Investor Sentiment and Corporate Bond Liquidity

Subhankar Nayak
Wilfrid Laurier University, Canada

ABSTRACT

Recent studies reveal that investor sentiment has significant explanatory power in the cross-section of stock returns and bond yield spreads. However, little is known on how and why investor sentiment influence security prices. It is suggested that these sentiment effects in prices arise from liquidity: sentiment-prone investors demand (avoid) securities, especially distressed speculative issues, when sentiment is high (low) causing overvaluation (undervaluation). In this paper, we explore whether there exist systematic differences in bond liquidity based on prevailing sentiment, and, if so, whether such differences are more prominent for high-yield speculative bonds. Using an extensive sample of corporate bond transactions and based on six measures of liquidity, we report two key findings. First, based on almost all metrics, bond liquidity is significantly larger under low sentiment than under high sentiment. Second, trends in liquidity based on prevailing sentiment are less pervasive for the relatively distressed high-yield bonds. Both results are in disagreement with the extant proposal on how investor sentiment channelizes its effects on security prices via liquidity.

Keywords: *Investor Sentiment; Corporate Bonds; Bond Liquidity; Yield Spreads*

INTRODUCTION

In the traditional financial framework (Markowitz, 1959), rationality of investors is the default necessary requirement whereby competition among rational investors leads to an equilibrium in financial markets and security prices reflect risk-based fundamentals. Investor biases and deviations from rationality are completely discounted. However, in light of events of extreme price movements in recent years as well as emerging empirical evidence that security returns deviate from classical rational predictions, current literature emphasize the relevance of investor outlooks, biases, perceptions, and irrationalities in security prices. In particular, studies reveal that stock price anomalies and deviations from classical predictions are better explained by behavioral models that incorporate *investor sentiment*.

Baker and Wurgler (2006) provide two related definitions of investor sentiment: (a) it denotes the level of (irrational) optimism or pessimism in projections of future cash flows and risks underlying any security, and (b) it reflects the propensity to speculate in certain securities that are more likely to be mispriced and are difficult and costly to arbitrage. Studies find that investor sentiment retains a very significant role in stock returns (Neal and Wheatley, 1998; Baker and Wurgler, 2006; Qiu and Welch, 2006) and well as corporate bond yield spreads (Nayak, 2010). In particular, when considered in tandem, Baker and Wurgler (2006) and Nayak (2010) highlight symmetry in the role of investor sentiment in the prices of stocks and bonds: both stocks as well as bonds are relatively overpriced in high sentiment ("optimistic") states, and demonstrate comparative undervaluation when low sentiment ("pessimism") reigns. Moreover, distressed stocks (small, young, high volatility, unprofitable, non-dividend paying stocks) and distressed bonds (low rated, Industrials and Utilities, extreme maturity issues) are more susceptible to sentiment-based mispricings and associated price trends.

But why does investor sentiment have any bearing on the prices of stocks and bonds? De Long et al. (1990) suggest that susceptibility of stocks to mispricings due to sentiment probably arise from wide dispersion in retail holdings and from being prone to noise trading. Baker and Wurgler (2007) propose two assumptions why investor sentiment affects stock prices. First, there exist sentiment-sensitive stocks which are more likely to be mispriced relative to risk-based fundamentals. Second, there are limits to arbitrage, i.e., betting against sentimental or biased investors is costly and risky. As a result, rational arbitrageurs are not aggressive in forcing sentiment biased prices back to risk-

based fundamentals. These biases and limits to arbitrage affect the liquidity of stocks and the corresponding trading behavior manifest as sentiment effects. Specifically, it is suggested that securities are overvalued when high sentiment prevails because arbitrageurs actively demand, seek out and buy securities, and securities are undervalued when sentiment is low due to avoidance and sell pressure; distressed securities are more sentiment-sensitive because of higher degree of speculation in such securities depending on prevailing sentiment. In short, it is hypothesized that *liquidity* is the primary driving force underlying sentiment influences in security prices.

However, there has been very little empirical investigation linking liquidity effects to sentiment-based mispricings. In particular, the literature on behavioral effects in bond markets is extremely meager and nothing is known regarding how sentiment based mispricings arise. In this paper, using an extensively large sample of corporate bond transactions and adopting several different measures of liquidity, we explore the relation between corporate bond liquidity and prevailing investor sentiment. Our results contradict the proposed hypotheses in extant literature regarding the role of liquidity in sentiment effects: we do not find any evidence that liquidity or trading volume, especially for distressed or high-yield bonds, are greater when sentiment is high than when it is low; in fact, we find just the opposite trends. Thus, how sentiment effects arise in security prices remains unresolved and cannot be explained based on liquidity arguments.

We proceed as follows. Section 2 describes the data, liquidity measures and test hypotheses. We list and discuss the results of empirical tests in Section 3. Section 4 concludes.

DATA, METHODOLOGY AND HYPOTHESES

We use a 6-year sample (2002-2007) of more than half a million transactions on corporate bonds issued by publicly traded firms that comes from two popularly adopted sources: Mergent Fixed Investment Securities Database (FISD) issuance data and FINRA's Trade Reporting and Compliance Engine (TRACE) bond transaction database. The FISD includes in depth issue- and issuer-related information on all U.S. debt securities maturing in 1990 or later. The TRACE database lists details of all over the counter secondary market bond transactions since 2001 by all brokers or dealers who are member firms of Financial Industry Regulatory Authority (FINRA).

From FISD, we collect issuance related information (offer date, maturity date, rating, offer amount, etc.) on all U.S. corporate bonds that are outstanding and have valid trades between 2002 and 2007. We impose certain screening criteria and exclude following bonds: Treasuries, TIPS, Munis, Treasury coupon- and principal-strips; agency bonds; Yankee, Canadian, and foreign currency issues; bonds with sinking fund, enhancement, or asset-backed features; perpetual and variable rate bonds. We also drop bond issues that are unrated, or have either missing or close-to-default bond ratings. Finally, we exclude bonds close to maturity, that is, with maturities less than 1 year. For each bond issue, we collect from TRACE the details of all transactions (trade date and time, par amount of traded bonds, trade price and yield, etc.) between 2002 and 2007. When there are multiple trades in a day, we aggregate all such trades to obtain a single daily transaction observation that reflects the number, mean and total of all trades in that day. Based on CUSIP identifiers, we match all bonds with the stock data in the Center for Research in Security Prices (CRSP) database. We drop all bond observations that do not have any matching stock in the CRSP database (that is, do not belong to a publicly traded firm).

For bond ratings, we use Standard & Poor's (S&P) rating if it exists; otherwise we use Moody's rating data. On the transaction date of each bond trade, we compute bond yield spreads as the excess of daily mean yields-to-maturity over matching maturity benchmark swap rates. Daily swap rates for 15 different maturities (ranging between 1 and 30 years) are obtained from Datastream. Each bond is matched to a corresponding swap rate based on flat interpolation of yields for extreme maturities of the swap rate curve and linear interpolation of two closest neighboring maturity swap yields for interim maturities.

Finally, we augment our data sample with the investor sentiment index developed by Baker and Wurgler (2006). This index captures the systematic level of investor optimism and pessimism independent of macro-economic conditions, lines up well with anecdotal accounts of the level of investor exuberance over the history of the index and possesses excellent explanatory power in the cross-section of stock returns. For each bond trade, we match the annual value of Baker-Wurgler investor sentiment index corresponding to the transaction date.

We compute the following six measures of corporate bond liquidity separately under high and low investor sentiment regimes and compare the values to establish any potential relation between bond liquidity and prevailing sentiment:

1. Mean number of daily trades: This is the simplest measure of trading activity; *higher* values denote greater liquidity.
2. Mean and total daily trade size: These additional measures of trading activity capture the volume of trades in dollars; *higher* values denote greater liquidity.
3. Mean and total daily turnover: These two measures are computed based on the mean and total daily dollar trading volumes as a percentage of total amount of bonds outstanding; *higher* values denote greater liquidity.
4. LOT measure: Using the Das and Hanouna (2009) adaptation of Lesmond et al. (1999) measure, we compute LOT metric as the ratio of the number of zero trading volume days divided by the total number of all trading days; *smaller* values denote greater liquidity.
5. Covariance illiquidity measure: This measure, adapted from Bao et al. (2008), is computed as the time-series covariance of daily bond returns (yield spread changes); *smaller* values denote greater liquidity.
6. Amihud illiquidity measure: This measure is based on Amihud (2002) and is computed as follows; *smaller* values denote greater liquidity:

$$ILLIQ_{it} = \frac{1}{DAYS_{it}} \sum_{t=1}^{DAYS_{it}} \frac{|r_{it}|}{\$VOL_{it}} * 10^6$$

where r_{it} is the *i*th bond's return (spread change) on day *t*, $\$VOL_{it}$ is the total daily trading volume in dollars, and $DAYS_{it}$ is the total number of trading days for bond *i* in the year under consideration.

We seek to explore whether bonds are relatively overpriced or underpriced depending on the prevailing sentiment, and whether bond liquidity and trading activity are also sentiment-dependent and thereby explain the effects of investor sentiment on bond yield spreads. To this end, based on Baker and Wurgler (2007) elucidation, we propose the following four hypotheses (the first two relate to yield spreads, and the remaining two focus on bond liquidity):

H1A: In high (low) sentiment regimes, bonds are overpriced (underpriced) and hence demonstrate lower (higher) yield spreads.

H1B: The difference in yield spreads between high and low sentiment regimes is larger (smaller) for high-yield (low-yield) bond issues.

H2A: Bond trading activity and liquidity are greater (smaller) during high (low) sentiment periods.

H2B: The differences in bond trading activity and liquidity between high and low sentiment regimes are more (less) prominent for high-yield (low-yield) bond issues.

EMPIRICAL RESULTS

Our final sample consists of 585,417 daily transaction observations from 2002 through 2007 for 2,493 different domestic corporate bonds issued by 819 publicly listed firms. The 2,493 unique bonds represent 1,397 high-rated bonds (rating A and above), 1,096 low-rated issues (rated BBB and below), 1,482 Industrials, 604 Financials, 407 Utilities, 1,325 short-term issues (maturities 1-7 years), 410 medium-term bonds (maturities 7-15 years), and 758 long-term issues (maturities greater than 15 years).

First, we explore the trend of bond yield spreads along investor sentiment. To this end, we classify the six years into high sentiment versus low sentiment years based on the median value of investor sentiment index. We compare the yield spreads of various bond portfolios under the two sentiment regimes. Table 1 presents the results. For all bonds, the average spread is 3.94% under high sentiment, and 5.66% under low sentiment, and the sentiment-based spread differential of 1.71% is significant. When we classify bonds by ratings, maturity and industry, two key results emerge: (a) the average spreads are always larger under low sentiment than when high sentiment reigns, and (b) the sentiment-based spread differentials are larger for relatively distressed high-yield bonds (lower ratings, extreme maturities, and Industrials and Utilities) compared to low-yield issues (higher ratings, medium maturities, and Financials). Confirming the results of Nayak (2010), we find that bonds are undervalued (with higher spreads) when sentiment is pessimistic,

and overvalued (with lower spreads) when sentiment is optimistic, and the degree of mispricing is higher for relatively distressed high yield bonds. Thus, we report overwhelming support for the first two hypotheses, H1A and H1B.

Table 1: Bond Yield Spreads Under Different Sentiment Regimes

	High sentiment regime		Low sentiment regime		Difference	
Bond portfolio	# of trades	Mean spread	# of trades	Mean spread	in spread	*t*-statistic
All bonds	228,957	3.94%	356,460	5.66%	–1.71%	–4.84***
By rating:						
high rated	148,313	3.04%	262,612	4.44%	–1.41%	–5.26***
low rated	80,644	4.50%	93,848	6.47%	–1.97%	–6.15***
By maturity:						
short-term	125,366	5.70%	215,863	8.09%	–2.39%	–6.66***
medium-term	37,868	1.39%	55,267	1.53%	–0.15%	–1.99*
long-term	65,723	1.99%	85,330	2.27%	–0.28%	–2.28*
By industry:						
Industrials	146,030	2.27%	197,681	3.36%	–1.09%	–4.51***
Financials	59,453	0.77%	127,245	1.12%	–0.35%	–2.46*
Utilities	23,474	1.25%	31,534	2.15%	–0.87%	–3.11**

* *p*-value < 0.05; ** *p*-value < 0.01; *** *p*-value < 0.001

Next, we establish trends in bond trading activity and liquidity depending on prevailing investor sentiment. In the first step, we focus on the complete set of transactions on the portfolio of all bonds, and compute the six measures of liquidity under high and low sentiment regimes. Table 2 reports the results. In terms of trading activity, *low* sentiment years witness more number of trades in a day, larger daily trading volumes, and higher total daily turnover; only the mean daily turnover is higher under high sentiment regime. All the three *illiquidity* metrics (LOT measure, covariance measure and Amihud measure) are larger under *high* sentiment than when sentiment is low. Thus, contrary to extant suggestions, we find that bond trading activity and liquidity are *smaller* during high sentiment periods and *greater* when low sentiment prevails. Hence, we can reject the third hypothesis, H2A.

Table 2: Liquidity Measures Under Different Sentiment Regimes, All Bonds

	Value under		Difference
Liquidity measure	High sentiment	Low sentiment	(test statistic)
Mean number of daily trades	4.34	4.74	–16.76***
Total daily trade size ($ millions)	1.40	1.73	–25.73***
Mean daily trade size ($ millions)	0.41	0.41	–0.16
Total daily turnover (%)	0.36	0.38	–3.97***
Mean daily turnover (%)	0.14	0.13	5.02***
LOT measure	0.78	0.75	8.66***
Covariance illiquidity measure, mean	0.64	0.52	1.24
Covariance illiquidity measure, median	0.03	0.01	8.78***
Amihud illiquidity measure, mean	8.74	5.51	1.98*
Amihud illiquidity measure, median	2.69	2.42	3.71**

* *p*-value < 0.05; ** *p*-value < 0.01; *** *p*-value < 0.001
Difference test statistic: *t*-statistic for *t*-tests of means, *Z*-statistic for rank-sum tests of medians

To explore whether sentiment effects on bond spreads are exacerbated for distressed high-yield bonds, we classify all bonds based on ratings, and compute the six liquidity measures under the two sentiment regimes separately for high- and low-rated issues. Table 3 reports the values of the six liquidity metrics in high and low sentiment years for all transactions on 1,397 high-rated bonds (ratings AAA, AA or A). We find that high-rated issues demonstrate greater trading activity (larger trading volumes and turnover) and higher liquidity (smaller values of LOT, covariance, and Amihud illiquidity metrics) when low sentiment or pessimism prevails; only the number of daily trades are larger under high sentiment. Thus, contrary to expectations, bond liquidity are pervasively smaller when investor sentiment is high.

Table 3: Liquidity Measures Under Different Sentiment Regimes, High-Rated Bonds

Liquidity measure	Value under		Difference (test statistic)
	High sentiment	Low sentiment	
Mean number of daily trades	5.05	4.91	4.45***
Total daily trade size ($ millions)	1.32	1.49	–12.34***
Mean daily trade size ($ millions)	0.33	0.35	–4.72***
Total daily turnover (%)	0.32	0.32	–2.63**
Mean daily turnover (%)	0.11	0.11	–3.00**
LOT measure	0.75	0.72	6.21***
Covariance illiquidity measure, mean	0.11	0.07	3.92***
Covariance illiquidity measure, median	0.02	0.01	6.88***
Amihud illiquidity measure, mean	5.49	3.97	1.54
Amihud illiquidity measure, median	2.25	2.17	1.44

* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001
Difference test statistic: t-statistic for t-tests of means, Z-statistic for rank-sum tests of medians

Table 4 presents the values of the six liquidity metrics in high and low sentiment years for all transactions on 1,096 low-rated bonds (ratings BBB, BB or B). Similar to the previous results, we consistently find that the trading activity of low-rated bonds are smaller and the three illiquidity metrics are larger during high sentiment periods. Thus, low-rated bonds too depict more trading activity and higher liquidity under pessimistic low sentiment regime. Hypothesis H2A is hence conclusively rejected.

Table 4: Liquidity Measures Under Different Sentiment Regimes, Low-Rated Bonds

Liquidity measure	Value under		Difference (test statistic)
	High sentiment	Low sentiment	
Mean number of daily trades	3.04	4.25	–37.03***
Total daily trade size ($ millions)	1.55	2.38	–30.92***
Mean daily trade size ($ millions)	0.55	0.59	–8.06***
Total daily turnover (%)	0.45	0.52	–11.73***
Mean daily turnover (%)	0.19	0.18	2.37*
LOT measure	0.82	0.79	5.60***
Covariance illiquidity measure, mean	4.04	4.17	0.12
Covariance illiquidity measure, median	0.05	0.03	2.55*
Amihud illiquidity measure, mean	13.62	8.82	1.14
Amihud illiquidity measure, median	3.69	3.21	2.47*

* p-value < 0.05; ** p-value < 0.01; *** p-value < 0.001
Difference test statistic: t-statistic for t-tests of means, Z-statistic for rank-sum tests of medians

Furthermore, when we compare all six liquidity measures of high-rated bonds (Table 3) against those of low-rated bonds (Table 4), an interesting trend emerges. Trading volumes and turnover are larger for low-rated bonds and the sentiment effects on these two dimensions of liquidity are more prominent for low-rated issues. However, high-rated bonds are characterized by larger number of trades, and smaller values of the three illiquidity metrics; and the sentiment effects are more prominent for high-rated bonds along these four dimensions of liquidity. Thus, we find very weak and marginal support for the fourth hypothesis, H2B. Sentiment effects are more prominent for high-yield low-rated bonds along only two of the six dimensions of liquidity; and even for these two, contrary to predictions, liquidity is higher when sentiment is low.

When we classify bonds based on industry (Industrials and Utilities versus Financials) and maturity (extreme maturities versus medium maturities) and replicate the tests, we find very similar results (tables not reported for reasons of brevity) yielding identical conclusions. For all classifications, trading activity and liquidity are never greater under high sentiment regimes as predicted by hypothesis H2A. Moreover, contrary to hypothesis H2B, sentiment effects in liquidity are rarely more pronounced for high yield bonds (Industrials and Utilities or extreme maturity issues). These results confirm the rejection of hypothesis H2B as well.

CONCLUSIONS

Recent literature highlights the relevance of investors' biases, subjective perceptions, outlooks, and irrationalities in security prices. Investor sentiment retains significant explanatory power in the cross-section of stock returns (Baker and Wurgler, 2006) and bond yield spreads (Nayak, 2010). However, there is little empirical evidence on how and why sentiment effects manifest in security prices. In the elucidation of the role of investor sentiment, Baker and Wurgler (2007) propose that sentiment effects in security prices arise due to liquidity reasons. They suggest that demand for securities, especially those of relatively distressed speculative issues, increases during periods of optimism (high sentiment) causing overvaluation and higher prices; on the other hand, sentiment-prone investors avoid speculative securities and seek out low risk issues when low sentiment or pessimism prevails leading to underpricing of the speculative securities. In short, they claim that investor sentiment channelizes its effects on security prices via liquidity.

However, there has been no empirical substantiation of the proposed liquidity effects due to sentiment. Thus, in this paper, using an extensive sample of corporate bond transactions and based on six measures of liquidity, we empirically address the following two unresolved issues: (a) is bond liquidity greater when sentiment is high, and smaller when low sentiment prevails, and (b) are the differences in liquidity between high and low sentiment periods more prominent for relatively distressed speculative bonds?

We do not find any empirical support for either of the two hypotheses proposed on the relevance of liquidity. First, based on almost all metrics, bond liquidity is significantly higher under low sentiment than under high sentiment. Second, trends in liquidity based on prevailing sentiment are less pervasive for the relatively distressed high-yield bonds. Both findings are in stark disagreement with the extant (and hitherto unsubstantiated) proposal that investor sentiment channelizes its effects on security prices via liquidity. The question why investor sentiment has any bearing on the prices of stocks and bonds remains unresolved.

REFERENCES

Amihud, Y., (2002), "Illiquidity and Stock Returns: Cross-Section and Time-Series Effects," *Journal of Financial Markets*, 5, 31-56.

Baker, M., & J. Wurgler, (2006), "Investor Sentiment and the Cross-Section of Stock Returns," *Journal of Finance*, 61, 1645-1680.

Baker, M., & J. Wurgler, (2007), "Investor Sentiment in the Stock Market," *Journal of Economic Perspectives*, 21, 129-151.

Bao, J., J. Pan, & J. Wang, (2008), "Liquidity of Corporate Bonds," *Working paper*, MIT.

Das, S., & P. Hanouna, (2010), "Run Lengths and Liquidity," *Annals of Operations Research*, 176, 127-152.

De Long, J., A. Shleifer, L. Summers, & R. Waldmann, (1990), "Noise Trader Risk in Financial Markets," *Journal of Political Economy*, 98, 703-738.

Lesmond, D., J. Ogden, & C. Trzcinka, (1999), "A New Estimate of Transaction Costs," *Review of Financial Studies*, 12, 1113-1141.

Markowitz, H., (1959), "Portfolio Selection: Efficient Diversification of Investments," *New York: Wiley*.

Nayak, S., (2010), "Investor Sentiment and Corporate Bond Yield Spreads," *Review of Behavioral Finance*, forthcoming.

Neal, R., & S. Wheatley, (1998), "Do Measures of Investor Sentiment Predict Returns?," *Journal of Financial and Quantitative Analysis*, 34, 523-547.

Qiu, L., & I. Welch, (2006), "Investor Sentiment Measures," *Working paper*, Brown University.