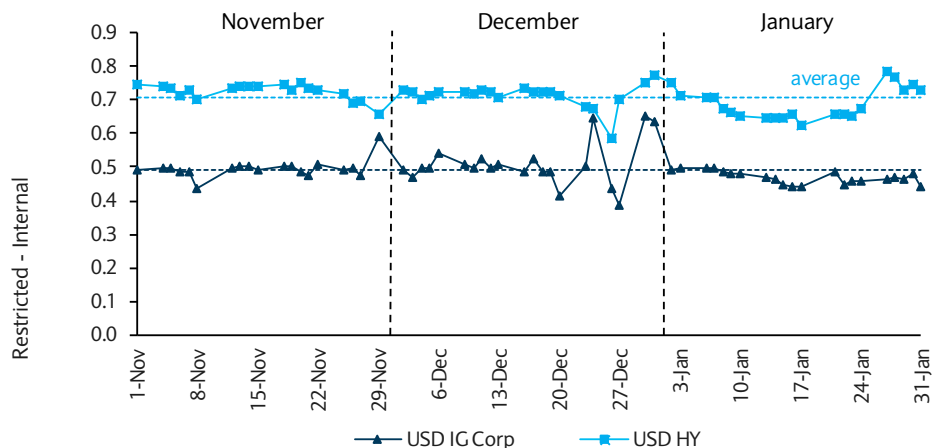


## LCS® Report – January 2020

FIGURE 1  
 Daily LCS, USD IG and HY Corporates, %



Daily LCS are computed using a universe of the most frequently quoted bonds that do not undergo any model adjustments, unlike many bonds in broad indices, which see much less activity. Hence, Daily LCS tend to be lower than the monthly values reported in Figure 2.

Source: Unless stated otherwise, the source for all figures is Barclays Research.

LCS of USD IG and HY credit were somewhat lower in January (Figure 2). In European credit markets, however, the improvement in liquidity was material. Reflecting the return from the holiday season, trading volume was significantly higher across the board, more than doubling in some markets (Figure 5).

The pattern was similar in government debt markets (Figure 6). While LCS of US Treasuries were unchanged, liquidity of European sovereign debt, both nominal and inflation-linked, improved significantly. The two most liquid nominal government debt markets in Europe were Germany and Italy (Figure 7).

FIGURE 2  
 LCS for Various Markets, by Sector, %

	Current Month	-1m	-3m	-6m	-12m	-24m
USD IG Credit Index*	0.635	0.643	0.624	0.608	0.599	0.549
Industrials	0.682	0.687	0.670	0.636	0.653	0.638
Utilities	1.181	1.169	1.124	1.097	1.019	1.009
Financial Institutions	0.569	0.588	0.570	0.586	0.557	0.404
Non-corporate	0.366	0.374	0.356	0.355	0.349	0.353
Corporate	0.684	0.691	0.672	0.653	0.647	0.589
USD HY Index	0.932	0.965	0.957	0.941	1.079	0.902
Industrials	0.939	0.982	0.965	0.945	1.085	0.903
Utilities	0.887	0.872	0.920	0.914	1.025	1.009
Financial Institutions	0.868	0.835	0.888	0.913	1.041	0.865
USD EM Index	0.584	0.612	0.584	0.601	0.701	0.482
Non-corporate	0.554	0.584	0.554	0.571	0.657	0.466
Industrials	0.663	0.689	0.675	0.682	0.844	0.509
Financial Institutions	0.676	0.696	0.670	0.714	0.826	0.577
EUR IG Credit Index	0.368	0.423	0.402	0.368	0.404	0.318
Industrials	0.336	0.343	0.406	0.407	0.407	0.366
Utilities	0.465	0.477	0.399	0.414	0.421	0.365
Financial Institutions	0.389	0.523	0.405	0.321	0.330	0.310
Non-corporate	0.371	0.411	0.395	0.359	0.468	0.257
EUR HY Index	0.712	0.806	0.772	0.919	0.987	0.724
Industrials	0.734	0.836	0.802	0.972	1.039	0.781
Utilities	0.466	0.558	0.525	0.460	0.762	0.621
Financial Institutions	0.653	0.718	0.692	0.768	0.791	0.526
Global Covered Bonds	0.222	0.211	0.203	0.218	0.246	0.233
USD Convertibles	0.700	0.738	n/a	n/a	n/a	n/a

\* Throughout this report, "index" refers to Bloomberg Barclays bond indices

LCS and TES data are available with an annual subscription. Please contact us for details.

Spain and the Netherlands had the lowest LCS among the Pan-European corporate markets.<sup>1</sup> Figure 8 shows the LCS spread between corporates and Treasuries for the US and the European countries shown in Figure 7. Spain had the narrowest spread.

The heat maps in Figure 9 illustrate how the LCS of USD IG and HY credit depend on the age and issue size. “Warmer” colors signify higher LCS (this may be less clear if printed in black and white). Figure 10 presents the same diagram for EUR IG credit. We use different breakpoints in all three diagrams to better match the structure of each market.

Figure 11 shows a breakdown, by country and currency, of the global covered bond market; Belgium and Finland had the lowest LCS. Among the larger markets, Germany was the most liquid. Figure 12 shows LCS, the number of bonds, and MV% for the top 10 countries (by the number of bonds) in the Pan Euro Credit Index. Figure 13 contains basic statistics for various sector/quality buckets of the USD EM market.

Figures 14 and 15 plot the LCS time series of USD and EUR credit. Figures 16 and 17 plot the most recent 24 months of these time series. Figure 18 shows the LCS frequency distribution for USD IG and HY, as well as for EUR and GBP IG credit. Figure 19 demonstrates how this distribution for USD IG credit has changed over time.

Figure 20 plots the historical spread decomposition for a basket of liquid USD IG credit bonds. Figure 21 shows statistics of the 10 Trade Efficiency Score (TES) buckets for the USD Corporate Index. Figure 22 contains one- and six-month transition matrices of USD IG and HY credit LCS. Figure 23 is a scorecard for Tradable Cash Credit Baskets (TCX), highly liquid portfolios designed to track a particular benchmark.

Figure 24 displays the historical time series of Price Impact Measure (PIM) for USD IG and HY credit.

FIGURE 3  
Basic Index Statistics, by Sector

	Number of bonds	Avg Issue size, mn	OAD	OAS, bp	12m Avg LCS	12m StDev LCS
USD IG Credit Index	6,867	917	7.81	98	0.619	0.019
Industrials	3,618	891	8.65	110	0.658	0.021
Utilities	806	480	10.91	102	1.103	0.052
Financial Institutions	1,685	1,001	6.17	87	0.579	0.015
Non-corporate	758	1,313	6.52	75	0.366	0.014
Corporate	6,109	867	8.05	102	0.665	0.020
USD HY Index	1,905	661	3.07	390	0.968	0.021
Industrials	1,691	662	3.04	404	0.975	0.023
Utilities	49	624	3.38	282	0.916	0.042
Financial Institutions	165	671	3.30	291	0.923	0.057
USD EM Index	2,051	1,025	6.35	321	0.607	0.018
Non-corporate	1,287	1,203	7.01	325	0.574	0.013
Industrials	505	758	5.02	348	0.701	0.040
Financial Institutions	216	664	2.97	204	0.721	0.039
EUR IG Credit Index	3,375	987	5.96	82	0.381	0.018
Industrials	1,524	817	5.64	90	0.389	0.031
Utilities	219	734	5.54	87	0.422	0.026
Financial Institutions	1,158	897	4.68	99	0.359	0.065
Non-corporate	474	1,869	7.90	52	0.385	0.020
EUR HY Index	559	575	3.36	329	0.833	0.063
Industrials	432	586	3.29	338	0.873	0.074
Utilities	14	608	3.26	190	0.562	0.080
Financial Institutions	113	527	3.69	311	0.709	0.029
Global Covered Bonds	1,337	992	4.97	41	0.229	0.024
USD Convertibles	416	382	-	-	n/a	n/a

<sup>1</sup> These comparisons do not adjust for the potentially different characteristics of various markets.

FIGURE 4

## Current LCS Market Coverage

Asset Class (Bloomberg Barclays Index)	Inception Date	January 2020 LCS, %
USD Credit IG	Jan-07	0.635
USD Credit HY	Jan-07	0.932
USD IG Credit 144A (no registration rights)	Jan-07	0.608
USD Treasuries	Nov-09	0.025
USD TIPS	Jul-10	0.133
USD Fixed Rate Agency MBS	Mar-10	0.090
USD Emerging Markets	Feb-12	0.584
USD Convertible Bonds	Dec-19	0.700
Pan Euro Credit IG	May-10	0.436
Pan Euro Credit HY	May-10	0.765
Pan Euro Credit FRN	May-10	0.193
GBP Corporate 100–200mm Amt Outstand	May-10	1.387
Pan Euro Agencies	May-10	0.389
Pan Euro Local Authorities	May-10	0.274
Pan Euro Treasuries	Feb-11	0.103
Pan Euro Inflation Linked	Mar-11	0.195
Global Covered Bonds	Sep-12	0.222
JPY Treasuries	Sep-13	0.245

FIGURE 5

## Average Monthly Trading Volume per Bond (mn), Adjusted to 21 Trading Days per Month

Index	Current Month	-1m	-3m	-6m	-12m	-24m
USD IG Credit (\$)	61.1	43.2	54.3	51.8	71.8	59.8
USD HY (\$)	113.9	77.3	92.4	84.6	110.5	55.4
USD EM (\$)	84.3	39.1	68.7	72.7	90.0	85.3
EUR IG Credit (€)	56.5	29.2	51.4	50.8	50.2	33.6
EUR HY (€)	68.7	41.2	66.3	57.1	49.3	43.0
GBP IG Credit (£)	46.3	15.2	24.6	26.8	36.7	20.0
GBP HY Credit (£)	34.5	14.0	30.4	29.8	25.7	27.0
Global Covered (€)	24.9	7.1	12.4	13.0	19.0	5.9
USD Convertibles (\$)	117.6	65.6	n/a	n/a	n/a	n/a

Source: TRACE, TRAX, Barclays Research

FIGURE 6

## Non-credit LCS, %

Index	Current Month	-1m	-3m	-6m	-12m	-24m
USD Treasuries	0.025	0.025	0.026	0.028	0.034	0.027
USD TIPS	0.133	0.135	0.136	0.137	0.144	0.145
USD MBS	0.090	0.092	0.087	0.084	0.094	0.110
EUR Treasuries	0.084	0.103	0.082	0.085	0.087	0.104
Sterling Gilts	0.082	0.086	0.083	0.063	0.106	0.067
UK inflation-linked	0.216	0.305	0.195	0.234	0.199	0.289
Germany inflation-linked	0.113	0.141	0.107	0.088	0.204	0.123
France inflation-linked	0.113	0.143	0.121	0.108	0.194	0.125
Italy inflation-linked	0.248	0.324	0.248	0.248	0.328	0.176
JPY Treasuries	0.245	0.244	0.209	0.177	0.433	0.174

FIGURE 7  
Treasury and Corporate LCS by Country of Issuer, %

Country	Treasury (domestic currency)		IG Corporate (Pan Euro currencies)		IG Corporate (Sterling)	
	Bonds	LCS	Bonds	LCS	Bonds	LCS
France	47	0.065	636	0.422	47	0.689
Germany	50	0.045	492	0.402	60	0.587
Italy	75	0.050	129	0.396	6	0.977
Netherlands	19	0.055	165	0.368	19	0.705
Spain	40	0.117	179	0.368	8	0.479
United Kingdom	42	0.082	791	0.663	509	0.906
United States	257	0.025	681	0.416	116	0.747
Japan	274	0.245	40	0.413	6	0.831

FIGURE 8  
Treasury and Corporate LCS, Current versus One Year Ago, %

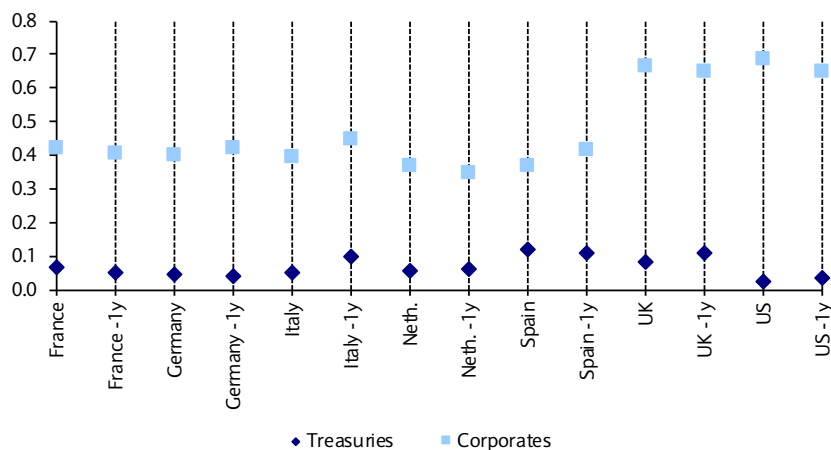


FIGURE 9  
LCS by Issue Size and Age, USD Credit, %

Inv. Grade	Maturity: 1-5 (37.3% MV)				Maturity: 5-10 (28.0% MV)			
	Age, yr				Age, yr			
Size, \$mn	<1	1-5	5-7.5	7.5+	<1	1-5	5-7.5	7.5+
<500	0.40	0.36	0.45	0.33	0.71	0.73	0.65	0.87
500-750	0.27	0.30	0.37	0.26	0.59	0.68	0.56	0.99
750-1,500	0.23	0.22	0.30	0.19	0.46	0.54	0.49	0.55
1,500-2,000	0.17	0.18	0.26	0.23	0.35	0.45		
2,000-3,000	0.17	0.17	0.24	0.15	0.31	0.40	0.51	
>3,000	0.17	0.16	0.19	0.14	0.30	0.35		

Inv. Grade	Maturity: 10+ (34.7% MV)				Maturity: All			
	Age, yr				Age, yr			
Size, \$mn	<1	1-5	5-7.5	7.5+	<1	1-5	5-7.5	7.5+
<500	1.34	1.78	1.78	1.45	0.93	0.97	0.94	1.10
500-750	1.10	1.59	1.50	1.39	0.63	0.79	0.75	1.01
750-1,500	0.86	1.23	1.38	1.31	0.47	0.56	0.66	0.87
1,500-2,000	0.80	0.93	1.07	1.18	0.39	0.47	0.56	0.88
2,000-3,000	0.63	1.01	1.11	0.93	0.35	0.48	0.48	0.69
>3,000	0.56	0.75		0.78	0.28	0.35	0.29	0.43

High Yield  
Maturity: 1-4 (58.0% MV)      Maturity: 4-7 (30.6% MV)

Size, \$mn	Maturity: 1-4 (58.0% MV)				Maturity: 4-7 (30.6% MV)			
	Age, yr				Age, yr			
	<1	1-3	3-7	7+	<1	1-3	3-7	7+
<300	1.27	2.47	1.35	1.06		2.66	1.75	2.14
300-500	1.12	1.22	1.21	1.04	1.25	1.41	1.82	
500-750	0.93	1.00	1.10	1.28	0.99	1.61	1.22	
750-1,000	0.82	0.74	0.84	1.07	0.79	1.00	1.41	
>1,000	0.61	0.73	0.73	0.59	0.66	1.00	0.79	

Size, \$mn	Maturity: 7+ (11.4% MV)			Maturity: All				
	Age, yr			Age, yr				
	<1	1-3	3-7	7+	<1	1-3	3-7	7+
<300				2.41	1.32	2.49	1.43	1.85
300-500	1.00	1.09	2.49	3.11	1.16	1.27	1.39	2.24
500-750	1.10	1.07		2.53	1.00	1.20	1.13	1.67
750-1,000	0.75	0.81	1.39		0.79	0.83	1.02	1.41
>1,000	0.77	0.65		1.36	0.68	0.79	0.77	0.78

Note: Buckets with fewer than five bonds are not shown.

FIGURE 10  
LCS by Issue Size and Age, EUR IG Credit, %

Size, €mn	Maturity: 1-3 (22.9% MV)				Maturity: 3-7 (46.7% MV)			
	Age, yr				Age, yr			
	<1	1-3	3-7	7+	<1	1-3	3-7	7+
<500	0.21	0.25	0.19	0.21	0.35	0.37	0.40	0.51
500-750	0.16	0.19	0.18	0.23	0.33	0.38	0.41	0.41
750-1,500	0.14	0.15	0.20	0.23	0.29	0.36	0.38	0.46
1,500-2,000		0.20	0.16	0.26	0.27	0.27	0.42	
>2,000			0.15	0.21	0.21	0.18	0.22	0.37

Size, €mn	Maturity: 7+ (30.4% MV)				Maturity: All			
	Age, yr				Age, yr			
	<1	1-3	3-7	7+	<1	1-3	3-7	7+
<500	0.51	0.61	0.62	1.08	0.41	0.42	0.36	0.42
500-750	0.51	0.56	0.58	0.80	0.39	0.42	0.36	0.35
750-1,500	0.48	0.61	0.57	0.66	0.37	0.41	0.35	0.30
1,500-2,000	0.53	0.61	0.56		0.36	0.33	0.37	0.39
>2,000	0.28	0.43	0.52	0.53	0.25	0.31	0.32	0.34

Note: Buckets with fewer than five bonds are not shown.

FIGURE 11  
Global Covered Bonds Index, by Country and Currency

Country	LCS, %	-3m	# bonds	Currency	LCS, %	-3m	# bonds
Germany	0.100	0.095	230	EUR	0.102	0.098	975
Switzerland	0.638	0.614	199	CHF	0.655	0.639	208
France	0.105	0.100	185	USD	0.076	0.062	48
Sweden	0.476	0.410	83	SEK	0.602	0.529	42
Spain	0.117	0.111	71	GBP	0.318	0.369	28
Canada	0.090	0.084	67	DKK	0.581	0.531	15
Norway	0.118	0.113	61	AUD	0.644	0.627	10
Italy	0.208	0.205	60	NOK	0.624	0.618	8
Austria	0.104	0.098	59	CAD	0.595	0.562	2
United Kingdom	0.162	0.168	56				
Australia	0.145	0.142	55				
Netherlands	0.132	0.127	53				
Finland	0.085	0.083	35				
Denmark	0.405	0.368	30				
Belgium	0.082	0.081	23				

FIGURE 12  
Pan Euro Credit Index, Country-level Statistics (top 10 by the number of bonds)

Country	# Bonds	MV%	LCS, %	-1m	-3m	-6m
United Kingdom	797	12.71	0.661	0.684	0.662	0.640
United States	684	14.26	0.417	0.466	0.477	0.441
France	663	13.64	0.456	0.504	0.453	0.428
Germany	548	11.08	0.405	0.427	0.385	0.387
Spain	180	3.65	0.370	0.391	0.367	0.379
Netherlands	179	3.75	0.384	0.474	0.414	0.371
Italy	131	2.83	0.416	0.466	0.415	0.450
Switzerland	129	2.38	0.335	0.420	0.403	0.362
Sweden	113	1.75	0.368	0.411	0.378	0.339
Australia	99	1.61	0.419	0.474	0.424	0.402

FIGURE 13  
USD Emerging Markets Index, LCS and Market Structure

LCS, %	IG	-3m	Non-IG	-3m	Total	-3m
Non-Corporate	0.456	0.452	0.767	0.774	0.554	0.554
Industrial	0.559	0.563	0.778	0.804	0.663	0.675
Utility	0.523	0.577	0.957	0.733	0.698	0.641
Financial	0.552	0.529	0.882	0.893	0.676	0.670
Total	0.478	0.474	0.781	0.789	0.584	0.584

Bonds / %MV	IG	Non-IG	Total
Non-Corporate	864 / 50.5%	423 / 23.3%	1,287 / 73.8%
Industrial	252 / 9.6%	253 / 8.6%	505 / 18.2%
Utility	23 / 0.7%	20 / 0.5%	43 / 1.2%
Financial	138 / 4.2%	78 / 2.6%	216 / 6.8%
Total	1,277 / 65.1%	774 / 35.0%	2,051 / 100.0%

FIGURE 14  
Time Series of USD IG and HY Credit LCS, %, January 2007-January 2020

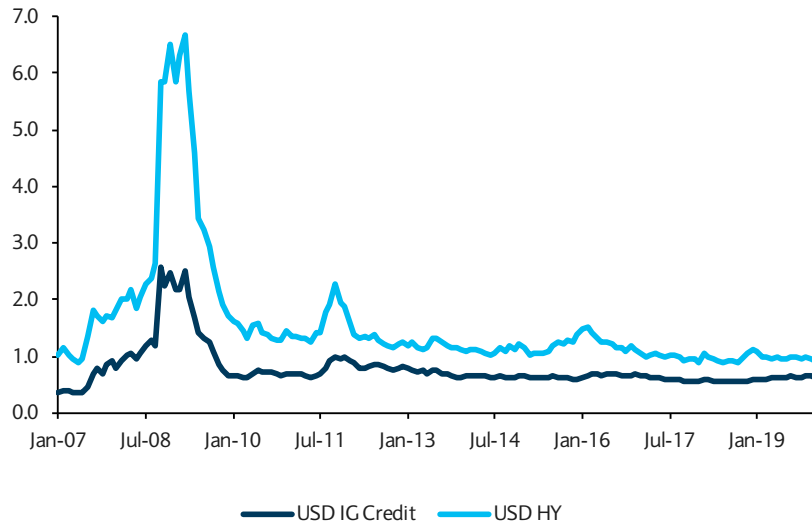


FIGURE 16  
Time Series of USD IG and HY Credit LCS, %, Past 24 Months

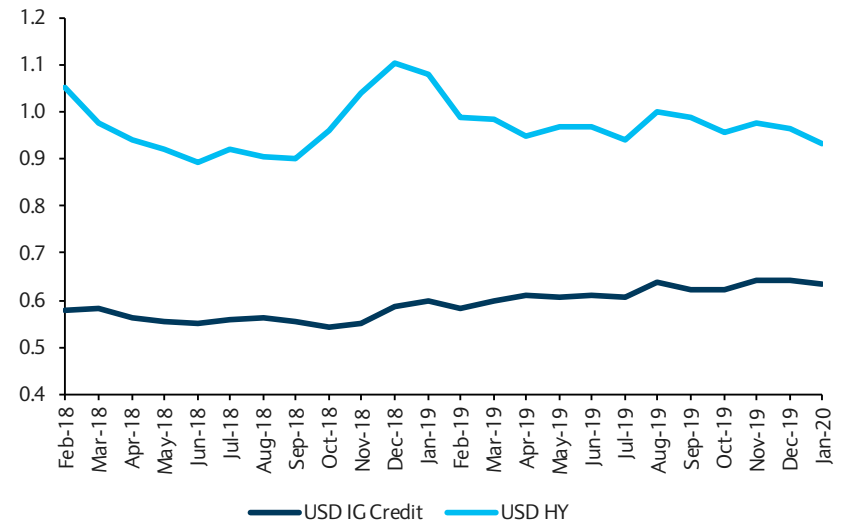


FIGURE 15  
Time Series of EUR IG and HY Credit LCS, %, May 2010-January 2020

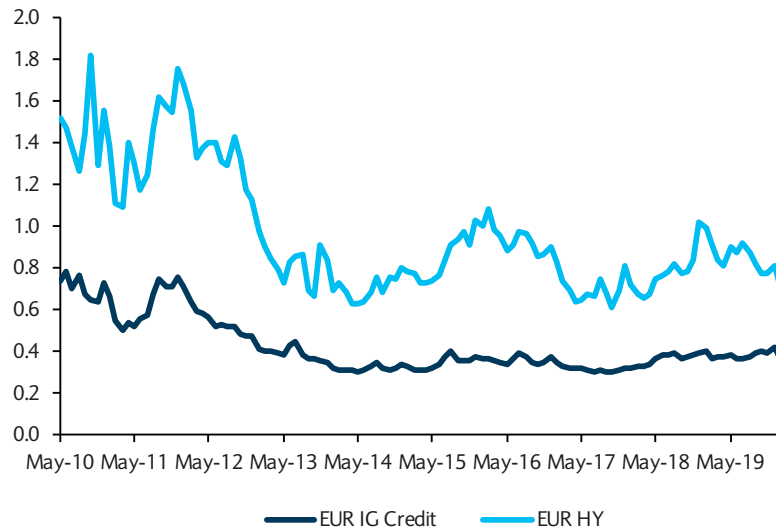
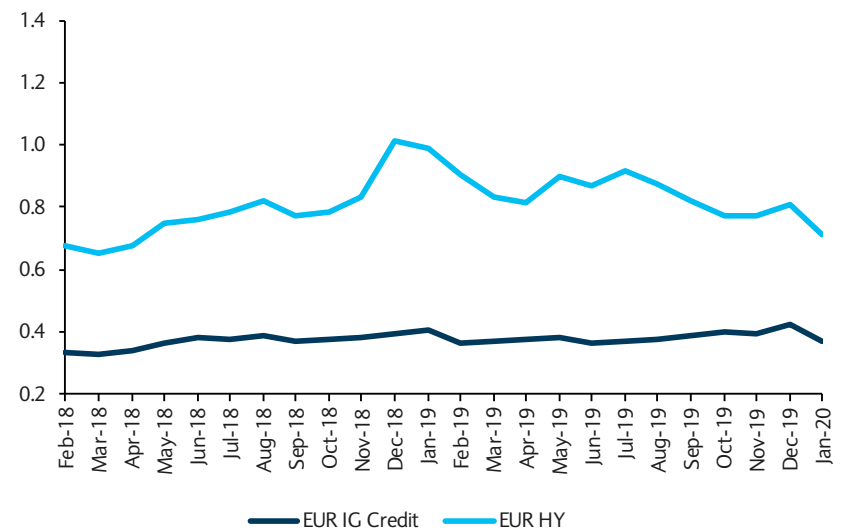
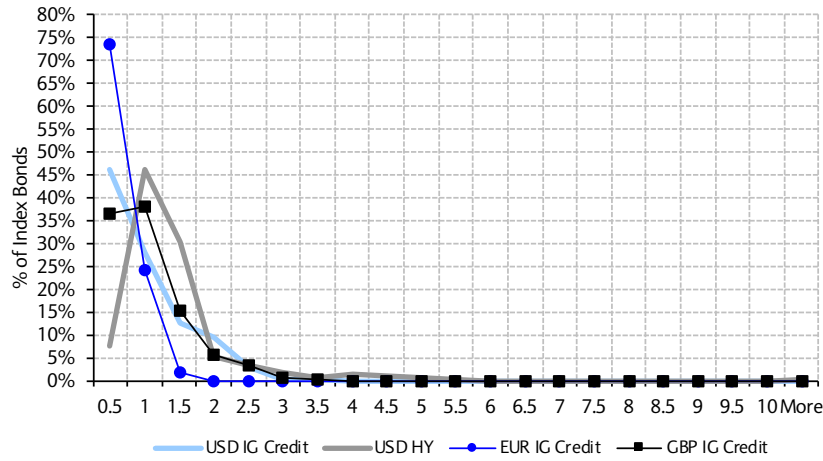


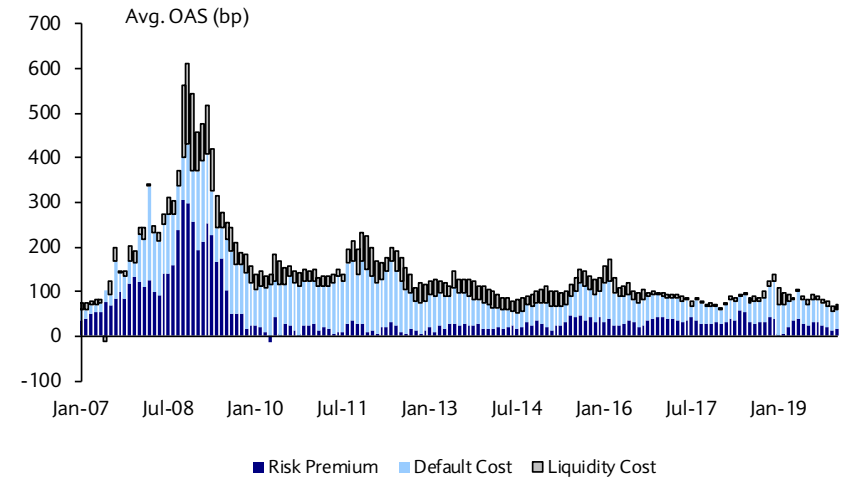
FIGURE 17  
Time Series of EUR IG and HY Credit LCS, %, Past 24 Months



**FIGURE 18**  
Cross-Sectional LCS Frequency Distribution for Various Credit Markets

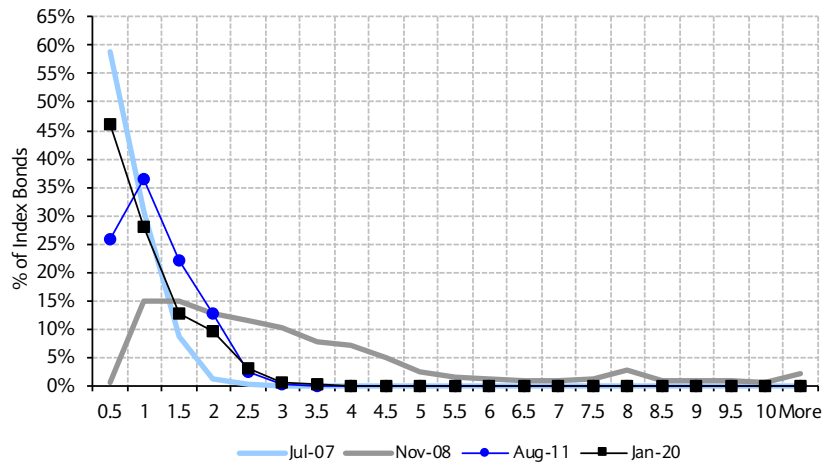


**FIGURE 20**  
Risk Premium, Default, and Liquidity Components of USD IG Credit Bonds OAS, January 2007-January 2020



Note: The sample is limited to 5y bonds from issuers belonging to the CDX basket.

**FIGURE 19**  
Historical Cross-Sectional LCS Frequency Distribution for USD IG Credit



**FIGURE 21**  
Trade Efficiency Score (TES) Buckets Statistics, USD IG Corporates

TES	# bonds	# bonds %	MV %	Age	Avg issue size, mn	OAS, bp	OASD	LCS, %	Avg Vol, mn
1	845	13.8	26.5	2.37	1,682	110	9.11	0.462	245.0
2	878	14.4	20.3	3.67	1,248	92	6.75	0.518	91.7
3	424	6.9	7.6	4.15	957	100	7.43	0.610	55.1
4	477	7.8	7.9	4.75	879	100	7.25	0.682	41.9
5	532	8.7	7.7	4.91	766	98	7.13	0.760	33.3
6	490	8.0	6.3	5.18	676	97	7.36	0.798	23.1
7	519	8.5	6.0	5.38	597	102	8.26	0.921	14.9
8	531	8.7	5.5	5.79	539	102	8.23	0.976	9.9
9	471	7.7	4.5	6.06	489	107	9.15	1.142	6.0
10	942	15.4	7.8	8.13	416	111	8.27	1.130	2.0

FIGURE 22  
LCS Quintiles: One- and Six-month Transition Rates and Average LCS, %

USD IG Credit

Current	Q1 (0.144)	Q2 (0.317)	Q3 (0.560)	Q4 (0.910)	Q5 (1.710)
Previous month					
Q1 (0.165)	84.5	14.6	0.9	0.0	0.0
Q2 (0.341)	11.4	74.6	13.5	0.5	0.0
Q3 (0.586)	0.6	10.3	75.9	12.7	0.5
Q4 (0.947)	0.0	0.1	7.9	79.6	12.4
Q5 (1.689)	0.0	0.0	0.4	8.0	91.6
6 months ago					
Q1 (0.169)	84.6	12.6	2.1	0.6	0.1
Q2 (0.335)	22.5	60.0	13.2	3.8	0.5
Q3 (0.538)	2.8	20.8	63.2	12.2	1.0
Q4 (0.872)	0.1	1.4	15.7	66.1	16.7
Q5 (1.583)	0.0	0.1	0.9	11.7	87.3

USD HY

Current	Q1 (0.524)	Q2 (0.756)	Q3 (0.965)	Q4 (1.173)	Q5 (2.619)
Previous month					
Q1 (0.547)	75.5	20.7	3.5	0.3	0.0
Q2 (0.800)	16.4	53.6	24.9	5.2	0.0
Q3 (1.009)	3.8	18.6	49.3	25.6	2.7
Q4 (1.186)	1.1	6.0	20.4	60.9	11.7
Q5 (2.574)	0.3	0.8	2.4	9.9	86.6
6 months ago					
Q1 (0.578)	64.9	21.9	7.9	5.0	0.3
Q2 (0.857)	22.8	36.9	22.5	13.5	4.2
Q3 (1.059)	5.9	17.6	31.4	35.2	10.0
Q4 (1.187)	4.6	12.5	28.9	36.2	17.9
Q5 (2.088)	0.6	2.9	7.5	15.3	73.7

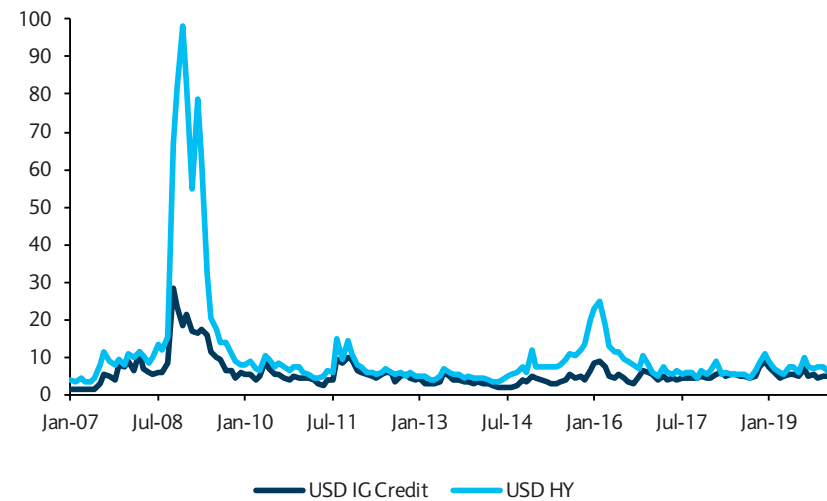
Note: At the beginning of the observation period (ie, last month or six months ago), we sort index bonds into LCS quintiles and follow the quintile-migration of bonds still in the index at the end of the period. For example, a bond that was in Q3 six months ago but is in Q2 now is counted in the third row, second column of the six-month transition matrix. This approach means that while rows sum to 100%, columns usually do not.

FIGURE 23  
Tradable Cash Credit Baskets (TCX) Scorecard; TE and TEV in bp, LCS in %

	USD Credit	USD Long Credit	USD Corporate	EUR Credit	EUR Corporate	USD EM Corp
Inception	Feb-07	Feb-07	Feb-07	Jun-10	Aug-10	Mar-12
# of bonds	50	36	50	48	40	28
Rebalancing	Monthly	Monthly	Quarterly	Monthly	Quarterly	Monthly
January TE	13.0	13.7	-13.1	6.4	-2.2	28.1
Avg. monthly TE	-1.1	2.4	-1.2	1.2	-1.4	-5.9
TEV	48.2	36.9	48.0	12.3	23.2	46.3
Index ExRet Vol	138.8	237.0	156.3	73.3	83.5	137.9
LCS	0.375	0.787	0.435	0.179	0.257	0.463
Index LCS	0.635	1.167	0.684	0.368	0.367	0.668

Note: TCX baskets are small portfolios of highly liquid bonds, designed to track an underlying benchmark. For details, see *Edelstein, A., S. Dastidar and B. Phelps, April 2010, Tradable Credit Portfolio (TCX) to Track the USD IG Credit Index, Barclays Cross Asset Research.*

FIGURE 24  
Time Series of Price Impact Measure (PIM), bp, USD IG and HY Credit, January 2007-January 2020



Note: This figure shows the index-level PIM, which is an arithmetic average of bond-level PIM values (net of market).



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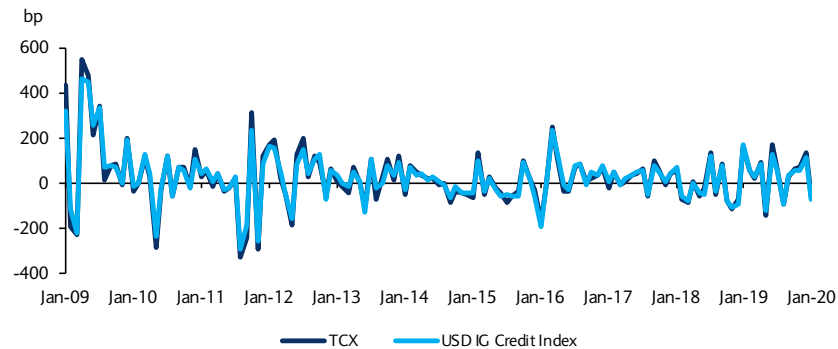
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## TCX Report – January 2020

FIGURE T1  
 USD Credit TCX and Credit Index Excess Returns (to Treasuries), January 2009-January 2020

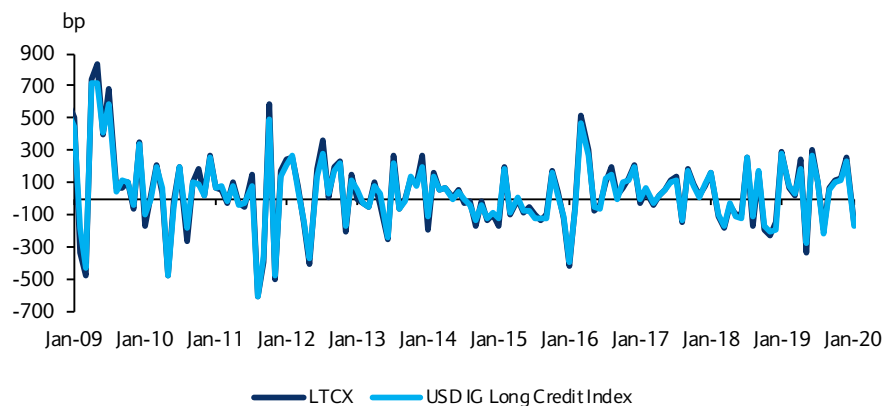


The USD Credit TCX (TCX) is a 50-bond portfolio of highly liquid bonds designed to track the USD Credit Index. It is constructed to match the index’s DTS and market value weights in 25 sector/duration buckets, while selecting from among the most liquid (lowest-LCS) bonds. The USD Credit TCX is rebalanced monthly.

In terms of excess return (to Treasuries), the TCX tracking error versus the USD Credit Index was 13.0bp in January. Figure T1 shows the excess return tracking performance of the TCX since 2009. Over that period, its monthly tracking error versus the index has averaged 0.2bp, with a volatility of 25bp (for comparison, over the same period, the monthly excess return volatility of the index has been 113bp).

The LCS of the January Credit TCX basket is 0.375, versus the Index LCS of 0.635.

FIGURE T2  
 USD Long Credit TCX and Long Credit Index Excess Returns (to Treasuries), January 2009-January 2020

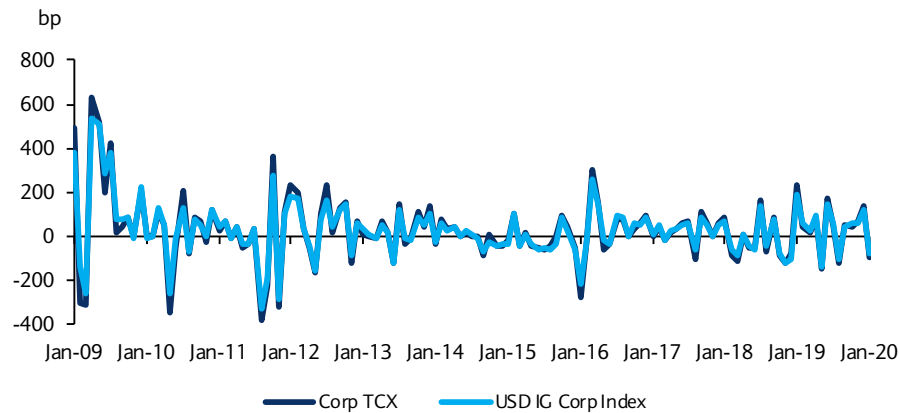


The USD Long Credit TCX (LTCX) is a 36-bond portfolio of highly liquid bonds designed to track the USD Long Credit Index. It is constructed to match the index’s DTS and market value weights in 18 sector/duration buckets, while selecting from among only the most liquid (lowest-LCS) bonds. The USD Long Credit TCX is rebalanced monthly.

In January, the LTCX tracking error versus the USD Long Credit Index was 13.7bp. Figure T2 shows the excess return tracking performance of the LTCX since 2009. Over that period, its monthly tracking error versus the index has had an average of 2.7bp and a volatility of 37bp (for comparison, the monthly excess return volatility of the index has been 208bp).

The LCS of the January LTCX basket is 0.787, versus the Index LCS of 1.167.

FIGURE T3  
 USD Corporate TCX and Corporate Index Excess Returns (to Treasuries), January 2009-January 2020

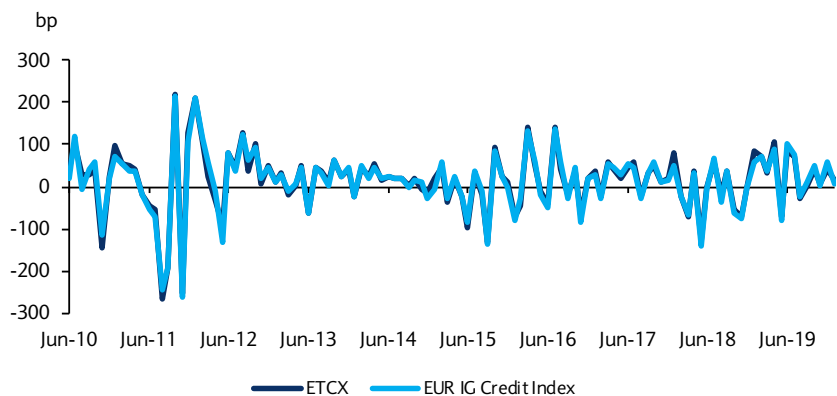


The USD Corporate TCX is a basket of 50 highly liquid bonds designed to track the excess returns of the USD Corporate Index. It is rebalanced quarterly. To ensure that the basket stays liquid over three months, we tighten the liquidity constraint by requiring candidates to have a high TRACE trading volume and amount outstanding, in addition to the regular low-LCS threshold.

In January, the USD Corporate TCX tracking error versus the Corporate index was -13.1bp. Figure T3 shows the excess return tracking performance of the USD Corporate TCX since 2009. Over that period, its monthly tracking error versus the index has averaged -0.8bp, with a volatility of 32bp (for comparison, the monthly excess return volatility of the index has been 126bp).

The LCS of the January Corporate TCX basket is 0.435, versus the Index LCS of 0.684.

FIGURE T4  
 EUR Credit TCX and Euro Credit Index Excess Returns (to Treasuries), June 2010-January 2020

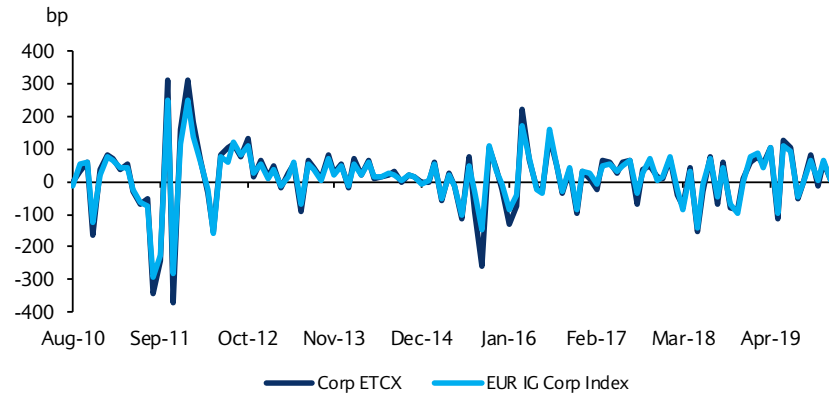


The EUR Credit TCX (ETCX) is a 48-bond portfolio of highly liquid bonds. It is designed to track the excess returns of the Euro IG Credit Index, while selecting from among only the most liquid (lowest-LCS) bonds. The ETCX is constructed to match the index's DTS and market value in 24 sector/duration buckets and is rebalanced monthly.

In January, the ETCX tracking error versus the Euro Credit Index was 6.4bp. Figure T4 shows the excess return tracking performance of the ETCX. Since June 2010, its monthly tracking error versus the index has had an average of 1.2bp and a volatility of 12bp (for comparison, the monthly excess return volatility of the index has been 73bp).

The LCS of the January ETCX basket is 0.179, versus the Index LCS of 0.368.

FIGURE T5  
**EUR Corporate TCX and Euro Corporate Index Excess Returns (to Treasuries), August 2010-January 2020**

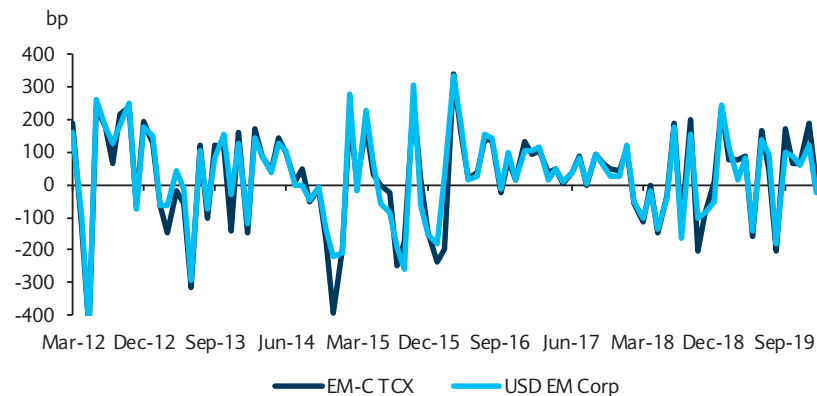


The EUR Corporate TCX is a basket of 40 highly liquid bonds. It is designed to track the excess returns of the Euro Corporate Index and is rebalanced quarterly. As we do with the USD Corporate TCX, to ensure that the basket stays liquid over three months, we tighten the liquidity constraint by requiring candidates to have a high trading volume and amount outstanding, in addition to the low-LCS threshold.

In January, the EUR Corporate TCX tracking error versus the Euro Corporate Index was -2.2bp. Figure T5 shows the excess return tracking performance of the EUR Corporate TCX since August 2010. Over that period, its monthly tracking error versus the index has had an average of -1.4bp and a volatility of 23bp (for comparison, the monthly excess return volatility of the index has been 83bp).

The LCS of the January EUR Corporate TCX basket is 0.257 versus the Index LCS of 0.367.

FIGURE T6  
**USD EM Corporate TCX and USD EM Corporate Index Excess Returns (to Treasuries), March 2012-January 2020**



The USD EM Corporate TCX (EM-C TCX) is a 28-bond portfolio of highly liquid bonds. It is designed to track the excess returns of the Corporate component of the USD EM Aggregate Index and constructed to match the index’s DTS and market value in 14 region/duration buckets. The USD EM Corporate TCX is rebalanced monthly.

In January, the EM-C TCX tracking error was 28.1bp. Figure T6 shows the excess return tracking performance of the EM-C TCX. Since its launch in April 2012, its monthly tracking error versus the index has averaged -5.9bp, with a volatility of 46bp (for comparison, the monthly excess return volatility of the index has been 138bp).

The LCS of the January EM-C TCX basket is 0.463, versus the Index LCS of 0.668.

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