RE-EVALUATING TWO
TREND INDICATOR ASSUMPTIONS

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We initially launched the Newedge Trend Indicator in August 2010, and following feedback from the industry we released a set of updates in January 2012; since then the methodology has remained unchanged. There are a couple of items that have been bothering us with the way we calculate the Trend Indicator: the outdated transaction cost assumptions and the way that we allocate the weights to different sectors. This paper looks at both of these items in turn and proposes frameworks for evaluating both on an ongoing basis. We report the results that were produced when we recently ran these analyses and detail the improvements to the Trend Indicator that will be implemented on the first business day in January 2016.

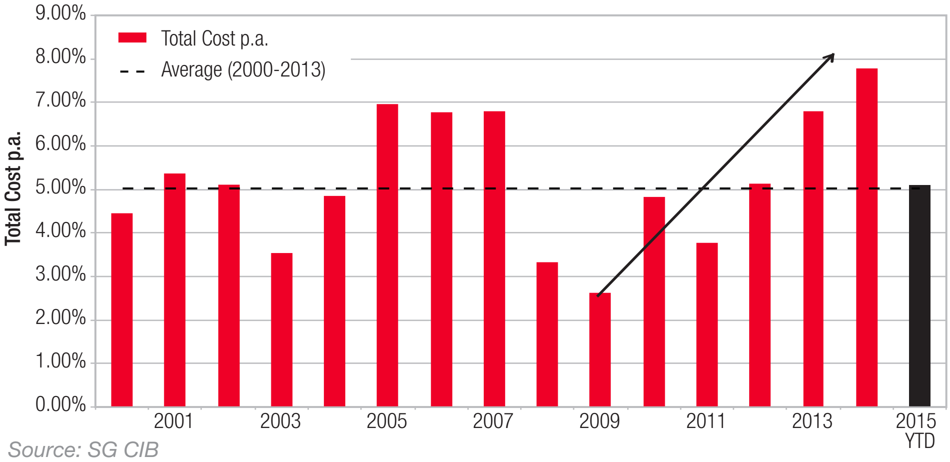
REDUCING THE TRANSACTION COST ASSUMPTIONS

From 2009 to 2014 we saw the total transaction costs for the Trend Indicator nearly triple to 7.8%, as shown in Exhibit 1. 2014 also saw the largest transaction costs over the 16-year period that we have calculated the Indicator, and these were 50% higher than the average of 2000 to 2013. From our conversations with various managers, this is also significantly higher than those experienced by actual CTAs. We therefore felt it appropriate to review why our transaction costs were so high and furthermore to develop a framework to determine what costs we should apply to the model going forward.

Since the launch of the Trend Indicator we have applied a fixed $50 per side cost to each trade. This number does sound fairly large, but it is important to note that this is to cover both explicit transaction costs such as exchange fees and clearing commissions in addition to execution slippage. While the explicit costs are well defined, it is the execution slippage that is a major source of uncertainty, in particular as we assume that we can transact at the next day's closing price, which isn't possible in practice. It is worth noting, however, that achieving the settlement price is becoming ever more possible due to advances in algorithmic trading technology and the advent of Trade At Settlement (TAS) markets for some contracts.

EXHIBIT 1

Trend Indicator Total Transaction Costs per Year

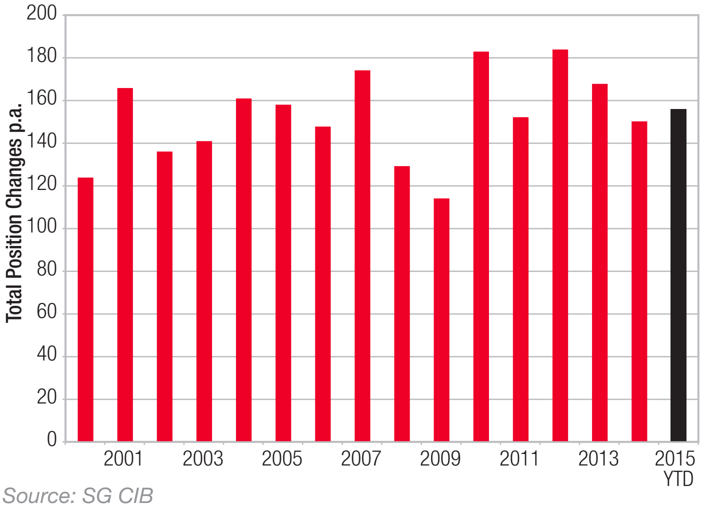


Source: SG CIB

It was surprising to some that the transaction costs were so high during 2014, particularly as it was a year that was characterised by a return to more "trendy" markets. Sustained moves in a number of different markets led to the Trend Indicator having the fewest number of position changes since 2009, as shown in Exhibit 2. The period between January 1 and December 18, 2015, has seen a similar number of position changes as in 2014, though the transaction costs are 30% below those of 2014. It is important to understand that position changes (i.e. the model going from short to long and vice versa) only represent 32% of the total transaction costs as shown in Exhibit 3. The remainder of the costs are incurred in rolling the futures positions before they reach expiry and in rebalancing trades to adjust the portfolio due to changes in market volatilities and correlations.

EXHIBIT 2

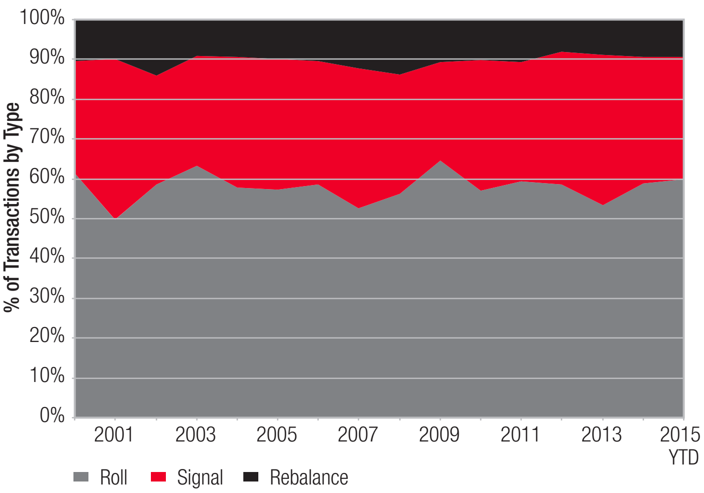
Trend Indicator Total Position Changes per Year



Source: SG CIB

EXHIBIT 3

Trend Indicator Transactions by Trade Type



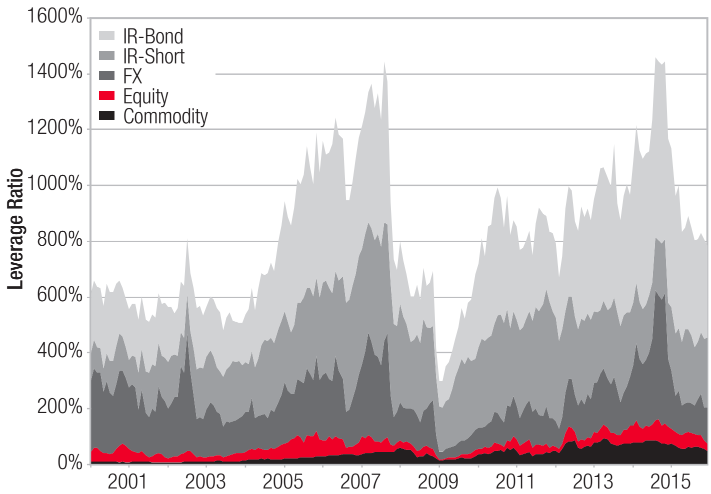
Source: SG CIB

It is therefore not just "whipsawing" markets that lead to higher transaction costs for CTAs; rather, the total transaction costs are directly proportional to the total number of contracts traded in a given year. In order to better understand this, we can study the leverage ratio of the Trend Indicator, which is detailed in Exhibit 4. This is calculated as the total notional value of all contracts held in the Trend Indicator portfolio and divided by the two-billion-dollar theoretical portfolio size. Of particular note is that the leverage ratio varies significantly through time. The reason for this variation is that the Trend Indicator is constructed with a 15% volatility target, and asset volatilities and correlations are not stable.

When average asset volatilities and correlations are low, larger position sizes are needed in order to achieve the targeted portfolio volatility and vice versa. As we showed in our *Back in Black: Part 2* snapshot earlier in the year, the first half of 2014 saw an interesting combination of low average market volatility and low correlation, and that in turn resulted in a high leverage ratio. Exhibit 5 shows the relationship between the leverage ratio and the annual costs for the Trend Indicator; the correlation between these two is 0.84.

EXHIBIT 4

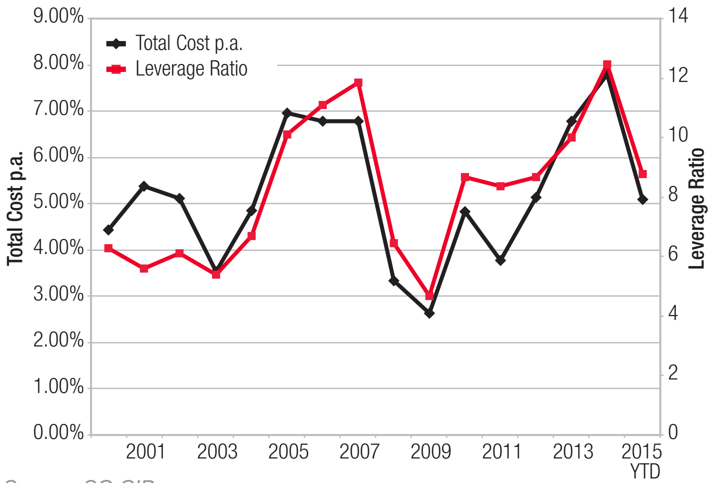
Trend Indicator Leverage Ratio



Source: SG CIB

EXHIBIT 5

Leverage Ratio and Annual Costs



Source: SG CIB

SIMULATION FRAMEWORK TO DETERMINE SLIPPAGE

In order to bring our transaction cost assumptions more up to date, we want to build a quantitative framework to determine the appropriate level of costs, and we need it to be repeatable, as we intend to run this analysis on an annual basis and adjust the costs accordingly. This framework is not meant to represent exactly what would be achievable by a manager who specialises in this sort of trading but rather to come up with a better broad brush stroke for our transaction costs.

At SG, we have a wealth of tick and order-book data, and we decided to leverage this information to develop our framework. In order to keep it relatively simple, we ran a series of Time Weighted Average Price (TWAP) strategies using different parameters across various markets from the 55 futures markets in the Trend Indicator portfolio. For each market, we evaluated not only the outright market that would cover signal change and rebalancing trades but also the roll market. The major caveat to this work is that we make a fairly large assumption that our "trading" activity would have no impact on the order book; clearly this wouldn't be the case in reality. It should be pointed out, however, that in the construction of our Trend Indicator, we limit the positions to 1% of open interest or 5% of the average daily traded volume, whichever is the lower.

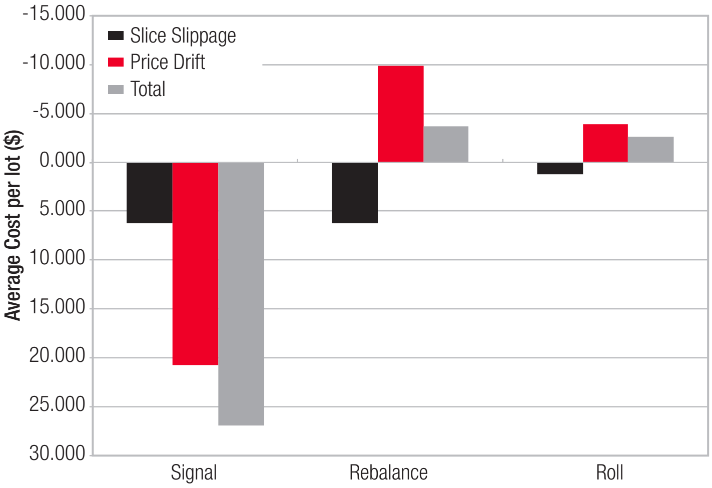
In this note, we present the results of a TWAP strategy run every second for the last five minutes prior to the futures settlement. We define the total slippage as the difference between the average executed price for each of the order slices and the mid price at the close. Furthermore, we decompose the total slippage into two parts:

- Price Drift: This details the difference between the mid price of each order slice with the mid price at the close
- Slice Slippage: This represents the difference between the fill price of each order slice vs. the mid price at the release time

An example of the results of the simulation covering the Emini S&P (ES) for the Trend Indicator trades conducted in 2014 is included in Exhibit 6. There are a few things to note here. Firstly, as we would expect, the slice slippage values are always negative and are identical for the Signal and Rebalance trades at $6.25. This number is not random and represents half a tick in that market (value of 1pt = $50, tick size = 0.25, therefore 1 tick = $12.50), indicating that the orders are able to be filled in the first level of the order book. The volatility of the spread markets is significantly lower than that of the outright markets, and as a result the tick size is smaller (0.05 vs. 0.25) in the ES roll market – half a tick is $1.25, which is consistent with our findings here. Secondly, the drift component varies among all three trade types and in the case of these rebalance and roll trades was actually a positive contribution, meaning that there would have been positive slippage in total for those trade types when compared to executing at the closing price. It needs to be highlighted that the sample size is fairly small, representing just 18 trades during the year. Twelve of these trades are small rebalancing trades, and four are roll transactions, meaning that there are just two signal trades.

EXHIBIT 6

2014 Slippage Costs by Type (E-Mini S&P)

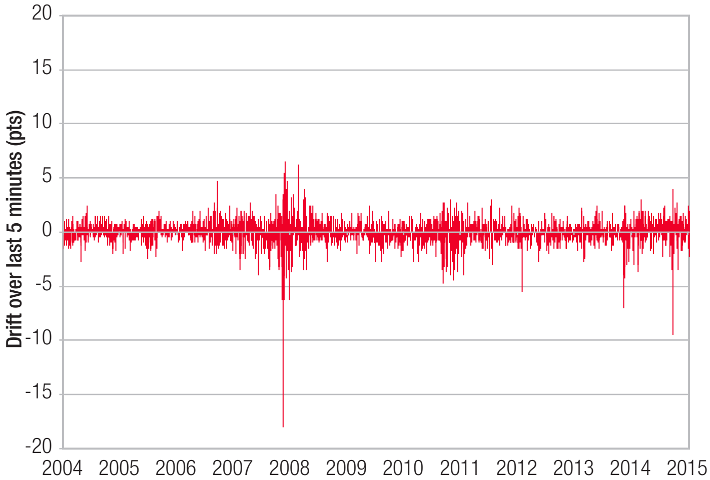


Source: SG CIB

In order to increase the sample size we simulated using our TWAP strategy to go from long to short for the average position size during 2014 (which, as described above, was much larger than average due to the high leverage ratio during the year). Our findings for the slice slippage were consistent with our earlier findings in that 74% of values fell at $6.25 exactly, and 96% fell between $6.20 and $6.35. What we found when we looked at the drift component matched our intuition that across the whole year the drift in the last five minutes of the day was indistinguishable from randomness. We looked to confirm these findings over an even greater sample size by looking at the drift of the Emini S&P in the last five minutes of every day during the last 10 years, which we plot in Exhibit 7. We have also included the distribution of the drift over the last five minutes in Exhibit 8. The mean of this distribution is almost indistinguishable from zero at 0.0115 points (or just 57 cents), and the z-score is 0.527. In our transaction cost modelling, we believe it would therefore be appropriate when looking at the Emini S&P to ignore the drift component, as in the long run this would even out and concentrate on the explicit costs and the slice slippage.

EXHIBIT 7

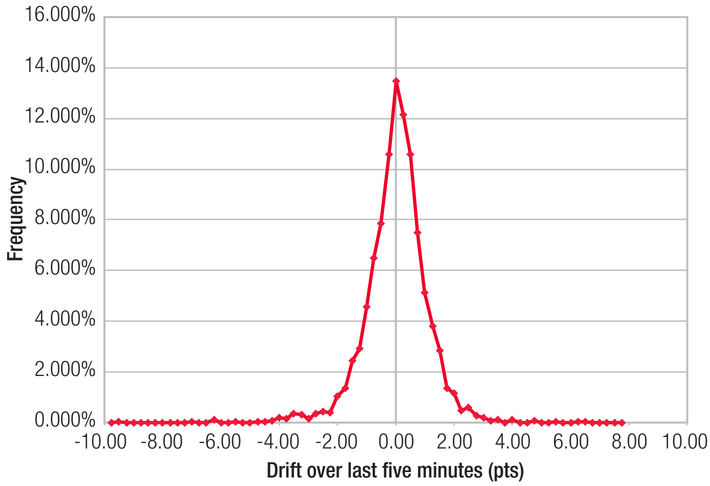
Price Drift Five Minutes Prior to Futures Settlement (E-Mini S&P)



Source: SG CIB

EXHIBIT 8

Distribution of Price Drift Five Minutes Prior To Futures Settlement (E-Mini S&P)



Source: SG CIB

We are conscious that the Emini S&P is one of the most liquid markets in the world, and so we wanted to test whether this assumption would hold true across a variety of markets. Exhibit 9 shows the summary statistics for this analysis across 15 markets in various asset classes and geographic regions. With the exception of Crude and JGB, the price drift in the five minutes prior to settlement is very small, with an average of 1.37 dollars and an absolute average of 2.7 dollars. Furthermore, the z-scores show that for eight of these the mean is statistically indifferent to zero. Clearly, the findings for Crude and JBG are statistically significant, but it is worthwhile pointing out that the impact in practice should be a lot smaller than their 26-dollar average as the Trend Indicator can be both long and short any given market, whereas the data shown in Exhibit 9 only looks at the market itself. We have therefore decided that when considering what the slippage should be for each market, we can ignore the drift component as in most markets this should wash out over time.

EXHIBIT 9

Summary Statistics of Last Five Minute Price Drift

Market	Mean ($)	StDev ($)	z-Score
Emini S&P	0.47	56.89	0.43
FTSE	-1.50	136.72	-0.57
EuroStoxx	1.37	47.03	1.53
Hang Seng	9.35	185.04	2.32
US 10Yr Note	-0.34	43.12	-0.40
JGB	-24.88	407.27	-3.03
Bund	0.71	81.56	0.46
Euribor	0.30	12.62	1.19
Euro FX	-3.78	64.41	-2.80
Swiss Franc	-0.04	0.72	-2.63
British Pound	-3.22	38.50	-3.99
WTI Crude	27.28	263.82	4.88
Corn	6.39	87.95	3.45
Gold	2.20	124.74	0.83
Nat Gas	5.96	189.74	1.48

Source: SG CIB

When determining how much slippage we should incorporate we therefore focus on the slice slippage. We showed in our Emini S&P example above that orders were able to be filled in the first level of the order book. In addition to this, where TAS markets exist (such as in energy and certain other markets), they are typically one tick wide for the front month. In order to be conservative, we intend to double this to two full ticks for the purposes of estimating slippage.

We use data from November 30 to compute an outright rate and a roll rate in US Dollars for each market as follows: Exchange Fees + $2, Execution & Clearing Commissions + 2 ticks slippage. We can then compute the new sector transaction cost rates as follows:

- Compute a Sector Average Outright Rate by averaging the outright markets in that sector.
- Compute a similar Sector Average Roll Rate from the individual roll rates.
- Both of these Sector Average rates are then rounded up to the nearest $5.

The results of this can be seen in Exhibit 10, which details the old and new rates for each sector and the impact on the transaction costs incurred by the Trend Indicator during 2015. In the upper part of the table, the old rates of $50 per side ($100 for rolls) are detailed and highlight the total 2015 year-to-date costs for the Trend Indicator of 510 basis points. The lower panel shows what the costs would have been had we applied the framework described above. The average rate for outright trades would have fallen from $50 to $30, but more importantly the roll rate falls from $100 to just over $30. The net impact of these reductions is that the total costs for 2015 would have been 232 basis points – a reduction of 55%. Exhibit 11 shows the impact of the revised rates on the attribution between different trade types. The pie charts are scaled so as to reflect the relative total transaction costs, and with the significant revision to the roll rates the proportion of costs attributed to roll trades has fallen from 60% to 44%.

EXHIBIT 10

YTD 2015 Transaction Costs for Trend Indicator Using Current and Revised Rates

Current Rates

	Outright rate ($)	Roll rate ($)	Outright cost (bps)	Roll cost (bps)
Commodities	50.00	100.00	45.55	90.64
Equity Indices	50.00	100.00	17.09	34.91
FX	50.00	100.00	53.63	64.27
Interest Rates	50.00	100.00	91.46	112.34
Portfolio Average	50.00	100.00	207.73	302.15

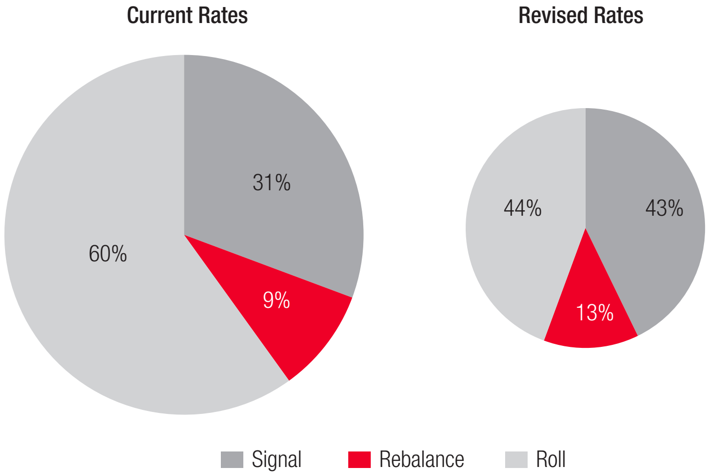
Revised Rates

	Outright rate ($)	Roll rate ($)	Outright cost (bps)	Roll cost (bps)
Commodities	30.00	30.00	27.99	28.95
Equity Indices	30.00	35.00	8.75	13.78
FX	25.00	15.00	27.87	9.64
Interest Rates	35.00	45.00	64.02	50.55
Portfolio Average			128.62	102.92

Source: SG CIB

EXHIBIT 11

Breakdown of YTD Transaction Costs for 2015



Source: SG CIB

MOVING TO EQUAL SECTOR WEIGHTS

In our snapshot *A Correlation Conundrum* earlier this year, we detailed the breakdown in correlation between our Trend Indicator and Trend Index during the early summer. In this piece we focused on the speed of our model due to the unusually large number of position changes. We received a number of questions about whether we had looked at our asset class weights and this got us thinking.

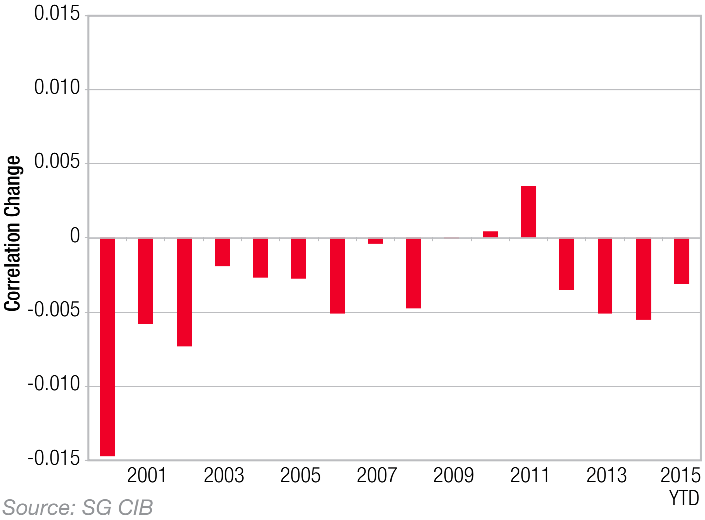
When we initially launched the Trend Indicator in 2010, we allocated 30% of the risk budget to each of the financial sectors (equities, currencies and interest rates) and 10% to commodities. Following feedback from both managers and investors, we revised these in 2012 to 30% in Interest Rates and FX, 25% in commodities and 15% in equities. But the fundamental question of “How do we know if these are correct?” still remains. We have continued to receive feedback on a fairly constant basis about how we came up with our sector weights and have wanted to build a quantitative framework to evaluate how we allocate risk rather than just relying on qualitative metrics and anecdotal information.

The starting point for our framework is the current weights and positions of the Trend Indicator. We then create four new portfolios where each one has the number of contracts traded within one of the asset classes increased by 10%. We then review the difference in the correlation between each new portfolio and our Trend Index. We acknowledge that by choosing this method we don't increase the allocations proportionally; a 10% increase in the Equity sector, which has a smaller starting weight, will have a smaller effect than that of the FX and Interest Rate sectors, which have twice the weight. We do, however, believe it to be a fair framework as in this analysis it is the pattern of the change in correlation that we particularly care about rather than the magnitude (which can be adjusted by varying the change in position size).

Exhibit 12 shows the effect of increasing the weight to the FX sector. In this example it is fairly clear that, in all but two years, having an increased FX position would have reduced the correlation of our Trend Indicator to our Trend Index. This effect is particularly marked in the earlier years (e.g. 2000 to 2007) and this was, in part, due to the way in which we limit the exposure to individual markets. We have both open-interest and daily traded volume caps applied in the Trend Indicator, which affects the Interest Rate and Commodity sectors in particular. The result of this is that in those earlier years there is already a greater allocation to FX than our 30% target allocation.

EXHIBIT 12

Correlation Change Due To 10% FX Position Increase

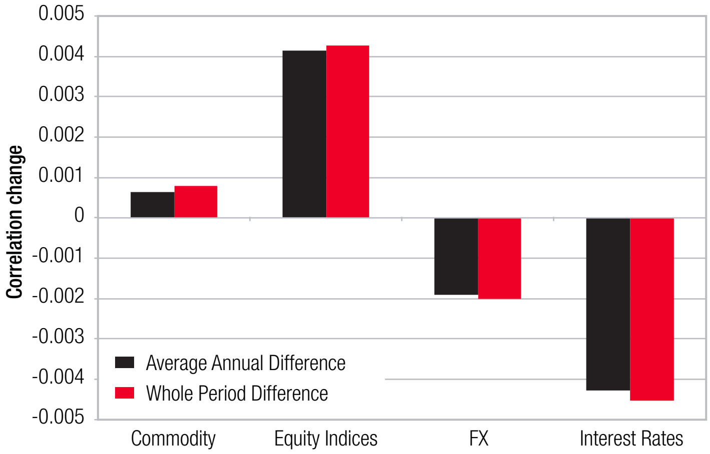


Source: SG CIB

In order to take this into account, when we compare our findings across sectors we focus on the last nine years, when the asset class spillover was less pronounced. Exhibit 13 shows the difference in correlation for each of the four asset classes over the entire nine-year period as well as the average annual correlation difference for each sector over this period. The data presented in this chart shows that when we increase our weight to the equity sector the correlation between our Trend Indicator and Trend Index increases; we therefore can conclude that our Trend Indicator is underweight equities. On the other hand, increasing the FX and Interest Rate sectors reduces the correlation between our Index and Indicator and therefore we are likely overweight those two sectors. Increasing the commodity weight would have a marginal impact on the correlation and therefore we can conclude that we are broadly in line with the Trend Index.

EXHIBIT 13

Sector Correlation Change Due To 10% Position Increase (2007 to Date)



Source: SG CIB

Armed with this knowledge, we have constructed two further versions of our Trend Indicator with different sector weights as follows:

- Decreased Interest Rate weight to 25%, increased Equity weight to 20% (other sectors remain unchanged)
- Decreased Interest Rate and FX weights to 25%, increased Equity weight to 25% (commodities remain unchanged)

Exhibit 14 shows the summary performance statistics of these two new portfolios in addition to the current weighting scheme. The performance of all three portfolios is very similar, though moving to equal-volatility weights reduces the performance slightly.

EXHIBIT 14

Summary Statistics of Different Portfolio Weights

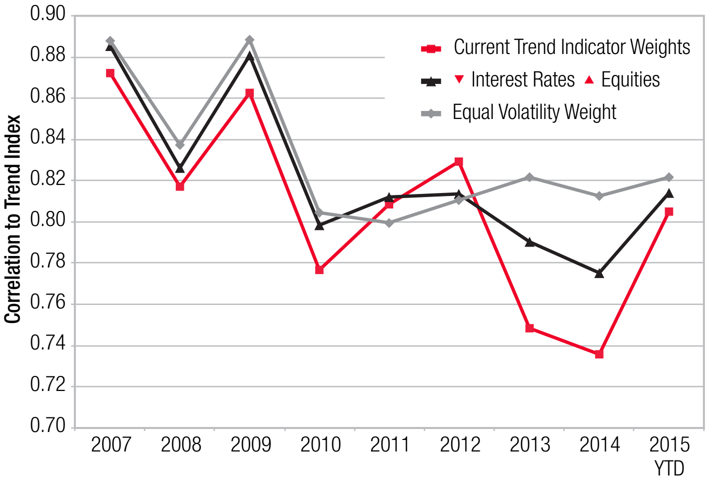
	Current Trend Indicator Weights	▼ Interest Rates ▲ Equities	Equal Volatility Weight
Mean	9.36%	9.37%	8.85%
Volatility	15.65%	15.74%	15.68%
Correlation to Trend Index	0.7746	0.7805	0.7814

Source: SG CIB

The primary objective of the Trend Indicator is not to optimise performance but rather to have a stable and high correlation to trend-following strategies and our Trend Index in particular. Whilst the performance of the equal-volatility weight portfolio is slightly lower, the correlation is the highest of the three. In addition to being the highest over the whole 16-year period, in Exhibit 15 we show that it had the highest correlation in seven of the last nine years and was particularly better over the last three years.

EXHIBIT 15

Portfolios Correlation to Trend Index by Year



Source: SG CIB

The Trend Index is constructed by averaging the performance of a number of managers. We were conscious that in the blending of the performance of these managers the asset classes' biases of the individual constituents may be removed, which may account for the equal-volatility weight portfolio being better. In order to look into this further, we identified nine managers for whom we have full daily track records over the last five years. We could have looked to do this analysis over the last nine years to be consistent with the above charts, but that would have necessitated reducing the number of managers evaluated, which we didn't feel was appropriate. Exhibit 16 shows the difference in correlation between the current Trend Indicator weights and equal-volatility weights vs. the individual managers. In the last three years the equal-volatility weighting scheme would have seen higher correlations to the individual managers, in some cases almost 0.1 higher. In 2012, however, our current weighting scheme would have provided better correlations, and in 2011 there was almost no difference between the two schemes.

EXHIBIT 16

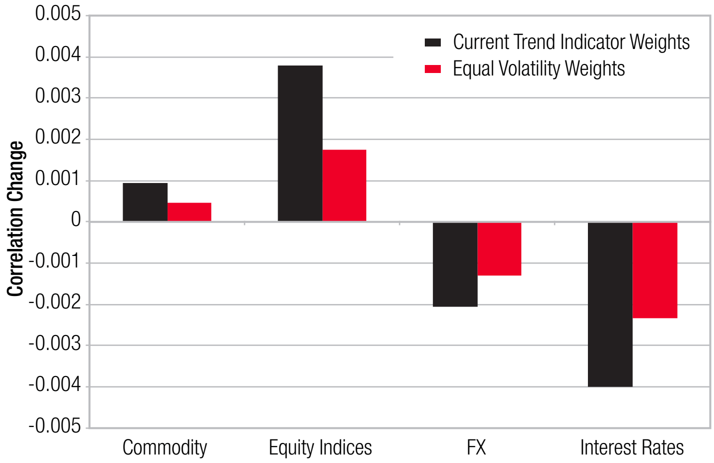
Correlation Difference to Individual Trend Managers (Equal Weight – Trend Indicator Weight)

Source: SG CIB

Having considered the above, we therefore feel it is appropriate, if we are going to change the sector weights, to move to an equal-volatility weighting methodology due to the better correlation numbers observed. Exhibit 17 shows the impact of rerunning our initial analysis where we increase the position sizes by 10%, and we can see that the impact of changing the sector weights has significantly lessened for all the asset classes. It would appear, though, that there may still be further to go however, and we propose to continue to monitor this through time.

EXHIBIT 17

Method Comparison: Sector Correlation Change Due To 10% Position Increase



Source: SG CIB

NEXT STEPS

The two improvements detailed above will be put into production on the first business day in January 2016. We are not intending on restating the 16 years of history for the Trend Indicator, but these changes will be reflected in the returns of the Trend Indicator going forward. We will, however, internally continue to calculate multiple versions of the model covering different transaction costs and asset-class weights and will run the same analyses described above on an annual basis.