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

Ariel Khait | khaitari | ariel.khait@mail.utoronto.ca Aleksander Dobak | dobakale | alex.dobak@mail.utoronto.ca Paul Esseyin | esseyinp | p.esseyin@mail.utoronto.ca

Motivation – Why Dividends?

Dividends as the ultimate factor of stock valuation:

Signals company strength and commitment to deliver long-term shareholder value; discounted dividend model.

Significant Contributor to Returns:

From 1987 to the end of 2023, reinvested dividends accounted for 55% of total market returns. (JP Morgan)

Extensive Market Impact:

Dividend-paying firms represent over 75% of the total market capitalization of the U.S. stock market. Firms that increase
dividends significantly outperform peers in market cap growth over decades, driving wealth creation for investors. (JP Morgan)

Predicting dividend changes requires analysing both firm-specific factors and broader economic indicators.





Returns of S&P 500 Index Stocks by Dividend Policy: Growth of \$100 (1973–2023)

Main Research Questions and Sub-Questions

Research Question	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?
Sub Questions	 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 relevant/irrelevant? Will previous issuance of dividends impact future dividend increase?

Literature Review

Paper Citation	Dingli, Alexiei and Karl Sant Fournier. "Financial Time Series Forecasting – A Machine Learning Approach."	Moreira, Ana Catarina Fernandes. "Prediction of Dividend Yields."	Kim, Jinhwa, Chaehwan Won, and Jae Kwon Bae. "A knowledge integration model for the prediction of corporate dividends."
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 Al techniques.
Results	81% accuracy for predicting future trend direction	Outperforms traditional bank predictions (MAPE for UBS: 118.89%), while ML models achieved lower errors.	It best outperforms the standard model for dividend prediction using KI; combines decision rules from CART trees into one cohesive framework.
Similarities with our paper	Uses some similar algorithms: K-Nearest Neighbour (KNN), Random Forest, decision trees, neural networks 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 and Neural Networks.
Differences with our paper; contribution.	Focuses on movements in stock price as opposed to movements in dividends. It did not use financial statement information; apart from exchange rates there are no macro predictors. Different data set time frame (2003- 2016) and different indices.	Focuses on the use of bank forecasts of public companies to boost its own model. Uses stock price data and time series features. It does not use financial statement information nor macro data. Finally, we are looking at different time frames and locations.	Does not use financial statement nor macro data. Does not use random forest. Again, we are looking at different time frames and locations.

Contribution

Firm-Specific Fundamentals:

 We incorporate financial statement data, whereas the papers rely on market-derived metrics or external predictions.

Classification vs. Regression:

 We address a classification problem (will dividends increase?), while the papers focus on time-series regression of continuous outcomes.

Broader Context:

 We integrate macroeconomic factors and industry benchmarks, providing a holistic approach that contrasts with the narrower, market-focused methods in the papers.



Data Description and Descriptive Statistics

- Data ranging from 1990-2023 of today's S&P 500 companies from Yahoo Finance and Warton Research Data Services (WRDS)
- Macroeconomics variables from FRED, turned into % change due to stationarity
- 11,196 panel data observations broken down into 15 macro and 11 micro (company specific) variables.
- We look at 444 unique S&P500 companies over 32 unique years.
- Preformed an ADF test for stationarity on all variables and eliminated non-stationarity.

Example Data	Year	div (Div Inc.)	Dividends	Revenue (Millions)	rGDP	10_Year_rate
	1992	1	0.25	784	3.52%	3.34
AAPL	1993	1	0.3	972	2.75%	2.71
	1994	0	0.3	982	 4.03%	3.54
	2010	0	1.0	1346	2.70%	0.87
MSFT	2011	1	3.5	1400	1.56%	0.53
	2012	0	0	1396	2.29%	-0.01

Data Description and Descriptive Statistics



Data Description and Descriptive Statistics



Methodology



Methodology

- To measure the "goodness" of our model we used:
 - Accuracy (or Precision):
 - Measure of how well your model predicted the outcome

Number of correct predictions
Number of predictions

- False Positive Rate:
 - Proportion of negatives that yield a positive test outcome

Number of False Positives

Total Number of Negatives

- Recall Rate:
 - Proportion of all positives that were classified correctly

Number of True Positives

Number of True Positives + False Negatives

Classification Tree – WITHOUT Macro Data



Classification Tree – WITH Macro Data



Random Forest – WITHOUT Macro



Feature Importance in Random Forest

Random Forest – WITH Macro



Fall 2024

Boosting Tree – WITHOUT Macro



Feature Importance in Gradient Boost

Boosting Tree – WITH Macro



Feature Importance in Gradient Boost

Results



Answers to our research questions

Question	Answer
Using previously available data on firm-specific and industry/macroeconomic factors, can we predict an increase in a firm's total dividends over the next calendar year?	Yes, we get an accuracy rate of 84.35% with our Random Forest model and a recall rate of 86.29%; effectively leverages firm-specific and industry/macro factors to predict increases in a firm's total dividends.
Are microeconomic or macroeconomic features more powerful at predicting the outcome?	Market features and firm specific data are more powerful predictors. However, industry averages and population have high predictive capacity on the classification and boosting trees.
Which specific features are most effective at predicting a dividend increase? Are there any predictors which are surprisingly relevant/irrelevant?	Population was the most relevant macro feature. Surprising – there are more obvious macro variable such as GDP. Dividend increase last year was the most powerful. Demonstrates the power of momentum.
Will previous issuance of dividends impact future dividend increase?	Yes, in fact this was our most powerful feature. The strong predictive power of past dividend increases aligns with EMH; it reflects market- recognized patterns of dividend "stickiness"; note, it's used probabilistically and not as a guaranteed outcome.

Fundamentally: By identifying firms likely to increase dividends, our model can guide investors toward firms that historically outperform, amplifying returns through both share price growth and reinvested payouts.

Bibliography

Bloomberg LP. "Data accessed via Bloomberg Terminal." Accessed October-November 2024.

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.

Federal Reserve Bank of St. Louis. "Federal Reserve Economic Data (FRED)." Accessed 26th October 2026. https://fred.stlouisfed.org.

Hartford Funds. "The Power of Dividends: Past, Present, and Future." Whitepaper, Hartford Funds, 2021. Accessed November 26, 2024. https://www.hartfordfunds.com/dam/en/docs/pub/whitepapers/WP106.pdf.

J.P. Morgan Asset Management. "The Era of Accelerated Dividend Growth Is Upon Us." Accessed November 26, 2024. <u>https://am.jpmorgan.com/gb/en/asset-management/adv/insights/portfolio-insights/pm-perspectives/equities/the-era-of-accelerated-dividend-growth-is-upon-us/</u>.

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.

Moreira, Ana Catarina Fernandes. "Prediction of Dividend Yields." Master's thesis, Universidade do Porto, 2022.

Williams, John Burr. The Theory of Investment Value. Cambridge, MA: Harvard University Press, 1938.