Predicting Changes to Moody’s Credit Rating

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Importance
The announcements of Moody’s credit rating change have impact on the financial market. Predicting them in advance enables making more informed investment decisions. Vanguard is interested in predicting the next Moody’s rating change to generate alpha.

Objective
Predict changes in Moody’s credit rating for July and August 2018 for five companies: 21st Century Fox, AT&T, CBS, Comcast and Verizon. Predictions are made based on Security and Exchange Commission (SEC) filings and news headlines. Moody’s announcements are rare, highly irregular and imbalanced!

Exploratory Data Analysis
- Moody’s ratings
- SEC filings: - categorical and sentiment
- The New York Times news: - sentiment

Results
We employed classification models based on two approaches:
1. Pairing each SEC filing with Moody’s rating at the time: 2619 data points.
   - Random Forest model using sentiment scores of 8-K files as input.
   - Bag-of-words model using event text as input.
   - Long short-term memory network (LSTM) using event text as input.
   - Wide and deep network using sentiment scores and event text as input.

2. Paring Moody’s announcements with time series data from the preceding 6 months.
   - Inputs: SEC categorical event type, SEC sentiment, NYT sentiment.
   - Used oversampling (SMOTE) to balance classes.
   - Training set cross-validation accuracy: 61%.
   - Our model assumes a rating change and predicts its type for each day in July-August.

Conclusions
Modeling of rare events is extremely challenging (if not futile), especially with limited unstructured data. We recommend to get more data (Moody’s ratings for more companies) and perform time series classification with a deep model.

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