Liquidity Risk Premia in Corporate Bond Markets

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Two important puzzles in corporate bond markets

1: Time-series variation of credit spreads
   - Integration/segmentation of equity and corporate bond markets?

2: Credit spread puzzle
   - Credit spreads much higher than justified by historical default losses
   - Long-term AA bonds:
     - Historical default loss generates credit spread of 3 basis points
     - Average credit spread of 67 basis points in our sample

   - Hard to explain fully using market risk factors
Liquidity and asset prices

- Recent developments: treat liquidity as a priced *risk* factor

- Hasbrouck-Seppi (2001) and Chordia et al. (2003) document commonality in liquidity

- Acharya-Pedersen (2005) and Pastor-Stambaugh (2003): add equity market liquidity shocks to a multifactor pricing model
Contribution of this paper

1. Do liquidity shocks in equity and government bond market spill over to corporate bond market?

2. Can premia on liquidity risk explain part of the credit spread puzzle?
Related literature

- Credit spread puzzle

- Integration of bond and equity markets

- Liquidity in corporate bonds
Remainder of presentation

- Corporate bond data
- Liquidity measures
- Model
- Results for US market
- Results for European market
Data: Corporate bond returns

- Lehman corporate bond returns, US, Jan 93-Feb 02
- Index level data, by rating class and maturity
  - AAA…CCC ratings; intermediate and long maturities

- Construct expected return (to maturity) by correcting yields for expected default and recovery rates

\[
E_{t, \sigma} \leftrightarrow B_D \leftrightarrow Y_{g,t} \leftrightarrow S_t \quad 1
\]
## Historical default rates (1985-2003)

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>US: 5 Years</th>
<th>US: 10 Years</th>
<th>US: 15 Years</th>
<th>Europe: 5 Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA</td>
<td>0.10%</td>
<td>0.48%</td>
<td>0.65%</td>
<td>0.0%</td>
</tr>
<tr>
<td>AA</td>
<td>0.31%</td>
<td>0.94%</td>
<td>1.45%</td>
<td>0.0%</td>
</tr>
<tr>
<td>A</td>
<td>0.65%</td>
<td>1.95%</td>
<td>3.10%</td>
<td>0.3%</td>
</tr>
<tr>
<td>BBB</td>
<td>3.41%</td>
<td>6.93%</td>
<td>10.02%</td>
<td>2.3%</td>
</tr>
<tr>
<td>BB</td>
<td>12.38%</td>
<td>21.00%</td>
<td>24.57%</td>
<td>7.3%</td>
</tr>
<tr>
<td>B</td>
<td>26.82%</td>
<td>35.41%</td>
<td>40.56%</td>
<td>48.4%</td>
</tr>
<tr>
<td>CCC</td>
<td>53.00%</td>
<td>58.44%</td>
<td>61.58%</td>
<td>69.0%</td>
</tr>
</tbody>
</table>
Data (2)

Liquidity measures

- ILLIQ for stocks (Datastream)
Liquidity measure for equity market

- ILLIQ: measures slope of price/volume relation

- Based on daily data of prices and volume

- Ratio of absolute daily return divided by volume, averaged over one month

\[ ILLIQ_{i,t} = \frac{1}{D_t} \sum_{d} D_t \frac{|r_{i,t}^d|}{V_{i,t}^d} \]

- Calculated for all S&P1500 stocks and averaged over cross-section to get market-wide liquidity measure
ILLIQ: Large (solid), Medium (dotted), and Small (dashed) Stocks
Model

- APT style multifactor model
  - Equity market return, ILLIQ, Govt bond BAS, Implied equity volatility (VIX)
- Two-step regression approach for excess returns

\[ r_{it} = \beta_l F_{it} + \beta_{L,i} L_t + \epsilon_{it}. \]

\[ E \leftarrow r_{i,t} \rightarrow F_{i} \uparrow F L_{i} \uparrow L u_i, \quad i = 1, \ldots, N \]

- Equity risk premium fixed at several values
  - Hard to estimate, fix at 2% - 8%
Empirical results

- Corporate bond returns: significant exposures to market and liquidity factors
  - Low ratings and long maturities are more exposed

- Significant estimates for liquidity risk premium

- Additional liquidity premium goes a long way in explaining credit spread puzzle
  - Only for high grade bonds, credit spreads remain too high
  - This may be solved by including tax effects or jumps
## Exposure to liquidity shocks

<table>
<thead>
<tr>
<th></th>
<th>ILLIQ Beta (x100)</th>
<th>Gov-Bond BAS Beta (x100)</th>
<th>S&amp;P 500 Beta</th>
<th>VIX Beta</th>
</tr>
</thead>
<tbody>
<tr>
<td>AAA short-mat</td>
<td>-0.22***</td>
<td>-0.17</td>
<td>0.013**</td>
<td>-0.005</td>
</tr>
<tr>
<td>AAA long-mat</td>
<td>-0.62***</td>
<td>0.77</td>
<td>0.028</td>
<td>-0.071**</td>
</tr>
<tr>
<td>AA short-mat</td>
<td>-0.10</td>
<td>-0.74**</td>
<td>0.024***</td>
<td>0.002</td>
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<tr>
<td>AA long-mat</td>
<td>-0.57***</td>
<td>-1.78</td>
<td>0.063***</td>
<td>-0.012</td>
</tr>
<tr>
<td>A short-mat</td>
<td>-0.18**</td>
<td>-1.01**</td>
<td>0.036***</td>
<td>-0.005</td>
</tr>
<tr>
<td>A long-mat</td>
<td>-0.55***</td>
<td>-2.04**</td>
<td>0.088***</td>
<td>-0.020</td>
</tr>
<tr>
<td>BBB short-mat</td>
<td>-0.19**</td>
<td>-1.16**</td>
<td>0.044***</td>
<td>0.001</td>
</tr>
<tr>
<td>BBB long-mat</td>
<td>-0.59***</td>
<td>-2.85**</td>
<td>0.111***</td>
<td>-0.016</td>
</tr>
<tr>
<td>BB</td>
<td>-0.77**</td>
<td>-5.28***</td>
<td>0.157***</td>
<td>0.030</td>
</tr>
<tr>
<td>B</td>
<td>-1.61***</td>
<td>-5.58**</td>
<td>0.294***</td>
<td>-0.087</td>
</tr>
<tr>
<td>CCC</td>
<td>-1.63*</td>
<td>-3.91</td>
<td>0.379***</td>
<td>0.077</td>
</tr>
</tbody>
</table>
## Liquidity risk premia

### Table 5

<table>
<thead>
<tr>
<th>Equity Premium</th>
<th>Regression I</th>
<th>Regression II</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ILLIQ</td>
<td>ILLIQ</td>
</tr>
<tr>
<td>2%</td>
<td>-0.068 [-4.21]</td>
<td>-0.060 [-1.60]</td>
</tr>
<tr>
<td>3%</td>
<td>-0.056 [-3.45]</td>
<td>-0.045 [-1.20]</td>
</tr>
<tr>
<td>4%</td>
<td>-0.044 [-2.74]</td>
<td>-0.030 [-0.80]</td>
</tr>
<tr>
<td>6%</td>
<td>-0.022 [-1.32]</td>
<td>-0.000 [-0.00]</td>
</tr>
<tr>
<td>8%</td>
<td>0.002 [0.10]</td>
<td>0.029 [0.79]</td>
</tr>
</tbody>
</table>

Cross-sectional $R^2$ at 4% EP: 91.8%            92.1%
Results for European corporate bonds

- Repeat analysis, now applied to European data

- Euro-denominated corporate bond indices (Lehman)

- 2000-2004 sample
  - Mainly focus on time series exposures
  - Hard to estimate risk premia using short sample
European data: ILLIQ (solid) versus credit spread (dotted)

Credit spread / ILLIQ Level

ILLIQ (divided by 50)

Credit spread

August 2000 until December 2004
Conclusions

- Corporate bond returns exposed to both equity and treasury bond market liquidity
  - Both priced, but quite strongly correlated in cross-section

- We explain part of credit spread puzzle by including liquidity as a priced risk factor
  - Most successful for long term and low-grade corporate bonds
  - Jumps may be necessary to explain short-term spreads

- Similar results for European bond market data