

Liquidity, Liquidity Risk and Spreads: Some Results and Open Questions

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Outline

- Spread puzzle for corporate bonds
- Liquidity and liquidity risk
 - ✓ Framework
 - ✓ Measurement
 - ✓ Examples
 - ✓ Evidence
- Open questions
- Time-varying risk-premium

Spread Puzzle

- *Spread* - Difference between yields on corporate bonds and equivalent maturity treasuries is *too high*
 - ✓ Inconsistent with
 - Observed default rates and recoveries
 - Structural models of credit risk a la Merton (1973)
 - ✓ Huang and Huang (2005): AAA spread close to zero!
- *Changes in the spread* are not explained well
 - ✓ By changes in factors affecting credit risk
 - Collin-Dufresne, Goldstein and Martin (2001)
 - ✓ R^2 of 30% to 40% only, higher for lower-rated bonds
 - ✓ Unexplained portion appears to have a common factor

Preferred Explanations

- *Hedge ratios* from credit risk models are close to the empirically computed hedge ratios
 - ✓ Schaefer and Strebulaev (2004)
 - ✓ Unexplained portion thus most likely unrelated to credit risk
- *Liquidity and liquidity risk*
 - ✓ A burgeoning area of research but many open questions
- *Time-varying risk-premium*
 - ✓ A less commonly adopted approach but potentially important
- *Are these two explanations related?*

Liquidity and Liquidity Risk

- *A useful framework: Acharya-Pedersen (2005)*

$$E_t(r_{t+1}^i - c_{t+1}^i) = r^f + \lambda_t \frac{\text{COV}_t(r_{t+1}^i - c_{t+1}^i, r_{t+1}^M - c_{t+1}^M)}{\text{var}_t(r_{t+1}^M - c_{t+1}^M)}$$

✓ *Expected illiquidity:* $E_t(c_{t+1}^i)$

✓ *Liquidity risk(s):* $\text{COV}_t(c_{t+1}^i, c_{t+1}^M)$ $\text{COV}_t(c_{t+1}^i, r_{t+1}^M)$

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Bond Liquidity Measures

<p><i>One-way or round-trip cost (bid-ask spread)</i></p>	<p>Chen, Lesmond and Wei (2005), Goldstein, Hotchkiss and Sirri (2005)</p>
<p><i>Price impact</i> based on Stulz (2001) approach, TRACE</p>	<p>Bessembinder, Maxwell and Venkataraman (2005), Edwards, Harris and Piwowar (2005), Goldstein, Hotchkiss and Sirri (2005)</p>
<p><i>Price impact</i> based on daily data using Amihud (2002)</p>	<p>Downing, Underwood and Xing (2005)</p>
<p><i>Frequency of zero returns</i> and its variants</p>	<p>Lesmond, Ogden and Trzcinka (1999), Chen, Lesmond and Wei (2005)</p>
<p><i>Accessibility</i>: Turnover of portfolios holding the bond</p>	<p>Chacko (2005), Chacko, Mahanti, Mallik and Subrahmanyam (2005)</p>

Example: Trade Size

- From Goldstein, Hotchkiss and Sirri (2005): BBB bonds
 - ✓ **2.35%** for trades of 10 bonds, with a standard deviation of **4.33%**
 - Comparable stocks: market capitalization of USD 50 million (Portfolio 22 out of 25 illiquidity-sorted portfolios)
 - ✓ **0.45%** for trades of ≥ 1000 bonds, standard deviation of **1.04%**
 - Comparable stocks: market capitalization of USD 250 million (Portfolio 13 out of 25 illiquidity-sorted portfolios)
- Suggests substantial illiquidity on average

Example: Cross-section

- From Chen, Lesmond and Wei (2005):

Liquidity & Yield Spreads	Medium Maturity (7-15 years)						
	S&P Credit Ranking						
	AAA	AA	A	BBB	BB	B	CCC to D
Zeros (%)	9.79	12.59	10.61	11.94	36.99	38.71	34.96
LOT (bp)	24.28	47.26	57.74	70.29	259.34	342.50	941.84
Yield Spread (bp)	82.44	146.24	177.68	277.45	566.53	947.14	2887.47
N	49	120	539	730	152	78	44
Zeros (%)	10.36	8.34	6.62	8.91	42.40	38.96	18.04
LOT (bp)	25.00	36.17	36.82	51.45	266.11	272.96	282.84
Bid-Ask (bp)	49.52	36.57	38.20	44.22	54.65	60.44	180.35
Yield Spread (bp)	70.65	129.02	154.19	251.68	497.45	863.71	1619.04
N	37	67	386	394	76	32	9

Liquidity and Spreads

- Chen, Lesmond and Wei (2005): $E_t(c_{t+1}^i)$
- *Cross-sectional* regressions:
 - ✓ Investment grade bonds:
 - 1 bp bid-ask implies 0.42 bp increase in spread, $R^2 = 7\%$
 - ✓ Speculative grade bonds:
 - 1 bp bid-ask implies 2.3 bp increase in spread, $R^2 = 22\%$
- *Time-series* regressions: Similar effects
- Do we expect the effect of bid-ask to be *so large*?

Liquidity and Liquidity Risk

- *Recall*

$$E_t(r_{t+1}^i - c_{t+1}^i) = r^f + \lambda_t \frac{\text{cov}_t(r_{t+1}^i - c_{t+1}^i, r_{t+1}^M - c_{t+1}^M)}{\text{var}_t(r_{t+1}^M - c_{t+1}^M)}$$

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Measurement of Liquidity Risk

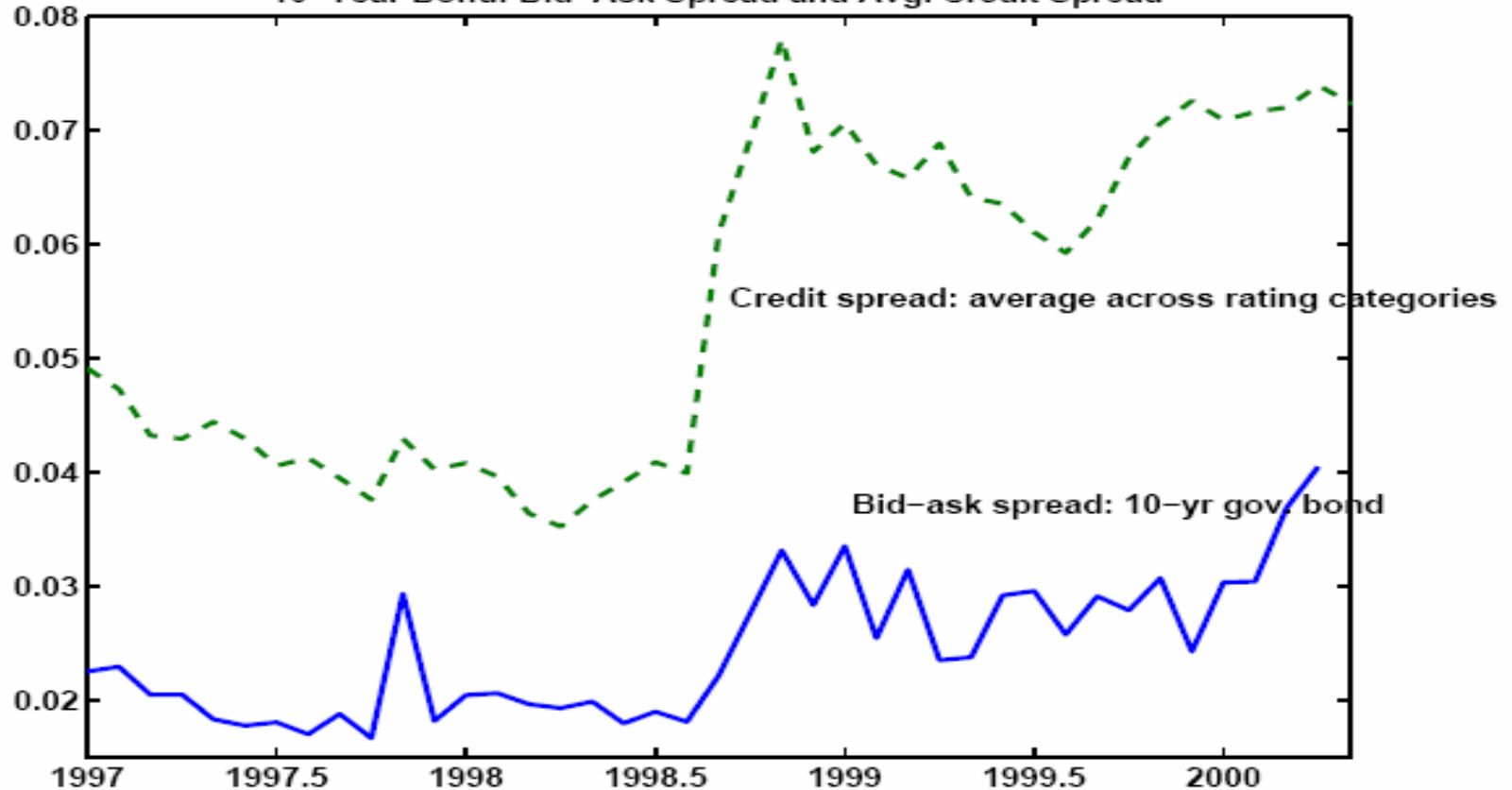
- Exposure of bond returns to liquidity risk: $\text{cov}_t(r_{t+1}^i, c_{t+1}^M)$
 - ✓ *Corporate bond-market factor*
 - Of high minus low liquidity portfolio returns
 - Downing, Underwood and Xing (2005)
 - Chacko (2005)
 - ✓ *Equity-market liquidity fluctuations*
 - de Jong and Driessen (2005)
 - ✓ *Treasury-market liquidity fluctuations*
 - Longstaff, Mithal and Neis (2004), de Jong and Driessen (2005)

Liquidity Risk and Spreads

- Credit, interest rate, and liquidity risks *correlated*
- Downing, Underwood and Xing (2005):
 - ✓ *Liquidity risk* adds 15% in explaining bond returns
- Chacko (2005): *Alphas* on liquidity risk portfolios
- de Jong and Driessen (2005):
 - ✓ One standard deviation *shock in stock market and treasury liquidity* each changes bond returns by 0.3%
 - ✓ Contribute 45 bps to spread for investment grade bonds
100 bps for (some) speculative grade bonds

de Jong and Driessen (2005)

Figure 3: Illiquidity measure for US government bond market and credit spread
10-Year Bond: Bid-Ask Spread and Avg. Credit Spread



The graph shows the bid-ask spread on 10-year US government bonds, and, for comparison, the average credit spread across all US indices.

Open Questions

- Evidence of *liquidity* and *liquidity risk* effects on bond spreads consistent and compelling
- *But are the effects distinct from each other?*
 - ✓ Liquidity studies do not control for liquidity risk, and vice-versa
 - ✓ *Illiquidity and liquidity risk are highly correlated*
 - Acharya and Pedersen (2005)
- Illiquidity effect should be 1 / Holding Period (yrs)
- Other forms of liquidity risk may be important

$$\text{COV}_t(c_{t+1}^i, c_{t+1}^M) \quad \text{COV}_t(c_{t+1}^i, r_{t+1}^M)$$

Open Questions (continued)

- How does the evidence on liquidity and liquidity risk relate to the time-series spread puzzle?
- Is the *common factor in residuals* from Collin-Dufresne, Goldstein and Martin (2001) closely related to a *liquidity risk factor*?
 - ✓ Chen, Lesmond and Wei (2005) relate bond spread changes to liquidity changes for that bond
 - ✓ Commonality in liquidity changes? $\text{cov}_t(c_{t+1}^I, c_{t+1}^M)$
 - ✓ Is liquidity risk time-varying?

Time-varying Risk-premium

- Two views: $\lambda_t = E_t(r_{t+1}^M - c_{t+1}^M - r^f)$
- ***Risk-premium common across equities and bonds***
 - ✓ Chen, Collin-Dufresne and Goldstein (2005)
 - ✓ Pricing kernel from habit-formation models helps explain/fit the BBB-AAA spread
 - ✓ BBB-AAA: ***credit*** spread, AAA-Tsy: ***liquidity*** spread
- ***Risk-premium in bonds due to market segmentation***
 - ✓ Lack of capital mobility into bond markets upon common shocks to banks and financial institutions
 - Example: GM and Ford downgrade in May 2005
 - ✓ Bond-market ***liquidity risk*** should capture this: Does it?

Berndt, Douglas, Duffie, Ferguson, Schranz (2005)

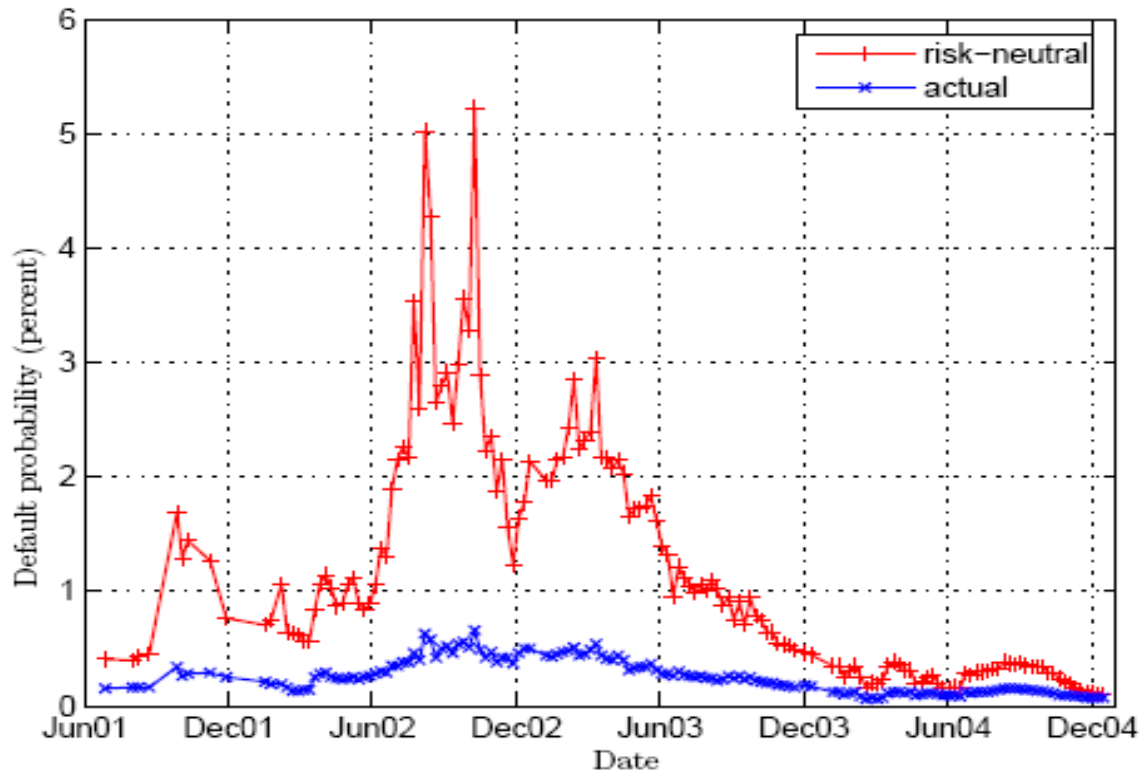


Figure 1: Estimated actual and risk-neutral 1-year default probabilities for Disney.

Conclusion

- Much has been accomplished over the past year
 - ✓ Measuring corporate bond market liquidity
 - ✓ Quantifying the liquidity risk of corporate bonds
 - ✓ Relating liquidity and liquidity risk to spreads
- Much remains to be done
 - ✓ Isolating effects of liquidity and liquidity risk
 - ✓ Relating these effects to time-series of spread changes
 - ✓ Understanding their relationship with time-varying risk-premium