Notes on Bonds: Liquidity at all Costs in the Great Recession
by
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Discussion

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- **Summary**

- **The Anomaly**

- **Discussion**

- **The CDS Basis**

- **Swap Spread**

- **Conclusion**
Summary

- Document large deviations from the Law of one Price among Treasury securities during the crisis
  - Off-the-Run notes (with 10Y at issue) became expensive relative to Off-the-run Bonds (30Y at issue) with similar remaining time to maturity

- The mispricing was persistent (from mid-2007 to mid-2009)

- Mispricing associated with difference in liquidity between securities:
  - Notes were more liquid than Bonds (e.g., lower Bid/Ask spreads)
  - Bonds traded above par (higher coupon)

- Mispricing was persistent because of limits to arbitrage:
  - Difficulty to locate the note to setup short positions
  - Length of drawdown on arbitrage suggests lack of arbitrage capital

- Investigate trades of Insurance companies and link demand for more liquid bond (“at any cost”) to higher distress of Insurer.
The Anomaly

- Document large deviations in yield to maturity of maturity-matched pairs of Notes and bonds.

Panel B: Average Yield Spread of Treasury Pairs with Matched Maturities
The Arbitrage

- Document large deviations in YTM of maturity matched pairs of Notes and bonds.
- Find 16 pairs of notes and bonds with identical maturities for which can construct pure arbitrage portfolio:
  - Short the Note.
  - Long a fraction of the Bond so as to match the coupon payments on the note.
  - Long a Treasury strip to match the full principal payment on the Note.

The returns ("from a well-timed trade"!) well exceed the funding cost of the trade (GS Repo minus Repo Special).
The Anomaly generalized

- Investigate deviations for the whole universe of Treasury prices from model prices computed using a smooth parametric yield curve estimated using all securities.


⇒ Might be interesting to ‘double sort’ deviations across maturity at origination and remaining maturity?
The Explanation: difference in liquidity

- Relate cross-sectional price deviations from smooth benchmark to security characteristics in panel regression.

- Price deviations increase during the crisis with:
  - higher Bid-Ask Spread
  - higher Outstanding Notional
  - higher share of notional used for stripping
  - lower trading volume
  - lower specials frequency (\(\sim\) demand for shorting the notes)

\[\Rightarrow\] differential liquidity seems to ‘explain’ the anomaly.

- Still, the dummy for Original issue maturity (10Y versus 30Y) remains statistically significant despite all liquidity controls (\(R^2\) roughly doubles 20% vs. 39%).
The Explanation: limits to arbitrage

- Regress time series of average pricing error across all 16 bond-note arbitrage pairs on aggregate variables

- Pricing errors increase during the crisis with:
  - the average Bid-Ask Spread
  - the number of Fails in Treasury Repo market
  - the share of specials at zero rate
  - funding costs

⇒ Limits to Arbitrage
Arbitrage during the crisis

▶ This paper adds to the many examples of ‘arbitrage’ opportunities during the crisis:
  ▶ Covered interest rate parity violations on USD transactions (Coffey, Hrung, Sarkar (2009))
  ▶ Treasury bond-TIP breakeven rate versus Inflation Swap rate (Fleckenstein, Longstaff, Lustig (2011))
  ▶ Corporate CDS-Cash basis (Bai and CD (2011)).
  ▶ Sovereign CDS-Cash basis (Buraschi, Sener and Menguturk (2012))
  ▶ Negative Swap-Treasury Spread

▶ It is an interesting addition, since the documented arbitrage does not require a position in a derivative instrument and thus rules out two plausible explanations:
  ▶ Funding/leverage differential of the (unfunded) derivative versus (funded) cash position.
  ▶ Counterparty Risk.

▶ Nevertheless all these papers bear many similarities
Common features

- All papers fail to identify the specific origin of the mispricing:
  - Why are the notes becoming more expensive relative to the bonds?
  - Why are specific CDS-Basis getting more negative than others?

- All find that there is high correlation between mis-pricing and liquidity of the instruments (e.g., bid-ask spreads).
  - Suppose average time between trades is \( \tau \) then the equilibrium value of a security that pays a continuous coupon \( \delta \) is (Amihud-Mendelsohn (1986)):
    \[
    P = \frac{\delta}{r} - \frac{BA}{r\tau}
    \]
  - If \( BA \) differential widens then price differential widens.
  - Suggests to add Bid/Ask spread times turnover as explanatory factor

- But why did Bid-Ask spread differential between two securities widen so much?
  - Adverse Selection?
  - Inventory Risk.... (for Treasury securities)?
  - Market power (of remaining liquidity providers)?

- All papers point to evidence of limits to arbitrage:
  - The higher the cost to implementing the arbitrage the larger the deviation
  - It seemed that arbitrage capital was scarce

- All have difficulty to assess size of the profits left on the table. What size trade could have been implemented?
Tremendously negative!

In a frictionless market, negative basis is a free lunch:

\[
\begin{align*}
\text{Borrow at Libor} \\
\text{Buy the bond} \\
\text{Buy protection} \\
\end{align*}
\]

\[\Rightarrow \text{Earn the basis risk-free!}\]
The CDS-Cash Basis during the crisis

Trading the Basis

- In practice, a negative ‘basis package’ typically consists in:
  - Fund the haircut \((h \times B)\) at the cost \((\text{libor} + f)\)
  - Borrow \((1 - h) \times B\) at repo rate to purchase the bond
  - Buy protection and post initial margin \((M)\) at \((\text{libor} + f)\).

- Return on the basis trade using \((hB + M)\) capital is approximately:
  \[
P&L(t + 1) \approx DB \times \Delta Basis_t - DB \Delta BAS_t - B_{t}^{\text{ask}} \times [h(Libor + f) + (1 - h) \times (\text{repo})] - M_t(Libor + f)
  \]

  If default on bond occurs at time \(\tau_B\), then
  \[
P&L(\tau_B) = RN + (B - NR)1_{\tau_C > \tau_B}
  \]

- Exposure (conditional on trade not converging) to:
  - funding cost widening \((\text{libor}, \text{repo}, f \uparrow)\)
  - collateral value deteriorating \((h \uparrow)\)
  - trading cost increasing \((\text{BAS} \uparrow)\)
  - counterparty risk \((\tau_C \leq \tau_B)\)
What causes the negative basis?

Examples of Firms with positive basis during the crisis

<table>
<thead>
<tr>
<th>ShortName</th>
<th>Crisis I</th>
<th>Crisis II</th>
<th>Credit Rating</th>
<th>Industry</th>
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<tr>
<td>Newmont Mng Corp</td>
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<td>250</td>
<td>BBB</td>
<td>Basic Materials</td>
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<tr>
<td>Berkshire Hathaway</td>
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<td>244</td>
<td>AAA</td>
<td>Financials</td>
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<td>BB</td>
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<td>MetLife Insurance Co</td>
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<td>178</td>
<td>A</td>
<td>Financials</td>
</tr>
<tr>
<td>Boyd Gaming Corp</td>
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<td>163</td>
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<td>General Electric Co</td>
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<tr>
<td>Las Vegas Sands Corp</td>
<td>108</td>
<td>106</td>
<td>B</td>
<td>Consumer Services</td>
</tr>
</tbody>
</table>

Note that Berkshire and GE qualify as ‘financials’: So, why is their basis positive?

A! All dealers are buyers of protection on Berkshire (big seller of derivatives - without collateral or MtM agreement - to the dealers!). So who is selling?

→ Many idiosyncratic reasons that drive the basis away from zero.
Evidence from Swap markets

- Evidence from Swap spreads

In a frictionless market, negative swap-Treasury spread is a free lunch:

Buy Treasury Bond
Fund with Repo
Enter payer Swap

\[ \Rightarrow \]  Earn the Treasury-Swap spread \((> 0)\)
+ the LIBOR-Repo \((> 0)\) spread (risk-free)!

- Explanation?
Conclusion

- Another nice example of a disclocation during the crisis.

- Dislocations persist because trading costs are high and risk-capital is unavailable.

- What is the cause for such dislocation? (Why did Bid/Ask spread differential widen so much on two Treasury securities).

- Seems to be very specific to the US-Treasury market.
  - Post reform of the Repo fail market anomaly seems to disappear. Causal?
  - No such dislocation in foreign (sovereign) bond markets (Cieslak).

- How much money was left on the table?

- What general implications (for policy) can one draw from this phenomenon?
  - Design of Repo market.
  - Treasury maturity issuance management.
  - Monetary policy transmission?