Enhancing Stock Market Return Predictions from 10-K Filings: Leveraging the Loughran–McDonald Dictionary and Sentiment Analysis with BERT

Radu Mistreanu

Vrije Universiteit Amsterdam

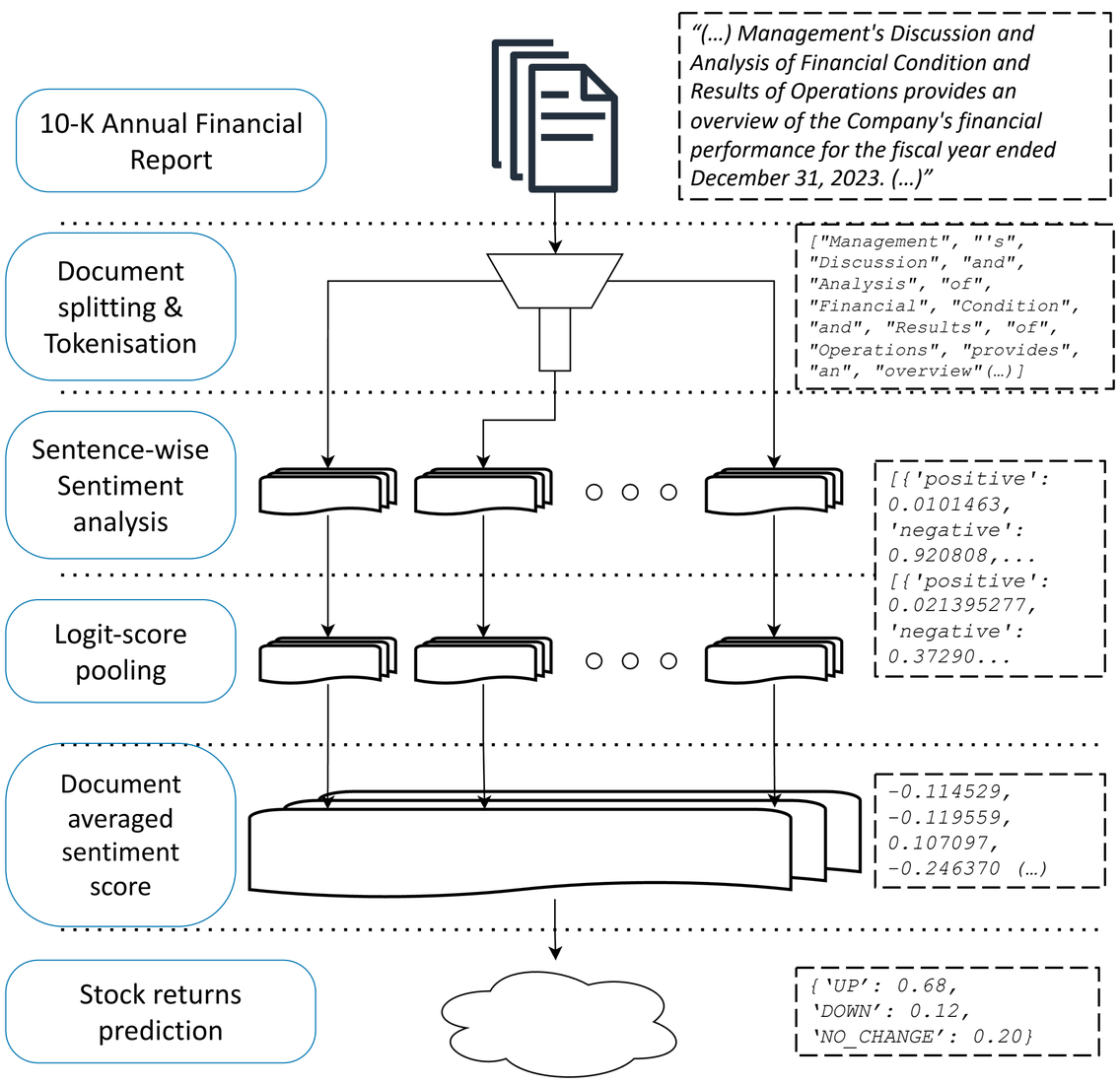
Motivation:

Accurate stock market predictions using natural language processing (NLP) are essential for enhancing financial decision-making and market efficiency.

Predicting stock prices from complex financial reports allows investors to make more informed and strategic decisions following significant financial disclosures.

Automating the analysis of complex financial documents is meaningful. A framework combining advanced NLP techniques with domain-specific knowledge is needed to deal with the the increasing volume of financial textual data (Dyer et al., 2016)

Constructing a custom pipeline and dataset ensures high-quality, relevant data tailored to the financial domain's nuances.



Implications & Results:

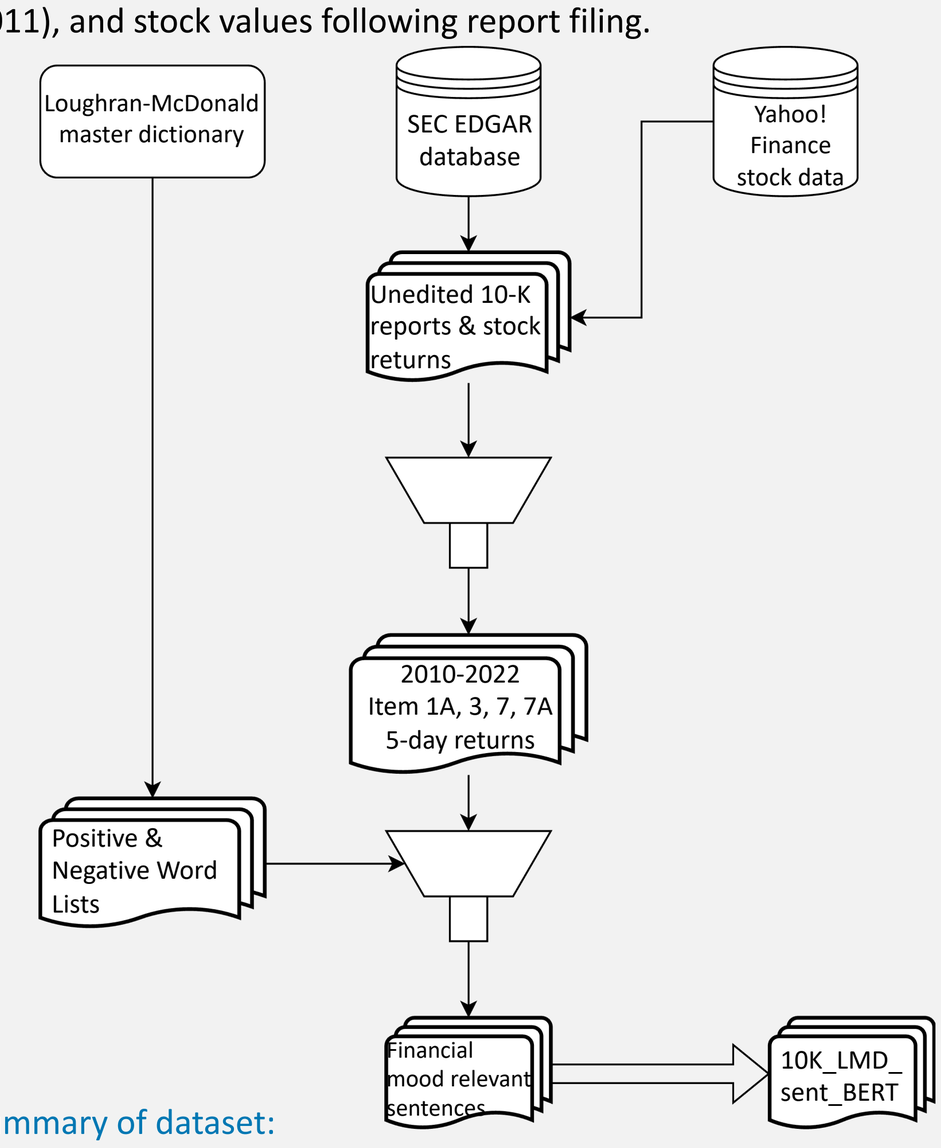
Sentiment scores correlated with stock price, in line with expectations and previous studies. Effect is statistically significant for 3–day and 5-day returns (p-values 0.012, 0.027), no correlation with longer time intervals.

FinBERT outperforms other configurations, has highest sensitivity and predictive power, highlights importance of domain-specific fine-tuning.

Important step towards more accurate automatic textual analysis tools in finance. Even if effect is not causal, financial tone is an important proxy for understanding the impact of information on stock returns.

Contribution:

1. Introduce a data preparation pipeline based on 10-K annual financial reports, the Loughran-McDonald Dictionary (Loughran & McDonald, 2011), and stock values following report filing.



Summary of dataset:

- 4805 S&P 500 10-K filings (10-year period).
- Analysed using 2692 LMD terms.
- Relevant sections (1A, 3, 7, 7A) averaged 990 sentences each.
- Average of 299 sentences retained per filing.
- Outliers: 2.29% with <10% sentences retained (4693 instances).
- Corresponding stock returns ranging from 1-day to 252-day.

2. Develop a stock price prediction tool utilising pre-trained BERT models and sentiment analysis.

3. Benchmark several model configurations and different BERT algorithms to identify the most effective model.

- BERT (sentiment analysis)
- FinBERT (sentiment analysis)
- Longformer (sequence classification)

Limitations & future work:

Study is limited to S&P 500 companies and excludes 10-K filings during market instability, limiting generalizability and insights.

The model will not put financial analysts out of business anytime soon.

Future work could expand the dataset to include more companies and conditions and include more features for increased predictive power.

References:

- Dyer, Travis, Mark H. Lang, and Lorien Stice-Lawrence. 'The Ever-Expanding 10-K: Why Are 10-Ks Getting so Much Longer (and Does It Matter)?' *SSRN Electronic Journal*, 2016. https://doi.org/10.2139/ssrn.2741682.
- Loughran, Tim, and Bill Mcdonald. 'When Is a Liability Not a Liability? Textual Analysis, Dictionaries, and 10-Ks'. *The Journal of Finance* 66, no. 1 (February 2011): 35–65. https://doi.org/10.1111/j.1540-6261.2010.01625.x.