

# Data and the Global Corporate Bond Market

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## Objective:

*Are there relative value opportunities in global corporate bond markets?*

We examined 25 thousand corporate bonds over 10 years in order to identify bond mispricings and determine the environments where these mispricings are more common.

## Goals:

1. Identify corporate bond pairs that are arbitrage candidates
2. Evaluate viability of identified candidates
3. Compare same-currency and cross-currency cases
4. Analyze characteristics of identified bonds

## Methods:

- Iterate through pairs of bonds issued by same company, and filter for similarity – same issuer, maturity, quality, high correlation
- Filter for opportunities – 50 basis point duration-adjusted OAS gap
- Visualize similar bonds over time
- Classify
  - Same currency – K-Nearest Neighbor supervised learning
  - Cross currency – filtering by relevant properties
- Compare same and cross-currency opportunities
- Compare common bond properties of identified bonds vs. baseline

1. Group by ticker      2. Make Pairs      3. Filter      4. Evaluate

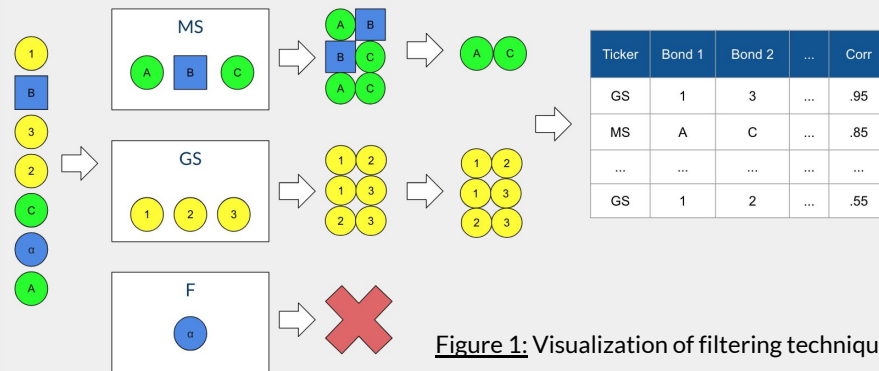
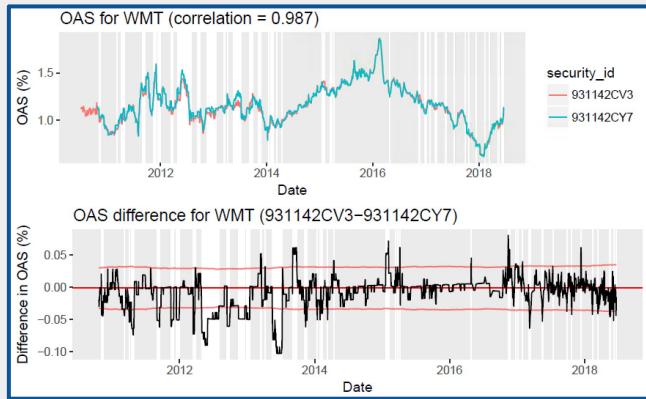


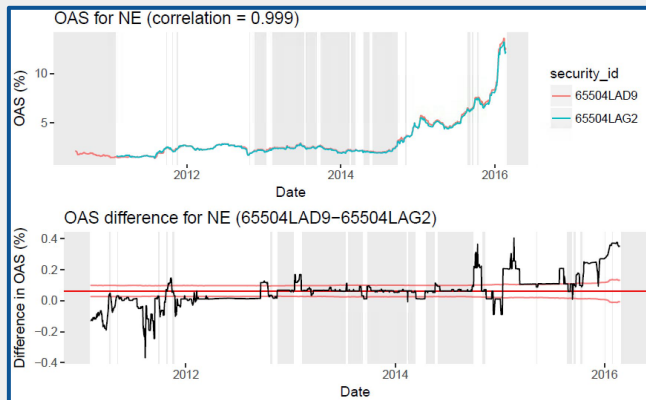
Figure 1: Visualization of filtering technique

# Visualization and Classification of Same Currency Cases

Actionable



Not Actionable



## How to Read These Visualizations:

- Top Graph: OAS of 2 bonds over time
- Bottom Graph: OAS differences over time
- Middle Red Line: Median of OAS differences
- Upper / Lower Red Line: Boundaries of a 50 basis point duration-adjusted oas gap from the median
- Vertical White Lines: Graph crosses boundaries (arbitrage opportunities)

## K-Nearest Neighbor Classification:

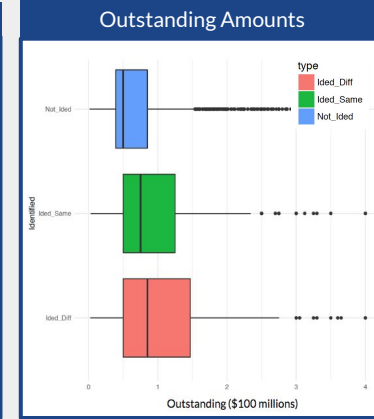
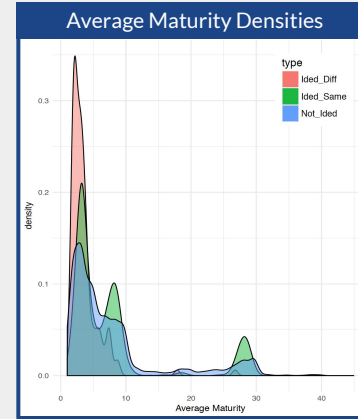
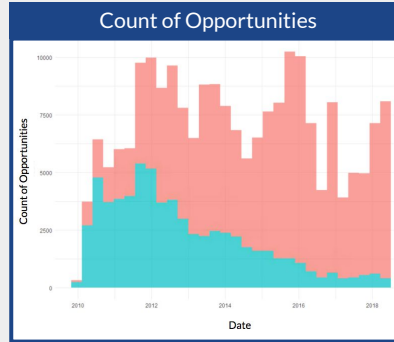
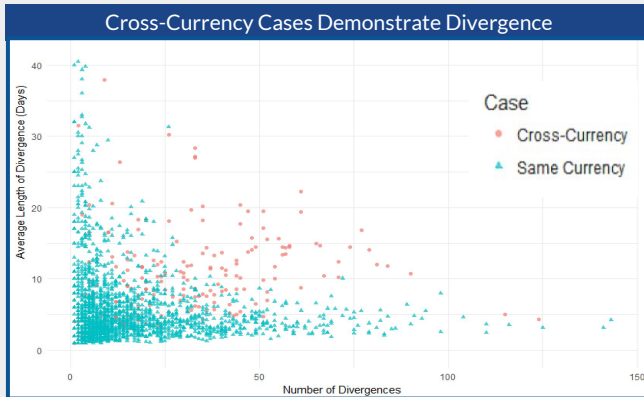
- Need to identify the profitable cases from the 5000 identified bond pairs
- Trained and validated on 300 manually classified observations
- Chose  $k = 18$  (square root of training set size)
- Engineered eight features
  - *Proportion of points outside bounds, consecutive points crossing lower bound, upper bound and median, same currency, correlation, volatility, squared difference from median*
- Used min-max normalization to scale all features between 0 and 1
- Identified 2090 good arbitrage cases
- Evaluated with 10-fold cross validation
  - Precision: 81.6%
  - Recall: 79.5%

Predicted	Bad	Good
0	.442	.097
1	.085	.376

# Analysis

## Cross-Currency vs Same-Currency Cases:

- More identified same currency cases (2090 vs 179)
- Cross-currency cases demonstrate more and longer divergences
  - 3.84 days vs 9.32 days
- Cross-currency cases have shorter maturities but higher median OAS differences



## Analysis of Bond Characteristics:

- Characteristics of identified bonds:
  - More outstanding shares
  - More likely to be issued in USD, EUR, CAD\*
  - Commonly traded maturities (5, 10, 30 year) overrepresented
  - Higher quality
  - More likely to be issued by financial institutions
- All differences are statistically significant at 0.01 alpha level

\*In descending order. Bonds issued in JPY not considered due to errors in data

# Conclusions, Limitations and Further Analysis

## Conclusions:

- Arbitrage opportunities exist in the global corporate bond market
- They tend to be characterized by properties shown in our analysis:
  - More outstanding amounts, higher quality, issued by financial institutions, in commonly traded currency pairs, occurs during times of high bond yields and volatility
- Cross-currency cases have lower convergence and higher volatility rates compared to the same-currency cases
  - Indicates mispricings in global bond markets are not corrected for long periods of times
  - Show that markets are less efficient, and presence of arbitrage opportunities is a common occurrence

## Limitations:

- Predictive power of model not yet explored
  - More confident in ability to predict for same-currency cases because of high convergence
- Idiosyncratic bond properties not in data could complicate results
  - Bid/ask spread manually evaluated for several cases, but not systematically
  - Guarantors, debt structure, specific call option structure
- Daily data may hide hourly patterns

## Further Analysis:

- Examine additional bond data for cross-currency cases in order to see if there are other structural differences within pairs that could explain divergences
- Test model by making predictions in real time and assessing the profitability of these predictions
- Incorporate bid/ask spread and currency forwards to dataset to formulate hedging strategies for investments

