



Arik Ben Dor
+1 212 526 7713
arik.bendor@barclays.com
BCI, US

Stephan Florig
+44 (0) 20 7773 1099
stephan.florig@barclays.com
Barclays, UK

Xiaming Zeng
+44 (0) 20 3134 4461
xiaming.zeng@barclays.com
Barclays, UK

Is Short Selling Informative about Future Corporate Bond Returns?

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Motivation

- Numerous studies document that the level of short interest in a company's equity is associated with low future equity returns¹
- A negative view on the prospects of a company applies equally to equity and bond holders

Is the level of equity short interest informative of a company's bond returns?

- The level of short interest in corporate bonds has been less well explored so far

Does bond lending have different information about corporate bond returns than equity lending?

1: See Rapach, Ringgenberg and Zhou, *Short Interest and Aggregate Stock Returns* (JFE, 2016) for a study of the aggregate stock market and Engelberg, Reed and Ringgenberg, *How are Shorts Informed? Short Sellers, Sews, and Information Processing* (JFE, 2012) for a study of the cross-section of equity.

1. The Data on Lending Activity



2. Forming Corporate Bond Portfolios based on Equity Short Interest



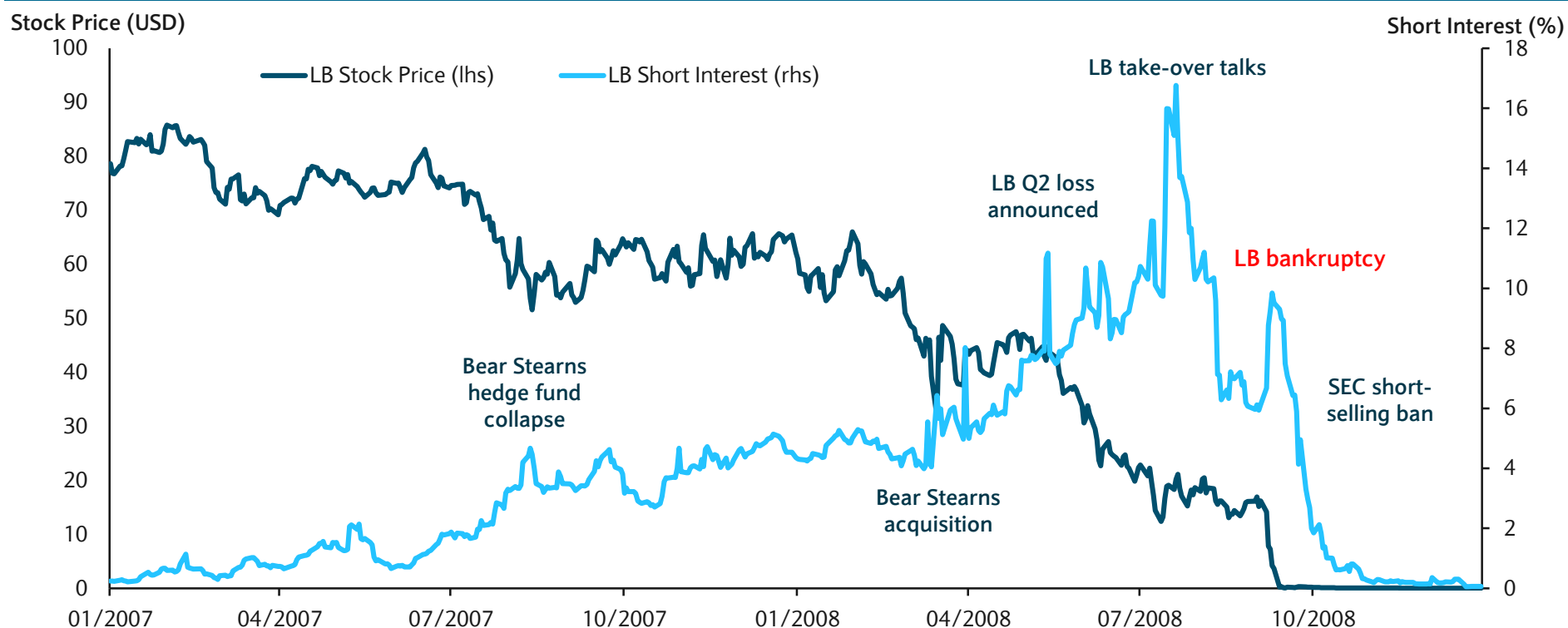
3. The Predictive Information in Bond Short Interest

1. The Data on Lending Activity

A Timeline: Short Interest in Lehman Brothers Stock

- Stock price and short interest data on Lehman Brothers (LB) before bankruptcy filing
- Short interest: Fraction of outstanding shares (or par value) in lending transactions

Price and Short Interest in Lehman Brothers Stock



Source: Astec FIS, Compustat, Barclays Research

How to Measure Lending Activity?

- Security lending allows a borrower to speculate on falling prices, hedge his exposure, or provide liquidity (market making)
- Global bond and equity lending data from Astec FIS since January 2007
 - ✓ Collection of transaction-level lending data originated by *Lending Pit*¹ users
 - ✓ Next-day availability of daily lending data aggregated to the security level (ISIN, CUSIP)

Selected Variables in Astec FIS Securities Lending Database

Field Name	Aggregation Levels
Date, CUSIP, ISIN	Date and Security Identifiers.
Contract Type ID	The contract type of the loans: A (any), O (overnight).
Loan Stage ID	The stage of a loan's life: A (any outstanding at business close), N (new), R (returned), L (recalled).
Collateral Type ID	The type of collateral for this loan: A (any), C (cash), N (non-cash).
Collateral Currency ID	ISO code for the currency of the cash loan's collateral (e.g. EUR, USD, XXX for non-cash).
Field Name	Variables Measuring Lending Activity
Tickets	The number of transactions.
Units	The number of units - shares (equity) or par value (bonds) - lent in transactions.
Retail Loan Rate Avg.	The weighted average retail loan rate for all transactions.

1: Lending Pit is a tool which provides recent lending information, such as lending volume and lending fees, and is used by lending agents, third-party lenders, beneficial owners, prime brokers and asset managers. If a security is not in the database, it is because a) it may have zero short interest or b) it is not covered by any of the lending agents reporting to Astec FIS.

Source: Astec FIS

Calculating Short Interest from Lending Data

- We use data on lending activity to calculate a security's
 - ✓ Short interest: Fraction of outstanding shares (or par value) in lending transactions
 - ✓ Lending fee: Average retail cost for outstanding security loans (all forms of collateral)

Example for Equity Shares

Company with 100 mn shares outstanding as of 27 Jan 2020

- We consider all forms of loans outstanding at market close
- Aggregate short interest based on “Units”
$$2 \text{ mn shares} / 100 \text{ mn shares outstanding} = \mathbf{2.00\%}$$
- Average lending fee equals “Retail Loan Rate Avg” = **3.55%**

Field Name	Value
Date	20200127
Contract Type ID	A
Loan Stage ID	A
Collateral Type ID	A
Units	2,000,000
Retail Loan Rate Avg	3.55

Example for Corporate Bonds

Corporate bond with USD 500 mn par value as of 27 Jan 2020

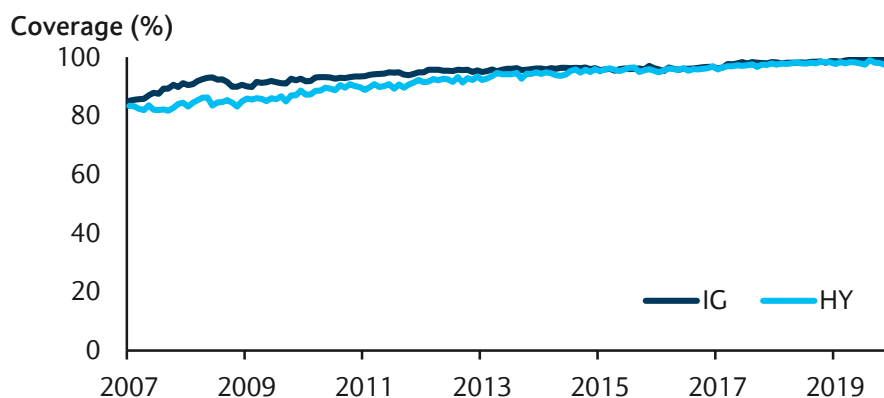
- We consider all forms of loans outstanding at market close
- Aggregate short interest based on “Units”
$$\text{USD } 3,750,000 / \text{USD } 500,000,000 = \mathbf{0.75\%}$$
- Average lending fee equals “Retail Loan Rate Avg” = **1.82%**

Field Name	Value
Date	20200127
Contract Type ID	A
Loan Stage ID	A
Collateral Type ID	A
Units	3,750,000
Retail Loan Rate Avg	1.82

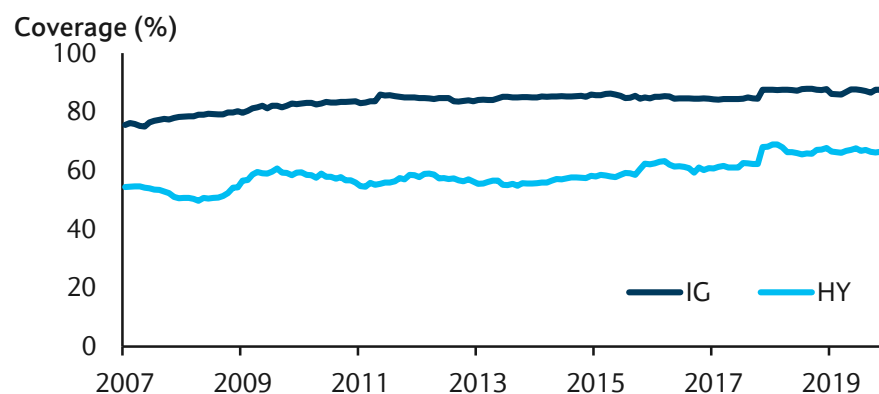
Coverage of Bloomberg Barclays US Corporate Bond Indices

- Mapping of equity and bond short interest data¹ – our sample covers all firms in the index with
 - ✓ Common stock traded on an US exchange, excluding ADRs
 - ✓ Short interest data for both common stock and corporate bonds
- Bond short interest data covers² on average 90% of the IG and HY index since 2007
- Equity short interest data covers on average 84% of the IG index since 2007
- Less equity coverage among HY issuers (more private companies in the HY universe)

**Percentage of Index Value
with Bond Short Interest Data**



**Percentage of Index Value
with Equity Short Interest Data**



1: See [Ben Dor and Xu \(2014\)](#) for details on the mapping of bond and equity data

2: All our subsequent estimates are made on the universe for which we have both equity and bond short interest data. The coverage of bond short interest is below 100% because a) bonds may have zero short interest or b) not all lending transactions are covered by Astec FIS.

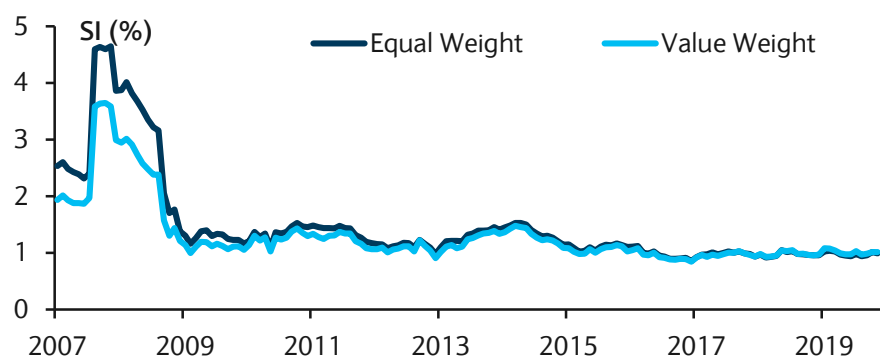
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Short Interest in US Equity and Corporate Bonds

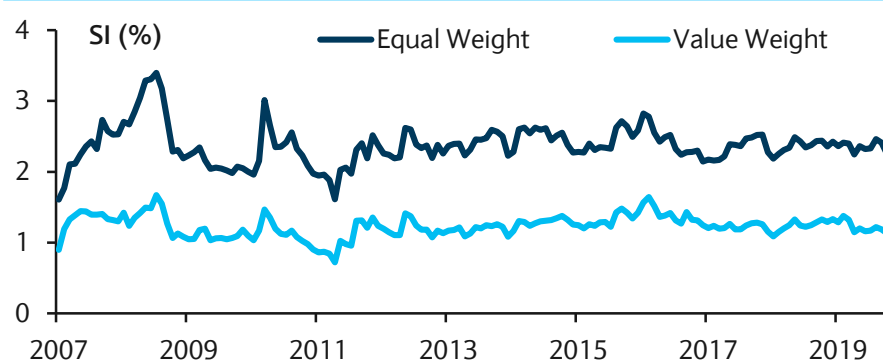
- HY issuers were more shorted than IG issuers, in both the equity and bond market
- Smaller stocks were more shorted than large stocks, as EW averages were significantly larger

Short Interest Dynamics in US IG Sample

Corporate Bonds

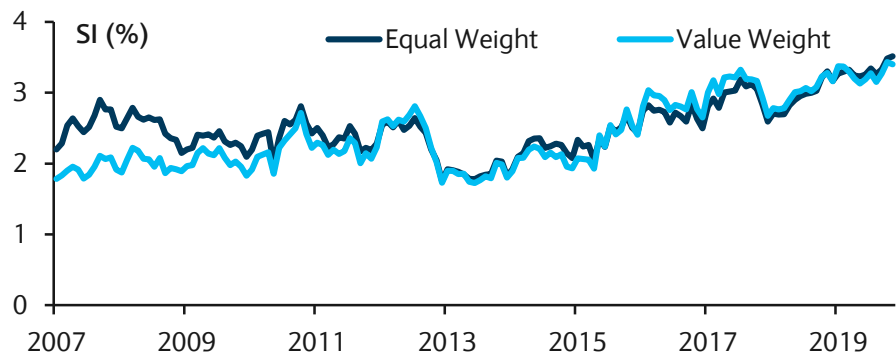


Equity

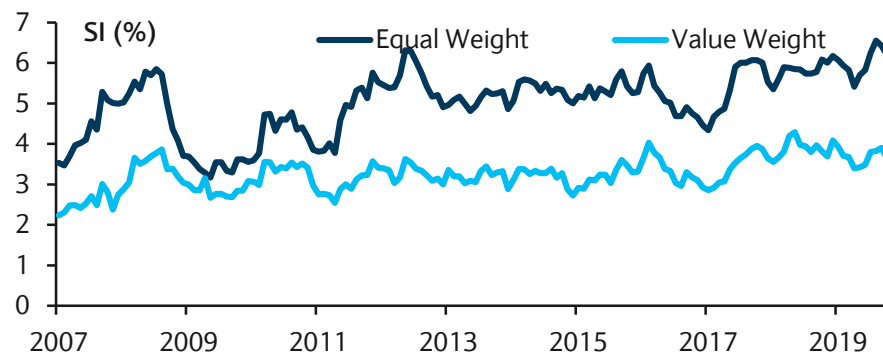


Short Interest Dynamics in US HY Sample

Corporate Bonds



Equity

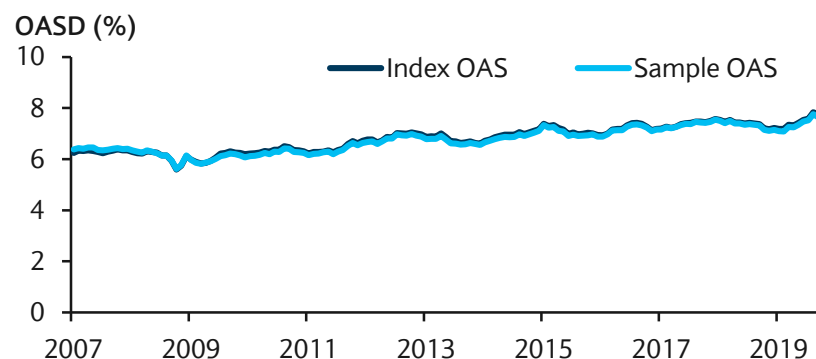
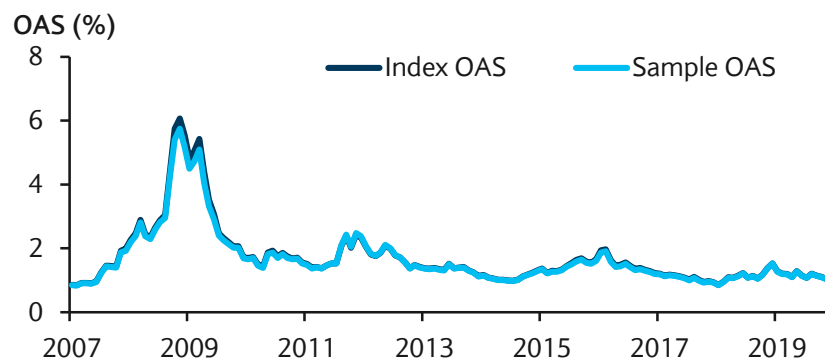


Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

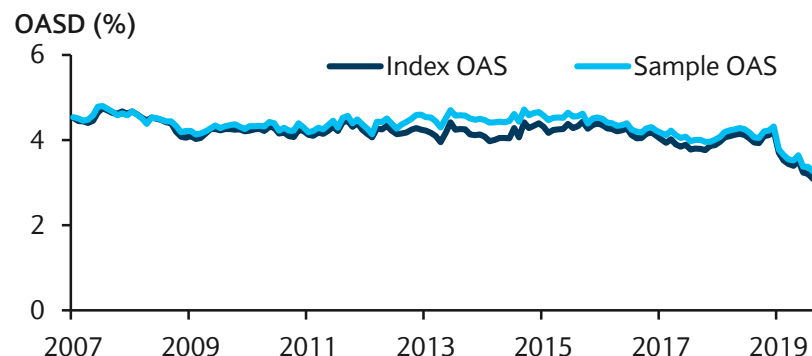
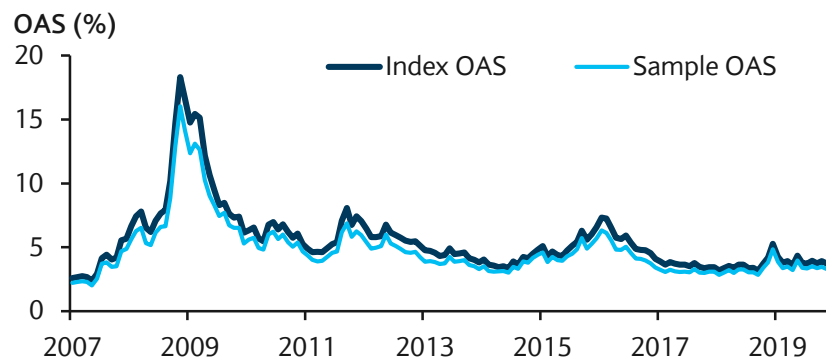
Samples are Similar to IG and HY Bond Indices

- Value-weight OAS and spread duration (OASD) are similar in Bloomberg Barclays indices and mapped samples
- Subsequent results are less likely driven by our sample selection

OAS and OASD in US IG Sample and Index



OAS and OASD in US HY Sample and Index



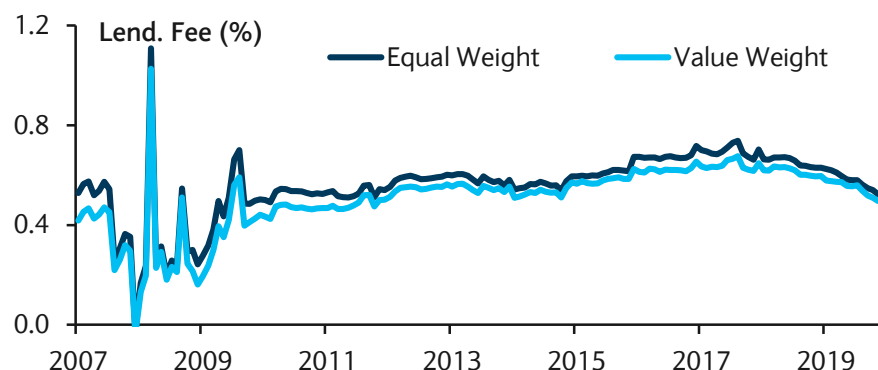
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Lending Fees in US Equity and Corporate Bonds

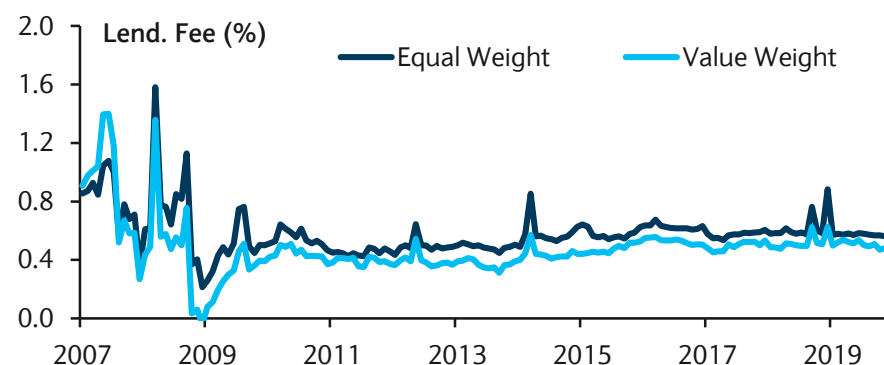
- On average, smaller issuers were more expensive to short in both the equity and bond market
- 2016 spike in HY equity lending fees due to some (e.g. distressed) issuers with fees > 100%

Lending Fee Dynamics in US IG Sample

Corporate Bonds

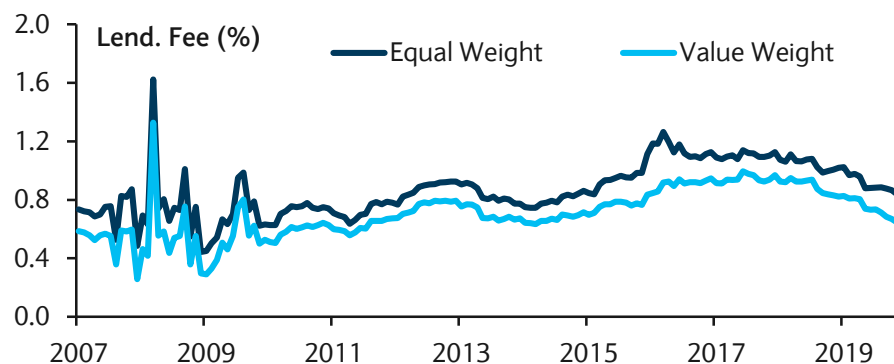


Equity

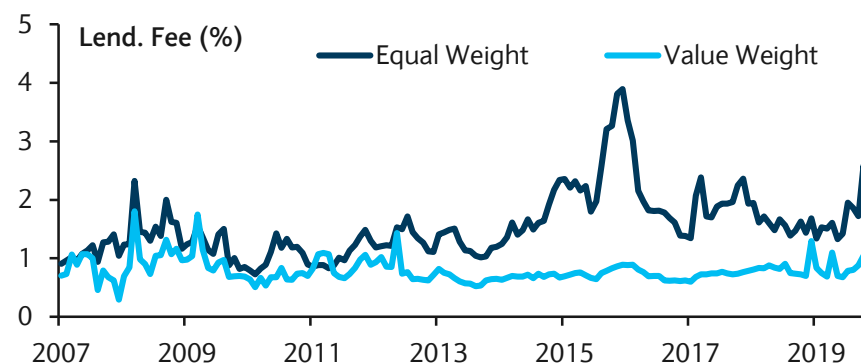


Lending Fee Dynamics in US HY Sample

Corporate Bonds



Equity



Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

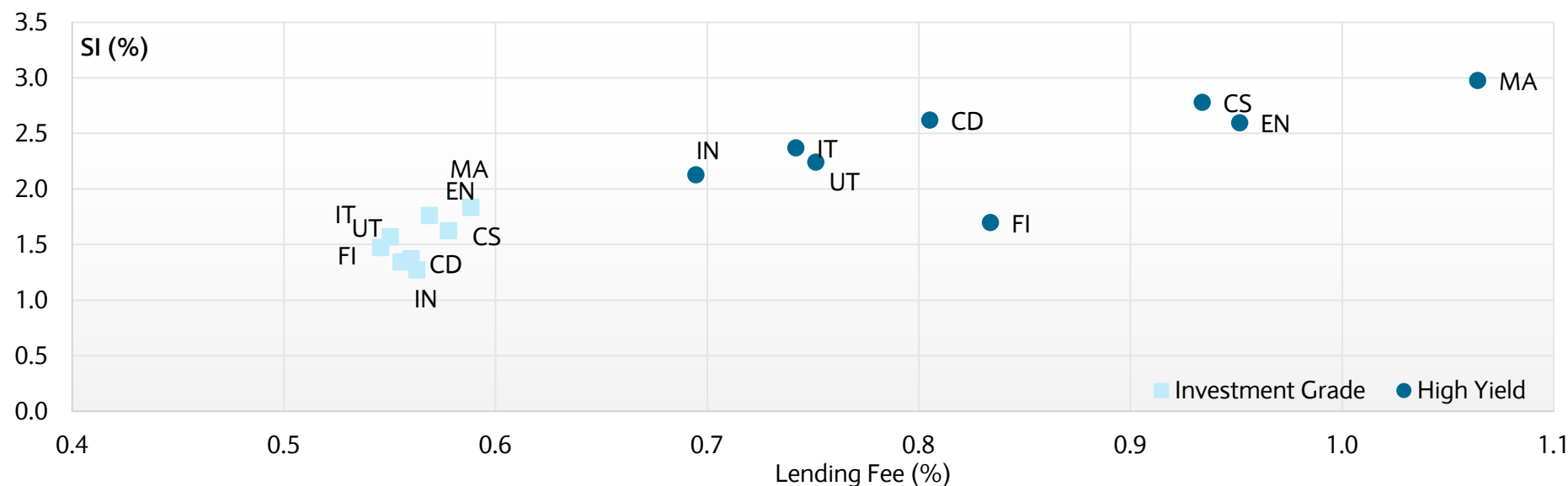
Variation in Lending Activity across Sectors

- Industry classification, mapping GICS sectors to Bloomberg Bond Classification

Code	Description	Code	Description
CD	Consumer Discretionary / Consumer Cyclical	CS	Consumer Staples / Consumer Non-Cyclical
EN	Energy / Energy and Transport	FI	Financials and Real Estate
IN	Industrials / Capital Goods	IT	Communications and Information Technology
MA	Materials / Basic Industry	UT	Utilities

- Stronger variation in lending fees and short interest across industries in HY bonds

Short Interest and Lending Fees across Industries (2007 – 2019)



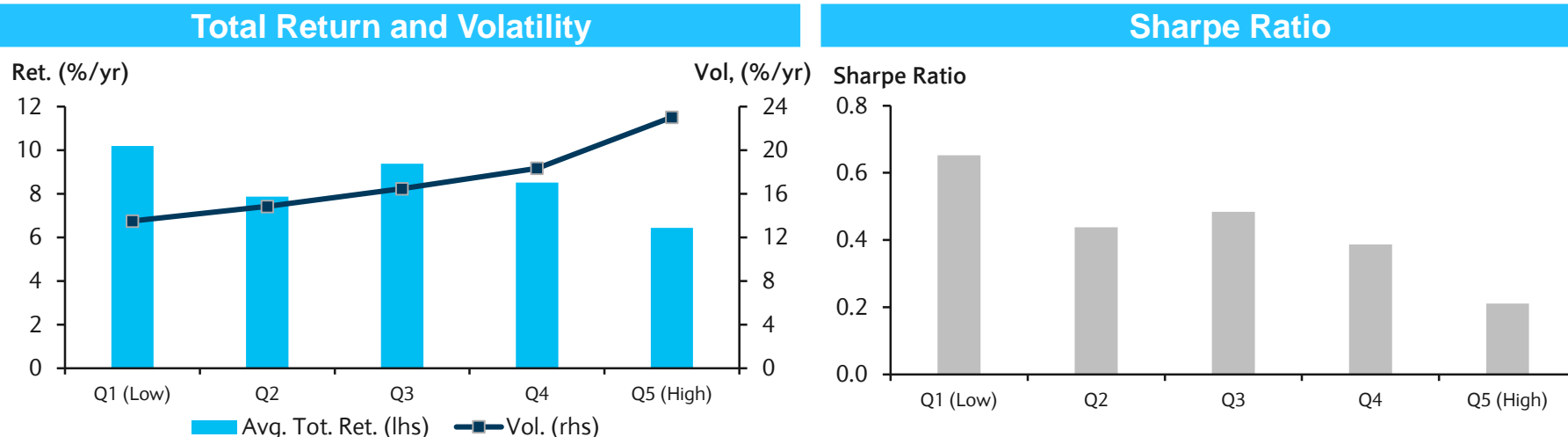
Note: Estimates are equal-weight averages of short interest and lending fees
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

2. Forming Corporate Bond Portfolios based on Equity Short Interest

Equity Short Interest is Predictive of Equity Returns

- Is equity short interest predictive of equity returns in our sample?
- Monthly ranking of firms into quintile portfolios based on equity short interest¹
- Volatility increased monotonically with short interest, from 13.5% (Q1) to 23.0% (Q5)
- On average, Q1 (least shorted) outperformed Q5 (most shorted) by 3.8% per year
- Is equity short interest also predictive of bond returns?

Performance of Value-Weight Equity Short Interest Portfolios (2007 – 2019)



1: We consider the latest available short interest during the month of implementation, skipping the last trading day of the month.

Note: We use 1-month LIBOR as funding rate to compute Sharpe ratios.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

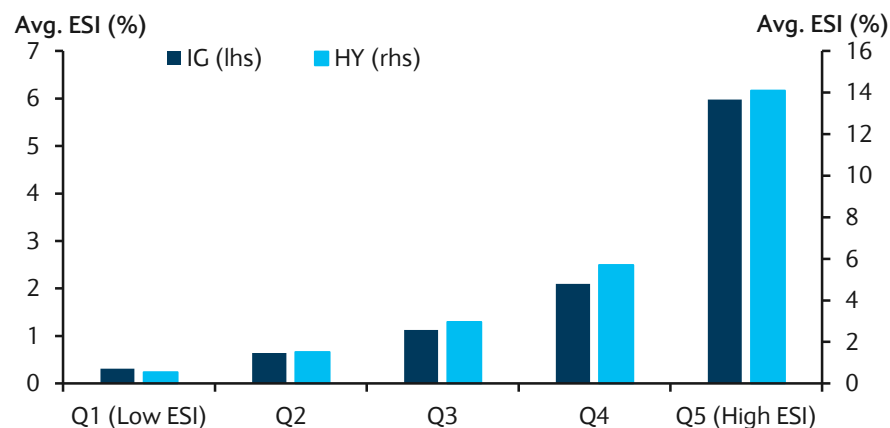
Forming Bond Portfolios based on Equity Short Interest (*ESI*)

- Monthly ranking of bond issuers¹ into quintile portfolios² based on *ESI*

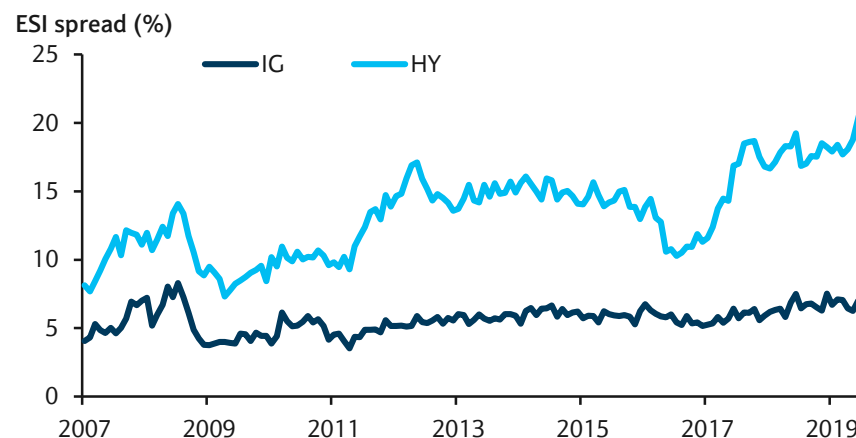
ESI: Latest available short interest in a bond issuer's publicly traded equity

- Across all portfolios, the average *ESI* was larger for HY issuers
- Increasing *ESI* spread between high *ESI* and low *ESI* HY issuers
- Does *ESI* reflect varying risk and returns across portfolios?

Average *ESI* in *ESI* Portfolios (2007 – 2019)



Q5-Q1 Spread in *ESI*



1: Issuers need both equity and at least one bond in a lending transaction in the month of portfolio formation. We skip the last trading day of the month for implementation.
2: We rank issuers within industries to keep the portfolios industry-neutral. The industry classification of an issuer's largest outstanding bond determines an issuer's industry. Page 12 contains the industry classifications used for the portfolio sorts. For IG issuers, we further separate Financials into Banks / Brokers and Other Financials.
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

ES/ Captures Risk beyond Initial Ratings

- *ES/* has been informative about the likelihood of being downgraded over the near future
- Within all rating classes, bonds with highest *ES/* were downgraded the most
- Example: The average Baa-rated bond in Q5 got downgraded 0.22 notches more than the average Baa-rated bond in Q1 over the next 12 months

Average Rating Notch Changes by *ES/* Portfolio, Rating and Horizon

US Investment Grade																		
	Aaa / Aa						A						Baa					
Horizon	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5
3m	0.00	0.06	0.04	0.09	0.10	0.10	0.00	0.01	0.03	0.04	0.06	0.06	-0.01	-0.01	-0.01	0.01	0.04	0.05
6m	0.06	0.11	0.11	0.20	0.20	0.14	0.00	0.03	0.07	0.08	0.12	0.12	-0.02	-0.02	-0.01	0.01	0.09	0.11
9m	0.12	0.21	0.18	0.28	0.30	0.18	0.01	0.06	0.10	0.13	0.18	0.17	-0.04	-0.03	-0.02	0.03	0.13	0.17
12m	0.21	0.30	0.27	0.40	0.40	0.19	0.02	0.09	0.13	0.16	0.24	0.22	-0.05	-0.04	-0.02	0.04	0.17	0.22
US High Yield																		
	Ba						B						Caa/Ca/C					
Horizon	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5
3m	-0.01	-0.03	0.00	0.02	0.11	0.12	-0.04	-0.04	-0.02	0.00	0.09	0.13	-0.01	-0.03	0.03	-0.02	0.13	0.14
6m	-0.02	-0.06	0.00	0.03	0.22	0.24	-0.06	-0.07	-0.02	0.01	0.17	0.24	-0.06	-0.03	0.02	-0.02	0.22	0.28
9m	-0.02	-0.09	-0.02	0.05	0.33	0.35	-0.08	-0.10	-0.02	0.02	0.24	0.32	-0.08	-0.04	-0.01	-0.01	0.29	0.38
12m	-0.02	-0.11	-0.02	0.08	0.41	0.43	-0.10	-0.12	-0.02	0.05	0.29	0.39	-0.10	-0.05	-0.06	-0.04	0.35	0.45

Note: Each rating notch is assigned a numerical value, and the better the rating the lower the value (Aaa=1, Aa1=2, ..., C=21, D=22). For each issuer, individual bond ratings were value weighted to obtain the aggregate issuer rating. The rating change is calculated as the difference between the end rating (last available rating at the earlier of the issuer exiting the index or the end of the evaluation window) and the rating at the beginning of the evaluation window. Issuers were sorted into quintiles by their value-weighted short interest. Rating changes were equally weighted among all issuers. The period covers 2007 to 2018.

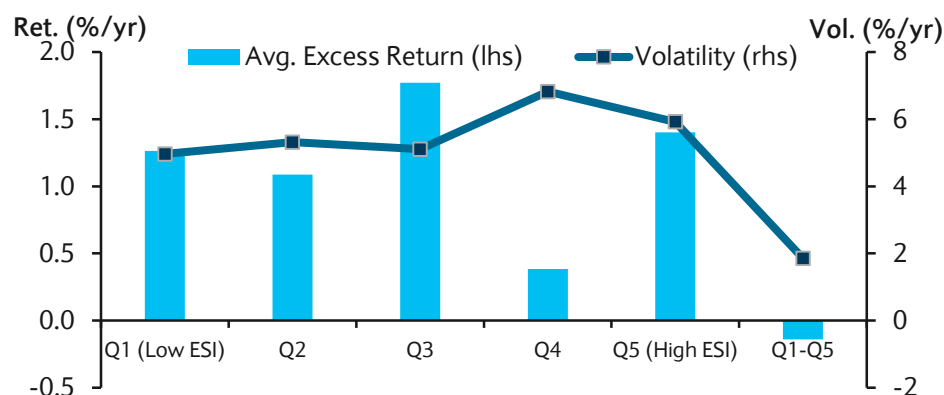
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Performance Dynamics of *ESI* Portfolios

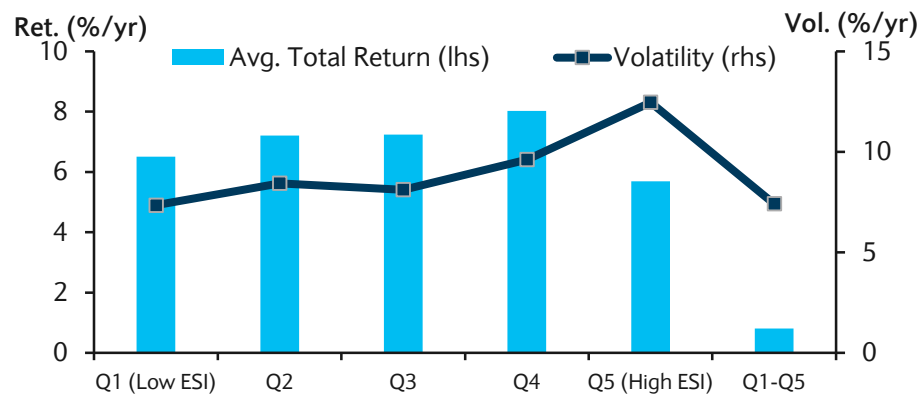
- Return volatility increased with *ESI*
- No clear pattern for average returns in either the HY or IG universe

Value-Weight Return and Volatility across *ESI* Portfolios (2007 – 2019)

Investment Grade

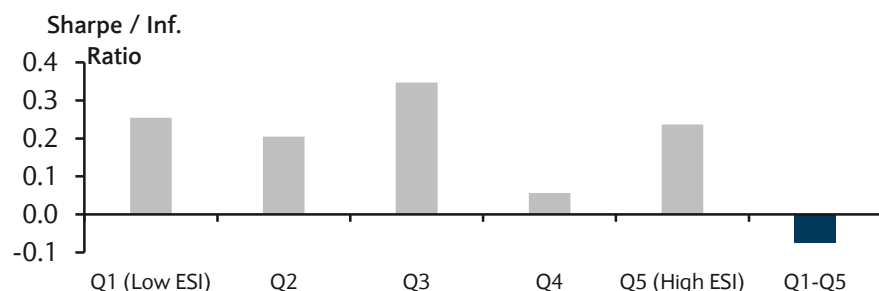


High Yield

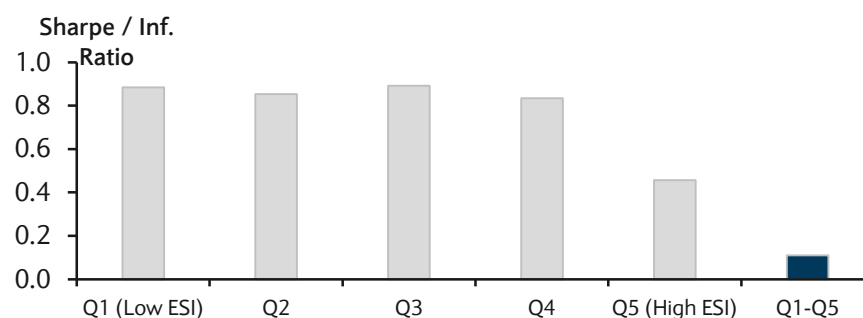


Sharpe / Information Ratio across *ESI* Portfolios (2007 – 2019)

US Investment Grade



US High Yield

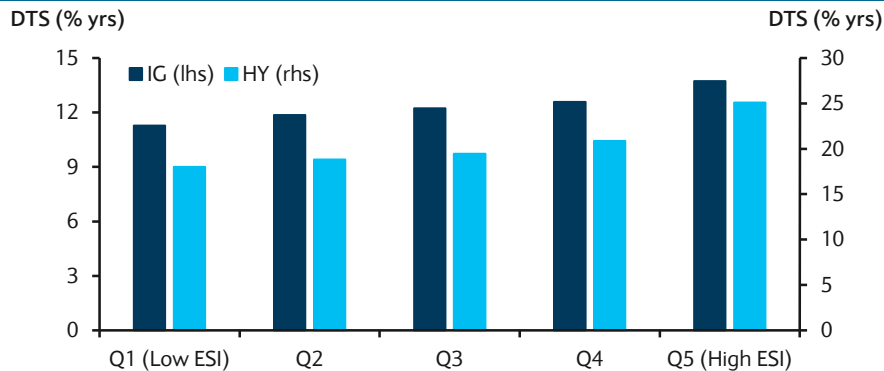


Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

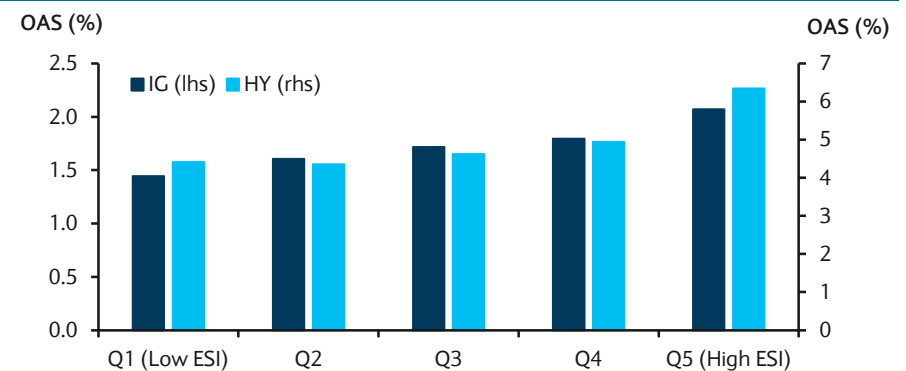
Risk Characteristics of *ES/* Portfolios

- Monotonically increasing DTS, OAS and worsening rating across portfolios
- Negative relationship between *ES/* and issuer size in IG universe
- Impact of varying risk characteristics may distort the portfolio performance

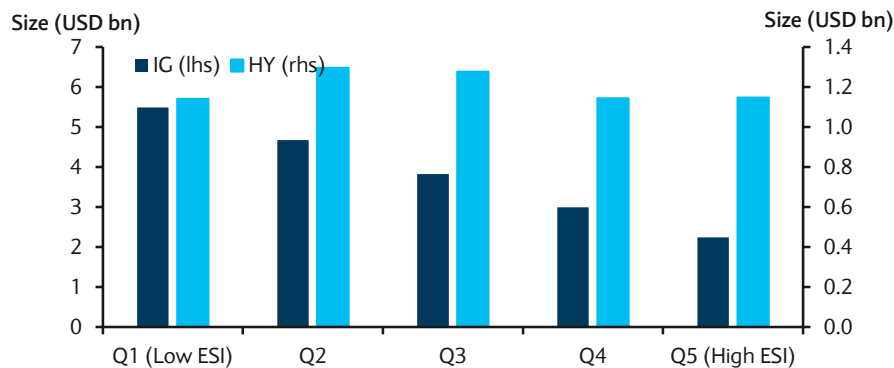
DTS across *ES/* Quintiles



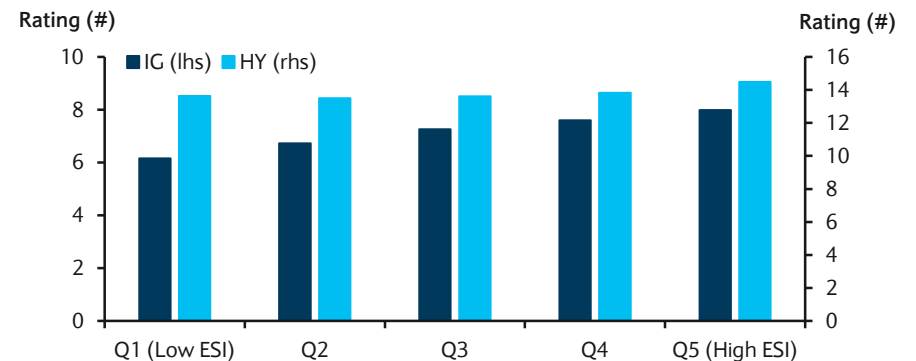
OAS across *ES/* Quintiles



Issuer Size across *ES/* Quintiles



Rating across *ES/* Quintiles



Note: See [Konstantinovskiy, Ng, and Phelps \(2015\)](#) for more details on LCS and [Ben Dor et al. \(2007\)](#) for more details on DTS. Estimates are for the period 2007 to 2019.

Note: Each rating is represented by a numerical value, where a better rating is represented by a lower value (Aaa=1, Aa1=2, ..., C=21, D=22).

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Index Replication with a Tilt on *ES/*

- To control for risk characteristics, construct index replicating portfolios with *ES/* tilt
- Replication universe is represented by a single liquid senior bond of each issuer
 - ✓ With > 3 years to maturity
 - ✓ Notional amount > 25-percentile of respective index
- Among all eligible bonds, select the one
 - ✓ Closest to average industry duration
 - ✓ With an age < 2 years

Comparison of Index and Replication Universe (2007 – 2019)

		Characteristics (Monthly Average)						Excess Returns (IG) / Total Returns (HY)				
	Avg # of Bonds/m	Quality	OAS (bps)	OASD (yr)	DTS	LCS	Avg Bond MV (\$MM)	Avg. Ret. (%/yr)	Vol. (%/yr)	Sharpe Ratio	Worst Ret. (%/m)	Corr. with Index
IG	Index	4537	3.26	170	6.80	12.10	0.84	790	1.18	5.41	0.22	-8.38
	Replication Universe	869	3.41	178	6.95	12.28	0.87	690	1.40	5.17	0.27	-8.31
HY	Index	1905	5.79	555	4.16	22.19	1.57	539	7.41	10.89	0.63	-15.91
	Replication Universe	937	5.91	574	4.17	23.34	1.68	489	7.15	9.53	0.68	-17.65

Note: Each rating is represented by a numerical value, and the better rating the lower the value (Aaa=1, Aa1=2, ..., C=21, D=22). Portfolio characteristics and returns are value-weighted. We use 1-month LIBOR as funding rate to compute Sharpe ratios in the HY universe.

Source: Bloomberg Barclays Indices, Compustat, Barclays Research

Replication Rules

- Form a replicating portfolio which minimises / maximises *ESI* subject to:
 - ✓ Matching the index industry weights
 - ✓ Matching the index DTS and OAS
 - ✓ Limiting issuer weights to not exceed 1%
 - ✓ Being fully invested
- Exact matching of OAS and DTS with on average 105 HY (106 IG) issuers

Characteristics of Replicating Portfolios by Maximising *ESI*

			Characteristics (Monthly Average)				
		Avg # of Bonds/m	Quality	OAS (bps)	OASD (yr)	DTS	Avg. Bond MV (\$MM)
IG	Index	4537	3.26	170	6.80	12.10	790
	Replication Universe	869	3.41	178	6.95	12.28	690
	Replicating Portfolio (max)	106	3.37	170	7.31	12.10	682
HY	Index	1905	5.79	555	4.16	22.19	539
	Replication Universe	937	5.91	574	4.17	23.34	489
	Replicating Portfolio (max)	105	5.77	555	4.07	22.19	487

Note: The industry classification of an issuer's largest outstanding bond determines an issuer's industry. Page 12 contains the industry classifications, where we further separate Financials into Banks / Brokers and Other Financials for IG issuers.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Replicating Portfolios with Min. and Max. *ESI*

- In both the IG and HY universe, the index outperformed the index tilted portfolio with highest *ESI*
- This finding suggests that *ESI* reflects negative views on a company, which are relevant for both equity and bond holders

Performance Statistics of Replicating Portfolios with Min and Max *ESI*

		Index	Min ESI	Max ESI	Index – Max ESI	Min – Max ESI
IG	Avg. Ex. Ret. (%/yr)	1.18	1.48	-0.03	1.21	1.51
	Vol. (%/yr)	5.41	4.82	4.84	1.61	1.09
	Sharpe / Inf. Ratio	0.22	0.31	-0.01	0.75	1.39
	Worst Monthly Ex. Ret. (%/m)	-8.38	-6.66	-6.77	-2.17	-1.21
	Corr. with Index		0.98	0.96	0.49	0.08
HY	Avg. Tot. Ret. (%/yr)	7.41	7.31	5.79	1.61	1.52
	Vol. (%/yr)	10.89	8.75	9.79	2.49	2.44
	Sharpe / Inf. Ratio	0.63	0.69	0.47	0.65	0.62
	Worst Monthly Tot. Ret. (%/m)	-15.91	-16.42	-17.49	-3.92	-2.37
	Corr. with Index		0.97	0.97	0.07	-0.40

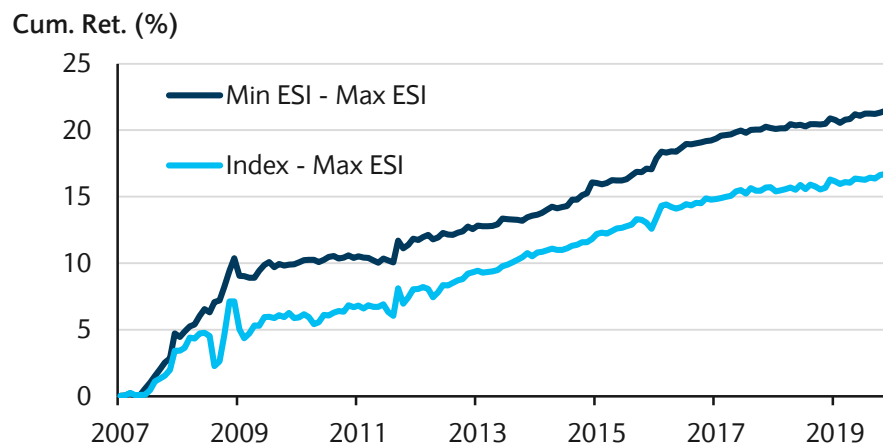
Note: We use 1-month LIBOR as funding rate to compute Sharpe ratios in the HY universe.
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Time Series Dynamics of Replicating Portfolios (*ESI*)

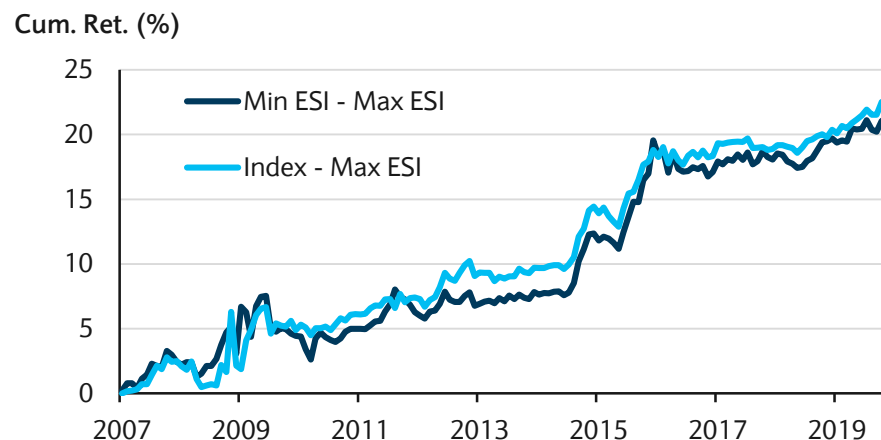
- The outperformance of the index over the Max *ESI* portfolio has been realised throughout the sample
- The efficacy of *ESI* as a signal has been present over time and cannot be attributed to specific events

Cum. Outperformance of Index and Min *ESI* over Max *ESI* Portfolio

Investment Grade



High Yield



Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Reconciling Results from Portfolio Sorts and Index Tilt

- Significantly higher annual return (1.40%) in Q5 than in tilted Max *ESI* portfolio (-0.03%)
- Q5 is riskier (OAS, DTS) than the tilted portfolio, higher returns compensate for higher risk
- In the HY universe, the higher risk in Q5 over the tilted portfolios did not get compensated

Performance Statistics of Replicating Portfolios with Max *ESI*

	Index	Q5 (no risk-matching)	Max ESI (DTS matched)	Max ESI (DTS + OAS matched)
IG	Avg. Ex. Ret. (%/yr)	1.18	1.40	0.80
	Vol. (%/yr)	5.41	5.92	4.89
	Sharpe / Inf. Ratio	0.22	0.24	0.16
	OAS (bps)	170	207	201
	DTS	12.10	13.73	12.10
HY	Avg. Tot. Ret. (%/yr)	7.41	5.69	6.02
	Vol. (%/yr)	10.89	12.46	9.72
	Sharpe / Inf. Ratio	0.63	0.40	0.49
	OAS (bps)	555	634	543
	DTS	22.19	25.11	22.19

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Takeaways from *ES/* Portfolios

1. *ES/* is a strong predictor of subsequent downgrades and bond returns in both the HY and IG universe throughout our sample
2. An index-replicating strategy, that is 'long' low *ES/* issuers and 'short' high *ES/* issuers, generated information ratios of 1.39 (IG) and 0.62 (HY) since 2007
3. Strategy performance cannot be found in univariate portfolio sorts, because risk characteristics, such as OAS and DTS, varied significantly across quintile portfolios - proper accounting for risk characteristics is key to estimating a signal's efficacy

Does bond lending information contain different information than *ES/*?

3. The Predictive Information in Bond Short Interest

Is Bond Short Interest Predictive of Bond Returns?

- Forming corporate bond portfolios based on bond short interest (*BSI*)

BSI: Aggregate¹ short interest of an issuer's bonds in lending transactions

- Monthly ranking of bond issuers into quintile portfolios based on *BSI*
- Average cross-sectional correlation² between *BSI* and *ESI*: 18% (IG) and 28% (HY)
- ESI* ranked portfolios are also monotonically increasing in *BSI* in both IG and HY
- Unlike in HY, IG *BSI* portfolios exhibited no monotonicity in *ESI*

Short Interest in *BSI* (top) and *ESI* (bottom) Portfolios (2007 – 2019)

	Investment Grade						High Yield					
BSI Portfolios	Q1 (Low)	Q2	Q3	Q4	Q5 (High)	Q5 – Q1	Q1 (Low)	Q2	Q3	Q4	Q5 (High)	Q5 – Q1
Avg. ESI	1.90	1.67	1.37	1.31	1.86	-0.04	3.95	4.00	4.01	4.52	7.08	3.13
Avg. BSI	0.11	0.45	0.92	1.57	3.30	3.19	0.12	0.58	1.32	2.51	6.58	6.46

ESI Portfolios	Q1 (Low)	Q2	Q3	Q4	Q5 (High)	Q5 – Q1	Q1 (Low)	Q2	Q3	Q4	Q5 (High)	Q5 – Q1
Avg. ESI	0.31	0.64	1.13	2.10	5.98	5.67	0.54	1.51	2.96	5.71	14.09	13.55
Avg. BSI	1.32	1.37	1.41	1.50	1.70	0.38	1.97	2.16	2.40	2.76	3.56	1.59

1: We use equal-weight averages to compute the issuer's overall short interest. Our main results hold qualitatively if we use value-weight averages of the short interest of an issuer's bonds, see Appendix. We skip the last trading day of the month for implementation.

2: Average cross-sectional correlations are computed at the company level.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

BSI Captures Future Downgrades in HY Issuers Only

- *BSI* has been less informative about future downgrades than *ESI* across all rating classes
- *BSI* was not informative for downgrades in Aaa, Aa and A rated bonds
- Equity a more likely candidate to express negative views on a company's credit quality

Average Rating Notch Changes by *BSI* Portfolio, Rating and Horizon

US Investment Grade																		
	Aaa / Aa						A						Baa					
Horizon	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5
3m	0.07	0.08	0.07	0.07	0.07	0.00	0.04	0.03	0.03	0.02	0.04	-0.01	0.00	0.00	0.00	0.00	0.03	0.04
6m	0.14	0.19	0.14	0.16	0.15	0.01	0.09	0.07	0.06	0.05	0.07	-0.02	-0.01	-0.01	0.01	0.00	0.06	0.07
9m	0.23	0.30	0.21	0.24	0.24	0.02	0.14	0.12	0.09	0.08	0.11	-0.03	-0.01	-0.02	0.01	0.01	0.09	0.10
12m	0.32	0.40	0.31	0.35	0.35	0.03	0.18	0.16	0.12	0.11	0.15	-0.03	-0.01	-0.02	0.01	0.01	0.12	0.14
US High Yield																		
	Ba						B						Caa/Ca/C					
Horizon	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5	Q1	Q2	Q3	Q4	Q5	Q1-Q5
3m	0.00	0.00	0.01	0.00	0.09	0.09	-0.04	-0.03	-0.01	-0.01	0.07	0.11	-0.02	-0.01	0.04	0.04	0.04	0.06
6m	-0.01	0.01	0.01	0.00	0.17	0.18	-0.07	-0.04	-0.02	0.00	0.14	0.21	-0.04	-0.04	0.06	0.06	0.08	0.12
9m	-0.02	0.02	0.01	0.01	0.24	0.26	-0.09	-0.05	-0.03	0.00	0.19	0.28	-0.05	-0.06	0.05	0.08	0.10	0.15
12m	-0.02	0.03	0.02	0.03	0.30	0.31	-0.11	-0.05	-0.04	0.02	0.24	0.34	-0.07	-0.07	0.03	0.07	0.10	0.17

Note: Each rating notch is assigned a numerical value, and the better the rating the lower the value (Aaa=1, Aa1=2, ..., C=21, D=22). For each issuer, individual bond ratings were value weighted to obtain the aggregate issuer rating. The rating change is calculated as the difference between the end rating (last available rating at the earlier of the issuer exiting the index or the end of the evaluation window) and the rating at the beginning of the evaluation window. Issuers were sorted into quintiles by their value-weighted short interest. Rating changes were equally weighted among all issuers. The period covers 2007 to 2018.

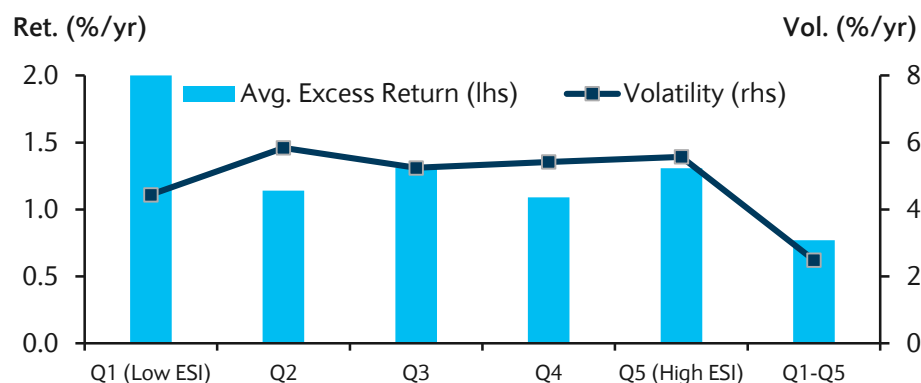
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Performance Dynamics of *BSI* Portfolios

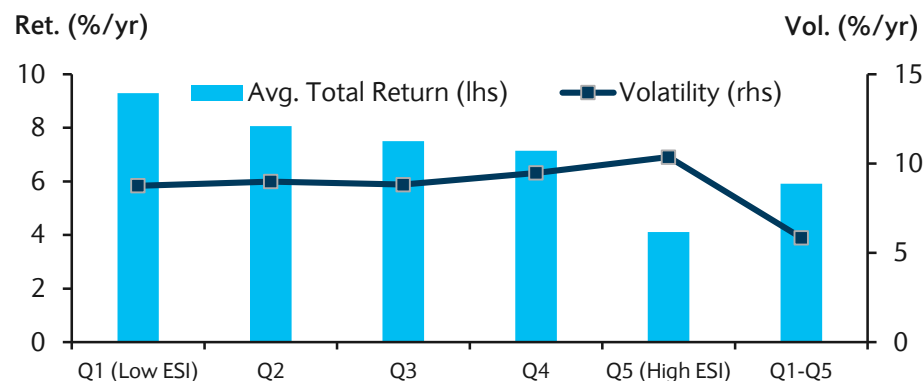
- HY universe: Returns decrease monotonically with increasing *BSI*
- IG universe: No monotonic relationship, yet positive excess return difference Q1-Q5

Return and Volatility across *BSI* Portfolios (2007 – 2019)

US Investment Grade

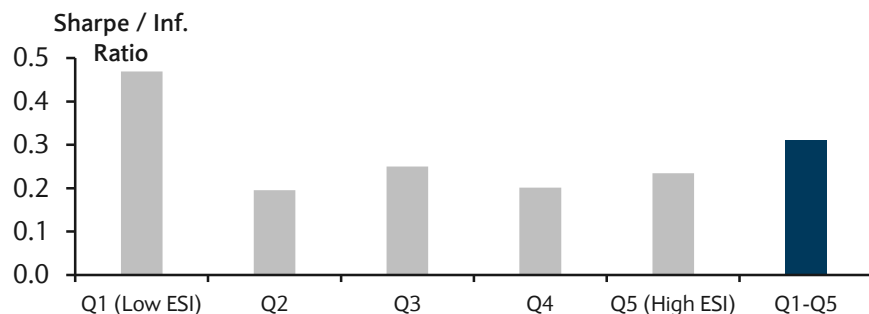


US High Yield

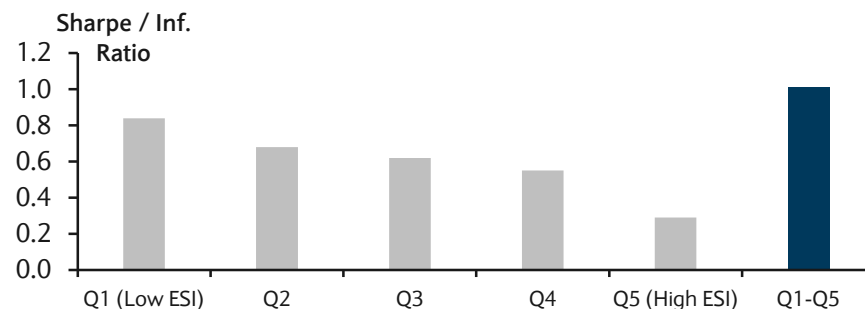


Sharpe / Information Ratio across *BSI* Portfolios (2007 – 2019)

US Investment Grade



US High Yield

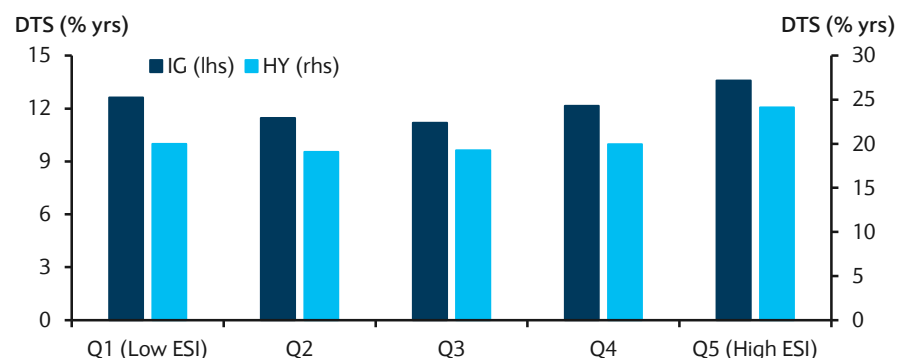


Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

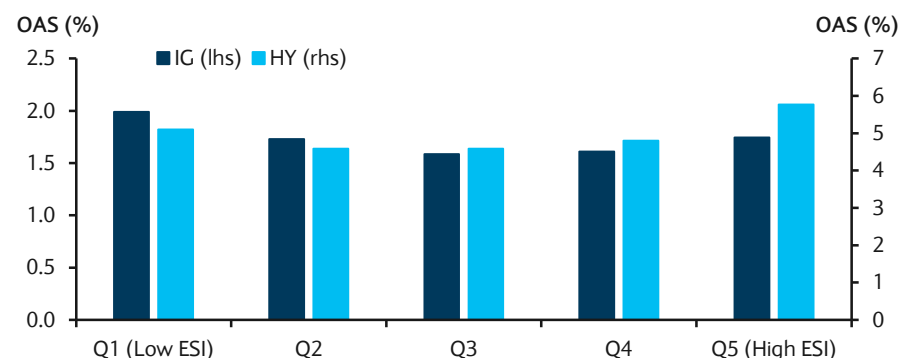
Risk Characteristics of *BSI* Portfolios

- Little variation in DTS, OAS and issuer ratings across *BSI* portfolios
- Unlike *ESI* portfolios, the least shorted issuers were the smallest issuers on average

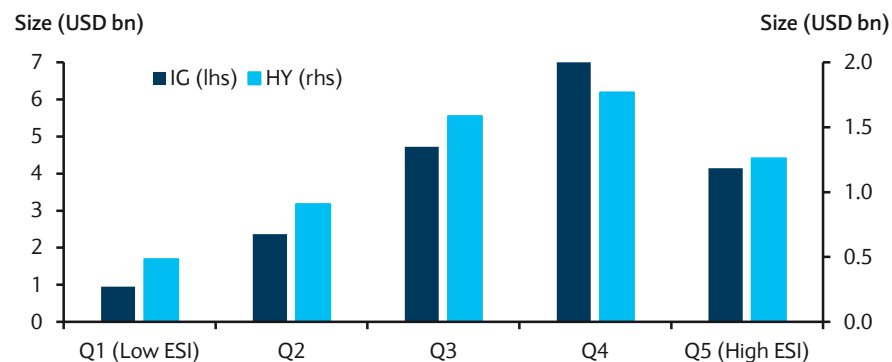
DTS across *BSI* Portfolios



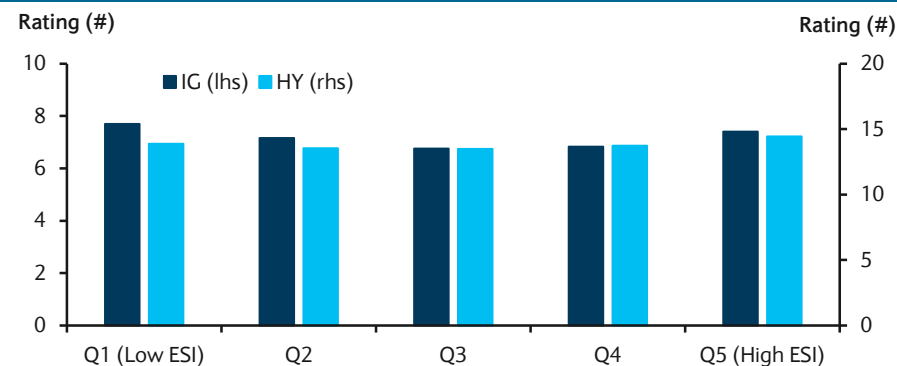
OAS across *BSI* Portfolios



Issuer Size across *BSI* Portfolios



Rating across *BSI* Portfolios



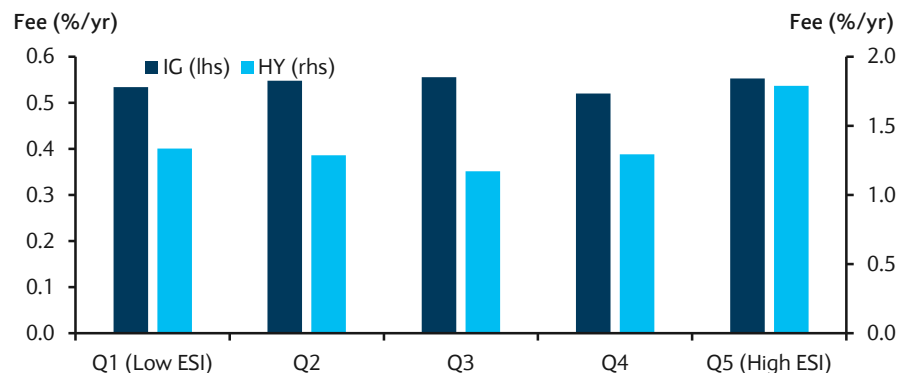
Note: Each rating is represented by a numerical value, where a better rating is represented by a lower value (Aaa=1, Aa1=2, ..., C=21, D=22). Estimates are for the period 2007 to 2019.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

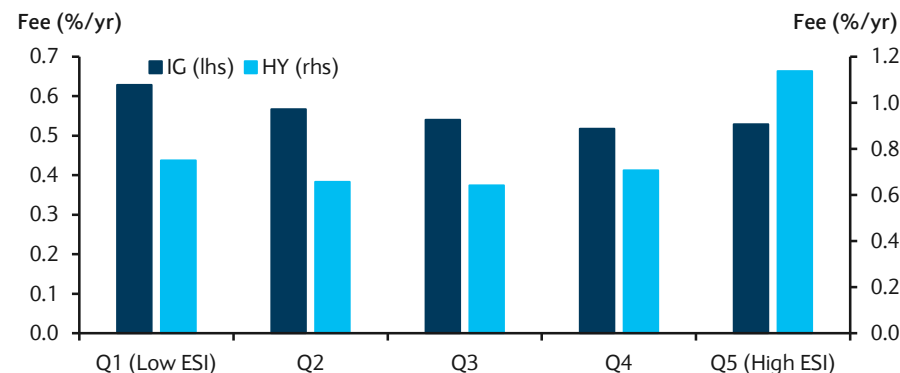
Equity and Bond Lending Fees in *BSI* Portfolios

- In the IG universe, bond lending fees decrease with an increasing *BSI*
- In the HY universe, highest lending fees among most shorted issuers (Q5) in both equity and bond market
- Average Q5 bond lending fee (1.14%/yr) significantly lower than the average return spread in Q1-Q5 (5.91%/yr)

Equity Lending Fees across *BSI* Portfolios



Bond Lending Fees across *BSI* Portfolios



Note: Bond lending fees are first value-weight aggregated to the issuer level, then value-weight aggregated to the portfolio level. Equity lending fees are at the stock level and value-weight aggregated to the portfolio level. Estimates are for the period 2007 to 2019.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Index Replication with a Tilt on *BSI*

- Was *BSI* superior to *ESI* in predicting bond returns once we account for risk?
- On average, *BSI* has not been an effective signal in the IG universe
- Unlike for IG, *BSI* has been of similar usefulness as *ESI* in the HY universe

Performance Statistics of Replication Portfolio with Min and Max *BSI*

		Index	Min BSI	Max BSI	Index – Max BSI	Min – Max BSI	Index – Max ESI
IG	Avg. Ex. Ret. (%/yr)	1.18	0.43	1.05	0.13	-0.62	1.21
	Vol. (%/yr)	5.41	4.70	4.88	1.16	1.51	1.61
	Sharpe / Inf. Ratio	0.22	0.09	0.21	0.11	-0.41	0.75
	Worst Monthly Ex. Ret. (%/m)	-8.38	-8.21	-6.40	-1.98	-3.53	-2.17
	Corr. with Index		0.96	0.98	0.56	-0.18	0.49
HY	Avg. Tot. Ret. (%/yr)	7.41	8.04	5.95	1.45	2.09	1.61
	Vol. (%/yr)	10.89	8.77	9.32	2.62	2.70	2.49
	Sharpe / Inf. Ratio	0.63	0.77	0.51	0.56	0.77	0.65
	Worst Monthly Tot. Ret. (%/m)	-15.91	-17.45	-18.05	-2.62	-2.24	-3.92
	Corr. with Index		0.95	0.96	0.26	-0.25	0.07

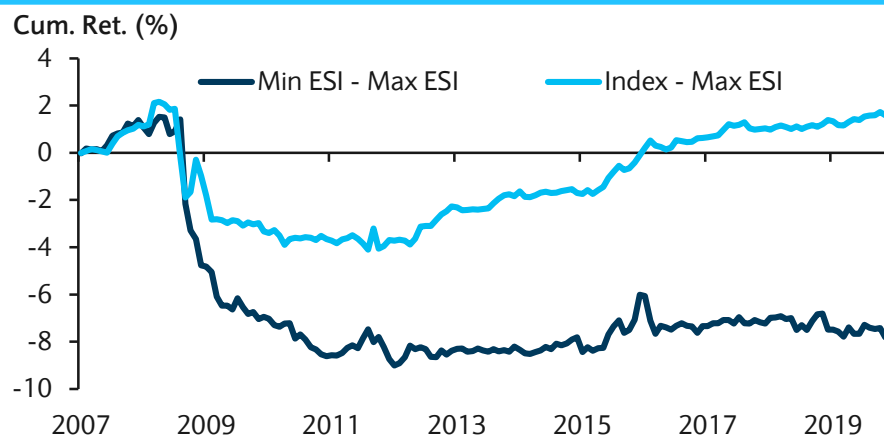
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Time Series Dynamics of *BSI* Replicating Portfolios

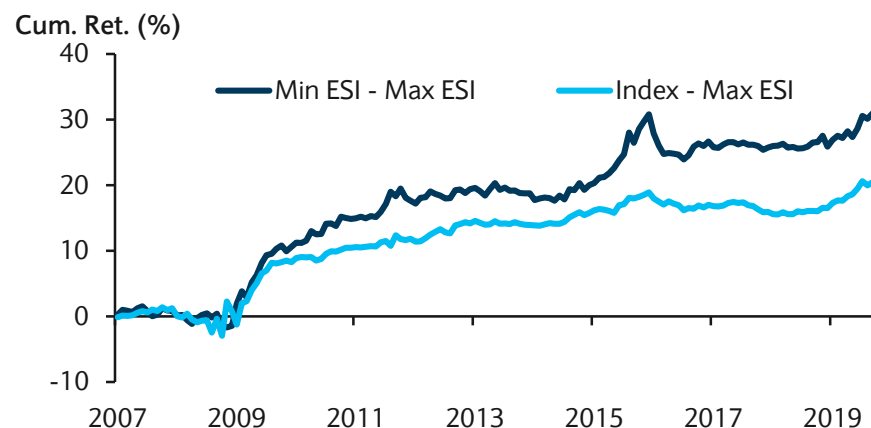
- Since 2009, *BSI* has been an effective signal in the HY universe
- The flat performance before 2009 is unique to *BSI*, as not present in *ESI*
- Findings suggest that short interest in IG issuers was more than a reflection of negative views
- Apart from negative views, market making activity and hedging purposes can have a significant impact on *BSI*, distorting its efficacy as a signal

Cum. Outperformance of Index and Min *BSI* over Max *BSI* Portfolio

Investment Grade



High Yield



Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Short Interest is not Subsumed by Value or Momentum

- Low correlations with QPS value (ESP) and momentum (EMC) signals¹
- All four signals capture different, possibly complementary information
- Future work – improved performance from combination of signals?

Average Correlations in the IG Universe (2007 - 2019)

Level Correlation					Rank Correlation				
	ESI	BSI	EMC	ESP		ESI	BSI	EMC	ESP
ESI	1.00	0.18	-0.05	0.08	ESI	1.00	0.01	-0.05	0.01
BSI		1.00	-0.01	0.19	BSI		1.00	0.01	0.10
EMC			1.00	-0.02	EMC			1.00	-0.01
ESP				1.00	ESP				1.00

Average Correlations in the HY Universe (2007 - 2019)

Level Correlation					Rank Correlation				
	ESI	BSI	EMC	ESP		ESI	BSI	EMC	ESP
ESI	1.00	0.28	-0.10	-0.10	ESI	1.00	0.17	-0.06	-0.12
BSI		1.00	-0.10	-0.02	BSI		1.00	-0.06	-0.02
EMC			1.00	0.04	EMC			1.00	0.03
ESP				1.00	ESP				1.00

1: See [Desclee and Polbennikov \(2017\)](#) for more details on EMC and [Desclee, Maitra and Polbennikov \(2016\)](#) for more details on ESP.

Note: Average cross-sectional correlations are at the company-level. We value-weight ESP and BSI measures to obtain the company-level estimates. We calculate the Kendall correlation to estimate the rank correlation, our results are similar when using the Spearman correlation.

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Summary

1. Equity Short Interest, *ESI*, is informative about corporate bond returns in both the US IG and HY universe, as well as subsequent downgrades
2. Bond short interest, *BSI*, is not informative for returns or downgrades in the IG universe, and of similar efficacy as *ESI* in the HY universe
3. Market making activity and hedging demand might distort the informational content coming from negative views in *BSI*, but less so for *ESI*
4. Our results illustrate that the correct assessment of a signal's efficacy requires a proper accounting for key risk factors

Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

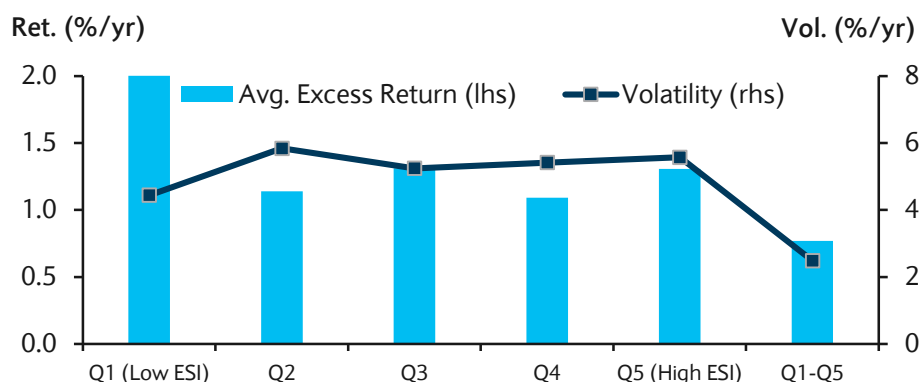
Appendix

Results are Robust to the Weighting Scheme behind *BSI*

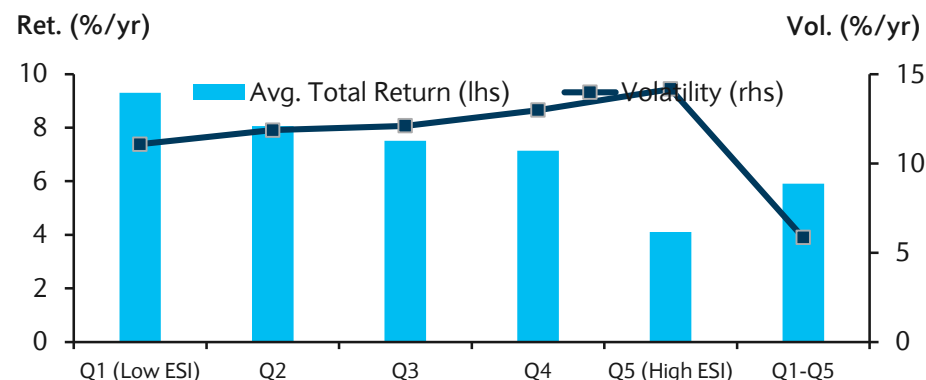
- Value-weighting the bond's short interest to the issuer level results in similar portfolio returns and volatilities as equal-weighting the bond's short interest

Return and Volatility across *BSI* Portfolios (2007 – 2009)

US Investment Grade

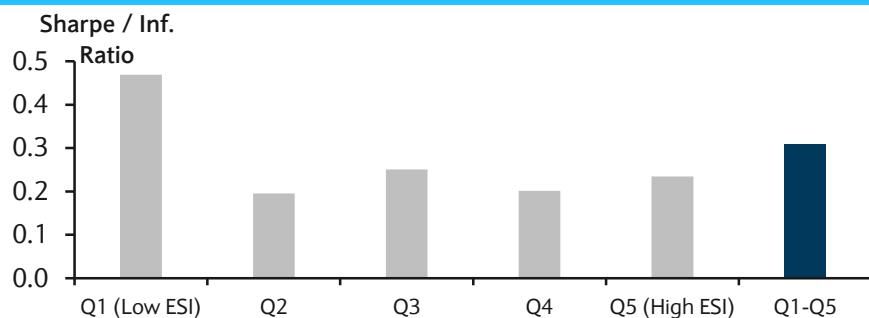


US High Yield

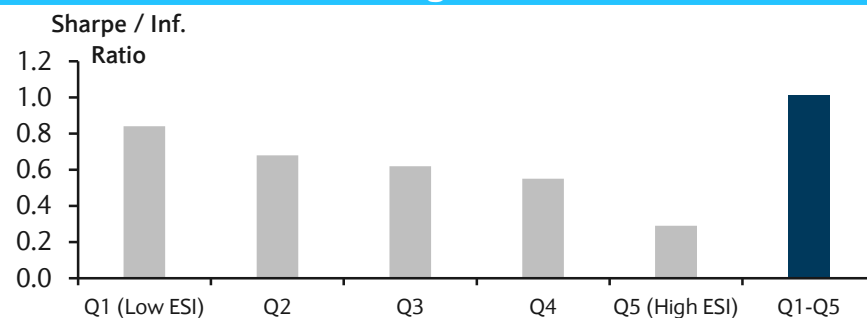


Sharpe / Information Ratio across *BSI* Portfolios (2007 – 2009)

US Investment Grade



US High Yield



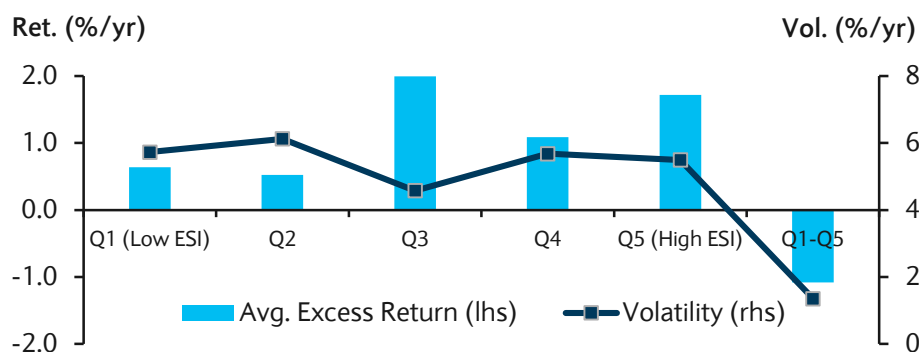
Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

Changes in *BSI* are not Informative about Future Returns

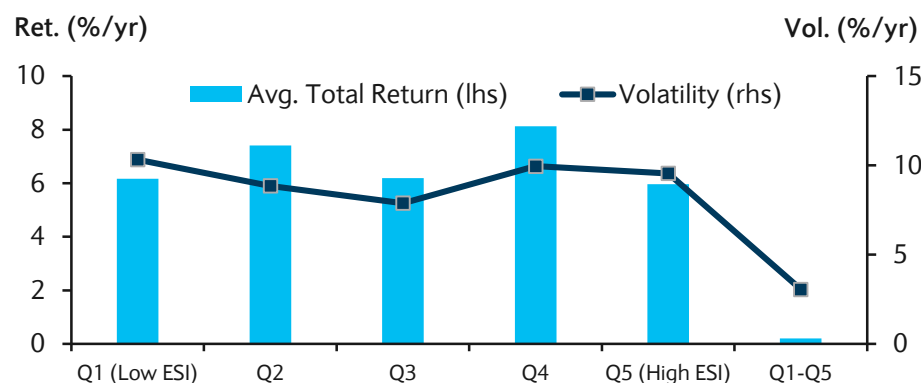
- We sort bond issuers into quintile portfolios based on monthly changes (first differences) in *BSI*
- Unlike in results based on the level of *BSI*, we find no monotonic pattern in volatility or returns

Return and Volatility across ΔBSI Portfolios (2007 – 2009)

US Investment Grade

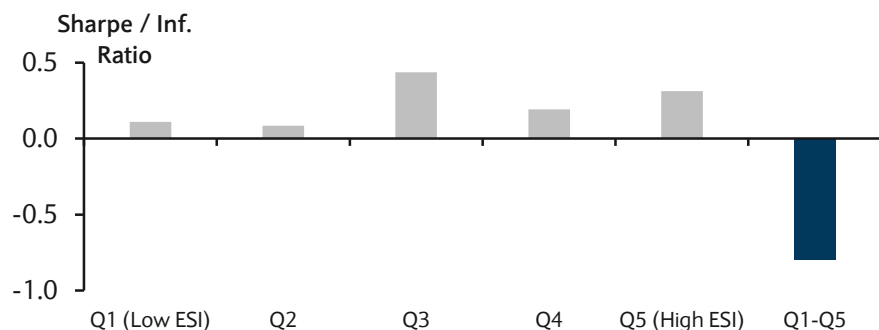


US High Yield

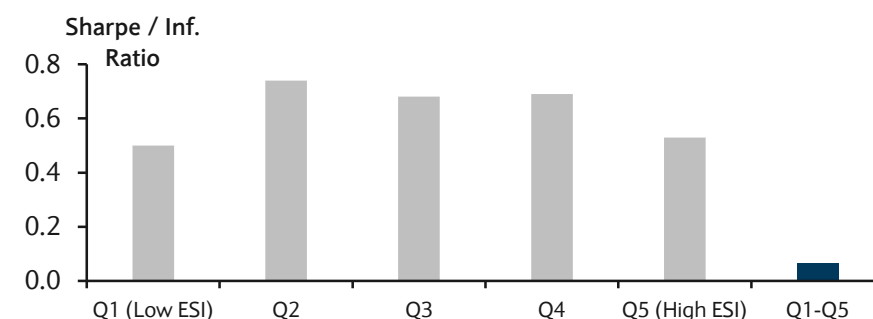


Sharpe / Information Ratio across ΔBSI Portfolios (2007 – 2009)

US Investment Grade



US High Yield



Source: Astec FIS, Compustat, Bloomberg Barclays Indices, Barclays Research

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