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Is Short Interest in Equity Markets Informative about Future Corporate Bond Returns?

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- **Equity Short Interest (ESI) measures the fraction of a company's equity in outstanding short positions. It has shown to be predictive of the company's equity returns.**
- **We investigate whether ESI is also predictive of a company's corporate bond returns and how ESI relates to several bond risk measures.**
- **We find that ESI is a one-sided signal. It is useful to identify corporate bond issuers with an increased likelihood of future rating downgrades and subsequent low returns, after controlling for risk measures such as duration, spread, and rating.**
- **Both a company's equity and bonds can be shorted. We examine whether the information in bond short interest is additive to the information in ESI, and find that ESI subsumes its return-relevant information. Various motives behind bond shorting, such as market-making activity, might be the reason bond short interest is less informative about future returns.**
- **Corporate bonds of issuers with high values of ESI tend to be overpriced, and one might wonder if the information in ESI is already reflected in measures of relative value. We use Excess Spread over Peers (ESP), a relative value measure for corporate bonds, and find that ESI and ESP have complementary information about future returns.**
- **We document a weakly negative correlation between ESI and EMC, a measure based on equity price momentum with predictive power for corporate bond returns. We find that ESI is predictive of returns among both issuers with low and issuers with high equity momentum.**
- **ESI is a measure based on position data in the equity market. This feature distinguishes ESI from traditional bond risk measures based on fundamental data, prices or ratings, and makes it a promising candidate to combine with other bond market signals.**

Introduction

Short selling of securities is widely recognized as beneficial to market liquidity and price efficiency. Market makers, for example, can use short selling to provide liquidity if a client order cannot be filled from their inventory. Short selling also allows investors to hedge their positions and manage certain risks, and allows informed investors to position themselves according to their negative views on a company. A large body of empirical evidence documents that stock market short sellers indeed have informational advantages and earn significant returns over relatively short horizons.[1]

Negative views on a company's prospects apply to the company's equity, but also to its corporate bonds, as the value of both assets is tied to the company's future performance. Short selling in a company's equities, if associated with negative views among informed traders, might therefore have return-relevant information for the company's corporate bonds, too. Yet, we find few studies on this relationship.[2]

In this paper, we investigate whether equity short interest has return-relevant information for corporate bonds. We define a company's ESI as the ratio between the number of shares on loan and total shares outstanding. The more a company's shares are in outstanding stock loans, the higher is ESI. Shorting is associated with high risk and involves an ongoing cost for borrowing the shares, thus increased lending activity in a company's stock is likely to come from investors with a strong conviction in their negative information. Intuitively, we expect high values of ESI to be followed by low future returns.

We find that ESI is predictive of future corporate bond returns and rating downgrades. For the Bloomberg Barclays US Corporate and High Yield indices, we show that issuers with the highest level of ESI within their rating category are the most likely issuers to be downgraded over the next 3 to 12 months. This finding suggests that ESI contains information about the quality of a company's corporate bonds.

ESI correlates positively with several bond risk measures. To correctly assess the efficacy of ESI as a signal for future issuer returns, we account for different risk measures and form tradable index-tracking portfolios from a universe of liquid bonds. These portfolios are formed separately for HY and IG issuers, with a tilt towards issuers with high ESI values. The tilted portfolios consistently underperform the index.

ESI is an addition to a growing suite of signals which use equity market information and help differentiate among corporate bond issuers. Another notable example is Equity Momentum in Credit (EMC), which differentiates issuers based on their stock price momentum; Desclée and Polbennikov (2017) document a positive empirical relationship between past equity returns and subsequent corporate bond returns of the same company[3]. Another example is the equity market's reaction around earnings announcements, we refer to Ben Dor, Guan, and Zeng (2020), which has been found to have valuable information about future corporate bond returns.

We further investigate bond short interest as an additional measure to identify future underperformance, and find that its predictive information is subsumed by information in ESI. Both signals lead to similar portfolios in the HY space, and bond short interest is not a useful indicator in the IG space as IG bonds are likely shorted as part of market-making activity.

[1] See Boehmer, Jones and Zhang (2008) for a study on the US stock market.

[2] Christophe et al. (2016) find that stock shorting activity is informative about subsequent corporate bond returns. Hendershott, Kozhan and Raman (2020) confirm this finding and conclude that short sellers' information flows from stocks to bonds, but not from bonds to stocks.

[3] We discuss the relationship between ESI and EMC in the appendix of this paper.

We also explore whether ESI is subsumed by relative value measures. We measure a bond's relative value by its Excess Spread over Peers (ESP), documented by Desclée, Maitra, and Polbennikov (2016) to be predictive of a bond's future performance. We find that ESI is useful to identify future underperformance among both cheap and expensive bonds, and that both signals complement each other. A portfolio formed on a combination of both signals achieves almost twice the risk-adjusted return of portfolios formed on the individual signals.

The remainder of this study is organized as follows. We begin with a description of securities lending data and our bond and equity universe. We then assess the performance of a long-short strategy in quintile portfolios formulated on ESI values and discuss risk characteristics of the different portfolios. In the subsequent section, we take account of many practical considerations for implementing the ESI strategy in reality and present a use case of exploiting ESI in index tracking portfolios. We discuss the benefits of combining ESI with two intuitively related signals – bond short interest and relative value among corporate bonds – before we conclude the study.

Lending Data and Sample Construction

A central part in this study is the mapping between corporate bonds and equity short interest of the same company. We leverage Ben Dor and Xu (2014) in order to map corporate bonds and equities at the security level. This section briefly describes our data sources and the filters we apply to obtain our corporate bond sample.

Stock Lending Activity

All data on equity and bond lending activity in this study is obtained from FIS Astec Analytics, a commercial provider of security lending market information. The data is collected from security lenders and borrowers who rely on FIS Astec's information service to receive timely updates on current lending fees and lending volumes. In exchange for this information, security lenders and borrowers have to submit all their lending and borrowing data such as fees and volumes to FIS Astec, which then matches and aggregates transaction-level data to the security level, and returns it to the end users.

The securities lending data files have historical position data at daily frequency and are updated each morning with the latest data for the previous trading day. The files cover several thousand equity and fixed income securities at each point in time, domiciled in more than 100 countries. Securities are identified by CUSIP or ISIN as of the day the data are reported.

Two other features of this data set are important to highlight. First, the lending activity reported by FIS Astec Analytics does not cover all lending transactions that took place. Some lenders or borrowers are not relying on FIS Astec's service and hence have no incentive to report their lending transactions. All data regarding shares on loan are therefore to be taken as a lower bound, likely underestimating the total lending volume in a security. Second, securities are only reported if at least one lending transaction is currently open. Thus, a security can be missing in the database either because there is no lending transaction involving this security, or the lenders and borrowers transacting this security do not report to FIS Astec Analytics.

In Figure 1, we briefly describe selected variables reported in the lending data files. We broadly group them into two categories. The first category contains variables to filter for the date, security, and characteristics of the loan. The *contract type* can either be specified as overnight (O) or any (A), which includes overnight and long-term. The *loan stage* differentiates between new (N), returned (R) and recalled (L) loans, any (A) summarizes all loans open at business close. The *collateral type* for a loan can be cash (C) or non-cash (N), both included in any (A). We also find a *collateral currency* code to identify the currency of all cash collateral, which determines the respective overnight rate paid on the collateral. The second category of variables is quantifying the lending activity. *Tickets* represents the number of lending transactions for every date, security, and all of the previously specified loan characteristics. *Units* has two interpretations, depending on the type of the transacted security. For equity securities, it represents the number of shares lent in transactions. For bonds, it represents the par value instead. To measure the average rate paid by the borrower to the lender for a particular security on a particular date, the variable *retail loan rate average* summarizes the costs across all tickets and hence types of loans, considering overnight rates and rebate rates where applicable.

FIGURE 1
Selected Variables in FIS Astec Analytics Security Lending Files

Aggregation Levels	Description
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).
Measures of Lending Activity	**Description**
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 of this security and date.

Source: FIS Astec Analytics, Barclays Research

The main part of our study relies on units in equity securities, for which we consider all contract types, any loan outstanding at business close with any type of collateral. To illustrate the calculation of ESI from FIS Astec Analytics data, we provide an example in Figure 2.

For a particular security, we find 2,000,000 shares across all lending transactions outstanding at business close on January 28, 2020. Based on a total of 100,000,000 shares outstanding, for which we consult Compustat North America, we obtain a 2% ESI for this security on this date.

The retail loan rate average, an estimate of the annualized cost the average investor faces when borrowing this security, is 3.55%.

FIGURE 2
Illustrative Data

Field Name	Value
Date	20200128
Contract Type ID	A
Loan Stage ID	A
Collateral Type ID	A
Tickets	10
Units	2,000,000
Retail Loan Rate Avg	3.55

Corporate Bond Universe

The corporate bond universe in our study comprises the Bloomberg Barclays US Corporate and High Yield indices between January 2007 and December 2019. For every corporate bond issuer, we check for each month separately whether the parent company has common stock listed on a US exchange that is part of at least one lending transaction. If this is the case, we include the issuer with all of its indexed bonds in our sample. We exclude ADRs from our sample because we find ESI in ADRs to be materially different from ESI in common stock.

Figure 3 lists the year-end market value of all bonds in the respective index that have been successfully mapped to equity securities (Compustat) and equity lending transactions (FIS Astec Analytics). From the start of our sample in 2007, the mapping has improved steadily for both the IG and HY index. In 2007 already, we can map 76% (in terms of market value) of the IG index to a company with common stock in lending transactions, this value increases to 84% at the end of 2019. For HY, the percentage increases from 57% to 75% over the same period. The main reason for the lower mapping rate in HY is the larger share of private issuers, whose equity is not listed on a stock exchange.

FIGURE 3

Bond Mapping to Equity Short Interest

Market Value and Percentage Mapped with Compustat and FIS Astec Analytics						
		2007	2010	2013	2016	2019
IG	Index (USD Billion)	1,978	2,843	3,727	4,907	5,809
	Mapped to ESI	76%	80%	82%	82%	84%
HY	Index (USD Billion)	629	930	1,270	1,334	1,277
	Mapped to ESI	57%	57%	58%	66%	75%

Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. Numbers are year-end statistics.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

How similar are the final samples to their respective index in terms of characteristics and performance? Our IG sample has a similar rating, spread, duration, and information ratio to the index on average, as can be seen in Figure 4. Our HY sample has a slightly better average rating, higher spread duration, lower spread and DTS than the HY index. This finding is intuitive given that we exclude all private issuers. Despite these differences, our sample and the index share almost the same information ratios. Dynamics in the strategies discussed later are thus unlikely to be driven by sample differences.

FIGURE 4

Characteristics of Bonds in the Samples and their Respective Index

			Characteristics					Return Statistics					
		Avg # Bonds	Quality	OAS (bps)	OASD (yr)	DTS (%*yr)	MV ($MM)	Ex. Ret. (%/yr)	Vol. (%/yr)	Inf. Ratio	Min. Ret. (%/m)	Max. DD (%)	Index Corr.
IG	Index	4,557	3.30	153	6.98	11.52	811	1.18	5.41	0.22	-8.38	-20.05	
	Sample	3,856	3.33	150	7.09	11.59	784	1.04	4.71	0.22	-7.42	-17.74	99%
HY	Index	1,905	5.78	503	4.10	20.20	552	3.81	10.89	0.35	-16.50	-44.76	
	Sample	1,213	5.62	442	4.17	18.52	559	3.26	9.80	0.33	-15.02	-40.63	99%

Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. The numeric values of quality are converted from ratings by the following scale: Aaa=1, Aa=2, A=3, Baa=4, Ba=5, B=6, Caa=7, Ca=8, C=9, D=10. Max. DD is short for maximum drawdown.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Time-Series and Cross-Sectional Characteristics of ESI

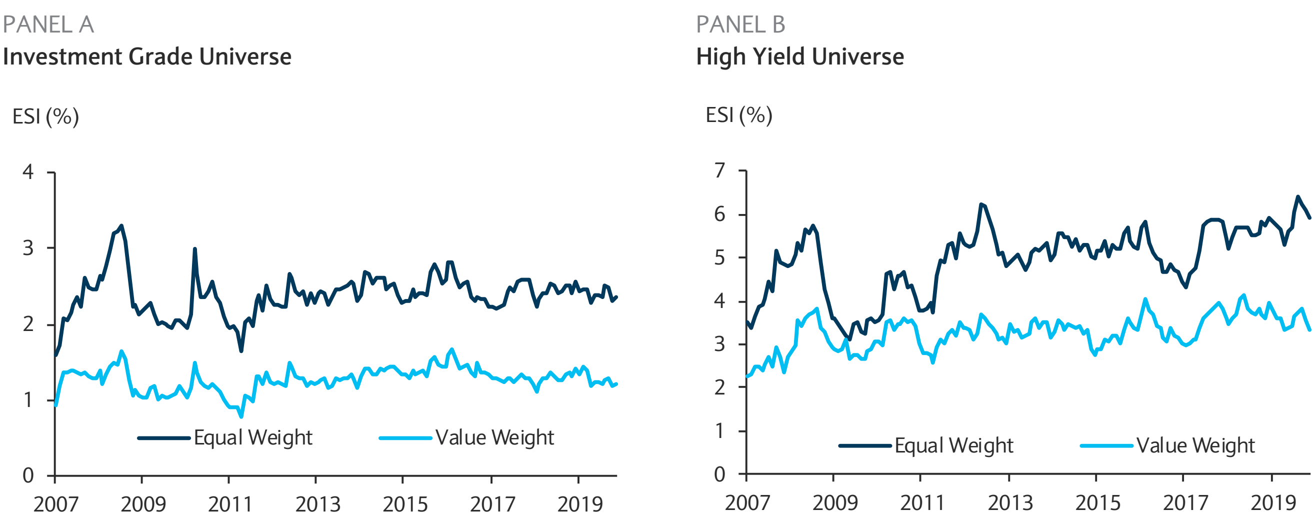
Equity short interest is defined as the ratio between shares in outstanding stock loans and total shares outstanding,

$$ESI_{i,t} = \frac{Shares\ \ Lent_{i,t}}{Shares\ \ Outstanding_{i,t}}.$$

Figure 5 illustrates the time series of average ESI values for the companies in our IG and HY sample. In order to obtain the value-weighted estimates, we weight each company's ESI value by the company's equity market value. Two features are particularly noteworthy. First, ESI is on average significantly larger for companies whose bonds are classified as high yield – the value-weighted average in the IG sample is 1.28%, less than half of the 3.27% in the HY sample. One potential reason is that high yield companies are perceived as more volatile, such that returns from successful speculative short positions are potentially larger. Second, the value-weighted estimates are significantly lower than the equal-weighted estimates of ESI. This implies that ESI is on average larger for smaller companies within the respective index. One potential reason is that smaller companies are less well researched and short sellers might find more opportunities to trade their informational advantages.

FIGURE 5

Estimates of Average ESI for US IG and HY Issuers



Source: Estimates are as of month-end. Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Variation of ESI across Sectors

Are certain sectors more shorted than others? There are several reasons why the average level of ESI across sectors might differ – industrials, for example, are more cyclical than consumer staples, and energy or financial companies might be shorted in expectation of sector-specific regulatory changes. For this, we group issuers into one of eight bond index sectors[4]. These sectors have been chosen to ensure that they include a sufficiently large number of issuers during the period of our study.

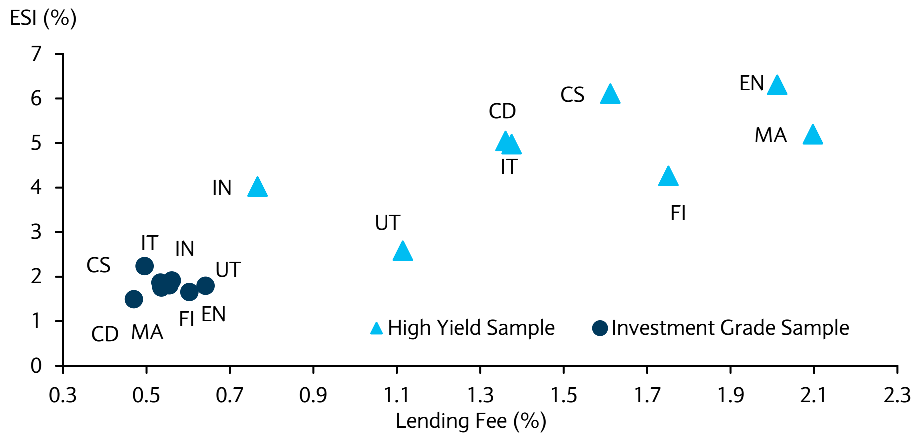
Figure 6 displays the value-weighted averages of ESI and the respective lending fees for each sector. Across all sectors, companies in the HY sample have been more shorted on

[4] We group issuers into sectors according to the Bloomberg sector classification of their largest bond in the respective index. We aggregate the different sectors into the following eight categories: consumer discretionary, consumer staples, energy and transport, financials and real estate, industrials, communications and information technology, materials, and utilities.

average than companies in the IG sample. In addition, we find that lending fees have been larger for HY bonds. Industrials have been the cheapest to short in HY with 0.77 %/yr, still more expensive than the most expensive sector in IG, utilities with 0.64 %/yr. Variation across sectors has also been stronger in the HY sample, in both ESI and lending fees – energy companies have been 2.4 times more shorted than utility companies on average. Based on this evidence, we argue for sector-neutrality in portfolios formed on ESI to not falsely attribute sector performance to the efficacy of ESI as a signal, and to assess whether the efficacy holds within sectors. For the strategies discussed in this study, we will explicitly state the respective approach to neutralize sector effects.

FIGURE 6

Value-weighted ESI and Lending Fees across Sectors



Note: We report average ESI and lending fees for the following eight sectors: consumer discretionary (CD), consumer staples (CS), energy and transport (EN), financials and real estate (FI), industrials (IN), communications and information technology (IT), materials (MA), and utilities (UT). The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

The Relationship between ESI and Fundamental Risk

If short sellers have an informational advantage on the quality of a company, we expect ESI to predict future changes in the company's credit worthiness beyond its current rating. Every month, we sort bond issuers into quintile portfolios within each rating bucket according to their ESI value from the previous month end. We then track the rating changes of these issuers over the subsequent three-, six-, nine- and twelve-month horizons. Figure 7 shows that after controlling for issuers' initial ratings, issuers with high ESI values (Q5) have realized larger or more downgrades than issuers with lower ESI values (Q1) over horizons up to one year. The pattern exists in all rating buckets and is more pronounced with an increasing horizon. This indicates that ESI predicts future downgrades and supports the hypothesis that equity short sellers possess information about the future quality of a company's corporate bonds which is not yet reflected in its current ratings.

FIGURE 7

Rating Notch Changes by ESI Quintile Portfolios, Rating and Horizon

PANEL A

Investment Grade Universe

	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	.00	.06	.04	.09	.10	.10	.00	.01	.03	.04	.06	.06	-.01	-.01	-.01	.01	.04	.05
6m	.06	.11	.11	.20	.20	.14	.00	.03	.07	.08	.12	.12	-.02	-.02	-.01	.01	.09	.11
9m	.12	.21	.18	.28	.30	.18	.01	.06	.10	.13	.18	.17	-.04	-.03	-.02	.03	.13	.17
12m	.21	.30	.27	.40	.40	.19	.02	.09	.13	.16	.24	.22	-.05	-.04	-.02	.04	.17	.22

PANEL B

High Yield Universe

	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	-.01	-.03	.00	.02	.11	.12	-.04	-.04	-.02	.00	.09	.13	-.01	-.03	.03	-.02	.13	.14
6m	-.02	-.06	.00	.03	.22	.24	-.06	-.07	-.02	.01	.17	.24	-.06	-.03	.02	-.02	.22	.28
9m	-.02	-.09	-.02	.05	.33	.35	-.08	-.10	-.02	.02	.24	.32	-.08	-.04	-.01	-.01	.29	.38
12m	-.02	-.11	-.02	.08	.41	.43	-.10	-.12	-.02	.05	.29	.39	-.10	-.05	-.06	-.04	.35	.45

Source: Each rating notch is assigned a numerical value. A better rating is assigned to a lower value: Aaa=1, Aa1=2, …, C=21, D=22. 1 represents one notch down. Each month, we sort issuers into quintile portfolios based on their ESI value from the end of the previous month. The ranking is done within each of the six rating buckets (Aaa/Aa, A, Baa, Ba, B, Caa / Ca / C). For each issuer, we then track its rating changes in the subsequent 3, 6, 9 and 12 months. 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. Individual bond ratings of an issuer are value-weighted to obtain the average issuer rating. All issuer rating changes are equally weighted within each quintile portfolio. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research.

Performance and Characteristics of ESI Quintile Portfolios

If it were true that short sellers trade on information which is not yet reflected in current valuations, we would expect bonds of issuers with high ESI values to underperform bonds of issuers with low ESI values. In this case, ESI should be useful in differentiating bond issuers with respect to their subsequent returns. In this section, we examine the existence of a stable relationship between ESI and corporate bond returns.

Predicting Risk, but not Returns?

On the last trading day of each month, we sort issuers within their sectors into quintile portfolios based on their most recent ESI value. We value-weight issuers at portfolio formation and keep the portfolios unchanged for one month, then rebalance again according to updated ESI values. Figure 8 contains the returns, volatilities and Sharpe ratios for each quintile portfolio in the IG sample (Panel A and C) and the HY sample (Panel B and D). For the IG sample, excess returns over duration-matched treasury portfolios are reported in order to focus on the credit component of performance. For the HY sample, total returns are used. The ESI strategy, which consists of buying the least shorted issuers (Q1) and selling short the most shorted issuers (Q5), is reported by Q1-Q5.

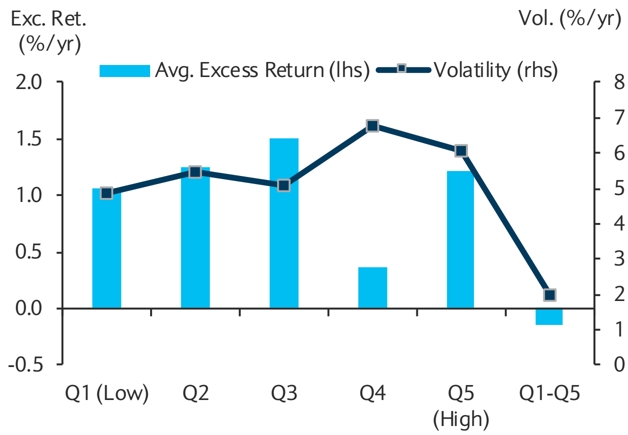
Surprisingly, the ESI strategy has delivered a negative information ratio of -0.08 between 2007 and 2019 for IG issuers, and an information ratio of 0.16 for HY issuers. While return volatility is increasing with ESI in both samples, we find no stable relationship with future returns. A long-only position in the least shorted issuers, Q1, has delivered identical risk-adjusted returns as the entire index for IG issuers – both have yielded a Sharpe ratio of 0.22. For HY issuers, being long Q1 has resulted in a Sharpe ratio of 0.82, close to the index at 0.77. The one significant difference to the index is in HY portfolio Q5, whose Sharpe ratio is half as large at 0.38. A closer look at portfolio characteristics might help us to interpret these results.

FIGURE 8

Average Excess Returns, Volatilities, and Information Ratios in ESI Quintile Portfolios

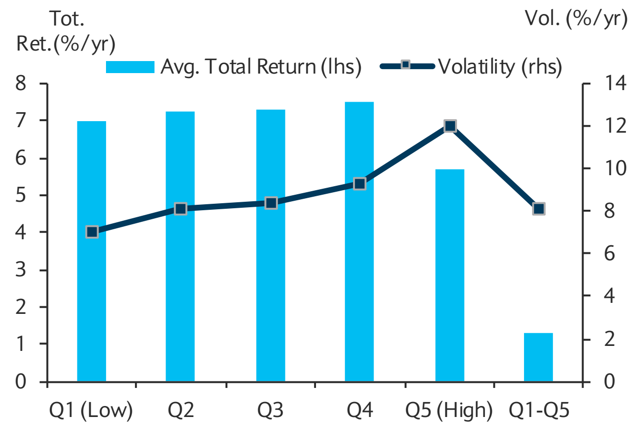
PANEL A

Excess Returns and Volatilities in IG Universe



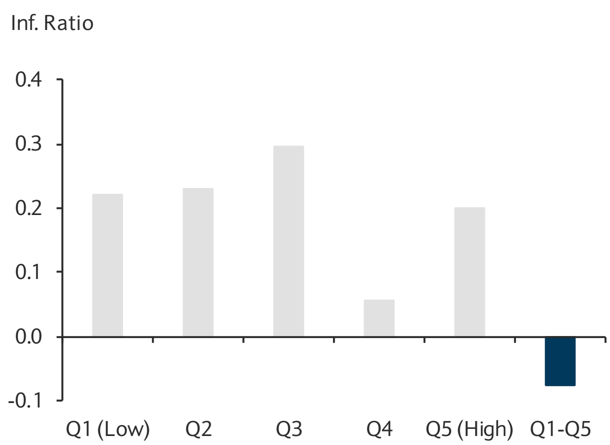
PANEL B

Total Returns and Volatilities in HY Universe



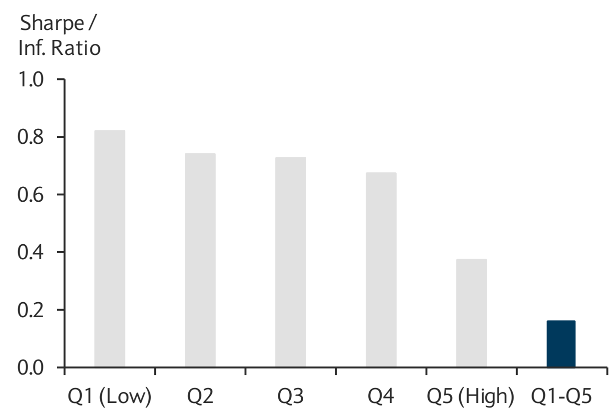
PANEL C

Sharpe / Information Ratios in IG Universe



PANEL D

Sharpe / Information Ratios in HY Universe



Note: We use 1-month LIBOR as funding rate to compute Sharpe ratios in HY portfolios. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

The Relation between ESI and Bond Risk Measures

We provide different characteristics of ESI quintile portfolios in Figure 9. For several measures of risk, we find that high ESI issuers are riskier. First, we find that issuer quality deteriorates with increasing ESI. Second, we find widening credit spreads as we move from Q1 to Q5, resulting in higher Duration Times Spread (DTS)[5], which measures the expected volatility of a bond's excess return. This suggests that the ESI strategy might be subject to market directionality. For IG issuers, we document a decrease in issuer size and mild deterioration of liquidity, as measured by the increase in LCS[6], meaning the ESI strategy might pick up a liquidity premium. All of these findings give potential reason for the low performance of the ESI strategy, as it has a negative exposure to certain risk measures with a long position in Q1 and a short position in Q5, thus reducing the expected returns of the strategy.

[5] See Ben Dor, Dynkin, Hyman, Houweling, Leeuwen and Penninga (2007) for details about DTS.

[6] LCS is a bond-level metric that measures the cost of an immediate, institutional-size, round-trip transaction, and is expressed as a percent of the corporate bond's price. See Konstantinovsky, Ng, and Phelps (2016) for details about LCS.

In the next section, we disentangle the contributions of ESI and other risk characteristics to portfolio performance, and thus evaluate ESI's efficacy more accurately. Instead of investing in several hundreds of bonds based on univariate quintile sorts, we apply ESI to a concentrated universe of liquid bonds and match the indices' key risk characteristics.

FIGURE 9

Average Issuer Characteristics in ESI Quintile Portfolios

	Investment Grade					High Yield				
Metric	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Quality	3.05	3.25	3.42	3.52	3.65	5.55	5.53	5.56	5.62	5.84
OAS (bps)	1.44	1.62	1.69	1.78	2.11	4.38	4.32	4.61	4.87	6.29
DTS	11.17	11.86	12.19	12.64	14.11	17.94	18.68	19.45	20.59	24.95
Size ($MM)	5.18	4.54	3.60	2.66	2.10	1.04	1.21	1.21	1.09	1.08
LCS (%)	0.19	0.20	0.22	0.27	0.33	0.83	0.72	0.71	0.78	0.79
ESI (%)	0.31	0.64	1.13	2.10	5.98	0.54	1.51	2.96	5.71	14.09

Note: The numeric values of quality are converted from ratings by the following scale: Aaa=1, Aa=2, A=3, Baa=4, Ba=5, B=6, Caa=7, Ca=8, C=9, D=10. OAS, DTS, LCS and ESI are aggregated by issuer bond market value weight across issuers. The market value weighted statistics are later averaged across all months. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Index Replicating Portfolios with an ESI Tilt

Index replicating portfolios have two noteworthy advantages over univariate quintile sorts. First, an index replicating portfolio matches the key characteristics of an index, allowing for a clearer attribution of performance to isolated risk measures. Second, the construction aims at a reasonably sized portfolio of liquid securities, meeting important constraints that credit portfolio managers usually face in practice. In this study, the corporate bond indices we replicate are the Bloomberg Barclays US Corporate and Bloomberg Barclays US High Yield indices.

The monthly portfolio construction is split into two steps. In the first step, we decide on a set of liquid bonds which are suitable for index replication, the replication universe. In the second step, we create an index replicating portfolio from these bonds.

To enter the replication universe, a bond must be senior, with a time-to-maturity beyond three years, and an outstanding notional that exceeds the 25th percentile of all outstanding bonds' notional in the index at month end. If an issuer has several bonds in the index which meet the criteria, of which at least one bond was issued less than two years ago, we discard all the bonds issued longer than two years ago. If there are still several bonds for an issuer to choose from, we choose the bond whose duration is closest to the average duration of its industry. The replication universe will thus consist of liquid senior bonds, with at most one bond per issuer.

We select and weigh bonds to match the risk profile of the index, and at the same time maximise the portfolio's average ESI, yet limiting idiosyncratic risks. The following set of constraints are in place to find such a portfolio on a monthly basis.

Each issuer (or bond) can account for up to 2% of the portfolio, which means that we have at least 50 different issuers to avoid a high concentration. In order to not load on sector effects, the portfolio sector allocation mimics the allocation in the index. In addition, the portfolio OAS and DTS must be the same as those of the index to eliminate undesired risk exposures. From all the possible combinations within these constraints, we pick the one that maximizes the portfolio's ESI.

Key analytics for the respective index, replication universe and tilted portfolio can be found in Figure 10. The weight limit of 2% at the issuer level results in portfolios with 55 issuers on average in both IG and HY. While OAS and DTS are the same in the indices and portfolios as intended, the average ESI in the tilted portfolios is about five (IG) and three (HY) times larger than the average ESI in the index or replication universe. This tilt does not materially affect the average rating and leads to only modest increases in LCS.

FIGURE 10

Bond Characteristics in Index, Replication Universe and Tilted Portfolio

		Avg # of Bonds/m	Quality	OAS (bps)	OASD (yr)	DTS (%*yr)	LCS (%)	ESI (%)	Bond MV ($MM)
IG	Index	4547	3.26	170	6.81	12.27	0.84	1.39	809
	Repl. Universe	546	3.45	174	6.72	11.79	0.84	1.80	803
	Repl. Portfolio (Max ESI)	55	3.39	170	7.25	12.27	0.96	6.94	730
HY	Index	1897	5.79	551	4.14	22.09	1.56	4.56	552
	Repl. Universe	400	5.71	493	4.17	20.59	1.43	4.78	602
	Repl. Portfolio (Max ESI)	55	5.75	551	4.03	22.09	1.67	15.90	554

Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. The reported ESI for the respective index ignores all issuers without ESI values. The tracking portfolio has a tilt towards high ESI and matches index DTS, OAS and sector weights, with no bond assuming more than 2% of the portfolio weight. The numeric values of quality are converted from ratings by the following scale: Aaa=1, Aa=2, A=3, Baa=4, Ba=5, B=6, Caa=7, Ca=8, C=9, D=10. We report returns in excess of a duration-matched Treasury portfolio for IG bonds, and total returns for HY bonds. The market value weighted statistics are later averaged across all months. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Astec Analytics, Barclays Research

Performance Statistics

Panel A in Figure 11 reports the performance of the replicating portfolios. In addition to the portfolio that maximizes ESI, which we expect to underperform the index, we compute the performance of a portfolio which minimizes ESI. While our sample does not include issuers with zero ESI, it is worth investigating if issuers with low ESI outperform the index.

In the IG universe, we find that bonds from issuers with high ESI tend to have low future returns. The index outperforms the Max ESI portfolio in 104 out of 155 months and by 1.61% on average per year. The Min ESI portfolio outperforms the Max ESI portfolio by 2.06%. This long short strategy, which we call ESI strategy going forward, achieves an information ratio of 1.28 in our sample. The significant return differences between the portfolios cannot be explained by DTS, carry or sector imbalances, as those are matched in the construction process. The cumulative performance of the different strategies shown in Panel B brings us two insights. First, the index outperforms the Max ESI portfolio consistently throughout our sample and is not driven by events. Second, the on average higher return of low ESI issuers relative to the index comes most of all from the outperformance during the financial crisis in 2008 and 2009.

Our findings in the HY universe are similar to the findings in the IG universe. ESI is useful to identify bonds with future underperformance, but not outperformance. The index return has been 1.97% per year larger on average than the Max ESI portfolio return, which it outperformed in 100 out of 155 months. Unlike in the IG universe, the average annualized return of the Min ESI portfolio has been 0.37% lower on average than the return of the index. We interpret this as evidence that ESI is a one-sided signal, useful for the identification of low future performance.

FIGURE 11

ESI Strategy Performance

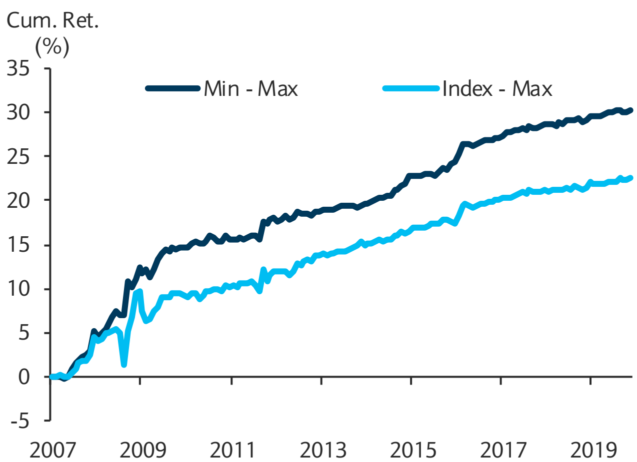
PANEL A

Performance Statistics of Replicating Portfolios and Long-Short Strategies

		Index	Min ESI	Max ESI	Min - Max	Index - Max	Min – Index
IG	Avg. Ex. Ret. (%/yr)	1.18	1.64	-0.42	2.06	1.61	0.45
	Vol. (%/yr)	5.41	4.81	5.13	1.61	2.20	1.63
	Sharpe / Inf. Ratio	0.22	0.34	-0.08	1.28	0.73	0.28
	Min. Ex. Ret. (%/m)	-8.38	-6.70	-10.36	-0.77	-3.55	-2.11
	Corr. with Index		0.95	0.91	-0.06	0.33	-0.50
HY	Avg. Tot. Ret. (%/yr)	7.41	7.04	5.44	1.61	1.97	-0.37
	Vol. (%/yr)	10.89	9.22	10.22	3.02	2.66	3.01
	Sharpe / Inf. Ratio	0.63	0.63	0.40	0.53	0.75	-0.12
	Min. Ex. Ret. (%/m)	-15.91	-17.20	-18.84	-2.77	-4.40	-3.55
	Corr. with Index		0.95	0.96	-0.35	-0.08	-0.13

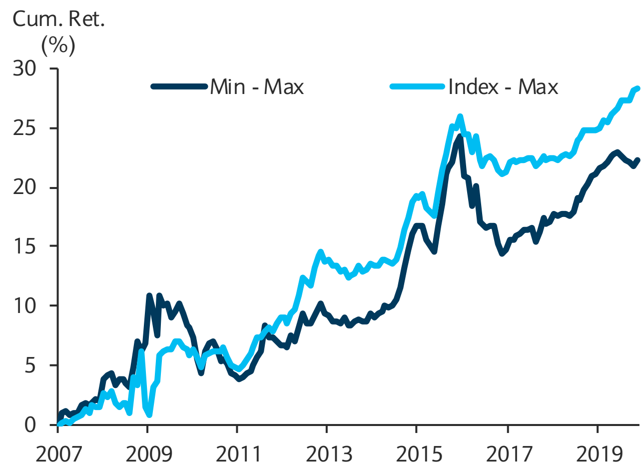
PANEL B

Cumulative Strategy Returns in the IG Universe



PANEL C

Cumulative Strategy Returns in the HY Universe



Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. Min and Max ESI are the replicating portfolios which minimize and maximize portfolio ESI, at the same time matching the index OAS, DTS and sector weights. Index – Max describes the return series of the index over the Max ESI portfolio, and Min – Max the return series of the Min ESI over the Max ESI portfolio. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

We conclude that ESI is an effective signal to identify corporate bond issuers with subsequent low returns in both indices – once we account for relevant risk measures in the portfolio construction. A univariate sort of bonds or issuers into low and high ESI portfolios ignores the fact that high ESI issuers, on average, tend to have higher spreads and DTS exposure. Accounting for these risk characteristics allows us to estimate a signal's efficacy more accurately.

Incorporating Short Interest from the Corporate Bond Market

Investors can also implement their negative views through short selling in the bond market. In this section, we investigate whether bond short interest is predictive of corporate bond returns and whether its information is complementary to information in ESI.

Bond Short Interest at the Issuer-Level

The data on bond short interest comes from FIS Astec Analytics at the security level. To differentiate issuers based on bond short interest, it is important to incorporate the available information across all their bonds and aggregate the data from the security level to the issuer level. We define issuer-level bond short interest (BSI) as the average short interest in all of their bonds for which we find at least one outstanding lending transaction in the current month.[7]

How different are BSI and ESI as predictive variables in the bond cross-section? Before we can answer this question, we have to add one additional filter to our IG and HY bond samples from the previous analysis – for a bond to be included, the issuer must have a value for both ESI and BSI. This ensures that we evaluate the efficacy of the signals in the same bond universe. We find that the sample is almost identical to the previous one. The average coverage of index market value is about 1 percentage point lower once we add the BSI requirement: from 81% to 80% in the IG universe and 63% to 62% in the HY universe.

Performance and Characteristics of BSI Quintile Portfolios

We sort issuers into quintile portfolios according to their BSI value the same way we did according to their ESI value. On the last trading day of each month, we rank issuers within sectors based on their most recent BSI value, then sort them into value-weighted quintile portfolios.

While high values of ESI correspond to an increased likelihood of being downgraded over the next 3 to 12 months in every rating class, BSI does not differentiate IG issuers in this regard. Although we find a positive relationship between BSI and the likelihood of being downgraded in the HY universe, the relationship is weaker than for ESI. This can be seen from the difference in future rating notch changes between low and high BSI issuers (Q1-Q5), which is smaller than for ESI in every rating class.

FIGURE 12

Rating Notch Changes by BSI Quintiles, Rating and Horizon

PANEL A

Investment Grade Universe

	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	.07	.08	.07	.07	.07	.00	.04	.03	.03	.02	.04	-.01	.00	.00	.00	.00	.03	.04
6m	.14	.19	.14	.16	.15	.01	.09	.07	.06	.05	.07	-.02	-.01	-.01	.01	.00	.06	.07
9m	.23	.30	.21	.24	.24	.02	.14	.12	.09	.08	.11	-.03	-.01	-.02	.01	.01	.09	.10
12m	.32	.40	.31	.35	.35	.03	.18	.16	.12	.11	.15	-.03	-.01	-.02	.01	.01	.12	.14

PANEL B

High Yield Universe

	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	.00	.00	.01	.00	.09	.09	-.04	-.03	-.01	-.01	.07	.11	-.02	-.01	.04	.04	.04	.06
6m	-.01	.01	.01	.00	.17	.18	-.07	-.04	-.02	.00	.14	.21	-.04	-.04	.06	.06	.08	.12
9m	-.02	.02	.01	.01	.24	.26	-.09	-.05	-.03	.00	.19	.28	-.05	-.06	.05	.08	.10	.15
12m	-.02	.03	.02	.03	.30	.31	-.11	-.05	-.04	.02	.24	.34	-.07	-.07	.03	.07	.10	.17

Source: Each rating notch is assigned a numerical value. A better rating is assigned to a lower value: Aaa=1, Aa1=2, …, C=21, D=22. 1 represents one notch down. Each month, we sort issuers into quintile portfolios based on their ESI value from the end of the previous month. The ranking is done within each of the six rating buckets (Aaa/Aa, A, Baa, Ba, B, Caa / Ca / C). For each issuer, we then track its rating changes in the subsequent 3, 6, 9 and 12 months. 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. Individual bond ratings of an issuer are value-weighted to obtain the average issuer rating. All issuer rating changes are equally weighted within each quintile portfolio. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research.

[7] Different to equity short interest, which is defined by the amount of shares in lending transactions versus shares outstanding, short interest at the bond level is defined by bond notional in lending transaction versus notional outstanding.

Is Short Selling of Investment Grade Bonds all about Negative Views?

We present average risk characteristics and return performance for each quintile portfolio in Figure 13. A few points are worth highlighting. In both the IG and HY universe, issuers with the lowest BSI values yield the highest Sharpe ratios. In the HY universe, the level of ESI increases with the level of BSI, and intuitively issuers in Q5 underperform issuers in Q1 to Q4. Yet, for investment grade issuers, Q5 has the second highest average return. This observation in the IG universe is at odds with the hypothesis of informed short sellers who implement their negative views, just as the previous results are on the predictability of downgrades.

While we do not know the purpose of the individual lending transactions, it is likely that lending activity in investment grade bonds is driven by very different motives. First, there are opportunistic traders implementing their negative views, which also applies to HY bonds. Second, market makers might borrow bonds in order to provide liquidity to investors with positive views. If a market maker cannot meet the demand of one of his clients from his inventory or purchase the relevant bond in the market, he might borrow the bond from another client instead and later net his short position. As soon as the latter scenario accounts for a significant share of lending activity, BSI is no longer as effective in differentiating bond issuers because it's not directly related to issuer-level information.

FIGURE 13

Issuer Characteristics and Performance of BSI Quintile Portfolios

	Investment Grade					High Yield				
Metric	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**	**Q1**	**Q2**	**Q3**	**Q4**	**Q5**
Avg. Ret. (%/yr)	1.99	1.03	1.22	0.95	1.32	8.76	6.42	8.67	6.50	4.67
Vol. (%/yr)	4.50	5.89	5.04	5.47	5.53	8.41	8.54	9.48	9.24	10.03
Sharpe Ratio	0.44	0.17	0.24	0.17	0.24	0.90	0.61	0.80	0.57	0.36
Quality	3.54	3.39	3.25	3.28	3.40	5.55	5.53	5.56	5.62	5.84
OAS (bps)	193	171	161	162	170	498	468	462	479	542
DTS (%*yr)	12.48	11.68	11.55	12.04	13.15	19.59	19.32	19.63	20.18	22.55
Size ($MM)	1.00	2.46	4.63	6.91	4.30	0.51	1.00	1.51	1.68	1.36
LCS (%)	0.60	0.30	0.19	0.16	0.23	1.34	0.81	0.62	0.58	0.69
ESI (%)	1.88	1.61	1.40	1.31	1.82	3.95	4.16	4.17	4.54	6.50

Note: We use 1-month LIBOR as funding rate to compute Sharpe ratios for HY portfolios. The numeric values of quality are converted from ratings by the following scale: Aaa=1, Aa=2, A=3, Baa=4, Ba=5, B=6, Caa=7, Ca=8, C=9, D=10. OAS, DTS, LCS and ESI are aggregated by issuer bond market value weight across issuers. The market value weighted statistics are later averaged across all months. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Index Replicating Portfolios with a BSI Tilt

As with ESI, we form index replicating portfolios tilted towards high and low BSI issuers to assess the efficacy of BSI as a signal for future corporate bond returns. We apply the exact same constraints to form our replication universe from each index as with ESI,[8] adding the constraint that issuers must have both an ESI and BSI value. Then we form our replicating portfolios by maximizing or minimizing BSI, matching index DTS and OAS, index sector weights and capping issuer weights at 2%.

The strategy performance is summarized in Figure 14. Consistent with previous findings, BSI is not informative about future returns in the investment grade universe. Since the end of the financial crisis in June 2009, the return of the Min BSI over the Max BSI portfolio was

[8] Qualifying bonds are senior bonds with at least 3 years to maturity, a notional above the 25th percentile, if available issued less than two years ago and with a duration closest to the sector average.

close to zero, at -0.15% per year. In addition, the Min BSI portfolio consistently underperforms the index, and the index yielded a cumulative return of only 0.43% over the Max BSI portfolio during the 13-year period.

The performance of BSI tilted portfolios in the HY space is qualitatively similar to the performance of ESI tilted portfolios. The Min BSI portfolio outperforms the index by 1.26% per year, just as much as the index outperforms the Max BSI portfolio. All long short strategies have a close-to-zero correlation with the HY index, the highest information ratio is obtained in the BSI strategy (Min BSI – Max BSI). A notable difference to ESI-tilted portfolios is the slightly improved return profile of the Min BSI portfolio over the index.

FIGURE 14

BSI Strategy Performance

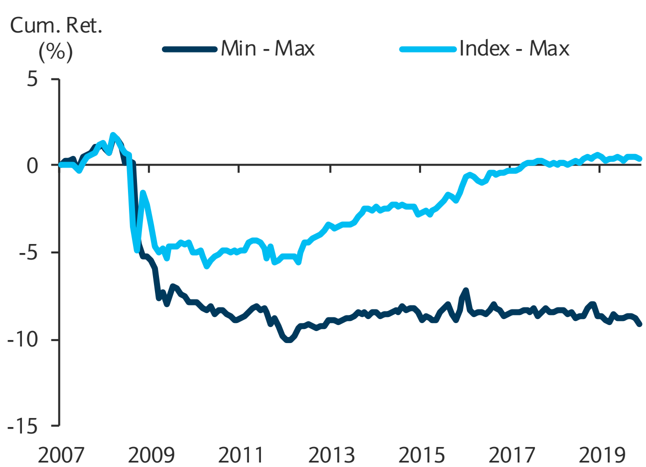
PANEL A

Performance Statistics of Replicating Portfolios and Long-Short Strategies

		Index	Min BSI	Max BSI	Min - Max	Index - Max	Min – Index
	Avg. Ex. Ret. (%/yr)	1.18	0.40	1.13	-0.73	0.05	-0.78
	Vol. (%/yr)	5.41	4.81	4.64	1.61	1.75	2.07
IG	Sharpe / Inf. Ratio	0.22	0.08	0.24	-0.45	0.03	-0.37
	Min. Ex. Ret. (%/m)	-8.38	-9.06	-5.07	-3.99	-4.19	-2.82
	Corr. with Index		0.92	0.95	0.02	0.57	-0.46
	Avg. Tot. Ret. (%/yr)	7.41	8.66	6.15	2.52	1.26	1.26
	Vol. (%/yr)	10.89	9.59	9.72	3.96	2.67	4.08
HY	Sharpe / Inf. Ratio	0.63	0.90	0.63	0.64	0.47	0.31
	Min. Ex. Ret. (%/m)	-15.91	-19.40	-17.59	-2.74	-4.00	-5.93
	Corr. with Index		0.80	0.83	-0.09	0.03	-0.11

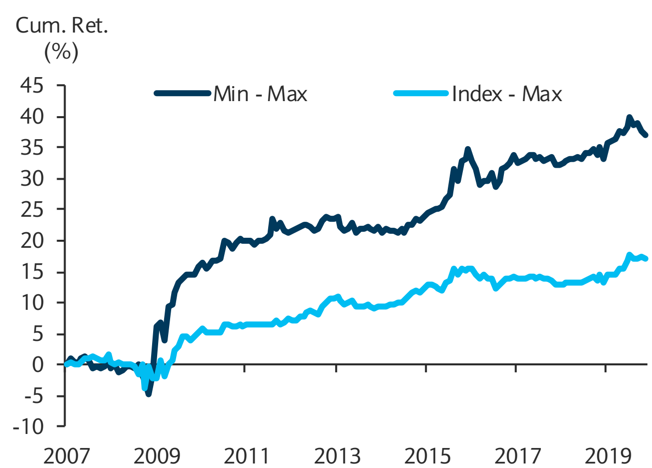
PANEL B

Cumulative Strategy Returns in the IG Universe



PANEL C

Cumulative Strategy Returns in the HY Universe



Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. Min and Max ESI are the replicating portfolios which minimize and maximize portfolio ESI, at the same time matching the index OAS, DTS and sector weights. Index – Max describes the return series of the index over the Max ESI portfolio, and Min – Max the return series of the Min ESI over the Max ESI portfolio. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Can We Benefit from a Combination of BSI and ESI in High Yield?

Before we discuss and explore possible combinations of ESI and BSI for an improved portfolio allocation, we discuss why a combination might actually be beneficial in the HY universe.

First, both signals are informative on their own. Our previous analysis documents that, while BSI is not an effective signal in the IG universe, both signals are predictive of future returns among HY issuers.

Second, the signals share a low correlation in the cross-section. For each month and index, we compute the Pearson and Spearman correlation coefficients between BSI and ESI in the cross-section. As a company can have several issuing entities present in the index, we aggregate issuer-level short interest to the company level, value-weighting individual BSI by the market value of an issuer's bond in the respective index. The average cross-sectional correlation coefficients are 0.20 (Pearson) and 0.18 (Spearman) for high yield issuers, and 0.14 (Pearson) and 0.01 (Spearman) for investment grade issuers.

In order to assign the same importance to both measures within a combined signal, we standardize both BSI and ESI to have a mean of zero and standard deviation of one on a monthly basis. The combined signal is then the sum of both standardized measures at the issuer level,

$$CSI_{i,t} = standardized\ \ ESI_{i,t} + \ \ standardized\ \ BSI_{i,t}.$$

Despite the low cross-sectional correlation between ESI and BSI and their individual predictive power, the CSI-tilted portfolio does not offer an improved performance over the ESI-tilted portfolio. Figure 15 compares the performance of the different portfolios in our HY sample of issuers with values on both BSI and ESI. The performance in the two long portfolios (Min ESI, Min CSI) is almost identical in terms of returns and volatility, just as in the two short portfolios (Max ESI, Max CSI).

FIGURE 15

Performance Comparison of Replicating Portfolios and Long-Short Strategies in the HY Universe

		Min CSI	Min ESI	Max CSI	Max ESI	Index – Max CSI	Index – Max ESI
HY	Avg. Tot. Ret. (%/yr)	7.11	7.03	5.54	5.31	1.97	2.19
	Vol. (%/yr)	9.08	9.22	10.10	10.22	2.59	2.78
	Sharpe / Inf. Ratio	0.64	0.63	0.43	0.40	0.76	0.79
	Min. Ex. Ret. (%/m)	-18.16	-17.21	-18.80	-18.84	-2.43	-4.40
	Corr. with Index	0.95	0.95	0.96	0.96	-0.06	-0.07

Note: Index refers to the Bloomberg Barclays US High Yield Index. Min and Max CSI are the replicating portfolios which minimize and maximize portfolio CSI, at the same time matching the index OAS, DTS and sector weights. Index – Max CSI describes the return series of the index over the Max CSI portfolio. The sample period covers January 2007 – December 2019. Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

An Explanation for the Similarity between the Combined Signal and ESI

In order to better understand the surprising result that the combined signal does not improve upon ESI, we rank issuers twice into quintile portfolios – once according to BSI, once according to ESI. This independent double-sort offers additional insights about the correlation results obtained from the cross-section. We compute the average number of issuers in each of the 25 rank combinations, the average ESI, BSI and next month's total return.

The matrix in Panel A of Figure 16 shows that issuers with high (low) ESI values tend to have high (low) BSI values, as the buckets with most issuers are located at both ends of the main diagonal. The return matrix in Panel B illustrates that the issuers which rank highest in both ESI and BSI have significantly lower returns (-2.12%) than issuers that rank high in only one of the measures (on average 6.67% for the remaining ESI 5 issuers and 5.93% for the remaining BSI 5 issuers). This observation adds to the puzzle why the combination of ESI and BSI does not improve upon ESI as a standalone signal.

A potential resolution can be found in Panels C and D. In Panel C, we document the average ESI value for each one of the 25 rank combinations. Within a particular ESI rank, ESI is almost the same across the different levels of BSI – except for within ESI 5. In Panel D, we observe the same for BSI. Within a particular BSI rank, ESI seems to be uncorrelated with BSI, except for within BSI 5. In addition, the highest values for ESI and BSI can be found in the same bucket. An allocation strategy that maximizes the combination of ESI and BSI will invest in several bonds that are part of a strategy that maximizes ESI alone.

This leads us to an important question – do the tilted portfolios with maximized short interest have a significant overlap? On average, we find that 22% of the bonds in the Max ESI and Max BSI portfolios are the same. Between the portfolios formed on ESI and the combined signal CSI, the overlap is even at 57%, and at 62% between portfolios formed on BSI and CSI.

FIGURE 16

Statistics from ESI and BSI Double Sorts in the HY Universe

PANEL A

Average Number of Issuers

	BSI 1	BSI 2	BSI 3	BSI 4	BSI 5
ESI 1	20.73	18.83	17.14	14.12	10.08
ESI 2	17.29	18.06	17.02	15.63	12.03
ESI 3	16.12	16.12	17.05	16.03	14.88
ESI 4	14.81	14.82	15.45	17.38	17.71
ESI 5	11.72	12.26	13.45	16.95	25.81

PANEL B

Average Annualized Total Return (%)

	BSI 1	BSI 2	BSI 3	BSI 4	BSI 5
ESI 1	7.67	5.94	6.05	7.76	6.30
ESI 2	7.52	9.01	7.86	6.40	6.48
ESI 3	7.66	6.74	6.89	5.36	5.50
ESI 4	11.62	5.99	5.62	4.03	5.42
ESI 5	8.95	6.94	5.91	4.90	-2.12

PANEL C

Average ESI (%)

	BSI 1	BSI 2	BSI 3	BSI 4	BSI 5
ESI 1	0.46	0.48	0.49	0.49	0.48
ESI 2	1.45	1.45	1.43	1.46	1.50
ESI 3	2.92	2.92	2.93	2.97	2.99
ESI 4	5.77	5.87	5.90	5.91	6.08
ESI 5	13.87	14.36	14.63	15.59	17.03

PANEL D

Average BSI (%)

	BSI 1	BSI 2	BSI 3	BSI 4	BSI 5
ESI 1	0.18	0.74	1.51	2.77	6.95
ESI 2	0.19	0.73	1.51	2.79	7.11
ESI 3	0.18	0.75	1.51	2.82	7.45
ESI 4	0.17	0.73	1.53	2.83	7.76
ESI 5	0.17	0.73	1.54	2.91	8.53

Note: Each month, HY issuers are ranked according to their ESI and BSI values independently and sorted into 25 portfolios. For example, ESI 1 contains the 20% of issuers with the lowest ESI values, ESI 2 the next 20% of issuers, and so on. Issuer-level returns, ESI and BSI are equal-weighted within the quintile and then averaged across time. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Although the combination of the two predictive signals BSI and ESI appeared promising due to their low average cross-sectional correlation, it did not improve upon ESI as a standalone signal. A closer look at the portfolio compositions and the distribution of returns across the different values of ESI and BSI suggests that ESI and BSI share similar information in the tail of the distribution.

We formally evaluate the interaction between ESI and BSI with a set of regressions of total returns within our HY replication universe on ESI, BSI and an interaction term:

$$r_{i,t+1} = a + b\ BSI_{i,t} + c\ BSI_{i,t} + d\ BSI_{i,t} * ESI_{i,t} + \varepsilon_{i,t.}$$

The coefficient estimates documented in the first three columns of Figure 17 suggest that both ESI and BSI are, alone and jointly, predictive of future corporate bond returns. The introduction of an interaction term, although only weakly significant, brings the coefficient estimates for both ESI and BSI closer to zero, indicating that bonds with high ESI and BSI values perform worse than the average bond in the sample. In addition, the coefficient estimate on BSI becomes less significant, while the estimate for ESI remains significant at the 1% level. This supports our finding that part of the predictive information in BSI can be attributed to its interaction with ESI.

FIGURE 17

Regression Coefficient Estimates

	BSI	ESI	BSI and ESI	With Interaction
Intercept (*a*)	0.6135***	0.7005***	0.7513***	0.7333***
ESI (*b*)	-0.0392***		-0.0329***	-0.0298***
BSI (*c*)		-0.0359***	-0.0249***	-0.0188*
ESI * BSI (*d*)				-0.0008*

Note: All estimates are for the period January 2007 to December 2019 and all bonds within the HY replication universe. The econometric method is ordinary least squares. The superscripts ***, **, and * indicate statistical significance at the 1%, 5% and 10% level, respectively, and are based on autocorrelation-consistent Newey-West standard errors.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

ESI and Relative Value in Credit

We have documented that bonds of issuers associated with high ESI values tend to be overpriced and perform significantly worse than bonds with similar risk characteristics, but lower ESI values. In light of this evidence, one might wonder whether the informational content in ESI is subsumed by measures of relative value in credit.

To investigate whether ESI becomes redundant once we account for relative value, we rely on a relative value measure developed by Desclée, Maitra, and Polbennikov (2016). The Excess Spread over Peers (ESP) is a quantitative filter designed to measure a bond's relative value. ESP ranks bonds (from 1 to 10) within their peer group according to their relative value, derived from its spread over peers unexplained by issuer characteristics and fundamentals. A high ESP score is an indication that a bond is relatively undervalued.

We first estimate the cross-sectional correlation between the two signals. This time, for a bond to be included in our sample, the bond must have a value for both ESI and ESP. We find that the IG sample is almost identical to the initial sample based on ESI alone. With few exceptions, all bonds with an ESI value also have an ESP score, such that the index coverage stays at 81% on average across the sample. For HY issuers, the ESP score is available for all issuers with a rating of single B and above, which reduces our sample from 63% to 54% in terms of index coverage.

At the company level,[9] the average cross-sectional Spearman correlation coefficient between ESP and ESI is 0.08 in the IG sample and -0.04 in the HY sample. To further understand the correlation between the two signals, we sort companies twice independently into quintile portfolios: once according to their ESP scores and once according to their ESI values. The resulting double-sort matrix will allow us to see whether particular combinations of ESI and ESP are dominant in our sample.

Figure 18 illustrates the average number of companies per ESP and ESI combination in our sample. The result for IG companies in Panel A suggests that the most shorted companies (ESI 5) tend to have more relatively cheap than expensive bonds, as the number of bonds increases with the ESP score. We do not find a consistent pattern across other quintile combinations. We can see in Panel B that there is no particular relationship between ESI and

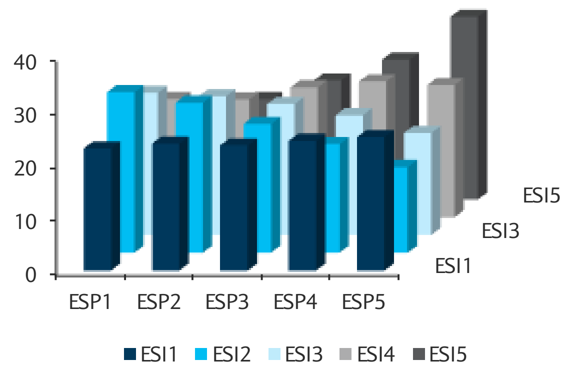
[9] We aggregate bond-level ESP scores to the company level by taking the value-weighted average of all of the ESP scores of the company's bonds which are part of the respective index.

FIGURE 18

Average Number of Companies per ESI and ESP Quintile Combination

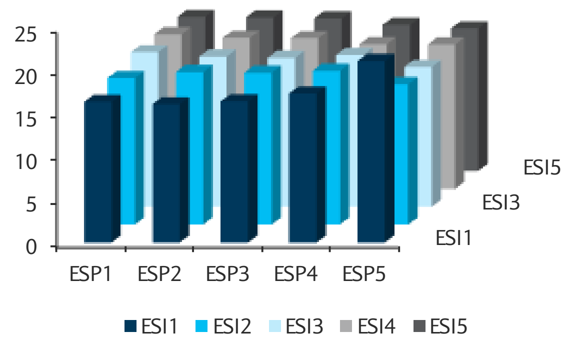
PANEL A

Investment Grade Universe



PANEL B

High Yield Universe



Note: Each month, companies are ranked according to their ESI value and ESP score independently and sorted into 25 portfolios. For example, ESI 1 contains the 20% of issuers with the lowest ESI values, ESI 2 the next 20% of issuers, and so on. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

ESP for HY companies: we find a very similar number of bonds for all signal combinations but one. The combination of cheapest (ESP 5) and least shorted (ESI 1) is the one combination which stands out, which is plausible as the equity corresponding to these bonds might also be considered cheap and less worth shorting.

Does ESI Predict Returns within Bonds of similar ESP Scores?

If ESI were subsumed by relative value measures, we would expect the ESI strategy to not work for bonds with similar ESP scores. To see whether ESI has predictive information beyond the information in ESP scores, we split both the IG and HY replication universe into two universes each. One universe contains 'expensive' bonds with an ESP score of 1-5, the other universe contains 'cheap' bonds with an ESP score of 6-10. For each of these universes, we form our index replicating portfolios according to the same criteria we used for the entire replication universe. We are then going to compare the return characteristics of the Max ESI and Min ESI portfolio. If ESI were without predictive information beyond ESP, we would expect the Min ESI portfolio to not outperform the Max ESI portfolio.

Figure 19 documents the outperformance of the Min ESI portfolio over the Max ESI portfolio, which is significant regardless of the index and the ESP filter. An index-replicating portfolio that minimizes ESI achieves larger returns and better Sharpe ratios than a similar portfolio that maximizes ESI, among both relatively cheap and expensive HY and IG bonds. Our results show that a relative value measure is complementary to the return-relevant information in equity short interest.

FIGURE 19

Performance Statistics of Replicating Portfolios with an ESI-Tilt – Universe Split into Expensive and Cheap Bonds

		Entire Repl. Universe			Expensive Bonds			Cheap Bonds		
		Min	Max	Min - Max	Min	Max	Min - Max	Min	Max	Min - Max
IG	Avg. Ex. Ret. (%/yr)	1.64	-0.42	2.05	0.61	-0.65	1.25	2.33	1.25	1.08
	Vol. (%/yr)	4.81	5.13	1.61	4.86	5.10	1.25	4.85	5.03	1.37
	Sharpe / Inf. Ratio	0.34	-0.08	1.27	0.12	-0.13	1.00	0.48	0.25	0.79
	Min. Ex. Ret. (%/m)	-6.7	-10.36	-0.76	-8.44	-9.17	-1.19	-6.01	-6.83	-1.94
	Corr. with Index	0.96	0.92	-0.06	0.95	0.91	-0.05	0.97	0.95	-0.08
HY	Avg. Tot. Ret. (%/yr)	7.04	5.44	1.60	3.13	2.19	0.93	5.71	3.84	1.86
	Vol. (%/yr)	9.22	10.21	3.02	4.61	4.7	0.98	8.29	8.85	2.14
	Sharpe / Inf. Ratio	0.76	0.53	0.53	0.41	0.21	0.95	0.54	0.30	0.87
	Min. Ex. Ret. (%/m)	-17.21	-18.85	-2.77	-4.44	-3.89	-0.58	-18.47	-17.79	2.62
	Corr. with Index	0.84	0.82	-0.21	0.44	0.44	-0.06	0.82	0.83	-0.27

Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. Expensive bonds are bonds within the replication universe that have an ESP score from 1-5, cheap bonds are those within the replication universe that have an ESP score from 6-10, Min and Max replicating portfolios minimize and maximize the portfolios overall ESI value, at the same time matching the index OAS, DTS and sector weights. Min – Max represents the return series of the Min over the Max portfolio. The sample period covers January 2007 – December 2019. We use 1-month LIBOR to compute Sharpe ratios from total returns.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Our analysis shows that ESI and ESP share a low cross-sectional correlation and have different informational content regarding future corporate bond returns. Over a pure ESI strategy, it seems preferable to hold relatively cheap bonds with low ESI values and to short expensive bonds with high ESI values. The same applies to a relative value strategy. It appears preferable to differentiate cheap bonds by those with low and high ESI values; the same holds for expensive bonds.

We provide evidence on the relationship between ESI and equity momentum with a similar analysis. For brevity, this analysis can be found in the appendix of this paper. In the next section, we illustrate the improved performance of a replicating portfolio from a combination of the signals over the signals on their own with an intuitive example.

Index Replicating Portfolios with a Tilt towards ESI and ESP

We will compute and compare the performance of an ESI-tilted portfolio, an ESP-tilted portfolio and a portfolio tilted towards a combination of ESP and ESI (ESIvalue). As before with ESI and BSI, we combine both standardized signals on an equal-weight basis:

$$ESIvalue_{i,t} = standardized\ \ ESI_{i,t} - \ \ standardized\ \ ESP_{i,t}.$$

The standardization computes both signals with a mean of zero and standard deviation of one. Instead of adding the standardized signals, we subtract the standardized ESP score from the standardized ESI value. ESIvalue is aimed at identifying potential underperformers. Intuitively, we would like to avoid issuers that trade relatively expensive to their peers (low ESP) and whose parent companies are shorted to a relatively large extent (high ESI), thus we flip the sign of the ESP score in order to maximize the ESIvalue signal.

We apply the same filters to our IG and HY samples as with ESI to identify the respective replication universes. We find that the replication universe in the IG space is almost unchanged, and so are the average characteristics, as almost all bonds have an ESP score. Once we exclude issuers in the HY sample which do not have an ESP score, the average number of bonds in the HY replication universe decreases from 400 to 337.

The average DTS and OAS in the HY replication universe slightly decrease and average quality slightly improves.

The performance of the different portfolios is summarized in Panel A of Figure 20. For investment grade issuers, the ESIvalue signal is superior to the single signals in both the long and short portfolios. While the ESP strategy (Max ESP - Min ESP) and the ESI strategy (Min ESI - Max ESI) achieve information ratios of 1.40 and 1.27, respectively, the ESIvalue strategy achieves an information ratio of 2.42, with higher average returns and lower average volatility. The consistent improvement in both legs of the strategy is reflected in the cumulative returns in Panel B and makes this signal combination interesting to both long-only and long-short investors. In HY, results are mixed, with ESI being the superior signal in the short portfolio and ESP being the superior signal in the long portfolio. The combination of both signals is in all three cases slightly inferior to one of the other signals on their own.

FIGURE 20

ESI + ESP Strategy Performance, January 2007– December 2019

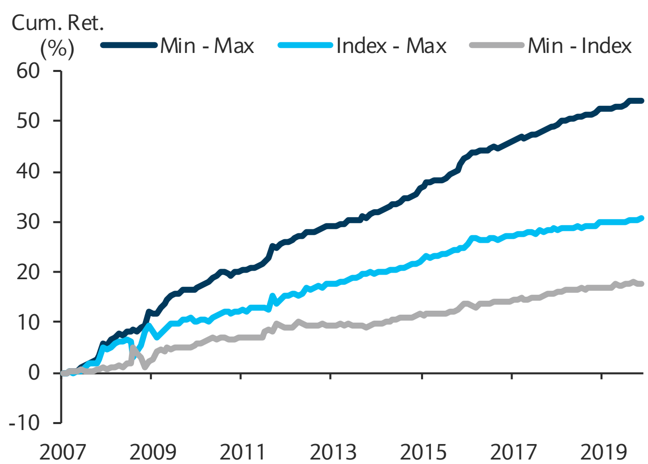
PANEL A

Performance Statistics of Replicating Portfolios and Long-Short Strategies

		Index	Min ESI	Max ESP	Min ESIvalue	Max ESI	Min ESP	Max ESIvalue	ESI Strategy	ESP Strategy	ESIvalue Strategy
IG	Avg. Ex. Ret. (%/yr)	1.18	1.64	1.79	2.45	-0.42	-0.27	-0.92	2.05	2.06	3.37
	Vol. (%/yr)	5.41	4.81	5.23	4.93	5.13	4.69	4.77	1.61	1.47	1.39
	Sharpe / Inf. Ratio	0.22	0.34	0.34	0.50	-0.08	-0.06	-0.19	1.27	1.40	2.42
	Min. Ex. Ret. (%/m)	-8.38	-6.70	-9.12	-7.47	-10.36	-5.68	-7.41	-0.76	-3.44	-0.65
	Corr. with Index		0.96	0.96	0.96	0.92	0.97	0.94	-0.06	0.31	0.18
HY	Avg. Tot. Ret. (%/yr)	7.41	7.04	10.38	9.91	5.44	4.67	4.78	1.60	5.70	5.13
	Vol. (%/yr)	9.61	9.22	9.45	9.43	10.21	10.44	10.67	3.02	2.91	2.83
	Sharpe / Inf. Ratio	0.77	0.76	1.10	1.05	0.53	0.45	0.45	0.53	1.96	1.81
	Min. Ex. Ret. (%/m)	-15.91	-17.21	-17.10	-18.26	-18.85	-20.90	-20.68	-2.77	-2.23	-2.80
	Corr. with Index		0.84	0.83	0.83	0.82	0.81	0.81	-0.21	-0.21	-0.30

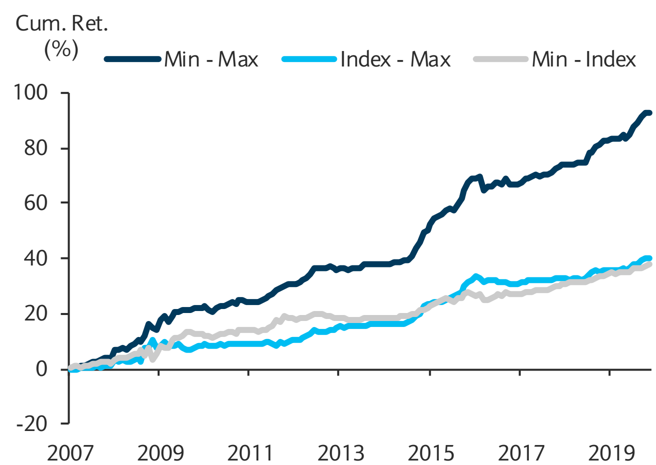
PANEL B

Cumulative ESIvalue Strategy Returns in the IG Universe



PANEL C

Cumulative ESIvalue Strategy Returns in the HY Universe



Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. Min and Max replicating portfolios minimize and maximize the portfolios signal value, at the same time matching the index OAS, DTS and sector weights. Min – Max represents the return series of the Min over the Max portfolio.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Conclusion

We document the efficacy of Equity Short Interest (ESI), a well-documented indicator of low returns in the cross-section of equity, as a signal for corporate bond returns. ESI consistently identifies issuers with an increased likelihood of rating downgrades and low corporate bond returns in both the HY and IG universe. An index-replicating portfolio with a tilt towards high ESI consistently underperforms its respective index over the next month.

ESI is a measure based on position data in the equity market. This feature distinguishes ESI from traditional bond risk measures based on fundamental data, prices or ratings, and makes it a promising candidate to combine with pure bond market signals. We include two such signals in our study to further understand the informational content in ESI. We find that the return-relevant information in bond short interest is subsumed by information in ESI. In addition, we find that ESI is only weakly correlated with relative value in credit and has complementary information regarding future returns.

Appendix: ESI and Equity Momentum in Credit

Companies with high values of ESI tend to have low subsequent equity returns, and might therefore be associated with low equity price momentum. Introducing EMC (Equity Momentum in Credit), Desclée and Polbennikov (2017) show that equity momentum has a strong positive relationship with future corporate bond returns of the same company. As a consequence, ESI and EMC might overlap in their informational content regarding future corporate bond returns. Here, we provide a brief analysis of the relationship between the two measures.

First, we keep all bonds of our mapped universe for which we have an EMC score. Not surprisingly, the sample is largely unchanged, since it is a prerequisite to have listed equity for an issuer to be included. In both the HY and IG universe, the index coverage decreases by less than half a percentage point on average in terms of market value once we exclude bonds without EMC score. Next, we look at the average cross-sectional Spearman correlation between EMC and ESI at the company level. We find average correlation coefficients of -0.01 in the IG sample and -0.09 in the HY sample. Figure 21 illustrates the average number of companies for different ESI and EMC quintile portfolio combinations. Both the IG and HY universes share a relatively flat distribution of companies in the different quintile combinations. Intuitively, we find a slightly increased number of companies in the lowest EMC quintile that are at the same time among the most shorted.

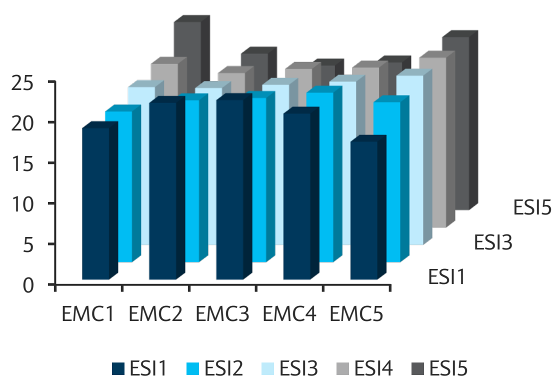
We test whether ESI is predictive of corporate bond returns for companies with either low or high equity momentum. Similar to our analysis with ESP, we divide our IG and HY universes into bonds with low and bonds with high equity momentum, based on their EMC score. The EMC score is a bond-level metric ranging from 1 (lowest equity momentum) to 10 (highest equity momentum). All bonds with an EMC score above 5 are considered to have high equity momentum, the remaining bonds to have low equity momentum. We then form replicating portfolios in the different universes and again compare the return characteristics of the Max ESI and Min ESI portfolio. If ESI were without predictive information beyond EMC, we would expect the Min ESI portfolio to not outperform the Max ESI portfolio.

FIGURE 21

Average Number of Companies per ESI and EMC Quintile Combination

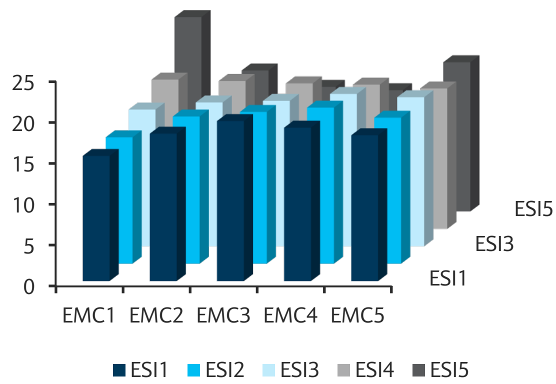
PANEL A

Investment Grade Universe



PANEL B

High Yield Universe



Note: Each month, companies are ranked according to their ESI value and EMC score independently and sorted into 25 portfolios. For example, ESI 1 contains the 20% of issuers with the lowest ESI values, ESI 2 the next 20% of issuers, and so on. The sample period covers January 2007 – December 2019.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

Figure 22 documents the outperformance of the Min ESI portfolio over the Max ESI portfolio, which is significant regardless of the index and the EMC filter. Our results suggest that information in equity short interest is complementary to the return-relevant information in equity momentum, as ESI is useful to differentiate among issuers with high and low equity momentum.

FIGURE 22

Performance Statistics of Replicating Portfolios with an ESI-Tilt – Universe Split into Low and High Equity Momentum Bonds

		Entire Repl. Universe			Low Equity Momentum Bonds			High Equity Momentum Bonds		
		Min	Max	Min - Max	Min	Max	Min - Max	Min	Max	Min - Max
IG	Avg. Ex. Ret. (%/yr)	1.64	-0.42	2.05	1.00	-0.33	1.33	2.47	1.19	1.28
	Vol. (%/yr)	4.81	5.13	1.61	4.21	4.25	1.16	4.41	4.69	1.21
	Sharpe / Inf. Ratio	0.34	-0.08	1.27	0.23	-0.07	1.14	0.56	0.25	1.05
	Min. Ex. Ret. (%/m)	-6.7	-10.36	-0.76	-4.99	-5.61	-1.67	-5.21	-7.89	-0.63
	Corr. with Index	0.96	0.92	-0.06	0.85	0.84	0.02	0.91	0.90	-0.20
HY	Avg. Tot. Ret. (%/yr)	7.04	5.44	1.60	0.87	-0.65	1.52	7.10	6.65	0.46
	Vol. (%/yr)	9.22	10.21	3.02	7.58	7.88	1.66	4.15	4.34	1.23
	Sharpe / Inf. Ratio	0.76	0.53	0.53	-0.04	-0.23	0.91	1.40	1.23	0.37
	Min. Ex. Ret. (%/m)	-17.21	-18.85	-2.77	-20.04	-20.08	-1.49	-3.06	-3.81	-2.36
	Corr. with Index	0.84	0.82	-0.21	0.68	0.69	-0.16	0.36	0.37	-0.07

Note: The indices are the Bloomberg Barclays US Corporate and High Yield Index. low equity momentum bonds are those within the replication universe that have an EMC score from 1-5, high equity momentum bonds are bonds within the replication universe that have an EMC score from 6-10, Min and Max replicating portfolios minimize and maximize the portfolios overall ESI value, at the same time matching the index OAS, DTS and sector weights. Min – Max represents the return series of the Min over the Max portfolio. The sample period covers January 2007 – December 2019. We use 1-month LIBOR to compute Sharpe ratios from total returns.
Source: Bloomberg, Compustat, FIS Astec Analytics, Barclays Research

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