

AI-Driven Stock Market Forecasting Using Financial Statement Analysis

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Literature Review

1. A study on stock forecasting using deep learning and statistical models

Gupta, H., & Jaiswal, A. (2024), find that the result of all the models is different and the best result is coming from the LSTM model and we have also seen how the Full CNN outweighs the pre-process CNN. This model helps the investors to know when to sell and buy the stock prices. As it is also known how the stock prices are affected by the climatic or geographical changes, company profit or loss, change in geographical seasons, loss in the region, inflation, competition in the market etc.

2. Stock selection using machine learning based on financial ratios.
Mathematics

3. TRNN: An efficient time-series recurrent neural network for stock price prediction. Information Sciences

Lu, C., & Xu, Y. (2023), The TRNN (Time-series Recurrent Neural Network) is an innovative and efficient model for stock price prediction, recently proposed in the field of financial forecasting. This model, published in Information Sciences, combines the power of recurrent neural networks with advanced time series processing techniques to enhance prediction accuracy and efficiency

4. Financial Statement Analysis and Earnings Forecasting

Financial statement analysis and earnings forecasting are critical components of investment decision-making. According to Monahan (2017), these analyses, particularly with an emphasis on accrual-based earnings over cash flows and dividends, play a pivotal role in predicting stock returns. Monahan introduced econometric models and panel-data approaches to enhance the accuracy of financial forecasts but highlighted the persistent dominance of the random-walk model. This raises concerns about the effectiveness of complex forecasting methods in real-world financial markets.

5. Estimating Stock Price Based on Financial Statements Using Machine Learning Approaches

Kunathananon (2022) explored stock price estimation using financial statement data and machine learning techniques, specifically Long Short-Term Memory (LSTM) networks. His study demonstrated that LSTM models effectively capture intricate financial patterns and dependencies, significantly improving predictive accuracy. However, he emphasized the necessity of proper data preprocessing and feature selection to optimize model performance.

6. Stock Price Prediction Based on Financial Statements Using SVM

Heo and Yang (2016) investigated the application of Support Vector Machines (SVM) for stock price prediction using financial statements. They analyzed key financial indicators such as Earnings Per Share (EPS), Book Value Per Share (BVPS), and Net Profit Growth Rate (NPGR). Their findings indicated that while SVM models provided reliable short-term stock predictions, their accuracy declined over time due to market efficiency constraints, aligning with the Efficient Market Hypothesis (EMH).

7. Using SVM with Financial Statement Analysis for Stock Prediction

Similarly, Han and Chen (2007) applied SVM to financial statement-based stock forecasting and found that integrating multiple financial ratios improved predictive performance. However, they emphasized that careful parameter tuning is necessary to avoid overfitting, ensuring that models remain generalizable and effective across different market conditions.

Methodology

This study will use a deep learning approach to stock price movement prediction in the Saudi stock market (Tadawul All Share Index – TASI) using analysis of financial statements. The approach is intended to extract important financial features and apply time-series modeling techniques to predict future stock price movements.

Data Description

Source: Historical financial statement data and market prices were obtained for listed companies on the Tadawul Stock Exchange. The dataset includes data from 100 publicly traded companies across various sectors, including banking, energy, industrials, healthcare, and real estate.

Time Period: Data covers the period from 2015 to 2023, using quarterly financial reports.

Financial Metrics:

Total Assets

Total Liabilities

Shareholders' Equity

Earnings Per Share (EPS)

Price-to-Earnings (P/E) Ratio

Return on Assets (ROA)

Net Profit Margin

Market Capitalization

Book Value Per Share (BVPS)

Revenue and Net Income

The proposed Deep Learning models:

- Long Short-Term Memory (LSTM)

It takes in a sequence of financial ratios and macroeconomic indicators over several quarters. Processes the sequence step-by-step using memory cells and gates (input, output, forget). Outputs the predicted percentage change in stock price for the next quarter.

- Extreme Gradient Boosting (XGBoost)

Uses decision trees built sequentially to correct errors from previous trees. Inputs include financial statement features such as total assets, EPS, P/E ratio, etc.

Outputs a stock price movement classification or a regression value (expected percentage change). It is known for its high accuracy, speed, and ability to handle missing values and noise in the data.

Evaluation

Mean Absolute Error (MAE) to measure the average absolute difference between predicted and actual stock price changes.

Timeline

Task	Week
Data collection and preprocessing	1-3
Models design, train, and test	4-8
Evaluate and analyze results	9-10

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