ORIE 5741: Project Proposal

Analysis of Probability of Default and Recovery Rate in CDS Pricing

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Statement of Problem:

The US Corporate CDS market is, in many ways, inefficient. In contrast to the more liquid US Equities market, CDS are not exchange-traded, have fewer participants, higher regulatory barriers to entry, and are (relatively) new. Moreover, CDS pricing models are far less developed. Having a stronger pricing model could both instill more confidence when market-making, in the form of a tighter bid-ask spread and willingness to traffic larger size, and when investing, by better identifying mispricings.

How can we improve the pricing of US High Yield Corporate 5-year Credit Default Swaps, focusing on key inputs and assumptions of the pricing model?

Two key metrics we would like to evaluate are:

1. Probability of Default: $P(0,t) = 1 - exp(\frac{-S_t}{1-R})$[1]

   In this formula, S_t is the CDS Spread and R is the Recovery Rate. The observed CDS Spread is inefficient and the recovery rate is naively assumed; the true probability of default may differ significantly from the implied. With regression and feature engineering, we will form and compare an adjusted measure of default probability across time to true historical default probabilities to assess the strength of our adjustment methodology.
2. Recovery Rate:

   In a given CDS pricing model, a static recovery rate of 40% may be used to price every High Yield CDS. We would like to form a more rigorous estimate of the recovery rate by company. To do this, we will classify companies' recovery rates as either over or under our benchmark.

Dataset: To build our dataset, we pulled the following information from Bloomberg.

1. Historical data for CDS and Corporate Bonds:

   Using the iShares iBoxx High Yield Corporate Bond ETF, we selected companies to examine in our project, pulling company financial data such as CDS pricing, benchmark 5-year bond pricing, as well as bond rating (ordinal).
2. Financial Statement Data:

   To understand a company's default risk, we will use key financial information such as gross operating margin and level of leverage (total debt vs. cash flow).
3. Macroeconomic Indicators:

   There are many general market factors that directly affect the probability of default for a company, as well as their rate of recovery after defaulting. We will use macroeconomic indicators such as overall market volatility, industrial production, and GDP to help better understand these effects.

[1] Hull, J. C. (2014). *Options, Futures, and Other Derivatives* (9th ed.). Pearson.