A framework for analyzing Liquidity risk in negotiated markets for Fixed Income securities

April 27th, 2017
Sahil Kapoor, Vice President
Regulatory and Industry Standard Risk Solutions, State Street
LIQUIDITY IN THE FIXED INCOME MARKET

The basics – liquidity cost surface for equities
Order driven vs negotiated markets
Insights from transaction data
Industry findings
Key factors contributing to FI liquidity
Brexit case study
Q&A
THE BASICS
Familiar liquidity cost surface in Equity markets

Immediacy prices as a function of dollar transaction size

- Transaction costs increase with trade size
- Relationship is non linear
- Transaction cost impacts tapers off at some point
- Trades for Larger market cap stocks are executed at lower costs

Corporate Bond Market Transparency and Transaction Costs

Early 2004 research on bond trade size and transaction costs

Abstract:

Using TRACE data - a complete record of all US OTC secondary trades in corporate bonds - we estimate average transaction cost as a function of trade size for each bond that traded more than nine times in 2003. We find that transaction costs are higher than in equities and decrease significantly with trade size. Highly rated bonds, recently issued bonds, and bonds that will soon mature have lower transaction costs than do other bonds. Costs are lower for bonds with publicly disseminated trade prices, and they drop when the TRACE system starts to publicly disseminate their prices. The results suggest that public traders would significantly benefit if bond prices were made more transparent.

Authors

Amy K. Edwards
Securities and Exchange Commission (SEC)

Lawrence Harris
University of Southern California - Marshall School of Business - Finance and Business Economics Department; Institute for Quantitative Research in Finance (the Q-Group); Interactive Brokers, Inc. (IBKR); University of Pennsylvania - Financial Economists Roundtable

Michael S. Piwowar
Government of the United States of America - Banking Committee

Source

Oppenheimer funds findings
Report providing insight into some myths surrounding corporate bond liquidity

Exhibit 5: Bid/Offer Spreads for Investment-Grade Corporate Bonds Tend to be Wider for Smaller Trades, While Large Trades Have the Tightest Spreads

• Larger trades have lower costs & less volatile realized bid ask spreads than smaller trades, even during increased volatility

Source: MarketAxess, as of 8/15/16.

Source: OppenheimerFunds, Challenging the Myths About Corporate Bond Liquidity
Federal Reserve Bank of New York study
Report providing insight into some myths surrounding corporate bond liquidity

Bid-Ask Spreads Are Narrower for Larger Trades

- Edwards et al. and Bernhardt et al. have shown that transaction costs decline with trade size. They argue that in markets with a private negotiation phase, dealers offer better prices to large clients with repeat business potential.

- Our findings (left) confirm that spreads are indeed narrower for larger transactions; average spreads in 2015 (through December 11) are 1.04 percent for micro trades, 0.28 percent for odd-lot trades, 0.13 percent for round-lot trades, and 0.13 percent for block trades.

Source: Liberty Street Economics, Corporate Bond Market Liquidity Redux: More Price-Based Evidence
libertystreeteconomics.newyorkfed.org/2016/02/corporate-bond-market-liquidity-redux-more-price-based-evidence.html=pdf
Liquidity Cost - Trade Size
FINRA analysis* of market impact of US corp trades by size

- FINRA analyzed US corp bond transactions from Jan 2003 to Sep 2015
- The figure on the left shows the median increase (decrease) of the price of trade immediately after a block trade.
- Trade impact is time variant with investor risk appetite.
- Trades >25 million, consistently have lower market impact than trades in the 5-25 million range. Even in stressed period

*Analysis of Corporate Bond Liquidity by Bruce Mizrach (FINRA)
“Overall, the cost of trading in this gilt has fallen on average over this period. When examining the spreads of different transaction sizes, on the basis of the nominal value of the transaction, there is a clear size effect. Figure 8 shows that, as the nominal value of the transaction increases, the observed spreads (and their volatility) decrease. This suggests that spreads are tighter for larger transactions. For instance, the average spread for transactions over £2 million was 6 bps and thus approximately one-third of the size of the average spread for transactions less than £5,000 (15 bps). However, spreads on the retail side have dropped significantly over time, possibly a consequence of increased competition and the introduction of electronic trading platforms.”

FCA – January 2015

Source
Transparency in the UK Bond Markets: An overview January 2015
http://citeseerx.ist.psu.edu/viewdoc/download;jsessionid=0D4F7D677119D0D6FCDDDF688D1658801?doi=10.1.1.674.6245&rep=rep1&type=pdf
NEGOTIATED MARKETS FOR BONDS
A close look at US Corp bond market microstructure

- Blue line, green line, & the red line show the volume weighted average price for dealer sales, inter dealer trades & dealer purchases respectively.

- In general, it is observable that dealers are buying low and selling high to clients.

- Inter dealer market (green dots) tend to cluster somewhere in the middle of the dealer purchases (red dots) and dealer sales (blue dots).

- Inter dealer market is more competitive than dealer client markets resulting in lower markups.

- Institutional sized trades (>100k) in this JPM bond show tighter prices for larger trades than for smaller trades.

- In general, chart on the left shows that clients who bought (blue dots) this bond in smaller sizes received inferior pricing relative to clients who bought in bulk.

Source: Bond transactions as of May 11th 2016 as reported by TRACE
Liquidity Costs in the US Corp Bond Market Impact

Relationship between bond sale prices and size of the trade

- Above is a histogram on 296 correlations of daily trade volume vs corresponding trade price of 204 bonds that had sufficient daily trades from Sep – Nov 2013 (*all trades >100K*).

- Larger volume bond sales seem to command higher price for the investor.

- The histogram is positively biased suggesting that larger sized sales provide larger prices for investors thereby resulting in lower liquidity costs.

*Source: Based on US corp bond transactions as from Sep – Nov 2013 as reported by TRACE*
KEY FACTORS CONTRIBUTING TO FIXED INCOME LIQUIDITY

Section 2
Limited Access

Source: Liquidity Cost Analytics calculated by State Street Global ExchangeSM using US Corp bond transactions provided by TRACE from February – March 2017

Trade Chain Description

BDS  Dealer Buy -> Inter Dealer - > Dealer Sell
BS   Dealer Buy -> Dealer Sell
DB   Dealer Buy -> Inter Dealer
DS   Inter Dealer -> Dealer Sell

- Overall, dealers are more likely to offer lower markups when trades are matched with counterparties on opposite sides of the trade (agency model - BS)
- Other trade chains often have higher expected costs as well as higher volatility
FACTORS THAT INFLUENCE MARKET LIQUIDITY

Number of Market Makers

• Above shows the relationship between bid-ask spread and number of market makers
• Data suggests that larger the number of market makers lower the bid-ask spread
• It is observed that there is no significant difference in the spread when number of market maker is more than 5

Source: Derived Data from market Axess's dealer inventory feed as of June 30th 2016.
FACTORS THAT INFLUENCE MARKET LIQUIDITY

Number of Quotes

• Above shows the relationship between bid-ask spread and number of total quotes
• Larger quotes indicate lower bid-ask spread, suggesting that larger number of total quotes is negatively correlated to the bid-ask spread
• It is observed that there is no significant difference in the spread when number of total quotes is more than 300

Source: Derived Data from market Axess's dealer inventory feed as of June 30th 2016.
FACTORS THAT INFLUENCE MARKET LIQUIDITY

Liquidity cost matrix - Integration of quotes and market makers

Source: Liquidity cost analytics calculated by State Street Global Exchange\textsuperscript{SM} using US Corp bond transactions provided by TRACE
RESULTS

Back testing –
A look at model results over recent turbulent market periods

Section 3
LIQUIDITY RISK UNDER STRESS

Liquidity cost volatility under recent stressed periods show liquidity is fragile

Source: Liquidity Cost Analytics calculated by State Street Global Exchange™ using US Corp bond transactions provided by TRACE
Liquidity Risk Under Stress

Liquidity cost aggregated by market segment

Source: Liquidity Cost Analytics calculated by State Street Global Exchange™ using US Corp bond transactions provided by TRACE
LIQUIDITY RISK UNDER STRESS
Liquidity cost aggregated by industry

Source: Liquidity Cost Analytics calculated by State Street Global ExchangeSM using US Corp bond transactions provided by TRACE
BREXIT VOTE CASE STUDY

Section 4
**Brexit Vote Case Study**

Impact of the Brexit vote on liquidity costs of UK bank debt

Liquidity Costs under Brexit

- Liquidity costs to trade Barclays, HSBC PLC, Lloyds debt rose immediately after the Brexit vote.
- In contrast liquidity costs for Bank of America and Johnson & Johnson declined in the immediate aftermath of the vote.
- HSBC USA’s liquidity costs rose less than HSBC PLC.

*Source: Liquidity costs are derived by State Street Global Exchange using bond transactions submitted to FINRA.*
Brexit Vote Case Study
Impact of the Brexit vote on liquidity costs of UK bank debt

Issuer Volume after the Brexit

Source: Total volume derived by State Street Global Exchange using bond transactions submitted to FINRA
REFERENCES

Section 5
Assorted academic research on fixed income liquidity costs

COMMISSIONED BY: Municipal Securities Rulemaking Board


Financial Conduct Authority
Transparency in the UK Bond Markets: An overview January 2015
citeseerx.ist.psu.edu/viewdoc/download;jsessionid=0D4F7D677119D0D6FCDDDF688D1658801?doi=10.1.1.674.6245&rep=rep1&type=pdf

John Chalmers, University of Oregon Steve Liu, University of Oregon Zhi Jay Wang, University of Oregon - Charles H. Lundquist School of Business

FINRA – Financial Industry Regulatory Authority
*Analysis of Corporate Bond Liquidity by Bruce Mizrahi (FINRA)
finra.org/sites/default/files/OCE_researchnote_liquidity_2015_12&rep=rep1&type=pdf

Journal of Finance June 2008
Chacko, George C., Jurek, Jakub W. and Stafford, Erik, The Price of Immediacy ,

Oppenheimer funds study
Challenging the Myths About Corporate Bond Liquidity

Federal Reserve bank of NY study
Corporate Bond Market Liquidity Redux: More Price-Based Evidence
MSRB study
Report on secondary market trading in the municipal securities market – July 2014

**FIGURE V.G: Chart of Average Total Customer-to-Customer Differentials by Trade Size and Number of Dealer Intermediaries**

- **Total Customer-to-Customer Differential in Secondary Market Trading**
  The average customer-to-customer differential of moving municipal securities from one customer through one or more dealers to another customer was calculated by subtracting the price at which the initial customer sold the security in the first trade in the customer-to-customer chain of transactions from the price at which the second customer purchased the security in the last trade in the chain of transactions.

- MSRB research found that liquidity costs or “Differentials” also known are markups are decreasing with trade size. Larger trade are executed with lower transaction costs than smaller trades.

- Larger trade sizes experienced greater reductions in average total customer-to-customer differentials, with $100,000 trades resulting in a 28.7% lower average total customer-to-customer differential as compared to $25,000 trades, $1 million trades resulting in a 64.9% lower average total customer-to-customer differential as compared to $100,000 trades, and trades larger than $5 million resulting in a 75.9% lower average total customer-to-customer differential as compared to $1 million trades. This effect is illustrated in the chart in Figure V.G.

**Source**
University of Oregon paper on bond liquidity
Transaction costs by trade size in the municipal bond market

**Figure 1 Net Markups of Municipal Bonds (1999-2012)**

**Net Markup**
Difference between the purchase and resale price divided by the purchase price, adjusted with municipal market index and truncated at 0.5% and 99.5%.

**Key findings**
The chart on the left shows a time series of liquidity markups on bond trades broken up by trade sizes.

Results show that liquidity costs in municipal bond market are negatively correlated with trade size. In other words, larger trades are executed at lower liquidity costs than smaller trades in similar bonds.

**Source**
University of Oregon paper on bond liquidity
Transaction costs by trade size in the corporate bond market

Figure 2 Net Markups of Corporate Bonds (2002-2012)

**Net Markup** - Difference between the purchase and resale price divided by the purchase price, adjusted with municipal market index and truncated at 0.5% and 99.5%.

**Key findings** –
The chart on the left shows a time series of liquidity markups on bond trades broken up by trade sizes.

Results show that liquidity costs in municipal bond market are negatively correlated with trade size. In other words, larger trades are executed at lower liquidity costs than smaller trades in similar bonds.

Source
DISCLAIMER

State Street Global Exchange℠ is a trademark of State Street Corporation (incorporated in Massachusetts) and is registered or has registrations pending in multiple jurisdictions. This document and information herein (together, the “Content”) is subject to change without notice based on market and other conditions and may not reflect the views of State Street Corporation and its subsidiaries and affiliates (“State Street”). The Content provided is for informational, illustrative and/or marketing purposes only; it does not take into account any client or prospects particular investment or other financial objectives or strategies, nor any client’s legal, regulatory, tax or accounting status, nor does it purport to be comprehensive or intended to replace the exercise of a client or prospects own careful independent review regarding any corresponding investment or other financial decision. The Content does not constitute investment, legal, regulatory, tax or accounting advice and is not a solicitation to buy or sell securities, nor is it intended to constitute any binding contractual arrangement or commitment by State Street of any kind. The Content provided was prepared and obtained from sources believed to be reliable at the time of preparation, however it is provided “as-is” and State Street makes no guarantee, representation, or warranty of any kind including, without limitation, as to its accuracy, suitability, timeliness, merchantability, fitness for a particular purpose, non-infringement of third-party rights, or otherwise. State Street disclaims all liability, whether arising in contract, tort or otherwise, for any claims, losses, liabilities, damages (including direct, indirect, special or consequential), expenses or costs arising from or connected with the Content. The Content is not intended for retail clients or for distribution to, and may not be relied upon by, any person or entity in any jurisdiction or country where such distribution or use would be contrary to applicable law or regulation. The Content provided may contain certain statements that could be deemed forward-looking statements; any such statements or forecasted information are not guarantees or reliable indicators for future performance and actual results or developments may differ materially from those depicted or projected. Past performance is no guarantee of future results. No permission is granted to reprint, sell, copy, distribute, or modify the Content in any form or by any means without the prior written consent of State Street.

© 2017 State Street Corporation, All rights reserved.