Will Dividends Go Up or Down?: Predicting S&P 500 Payouts with Microeconomic and Macroeconomic Data

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Motivation

- Dividends are a crucial component of investment strategies, impacting stock selection and portfolio composition for all investing individuals.

- Correctly predicting future increases in dividends informs investors about profitability of a firm, and their growth prospects in the future.

- The challenge is that predicting whether dividends will go up or down depends on both internal (firm-specific) and external (economic) factors.

- We aim to use machine learning algorithms that will allow us to combine these micro and macro perspectives; this will create a more holistic model capable of determining patterns and non-linearities that may go unaccounted for in traditional models.

S&P Global

Main Research Questions and Sub-Questions

- **Using previously available data on firm–specific and macroeconomic factors, can we predict an increase in a firm's total dividends over the next calendar year?**

- Are microeconomic or macroeconomic features more powerful at predicting the outcome?
    - Which specific features are most effective at predicting a dividend increase?
    - Are there any predictors which are surprisingly irrelevant?
- Can certain sectors be more accurately predicted than others?
- How does dividend prediction accuracy differ during recessions, recoveries, and booms?
- Will previous issuance of dividends impact future dividend increases as opposed to the efficient market hypothesis?

Hypothetical Answer to RQs and Contribution

- We expect to see dividends rise in correlation with positive macroeconomics shocks as well as increases in revenue and growth associated variables.
  - We hope to see macroeconomic variables impact industries differently, causing greater effects in consumer driven businesses rather than the real estate sector, for example, which is much less prone to inflationary shocks.
- Contributions
  - Our paper's unique contribution is the inclusion of macroeconomic data in our training set, giving a more holistic framework that will improve the accuracy of classifying whether dividends go up.
  - Previous studies have tended to be solely micro focused with no attention given to macroeconomic movements, missing a crucial driver of profitability and therefore dividend yield.
  - We will also break down our analysis by industry to see whether this will allow us to obtain higher accuracy rates for dividend movements; another aspect which has been neglected by previous studies.

Method Used

- Data
  - Normalized to a Gaussian distribution.
  - All non-stationary data (Unit Root Test) will be in percent change terms.
  - We will use an 80-20 training/test split.
  - Lagged and averaged values of key microeconomics and macroeconomic data.

- Machine Learning Methods
  - Logistic Regression; due to the large volume of regression analysis papers, logit coupled with macro variables may yield more significant results.
  - Tree-based methods; since we are using panel data instead of time series data, we can randomize the training data to reduce the risk of overfitting and get a more accurate classification tree.
    - Random Forest
    - Boosting Trees
  - Naïve Bayes Classifier; it works well with high-dimensional data; moreover, since our outcome is probabilistic a Naïve Bayes Classifier will work well.
  - KNN; useful for capturing intra-industrial similarities, grouping firms with similar profiles to predict dividend movements.

Literature Review

Paper Citation	Dingli, Alexiei and Karl Sant Fournier. "Financial Time Series Forecasting – A Machine Learning Approach." *Machine Learning and Applications: An International Journal* 7, no. 5 (October 2017): 11-27.	Moreira, Ana Catarina Fernandes. "Prediction of Dividend Yields." Master's thesis, Universidade do Porto, 2022.	Kim, Jinhwa, Chaehwan Won, and Jae Kwon Bae. "A knowledge integration model for the prediction of corporate dividends." *Expert Systems with Applications* 37, no. 2. (March 2010): 1344-1350.
Summary	Uses ML classification and regression to estimate next period stock direction and price change using a 2003-2016 data set of multiple world indices.	Predicts dividend yield of Australian companies 6 months in advance, using the dividend forecasts of banks and stock market data through ML.	Predicts dividends of Korean companies by using a traditional regression model as a baseline and enhances accuracy by applying AI techniques.
Similarities with our paper	Uses some similar algorithms: K-Nearest Neighbour (KNN), Random Forest, decision trees, and Naïve Bayes.	Predicts dividend related information of publicly traded companies. Some similar algorithms: KNN and Random Forest.	Predicts dividend related information of publicly traded companies. Similarity in algorithms: decision trees.
Differences with our paper	Focuses on movements in stock price as opposed to movements in dividends. It is also micro focused; apart from exchange rates there are no macro predictors. Different data set time frame (2003-2016) and different indices.	The study is micro focused and does not consider macro predictors. It also focuses on the use of bank forecasts of public companies to boost its own model. Finally, we are looking at different time frames and locations.	Again, the study is micro focused and does not consider macro predictors. The study also uses neural networks, but it does not use random forest. Again, we are looking at different time frames and locations.

Data Description and Descriptive Statistics

- Data
  - 1990-2023 data on today's S&P 500 companies from Yahoo Finance; company financials from Bloomberg.
  - Macroeconomics variables from FRED.
  - 12684 panel data observations broken down into 20 macro and 25 micro variables.

Group	Variable	Count	Mean	Std	Min	25%	50%	75%	Max
Variable	Div Per Share	12684	0.843	1.87	0.0	0.0	0.25	1.15	104.48
Macro	RGDP	12684	0.0245	0.0178	-0.0257	0.0200	0.027	0.035	0.0605
	1 - Year Rate	12684	2.5186	2.0916	0.1	0.37	2.0	4.94	6.11
	Inflation	12684	0.0259	0.0152	-0.0032	0.0162	0.0244	0.0314	0.0799
Micro	Split	12684	0.1428	0.5412	0.0	0.0	0.0	0.0	20.0
	Price	12684	0.1678	0.3329	-0.9471	-0.0074	0.1376	0.2935	7.6433
	Sector	11	-	-	-	-	-	-	-

Distribution of Companies by Industry