FICC Portfolio Monthly

Unlocking "value"

What value means in credit

In our inaugural note in the Quantitative Investment Strategies space, Demystifying the credit risk premium, we provided the building blocks to explain the Credit Risk Premium. In the credit space, an investor harvests the premium between the implied default risk and the subsequently realised default risk. **In this note, we touch upon one of the key factors credit investors are fundamentally exposed to; value.**

A systematic trading strategy that looks to harvest the value factor should aim to capture the excess return from the part of the market that has the widest spreads relative to their fundamental (default) risk. A value strategy should buy credits that offer a higher credit risk premium (i.e. are relatively cheaper) and sell those that offer a low credit risk premium (i.e. are relatively expensive). The value factor is based on the belief that bonds or CDS that are inexpensive, i.e. too wide relative to default risks, outperform those credit instruments that offer a below-average and narrower spread pick-up vs. their default risk profile.

Risk aversion drives the credit value premium

We think that assets that exhibit: (i) greater volatility in companies' fundamental metrics; (ii) higher liquidity downside risks; (iii) a more highly asymmetric upside/downside risk reward and (iv) greater sensitivity to the macroeconomic cycle would see a higher contribution of the value effect. Investors typically overestimate default risks and mark-to-market volatility in the high-yield more than in the high-grade space. They also assign a higher liquidity premium on the back of potentially higher risk of fund outflows when the macroeconomic cycle deteriorates.

How to harvest value in credit

In this note we present four different ways to harvest value in credit. Firstly, we employ a **fundamentals-driven approach**, based on leverage stats for the high-grade and high-yield markets, to better reflect quality differentials between these markets.

Secondly, we employ a **beta-neutral approach** where exposures are adjusted vs. rolling historical betas, in order to harvest value in a beta-neutral way and reduce correlation to the market directionality.

We also employ an **equal notional approach** where the high-yield long and the high-grade short have equal notionals in order to capture the absolute credit risk premium gap of the two markets.

Finally, we employ a **macroeconomic cycle-driven approach** using signals from our European Credit Macro Indicator, to better align the business cycle and the beta cycle.

We present the pros and cons of each approach to harvest value in credit. We find that unlike in equities, value in credit has worked.

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Unlocking “value” in credit

Efficiently harvesting risk premia across asset classes has been one of the strongest trends in the asset management industry in recent years. Credit has seen fewer such strategies develop than in other asset classes. Higher transaction costs than for other asset classes and the fact that credit products tend to trade over-the-counter, have not helped. The growth of the more liquid (from bonds) CDS index market, with tighter bid/offer costs, has enabled greater development of investable credit factors in recent years.

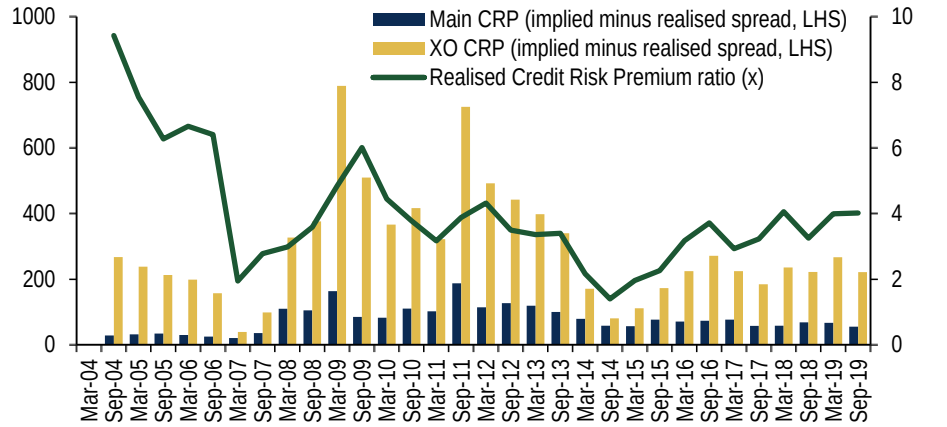
In our inaugural note in the Quantitative Investment Strategies (QIS) space, Demystifying the credit risk premium, we provided the building blocks to explain the Credit Risk Premium. In this note, we touch upon one of the key factors credit investors are fundamentally exposed to **value**. In the credit space, an investor harvests the premium between the implied default risk and the subsequently realised default risk.

A systematic trading strategy that looks to harvest the value factor should aim to capture the excess return from the part of the market that has the widest spreads relative to their fundamental (default) risk. Effectively a value strategy should buy credits that offer a higher credit risk premium (i.e. are relatively cheaper) and sell those that offer a low credit risk premium (i.e. are relatively expensive).

A measure of “cheapness” for the credit market should be driven by how large a credit risk premium a market can offer to investors to harvest. An investor should be harvesting the credit risk premium that the “cheaper” pocket can offer, vs. the credit risk premium that the more “expensive” pocket can offer.

Chart 1: HY credit has always offered a higher credit risk premium vs. IG credit

Comparing Crossover to iTraxx Main credit risk premium for the on-the-run series 5y contract



Source: BofA Global Research, Bloomberg

In chart 1 we present the credit risk premium for iTraxx Main and Crossover. We show this in spread terms by calculating the difference between (i) the credit spreads that depict the implied default risk and (ii) the realised default risk in spread terms. We find that XO has significantly higher levels of credit risk premium vs. iTraxx Main. This has historically been around the ~3.4x mark, i.e. the spread differential between implied and realised default risk for XO has been on average 3.4x that of iTraxx Main (chart 1).

The value factor is based on the belief that bonds or CDS that are inexpensive, i.e. too wide relative to default risks, outperform those credit instruments that offer a below-average and narrower spread pick-up vs. their default risk profile.

What drives the value premium?

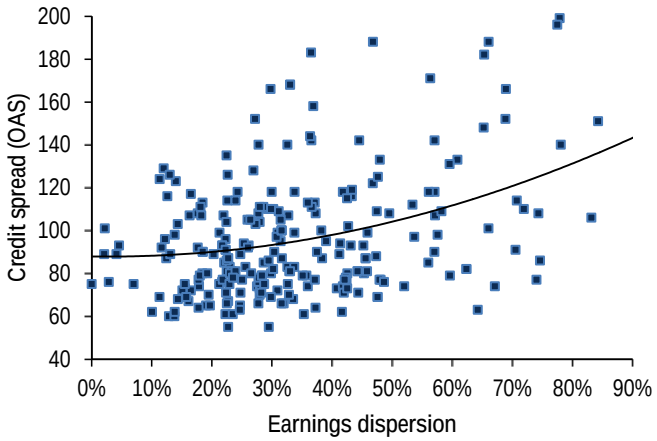
While cheaply valued assets (vs. their fundamental risk) deserve to deliver higher returns over time, why is there a premium over the risk associated with investing in higher-risk instruments in an efficient market setup? Why does high-yield outperform high-grade credit even if we apply historical leverage ratios (as demonstrated later in our report) in order to adjust for the fundamental riskiness of the former?

We think that assets that exhibit: (i) greater volatility in companies' fundamental metrics; (ii) higher liquidity downside risks; (iii) a more highly asymmetric upside/downside risk reward and (iv) greater sensitivity to the macroeconomic cycle would see a higher contribution of the value effect. This would ultimately mean that weaker names should trade at a higher credit risk premium vs. the rest of the market.

Fundamentals matter

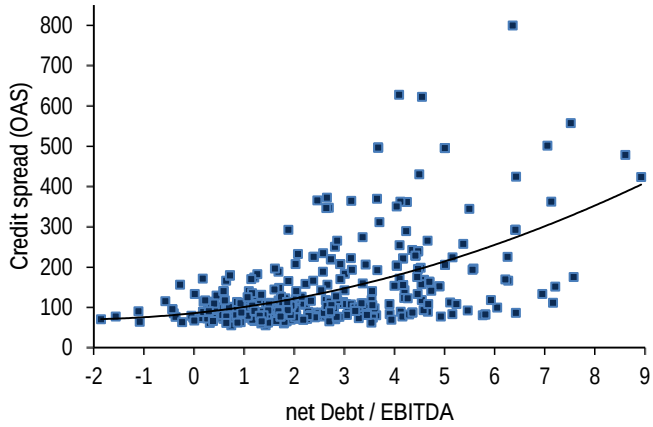
Names that trade at wider levels tend to exhibit less stable fundamental metrics. In our work we find that, for instance, the net debt/EBITDA metric has historically tended to be much more volatile for names that trade at wider spreads than for names that trade at tighter spreads. Naturally names with higher fundamental metrics volatility – and thus uncertainty – come at higher spreads.

Chart 2: The higher the earnings volatility the higher the spread but also the higher the valuation dispersion



Source: Bloomberg, ICE Data Indices, LLC. Using high-grade issuers quarterly data since 2004

Chart 3: The higher the leverage the higher the spread but also the higher the valuation dispersion



Source: Bloomberg, ICE Data Indices, LLC. Using high-grade and high-yield issuers leverage ratios over the past three years

In order to assess the impact of fundamentals on credit spreads and effectively the Credit Risk Premium, we pool a large number of high-grade and high-yield names where we can source ***net debt/EBITDA*** ratios and earnings figures. Under our microscope we have ~250 high-grade and ~100 high-yield names (a subset of the ER00 and HE00 bond indices we managed to source reliable data).

- In chart 3 we present the average net debt/EBITDA ratios over the past three years (to focus over the recent history dominated by central bank accommodative funding cost levels) vs. the current OAS levels for each of the names.
- In chart 2 we present the dispersion (standard deviation divided by average) of quarterly earnings figures (we used quarterly data since 2004 to capture different business cycles) vs. the current levels of OAS spreads for each of these names.

We find that names with higher leverage and more volatile earnings tend to trade at wider spread levels than names that trade at more moderate leverage ratios and exhibit more stable earnings. Not only that but **we find that the higher the earnings vol and the higher the leverage ratios, the larger the dispersion of the potential spread level assigned for an issuer.** That means that more stretched and/or volatile fundamentals are not only associated with wider "absolute" spreads, but also with higher valuation "uncertainty" as the range of the "fair value" of the Credit Risk Premium an investor needs to assign becomes larger. High-yield/lower-rated companies ("cheap" in terms of spreads) tend to exhibit less stable earnings and have a higher debt burden for which investors demand compensation in the form of higher spreads.

Credit investors need to assign a higher risk premium to a name that exhibits higher earnings volatility and/or higher leverage. Not only that, but there is greater "uncertainty" associated with the risk premium that needs to be assigned, as the higher the fundamental risk, the higher the risk of a negative credit event. This is key to harvesting value in the credit space. The fact that credit value "works" seems to suggest credit investors are typically over-pessimistic, or more likely, crowd into "safer" names, making them *relatively* expensive.

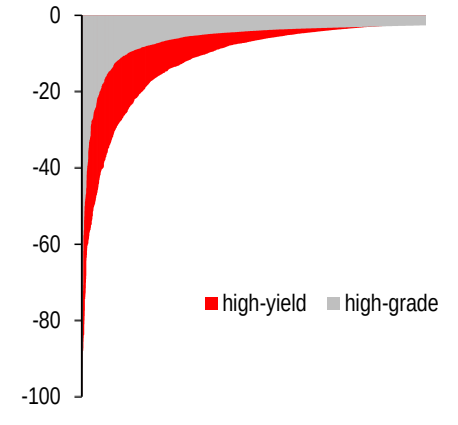
Additionally, we think that the opportunity to harvest/capitalise on the value factor stems from the fact that when issuers suffer from a negative fundamentals shock, the market typically "overreacts" and pushes spreads/prices to a much lower level (wider spreads) than fundamentals would suggest to reflect the higher valuation uncertainty (or else higher valuation dispersion) for these names with weak fundamentals.

Asymmetrical downside risks accentuate the value effect

The weaker the fundamentals, the higher the risk premium an investor needs to attribute. This is due to higher probability of a default and thus potentially steeper losses. The high-yield market suffers from highly asymmetrical risks.

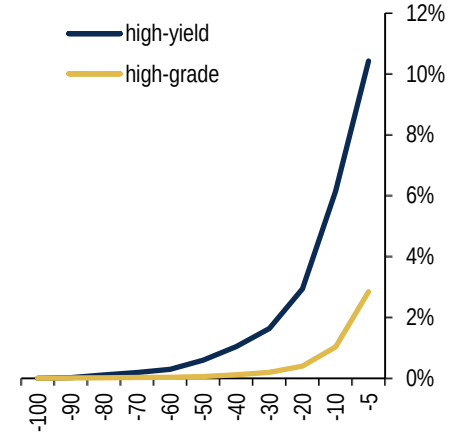
Mark-to-market (MtM) risks are higher for weaker names/pockets. As credit is a negatively convex product (as ultimately it has a predetermined upside of coupons plus par, against a much more binary and significant potential loss upon default) investors are more cognisant of the disproportionate magnitude of downside versus upside payoff.

Chart 4: A much higher proportion of the high-yield market has suffered large losses vs. high-grade



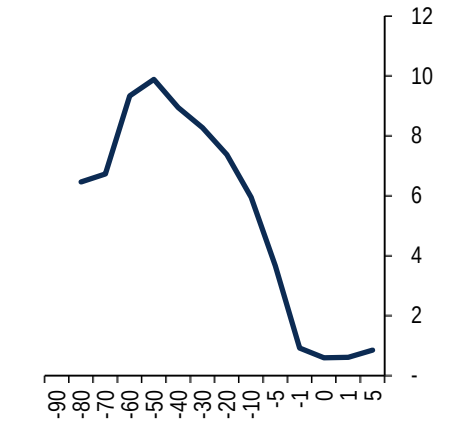
Source: ICE Data Indices, LLC; Using the ER00 and HE00 indices

Chart 5: HY names have historically had much higher occurrence of losses in the 5-70pts range



Source: ICE Data Indices, LLC; Using the ER00 and HE00 indices

Chart 6: The occurrence ratio of difference price drops is much higher in HY



Source: ICE Data Indices, LLC; HY vs. IG occurrence ratio

Looking into the bond market we find that high-yield bonds tend to overreact faster and more frequently on the downside. Charts 4, 5 and 6 illustrate our point. High-yield names tend to realise sharper losses much more frequently than their high-grade counterparts. To show that we use quarterly excess returns (to capture only the credit risk premium – away from rates). In chart 4 we provide all these quarterly excess returns by ticker since 2005. There is a striking difference between high-yield and high-grade names.

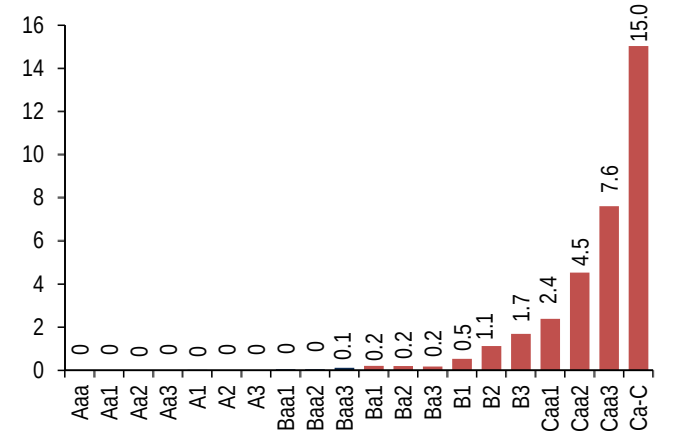
This is more clearly presented in chart 5, as we show the historical occurrence of different levels of sell-offs. We found, for instance, that high-yield names had suffered price drops of 10pts or more 6% of the quarters historically, while high-grade names had suffered similar magnitude losses only 1% of the quarters historically. **All in all, we find a much higher occurrence of "tail" MtM events.**

The high asymmetry of risks in the high-yield space is also attributed to the perception of default risk, away from just MtM. Since CDS indices were launched (16 years ago), high-grade portfolios have never experienced defaults/credit events. iTraxx Main and CDX IG 5y have never suffered an event on the on-the-run (OTR) series. On the contrary, CDX HY OTR series have suffered 26 in total, and Crossover two.

Crucially this is less than what is implied by spreads. The reason that value exists in credit is that spreads for weaker credits are too pessimistic vs. reality relative to more sound credits.

Chart 7: Jump-to-default probabilities

Global rating migration rate forecasts for next 12m (%)



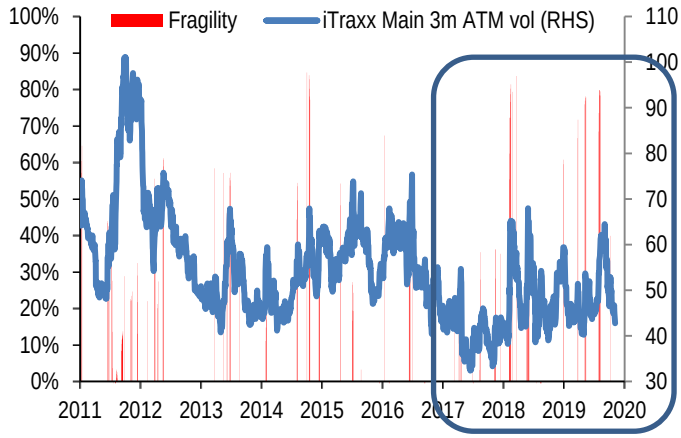
Source: Moody's

This shows that there is higher realisation of tail events among HY issuers than in the IG market. The probability of a "jump-to-default" event is remote for high-grade names. On the contrary, in the high-yield space, the risk of a credit event increases exponentially as the quality declines (chart 7).

Liquidity tends to be more "uncertain" for weaker names

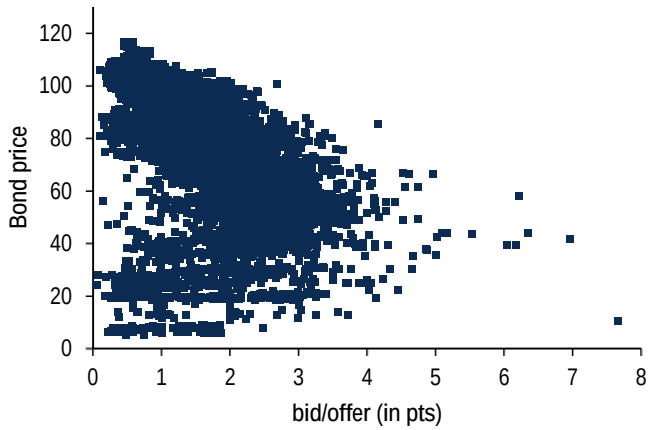
Liquidity is also a key factor. Not only is the risk of defaults higher for those issuers/bonds that have weak fundamentals and low ratings, but so is the mark-to-market volatility and the illiquidity-driven discount.

Chart 8: Liquidity shocks are becoming more frequent and sharper



Source: BofA Global Research. Options data only available since late-2010.
We measure 5-day moves for the 3m ATM vol vs. moves over the same 5-day period for the put-call skew (120-80% of the Fwd). We then calculate the 50-day rolling correlation between these two time series. We only present correlations when 5-day vol moves are higher than 5 vol points.

Chart 9: The lower the price the higher the transaction cost uncertainty



Source: Bloomberg, BofA Global Research calculations

Price action can be very sharp in periods of challenging bond market liquidity. In these cases investors tend to gravitate towards the CDS market to own protection against downside risks. In this way they tend to overestimate the price of protection they are willing to pay to own insurance against losses in pockets that are more exposed to asymmetrical downside risks (i.e. high-yield space). This ultimately results in attributing higher credit risk premia for these instruments (i.e. Crossover and CDX HY) compared with relatively "safer" ones (iTraxx Main and CDX IG).

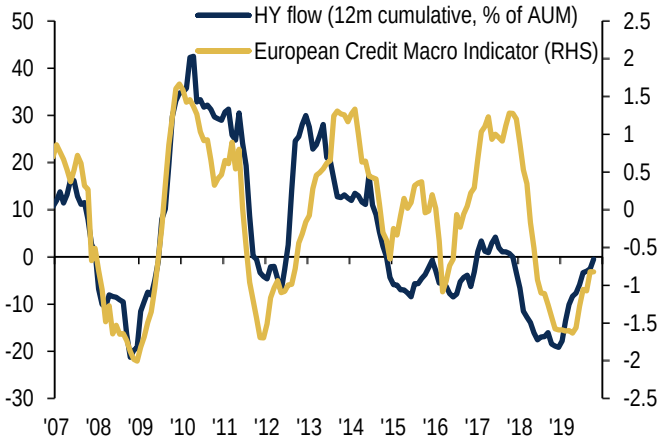
Our work shows that the **range of transaction costs becomes more uncertain the lower the price of a credit instrument is**. We pooled a large number of high-yield bonds (were data were available) that have all suffered significant price drops (more than 25pts) at some point over the past two years. In chart 9, we present the bid/offer costs for different price levels (mids) for the bonds under our microscope. We found that at higher price / tight spread levels there is a greater certainty about transaction costs. This "certainty" declines rapidly the lower the price / wider the spreads assigned to a credit.

The value effect gets amplified in a slowing macro cycle

Fundamental shocks are highly correlated to the macroeconomic cycle. Companies and assets that are more closely linked to the business cycle, i.e. high-yield credits, are more exposed to fundamental uncertainty, but also more exposed to uncertainty/volatility in fund flow terms. Fund flows "volatility" amplifies the value factor in the high-yield space that typically has weaker fundamentals.

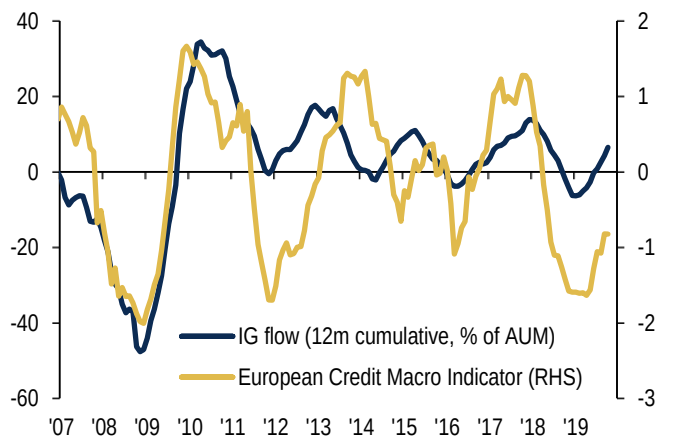
Another reason why the value factor persists is that its effects arise because negative shocks to credit fundamental trigger outflows from credit funds. Typically flows into high-yield funds are more volatile than those into high-grade ones and, more importantly, **are more correlated to the macroeconomic cycle**. The negative effects of shocks in markets that are exposed to larger downside risks are also amplified due to lower liquidity and accelerating outflows when markets sell off.

Chart 10: HY fund flows have been much more correlated to macro …



Source: BofA Global Research, EPFR Global

Chart 11: …than flow trends into high-grade funds



Source: BofA Global Research, EPFR Global

Chart 10 and chart 11 highlight that flow trends into high-yield funds are more correlated to the macroeconomic cycle than flow trends into high-grade funds. As the downside risk is much more amplified in the high-yield space, as we discussed above, **high-yield investors are much more sensitive to shifts in the macroeconomic cycle** and thus are the first to rush to the exit (or hedge). Outflows cause asset sales, which amplify the shocks' negative effects.

Additionally monetary policy accommodation and record-low funding costs have increased the levels of idiosyncratic risk, but at the same time have significantly dampened the level of systemic risk. For that very reason we still see material risk aversion to owning low-quality credits, due to their higher downside risk against a weaker macroeconomic backdrop. **The value factor is thus more apparent in more cyclical assets that are suffering from weaker fundamentals.**

Ultimately the premium to the value factor can also be viewed as "compensation" for owning macro risk. A systemic risk will harm the high-yield, higher-risk pockets of the credit market more than the "safer" ones (like high-grade) and this will more likely than not be reflected in fund flows into these parts of the market. If the outflows are rapid rather than gradual (on the back of rising systemic risks) then the amplification of the downside risk is also greater for those names/pockets that have weaker fundamentals. After all, the high-yield market is much more linked to the global growth outlook, due to its cyclicality, than its high-grade counterpart.

How to harvest value in credit

The backbone of value investing is identifying undervalued assets to be long vs. overvalued ones to be short. In the credit space, high-yield is the pocket that offers a stronger risk-reward profile, as our work showed in our "Demystifying the credit risk premium" note. **Investors typically overestimate default risks and mark-to-market volatility in the high-yield more than in the high-grade space. They also assign a higher liquidity premium on the back of potentially higher risk of fund outflows when the macroeconomic cycle deteriorates. All these factors ultimately accelerate market price action and accentuate downside risks.**

Long-only risk factor strategies are simpler to implement than long/short alternatives, though the former are directly exposed to market directionality. In order to purely access a risk factor, a long/short implementation is necessary. The key attraction is that by purely harvesting a particular factor, investors can generate strong risk adjusted returns that exhibit low correlations to the underlying market.

Optimally a long/short value factor investing systematic strategy should harvest the "mispricing" of market risk perception with a relatively low correlation to market moves. In the sections below we provide our key takeaways on some different implementations of the value factor in the CDS index market. We employ different methodologies and focus on different long/short implementations to harvest the value factor based on data from beginning of January 2007 to end of January 2020.

- **A fundamentals-driven approach**, based on leverage stats for the IG and HY markets, to better reflect quality differentials between these markets.
- **A beta-neutral approach** where exposures are adjusted vs. rolling historical betas, in order to harvest value in a beta-neutral way and reduce correlation to the market directionality.
- **An equal notional approach** where the high-yield long and the high-grade short have equal notionals in order to capture the absolute credit risk premium gap of the two markets.
- And **a macroeconomic cycle-driven approach** using signals from our European Credit Macro Indicator (When Macro Cycle met Credit Cycle), to better align the business cycle and the beta cycle.

The analysis of these strategies in this report is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the hypothetical back-tested performance of a particular strategy over the time period indicated. In future periods, market and economic conditions will differ and the same strategy will not necessarily produce the same results.

No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. In fact, there are frequently sharp differences between back-tested returns and the actual results realized in the actual management of a portfolio.

Back-tested performance results are created by applying an investment strategy or methodology to historical data and attempts to give an indication as to how a strategy might have performed during a certain period in the past if the product had been in existence during such time.

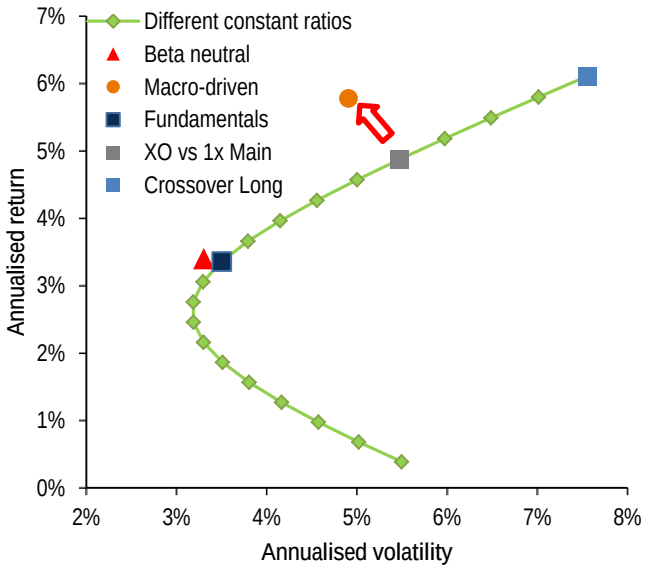
Back-tested results have inherent limitations including the fact that they are calculated with the full benefit of hindsight, which allows the security selection methodology to be adjusted to maximize the returns.

Further, the results shown do not reflect actual trading or the impact that material economic and market factors might have had on a portfolio manager's decision-making under actual circumstances. Back-tested returns do not reflect advisory fees, trading costs, or other fees or expenses.

In charts 12 and 13, we present the summary of our different value strategies in the European CDS index market. This includes the risk/reward payoff and the historical backtested performance.

Chart 12: Risk/reward profiles for all our backtested quantitative investment strategies to harvest the value factor in credit

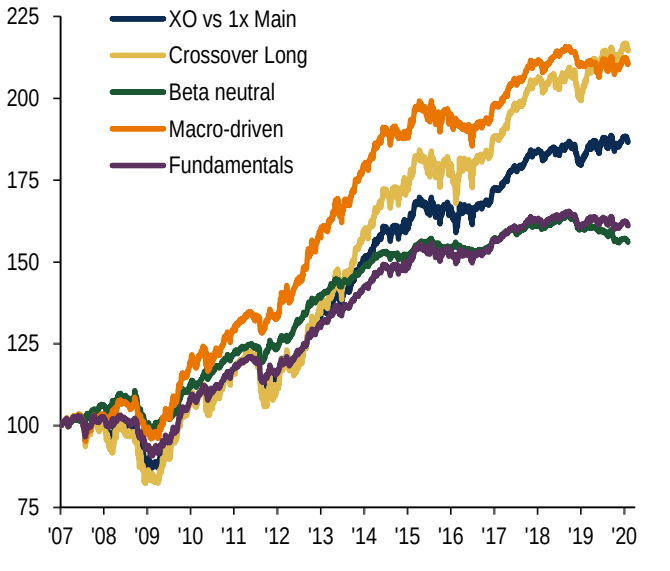
European CDS indices market (Crossover vs. iTraxx Main)



Source: Bloomberg, Markit, BofA Global Research; This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. We should highlight that the above backtest does not include transaction costs.

Chart 13: Performance trends for all our backtested quantitative investment strategies to harvest the value factor in credit

European CDS indices market (Crossover vs. iTraxx Main)



Source: Bloomberg, Markit, BofA Global Research; This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. We should highlight that the above backtest does not include transaction costs.

In charts 14 and 15 we do the same for the US CDS market. In table 1 we summarise and compare the same metrics for both the European and the US market.

Table 1: Backtested analysis of a HY long (via Crossover or CDX HY) vs. an IG short (via iTraxx Main or CDX IG) at different hedging ratios variations

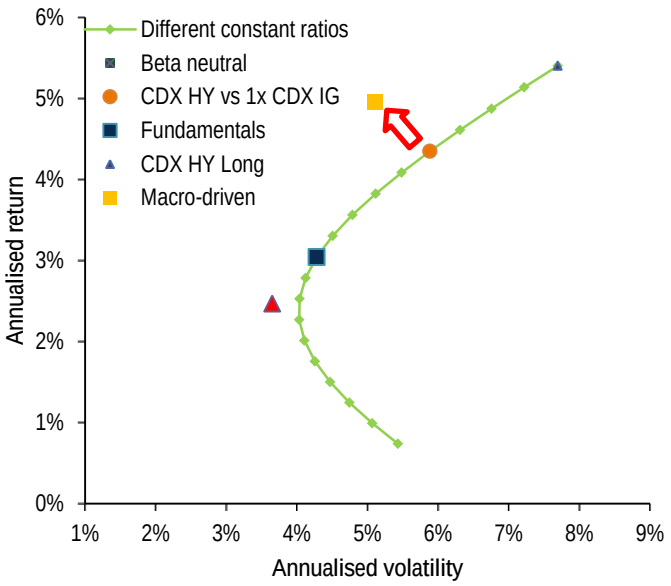
	European CDS market - Crossover vs. iTraxx Main (5y OTR)						US CDS market - CDX HY vs. CDX IG (5y OTR)					
Key stats	*XO long (1 x 0)*	*Equal notional (1 x 1)*	*Fundamental (1 x 2)*	*Market neutral (1 x dynamic)*	*Macro-driven (1 x dynamic)*	*Main long*	*CDX HY long (1 x 0)*	*Equal notional (1 x 1)*	*Fundamental (1 x 2.25)*	*Market neutral (1 x dynamic)*	*Macro-driven (1 x dynamic)*	*CDX IG long (1 x 0)*
avg hedge ratio	*0x*	*1x*	*2x*	*2.9x*	*1.4x*		*0x*	*1x*	*2.25x*	*3.1x*	*1.5x*	
Annual return	6.1%	4.9%	3.7%	3.4%	5.8%	1.2%	5.4%	4.3%	3.0%	2.5%	5.0%	1.0%
Annual volatility	7.5%	5.5%	3.8%	3.3%	4.9%	2.4%	7.7%	5.9%	4.3%	3.6%	5.1%	2.3%
Information Ratio	**0.81**	**0.89**	**0.97**	**1.03**	**1.18**	**0.49**	**0.70**	**0.74**	**0.71**	**0.68**	**0.97**	**0.45**
Max Drawdown	-20.6%	-15.8%	-12.2%	-12.0%	-11.7%	-6.6%	-29.4%	-22.6%	-16.1%	-17.4%	-18.9%	-9.8%
Calmar ratio	**0.30**	**0.31**	**0.30**	**0.28**	**0.49**	**0.18**	**0.18**	**0.19**	**0.19**	**0.14**	**0.26**	**0.10**
R-squared to IG	82%	66%	30%	4%	36%	100%	73%	53%	12%	5%	28%	100%

Source: Bloomberg, Markit, BofA Global Research; data in line with charts 13 and 15

This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. We should highlight that the above backtest does not include transaction costs.

Chart 14: Risk/reward profiles for all our backtested quantitative investment strategies to harvest the value factor in credit

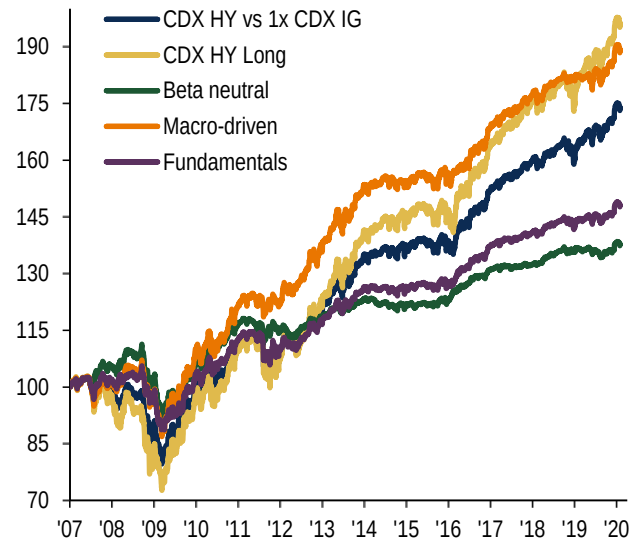
US CDS index market (CDX HY vs. CDX IG)



Source: Bloomberg, Markit, BofA Global Research; This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. We should highlight that the above backtest does not include transaction costs.

Chart 15: Performance trends for all our backtested quantitative investment strategies to harvest the value factor in credit

US CDS index market (CDX HY vs. CDX IG)



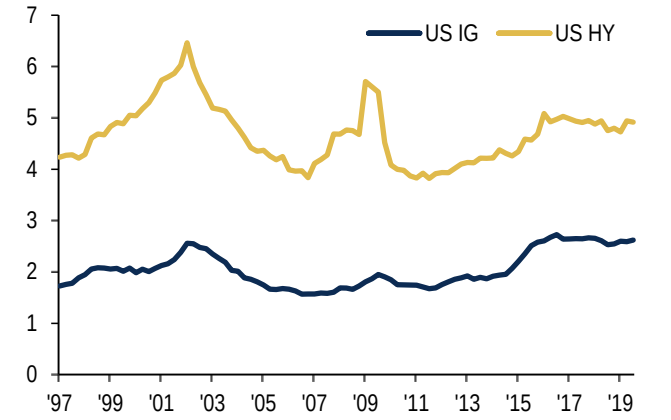
Source: Bloomberg, Markit, BofA Global Research; This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. We should highlight that the above backtest does not include transaction costs.

The company fundamentals driven approach

Our fundamentals-driven approach looks to harvest the value factor by keeping our systematic strategy's beta as close as possible to market fundamental metrics as captured by debt/EBITDA figures.

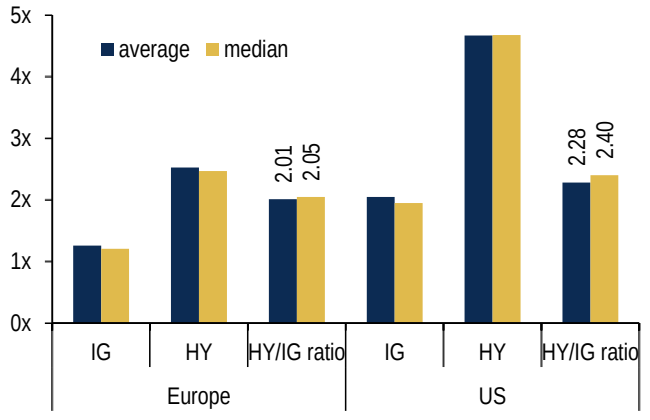
Leverage ratios are key to assessing the health of a company. Debt/EBITDA can quantify the risk of default as an issuer might be exposed to high levels of debt relative to the profitability of the company.

Chart 16: Leverage ratios for US IG and HY credit markets



Source: BofA Global Research, Bloomberg

Chart 17: Leverage ratios in European and the US IG and HY markets



Source: BofA Global Research, Bloomberg

In order to derive the historical "fundamental" ratio of a **value** long/short strategy, one should identify the historical ratio of leverage of these two pockets of risk. We pool a large universe of high-yield and high-grade issuers from Europe and the US were data

are available. In chart 17 we present a summary of the historical leverage ratios for the US and the European credit markets.

Based on these debt/EBITDA figures the average European IG credit market leverage was around 1.25x, while that for the European HY market was around 2.5x. This entails that the "fundamental" ratio of default risk of the HY vs. that of the IG market should be around 2x. Based on similar analysis we found that the ratio for the US "value" factor based on leverage ratios (fundamentally driven approach) should be around 2.25x (chart 17).

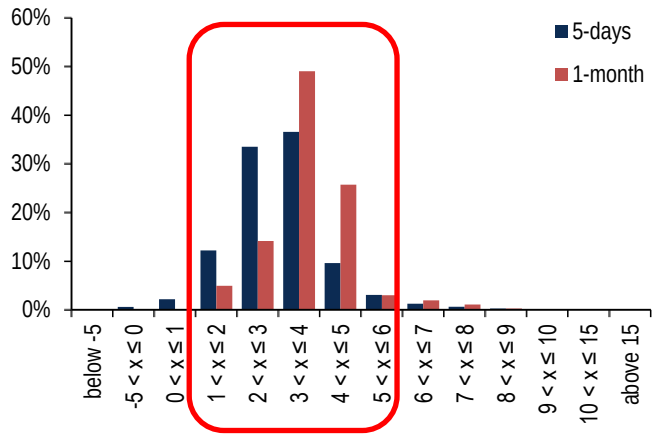
Based on these ratios we run a high-yield (via Crossover or CDX HY 5y OTR) long risk vs. short risk on the respective high-grade (iTraxx Main or CDX IG 5y OTR) CDS index. We scale the high-grade instrument's notional to the leverage metric ratios (long risk 1x Crossover vs. short risk 2x iTraxx Main and long risk 1x CDX HY vs. 2.25x short risk CDX IG). We keep this hedging ratio constant across our backtesting period. We employ ratios to the closest quarter unit.

The beta-neutral approach

Our beta-neutral approach looks to harvest the value factor by keeping our systematic strategy's beta as close as possible to beta-neutral.

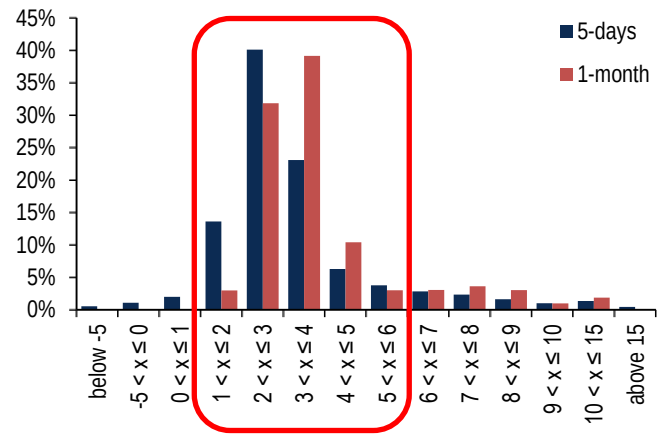
To harvest the value factor in a beta-neutral fashion, a Crossover 5y OTR (or a CDX HY) long (risk) is paired with a short (risk) on iTraxx Main (or CDX IG) 5y OTR of a notional to the tune of the average realised 5-day rolling beta over the previous calendar month. We limit the range of the iTraxx Main or CDX IG short position at between 1x and 6x of the Crossover or CDX HY long. Historically the European market market-neutral beta has been 2.9x and in the US 3.1x.

Chart 18: Realised betas of CDX HY vs. CDX IG



Source: BofA Global Research, realised return betas on a rolling 5-day or 1-month periods

Chart 19: Realised betas of Crossover vs. iTraxx Main



Source: BofA Global Research, realised return betas on a rolling 5-day or 1-month periods

We do so to avoid running a high-yield long (if the hedging ratio of Main or CDX IG is below 1x) or running a net short (if the hedging ratio is too high for the high-grade leg, above 6x). Note that according to our backtested analysis (chart 18 and 19) betas have rarely deviated from this range (either on a 5-day or 1-month rolling window basis). Also note that the realised credit risk premium in Crossover has never been higher than 6x that of iTraxx Main during our backtested period (chart 1).

We use a short rolling window (5-day) to capture abrupt market shifts and adjust the market betas accordingly. For every month we hedge the Crossover (or CDX HY) long risk leg with the average realised (5-day rolling) beta over the previous calendar month between Crossover and Main (or CDX HY and CDX IG in the US market).

The equal notional (1x1) approach

In our equal notional value harvesting approach, we use the same weights for the long risk high-yield leg and the short risk high-grade leg.

In order to backtest an equal notional long/short strategy a long of 1x notional of the high-yield instrument is matched to a 1x notional short of the high-grade instrument. As such, we access the value factor without "beta" adjusting the long to the short, but by simply applying equal weights to the two legs.

Our backtesting showed, as per table 1, that an equal notional long/short systematic strategy would have generated superior absolute returns in both the European and US CDS markets vs. the aforementioned long/short strategies (beta-neutral and the fundamentally driven approaches). Note also that in the case of the US CDS market, it would also generate superior risk adjusted returns, as information ratios are the strongest (vs. the long-only CDX HY, the beta-neutral and the fundamentally driven approaches)

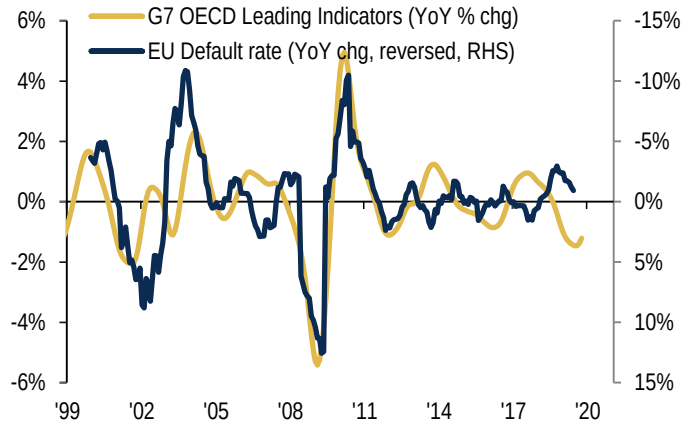
The macroeconomic cycle-driven approach

The performance of the value factor is well linked to the macroeconomic cycle. The stronger the macroeconomic cycle, the stronger the performance of the value factor in credit, as high-yield tends to outperform high-grade in periods of improving macro trends.

We have highlighted in the past that macroeconomic data provide great insights into the cycle of risk assets. Macro also helps us to understand the cycle of beta, i.e. the relative performance between higher risk vs. lower risk pockets.

Chart 20: The default cycle is highly correlated to the economic cycle…

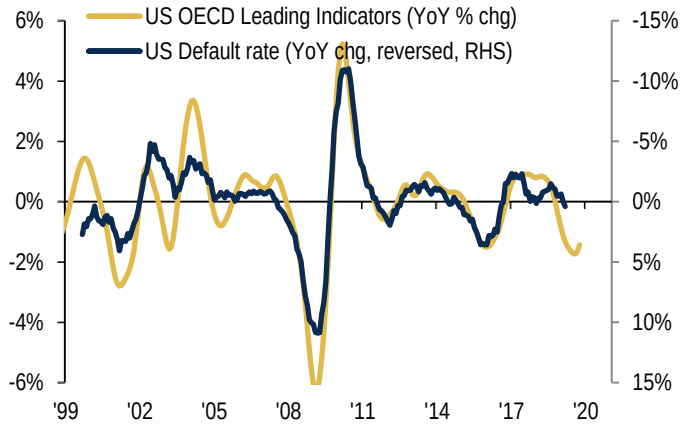
European HY defaults (12m trailing) vs. G7 OECD LIs



Source: Bloomberg, Moody's
The OECD LIs are leading by four months (we come to this result by maximizing the correlation between two time series)

Chart 21: … therefore the high-yield market (and thus the value factor) is well linked to macroeconomic trends

US HY defaults (12m trailing) vs. US OECD LIs



Source: Bloomberg, Moody's
The OECD LIs are leading by four months (we come to this result by maximizing the correlation between two time series)

This is explained by the following factors:

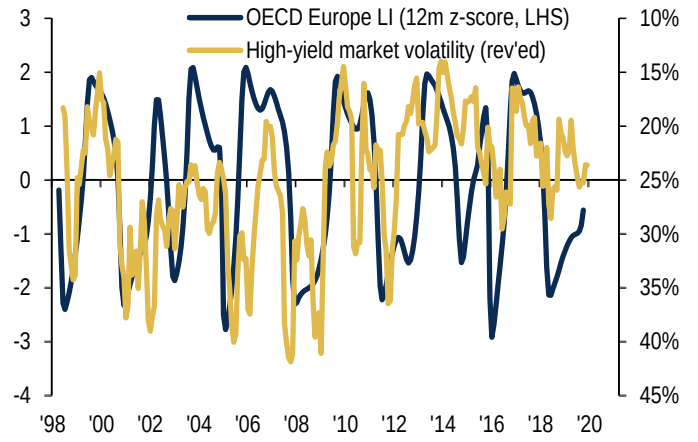
- default risks decline as the macroeconomic cycle improves (charts 20 and 21),
- high-yield market volatility is much more correlated to macroeconomic trends than high -grade market volatility (charts 22 and 23), and
- an improving macroeconomic cycle is typically linked to stronger inflows into higher-yield pockets of the credit market (charts 10 and 11). Consequently, this provides more cushion to investors to "buy-the-dip" as they have spare

capacity to add risk due to increased inflows into their funds (especially in the high-yield space). This improves their risk appetite and the feel of risk aversion.

For these reasons, we think that conceptually it makes sense to use a macro cycle-generated signal to be able to adjust/time our value factor framework.

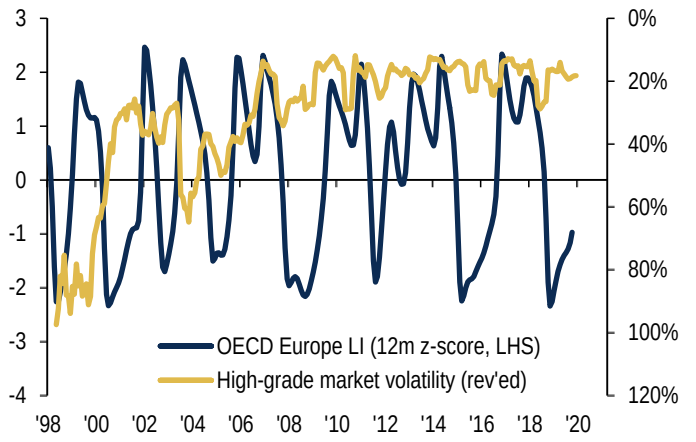
So far we have seen that the beta/market-neutral approach has provided a stronger risk-reward compared with an equal notional long/short systematic strategy (long risk 1x XO vs. short 1x iTraxx Main), while exhibiting very low correlation to the market direction. However, this comes at the expense of absolute returns as a beta-neutral value factor strategy would typically provide lower return vs. a long/short value strategy at equal notionals (long risk high-yield vs. short 1x high-grade).

Chart 22: High-yield market volatility is more correlated to macroeconomic data trends (correlation of 40%)...



Source: Bloomberg, ICE Data Indices, LLC
Data since 1998. Using 100 business days realised volatility for the HY bond index (HE00)

Chart 23: ... than high-grade market volatility (correlation of 0%)



Source: Bloomberg, ICE Data Indices, LLC
Data since 1998. Using 100 business days realised volatility for the IG bond index (ER00)

For those investors that want to find a balance between (i) a beta-neutral value factor investing strategy that achieves strong risk-reward ratios with low directionality bias and (ii) an equal notional hedged long/short (like Crossover long vs. 1x iTraxx Main short) systematic strategy that provides stronger performance but has higher market correlation, we found that using macro signals can improve risk adjusted return while also improving absolute returns.

Our backtesting analysis, as per table 1, shows that a well-timed hedged long in high-yield CDS indices (Crossover or CDX HY) via their high-grade counterparts (iTraxx Main and CDX IG) does very well, and actually increases not only the risk/reward profile, but also the absolute performance. We effectively increase the hedging ratios from 1x to the market-neutral one when it is justified/warranted by the macro cycle

Methodology

In order to identify the periods to increase the hedging ratio to that of the beta-neutral approach vs. keeping it at 1x (equal-notional approach) we use our Indicator (When Macro Cycle met Credit Cycle). For the months where our Indicator is negative and declining we assign the beta-hedging ratio from our beta-neutral approach. For all other periods (positive, or negative but increasing level for our indicator) we just employ an equal notional hedge.

For example in order to determine the level of the beta, i.e. the hedging ratio for the iTraxx Main (CDX IG) leg vs. Crossover (CDX HY) long, for the month of October 2019, we calculate:

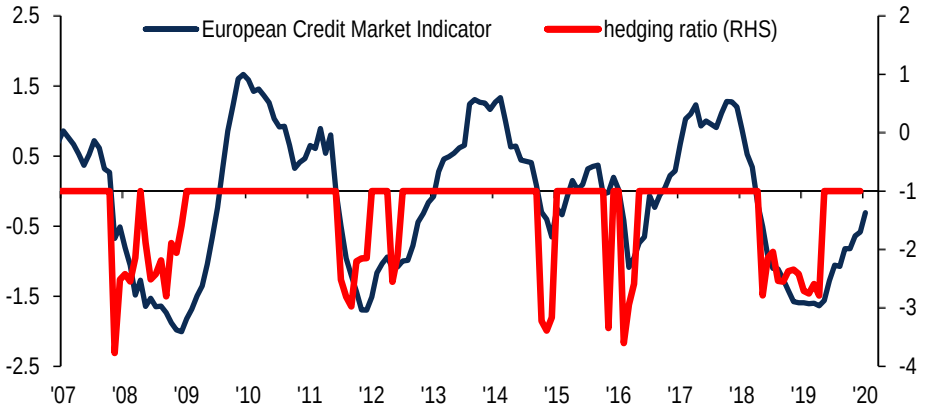
- the average of the levels of our Indicator for October (based on data available by end of September) and September 2019 (based on data available by end of

August). If the average of the two prints is negative (i.e. our Indicator is in negative trend territory) **and**

- the average of the prints of our Indicator for August and September are higher than the print for October (i.e. the trend is deteriorating further),

then we apply the hedging ratios from the beta-neutral approach. If both of the above conditions are not met, then we apply an equal notional hedge (1x long Crossover or CDX HY vs. 1x short iTraxx Main or CDX IG).

Chart 24: Hedging ratios according to trends of our Indicator



Source: BofA Global Research, Bloomberg, ICE Data Indices, LLC; Note that a negative (positive) reading reflects deteriorating (improving) trends. This performance is back-tested and does not represent the actual performance of any account or fund. Back-tested performance depicts the theoretical (not actual) performance of a particular strategy over the time period indicated. No representation is being made that any actual portfolio is likely to have achieved returns similar to those shown herein. The shaded area represents backtested results from January 2004 – March 2019. The un-shaded area represents actual performance since March 2019. Backtesting is hypothetical in nature and reflects application of the screen prior to its introduction; it is not intended to be indicative of future performance. The indicator identified as European Credit Macro Indicator above is intended to be an indicative metric only and may not be used for reference purposes or as a measure of performance for any financial instrument or contract, or otherwise relied upon by third parties for any other purpose, without the prior written consent of BofA Global Research. This indicator was not created to act as a benchmark..

In chart 24, above, we present the hedging ratios that our Indicator would direct us to employ in our backtesting analysis between the high-yield (Crossover) long and the short on the high-grade (iTraxx Main) instrument. In periods where the Indicator was declining and in negative territory, we would employ a market neutral beta, while in all other cases we would employ an equal notional hedging ratio.

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