



Liquidity, credit quality, and the relation between volatility and trading activity: Evidence from the corporate bond market



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ABSTRACT

This paper investigates the roles of illiquidity and credit risk in determining the relations between price volatility of a bond and its trading frequency and trade size based on a large transaction dataset from October 2004 to June 2012. We find a positive relation between volatility and trading frequency and a negative relation between volatility and trade size. Consistent with the prediction of the search-based theory, the relations are much stronger for illiquid and risky bonds. Furthermore, both liquidity and credit risk become more important in times of stress and their effects are reinforcing. Results strongly suggest that search frictions and credit risk are important factors driving the relation between volatility and trading activity in the corporate bond market.

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1. Introduction

Price volatility and volume are two of the most closely watched trading variables in the financial market. Both are constantly monitored by practitioners and regulators who have a great deal of interest in trading risk, capital adequacy, price discovery and liquidity. Likewise, academicians have long been interested in volatility and trading behaviors, and a bulk of literature has been devoted to understanding their relation.² As trading technologies evolve, researchers have looked into different dimensions of market quality, but price and trading behaviors remain the focal points of many recent empirical studies. As an example, volatility and trading liquidity continue to be important issues in recent high frequency trading research (see, for example,

Nishimura, 2010; Hendershott et al., 2011; Hendershott and Moulton, 2011; Kirilenko et al., 2011; Jarrow and Protter, 2012; Hendershott and Riordan, 2013).

A bulk of literature has documented a significant positive relation between trading volume and price volatility, and this relation appears to be robust to different asset classes and trading intervals (see Karpoff, 1987; Bessembinder and Seguin, 1993; Foster and Viswanathan, 1993; Jones et al., 1994; Chan and Fong, 2000; Downing and Zhang, 2004; Fleming et al., 2006a). When volume is further decomposed into trading frequency and size components, it has been shown that the former has the most explanatory power for volatility of stock returns (Jones et al., 1994). Theories have been proposed to explain these relations, which include competitive microstructure models (e.g., Pflleiderer, 1984; Grundy and McNichols, 1989; Kim and Verrecchia, 1991), strategic microstructure models (Kyle, 1985; Admati and Pflleiderer, 1988; Foster and Viswanathan, 1990; Holden and Subrahmanyam, 1992), and information flow models (e.g., Tauchen and Pitts, 1983; Harris, 1986; Schwert, 1989, 1990; Hasbrouck, 1991; Gallant et al., 1992; Andersen, 1996; Engle and Russell, 1998; Dufour and Engle, 2000; Fleming et al., 1998, 2006a, 2006b; Fleming and Paye, 2011). These models have built on the information theory of

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² A classic example is the study by Admati and Pflleiderer (1988), who develop a theory for the pattern of volume and volatility at the intraday level. See Karpoff (1987) for a survey.

marketmaking to explain the relation between price volatility of a security and its trading volume.³

In a separate vein, the search-based theory has suggested that illiquidity can generate the familiar microstructural phenomena without asymmetric information. Duffie et al. (2005) develop a model of marketmaking with trading frictions and show that illiquidity affects prices and widens bid-ask spreads under symmetric information.⁴ Extending the model to include risk aversion and risk limits, Duffie et al. (2007) show that the liquidity discount is larger when trading frictions and risk aversion are higher, and volatility and illiquidity are positively correlated. Considering funding liquidity, Brunnermeier and Pedersen (2009) show that volatility is high when liquidity is low and that this relation is stronger for riskier securities. Garleanu and Pedersen (2011) find that securities with lower funding liquidity have higher price volatility, as speculators are unable to take on positions to smooth price fluctuations. A common thread of these studies is that illiquidity and search frictions can be important factors driving price volatility and spreads even in the absence of asymmetric information.

Empirical studies on volatility and its relation with trading behavior and have a long history in finance. Studies of this relation have improved our understanding of the price discovery process and have led to the development of important models that form the foundation of modern market microstructure and intermediation theories. Much of the empirical research in this area has attempted to distinguish between the effects of informational and non-informational factors on price volatility. Identifying the sources of volatility is important for understanding price discovery and information efficiency of financial markets. For example, price volatility can be due to information flow or market frictions. It is important to differentiate these effects in assessing information efficiency and quality of financial markets.

This paper expands the literature by investigating the roles of illiquidity and credit risk in the relation between trading activity and price volatility in the corporate bond market using transaction data, whose quality has improved dramatically since the establishment of TRACE (the Trade Reporting and Compliance Engine) in 2002. The selection of the corporate bond market for this study offers several advantages. First, the over-the-counter (OTC) market structure of corporate bonds provides an ideal laboratory for examining the implications of the search-based models advanced by Duffie et al. (2005, 2007) and others. Corporate bonds are traded in an OTC market where traders are required to search and negotiate with counterparties. The cost of search for counterparties and information is high when a market is inactive and opaque. The corporate bond market is not as active and transparent as the stock market and illiquidity has long been a concern to bond investors, making it an ideal place for studying the role of illiquidity in microstructural phenomena. Moreover, the population of corporate bonds has a wide dispersion in credit quality,⁵ which permits tests of the differential effects of illiquidity on the volatility–volume relation for securities with varying risk as implied by the search-based model.

Second, the corporate bond market provides additional evidence to compare and contrast with other markets. The corporate bond market differs from stock and derivatives markets in several aspects. Aside from the differences in the market structure and

trading process, the corporate bond market consists of securities with different return and risk characteristics, and trading is dominated by institutional investors. In addition, there are differences in trade and disclosure regulations between bond and other markets which may affect insiders' trading behavior.⁶ These features shape a distinct microstructure for the corporate bond market. Investigating the sources of price volatility in the corporate bond market improves our understanding of price discovery in different markets, which is important for developing a general theory to explain microstructure phenomena across markets with different assets.

Last, from the investment and policy perspectives, understanding volatility and trading behaviors is essential for forming the trading strategies of portfolio managers, asset allocations, firm-level issuance decisions and for assessing market quality. Our empirical findings aid in these decisions.

Our paper provides the first comprehensive empirical analysis on the relation between trading activity and price volatility in the corporate bond market using a large transaction data set. By trading activity, we mean a combination of trading volume, frequency and size. By examining this relation across bonds with varying liquidity and risk characteristics and over different market liquidity environments, we document several unique findings that expand the current literature.

First, we find that liquidity plays an important role in the relation between the volatility of a corporate bond and its trading activity. High volatility associated with trading volume therefore does not necessarily imply high information asymmetry. Our finding supports the hypothesis of search-based models that when search frictions are high or liquidity is low, the impact of trading on prices of corporate bonds is high. This in turn implies a stronger relation between price volatility and volume when liquidity is low. Consistent with this hypothesis, trades with small size and trades of old bonds (off-the-run) have a higher correlation with price volatility. Furthermore, the correlation is stronger for bonds with a small issue amount (low supply) and low trading volume. Results suggest that search frictions are an important factor determining the relation between price volatility and trading activity.

Second, there is a significantly positive relation between trading frequency and volatility and a significantly negative relation between trade size and volatility in the corporate bond market. The former is consistent with the finding for the stock market. However, the latter finding is in sharp contrast with that for the stock market. This phenomenon can be attributed to higher trading costs and search frictions for small corporate bond trades.

Third, the relation between volatility and trading activity varies across bonds with different characteristics. The strength of this relation rises with credit risk and maturity. The relation tends to be stronger for callable and convertible bonds. More importantly, the relation between price volatility and trading volume is conditional on liquidity, risk and information asymmetry. We find that the relation is stronger for firms with high analyst earning forecast dispersion, high risk and low liquidity. Results strongly suggest the hypothesis that the relation between price volatility and trading volume is highly nonlinear, which depends on information asymmetry, risk and search frictions.

Finally, the effects of illiquidity and credit quality on the relation between volatility and trading volume become much stronger in times of stress. Tests on these relations over the normal and crisis periods show that the illiquidity effect magnifies during times of liquidity crisis and heightened market uncertainty. Results are consistent with the contention that when market liquidity dries

³ Past studies have found that volume contains fundamental information about a given security (see Campbell et al., 1993; Blume et al., 1994; Lee and Swaminathan, 2000).

⁴ Several studies for the equity market have touched the issue of liquidity under information asymmetry (see Kyle, 1985; Admati and Pfleiderer, 1988; Easley et al., 1996; Li and Wu, 2006).

⁵ This contrasts with the municipal bond market where a large portion of bonds are insured and have low risk of default.

⁶ As pointed out by Kwan (1996), the laws require insiders to disclose their trades for stock, option and equity-linked bond trades, but there is no such requirement for corporate bonds.

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