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**APPLICATION OF GENERATIVE AI IN PREDICTING READER SENTIMENT AND BEHAVIOR IN STOCK MARKET INVESTMENT THROUGH TEXTUAL DATA: A CASE STUDY OF STOCK ANALYSIS FOR VIB AND HOA PHAT GROUP USING CHATGPT**

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**Abstract**

This study examines how generative AI can be used to analyze textual data and forecast reader attitudes and behavior about stock market investing. Since investor psychology is creating a bigger impact on financial markets, it is essential to comprehend sentiment from news stories, social media, and financial reports to make wise investing choices. The study analyzes volumes of unstructured textual data using cutting-edge generative AI models, such as ChatGPT, to identify emotional triggers that influence investor behavior, such as fear, greed, and optimism. To gain insight into how textual narratives influence investing decisions, this project aims to identify patterns that link sentiment with market movements by fusing sentiment analysis with behavioral finance principles. Ultimately, the findings will enhance emotional prediction models, support improved investment strategies, and inform both academic research and real-world financial decision-making.

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**Keywords:** Generative AI, emotional analysis, behavioral analysis, financial forecasting, stock market prediction.

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## 1. Introduction

The application of artificial intelligence, especially generative AI, in financial markets is rapidly evolving and holds transformative potential for investment decision-making. Traditional investment strategies often rely on historical data and statistical analysis, which, while useful, lack the capability to fully capture real-time investor emotions—a crucial factor influencing market behavior.

Generative AI models have shown promise in generating synthetic data and processing complex, unstructured information like emotions from social media, news, and investor reports (Bai et al., 2024). These capabilities allow generative AI to analyze investor emotions effectively, contributing to more informed investment decisions and enhanced market predictions (Remolina, 2024; Shanmuganathan, 2020).

The importance of incorporating emotional analysis into stock market predictions lies in the strong correlation between public emotions and price movements. Emotions such as fear and optimism significantly impact investment choices, often causing price shifts that are independent of fundamental analysis (Hunguru et al., 2020). However, traditional analytical models fall short of processing these unstructured emotional data sources effectively. By leveraging generative AI, which can synthesize and analyze large volumes of real-time emotional data, this research aims to bridge this gap and provide nuanced insights for investors in volatile market environments (Zhang et al., 2020). Hence, this study is vital in exploring the use of generative AI in emotional analysis to advance predictive models for stock investments.

## 2. Literature Review

### 2.1. Stock market and investment activities

#### 2.1.1. Overview of the stock market

The stock market plays a critical role in capital allocation, connecting investors and companies to promote economic growth (Fama, 1970). Investors buy shares in anticipation of financial returns, while companies raise capital to fund operations and expansion. Efficient stock markets, according to the **Efficient Market Hypothesis (EMH)**, reflect all available information in asset prices (Fama, 1970). However, this theory has been challenged, particularly in emerging markets like Vietnam, where market inefficiencies, investor irrationality, and information asymmetry are prevalent (Truc et al., 2023).

In Vietnam, the stock market has experienced substantial growth, particularly over the last two decades as it transitioned toward a market economy. According to Truc et al. (2023), the Vietnamese stock market is characterized by a large number of individual investors with limited investment expertise, contrasting with more developed markets dominated by institutional

investors. This demographic distinction creates volatility and inefficiency, making it an interesting case study for behavioral finance.

### *2.1.2. Behavior in financial decisions*

Behavioral finance highlights the psychological factors that affect investor decision-making, directly challenging the assumptions of rationality in traditional financial theories (Thaler, 1992). Emotions such as fear, greed, and overconfidence play significant roles in influencing market outcomes (Kumar et al., 2023). For instance, fear during market downturns can cause panic selling, leading to price crashes, while greed during market upswings can result in excessive risk-taking (Altaf & Jan, 2023).

In Vietnam, behavioral biases such as overconfidence and herd mentality are prevalent among individual investors. A study by Quang et al. (2023) found that overconfidence leads to excessive trading and suboptimal investment performance. The authors argue that emotions such as fear and greed are often more pronounced in emerging markets, where market participants tend to have lower financial literacy and less access to information compared to their counterparts in developed markets. This emotional influence often results in stock price volatility that cannot be explained by fundamentals alone (Baker & Wurgler, 2006). Therefore, to mitigate the negative impact of emotional biases on investment decisions, our research team aims to leverage AI to make data-driven investment choices.

## ***2.2. Application of AI in finance and stock market analysis***

### *2.2.1. Overview of the role of AI in finance*

AI (Artificial Intelligence) is fundamentally changing how financial markets operate by enabling investors to analyze vast amounts of data more efficiently and make faster, more accurate decisions. Technologies such as Machine Learning (ML), Deep Learning (DL), and Natural Language Processing (NLP) are at the core of AI's ability to process both structured and unstructured data, such as social media emotions, financial news, and market reports (Schneider et al., 2023; Hunguru et al., 2020). This increased data processing capability has allowed AI to play a crucial role in both predictive analytics and investment decision-making (Goodell et al., 2023; Shanmuganathan, 2020).

Traditional financial models, such as the Capital Asset Pricing Model (CAPM) and Modern Portfolio Theory (MPT), focus on rational decision-making. However, AI can enhance these models by adding the ability to incorporate real-time data, making decisions faster and more adaptable (Hunguru et al., 2020). For instance, Tong et al. (2021) emphasize that models like Long Short-Term Memory (LSTM) and Random Forest can improve short-term stock price predictions by detecting patterns that are not immediately obvious to human analysts.

Furthermore, Generative AI models like Generative Adversarial Networks (GANs) and Variational Autoencoders (VAEs) have become increasingly popular in finance for creating synthetic data, simulating future market conditions, and improving forecasting accuracy (Goodell

et al., 2023; Hunguru et al., 2020). These AI models allow investors to explore potential market movements under different conditions and to mitigate risks more effectively (Generative AI in Finance, 2023).

### 2.2.2. Generative Artificial Intelligence (GAI) Model

A generative AI model's architecture is its fundamental structural blueprint. It outlines the arrangement and interconnection of its layers, neural networks, and constituent components. This architectural design dictates how the model processes and generates information, making it a pivotal factor in its functionality and suitability for particular tasks (Bandi, 2023). Table 1 provides a detailed overview of the architectural components and training methodologies employed in various generative AI models.

**Table 1.** Overview of the architectural components and training methodologies

Model	Architecture Components	Training Method
Variational Autoencoders (VAEs)	Encoder-Decoder	Variational Inference (Tong & Liu, 2021)
Generative Adversarial Networks (GANs)	Generator-Discriminator	Adversarial (Goodfellow et al., 2020)
Transformers	Encoder-Decoder	Supervised (Vaswani et al., n.d.)

**Source:** Summarized by the group authors (2024)

## 3. Related studies

### 3.1. Practical applications of AI in stock market analysis

#### (i) Price trend analysis and market volatility prediction

AI models are widely used in predicting stock price trends and market volatility. **Machine learning models** like **LSTM** and **Random Forest** help process vast datasets of historical price movements and reveal hidden patterns (Goodell et al., 2023; Schneider et al., 2023). For instance, Tong et al. (2021) demonstrated that these models significantly improve the accuracy of short-term stock price predictions, enabling investors to make more informed trading decisions.

**GANs and VAEs** are crucial tools for generating synthetic data, which can be used to simulate market trends and predict future price movements (Generative AI in Finance, 2023). As Schneider et al. (2023) point out, GANs can create various market scenarios based on historical trends, helping investors evaluate potential risks and forecast the market's direction under different conditions. Moreover, Hunguru et al. (2020) highlighted that the use of AI in predicting price

trends reduces reliance on human intuition and minimizes cognitive biases, such as overconfidence or gambler's fallacy, which are common among individual investors.

### **(ii) Emotions Analysis**

One of the most prominent applications of AI in finance is emotions analysis, which involves extracting market emotions from unstructured data sources like social media posts and news articles (Goodell et al., 2023; Schneider et al., 2023). **Natural Language Processing (NLP)** enables AI to assess the emotional tone of millions of tweets, articles, and financial reports, helping investors gauge the overall mood of the market and predict short-term price fluctuations (Truc et al., 2023). For example, Truc et al. (2023) showed that analyzing investor emotions from platforms like Twitter helps detect market emotion shifts, allowing for better market timing decisions. Hunguru et al. (2020) also emphasized that emotions like fear and regret play significant roles in stock market anomalies and fluctuations, and AI helps quantify these emotions in real-time, enabling more responsive and data-driven investment strategies.

AI tools like **GPT (Generative Pre-trained Transformer)** are now widely used to analyze the emotions behind vast amounts of unstructured data (Schneider et al., 2023). According to Goodell et al. (2023), negative emotions, such as fear or uncertainty, often lead to short-term sell-offs and market corrections, while positive emotions can trigger rallies in stock prices.

### **(iii) Algorithmic Trading**

AI has revolutionized algorithmic trading, enabling trading bots to execute trades automatically based on real-time market conditions, without the need for human intervention (Generative AI in Finance, 2023). These AI-powered systems can process data at lightning speed and execute thousands of trades per second, minimizing delays and reducing human errors (Hunguru et al., 2020).

**Robo-advisors** are prominent examples of how AI is transforming the management of investment portfolios. These systems use algorithms based on **Modern Portfolio Theory (MPT)** to build and manage portfolios automatically, adjusting them based on market conditions and risk preferences (Shanmuganathan, 2020). According to Shanmuganathan (2020), robo-advisors like **Betterment** and **Wealthfront** offer automated services such as portfolio rebalancing and tax-loss harvesting, making advanced investment strategies accessible to retail investors at a fraction of the cost of traditional advisory services.

Furthermore, Hunguru et al. (2020) point out that AI can detect anomalies in financial markets more effectively than humans, identifying fraud and other risks more accurately. This ability to automate decision-making and detect fraud makes AI essential in high-frequency trading environments, where even the slightest delay can result in substantial losses.

## ***3.2. Studies of impact of AI in Finance and Stock Market***

### ***3.2.1. International Studies***

A wide variety of methods have been used to integrate Artificial Intelligence (AI) into financial forecasting, especially in stock market analysis. For increasing prediction accuracy, researchers have included emotion analysis in prediction models—a topic that has attracted a lot of attention (Maknickiene et al. 2018). Additionally, feature selection and data pretreatment significantly improve the efficacy of AI models in stock market forecasting. These methods are essential for decreasing the dimensionality of data, eliminating superfluous characteristics, and enhancing algorithm stability and convergence (Sonkavde et al., 2023).

In order to increase forecast accuracy, numerous researchers have combined textual data with stock market data. For example, Khan et al. (2020a) used social media and financial news data to anticipate stock market data for 10 days. Their findings showed that using textual data increased prediction accuracy by 80.53% and 75.16%, respectively. According to Khan et al. (2020b), who employed both emotions and situational features in their machine learning model, the emotions feature improves prediction accuracy by 0–3% while the political scenario feature improves it by almost 20%. In order to increase prediction accuracy, researchers have also included emotion analysis in prediction models—a topic that has attracted a lot of attention (Maknickiene et al. 2018).

### ***3.2.2. Domestic Studies***

Vietnam's stock market is experiencing a significant increase in the application of Artificial Intelligence (AI) in investment and stock analysis. Beyond individual investors, financial institutions in Vietnam are utilizing AI and Big Data technologies to align with global market standards. AI is being adopted for predictive modeling, anomaly detection, and algorithmic trading, enabling institutions to optimize portfolio management and reduce risks. AI-powered ETFs (Exchange Traded Funds) in Vietnam have demonstrated higher turnover rates compared to traditional ETFs, indicating enhanced liquidity and more dynamic market conditions (BSC, 2023).

Despite these advancements, several challenges hinder the widespread adoption of AI in Vietnam's stock market. Issues such as the lack of standardized data, limited access to advanced AI tools for smaller firms, and uneven financial literacy levels among retail investors remain barriers. Addressing these challenges will require collaborative efforts from financial institutions, regulators, and technology providers to establish a robust ecosystem for AI integration (Tuổi Trẻ, 2023).

Our research focuses on the immense potential of large language models (LLMs) like ChatGPT Plus in the finance market. We aim to empirically evaluate LLMs' capabilities in forecasting and investment decisions, maximizing their benefits while minimizing resource use.

## **4. Methodology**

### ***4.1. Research Evaluation Method***

To provide a comprehensive understanding of AI's potential in stock analysis, our research combined qualitative and quantitative methods. The qualitative phase involved a literature review and data analysis, while the quantitative phase focused on evaluating ChatGPT's predictive accuracy. In the qualitative phase, the team utilized numerous documents, research papers, and news articles to explore, gather information, and analyze the financial market, as well as investment behaviors and AI applications. This process provided the team with a more comprehensive understanding of the stock market and the finance sector, leading to the proposal of AI applications in stock analysis. In the quantitative phase, By comparing ChatGPT's predictions to real-world data, we were able to conclude its effectiveness.

#### ***4.1.1. Data and Sources of Research Data***

The information used in this research was taken from articles published on VnExpress and VnEconomy, two reputable and official Vietnamese news websites that cover financial subjects. It is simple to examine the feelings of news readers because we select articles on common occurrences and noteworthy news. To improve the precision and rigor of emotional analysis and stock price prediction, selecting articles and material released adjacent to one another is another criterion to take into account when filtering the input.

The real stock price data that will be compared to the projected figures will come from the X floor, a respectable stock exchange that is used by many big businesses and investors. A multitude of historical stock price data is available on X, including market capitalization numbers, trading volumes, and daily opening and closing prices.

Through the use of these extensive datasets, the study seeks to establish significant connections between the general emotions expressed in the articles from VnExpress and VnEconomy and the real changes in stock prices.

#### ***4.1.2. Research Model Design***

This research seeks to assess the effectiveness of ChatGPT Plus in predicting stock price movements by analyzing investor emotions and behavior influenced by company-related news articles. The focus is on articles containing impactful information that significantly affects investor psychology, whether positive—such as the announcement of a new investment plan with promising profit growth projections—or negative, like controversies surrounding unethical practices by the company or its management.

The study will focus on Vietnam International Commercial Joint Stock Bank (VIB) and Hoa Phat Group (HPG), gathering all news articles published during the first week of October 2024 and the corresponding stock price data for the first and second weeks of October. The AI model will analyze the articles to infer investor emotions (e.g., happiness, worry) and predict their likely

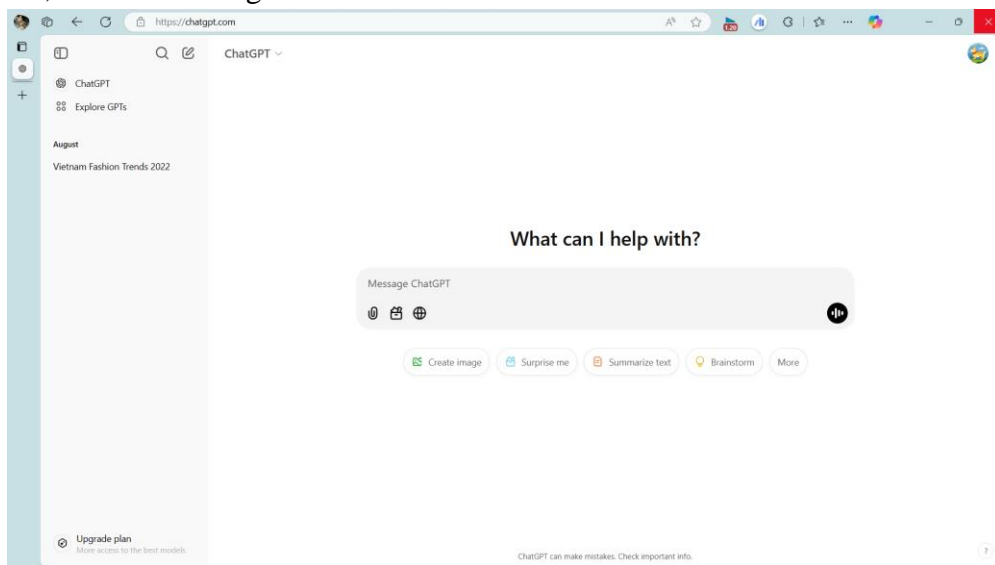
actions (buy, sell, or hold). Using these emotions and behavior data, the model will forecast stock price movements for the second week of October.

The selection of these two companies as research subjects was based on the criterion of frequent media coverage within a short time frame. This decision aimed to ensure the consistency and focus of the dataset, thereby enhancing the reliability of the analysis. By limiting the data collection period, we hypothesized that public attention on these companies would be higher, leading to a greater volume of interactions and feedback on related articles. This would provide the ChatGPT model with a rich and up-to-date dataset, thereby improving the accuracy of its predictions.

These predictions will be compared to actual stock price changes to assess accuracy. The findings will provide insights into the reliability of ChatGPT Plus in emotions-driven stock price prediction and highlight potential improvements for its application in financial decision-making.

## 4.2. Application

Using the ChatGPT is quite simple; you only need to register and log into the platform (<https://chat.openai.com/chat>). After registering, you are automatically redirected to a chat screen, as shown in Figure. The tests were conducted in December 2024 in Vietnam.



**Image 1:** Screenshot of ChatGPT

**Source:** captured by the group authors (2024)

In recent times, a lot of people are reading newspapers to update the information of the market, and we may have many opinions and emotions against the news. To better understand human behavior, we will ask ChatGPT to predict human emotions based on the content of the news. Based on its responses, we will keep asking it to predict individual investors' decisions. After that, we will provide the stock price of the company in the week where the papers were published, and then we will ask ChatGPT to predict the stock price for the following week.



To evaluate the performance of the ChatGPT concerning the analysis process for making finance decisions, two questions were chosen to ask ChatGPT.

1. These are the newspapers about the company. After reading each of the above articles, please summarize the general information about the emotions and behaviors of small individual investors, and predict how small individual investors will feel and what investment actions (buy/sell/hold) they will take after reading these articles.

2. Now we will provide you with the stock price during the week the newspapers were published. Please predict the stock price changes (ceiling price, floor price, opening price, closing price) for the following week.

## 5. Results & Discussion

### 5.1. Results

#### 5.1.1. ChatGPT's responses for HPG

These are the responses of ChatGPT for HPG (original responses are in Vietnamese and we have translated them into English)

#### **Question 1: Summarize and predict**

**Article 1:** Stocks peaked, Hoa Phat's boss registered to sell 1 million shares (VNEconomy, 03/06/2024)

**Article 2:** Hoa Phat shares attract cash flow (VNExpress, 03/12/2024)

**Article 3:** In 2024, Hoa Phat plans a profit of VND 10,000 billion and bonus shares at a rate of 10% (VNEconomy, 13/03/2024)

#### **Overall Emotions:**

- **Happiness (dominant):** Retail investors are generally optimistic due to a series of positive news, including:

- High liquidity and strong capital inflows into HPG shares.
- A profit target of 10,000 billion VND in 2024 (a 47% increase over the previous year).
- A 10% stock dividend plan, which brings additional value to shareholders.

- **Surprise:** Some investors are surprised by the strong attractiveness of HPG, the better-than-expected recovery of the steel industry, and the company's ambitious plans in a challenging market.

- **Slight Concern:** A small group of investors are concerned about the impact of the leadership selling shares and the company's ability to achieve its ambitious goals. Additionally, the stock dividend issuance may dilute short-term benefits.

- **Fear (very few):** A few more cautious investors are concerned about the risk of a price correction when considering the information about the leadership selling shares at a high price.

**Overall Investment Behaviors:**

- **Buying (most common):** Retail investors tend to buy HPG shares due to:
  - Expectations of long-term profit growth.
  - Support from stock dividends and the high liquidity of this stock.
  - Confidence in Hòa Phát's reputation and leading position in the steel industry.
- **Holding:** Those who already own HPG shares will continue to hold to benefit from expected price increases, especially thanks to positive factors such as dividends and business prospects.
- **Taking profits (small):** A small number of short-term investors or those who have made significant profits may sell to realize profits, especially when the company's leadership sells shares.

**Overall Conclusion:** Overall, positive emotions such as happiness and surprise dominate, reflecting the optimism of retail investors towards HPG shares. Investment behavior is primarily inclined towards buying or holding, indicating strong belief in Hòa Phát's long-term prospects as the company sets specific and attractive growth targets."

**Question 2: Forecast**

Actual Price (VND)		Open price	Close Price	High price	Low price
3/7	Thursday	27,900	28,200	28,500	27,800
3/8	Friday	28,200	27,550	28,250	27,500
3/11	Monday	27,550	27,200	27,800	27,100
3/12	Tuesday	27,150	27,450	27,650	27,100
3/13	Wednesday	27,450	28,000	28,050	27,350

**Figure 2:** Actual Price of HPG in the first week

**Source:** Summarized by the Group authors (2024)

Based on HPG's stock price performance in the past week, along with the impact of news articles and market emotions, I will forecast the trend and price of HPG shares for the coming week.

**Current Trend Analysis:**

- **Positive factors:** The profit plan of 10,000 billion VND and the 10% stock dividend are creating great expectations for investors. High liquidity in the past week shows that money is still flowing into HPG.

- **Hindrances:** Concerns about selling pressure from the company's leadership. The overall market may be affected by macroeconomic factors, impacting investor emotions.

**HPG's stock price forecast for the next week:** Based on the current trend and emotions, HPG's stock price may continue to fluctuate within a narrow range with slight fluctuations.

- **Predicted price:**

<b>Predicted Price (VND)</b>		<b>Open price</b>	<b>Close Price</b>	<b>High price</b>	<b>Low price</b>
3/14	Thursday	28,100	27,600	28,100	27,500
3/15	Friday	27,600	27,350	27,900	27,250
3/18	Monday	27,400	26,900	27,450	26,350
3/19	Tuesday	26,800	27,100	27,800	26,750
3/20	Wednesday	27,150	27,250	27,350	27,050

**Figure 3:** Predicted Price of HPG for the following week (VND)

**Source:** ChatGPT (2024)

**Conclusion:**

- **Main trend:** A slightly upward fluctuation with support from positive emotions, but under pressure from profit-taking flows.

- Investors will need to closely monitor cash flow and macroeconomic market information in the coming week."

**Discussion:**

The actual price for the following week decreased significantly.

Actual Price (VND)		Open price	Close Price	High price	Low price
3/14	Thursday	28,100	27,600	28,100	27,500
3/15	Friday	27,600	27,350	27,900	27,250
3/18	Monday	27,400	26,900	27,450	26,350
3/19	Tuesday	26,800	27,100	27,800	26,750
3/20	Wednesday	27,150	27,250	27,350	27,050

**Figure 4:** Actual Price of HPG for the following week (VND)

**Source:** Summarized by the Group authors (2024)

Differences in Actual and Predicted Price (VND)		Open price	Close Price	High price	Low price
3/14	Thursday	600	300	300	500
3/15	Friday	300	350	400	550
3/18	Monday	500	-300	-150	-250
3/19	Tuesday	-400	-400	-100	-150
3/20	Wednesday	-250	-550	-850	-150

**Figure 5:** Differences between Actual and Predicted Price (VND)

**Source:** Summarized by the Group authors (2024)

Although the overall emotions were more negative, ChatGPT still predicted a price increase. The results from the table above indicate that ChatGPT's predictions exhibit a slight discrepancy from the actual results. In the initial days, ChatGPT's predictions were lower than the actual results, which could have caused short-term investors to miss out on opportunities. However, in the second half of the week, the results reversed, with the predictions being higher than the actual results, leading investors to become complacent and potentially incur losses if they decided to sell at that time

### 5.1.2. ChatGPT's responses for VIB

These are the responses of ChatGPT for VIB (original responses are in Vietnamese and we have translated them into English)

#### **Question 1: Summarize and predict**

**Article 1:** Cancellation of sale of more than 2.6 million shares of VIB Chairman's sister-in-law (VNExpress, 01/11/2024)

**Article 2:** HoSE eliminates related person's sale of VIB shares due to information disclosure violation (VNEconomy, 03/11/2024)

**Article 3:** VIB Deputy General Director registered to buy 3 million shares (VNEconomy, 05/11/2024)

**Article 4:** Commonwealth Bank of Australia ceases to be the major shareholder of VIB, estimated to collect 8,000 billion (VNEconomy, 07/11/2024)

## **Summary of retail investors' emotions and behaviors towards VIB:**

### **1. Overall Emotions:**

- **Worry** (dominant): Retail investors' concerns stem from a series of disturbing events, such as insider trading violations related to the leadership and the withdrawal of funds by major shareholder Commonwealth Bank of Australia (CBA). These factors raise doubts about VIB's transparency and long-term prospects.

- **Anger:** Investors express anger at insider trading violations by VIB's leadership's relatives and believe that stricter penalties are needed to ensure market fairness.

- **Surprise:** Surprise arises when VIB's Deputy General Director registers to buy 3 million shares, contrary to the negative trend from previous events. Investors are also surprised by the large-scale withdrawal from CBA, a strategic shareholder.

- **Happiness** (limited): Some investors feel positive about the senior management's share purchase, seeing it as a signal that insiders still believe in the bank's prospects.

- **Sadness:** Disappointment stems from the fact that incidents related to VIB may erode market confidence, negatively impacting the share price in the short term.

### **2. Overall Behaviors:**

- **Cautious observation (most common):** Retail investors, especially those sensitive to risk, choose to monitor subsequent developments rather than rush into transactions. They want to assess further actions from VIB's leadership and the impact of CBA's withdrawal.

- **Selling shares:** Some investors, concerned about negative signals such as insider violations and CBA's withdrawal, may choose to sell VIB shares to avoid short-term price declines.

- **Buying (less):** Investors who believe in VIB's long-term prospects, especially due to the share purchase by the Deputy General Director, may see this as an opportunity to accumulate shares if the price falls. Holding shares: Existing VIB shareholders tend not to act immediately, continuing to hold shares and waiting to see how the situation unfolds.

### Overall Conclusion:

- **Emotions:** Worry and anger dominate, with some surprise and hope from positive actions by VIB's leadership.
- **Behaviors:** Retail investors primarily choose cautious observation or short-term selling, while a small group chooses to buy or hold with long-term expectations.
- **Impact:** Confidence in VIB is negatively impacted in the short term, but if the bank has a clear and transparent strategy, this can help restore investor confidence.

### Question 2: Forecast

Actual Price (VND)		Open price	Close Price	High price	Low price
1	Tuesday	14,150	14,350	14,550	14,100
2	Wednesday	14,350	14,750	15,150	14,300
3	Thursday	14,650	14,450	14,800	14,400
4	Friday	14,250	14,050	14,450	13,450
7	Monday	13,700	13,150	14,050	13,100

**Figure 6:** Actual Price of VIB in the first week (VND)

**Source:** Summazed by the Group authors (2024)

### VIB Stock Price Forecast for Next Week:

#### 1. Next Week's Forecast:

Based on current factors, VIB's stock price is likely to continue fluctuating within a narrow range with a predominant **downward or sideways trend**.

Predicted Price (VND)		Open price	Close Price	High price	Low price
8	Tuesday	12,800	13,200	13,300	12,800
9	Wednesday	13,050	13,100	13,450	12,900
10	Thursday	12,800	12,450	12,950	12,200
11	Friday	12,700	12,450	12,800	11,750
14	Monday	12,150	12,400	12,550	11,700

**Table 7:** ChatGPT's Predicted Price for the following week (VND)

**Source:** Summazed by the Group authors (2024)

## 2. Conclusion:

- **Trend:** Downward or sideways fluctuation within a narrow range.
- **emotions:** Retail investors remain cautious, with a tendency to observe movements from VIB's leadership and the overall market.
- **Changing Conditions:** If there is new positive information, such as clear actions from the leadership or promising business plans, the stock price may recover faster than expected."

### Discussion

- ChatGPT accurately predicted the direction of the price and the emotions of the stock market.
- However, the predicted price level differed from the actual market. In reality, the stock price of VIB from November 8th to 14th declined sharply and deeply, with the lowest opening price dropping from 14,650 to 12,700 at the end of the week.

Differences in Actual and Predicted Price (VND)		Open price	Close Price	High price	Low price
8	Tuesday	-400	100	-200	0
9	Wednesday	-50	-100	-150	0
10	Thursday	-400	-850	-750	-800
11	Friday	-600	-950	-1,000	-1,350
14	Monday	-1,250	-1,100	-1,350	-1,500

**Figure 8:** Differences between Actual and Predicted Price (VND)

**Source:** Summarized by the Group authors (2024)

ChatGPT's prediction was correct in terms of the market direction. However, there was a slight discrepancy. The predicted results reflect a larger fluctuation compared to the actual results, which could lead investors to underestimate both risks and opportunities. From the table above, we can see that the initial difference is not too large, but as time goes on, there is a significant difference, which poses a significant risk to investors if they do not carefully consider the results provided by ChatGPT.

VIB		Open price	Close Price	High price	Low price
<b>Actual Price (VND)</b>					
11/1	Tuesday	12,800	13,200	13,300	12,800
11/2	Wednesday	13,050	13,100	13,450	12,900
11/3	Thursday	12,800	12,450	12,950	12,200
11/4	Friday	12,700	12,450	12,800	11,750
11/7	Monday	12,150	12,400	12,550	11,700
<b>Predicted Price (VND)</b>					
11/1	Tuesday	13,200	13,100	13,500	12,800
11/2	Wednesday	13,100	13,200	13,600	12,900
11/3	Thursday	13,200	13,300	13,700	13,000
11/4	Friday	13,300	13,400	13,800	13,100
11/7	Monday	13,400	13,500	13,900	13,200

**Figure 9:** Actual & Predicted Price of VIB

**Source:** Summazed by the Group authors (2024)

HPG		Open price	Close Price	High price	Low price
<b>Actual Price (VND)</b>					
3/7	Thursday	28,100	27,600	28,100	27,500
3/8	Friday	27,600	27,350	27,900	27,250
3/11	Monday	27,400	26,900	27,450	26,350
3/12	Tuesday	26,800	27,100	27,800	26,750
3/13	Wednesday	27,150	27,250	27,350	27,050
<b>Predicted Price (VND)</b>					
3/7	Thursday	27,500	27,300	27,800	27,000
3/8	Friday	27,300	27,000	27,500	26,700
3/11	Monday	26,900	27,200	27,600	26,600
3/12	Tuesday	27,200	27,500	27,900	26,900
3/13	Wednesday	27,400	27,800	28,200	27,200

**Table 10:** Actual & Predicted Price of HPG

**Source:** summarized by the Group authors (2024)



This study evaluates the predictive performance of an AI model in forecasting stock prices for two companies with distinct price trends. VIB exhibited an upward trend in stock prices, while HPG demonstrated a downward trend during the observation period. The primary objective is to determine the accuracy and reliability of the AI predictions by comparing them with actual stock prices using statistical measures and hypothesis testing.

The dataset consists of predicted and actual stock prices for five days. Errors were calculated as the difference between actual and predicted prices. Accuracy metrics including Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and Mean Error (ME) were used to evaluate prediction performance. Additionally, a t-test was conducted to test the null hypothesis (H0) that the mean error equals zero, indicating no systematic bias in the AI predictions.

Company	Mean Error	MAE	RMSE	t-test	p-value
VIB	580	620	755.65	2.39	0.0748
HPG	-120	380	391.15	-0.645	0.5543

**Figure 11:** Accuracy metrics of VIB and HPG

**Source:** Calculated by Group authors (2024)

A comparison of the two companies reveals that while both exhibited statistically insignificant mean errors ( $p > 0.05$ ), the predictive errors for VIB were larger (MAE = 620.0, RMSE = 755.65) than those for HPG (MAE = 380.0, RMSE = 391.15). This discrepancy might be attributed to higher price volatility or other external factors influencing VIB's stock performance. Despite this, the t-test results demonstrate that the AI model provides reliable predictions for both companies, regardless of their differing price trends.

The findings highlight the AI model's potential for accurate stock price forecasting, showcasing its adaptability to distinct stock behaviors. However, further improvements can be made by incorporating additional features, such as emotional analysis from news and social media, to capture market dynamics better. Moreover, optimizing the model for high-volatility scenarios and conducting sector-specific analyses could further enhance its robustness and predictive power.

## 6. Conclusion

### 6.1. Conclusion

In summary, ChatGPT's ability to predict stock prices still needs more testing and training, as predictions are not always accurate and there are still many discrepancies.

Significant prediction errors are caused by the lack of input information, especially information with investor comments because when GPT has access to these emotional contents, it can make more accurate predictions. Additionally, the limited number of articles or the fact that the input article data does not truly address issues crucial to financial investment can also lead to

inaccurate predictions from ChatGPT. This could lead to erroneous judgments by ChatGPT, resulting in inaccurate predictions. This is particularly evident over longer periods, where the discrepancies become more pronounced towards the end of the week, posing significant risks to investors.

It could also be because GPT's natural language processing capabilities cannot accurately predict based solely on text; they need to be further trained through various other datasets related to the finance field.

ChatGPT's prediction results can be influenced by the subjectivity of the data source. Focusing on biased articles can lead to incorrect conclusions. Even a highly influential negative article can reverse the prediction trend. This shows that ChatGPT cannot yet accurately assess the importance of each piece of information, especially when it is emotional.

Additionally, in ChatGPT's predictions, one factor that has not been considered is the number of readers of the article. If the number of readers is large enough, their actions can have a greater impact on the stock price, whereas if the number of readers is small, the emotions of a few small investors may not be enough to change the stock price. Therefore, the research team suggests adding the variable of the number of readers so that ChatGPT's predictions can be more accurate.

## **6.2. Recommendations**

To enhance ChatGPT's ability to predict stock prices, several improvements can be implemented. First, expanding the model's training data with a more diverse range of articles from various sources would provide a broader perspective on market dynamics. Second, increasing the number of training examples, particularly those involving emotional language in financial contexts, would allow the model to better understand and respond to investor emotions. Finally, incorporating the number of article readers as a variable in the prediction model could account for the influence of public opinion on stock prices. By addressing these areas, ChatGPT can become a more reliable tool for financial analysis.

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