

Chapter 2: Literature Review

2.1 Introduction

In chapter-2, it examines the present status of sentiment analysis research and its implementation in financial markets, with a specific emphasis on its usage in the Malaysian stock market. Also, it provides a summary of the main advancements, obstacles, and possibilities in this field. Section 2.2 discusses the importance of sentiment analysis in financial markets, highlighting the use of sophisticated models like FinBERT and eXplainable Lexicons (XLex) to improve effectiveness and understandability. Section 2.3 explores the relationship between sentiment analysis and stock price changes, showing how investor sentiment influences stock performance. Section 2.4 looks into the sentiment analysis's application in the Malaysian stock market, particularly amidst the COVID-19 pandemic. Section 2.5 presents predictive models for predicting stock prices, utilizing methods such as LSTM, GRU, and mixed frameworks. In conclusion, Section 2.6 highlights areas lacking or gaps in the literature and suggests research possibilities like analyzing news article headlines, experimenting with effective sentiment analysis techniques, and enhancing the categorization of neutral sentiment.

2.2 Sentiment Analysis in Financial Markets

Sentiment Analysis in financial markets can be useful for understanding and predicting market movements by analyzing textual data from the financial articles, news, and social media. Various methodologies have been investigated and developed to enhance the accuracy and efficiency of sentiment analysis in this domain. One prominent approach involves using FinBERT, a transformer model specifically tailored for financial sentiment analysis, which has been shown to be effective in predicting market movements when applied to stock news datasets. This model outperforms traditional methods like BERT, LSTM, and ARIMA, highlighting the importance of sentiment as a predictive factor (Jiang & Zeng, 2023). However, transformer models, despite their superior performance, require computational resources and extensive data, making them less suitable for real-time applications or systems with limited processing capabilities (Rizinski et al., 2024). To address these limitations, the eXplainable Lexicons (XLex) methodology combines the advantages of lexicon-based methods and

transformer models, utilizing SHapley Additive exPlanations (SHAP) for enhanced explainability. This approach not only improves the vocabulary coverage of financial lexicons but also offers better efficiency and interpretability compared to traditional transformer models, making it a viable tool for financial decision-making (Rizinski et al., 2024).

2.3 Sentiment Analysis and Stock Price Movements

Sentiment analysis can be emerged as a pivotal tool to predicts the stock price movements, leveraging the vast amount of textual data that available from social media, news, and reports of financial. Studies have shown that investor sentiment, particularly from platforms like Stocktwits, can significantly influence stock prices, although challenges such as the accurate classification of neutral comments persist. To address these, advanced models like FinBERT have been employed, demonstrating superior performance in sentiment analysis and improving prediction accuracy when combined with ensemble support vector machines (Liu et al., 2023). Additionally, integrating sentiment analysis with other data sources, such as historical stock prices and commodity prices, has proven effective. For instance, a classification model using Naive Bayes achieved a 60% accuracy in predicting stock movements over a three-day period by incorporating copper prices and sentiment features (Sinatrya et al., 2022).

Aslim et al. (2023) emphasize the use of Long Short-Term Memory (LSTM) models combined with lexicon-based sentiment analysis to predict stock prices, highlighting enhanced accuracy when integrating sentiment data. This approach aids investors in making informed decisions. Similarly, Praturi et al. (2023) discuss an application that leverages sentiment analysis on financial news through deep learning and cloud computing, demonstrating its efficacy in accurate stock price forecasting. Shah et al. (2019), who review the impact of Twitter sentiments on stock market movements, suggesting that social media plays a pivotal role in influencing stock prices. These research findings show that analyzing sentiments, whether from financial news or social media, is a useful method to forecast stock price changes and assist in investment strategies. Collectively, their findings underscore the critical role of sentiment analysis in stock price prediction, particularly when combined with other analytical techniques and robust models.

2.4 Sentiment Analysis in the Malaysian Stock Market

Sentiment analysis is significant in understanding and predicting stock market behavior in Malaysia, especially during the periods of economic uncertainty like COVID-19 pandemic. Studies have shown that public sentiments from online news portals, can significantly influence the stock price movements of Bursa Malaysia. For instance, a study utilizing long short-term memory (LSTM) models demonstrated that incorporating news polarity values improved the prediction accuracy of stock prices, with the root mean squared error (RMSE) values being less than one for every company stock analyzed (Sidek et al., 2023). During the COVID-19 pandemic, the sentiment expressed in the discussion of management and analysis sections of annual reports from Malaysian public listed companies revealed predominantly negative tones, reflecting concerns about the pandemic's impact on business operations. This sentiment was confirmed through both automated textual analysis and qualitative content analysis (Non & Ab Aziz, 2023). The pandemic had a significant impact on how investors felt or sentiment and the performance of the stock market. The steep downward trend in the FTSE BURSA 100 Index (T100) during the early months of the outbreak was evidenced it. The rapid increase in COVID-19 cases and deaths heightened uncertainty and it disrupted the investment decisions, as captured by the Sentiment Index (SMI) constructed using principal component analysis (PCA) (Albada & Nizar, 2022).

2.5 Advanced Predictive Models for Stock Price Forecasting

Sophisticated machine learning and deep learning techniques are used in advanced predictive models to address the unpredictable nature and complex non-linear features of stock markets. Gated Recurrent Unit (GRU) and Long Short-Term Memory (LSTM) models are powerful predictive models because of their talent to capture long-term dependencies and complex relationships in time series data (Momaya et al., 2023). For example, research conducted on Indian blue-chip stocks demonstrated the efficacy of LSTM and GRU models in forecasting stock prices with high accuracy by training on historical data spanning 17 years (Momaya et al., 2023). Furthermore, the Multivariate Sequential LSTM Autoencoder (MSLSTMA) model, which combines LSTM with an autoencoder component, has been found to excel in capturing dependencies between multiple variables and improving prediction accuracy through unsupervised learning (G et al., 2023). This model outperformed other techniques such as Univariate Sequential LSTM, GRU, Random Forest, and Generative

Adversarial Networks (GAN) in experiments with real stock market data (G et al., 2023). Another innovative approach involves a hybrid framework combining stacked LSTM with a Convolutional network, which has shown competitive performance in predicting stock prices, as evidenced by experiments on ADANI stock data over 14 years (Singh & Malhotra, 2023). By using deep learning architectures and hybrid frameworks on advanced models, provide robust tools for investors aiming to maximize returns through accurate stock price predictions.

2.6 Gaps in the Literature and Research Opportunities

Previous studies on the relationship between sentiment analysis and stock price movements have provided valuable insights, particularly in the Malaysian context. However, there are various gaps in the existing literature that offer possibilities for further exploration and advancement.

First, limited focus on the sentiment conveyed in news article titles, rather than the full text of the articles. While studies have analyzed the sentiment in various textual sources, such as social media posts and financial reports, the unique influence of news titles, which are often the primary information source for investors, has not been extensively examined. Investigating the relationship between the sentiment expressed in news titles and stock price changes could yield important insights into investor decision-making processes (Jiang & Zeng, 2023; Jiang et al., 2023).

Another gap in the literature is the computational and data-intensive nature of transformer models like FinBERT, which are commonly used for sentiment analysis. These models need computational resources and extensive data, limiting their suitability for real-time applications or systems that pose limited processing capabilities. Exploring more efficient and interpretable sentiment analysis methods, such as the eXplainable Lexicons (XLex) approach, could enhance financial decision-making and make sentiment analysis more accessible for a wider range of applications (Rizinski et al., 2023, 2024).

Additionally, the existing research has faced challenges in accurately classifying neutral comments in sentiment analysis of social media platforms like Stocktwits. Developing advanced models and techniques to improve the classification of neutral sentiment and it could further enhance the predictive accuracy of stock price movements (Liu et al., 2022, 2023). These gaps in the literature, as illustrated in Table 2.1, offer the opportunities for future research

to contribute to a deeper understanding of the role of sentiment analysis in the stock market of Malaysia and provide useful insights for investors, policymakers, and financial analysts.

<i>Gap</i>	<i>Description</i>
Limited focus on sentiment in news article titles	Studies have analyzed sentiment in various textual sources, but the unique influence of news titles (a primary information source for investors) has not been extensively examined. Investigating the relationship between news title sentiment and stock price changes could provide insights into investor's decision-making.
Computational and data-intensive nature of transformer models	Transformer models like FinBERT, commonly used for sentiment analysis, which need extensive data and computational resources. This limits their suitability for real-time applications or systems that pose limited processing capabilities. Exploring more efficient and interpretable sentiment analysis methods, such as eXplainable Lexicons (XLex), could enhance financial decision-making and make sentiment analysis more accessible.
Challenges in accurately classifying neutral comments	Existing research has faced difficulties in accurately classifying neutral comments in sentiment analysis of social media platforms like Stocktwits. Developing advanced models and techniques to improve neutral sentiment classification could enhance the predictive accuracy of stock price movements.
Research Opportunities	These gaps in the literature present opportunities for future research to contribute to a more depth understanding of the role of sentiment analysis in the Malaysian stock market. This could provide valuable insights for investors, policymakers, and financial analysts.

Table 2.1: Research gap analysis