

European Credit Strategy

Hanyi Lim +44 (0) 20 3555 0397 hanyi.lim@barclays.com Barclays, UK

Soren Willemann +44 (0) 20 7773 9983 soren.willemann@barclays.com Barclays, UK

US Credit Strategy

Bradley Rogoff, CFA +1 212 412 7921 bradley.rogoff@barclays.com BCI, US

Scott Schachter +1 212 526 9716 scott.schachter@barclays.com BCI, US

Steve Wang +1 212 526 4620 steve.wang2@barclays.com BCI, US

Rumble II: EUR vs. USD HY bonds: 1: nil

We prefer EUR HY to USD HY given attractive hedged yield and spread pick-ups and we would rather be positioned in a lower beta market given the rally YTD, downside risks ahead and our base case for some spread widening by year-end in both markets. We caveat that our preference rests on our base case assumption for eurozone and global growth to be slowing but not recessionary in the next 12 months, as in such an environment, demand for yields and unattractive hedging costs for USD-assets should keep technicals relatively supportive for EUR vs. USD HY.

Contender profiles: EUR HY vs USD HY

On a hedged basis, EUR HY have looked more attractive than USD HY since the second half of last year (Figure 1 and Figure 2) and, despite recent compression, the average pick-up across rating buckets (BB to CCC) is still 1.2% on a hedged-yield basis and 120bp on a spread basis (Figure 10) for EUR HY vs USD HY. The headline index yield and spread pick-up for the EUR HY vs USD HY look lower (at +0.2% and +7bp respectively) due to the skew driven by the BBs-majority composition of the EUR HY index, while the USD HY index (Figure 5) has a much larger percentage (by c.20%) of single Bs and CCC bonds. ¹

The pick-up in hedged yield and spreads for EUR HY vs USD HY rose in the later part of last year for two reasons i) the rise in USD hedging cost and ii) underperformance of EUR HY vs USD HY spreads for most of 2018 except the fourth quarter.

The rise in hedging costs isn't recent news: it began when the Fed started its hiking campaign in late 2015, which over time caused a divergence between USD and EUR Libors. This, coupled with a climb in cross-currency basis towards the end of 2017 and again at the start of 4Q 18, saw annualised 3m EURUSD hedging costs for non-USD investors rise from sub-1% at the close of 2015, to 2.2% at the end of 2017 and to a peak of 3.6% in mid-November last year, before gradually falling to 3.1% currently (Figure 3). For a full discussion on cross-currency hedge dynamics and estimating forward FX hedge costs, please see Forward thinking, 20 April 2018.



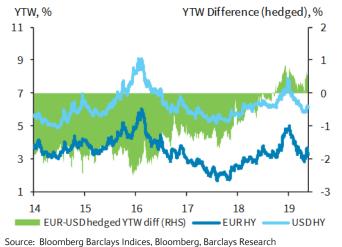
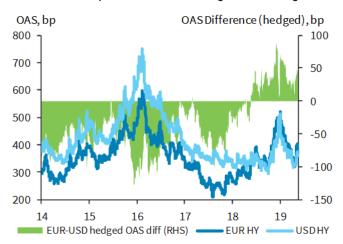


FIGURE 2 EUR vs. USD HY spread differential, hedged vs. unhedged



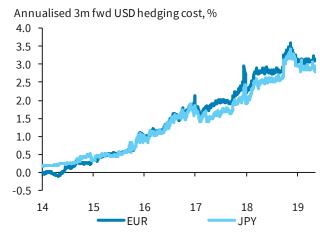
Source: Bloomberg Barclays Indices, Bloomberg, Barclays Research

This document is intended for institutional investors and is not subject to all of the independence and disclosure standards applicable to debt research reports prepared for retail investors under U.S. FINRA Rule 2242. Barclays trades the securities covered in this report for its own account and on a discretionary basis on behalf of certain clients. Such trading interests may be contrary to the recommendations offered in this report. PLEASE SEE ANALYST CERTIFICATIONS AND IMPORTANT DISCLOSURES STARTING AFTER PAGE 9

¹ All references made to "EUR HY" or "USD HY" indices in this note refer specifically to the Bloomberg Barclays EUR (or $\ensuremath{\mathsf{USD}})$ HY index ex-financials and hybrids but includes debt collectors.

FIGURE 3

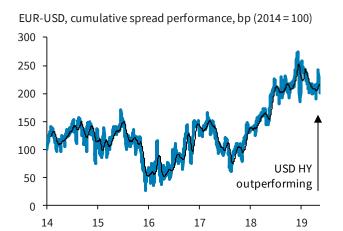
USD-EUR and –JPY hedging costs rose steadily over the latest Fed rate hiking cycle until the recent pause



Source: Bloomberg, Barclays Research

FIGURE 4

USD HY strongly outperformed EUR HY between 4Q '17 to the start of 4Q '18



Note: Trend line shows rolling 22 trading days' average. Source: Bloomberg Barclays Indices, Barclays Research

Secondly, the EUR HY market also underperformed USD HY for much of 2018 (Figure 4), particularly in the first three quarters, driven by slowing Eurozone growth (vs strong US activity) and uncertainties caused by geopolitical risks such as Italy and Brexit weighing on sentiment and business confidence. The compression of spreads however did come to an abrupt end late in 4Q 18 as concerns on trade wars, external demand weakness, tighter financial conditions and a partial US government shutdown all weighed on market sentiment and the USD HY market saw large outflows (Figure 7).

EUR HY outperformed USD HY in 4Q 18, which was not surprising as Figure 6 shows EUR HY market excess returns are of a lower beta to the USD HY market historically. In part, this is explained by the higher quality composition of the EUR HY index, which also explains the historically low average trailing default rate in European vs US HY bond markets (averages since March 2000 are 4.7% and 1.2% for the US and European markets respectively; since 2014, the averages are 3.4% and 2.5% respectively and the current 12-month trailing default rate for European speculative bonds is 0.9% compared to 2.7% in

FIGURE 5

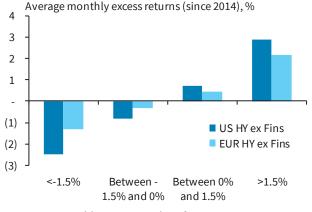
EUR vs. USD HY ex-fin markets: EUR market is smaller, but have better average rating and lower trailing default rate

Index	EUR HY ex-fins	USD HY ex-fins
Currency	EUR	USD
Amt Outstanding	€222bn	\$1,127bn
# of Bonds	419	1,732
# of Issuers	238	806
Average Issue Size, €/\$mn	530	651
Duration	3.3	3.4
Rating Mix	BB 63%, B 29%, CCC 8%	BB 42%, B 41%, CCC 15%
Top Three Sectors	Comm 28%, Cons Cyc 18%, Cap Goods 14%	Comm 22%, Cons Cyc 17%, Energy 16%
LTM Default Rate (Moody's)	0.9%	2.7%

Source: Bloomberg Barclays Indices, Moody's, Barclays Research

FIGURE 6

The average monthly excess returns for EUR HY have been of a lower beta to USD HY



Mthly Exc. Ret Buckets for US HY ex. Fin

Source: Bloomberg Barclays Indices, Barclays Research

FIGURE 7

Strong retail outflows from USD HY in 4Q '18

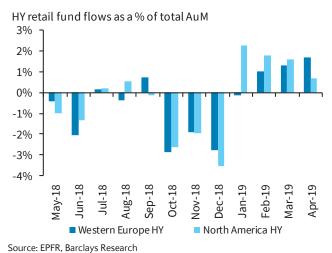
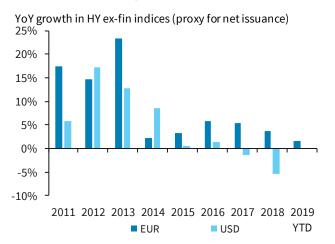


FIGURE 8

EUR vs. USD HY market growth



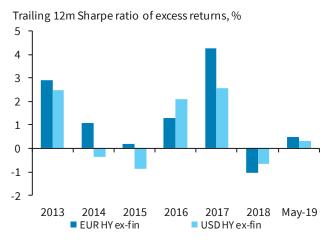
Source: S&P LCD, Bloomberg, Barclays Research

the US). A more accommodative market to credit investors in Europe compared to a more equity-friendly market in the US has likely also contributed to the higher average default rate in the US.

YTD, on a volatility-adjusted basis (Figure 9), EUR HY has returned more than USD HY. This is despite the flat USD HY growth YTD (having shrunk in the last couple of year (Figure 8)), though gross issuance has been stronger in USD HY than EUR HY (+1% and -19% respective YTD y/y growth; with the EUR market until recently seeing scarce B or CCC-rated issuance) and inflows, as a percentage of the size of the respective markets, have been marginally stronger into the European market. We expect demand for EUR HY bonds to be structurally supported by i) low core bond yields in Europe and Japan, and ii) unfavourable hedging costs to purchase USD-assets.

FIGURE 9

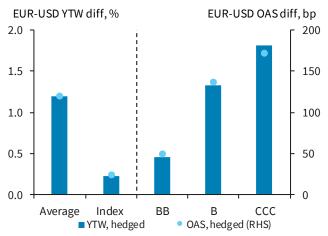
EUR vs. USD HY: Historical annual excess returns (adjusted for volatility)



Source: Bloomberg Barclays Indices, Barclays Research

FIGURE 10

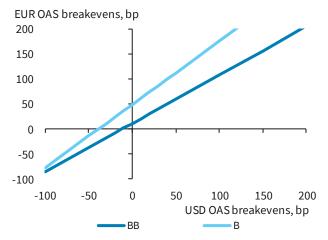
Current average yield and spread pick-ups are higher than at the index level due to the rating composition of indices



Source: Bloomberg Barclays Indices, Barclays Research

FIGURE 11

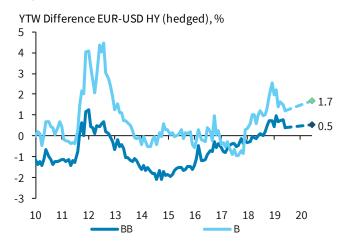
EUR HY BBs and Bs can widen 12bp and 54bp, respectively, (if USD spreads remain flat) to still breakeven on a yield basis



Source: Bloomberg Barclays Indices, Barclays Research

FIGURE 12

Breakeven levels for EUR HY vs. USD HY BBs and Bs on a hedged yield basis in a historical context



Source: Bloomberg Barclays Indices, Barclays Research

Valuation: On a hedged basis, EUR HY is a better carry

As noted above, and shown in Figure 10, the current hedged yield and spread pick-up for EUR HY vs USD HY bonds look attractive in absolute terms but also relative to history (Figure 1 and Figure 2).

What does this pick-up 'buy' in terms of buffer against further European weakness? In Figure 11 we show that the relative spread widening/tightening we can afford to see in the EUR HY vs. USD HY market in the next 12 months for the relative hedged yield of EUR HY to breakeven with USD HY.

EUR HY BBs and Bs can widen 12bp and 54bp, respectively, before the current carry of 0.5% and 1.2% for EUR-USD HY BBs and Bs trade, respectively, will be eroded completely. Conversely, suppose EUR HY does not move for 12 months, for USD HY to break even on a currency-hedged basis, US BBs would need to tighten 11bp and US Bs would need to tighten 39bp.

Note that we are agnostic of whether the moves come from government bond yields or HY spreads themselves. This means that for the case of US Bs, we need to see spreads tighten 39bp more than whatever rise in US treasury yields which is likely to happen amid this rally.

How do these break-evens look in a historical context? Suppose USD HY does not move and EU BBs and Bs widen to break even on a total return basis to the levels from above, where will US-EU BB and B differentials be? We show these "break-even equivalent differentials" in Figure 12.

This illustrates that if Europe was to experience another sovereign crisis a la 2012, the degree of underperformance witnessed historically will be far higher than the break-evens currently. However, European Bs in particular can see the EU-US differential move to levels similar to what was seen at the peak of recent EU underperformance and still break even.

As such, we conclude that European HY is priced for some further underperformance vs US driven by weakening growth, but by no means priced for a resurgent sovereign crisis.

24 May 2019

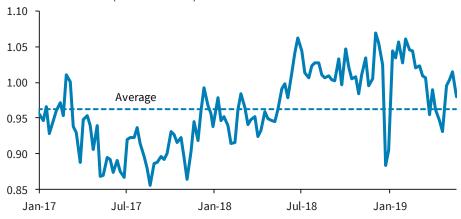
Observed biases: home issuers, quality and short duration

Having concluded that EUR HY has a meaningful pick-up over USD HY on a cross-currency basis at the index level, we take a closer look under the hood of the broad pick-up by looking at the spread and yield pick-up for matched issuers.

FIGURE 13

EUR HY vs. USD HY spread pick-up for matched issuers has compressed, but still above historical average

EUR vs. USD HY ex-fin (matched issuer) OAS ratio

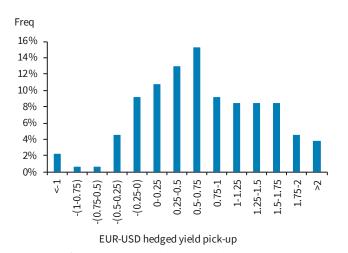


Source: Bloomberg Barclays Indices, Barclays Research

Using bonds in the USD HY ex-fin and EUR HY ex-fin universes, we found 76 matched tickers/issuers of which we then consider 130 EUR-USD bond pairs where the rating and maturity (up to 1.5 years' gap) matched. We examine the distribution of their hedged EUR-USD yield pick-ups (Figure 14) and found that the average pick-up is c.70bp and is considerably disperse in variation, though with a skew or significantly more pairs offering more yield in the EUR vs USD bond; 107 pairs or 82% offer more yield pick-up in EUR vs USD, with 22 pairs or 17% offering more than 1.5% pick up for the EUR vs USD bond.

We also note a number of trends for these pairs. As we noted in *Seeing value in EUR versus USD HY*, 19 October 2018, a home- or domestic-bias observed where relative EUR/USD spread ratio

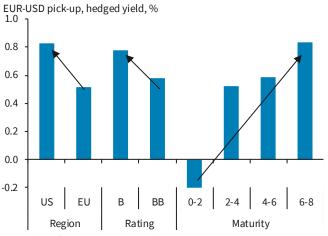
FIGURE 14
Pair-wise EUR-USD hedged yield pick-up is widely dispersed



Note: Basket of 130 pairs. Source: Barclays Research

FIGURE 15

US issuers have more pick-up in EUR, B more than BB, and longer-dated bonds have more pick-up



Note: Basket of 130 pairs. Source: Barclays Research

is usually tighter (less than 1.0x) for domestic issuers. As Figure 16 shows, the EUR vs USD spread ratio for matched issuers (and thus eliminating broader macro risks that might be perceived as a reason preference to hold bonds in one currency vs the other) is persistently less than 1.0x for European issuers while the USD vs EUR spread ratio is persistently less than 1.0x for North American issuer; providing a structural opportunity for investors with a global mandate. Figure 15 shows that in the sample of 130 EUR-USD pairs, the pick-up is greater for US issuers in aggregate compared to European issuers.

We note that single B-rated issuers offer more pick-up on average than BB issuers, corroborating an up-in-quality bias observation we've seen in both markets, particularly in Q4 18 but as well during most of the rally this year (see *Musings for April*, 29 March 2019).

Additionally, pick-up is greater for longer-duration bonds (Figure 15), which (and the fact that the average EUR-USD pick-up is negative for 0-2Y bonds) supports our view that yield curve is steep in Europe and is near historical highs (Figure 17); and anecdotal comments that structural demand for short-duration bonds have been very strong.

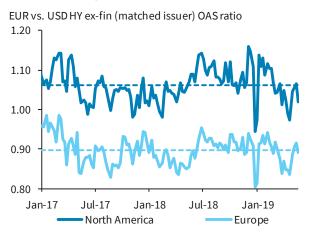
Results: 1-0, we prefer EUR HY to USD HY

The above analyses tell us that while there are pockets of value in both markets, we prefer EUR to USD HY on a thematic level given attractive yield and spread pick-up on a hedged basis in aggregate and across rating buckets and we would rather be positioned in a lower beta (EUR HY) market given the rally YTD, downside risks ahead and our base case for some *spread widening* by year-end in both markets.

As flagged above, we also think that low core bond yields in Europe and Japan for an indefinite period reviving and prolonging the "search for yield" environment and high hedging cost for foreign investors to purchase USD assets will be structurally supportive of demand for EUR HY assets.

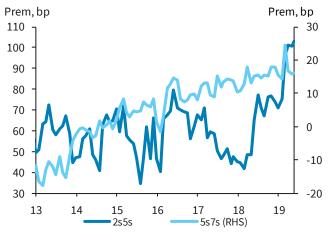
However, we caveat that this preference rests on broad realisation of our house base case view of growth for the eurozone and globally over the next 12 months. The obvious risks would be the relative weak growth in the Eurozone compared to the US (though US growth is also expected to normalise from 3Q this year as effects from fiscal policies wane) and

FIGURE 16 Home-bias: domestic issuers tend to trade at a relative discount to foreign issuers



Source: Bloomberg Barclays Indices, Barclays Research

FIGURE 17
EUR HY: Premium for moving up in duration is steepest in recent years



Note: For more on the calculations of curve premium above, please see *Seeing through the haze with a factor model*, 2 November 2018.

Source: Bloomberg Barclays Indices, Barclays Research

vulnerability of the region's growth to uncertainties surrounding (as well as the final outcome of) US-China and US-EU trade negotiations, as well as persistent geopolitical risks on the continent, particularly those surrounding Italy and Brexit. That said, should our growth expectations (of 1.2% and 1.4% for 2019 and 2020, respectively, for the eurozone and c. 3.6-3.7% for 2019-20 globally) materialise, we think EUR HY provides a better carry, particularly on a hedged basis compared to USD HY. We would be cautious if recession (not our base case for this year) risks rise materially for Europe.

Screening for EUR-USD pairs with the highest hedged yield pick-up

In Figure 18 and Figure 19, we highlight EUR-USD bond pairs with the highest hedged yield pick-up for. Figure 18 shows the highest hedged yield pick-up for swapping out of a USD bond into the EUR bond of the same issuer. We have also removed pairs where the cash price differential is more than 0.5 points higher for the EUR vs. USD leg. Vice versa, Figure 19 shows the highest hedged yield pick-up for swapping out of a EUR bond into the USD bond of the same issuer. Unsurprisingly, the broader market valuations and, importantly, the annualised EURUSD hedging cost at 3.1% mean that there is currently more USD-into-EUR swaps with a positive hedged yield pick-up than EUR-into-USD swaps.

FIGURE 18
Screen I: Highest hedged yield pick-up for swapping out of USD into EUR bonds

EUR Bonds						USD Bonds							Differential, EUR vs. USD (hedged)			
Security	Mat	Price	OAS, bp	YTW, %	Average Rating	Security Type	Security	Mat	Price	OAS, bp	YTW, %	Average Rating	Security Type	Price	OAS, bp	YTW, %
TTMTIN 2.2 01/15/24	4.6	88.0	566	5.1	BA3	Sr Unsecured	TTMTIN 5 5/8 02/01/23	3.7	99.1	339	5.9	BA3	Sr Unsecured	11.0	245	2.3
IRM 3 01/15/25	5.7	101.2	270	2.6	BA3	Sr Unsecured	IRM 6 08/15/23	4.2	102.5	116	3.6	BA3	Sr Unsecured	1.3	173	2.1
BHCCN 4 1/2 05/15/23	4.0	101.2	341	3.3	В3	Sr Unsecured	BHCCN 5 1/2 03/01/23	3.8	100.9	178	4.3	В3	Sr Unsecured	-0.3	181	2.0
SHAEFF 2 3/4 09/15/21	2.3	101.3	281	0.8	BA1	1st lien	SHAEFF 4 1/8 09/15/21	2.3	101.7	114	1.9	BA1	1st lien	0.4	184	2.0
SGMS 5 1/2 02/15/26	6.7	95.0	668	6.4	CAA1	Sr Unsecured	SGMS 8 1/4 03/15/26	6.8	102.8	499	7.5	CAA1	Sr Unsecured	7.8	189	2.0
FINRSK 6 7/8 11/15/26	7.5	100.3	675	6.8	В3	Sr Unsecured	FINRSK 8 1/4 11/15/26	7.5	101.2	522	7.9	В3	Sr Unsecured	0.9	173	2.0
POWSOL 4 3/8 05/15/26	7.0	102.1	406	3.9	BA3	Secured	POWSOL 6 1/4 05/15/26	7.0	104.3	275	5.3	BA3	Secured	2.2	151	1.7
BMC 8 3/8 09/01/26	7.3	97.8	881	8.8	CAA2	Sr Unsecured	BMC 9 3/4 09/01/26	7.3	97.5	758	10.2	CAA2	Sr Unsecured	-0.3	143	1.6
SGMS 3 3/8 02/15/26	6.7	98.5	382	3.6	B1	1st lien	SGMS 5 10/15/25	6.4	99.6	257	5.1	B1	1st lien	1.1	145	1.6
ATCNA 7 1/4 05/15/22	3.0	102.0	524	4.5	CAA1	Sr Unsecured	ATCNA 7 3/4 05/15/22	3.0	101.6	347	6.0	CAA1	Sr Unsecured	-0.4	195	1.6
CAR 4 1/2 05/15/25	6.0	103.9	340	3.5	B1	Sr Unsecured	CAR 6 3/8 04/01/24	4.9	103.7	235	5.0	B1	Sr Unsecured	-0.2	125	1.6
NFLX 4 5/8 05/15/29	10.0	109.0	366	3.5	BA3	Sr Unsecured	NFLX 6 3/8 05/15/29	10.0	109.8	272	5.1	BA3	Sr Unsecured	0.8	115	1.5
FINRSK 4 1/2 05/15/26	7.0	101.4	425	4.2	B2	1st lien	FINRSK 6 1/4 05/15/26	7.0	102.0	318	5.7	B2	1st lien	0.5	127	1.5
BHCCN 4 1/2 05/15/23	4.0	101.2	341	3.3	В3	Sr Unsecured	BHCCN 5 7/8 05/15/23	4.0	100.9	232	4.9	В3	Sr Unsecured	-0.2	127	1.5
NFLX 3 7/8 11/15/29	10.5	104.0	349	3.4	BA3	Sr Unsecured	NFLX 5 7/8 11/15/28	9.5	105.7	272	5.1	BA3	Sr Unsecured	1.8	97	1.4
NFLX 3 7/8 11/15/29	10.5	104.0	349	3.4	BA3	Sr Unsecured	NFLX 6 3/8 05/15/29	10.0	109.8	272	5.1	BA3	Sr Unsecured	5.8	97	1.4
CSTM 4 1/4 02/15/26	6.7	102.4	353	3.5	B2	Sr Unsecured	CSTM 6 5/8 03/01/25	5.8	103.1	274	5.4	B2	Sr Unsecured	0.8	99	1.2
SIGHCO 5 3/4 05/15/26	7.0	92.6	736	7.1	В3	Sr Unsecured	SIGHCO 7 7/8 05/15/26	7.0	93.5	668	9.2	В3	Sr Unsecured	0.9	88	1.0
BBDBCN 6 1/8 05/15/21	2.0	107.0	309	2.5	В3	Sr Unsecured	BBDBCN 8 3/4 12/01/21	2.5	109.9	232	4.5	В3	Sr Unsecured	2.9	94	1.0
LHMCFI 4 3/4 05/22/25	6.0	101.4	451	4.4	B2	Secured	LHMCFI 7 7/8 12/20/23	4.6	103.9	393	6.5	B2	1st lien	2.4	78	1.0
TITIM 2 3/4 04/15/25	5.9	97.9	355	3.1	BA1	Sr Unsecured	TITIM 5.303 05/30/24	5.0	100.0	309	5.3	BA1	Sr Unsecured	2.1	65	0.9
ATCNA 8 05/15/27	8.0	101.2	767	7.7	CAA1	Sr Unsecured	ATCNA 10 1/2 05/15/27	8.0	102.2	724	9.9	CAA1	Sr Unsecured	0.9	64	0.8
TITIM 3 09/30/25	6.4	99.6	345	3.0	BA1	Sr Unsecured	TITIM 5.303 05/30/24	5.0	100.0	309	5.3	BA1	Sr Unsecured	0.4	55	0.8
CAR 4 1/8 11/15/24	5.5	103.7	265	2.7	B1	Sr Unsecured	CAR 6 3/8 04/01/24	4.9	103.7	235	5.0	B1	Sr Unsecured	-0.1	49	0.8
VMED 4 1/2 01/15/25	5.7	103.6	268	2.4	B2	Sr Unsecured	VMED 6 10/15/24	5.4	103.4	170	4.7	B2	Sr Unsecured	-0.1	118	0.7

Source: Bloomberg Barclays Indices, Bloomberg, Barclays Research

24 May 2019

FIGURE 19
Screen II: Highest hedged yield pick-up for swapping out of EUR into USD bonds

EUR Bonds							USD Bonds							Differential, USD vs. EUR (hedged)		
Security	Mat	Price	OAS, bp	YTW, %	Average Rating	Security Type	Security	Mat	Price	OAS, bp	YTW, %	Average Rating	Security Type	Price	OAS, bp	YTW, %
HTZ 4 1/8 10/15/21	2.4	101.9	231	1.8	В3	Sr Unsecured	HTZ 6 1/4 10/15/22	3.4	97.4	474	7.1	В3	Sr Unsecured	4.5	226	2.2
ALTICE 9 06/15/23	4.1	103.5	296	2.2	CAA1	2nd lien	ALTICE 8 1/8 01/15/24	4.6	102.9	389	6.9	CAA1	2nd lien	0.6	75	1.6
HTZ 4 1/8 10/15/21	2.4	101.9	231	1.8	В3	Sr Unsecured	HTZ 5 7/8 10/15/20	1.4	99.9	311	5.9	В3	Sr Unsecured	2.0	63	1.1
SFRFP 5 5/8 05/15/24	5.0	103.1	204	1.3	B2	1st lien	SFRFP 6 1/4 05/15/24	5.0	102.4	261	5.4	B2	1st lien	0.8	39	1.0
BBDBCN 6 1/8 05/15/21	2.0	107.0	309	2.5	В3	Sr Unsecured	BBDBCN 6 10/15/22	3.4	98.5	393	6.5	В3	Sr Unsecured	8.5	68	0.9
HTZ 4 1/8 10/15/21	2.4	101.9	231	1.8	В3	Sr Unsecured	HTZ 7 3/8 01/15/21	1.7	100.1	332	5.5	В3	Sr Unsecured	1.8	84	0.6
LHMCFI 6 1/4 12/20/23	4.6	106.5	338	2.9	B2	1st lien	LHMCFI 7 7/8 12/20/23	4.6	103.9	393	6.5	B2	1st lien	2.6	35	0.4
EQIX 2 7/8 03/15/24	4.8	104.0	145	0.9	BA1	Sr Unsecured	EQIX 5 3/4 01/01/25	5.6	103.6	154	4.4	BA1	Sr Unsecured	0.4	-10	0.4
TDCDC 7 06/17/23	4.1	108.0	315	2.6	В3	1st lien	TDCDC 9 3/8 06/17/23	4.1	107.8	344	6.1	В3	1st lien	0.2	11	0.4

Source: Bloomberg Barclays Indices, Bloomberg, Barclays Research

24 May 2019

Analyst Certification

We, Hanyi Lim, Bradley Rogoff, CFA, Scott Schachter, Steve Wang and Soren Willemann, hereby certify (1) that the views expressed in this research report accurately reflect our personal views about any or all of the subject securities or issuers referred to in this research report and (2) no part of our compensation was, is or will be directly or indirectly related to the specific recommendations or views expressed in this research report.

Important Disclosures:

Barclays Research is produced by the Investment Bank of Barclays Bank PLC and its affiliates (collectively and each individually, "Barclays").

All authors contributing to this research report are Research Analysts unless otherwise indicated. The publication date at the top of the report reflects the local time where the report was produced and may differ from the release date provided in GMT.

Availability of Disclosures:

For current important disclosures regarding any issuers which are the subject of this research report please refer to https://publicresearch.barclays.com or alternatively send a written request to: Barclays Research Compliance, 745 Seventh Avenue, 13th Floor, New York, NY 10019 or call +1-212-526-1072.

Barclays Capital Inc. and/or one of its affiliates does and seeks to do business with companies covered in its research reports. As a result, investors should be aware that Barclays may have a conflict of interest that could affect the objectivity of this report. Barclays Capital Inc. and/or one of its affiliates regularly trades, generally deals as principal and generally provides liquidity (as market maker or otherwise) in the debt securities that are the subject of this research report (and related derivatives thereof). Barclays trading desks may have either a long and / or short position in such securities, other financial instruments and / or derivatives, which may pose a conflict with the interests of investing customers. Where permitted and subject to appropriate information barrier restrictions, Barclays fixed income research analysts regularly interact with its trading desk personnel regarding current market conditions and prices. Barclays fixed income research analysts receive compensation based on various factors including, but not limited to, the quality of their work, the overall performance of the firm (including the profitability of the Investment Banking Department), the profitability and revenues of the Markets business and the potential interest of the firm's investing clients in research with respect to the asset class covered by the analyst. To the extent that any historical pricing information was obtained from Barclays trading desks, the firm makes no representation that it is accurate or complete. All levels, prices and spreads are historical and do not necessarily represent current market levels, prices or spreads, some or all of which may have changed since the publication of this document. Barclays Research Department produces various types of research including, but not limited to, fundamental analysis, equity-linked analysis, quantitative analysis, and trade ideas. Recommendations and trade ideas contained in one type of Barclays Research may differ from those contained in other type

In order to access Barclays Statement regarding Research Dissemination Policies and Procedures, please refer to https://publicresearch.barcap.com/S/RD.htm. In order to access Barclays Research Conflict Management Policy Statement, please refer to: https://publicresearch.barcap.com/S/CM.htm.

All pricing information is indicative only. Prices are sourced from Refinitiv as of the last available closing price at the time of production of the research report, unless another time and source is indicated.

Types of investment recommendations produced by Barclays FICC Research:

In addition to any ratings assigned under Barclays' formal rating systems, this publication may contain investment recommendations in the form of trade ideas, thematic screens, scorecards or portfolio recommendations that have been produced by analysts in FICC Research. Any such investment recommendations produced by non-Credit Research teams shall remain open until they are subsequently amended, rebalanced or closed in a future research report. Any such investment recommendations produced by the Credit Research teams are valid at current market conditions and may not be otherwise relied upon.

Disclosure of other investment recommendations produced by Barclays FICC Research:

Barclays FICC Research may have published other investment recommendations in respect of the same securities/instruments recommended in this research report during the preceding 12 months. To view all investment recommendations published by Barclays FICC Research in the preceding 12 months please refer to https://live.barcap.com/go/research/Recommendations.

Legal entities involved in producing Barclays Research:

Barclays Bank PLC (Barclays, UK)

Barclays Capital Inc. (BCI, US)

Barclays Bank Ireland PLC, Frankfurt Branch (BBI, Frankfurt)

Barclays Bank Ireland PLC, Paris Branch (BBI, Paris)

Barclays Bank Ireland PLC, Milan Branch (BBI, Milan)

Barclays Securities Japan Limited (BSJL, Japan)

Barclays Bank PLC, Hong Kong branch (Barclays Bank, Hong Kong)

Barclays Capital Canada Inc. (BCCI, Canada)

Barclays Bank Mexico, S.A. (BBMX, Mexico)

Barclays Securities (India) Private Limited (BSIPL, India)

Barclays Bank PLC, India branch (Barclays Bank, India)

Barclays Bank PLC, Singapore branch (Barclays Bank, Singapore)

Disclaimer

This publication has been produced by Barclays Research Department in the Investment Bank of Barclays Bank PLC and/or one or more of its affiliates (collectively and each individually, "Barclays"). It has been prepared for institutional investors only and not for retail investors. It has been distributed by one or more Barclays affiliated legal entities listed below. It is provided to our clients for information purposes only, and Barclays makes no express or implied warranties, and expressly disclaims all warranties of merchantability or fitness for a particular purpose or use with respect to any data included in this

publication. To the extent that this publication states on the front page that it is intended for institutional investors and is not subject to all of the independence and disclosure standards applicable to debt research reports prepared for retail investors under U.S. FINRA Rule 2242, it is an "institutional debt research report" and distribution to retail investors is strictly prohibited. Barclays also distributes such institutional debt research reports to various issuers, media, regulatory and academic organisations for their own internal informational news gathering, regulatory or academic purposes and not for the purpose of making investment decisions regarding any debt securities. Media organisations are prohibited from re-publishing any opinion or recommendation concerning a debt issuer or debt security contained in any Barclays institutional debt research report. Any such recipients that do not want to continue receiving Barclays institutional debt research reports should contact debtresearch@barclays.com. Barclays will not treat unauthorized recipients of this report as its clients and accepts no liability for use by them of the contents which may not be suitable for their personal use. Prices shown are indicative and Barclays is not offering to buy or sell or soliciting offers to buy or sell any financial instrument.

Without limiting any of the foregoing and to the extent permitted by law, in no event shall Barclays, nor any affiliate, nor any of their respective officers, directors, partners, or employees have any liability for (a) any special, punitive, indirect, or consequential damages; or (b) any lost profits, lost revenue, loss of anticipated savings or loss of opportunity or other financial loss, even if notified of the possibility of such damages, arising from any use of this publication or its contents.

Other than disclosures relating to Barclays, the information contained in this publication has been obtained from sources that Barclays Research believes to be reliable, but Barclays does not represent or warrant that it is accurate or complete. Barclays is not responsible for, and makes no warranties whatsoever as to, the information or opinions contained in any written, electronic, audio or video presentations of third parties that are accessible via a direct hyperlink in this publication or via a hyperlink to a third-party web site ('Third-Party Content'). Any such Third-Party Content has not been adopted or endorsed by Barclays, does not represent the views or opinions of Barclays, and is not incorporated by reference into this publication. Third-Party Content is provided for information purposes only and Barclays has not independently verified its accuracy or completeness.

The views in this publication are solely and exclusively those of the authoring analyst(s) and are subject to change, and Barclays Research has no obligation to update its opinions or the information in this publication. Unless otherwise disclosed herein, the analysts who authored this report have not received any compensation from the subject companies in the past 12 months. If this publication contains recommendations, they are general recommendations that were prepared independently of any other interests, including those of Barclays and/or its affiliates, and/or the subject companies. This publication does not contain personal investment recommendations or investment advice or take into account the individual financial circumstances or investment objectives of the clients who receive it. The securities and other investments discussed herein may not be suitable for all investors. Barclays is not a fiduciary to any recipient of this publication. Investors must independently evaluate the merits and risks of the investments discussed herein, consult any independent advisors they believe necessary, and exercise independent judgment with regard to any investment decision. The value of and income from any investment may fluctuate from day to day as a result of changes in relevant economic markets (including changes in market liquidity). The information herein is not intended to predict actual results, which may differ substantially from those reflected. Past performance is not necessarily indicative of future results. The information provided does not constitute a financial benchmark and should not be used as a submission or contribution of input data for the purposes of determining a financial benchmark.

United Kingdom: This document is being distributed (1) only by or with the approval of an authorised person (Barclays Bank PLC) or (2) to, and is directed at (a) persons in the United Kingdom having professional experience in matters relating to investments and who fall within the definition of "investment professionals" in Article 19(5) of the Financial Services and Markets Act 2000 (Financial Promotion) Order 2005 (the "Order"); or (b) high net worth companies, unincorporated associations and partnerships and trustees of high value trusts as described in Article 49(2) of the Order; or (c) other persons to whom it may otherwise lawfully be communicated (all such persons being "Relevant Persons"). Any investment or investment activity to which this communication relates is only available to and will only be engaged in with Relevant Persons. Any other persons who receive this communication should not rely on or act upon it. Barclays Bank PLC is authorised by the Prudential Regulation Authority and regulated by the Financial Conduct Authority and the Prudential Regulation Authority and is a member of the London Stock Exchange.

European Economic Area: This material is being distributed to any "Authorised User" located in a Restricted EEA Country by Barclays Bank Ireland PLC. The Restricted EEA Countries are Finland, Austria, Luxembourg, Portugal, Liechtenstein, Iceland, Slovenia, Malta, Lithuania, Slovakia, Hungary, Romania and Bulgaria. For any other "Authorised User" located in a country of the European Economic Area, this material is being distributed by Barclays Bank PLC. Barclays Bank Ireland PLC is a bank authorised by the Central Bank of Ireland whose registered office is at 1 Molesworth Street, Dublin 2, Ireland. Barclays Bank PLC is not registered in France with the Autorité des marches financiers or the Autorité de contrôle prudentiel.

Americas: The Investment Bank of Barclays Bank PLC undertakes U.S. securities business in the name of its wholly owned subsidiary Barclays Capital Inc., a FINRA and SIPC member. Barclays Capital Inc., a U.S. registered broker/dealer, is distributing this material in the United States and, in connection therewith accepts responsibility for its contents. Any U.S. person wishing to effect a transaction in any security discussed herein should do so only by contacting a representative of Barclays Capital Inc. in the U.S. at 745 Seventh Avenue, New York, New York 10019.

Non-U.S. persons should contact and execute transactions through a Barclays Bank PLC branch or affiliate in their home jurisdiction unless local regulations permit otherwise.

This material is distributed in Canada by Barclays Capital Canada Inc., a registered investment dealer, a Dealer Member of IIROC (www.iiroc.ca), and a Member of the Canadian Investor Protection Fund (CIPF).

This material is distributed in Mexico by Barclays Bank Mexico, S.A.

Japan: This material is being distributed to institutional investors in Japan by Barclays Securities Japan Limited. Barclays Securities Japan Limited is a joint-stock company incorporated in Japan with registered office of 6-10-1 Roppongi, Minato-ku, Tokyo 106-6131, Japan. It is a subsidiary of Barclays Bank PLC and a registered financial instruments firm regulated by the Financial Services Agency of Japan. Registered Number: Kanto Zaimukyokucho (kinsho) No. 143. Asia Pacific (excluding Japan): Barclays Bank PLC, Hong Kong Branch is distributing this material in Hong Kong as an authorised institution regulated by the Hong Kong Monetary Authority. Registered Office: 41/F, Cheung Kong Center, 2 Queen's Road Central, Hong Kong.

All Indian securities-related research and other equity research produced by Barclays' Investment Bank are distributed in India by Barclays Securities (India) Private Limited (BSIPL). BSIPL is a company incorporated under the Companies Act, 1956 having CIN U67120MH2006PTC161063. BSIPL is registered and regulated by the Securities and Exchange Board of India (SEBI) as a Research Analyst: INH000001519; Portfolio Manager INP000002585; Stock Broker/Trading and Clearing Member: National Stock Exchange of India Limited (NSE) Capital Market INB231292732, NSE Futures & Options INF231292732, NSE Currency derivatives INE231450334, Bombay Stock Exchange Limited (BSE) Capital Market INB011292738, BSE Futures & Options INF011292738; Depository Participant (DP) with the National Securities & Depositories Limited (NSDL): DP ID: IN-DP-NSDL-299-2008; Investment Adviser: INA000000391. The registered office of BSIPL is at 208, Ceejay House, Shivsagar Estate, Dr. A. Besant Road, Worli, Mumbai – 400 018, India. Telephone No: +91 2267196000. Fax number: +91 22 67196100. Any other reports produced by Barclays' Investment Bank are distributed in India by Barclays Bank PLC, India Branch, an

associate of BSIPL in India that is registered with Reserve Bank of India (RBI) as a Banking Company under the provisions of The Banking Regulation Act, 1949 (Regn No BOM43) and registered with SEBI as Merchant Banker (Regn No INM000002129) and also as Banker to the Issue (Regn No INBI00000950). Barclays Investments and Loans (India) Limited, registered with RBI as Non Banking Financial Company (Regn No RBI CoR-07-00258), and Barclays Wealth Trustees (India) Private Limited, registered with Registrar of Companies (CIN U93000MH2008PTC188438), are associates of BSIPL in India that are not authorised to distribute any reports produced by Barclays' Investment Bank.

This material is distributed in Singapore by the Singapore branch of Barclays Bank PLC, a bank licensed in Singapore by the Monetary Authority of Singapore. For matters in connection with this material, recipients in Singapore may contact the Singapore branch of Barclays Bank PLC, whose registered address is 10 Marina Boulevard, #23-01 Marina Bay Financial Centre Tower 2, Singapore 018983.

This material is distributed to persons in Australia by Barclays Bank PLC. None of Barclays Bank PLC, nor any other Barclays group entity, holds an Australian financial services licence and instead relies on an exemption from the requirement to hold such a licence. This material is intended to only be distributed to "wholesale clients" as defined by the Australian Corporations Act 2001.

Middle East: Nothing herein should be considered investment advice as defined in the Israeli Regulation of Investment Advisory, Investment Marketing and Portfolio Management Law, 1995 ("Advisory Law"). This document is being made to eligible clients (as defined under the Advisory Law) only. Barclays Israeli branch previously held an investment marketing license with the Israel Securities Authority but it cancelled such license on 30/11/2014 as it solely provides its services to eligible clients pursuant to available exemptions under the Advisory Law, therefore a license with the Israel Securities Authority is not required. Accordingly, Barclays does not maintain an insurance coverage pursuant to the Advisory Law.

This material is distributed in the United Arab Emirates (including the Dubai International Financial Centre) and Qatar by Barclays Bank PLC. Barclays Bank PLC in the Dubai International Financial Centre (Registered No. 0060) is regulated by the Dubai Financial Services Authority (DFSA). Principal place of business in the Dubai International Financial Centre: The Gate Village, Building 4, Level 4, PO Box 506504, Dubai, United Arab Emirates. Barclays Bank PLC-DIFC Branch, may only undertake the financial services activities that fall within the scope of its existing DFSA licence. Related financial products or services are only available to Professional Clients, as defined by the Dubai Financial Services Authority. Barclays Bank PLC in the UAE is regulated by the Central Bank of the UAE and is licensed to conduct business activities as a branch of a commercial bank incorporated outside the UAE in Dubai (Licence No.: 13/1844/2008, Registered Office: Building No. 6, Burj Dubai Business Hub, Sheikh Zayed Road, Dubai City) and Abu Dhabi (Licence No.: 13/952/2008, Registered Office: Al Jazira Towers, Hamdan Street, PO Box 2734, Abu Dhabi). Barclays Bank PLC in the Qatar Financial Centre (Registered No. 00018) is authorised by the Qatar Financial Centre Regulatory Authority (QFCRA). Barclays Bank PLC-QFC Branch may only undertake the regulated activities that fall within the scope of its existing QFCRA licence. Principal place of business in Qatar: Qatar Financial Centre, Office 1002, 10th Floor, QFC Tower, Diplomatic Area, West Bay, PO Box 15891, Doha, Qatar. Related financial products or services are only available to Business Customers as defined by the Qatar Financial Centre Regulatory Authority.

Russia: This material is not intended for investors who are not Qualified Investors according to the laws of the Russian Federation as it might contain information about or description of the features of financial instruments not admitted for public offering and/or circulation in the Russian Federation and thus not eligible for non-Qualified Investors. If you are not a Qualified Investor according to the laws of the Russian Federation, please dispose of any copy of this material in your possession.

IRS Circular 230 Prepared Materials Disclaimer: Barclays does not provide tax advice and nothing contained herein should be construed to be tax advice. Please be advised that any discussion of U.S. tax matters contained herein (including any attachments) (i) is not intended or written to be used, and cannot be used, by you for the purpose of avoiding U.S. tax-related penalties; and (ii) was written to support the promotion or marketing of the transactions or other matters addressed herein. Accordingly, you should seek advice based on your particular circumstances from an independent tax advisor.

© Copyright Barclays Bank PLC (2019). All rights reserved. No part of this publication may be reproduced or redistributed in any manner without the prior written permission of Barclays. Barclays Bank PLC is registered in England No. 1026167. Registered office 1 Churchill Place, London, E14 5HP. Additional information regarding this publication will be furnished upon request.

BRCF2242