

## Credit Market Technical Indicators

### Strategies for Rules-based and Algorithmic Investors 2 July 2014

- **Our iTraxx Main Technical Indicators (latest spread level 58.50bp S21, all spreads in this document and in our calculations are roll-adjusted):**

Momentum Indicator: Long risk trade 23 May 69.00bp

Directional Movement Indicator: No trade at present

Relative Strength Index: No trade at present

House of Cards Indicator: No trade at present

Regime Switching Indicator: Trending mode, Momentum long risk trade 1 July 59.75bp

- We track the performance of two portfolios – Portfolio A which is an equally weighted average of Momentum, DMI, RSI and House of Cards. And separately, the Regime Switching Indicator on its own.
- Portfolio A P&L over the past 12 months is 10.4bp, and 0.3bp YTD, Regime Switching model P&L over the past 12 months is 30.9bp, and -2.8bp YTD
- If you would like to receive this publication on a more frequent basis (when a signal is produced), please email [tina.t.zhang@jpmorgan.com](mailto:tina.t.zhang@jpmorgan.com) to be added to our mailing list.
- While we try not to put too much emphasis on “technical analysis”, we have found that our indicators would have historically provided very good results for rules-based/algorithmic investors. The signals are also interesting to look at from the perspective of gauging how much impetus there is behind market moves – some indicators attempt to confirm whether a trend has been established, while the others attempt to signal turning points.
- Since our previous publication, our mean reversion indicators that put on short risk trades in early June have been forced to stop out of their trades.
- As the pace of spread tightening has slowed, our Momentum model could close out of its long-held sell protection trade if spreads widen to the low-60s.

#### European Credit Strategy

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#### Recent Technical Indicator trades

| Model                | Momentum  | DMI        | RSI        | House of Cards | Regime Switch |
|----------------------|-----------|------------|------------|----------------|---------------|
| Trade                | Long risk | Short risk | Short risk | Short risk     | Long risk     |
| Trade open           | 23 May    | 11 Apr     | 11 Jun     | 5 Jun          | 1 Jul         |
| Open level           | 69.00     | 73.75      | 59.38      | 61.13          | 59.50         |
| Trade close          | -         | 22 Apr     | 23 Jun     | 19 Jun         | -             |
| Closed level         | -         | 69.75      | 58.25      | 56.88          | -             |
| P&L, bp <sup>1</sup> | 10.50     | -4.00      | -1.13      | -4.25          | 1.50          |

Source: J.P. Morgan. 1. P&L excludes carry and bid-offer, levels shown are mid at COB. All spreads used in this document are roll-adjusted.

#### Information Ratios since Oct-06

| Metrics               | Momentum | DMI  | RSI  | House of cards | Ptfolio A | Regime Switch |
|-----------------------|----------|------|------|----------------|-----------|---------------|
| P&L (bp)              | 25       | 27   | 11   | 21             | 21        | 70            |
| Stdev (bp)            | 68       | 42   | 26   | 31             | 21        | 62            |
| I. Ratio <sup>1</sup> | 0.78     | 1.35 | 0.90 | 1.44           | 2.12      | 2.39          |

Source: J.P. Morgan. 1: Based on a duration of 4.5, excluding carry

#### Information Ratios over past 12m

| Metrics               | Momentum | DMI  | RSI   | House of cards | Ptfolio A | Regime Switch |
|-----------------------|----------|------|-------|----------------|-----------|---------------|
| P&L (bp)              | 33       | 1    | 0     | 10             | 11        | 32            |
| Stdev (bp)            | 33       | 23   | 12    | 11             | 11        | 31            |
| I. Ratio <sup>1</sup> | 2.13     | 0.05 | -0.07 | 1.83           | 2.03      | 2.19          |

Source: J.P. Morgan. 1: Based on a duration of 4.5, excluding carry

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## Regime Switching Indicator

Our Momentum strategy is a simple, intuitive algorithm designed for trending markets (pg 5). Generally speaking, the nature of Momentum strategies is that they do not work well when markets are range-trading.

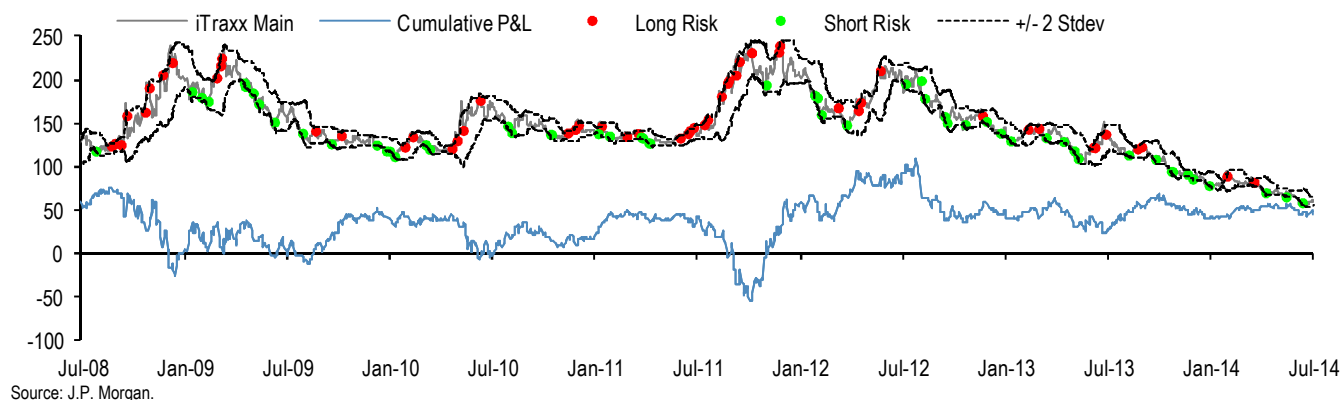
This has led us to search for a model that can identify when the market is range trading or trending. By using a regime switching indicator, we can move between Momentum and range-trading strategies.

### Method:

#### Bollinger Bands

A simple range-trading strategy is to trade spreads between a rolling  $\pm 2$  standard deviation range (i.e. Bollinger Bands). This model puts on a short risk trade, when spreads cross from below to above the lower boundary (defined by the average spreads minus 2 standard deviations). The take profit level is when spreads cross the upper boundary, and the stop loss is if spreads cross back below the lower boundary. When spreads are outside of the  $\pm 2$  standard deviation boundaries, there is no trade.

Figure 1: Bollinger Band



However, because during the short history of European credit indices the most volatile (i.e. more profitable) periods have been trending, the backtesting results for Bollinger Bands are unimpressive (see Figure 1). It did, however, perform well over the most recent range trading periods -3Q09 and July to August 2010.

Historically, Bollinger Bands and Momentum have only had the same position on 25% of the time. Hence if we can find a successful regime switching signal, then we can alternate between Bollinger Bands and Momentum for range-trading and trending environments respectively.

#### Regime Switching Signal

One potential way to do this is by looking at the extent to which single names move together. In trending environments, when systemic risk factors are more important, you would expect a higher level of correlation in spread movements between the single names in the index.

We look at spread volatility (as a percentage) for the index and the duration weighted average of the single names. We then use an approximation to get average single name correlation.

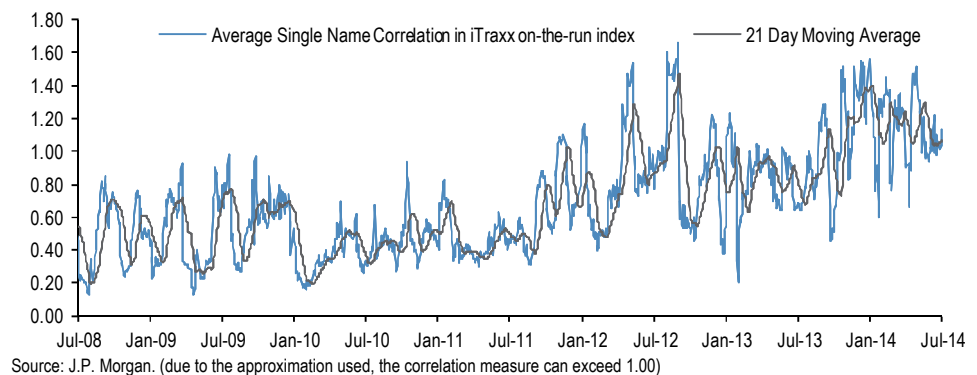
#### Average single name correlation approximation

$$\bar{\rho}_{ij} = \frac{\sigma_{index}^2}{\left( \sum_i^n w_i \sigma_i \right)^2}$$

In order to decide whether we should use the Momentum or Bollinger band strategy at a given time, we look at whether this correlation measure is above or below a certain threshold (if it is higher, i.e. single names more correlated, then trade Momentum, otherwise use Bollinger Bands). The threshold is a moving average of the single name correlations over the prior month.

In Figure 2 below, when the latest average single name correlation is above the moving average threshold, our model interprets this as signaling that iTraxx is in a trending regime and when it is below the threshold, a range-trading regime is implied.

Figure 2: Regimes



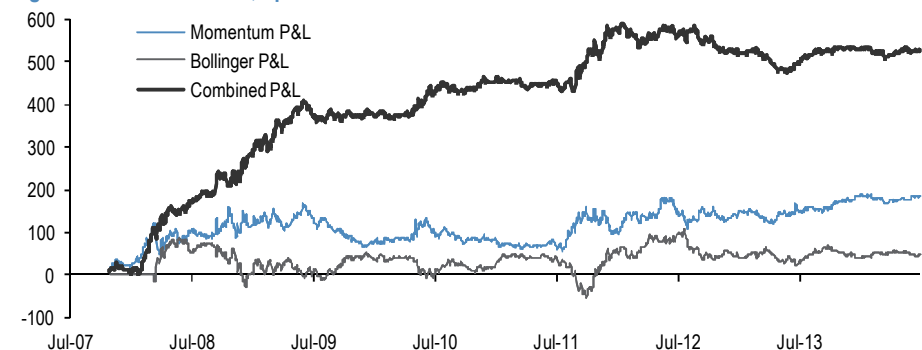
### P&L:

Using this to determine when to use Momentum and Bollinger Bands leads to a significant improvement in both the cumulative P&L profiles and information ratios. Although the number of trades rises, so does the average P&L per trade.

**Cumulatively, a regime switching strategy initiated in October 2006 would have made 526bp or 70p per year, or 3.16% of notional assuming a duration of 4.5 and ignoring carry. (This would translate into a 31.6% return on margin, assuming a conservative 10% margin for iTraxx Main.)**

In backtesting, many algorithmic strategies' performance are heavily dependent on signals in 2008-2009. Although the regime switching strategy P&L was flat over 2H09, it avoided the heavy losses incurred by Momentum. Using the full history of data we have from 2004, the time spent in range-trading versus trending environments has been split 50-50, but in total, 2/3 of the P&L has come from the Momentum strategy.

Figure 3: Cumulative P&L, bp



### Trades:

Markets have been trading within a tight range, and average single name correlation has been fluctuating around the thresholds we use to determine whether the model should follow Momentum or Bollinger Band signals, which has caused the model to switch frequently between trades. At present, the model is in trending mode and is following the Momentum long risk signal. The Bollinger band model is in short risk mode, targeting 62.25bp, with a stop-loss at 56.125bp.

Figure 4: Regime Switching Model signals (combination of Momentum and Bollinger Bands)



Source: J.P. Morgan.

### Recent Trade History

P&L is expressed in basis points. B=buy protection, S=sell protection. Entry levels are roll-adjusted spreads

Table 1: Regime Switching Model Trades (Model M = Momentum, B= Bollinger Bands)

| Signal | Model | Entry Date | Entry Level | Exit Date | Exit Level | P&L    | YTD Cumulative P&L |
|--------|-------|------------|-------------|-----------|------------|--------|--------------------|
| S      | M     | 1-Jul-14   | 59.75       |           |            | 1.25   | -2.75              |
| B      | B     | 23-Jun-14  | 58.25       | 01-Jul-14 | 59.75      | 1.50   | -4.00              |
| S      | M     | 19-Jun-14  | 56.88       | 23-Jun-14 | 58.25      | -1.38  | -5.50              |
| B      | B     | 18-Jun-14  | 59.75       | 19-Jun-14 | 56.88      | -2.88  | -4.13              |
| S      | M     | 16-Jun-14  | 61.13       | 18-Jun-14 | 59.75      | 1.38   | -1.25              |
| B      | B     | 13-Jun-14  | 59.50       | 16-Jun-14 | 61.13      | 1.63   | -2.75              |
| S      | M     | 10-Jun-14  | 57.75       | 13-Jun-14 | 59.50      | -1.75  | -4.25              |
| S      | M     | 5-Jun-14   | 61.13       | 09-Jun-14 | 56.50      | 4.62   | -2.50              |
| B      | B     | 13-May-14  | 66.13       | 05-Jun-14 | 61.13      | -5.00  | -7.13              |
| S      | M     | 15-Apr-14  | 74.50       | 12-May-14 | 66.25      | 8.25   | -2.13              |
| B      | B     | 7-Apr-14   | 70.75       | 15-Apr-14 | 74.50      | 3.75   | -10.38             |
| S      | M     | 19-Mar-14  | 79.75       | 31-Mar-14 | 75.75      | 4.00   | -14.13             |
| B      | M     | 13-Mar-14  | 87.00       | 19-Mar-14 | 79.75      | -7.25  | -18.13             |
| S      | M     | 11-Feb-14  | 82.88       | 13-Mar-14 | 87.00      | -4.13  | -10.88             |
| B      | M     | 24-Jan-14  | 93.75       | 11-Feb-14 | 82.88      | -10.88 | -6.75              |
| B      | B     | 3-Jan-14   | 78.63       | 22-Jan-14 | 81.63      | 3.00   | 4.13               |
| S      | M     | 2-Jan-14   | 79.75       | 03-Jan-14 | 78.63      | 1.13   | 1.13               |

Source: J.P. Morgan.

## Momentum

### Method:

- Our measure of momentum looks at the 5-day (or weekly) moving average relative to the 20-day (or monthly) moving average on an exponentially weighted basis, giving more weighting to recent observations. If the weekly moving average is below the monthly moving average, market participants are selling protection – pushing spreads ever tighter – and momentum is likely to continue.
- A trade is held until an opposing signal is given, such that there is an active trade at all times. We have found good results from this strategy over the past two years. The Momentum model has continued to profit from the long risk trade it initiated towards the end of May. The slowdown in the pace of the spread tightening has narrowed the gap between the two moving averages to less than 1bp, meaning the model could switch to short risk if spreads move towards the low-60s.
- Figure 5 shows the iTraxx Main index, with the turning indicators of momentum marked in red (long risk) and green (short risk).

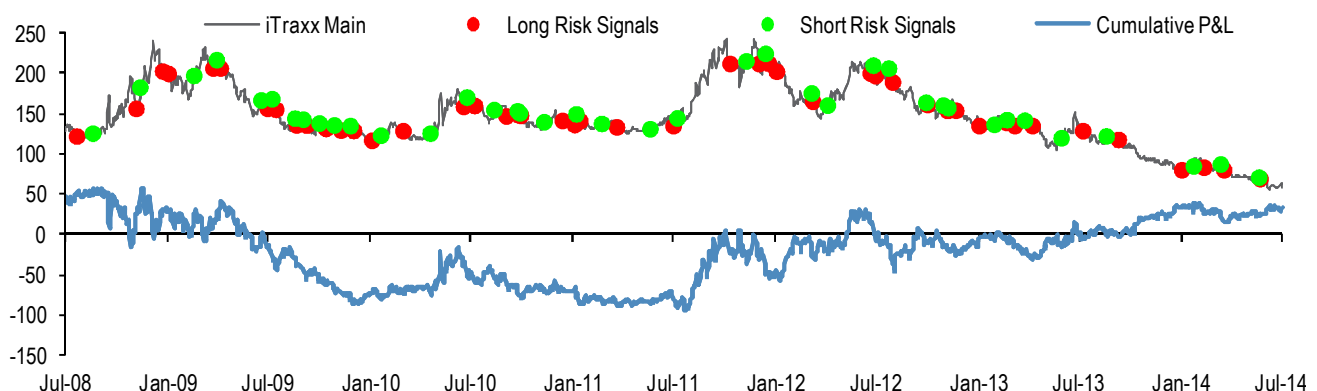
### P&L:

- **Cumulatively, a momentum-based strategy initiated in October 2006 would have made 187bp or 25bp per year, or 1.12% of notional assuming a duration of 4.5 and ignoring carry. (This would translate into an 11.2% return on margin, assuming a conservative 10% margin for iTraxx Main.)**
- While these are impressive returns, we note that momentum has not been great at picking the turning points in the market and needs to wait for a trend to establish before generating a signal. The biggest loss from the strategy would have come in March 2008 following the market sell-off and subsequent rally. While we did catch the rally, we lost the initial turn.

### Trades:

- The Momentum model has continued to profit from the long risk trade it initiated towards the end of May. The slowdown in the pace of the spread tightening has narrowed the gap between the two moving averages to less than 1bp, meaning the model could switch to short risk if spreads move towards the low-60s.

Figure 5: Momentum Index



Source: J.P. Morgan.

## Directional Movement Indicator

### Method:

- Like Momentum, this indicator also aims to identify trends rather than turning points. Its calculation is akin to the RSI in the sense that it looks at day-on-day changes, but instead of tracking closing marks, we look at changes in intraday highs and lows, normalized by average daily trading ranges.
- We calculate a widening indicator that measures the strength of upward trends in spreads and a corresponding tightening indicator. A trade signal is generated when one trend indicator crosses the other, i.e. when one trend is identified as being significantly stronger (see Figure 6)
- Trades become most profitable when the absolute gap between the widening indicator and the tightening indicator reaches a peak (i.e. these points coincide with turning points on Main). Our model keeps a trade on until the gap between the two indicators reaches the maximum gap seen within the past month, such that take-profit levels adapt to the volatility of the recent trading environment.
- This works better when spreads are range trading, but results in the fact that the model takes profits too early in a trending environment like that seen over the crisis (but in that scenario, we would hope our Momentum model would become the primary driver of P&L). However, we believe there are diversification benefits by making this adaptation to the model, as previously, the P&L at times tended to be quite correlated to our Momentum model.

### P&L:

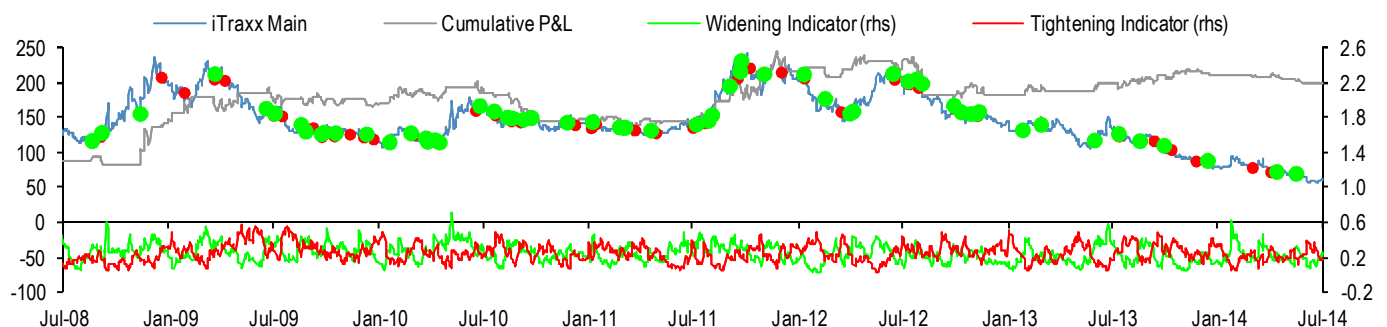
- **Cumulatively, a DMI strategy initiated in October 2006 would have made 201bp, or approximately 27bp per year, or 1.21% of notional assuming a duration of 4.5 and ignoring carry. (This would translate into a 12.1% return on margin per annum, assuming a conservative 10% margin for iTraxx Main.)**
- Like momentum, signals tend to come after turning points and the strategy does not tend to perform as well in range bound environments.

### Trades:

- Not surprisingly, the tightening trend is currently more dominant, but the model has missed the opportunity to enter into a long risk trade.

Figure 6: DMI Indicator

Green dots = short risk signals, red dots=long risk, Cumulative P&L in bp



Source: J.P. Morgan.

## Relative Strength Index (RSI)

### Method:

- This indicator monitors the relative strength and speed of day-on-day spread moves wider versus moves tighter, by looking at the ratio of average moves wider versus tighter over a certain lookback period. This ratio is then transformed into a number between 0 and 100 and we then aim to identify when the market has become oversold (when the RSI is above 70) or overbought (RSI <30).
- Because of the way the indicator is calculated, signals tend to occur a day after the actual peak in spreads and are for short trading horizons of up to a week. We have also attempted to build in stop-loss levels (if the RSI dips below 30 again or rises above 70) and take profit levels (if the RSI is approaching 50).
- The RSI tends to give counter-trend signals – Figure 7 illustrates that since July 2007, where the main trend has been spread widening, the indicator has been successful at identifying the majority of the main peaks, but not as good at picking up the troughs. This is why technical indicators such as this are best used in conjunction with others and the most successful signals are when more than one indicator signals within a short timespan.

### P&L:

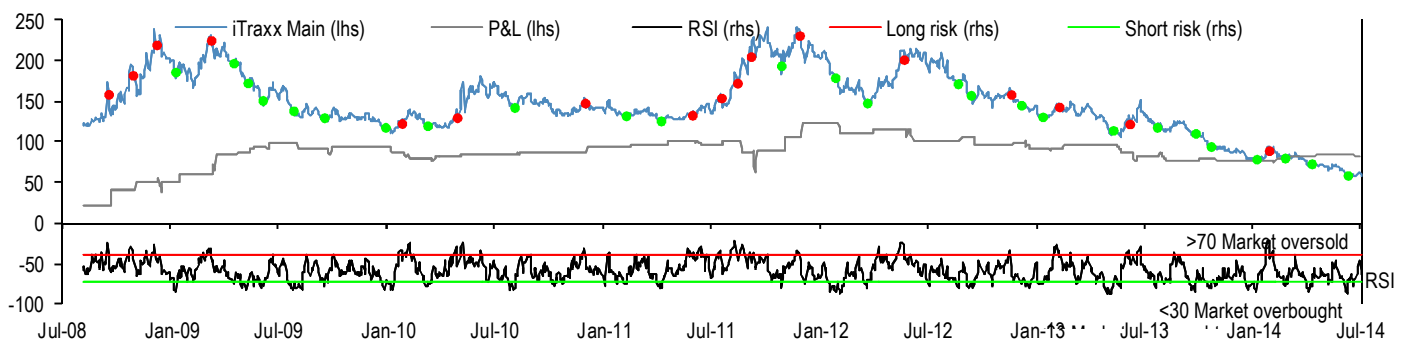
- **Cumulatively, an RSI-based investment strategy initiated in October 2006 would have made 83bp or approximately 11bp per year or 0.50% of notional** assuming a duration of 4.5 and ignoring carry. This P&L is considerable given the short trading horizon of the model's signals. (This would translate into a 5.0% return on margin p.a., assuming a conservative 10% margin for iTraxx Main.)

### Trades:

- Spreads did widen slightly after the model initiated a short risk trade on 11th June, but never quite reached the take profit level of 62bp. The resumption of the rally caused the model to close out its trade at a loss of 1.125bp. Currently, markets are viewed as balanced to slightly overbought.

Figure 7: RSI Indicator

Green dots = short risk signals, red dots=long risk, Cumulative P&L in bp



Source: J.P. Morgan.

## House of Cards Indicator

### Method:

- This indicator generates a signal when there is a diversion between iTraxx Main versus its historical relationship with measures of CDS basis (both to theoretical and cash), Credit market volatility (ATM vol, vol skew, correlation) and Other asset classes (equity vol, yield curve, swap spreads).
- We have used backtesting to determine what level of z-score triggers a profitable trading signal ( $Z\text{-score} = (Y_t - \hat{Y}_t) / \sigma_t$ ; where  $Y_t$  is the actual iTraxx Main spread at time  $t$ ,  $\hat{Y}_t$  is the fitted value using the other factors and  $\sigma_t$  is the standard error of the regression) for each of the factors stated above.
- Because of the way this indicator is constructed, it tends to generate significantly fewer signals than Momentum and RSI, but the trade horizon is longer. Unlike the other indicators, once a signal is generated, a trade is held for a fixed trading horizon of two weeks.

### P&L:

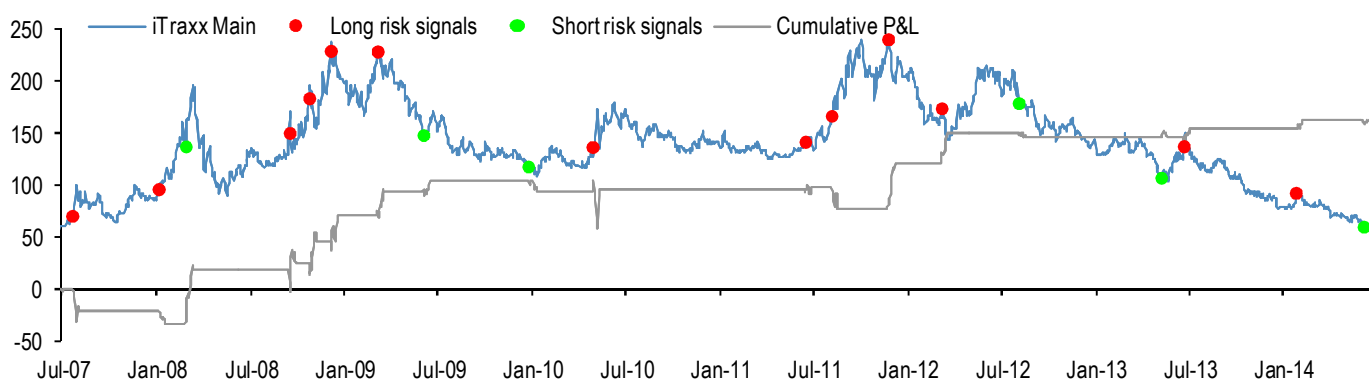
- **A strategy initiated in October 2006 would have made a cumulative P&L of 160bp or approximately 21bp per year**, or 0.96% of notional assuming a duration of 4.5 and ignoring carry. (This would translate into a 9.6% return on margin, assuming a conservative 10% margin for iTraxx Main.)

### Trades:

- The model closed out its most recent short risk trade on 19th June at a loss of 4.25bp, as other markets and credit vol caught up with the rally in iTraxx Main that started at the beginning of June. Currently, the model views spreads as fairly priced versus its input factors.

Figure 8: House of Cards Indicator

bp



Source: J.P. Morgan.



## Average Portfolio Trade History

P&L is expressed in basis points. B=buy protection, S=sell protection. Entry levels are roll-adjusted spreads. Source for all: J.P.Morgan

Table 2: Momentum Trades

| Signal               | Entry Date | Entry Level | P&L   | YTD Cumulative P&L |
|----------------------|------------|-------------|-------|--------------------|
| S                    | 23-May-14  | 69.00       | 10.50 | -0.50              |
| B                    | 21-May-14  | 70.75       | -1.75 | -11.00             |
| S                    | 19-Mar-14  | 79.75       | 9.00  | -9.25              |
| B                    | 13-Mar-14  | 87.00       | -7.25 | -18.25             |
| S                    | 11-Feb-14  | 82.88       | -4.13 | -11.00             |
| B                    | 23-Jan-14  | 84.75       | -1.88 | -6.88              |
| S                    | 02-Jan-14  | 79.75       | -5.00 | -5.00              |
| <b>2013 P&amp;L:</b> |            |             |       | <b>40.00</b>       |
| S                    | 10-Sep-13  | 117.50      | 37.75 | 40.00              |
| B                    | 19-Aug-13  | 121.75      | -4.25 | 2.25               |
| S                    | 08-Jul-13  | 128.50      | 6.75  | 6.50               |
| B                    | 30-May-13  | 119.38      | 9.13  | -0.25              |
| S                    | 08-Apr-13  | 134.50      | 15.13 | -9.38              |
| B                    | 25-Mar-13  | 141.38      | -6.88 | -24.50             |
| S                    | 07-Mar-13  | 134.63      | -6.75 | -17.63             |
| B                    | 21-Feb-13  | 142.13      | -7.50 | -10.88             |
| S                    | 20-Feb-13  | 138.50      | -3.63 | -3.38              |
| B                    | 29-Jan-13  | 136.38      | 2.13  | 0.25               |
| S                    | 02-Jan-13  | 134.50      | -1.88 | -1.88              |

Table 3: DMI Trades

| Signal               | Entry Date | Entry Level | P&L   | YTD Cumulative P&L |
|----------------------|------------|-------------|-------|--------------------|
| B                    | 15-May-14  | 71.00       | -4.50 | -11.50             |
| B                    | 11-Apr-14  | 73.75       | -4.00 | -7.00              |
| S                    | 01-Apr-14  | 73.25       | -0.50 | -3.00              |
| S                    | 28-Feb-14  | 79.25       | -2.50 | -2.50              |
| <b>2013 P&amp;L:</b> |            |             |       | <b>29.00</b>       |
| B                    | 12-Dec-13  | 89.50       | -2.63 | 29.00              |
| S                    | 22-Nov-13  | 88.50       | -1.38 | 31.63              |
| S                    | 10-Oct-13  | 105.13      | 11.50 | 33.00              |
| S                    | 01-Oct-13  | 107.50      | -2.00 | 21.50              |
| B                    | 27-Sep-13  | 111.13      | -3.63 | 23.50              |
| S                    | 10-Sep-13  | 117.50      | 9.63  | 27.13              |
| B                    | 16-Aug-13  | 117.63      | -0.13 | 17.50              |
| S                    | 11-Jul-13  | 124.38      | 6.75  | 17.63              |
| B                    | 10-Jul-13  | 128.00      | -3.63 | 10.88              |
| S                    | 09-Jul-13  | 125.00      | -3.00 | 14.50              |
| B                    | 29-May-13  | 118.50      | 13.00 | 17.50              |
| B                    | 25-Feb-13  | 141.00      | -0.88 | 4.50               |
| B                    | 24-Jan-13  | 133.13      | 5.38  | 5.38               |

Table 4: RSI Trades

| Signal               | Entry Date | Entry Level | P&L   | YTD Cumulative P&L |
|----------------------|------------|-------------|-------|--------------------|
| B                    | 11-Jun-14  | 59.38       | -1.13 | 6.63               |
| B                    | 11-Apr-14  | 73.75       | 0.75  | 7.75               |
| B                    | 25-Feb-14  | 80.75       | 3.00  | 7.00               |
| S                    | 28-Jan-14  | 89.88       | 2.38  | 4.00               |
| B                    | 08-Jan-14  | 79.38       | 1.63  | 1.63               |
| <b>2013 P&amp;L:</b> |            |             |       | <b>-7.50</b>       |
| B                    | 23-Oct-13  | 95.00       | -1.00 | -7.50              |
| B                    | 27-Sep-13  | 111.13      | 1.62  | -6.50              |
| B                    | 24-Jul-13  | 118.75      | -4.00 | -8.13              |
| S                    | 07-Jun-13  | 122.75      | -3.38 | -4.13              |
| B                    | 13-May-13  | 115.00      | -5.12 | -0.75              |
| S                    | 08-Feb-13  | 143.75      | 4.25  | 4.37               |
| B                    | 14-Jan-13  | 131.63      | 0.12  | 0.12               |

Table 5: House of Cards Trades

| Signal               | Entry Date | Entry Level | P&L   | YTD Cumulative P&L |
|----------------------|------------|-------------|-------|--------------------|
| B                    | 05-Jun-14  | 61.13       | -4.25 | 3.75               |
| S                    | 24-Jan-14  | 93.75       | 8.00  | 8.00               |
| <b>2013 P&amp;L:</b> |            |             |       | <b>2.38</b>        |
| S                    | 20-Jun-13  | 138.63      | 8.25  | 6.75               |
| B                    | 08-May-13  | 108.25      | 1.38  | -1.50              |
| B                    | 03-Jan-13  | 134.50      | -2.88 | -2.88              |

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|                                 | Overweight | Neutral | Underweight |
|---------------------------------|------------|---------|-------------|
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