Do Leveraged Credit Derivatives Modify Credit Allocation?

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Introduction

- Exponential expansion of credit derivatives markets
  - The fastest growing part of the global financial derivatives

- Driven by:
  - Need of higher yielding investments in a context of low yields
  - Need of hedging or gaining exposure to credit without funding
  - Strong interest by some market participants in leveraging
Introduction

A strong product innovation

- Initial growth began with single names CDS market
- Development of synthetic CDO, index tranches, CDO² (CDO of CDO), CPPI, CPDO…
Introduction

Our questions:

- Does this new “asset class” change the strategic global allocation for an asset manager?
  - What happens if we replace the investment in traditional corporate bonds in credit derivatives?

- How much should be invested in this new asset class?

- How much should we optimally leverage this asset class?
Methodology

- **This work:**
  - Builds efficient frontiers in a mean/variance framework
    - based on long term assumptions on expected returns and covariances
  - Compares efficient frontiers
    - traditional corporate bonds (IG and HY) or credit derivatives
    - with different degrees of leverage

- **The analysis requires long samples on all asset classes**
  - Credit derivatives: analysis of CDS market (deepest)
  - CDS indices begin in 2004
  - Approximation to recover a “simulated” longer history
Methodology

- **Approximation of CDS returns**

  - **A CDS is an agreement between 2 parties to exchange credit risk of a reference entity**
    - The seller of a CDS sells protection
    - He receives periodic fee if the credit of the reference stable or improves
    - He pays a compensation to the buyer in case of credit event

- **CDS premium approximated by the bond credit spread over swap**
  - Theoretically, funding at libor, buying protection through CDS and entering an asset swap is fully hedged in any state of the world (Hjort et al. (2002))
  - In practice, difference between the 2 : the “basis” (De Wit (2006))
  - Relatively good approximation to use the credit spread
This was true before the Subprime crisis!

- CDS monthly returns (iTraxx, source JPMorgan)
- Corporate bond – swap rate +3M cash rate monthly returns
Data

Traditional asset classes returns
- Weekly returns of gvt bonds, IG and HY bonds, equities in USD
- April 1995-June 2007
- Data source: Datastream for equity and govies (10Y benchmark) indices, Merrill Lynch for corporate bonds indices
Data

- Credit derivatives returns
  - IG and HY CDS indices approximation
  - Swap rates from Datastream
Historical risk / return tradeoff

- Historical volatility
  - Low level of volatility of corporate bond indices (especially HY) compared to govies
  - Smaller vol for credit derivatives than corporate bonds for IG
  - Higher vol for credit derivatives than corporate bonds for HY

- Historical returns
  - 120 bp credit spread for IG over govies, 70 bp over swap
  - 210 bp credit spread for HY over govies, 170 bp over swap

<table>
<thead>
<tr>
<th></th>
<th>Gvt Bonds</th>
<th>IG bonds</th>
<th>IG spreads</th>
<th>HY bonds</th>
<th>HY spreads</th>
<th>Equities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess return</td>
<td>1.3%</td>
<td>2.5%</td>
<td>0.7%</td>
<td>3.4%</td>
<td>1.7%</td>
<td>7.2%</td>
</tr>
<tr>
<td>Volatility</td>
<td>7.2%</td>
<td>5.1%</td>
<td>3.1%</td>
<td>4.9%</td>
<td>6.4%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Sharpe ratio</td>
<td>0.18</td>
<td>0.49</td>
<td>0.22</td>
<td>0.69</td>
<td>0.26</td>
<td>0.41</td>
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</table>
Discrepancy in the Sharpe ratios for all asset classes
- Attractive Sharpe ratios for IG (0.49) and HY bonds (0.69)
- Less attractive picture for credit derivatives (0.22 and 0.26), but still more interesting than govies
**Correlations**

- Much weaker (even negative) correlation of credit spreads with Treasuries
- Similar correlation with equities
- Credit derivatives have a strong diversifying power in a global portfolio

<table>
<thead>
<tr>
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<th>HY bonds</th>
<th>Equities</th>
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</thead>
<tbody>
<tr>
<td>Gvt bonds</td>
<td>94%</td>
<td></td>
<td>16%</td>
<td>-7%</td>
</tr>
<tr>
<td>IG bonds</td>
<td></td>
<td>38%</td>
<td>2%</td>
<td></td>
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<tr>
<td>HY bonds</td>
<td></td>
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<td>30%</td>
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<tr>
<td>Equities</td>
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</thead>
<tbody>
<tr>
<td>Gvt bonds</td>
<td>-34%</td>
<td>-63%</td>
<td>-7%</td>
<td></td>
</tr>
<tr>
<td>IG spreads</td>
<td></td>
<td>64%</td>
<td>8%</td>
<td></td>
</tr>
<tr>
<td>HY spreads</td>
<td></td>
<td>26%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Equities</td>
<td></td>
<td></td>
<td>100.0%</td>
<td></td>
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</table>
Portfolio construction

- Classic mean variance optimization with no short selling constraint
  
  - Historical VCV matrices on the studied period
  
  - Historical expected returns lead to inconsistent efficient frontiers
    - We suppose a constant Sharpe ratio at 0.3 for each asset class
    - Intermediate level between historical levels for Treasuries 0.18 and equities 0.41, close to credit spreads 0.22-0.26
  
  - This makes portfolio composition depend only on the risk profile
  
  - Optimal weights independant of the level of the Sharpe ratio
Results

Efficient frontiers: traditional credit compared to credit derivatives (no leverage)
Results

- Improvement in the efficient frontier by investing in credit derivatives

- Including IG credit derivatives, we can achieve much less volatile portfolios than with traditional corporate bonds
- At higher risk level, IG spreads disappear in favor of HY spreads
- Credit derivatives offer strong decorrelation and allow to introduce more risky assets (equities) for same level of portfolio risk

<table>
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<tr>
<th>Excess Return</th>
<th>Portfolio Risk</th>
<th>Optimal Weights</th>
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<tbody>
<tr>
<td></td>
<td>3.0% 5.0% 7.0%</td>
<td>Gvt bonds 43% 59%</td>
</tr>
<tr>
<td>-</td>
<td>- 2.3% 3.1%</td>
<td>IG bonds 0% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HY bonds 42% 8%</td>
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<td></td>
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<td>Equities 15% 32%</td>
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<td>3.0% 5.0% 7.0%</td>
<td>Gvt bonds 45% 45% 44%</td>
</tr>
<tr>
<td>-</td>
<td>2.1% 2.8% 3.2%</td>
<td>IG spreads 4% 0% 0%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>HY spreads 47% 32% 20%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Equities 5% 23% 37%</td>
</tr>
</tbody>
</table>
Traditional credit compared to leveraged credit derivatives

Influence of leverage

- No change in the Sharpe ratio

\[ r(L) = r_f + L^* (r - r_f) \]
\[ \sigma(L) = L^* \sigma \]

\[ SR(L) = \frac{r(L) - r_f}{\sigma(L)} = \frac{L^* (r - r_f)}{L^* \sigma} = \frac{(r - r_f)}{\sigma} \]
Traditional credit compared to leveraged credit derivatives

**Influence of leverage**

- Leveraging increases portfolio risk and allows higher returns

- At identical risk level, the higher the leverage, the more we can reduce the share of risky assets in the portfolio in favour of Treasuries

- Optimal allocations contain majority of Treasuries, HY and then equities

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<tbody>
<tr>
<td>Excess Return</td>
<td>3.0%</td>
<td>5.0%</td>
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<td>3.2%</td>
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*Optimal Weights*

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<tr>
<td></td>
<td>-</td>
<td>50%</td>
<td>35%</td>
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<td>0%</td>
<td>0%</td>
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<td></td>
<td>-</td>
<td>35%</td>
<td>36%</td>
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<tr>
<td></td>
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<td>16%</td>
<td>29%</td>
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</table>

<table>
<thead>
<tr>
<th>Portfolio Risk (L=3)</th>
<th>3.0%</th>
<th>5.0%</th>
<th>7.0%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excess Return</td>
<td>-</td>
<td>3.5%</td>
<td>4.0%</td>
</tr>
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*Optimal Weights*

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<td></td>
<td>-</td>
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<td>-</td>
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<tr>
<td></td>
<td>62%</td>
<td>0%</td>
<td>28%</td>
<td>10%</td>
</tr>
<tr>
<td></td>
<td>46%</td>
<td>0%</td>
<td>34%</td>
<td>20%</td>
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Conclusion

- We examine how credit derivatives change the construction of an efficient portfolio

- We compare 2 types of credit instruments included in a US global portfolio (including gvt bonds and equities)
  - conventional corporate bonds
  - credit derivatives

- Credit risk component has:
  - very low risk for IG, medium risk (smaller than govies) for HY
  - strong diversifying power relative to traditional asset classes (negative correlation with govies)

- Efficient frontiers in a mean variance framework show
  - the advantage of credit derivatives for portfolio diversification
  - usefulness of leveraging to allow flexible risk modulation
Conclusion

Directions for future research

- Expected returns hypothesis
  - Strong hypothesis of constant Sharpe ratio

- Asymmetric nature of credit spreads distribution
  - Short spikes and long periods of low values
  - Mean variance framework problematic for credit spreads: use VaR, conditional VaR?

- Analysis of crisis episodes
  - Credit derivatives performances / risk in times of stress
  - Consequence for asset allocation