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FICC Research
Quantitative Portfolio Strategy
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Credit spread risk and Duration Times Spread (DTS) during COVID-19

- The DTS (Duration Times Spread) measure of credit exposure we first introduced in 2005 proposes a simple and effective way to measure the risk of a credit portfolio as a product of its DTS and the volatility of proportional spread changes. Historically, DTS-based models were better able to predict credit market risk than alternative methodologies, including in the 2008 crisis.
- In light of the COVID-19 market sell-off, we separately analyse the two elements contributing to the volatility of credit excess returns: DTS exposure and spread volatility.
- DTS exposures of credit markets roughly doubled in February-March 2020 compared to the benign environment of the previous three years, reaching or exceeding levels previously observed during the European Sovereign Crisis in 2011. DTS levels observed in 2008-09 were significantly higher.
- However, the speed of the recent spread widening has been unprecedented. We use rolling volatilities of daily relative spread changes to show the associated speed of volatility pick-up.
- When applied cross-sectionally, DTS continues to provide an excellent tool for identifying the relative risk of different bonds. We show that through the current crisis, both the volatility of daily excess returns and the magnitude of month-to-date excess returns have been proportional to DTS.
- While credit returns observed in February and March 2020 clearly represent extreme tail events for most credit risk models, we show that the DTS-based approach is able to quickly adapt to the volatile market environment as wider spreads translate into higher portfolio risk via its DTS exposure.

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Changes in DTS exposures across credit markets

In 2005, we introduced a simple and elegant way to measure risk of a credit portfolio as a product of its Duration Time Spread (DTS) exposure and the volatility of proportional spread changes[1]. We also documented empirically that credit spreads tend to change proportionally to their level, so that the volatility of relative spread changes remain relatively stable over time.

Historically, DTS-based models have been able to predict credit market risk better than alternative methodologies , including in volatile periods[2]. In light of the recent COVID-19 crisis, we separately analyse the evolution of DTS exposures as well as respective volatilities of proportional spread changes across credit markets.

Global credit markets experienced a sharp increase in spreads in March 2020. Spreads of the US and Euro IG markets widened to 295bp and 241bp, respectively, as of 27 March 2020 (Panel A of Figure 1). This led to a significant rise in DTS exposures of corporate bond portfolios.

Indeed, the DTS exposure of the Euro IG index increased to 12.2 yr x % (Panel B of Figure 1), a level not seen since the European sovereign crisis of 2011. The US IG index experienced an even larger jump in credit exposure[3], significantly exceeding levels observed during 2011 (the Euro sovereign crisis) or 2016 (the oil crisis).

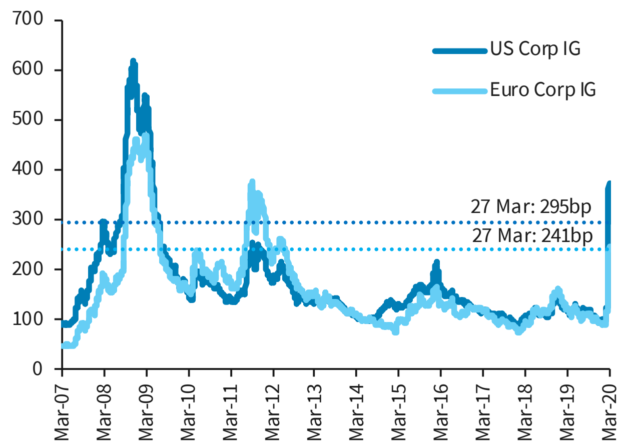
Higher spreads and DTS levels of the US Corp index have been observed only during the 2008 crisis.

FIGURE 1

Evolution of OA spreads and DTS of Bloomberg Barclays Corporate Indices

PANEL A

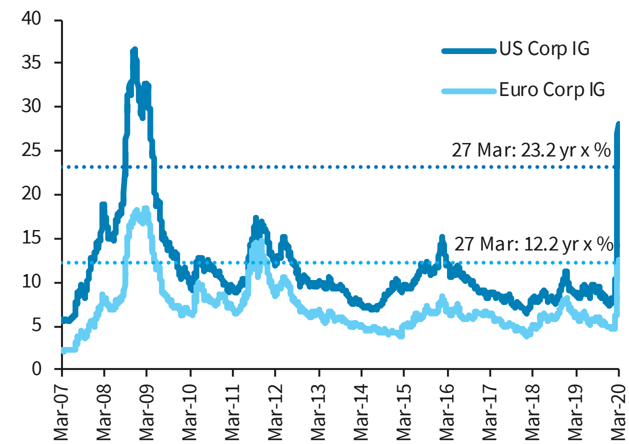
Historical OA spreads, bp



Source: Bloomberg, Barclays Research

PANEL B

Historical DTS, yr x %



Source: Bloomberg, Barclays Research

[1] See the reprint of the original publication: *DTS (Duration Times Spread): A New Measure of Spread Exposure in Credit Portfolios*, Barclays Research, February 2009.

[2] See *DTS (Duration Times Spread) in Credit Crunch: Did it Live Up to Expectations*, Barclays Research, April 2009.

[3] Duration of the US corporate index is significantly higher than that of the European one. Indeed, modified durations of the US and Euro corporate indices were 8.15 and 6.0 years respectively as of 28 February 2020. This, and higher spread levels, explain the difference in observed DTS exposures between the US and European markets.

Other credit markets and instruments experienced drastic increases in their DTS during March 2020 as well (Figure 2). The US IG market experienced a significantly larger change than its European counterpart owing to its longer duration, while DTS levels of the US and Euro HY markets are comparable.

Similar exposure increases occurred for synthetic instruments as shown at the bottom panel of Figure 2. The recent peak DTS levels are similar for US and European synthetic indices.

Exposures across credit markets matched or exceeded those observed during the 2011 Euro sovereign crisis.

FIGURE 2
Average DTS of corporate bond and CDS indices

	27-Mar-2020	Last three years	2007-20	Fin crisis 2008	Euro crisis 2011	Oil crisis 2016
US Corp IG	23.2	8.4	11.5	33.8	15.8	13.6
US HY	38.1	13.7	23.2	70.5	31.7	32.6
Euro Corp IG	12.2	5.7	7.1	17.6	12.5	7.6
Euro HY	31.2	14.2	20.3	58.0	30.6	21.2
CDX.IG 5Y	4.8	2.9	4.1	9.5	6.1	5.0
CDX.HY	25.7	15.1	18.8	30.5	26.1	21.3
iTraxx.EUR 5Y	4.8	3.1	4.1	7.6	8.0	4.7
iTraxx.XO	23.3	13.3	17.0	27.3	25.0	17.4

Note: DTS of synthetic indices are calculated using CDS spreads and DV01.
Source: Bloomberg, Barclays Research

The increase in DTS exposure did not occur uniformly across industry sectors as some industries were affected more severely by the crisis than others. Panel A of Figure 3 reports the increases in DTS of US IG by sector from 28 February to 27 March. Energy and Financing are the two most affected sectors. In fact, DTS of the Energy sector exceeded levels observed at the peaks of the 2016 (oil) or 2008 (financial) crises.

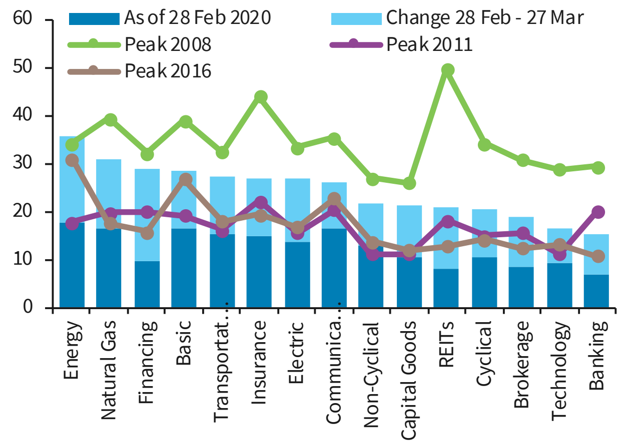
Panel B of Figure 3 shows average annual DTS contributions of various sectors in 2007-2019 and compares them to those observed on 27 March 2020. There have been large increases in the DTS contributions of major industry sectors.

FIGURE 3

DTS of the Bloomberg Barclays US Corp IG index by sector

PANEL A

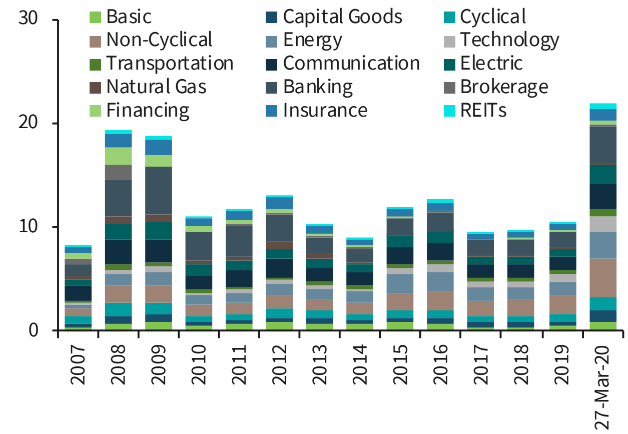
DTS of industry sectors



Source: Bloomberg, Barclays Research

PANEL B

Average annual sector DTS contributions



Source: Bloomberg, Barclays Research

Credit spread volatility during COVID-19

The changes in DTS exposures across credit markets reported in Figure 2 indicate that market spread risk more than doubled from the relatively benign environment observed in the last three years (2017-19). These exposure increases, however, were amplified by the unprecedented speed of spread widening. Indeed, spreads of US IG widened by more than 200% in March as illustrated in Figure 4. For comparison, in *DTS (Duration Times Spread): A New Measure of Spread Exposure in Credit Portfolios*, we documented a long-run monthly relative spread volatility of only 10%.[4] Such a sharp increase in credit spreads likely exceeded any ex-ante risk forecasts of various credit risk models, representing an extreme tail event. Even in the financial crisis of 2008, the spread widening occurred at a significantly slower pace (Figure 4).

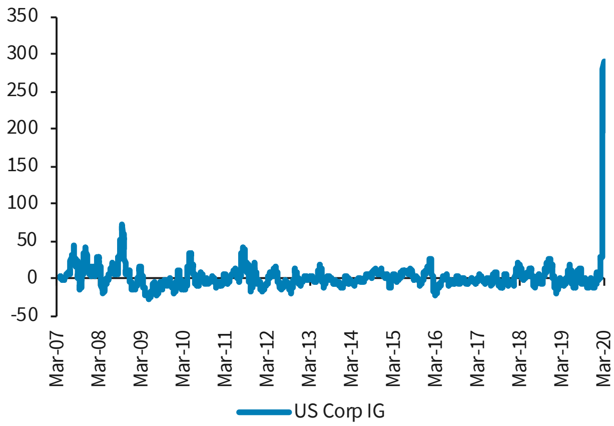
[4] Volatilities of monthly relative spread changes in the period 2007-2020 were 13% for the US Corp IG and 17% for CDX.IG 5 year on-the run index.

FIGURE 4

Monthly relative changes in credit spreads

PANEL A

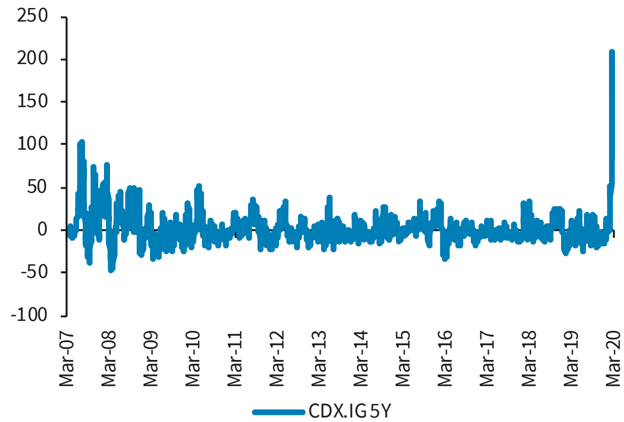
Bloomberg Barclays US Corp. IG



Source: Bloomberg, Barclays Research

PANEL B

CDX.IG 5Y On-The-Run Index



Source: Bloomberg, Barclays Research

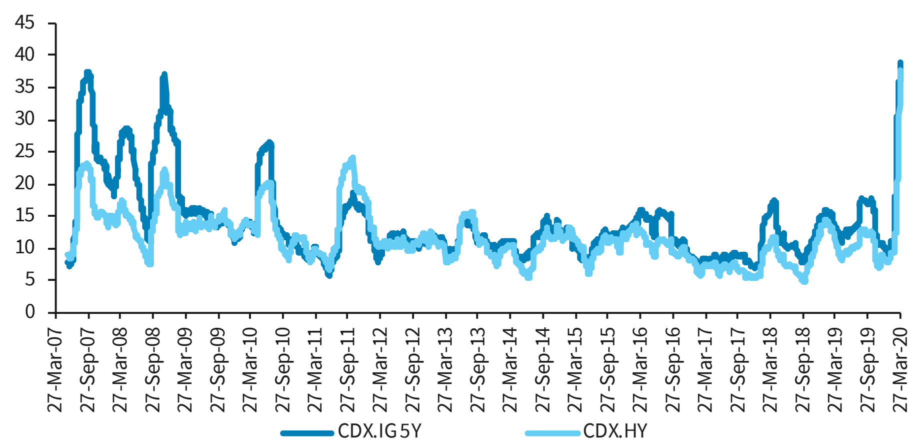
Figure 5 illustrates the evolution of relative spread volatilities of CDX.IG and CDX.HY estimated in rolling 60-day windows of daily relative spread changes[5]. Spread volatilities jumped almost three-fold: from 10% and 9% in the beginning of February to 39% and 38% in March. Such a drastic magnitude of volatility increases are comparable to the 2008 crisis.

While we can conclude that risk measures based on either absolute or relative spread changes, coupled with spread duration or DTS exposures respectively, would struggle to anticipate the magnitude of the recent market events, models based on DTS are usually better suited to capture market changes.

Indeed, widening spreads are directly incorporated into DTS exposure measures and, therefore, into higher risk estimates based on DTS. As a result, DTS-based models adjust to the market condition faster than alternatives based on volatility of absolute spread changes.

FIGURE 5

Monthly volatilities of the percentage spread changes estimated from rolling 60-day percentage daily spread changes



Source: Barclays Research

[5] We used synthetic CDS credit indices for this exercise as they are significantly more liquid than their corporate bond counterparts. Daily returns of the latter are likely to be subject to stale pricing issues due to inferior liquidity.

Where DTS truly shines is in its ability to distinguish between more and less risky securities. When applied cross-sectionally, bonds with higher DTS tend to exhibit greater risk – both systematic and idiosyncratic. When credit spreads move systematically, they do not tend to move in parallel. Bonds with wider spreads tend to widen by more; hence bonds with greater DTS tend to have excess returns of greater magnitude. This is illustrated in Figure 6, which shows both volatility of daily excess returns and cumulative excess returns for the month bucketed by DTS.

In Figure 6 Panel A, we group bonds into twenty different buckets based on beginning-of-day DTS levels and measure the daily return of each group. We then measure the volatility of these daily excess returns over the course of each of the past three months. In each case, we find that the volatility of excess returns is roughly proportional to DTS. In March, not only did volatility increase across the curve, but the sensitivity of volatility to DTS increased significantly as well.

In Figure 6 Panel B, we group bonds based on beginning-of-month DTS, and plot the average month-to-date excess return and their dispersion for March 2020 for each group. We find that while excess returns have been negative across the board, their magnitude has clearly been proportional to DTS. Additionally, we find that excess return dispersion also increases with DTS, indicating that higher DTS bonds tend to have higher idiosyncratic volatility.

In Figure 7, we compare the ability of two alternative risk model specifications to anticipate magnitude of credit returns during COVID19. As the crisis period is relatively short, we use daily returns of CDS indices, which have significantly better liquidity than corporate bond markets, *normalised* by ex-ante volatility estimates.

For the DTS model, we calculate return volatility as a product of DTS and volatility of relative spread changes of an index. The volatility is estimated using daily relative spread changes over the previous 60 days.

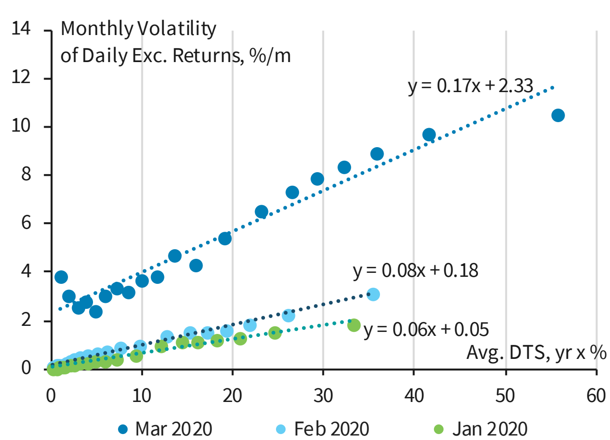
For the alternative (naive) approach, we estimate return volatility directly from index daily returns over the previous 60 days. This approach slowly adapts to changes in the volatility environment as increases in credit spreads are not immediately reflected in the risk estimates.

FIGURE 6

Magnitude of excess returns in US IG remained a linear function of DTS in March 2020

PANEL A

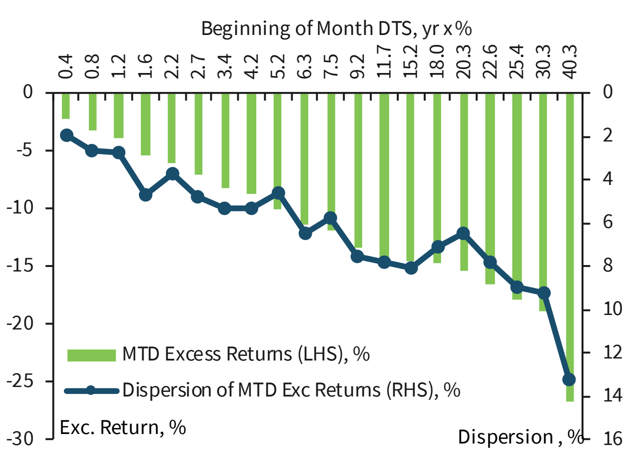
Volatility of daily excess returns in US IG, by DTS, per month



Source: Bloomberg, Barclays Research

PANEL B

Month-to-date excess returns and their cross-sectional dispersion in US IG by DTS, 27 March 2020



Source: Bloomberg, Barclays Research

The risk model that produces less extreme normalised index returns is able to anticipate their magnitude better. From this perspective, a DTS-based model seems to be superior as it adapts faster to the volatile market environment, so that subsequent index returns appear less extreme from the perspective of forecasted volatility.

For example, in Panel A of Figure 7, the initial return shock on 25 February comprised -9 standard deviations for the CDX.IG 5Y index. For both models (DTS-based and rolling return volatility) this represented an extreme tail event.

However, DTS exposure of the DTS-based model quickly increased and translated into higher subsequent volatility estimates as the index spread widened. As a result, the next extreme event on 9 March constituted only -7 standard deviations for the DTS-based model against -10 standard deviations for the outright model based on the volatility of historical index returns. Panels B, C, and D show similar results for CDX.HY, iTraxx.EUR, and iTraxx.XO.

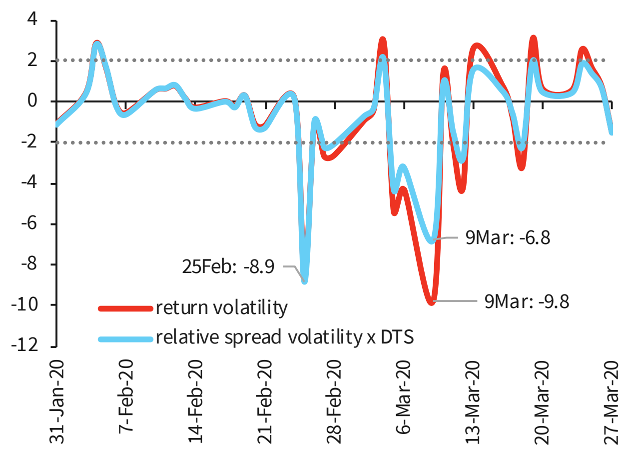
We conclude that DTS-based models adapt faster to changing market conditions. In our view, investors should continue using DTS to assess risk of their credit portfolios.

FIGURE 7

Daily CDS index returns normalised by predicted volatility using either rolling 60-day volatility of daily returns or DTS with rolling 60 day volatility of daily relative spread changes

PANEL A

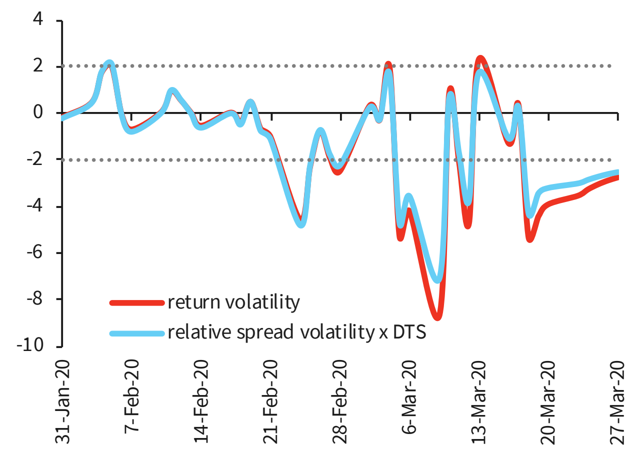
CDX.IG 5Y



Source: Bloomberg, Barclays Research

PANEL B

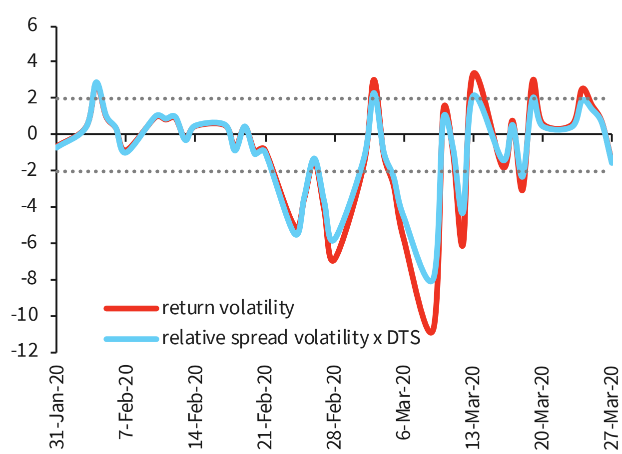
CDX.HY



Source: Bloomberg, Barclays Research

PANEL C

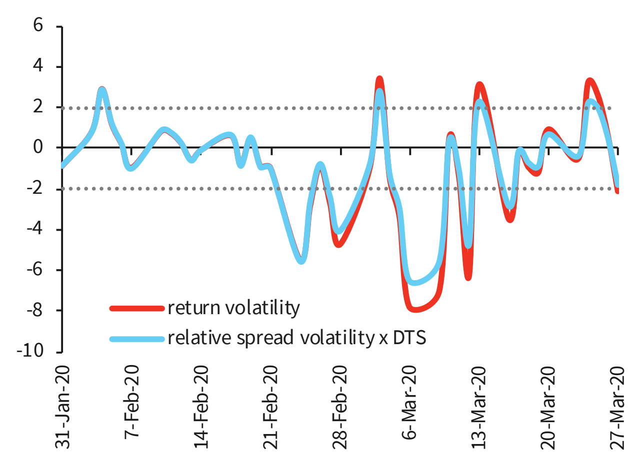
iTraxx.EUR 5Y



Source: Bloomberg, Barclays Research

PANEL D

iTraxx.XO



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