



Illiquidity or credit deterioration: A study of liquidity in the US corporate bond market during financial crises[☆]

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ARTICLE INFO

Article history:

Received 8 October 2010

Received in revised form

11 July 2011

Accepted 8 August 2011

Available online 10 February 2012

JEL classification:

G01

G12

G14

Keywords:

Liquidity

Corporate bonds

Financial crisis

OTC markets

ABSTRACT

We investigate whether liquidity is an important price factor in the US corporate bond market. In particular, we focus on whether liquidity effects are more pronounced in periods of financial crises, especially for bonds with high credit risk, using a unique data set covering more than 20,000 bonds, between October 2004 and December 2008. We employ a wide range of liquidity measures and find that liquidity effects account for approximately 14% of the explained market-wide corporate yield spread changes. We conclude that the economic impact of the liquidity measures is significantly larger in periods of crisis, and for speculative grade bonds.

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[☆] We thank INQUIRE Europe for their support of this project and Markit for providing us with valuation data. We also thank Viral Acharya, Engelbert Dockner, Peter Feldhütter, Alois Geyer, Frank de Jong, Robert Korajczyk, David Lando, David Lesmond, Stefan Pichler, Jian Wang, Jason Wei, and especially the referee, Paul Schultz, and the editor, William Schwert, for helpful comments on prior drafts. We are grateful to conference participants at the 2009 German Finance Association, the 2010 Midwest Finance Association, the 2010 Swiss Society for Financial Market Research, the Annual Finance Conference on Recent Advances in Corporate Finance of the Wilfrid Laurier University, the Fourth Annual Risk Management Conference of the National University of Singapore, the International Risk Management Conference of the University of Florence, the Third Erasmus Liquidity Conference of the Rotterdam School of Management, the 2010 China International Conference in Finance, the WU Gutmann Center Symposium 2011, and seminar participants at the Copenhagen Business School, University of Melbourne, ESSEC, NYU Stern School, the Italian Treasury, and Standard & Poor's for useful comments and suggestions.

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1. Introduction

The global financial crisis had its origins in the US subprime mortgage market in 2006–2007, but has since spread to virtually every financial market around the world. The most important aspect of this crisis, which sharply distinguishes it from previous crises, is the rapidity and degree to which both the liquidity and credit quality of several asset classes deteriorated. While clearly both liquidity and credit risk are key determinants of asset prices, in general, it is important to quantify their relative effects and, particularly, how much they changed during the crisis. It is also relevant to ask if there are interactions between these factors, and whether these relations changed substantially in magnitude and quality from prior periods. In this paper, we study liquidity effects in the US corporate bond market for the period October 2004 to December 2008, including the GM/Ford

downgrades and the subprime crisis, using a unique data set covering basically the whole US corporate bond market. We employ a wide range of liquidity measures to quantify the liquidity effects in corporate bond yield spreads.

Our analysis explores the time-series and cross-sectional aspects of liquidity for the whole market, as well as various important segments, using panel and Fama-MacBeth regressions, respectively.

Most major financial markets, including those for equity, foreign exchange, credit, and commodities, were severely affected in terms of price and liquidity in the subprime crisis. However, the impact has been disproportionately felt in the fixed income markets, including the markets for collateralized debt obligations (CDO), credit default swaps (CDS), and corporate bonds. An important point to note is that these securities are usually traded in over-the-counter (OTC) markets, where there is no central market place, or even a clearing house. Indeed, this aspect has come under regulatory scrutiny since the near collapse of the CDS market, which was an opaque OTC market. It is the OTC structure of fixed income markets that makes research, especially on liquidity effects, difficult as traded prices and volumes are not readily available, and important aspects of the markets can only be analyzed based on quotations from individual dealers, which are not necessarily representative of the market as a whole.

US corporate bonds trade in an important OTC market. This market is an ideal laboratory to examine liquidity and credit factors because of the following reasons: First, in contrast to most other OTC markets, detailed transaction data are available on prices, volumes, and other market variables since 2004, through an effort of the Financial Industry Regulatory Agency (FINRA), known as the Trade Reporting and Compliance Engine (TRACE). This database aggregates virtually all transactions in the US corporate bond market, which is unusual for any OTC market. Second, the US corporate bond market bore the brunt of the subprime crisis in terms of credit deterioration, almost to the same extent as the credit derivatives market, to which it is linked by arbitrage and hedging activities. Third, there is considerable variation in credit quality as well as liquidity in this market, both over time and across bonds, providing researchers with the opportunity to examine the differences arising out of changes in liquidity.

For our empirical analysis, we use all traded prices from TRACE, along with market valuations from Markit, bond characteristics from Bloomberg, and credit ratings from Standard & Poor's. Our combined data set is perhaps the most comprehensive one of the US corporate bond market that has been assembled to date, covering 23,703 bonds and 3,261 firms. This data set enables us to study liquidity effects for virtually the whole bond market, including bond segments that show very low trading activity.

The main focus of our research in this paper is to determine the quantitative impact of liquidity factors, while controlling for credit risk, based on credit ratings and other risk characteristics. In our analysis, we focus on the yield spread of a corporate bond, defined as its yield differential relative to that of a risk-free benchmark of

similar duration. The benchmark could be either the Treasury bond or the swap rate curve.

To measure liquidity, we consider several alternative proxies for liquidity. We employ *bond characteristics* that have been used as liquidity proxies in many studies. We use directly observable *trading activity variables* (e.g., the number of trades) and, most important, we employ several alternative *liquidity measures* proposed in the literature, i.e., the Amihud, Roll, zero-return, and price dispersion measure.

First, we explore the hypothesis that liquidity is priced in the US corporate bond market. We find that the liquidity proxies account for about 14% of the explained time-series variation of the yield spread changes over time for individual bonds, while controlling for credit quality. Most of the liquidity proxies exhibit statistically as well as economically significant results. While the trading activity variables are important in explaining the bond yield spread changes, the liquidity measures exhibit even stronger effects in terms of economic impact. In particular, measures estimating trading costs based on transaction data show the strongest effects.

Second, our main research question is whether the effect of liquidity is stronger in times of crises. Our hypothesis is that in crises, when capital constraints become binding and inventory holding costs and search costs rise dramatically, liquidity effects are more pronounced. Therefore, we analyze credit and liquidity effects for three different regimes during our sample period, i.e., the GM/Ford crisis, the subprime crisis, and the period in between, when market conditions were more normal. Based on time-series analysis, we find that the effect of the liquidity measures is far stronger in both the GM/Ford crisis and the subprime crisis: the economic significance of the liquidity proxies increased by 30% in the GM/Ford crisis compared to the normal period, and more than doubled in the subprime crisis. We also examine the cross-sectional behavior of the yield spread using Fama-MacBeth regressions in the three different time periods. In general, the cross-sectional results paint a picture similar to the time-series analysis. Moreover, we find in the cross-section that time-invariant bond characteristics, e.g., amount issued, show significant effects as well.

Third, we analyze the interaction between credit and liquidity risk. We expect to find higher liquidity in the investment grade sector if liquidity concerns cause investors to abandon the junk bond market in favor of investment grade bonds in a *flight-to-quality*. We present descriptive statistics providing evidence for a flight-to-quality during financial distress and the regression analysis indeed shows lower liquidity for speculative grade bonds as well as a stronger reaction to changes in liquidity. In general, these results indicate that the liquidity component is far more important in explaining the change in the yield spread for bonds with high credit risk.

The remainder of the paper is organized as follows: we present a survey of the relevant literature in Section 2 of the paper, focusing mainly on papers relating to liquidity effects in corporate bond markets. Section 3 discusses the hypotheses being tested in the paper and the economic

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