommend buying index protection funded by selling OTM payers** — We like taking advantage of the technical indicated by our regression model to position for spread widening at a lower cost. This can be done by buying index protection and selling volatility through OTM payers.

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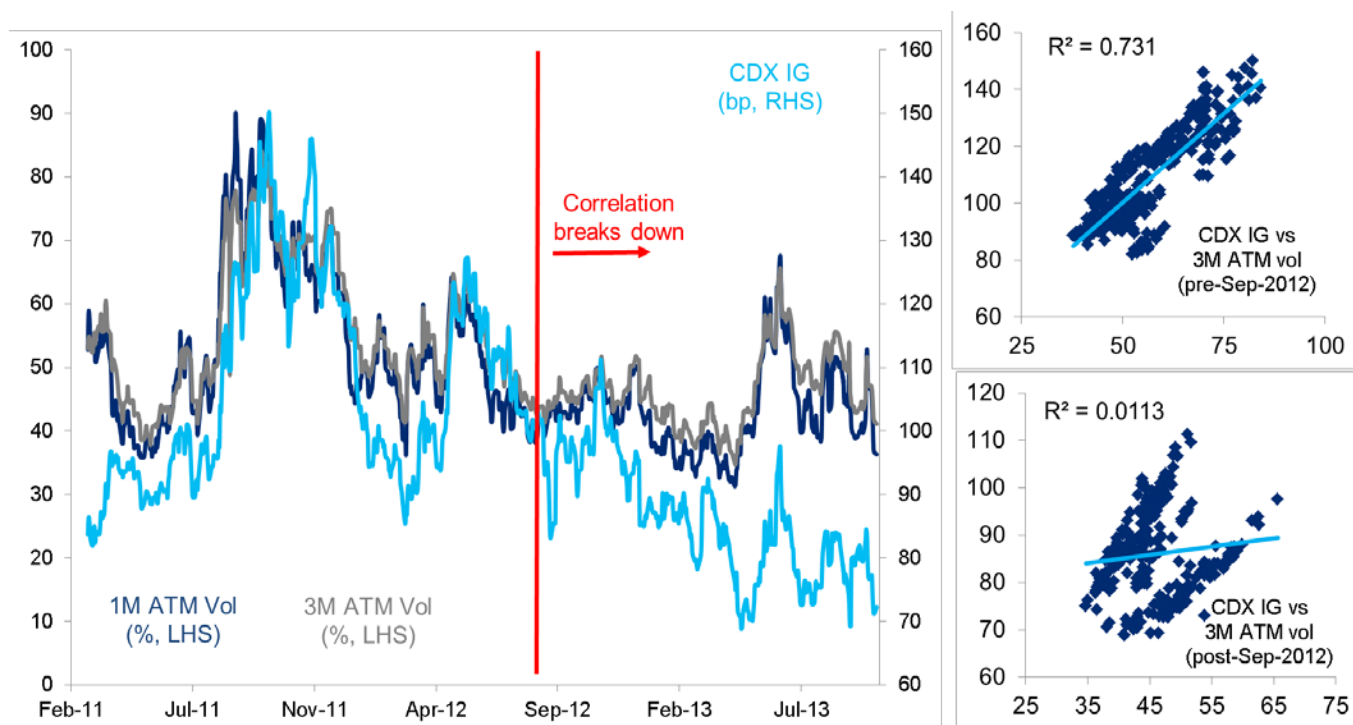
The Great Disconnect

Traditionally, investors have used volatility in risk asset classes as a measure of systemic risk. This is because, while (in theory) volatility can spike when markets make large moves, the reality is different. Given human psychology, risky asset volatility has always tended to spike during periods of market downturns because of the gappy nature of selloffs, while market rallies have tended to be relatively smooth. Therefore, volatility has always been regarded as a good hedge against sharp market down turns, and both options and volatility indices (e.g. VIX) have found a good market in hedge buyers.

What if that situation were to change? If we take a look at what is going on in the US credit volatility markets, it would certainly appear that there has been a regime change, and one that does not bode well for those that hedge with credit volatility products.

To illustrate this issue, we use the CDX IG index as an example. Using data dating back to 2011, we find that the traditionally strong positive correlation (volatility rises as spreads widen during a market selloff) between CDX IG index spreads and ATM implied volatility has taken a nosedive recently (see Figure 1).

Figure 1. Strong correlation between 1M or 3M ATM volatility and CDX IG spreads breaks down post Sep 2012 (left). Simple linear regressions between 3M ATM volatility (X-axis) and the underlying index spread (Y-axis) confirm the strong relationship pre-Sep 2012 (top right) and almost no relationship post-Sep 2012 (bottom right).



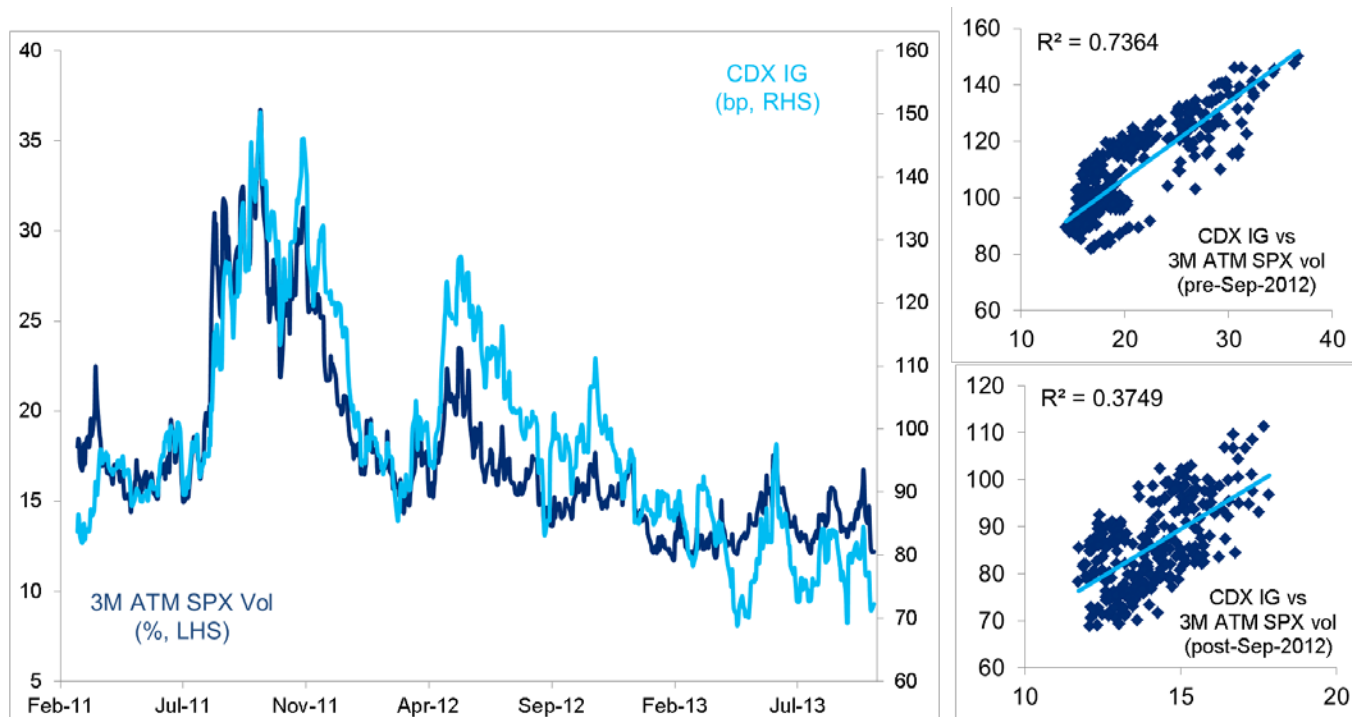
Source: Markit, Citi Research

Specifically, it would appear that the market has undergone a regime change after Sep 2012, and for the past year, the correlation between index spreads and implied volatility has been extremely weak – for example, the correlation between 3M ATM volatility and IG spreads has gone from a respectable 85% pre Sep 2012 to a paltry 10% post Sep 2012, and the weak correlation persists to this day.

Furthermore, this is true across credit indices and option maturities – both 1M and 3M ATM implied volatility for CDX IG and HY indices exhibit the same behavior

recently. At the same time, we find that the correlation between equity volatility (e.g. 3M ATM SPX volatility) and credit spreads does not suffer to this extent (see Figure 2). Does this mean that the credit volatility market has lost its signaling power as a barometer of systemic risk? Further, are equity volatility markets a better barometer for credit risk itself? We attempt to answer this question in the rest of this report.

Figure 2. In contrast to credit volatility, equity volatility shows stronger correlation to CDX IG index spreads in the post-Sep 2012 period (left). This is confirmed by regressions between 3M ATM SPX vol (X-axis) and CDX IG spreads (Y-axis) in the pre-Sep 2012 (top right) and post-Sep 2012 (bottom right) periods.



Source: Bloomberg, Markit, Citi Research

It's The Low Spread Regime

Why are we seeing this apparent decoupling? After all, the only significant thing that happened in Sep 2012 was the OMT announcement from ECB president Draghi which did send spreads tighter, and volatility lower, across the board. However, while this announcement served to take tail risk off the table for most investors, it is unlikely that it would cause the correlation between spreads and volatility to break down in this spectacular fashion.

We believe that the reason is different, but related. Once systemic risk was off the table after the OMT announcement, there was a sustained rally in spreads that has more or less continued unabated to the present. For most of this period, CDX IG spreads have remained at relatively low levels (see Figure 1). As spreads have gone tighter, implied (spread) volatility levels have approached a floor.

Why did this happen? Remember that implied volatility for credit spreads is represented as a percentage of the underlying spot (spread) level. For example, when the CDX IG index is trading at 120bp, an implied spread volatility of 40% means that the index is expected to move around 3bp/day¹. However, if the index spread falls to 60bp, the expected move falls to 1.5bp/day.

As spreads go tighter, the expected implied move in bp/day approaches a floor which is determined by the bid/ask spread for the index. In other words, in a tight spread regime, the implied volatility for the index cannot go below a floor that puts the corresponding expected index move in bp/day below the index bid/ask spread.

As we approach this implied (spread) volatility floor, the behavior of implied volatility begins to exhibit less sensitivity to spread moves, thus giving rise to convexity. This kind of behavior is a well-known phenomenon and can readily be seen in the relationships between other asset pairs, such as credit spreads and equity prices (e.g., CDX IG versus S&P 500), where credit spreads at very tight levels become de-sensitized to equity index moves.

¹ Expected move (in bp/day) = (Spot in bp) * (Implied Vol in %) / Sqrt (252)

The Workaround: Price Volatility

The stronger correlation between equity volatility (3M ATM S&P implied volatility) and credit spreads (CDX IG spreads) provides a clue as to what a workaround might be. The key is in looking at *spread* volatility versus *price* volatility.

Equity volatility is expressed as a percentage of the underlying (spot) price because the S&P index (and other equity indices) are quoted in price. Since equity prices have unlimited upside, equity volatility during a rallying market does not have to be above a certain minimum to ensure that the implied daily equity move is above the bid/ask spread. Thus, when markets are rallying, equity price volatility does not exhibit the kind of convex behavior that credit spread volatility exhibits.

Figure 3. Converting spread volatility to equivalent price volatility.

Expected yearly spread move in index (bp/year)	= (Spot in bp) * (Implied Vol in %)
Expected daily spread move in index (bp/day)	= Expected yearly move / Sqrt (252)
Expected daily price move in index (pt/day)	= Expected daily move (bp/day) * Duration / 100
Expected yearly price move in index (pt/year)	= Expected daily price move (pt/day) * Sqrt (252)
Price volatility (%)	= Expected yearly price move (pt/year) / Index spot price (pt)

Source: Citi Research

We proceed in a similar manner for credit volatility. Instead of using spread volatility, we use the corresponding price volatility, expressed as a percentage of the underlying index price. In order to convert spread volatility to price volatility, we use the procedure described in Figure 4. The important thing to note here is the use of duration² – as credit spreads tighten, durations go up.

Figure 4. Correlation remains strong between CDX IG spreads and 1M or 3M ATM (equivalent) price volatility.



Source: Markit, Citi Research

Now consider a market scenario where credit spreads are really tight. We have explained earlier how credit spread volatility must be above a certain floor in order for the implied move in bp/day to be above the bid/ask spread. However, if we look

² We define the duration of a credit default swap as the present value of a risky annuity of 1bp.

at the corresponding price volatility (as a percentage of index price), it need not be subject to a floor because the higher duration compensates for the lower (tighter) spreads. Thus, the convexity effects that distort the behavior of spread volatility at tight spreads disappear if we look at price volatility, and we get a cleaner relationship as shown in Figure 5.

We therefore recommend using price volatility as the appropriate measure to use as a barometer for systemic risk in credit markets as well as to determine whether credit spreads are rich or cheap relative to volatility levels.

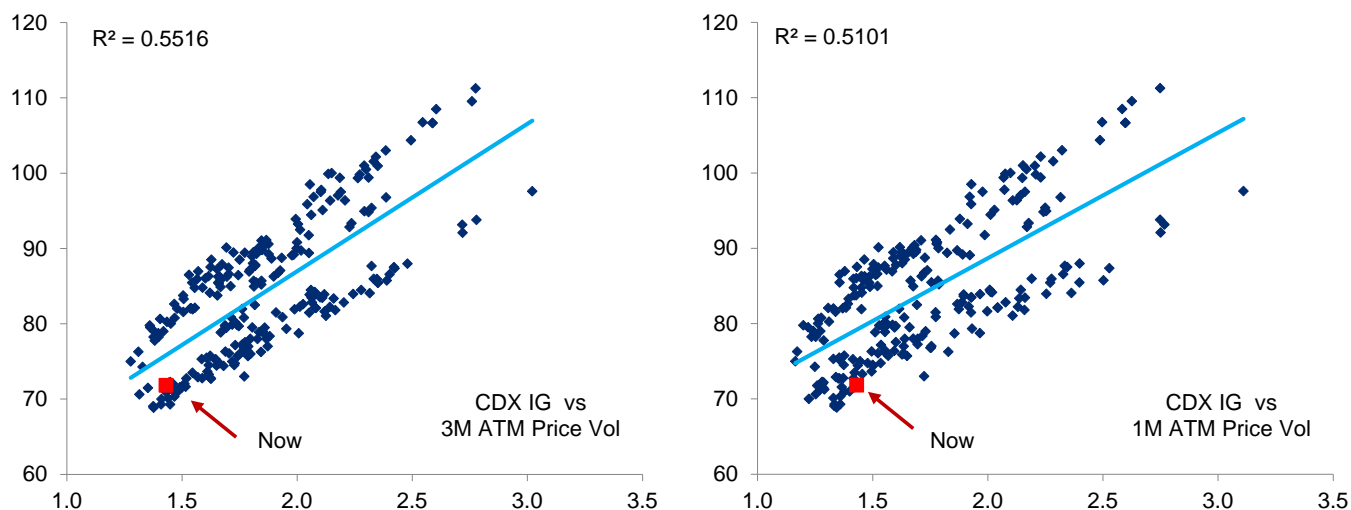
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Now that we have demonstrated the usefulness of price volatility as a measure of credit risk, we examine the relationship between price volatility and spread levels for the CDX IG index. We have shown how the two metrics have behaved with respect to each other in Figure 5. It is easy to see that the strong correlation between index spreads and 3M ATM price volatility has not broken down. The same holds for 1M ATM price volatility.

Running a regression model for the past 1 year of data also confirms the relationship (see Figure 6). We see from this figure that CDX IG spreads are too tight with respect to (price) implied volatility, and this holds across 1M and 3M option maturities. It is clear that the spread tightening in the CDX IG index has reached levels that are too tight relative to where volatility levels are.

Figure 5. Simple regressions for past 1 year's data (31-Oct-2012 through 28-Oct-2013) show that CDX IG spreads are too tight compared to volatility levels.



Source: Markit, Citi Research

Given the relative richness of spread levels, we would like to position for a spread widening going forward. However, instead of simply buying protection on the CDX IG index, we can take advantage of the technicals indicated by our regression to reduce the cost of buying protection. In other words, we fund the protection buying by selling OTM payers.

Figure 6. Trade details: all prices/spreads are mids, as of EOD 28-Oct-2013. A positive upfront means the investor gets paid to put on the position.

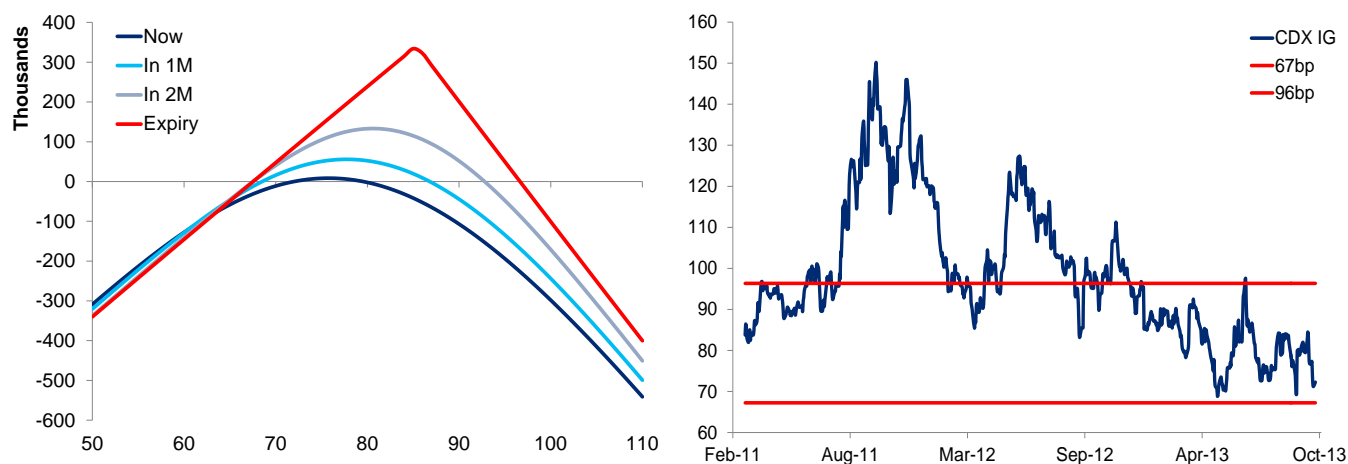
Trade	Index	Strike/Spot	Maturity	Notional	Price	Upfront	Delta	Gamma	Theta	Vega
Sell Payer	IG21	85.00	15-Jan-14	100,000,000	13.7c	136,728	-15,635	-589	2,300	-5,613
Buy Protection	IG21	71.69		40,000,000	71.69bp	558,325	20,177	0	-856	0
Net						695,053	4,542	-589	1,444	-5,613

Calculations do not include fees and other transaction costs.

Source: Citi Research

The details of the trade are shown in Figure 7. The notionals are adjusted such that the net trade is short vega (short volatility) and long delta (short credit risk). In general, if spreads were to widen, the trade would profit from the index position till the OTM strike is breached. If spreads were to tighten, the losses from the index position would be partially offset by the premium from selling the payer option. In other words, the trade performs best if spreads widen modestly, does reasonably if spreads tighten modestly, but underperforms if there is a large spread movement in either direction.

Figure 7. Projected P&L (USD) for various spread scenarios (left), breakeven spreads (right)



Source: Markit, Citi Research

We show an analysis of the P&L for various spread scenarios at option expiry in Figure 8 (left). The breakeven spreads are 67bp and 96bp, respectively – see Figure 8 (right) for the breakeven range.

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