**Investment Analysis Report for Prime INC**

**By**

**Kehinde Ogundana**

**Felix Omomah**

**Rene Fondufe**

**A hand touching a graph

Description automatically generated**

Contents

[Table of Figures 3](#_Toc190082730)

[1.0 Introduction 4](#_Toc190082731)

[2.0  Stock Market Analysis 5](#_Toc190082732)

[2.1 Data Statistics - NVDA & QUBT 5](#_Toc190082733)

[2.2 Stock Performance and Benchmark Comparison 5](#_Toc190082734)

[3.0 Predictive Modelling of Future Stock Variability 9](#_Toc190082735)

[3.1 Features Selection for Best Prediction: 9](#_Toc190082736)

[3.2 Model Selection, Building, and Training 10](#_Toc190082737)

[3.3 Model Performance Evaluation(XGBoost): 12](#_Toc190082738)

[4.0 Fundamental Analysis of NVIDIA (NVDA) 13](#_Toc190082739)

[4.1 Assessment of Key Financial Metrics 13](#_Toc190082740)

[5.0 Conclusion & Recommendations 15](#_Toc190082741)

[5.1 Investment Outlook for NVDA 15](#_Toc190082742)

# Table of Figures

[Figure 1. 1 Nvidia Corporation vs Quantum Computing Inc 4](#_Toc190082654)

[Figure 2. 1 Nvidia Returns, Stock Direction Distribution and Adjusted Closing Prices 5](#_Toc190082657)

[Figure 2. 2 Quantum Returns, Stock Direction Distribution and Adjusted Closing Prices 5](#_Toc190082658)

[Figure 2. 3 Nvidia and Quantum Stock Volatility 6](#_Toc190082659)

[Figure 2. 4 Nvidia and Quantum and S&P 500 Comparison 6](#_Toc190082660)

[Figure 3. 1 Models Training and Test Results 10](#_Toc190082477)

[Figure 3. 2 XGBoost Classification Metrics Results 11](#_Toc190082478)

[Figure 4. 1 Nvidia Fundamental Analysis 12](#_Toc190082483)

# 1.0 Introduction

This report presents a **data-driven investment analysis** for **Prime INC**, focusing on **identifying profitable stock opportunities and predicting future market trends**. The study evaluates the historical performance, volatility, and correlation of **NVIDIA Corporation (NVDA) and Quantum Computing Inc. (QUBT) with the S&P 500**, providing actionable investment insights.

To achieve this, the analysis integrates **exploratory data analysis, statistical modeling, and advanced machine learning techniques**, including **ARIMA, XGBoost, Logistic Regression, Random Forest, SVM, KNN, and deep learning models such as LSTM and CNN-LSTM**. These models are applied to forecast future stock price movements and assess investment risks.

Furthermore, a **fundamental financial analysis of NVDA** is conducted to evaluate its financial health and growth potential. Key financial metrics such as **profitability ratios, revenue growth, debt management, and return on equity** are examined to determine NVDA’s suitability as a long-term investment.

The data for this report was sourced from **Yahoo Finance (yfinance) API**, covering the period from **January 2nd, 2010, to December 31st, 2024**. Based on the findings, **NVDA emerges as the most promising investment option, backed by its strong financial performance, dominance in high-growth sectors like AI and data centres, and consistent market leadership**.

This report provides **strategic investment recommendations** to optimize **Prime INC’s** **portfolio**, ensuring a balanced approach to maximizing returns while managing risk exposure.

.

A black and white logo with a blue circle

AI-generated content may be incorrect.

Figure 1. 1 Nvidia Corporation vs Quantum Computing Inc

# 2.0 Stock Market Analysis

## 2.1 Data Statistics - NVDA & QUBT

Both datasets consist of 3,773 trading days each, with no missing values, ensuring the reliability of the analysis. The key features examined include the **trading date, adjusted closing price, closing price, high and low prices, opening price, and trading volume**. These metrics provide a comprehensive overview of stocks performance over time.

For **NVDA**, the price range varies from a minimum closing price of **$0.22** to a maximum closing price of **$148.88**. The standard deviation of high prices is **$28.54**, indicating considerable price fluctuations. The trading volume ranges from a minimum of **45.6 million** to a maximum **of 3.69 billion**, with an average volume of **497.1 million**. The stock exhibits a significant price increase, particularly between the **50th percentile ($3.54)** and the **75th percentile ($13.56),** reflecting strong growth over time.

Similarly, **QUBT** demonstrates a price range from a minimum closing price of **$0.015** to a maximum of **$238.00**. The standard deviation of high prices stands at $24.30, reflecting substantial price swings. The trading volume for QUBT ranges from zero, indicating inactive trading days, to a peak of **232.6 million**, with an average of **793,259**. Like NVDA, QUBT has experienced significant price increases over time, particularly in the upper percentiles of its price distribution.

## 2.2 Stock Performance and Benchmark Comparison

**2.2.1 Returns, Stock Direction Distribution and Adjusted Closing Prices**

**NVDA:**

An analysis of stock returns over time reveals key differences in performance.

A graph on a white sheet

Description automatically generated

Figure 2. 1 Nvidia Returns, Stock Direction Distribution and Adjusted Closing Prices

* **Stock Returns: -** The stock has a mean return of 0.19%, a standard deviation of 2.86%, indicating moderate volatility. The cumulative return stands at 32.91 showing significant long-term growth.
* **Stock Direction Distribution: -** There were **1,994** days with positive returns  and **1,779** days with negative returns. This distribution is more balanced, with positive returns occurring **52.9%** (bullish) of the time and negative returns on **47.1%** (bearish) of trading days.
* **Historical Adjusted Closing Price Trend:** In respect of  historical analysis of adjusted closing price trends, NVDA follows a consistent upward trajectory with a maximum close of $148.88.

**QUBT:**

A graph of a graph

Description automatically generated with medium confidence

Figure 2. 2 Quantum Returns, Stock Direction Distribution and Adjusted Closing Prices

* **Stock Returns: -**  The stockhas a higher mean return of 2.03% but variability is much greater with a standard deviation of 39.56%, reflecting high risk. The mean cumulative return is a low 0.035, indicating minimal long-term growth.
* **Stock Direction Distribution:-**  There were **2,893** days with negative returns and **880** days with positive returns. This indicates that QUBT experienced negative price movements on approximately **76.7%** (bearish) of trading days, while positive returns occurred only **23.3%** (bullish) of the time significantly underperforming NVDA.
* **Historical Adjusted Closing Price Trend:-** The QUBT adjusted closing price experiences sharp fluctuations with maximum close price at $238.00 but had lower average prices, indicating more sporadic performance, indicative of speculative trading patterns.

**2.2.2 Stock Volatility, S&P 500 Comparison using Correlation and Regression Analysis**

The volatility analysis provides a deeper understanding of the stock performance of NVDA and QUBT relative to the broader market.

**A graph of a graph

Description automatically generated with medium confidence**

Figure 2. 3 Nvidia and Quantum Stock Volatility

**NVDA:**

* **Volatility:** The analysis over time, using a 21-day rolling volatility measure, highlights further distinctions. **NVDA's** average volatility, though relatively low at **2.62%,** reflects consistent performance and its status as a stable, blue-chip growth stock.
* **S&P 500 Comparison:**

The S&P500's average volatility (0.93%)  serves as a benchmark, highlighting NVDA's market alignment and QUBT's extreme variability, indicating that NVDA is more stable than QUBT but still exhibits higher volatility than the broader market.

A black and white sign with white text

Description automatically generated

Figure 2. 4 Nvidia and Quantum and S&P 500 Comparison

* **Correlation Analysis:** A correlation analysis between NVDA and the S&P 500 reveals a high positive correlation of **0.623,** indicating that NVDA’s performance closely aligns with broader market trends. This correlation underscores NVDA’s sensitivity to macroeconomic conditions, reinforcing its position as a market-responsive stock.
* **Regression Analysis:** The regression analysis further supports this, with an R-squared value of 38.8%, meaning that nearly 39% of NVDA’s return variability can be explained by the S&P 500’s movements. Additionally, the coefficient of 1.6425 indicates that NVDA’s returns are amplified by market trends, demonstrating a leverage effect. With a p-value below 0.001, this relationship is statistically significant, making NVDA a more predictable stock for investors seeking stability within market fluctuations.

**QUBT:**

* **Volatility:**  In contrast, QUBT exhibits an entirely different volatility profile, with an **average volatility of 16.93%**, making it significantly more unstable than NVDA. This high level of volatility highlights QUBT’s speculative nature and reinforces the stock’s risk exposure.
* **S&P 500 Comparison:**
* **Correlation Analysis:** A correlation analysis between QUBT and the S&P 500 reveals a weak correlation of just 0.032, indicating that QUBT operates independently of broader market trends. This lack of correlation suggests that QUBT could serve as a diversification asset in a portfolio but comes with substantial risk.
* **Regression Analysis:** Regression analysis confirms QUBT’s independence from market trends, with an R-squared value of only 0.1%, demonstrating that the S&P 500 has minimal influence over QUBT’s returns. The coefficient of 1.1620 suggests only marginal sensitivity to market fluctuations, and with a p-value of approximately 0.05, its significance is weak. These findings reinforce QUBT’s speculative nature, making it highly unpredictable and unsuitable for risk-averse investors.

**2.2.3 Comparative Returns Investment Suitability for Prime INC**

When considering both return potential and volatility, **NVDA** emerges as a more stable and reliable investment. It offers substantial returns with moderate risk, making it suitable for **growth-oriented portfolios** that seek steady appreciation over time. **NVDA’s** alignment with broader market trends provides investors with a more predictable asset, ensuring long-term stability.

On the other hand, **QUBT** presents a high-risk, high-reward scenario. While its return potential can be substantial, its extreme volatility and speculative nature may not align with **conservative investment strategies**. **QUBT** is better suited for traders who are comfortable with sharp price swings and willing to take on greater risk for potential high rewards.

**Best Portfolio Strategy:**

For PRIME Inc., a strategic investment approach would favor **NVDA** as the preferred stock due to its stability, market sensitivity, and long-term growth potential. **NVDA** offers moderate risk with steady returns, making it ideal for investors seeking sustainable portfolio appreciation. Conversely, **QUBT** should be considered a speculative asset, more suitable for short-term traders who are willing to accept high volatility for the possibility of substantial short-term gains

# 3.0 Predictive Modelling of Future Stock Variability

To forecast future stock movements, Following the analysis of NVDA and QUBT, NVDA appears to be the better investment. Therefore, we will create technical indicators to analyze its stock price movement and enhance prediction accuracy and we employed various time series.

These are derived from historical price and volume data and are used to predict future movements:

* **Moving Averages (SMA, EMA):** Identify trends by smoothing price data over a specified period.
* **Relative Strength Index (RSI):** Measures momentum to determine if a stock is overbought or oversold.
* **Moving Average Convergence Divergence (MACD):** Analyzes trend strength and momentum using moving averages.
* **Volume:** Confirms the strength of price movements based on trading activity.
* Stochastic Oscillator: Compares closing prices to a range over time to assess momentum.
* **Williams %R:** Identifies overbought and oversold conditions by measuring price relative to highs and lows.
* **Price Rate of Change (ROC):** Tracks the speed of price movements to gauge momentum.

## 3.1 Features Selection for Best Prediction:

We used some models Correlation Matrix Heatmap and VIF Calcuation and PCA to determine the best features to use for our prediction

* **Correlation and  Variance Inflation Factor (VIF) Analysis** reveals that High VIF Features to remove  are Features such as Adj Close, Close, High, Low, Open, SMA\_20, EMA\_20, etc., exhibit multicollinearity (VIF > 5), meaning they are highly correlated with other features and do not contribute new information while Low VIF Features (to keep)  are Features like MACD, RSI, Price\_ROC, Returns, Returns\_sp500, Volatility, and Volume have low VIF values (≤ 5), indicating they provide independent and useful information.
* **PCA:**  The Cumulative Variance Ratio reveals that only 3 features were needed to explained  variance of 79% while additional 6 features will explain 94%. The top best six (6) features indicated by PCA to explained the cumulative 94% variance are  Returns\_sp500, Volatility, Volume, Price rate of Change, RSI, and Williams\_%R

## 3.2 Model Selection, Building, and Training

For this analysis, we will use a combination of traditional statistical models, machine learning (ML) models, and deep learning (DL) models to predict stock price movements.

* **Traditional Model**

**1. ARIMA:** A time-series forecasting model that captures trends and seasonality.

* **Machine Learning (ML) Models**

**2. KNN Classifier:** Classifies data points based on their nearest neighbors.

**3. Decision Tree:** A rule-based model that splits data into decision nodes for classification.

**4. Random Forest:** An ensemble of decision trees that improves accuracy and reduces overfitting.

**5. XGBoost:** A gradient boosting algorithm optimized for high performance.

**6. SVM (Support Vector Machine):** Classifies data by finding the optimal hyperplane.

**7. Logistic Regression**: A statistical model used for binary classification.

* **Deep Learning (DL) Models**

**8. LSTM (Long Short-Term Memory):** A recurrent neural network (RNN) designed for sequential data.

**9. CNN-LSTM:** A hybrid deep learning model that combines CNN for feature extraction and LSTM for sequential analysis.

**A screenshot of a graph

Description automatically generated**

Figure 3. 1 Models Training and Test Results

The goal  to predict Stock\_Direction using different sets of features, and we tested multiple classifiers under two conditions yielded the results below ;

**Using 6 features suggested by PCA:**

* **Best Model (Train Accuracy):** DecisionTreeClassifier (1.000)
* **Best Model (Test Accuracy):** LogisticRegression (0.5352)

**DecisionTree (100%)** are performing exceptionally well on the training data but **generalizing poorly to test data which**  suggests that **11 features are not enough** to capture meaningful patterns in stock direction, causing **high variance**  thus The models are learning patterns too specific to training data and failing on unseen data.

**Using All X-features:**

* **Best Model (Train Accuracy):** DecisionTreeClassifier (1.000)
* **Best Model (Test Accuracy):** XGBClassifier (0.67)

By adding more features, **XGBoost(0.94 → 0.67 test accuracy), known for robust model that can handle noisy stock market data well** shows a significant improvement in generalization which  improves the model’s ability to find meaningful signals instead of memorizing the training data.

**Therefore XGBoost is the best choice for stock prediction in this scenario.**

## 3.3 Model Performance Evaluation (XGBoost):

A graph of a graph

Description automatically generated with medium confidence

Figure 3. 2 XGBoost Classification Metrics Results

**3.3.1 Precision, Recall, F1 Score, and AUC-ROC Curve**

The model's performance evaluation metrics indicate a precision of 66.59%, meaning that when the model predicts an "up" movement, it is correct approximately 66.59% of the time. The recall stands at 74.05%, reflecting the model’s ability to correctly identify "up" instances among all actual "up" cases. The F1 score of 70.12% balances precision and recall, providing a comprehensive measure of the model's effectiveness. Additionally, the AUC-ROC score of 0.74 suggests a strong discriminatory ability between the "up" and "down" stock movement classes.

**3.3.2 Confusion Matrix Analysis**

An analysis of the confusion matrix highlights the model's misclassification tendencies. The model incorrectly classified 146 instances (33%) of "down" movements as "up", indicating a tendency to overpredict upward trends. Similarly, 105 instances (33%) of "up" movements were misclassified as "down", demonstrating a degree of uncertainty in identifying true upward trends. These misclassifications impact the overall predictive reliability and suggest potential areas for model refinement.

**3.3.3 Actual vs. Predicted Instances**

When comparing actual versus predicted values, the model correctly predicted 7 out of 10 instances (70%), aligning with the AUC-ROC curve's performance indication. This result suggests that while the model performs well in classifying stock movements, further optimization may enhance its predictive accuracy and reduce misclassification rates.

# 4.0 Fundamental Analysis of NVIDIA (NVDA)

A screenshot of a graph

AI-generated content may be incorrect.

Figure 4. 1 Nvidia Fundamental Analysis

## 4.1 Assessment of Key Financial Metrics

**4.1.1 Financial Performance Over the Past Four Years**

**NVIDIA (NVDA**) has demonstrated remarkable financial performance, solidifying its position as a leading technology company. The company's **gross profit margin increased significantly to 72.72% in 2024, up from 56.93% in 2023**, showcasing improved operational efficiency and pricing power. Additionally, **operating and net profit margins surged to 54.12% and 48.85%,** respectively, indicating effective cost management and strong demand for its products. Despite previous fluctuations in revenue and earnings growth, the latest fiscal year reflects a turnaround, positioning NVDA for sustained profitability.

**4.1.2 Capital Structure Evolution**

**NVDA** has maintained **a strong and balanced capital structure, with a debt-to-equity ratio of 0.53 in 2024, down from 0.86 in 2023**. This reduction suggests prudent financial management and a decreasing reliance on debt. Furthermore, the company’s **current ratio of 4.17** highlights strong liquidity, ensuring sufficient assets to cover short-term liabilities. These factors collectively indicate NVDA's financial stability and ability to sustain future growth.

**4.1.3 Future Growth and Profitability Outlook**

**NVDA's** strategic focus on **high-growth sectors such as artificial intelligence, data centers, and semiconductor advancements** positions the company as a key player in the evolving technology landscape. With continuous innovation and expanding market opportunities, **NVDA** is expected to sustain its **high return on equity (69.24%) and return on assets (45.28%),** making it a lucrative investment option.

# 5.0 Conclusion & Recommendations

## 5.1 Investment Outlook for NVDA

Based on a comprehensive financial analysis, **NVDA stands out as a highly attractive investment opportunity, demonstrating strong profitability, financial stability, and long-term growth potential. Its market capitalization has surpassed $2.64 trillion, reinforcing its dominant market position.**

**Recommendations:**

* **Strategic Investment:** Allocate a **significant portion** of the investment portfolio to NVDA to capitalize on its strong financial performance and growth trajectory.
* **Risk Management:** While NVDA exhibits financial stability, continuous monitoring of market trends and company performance is essential for informed investment decisions.
* **Long-Term Growth Potential:** NVDA's leadership in AI and semiconductor technologies makes it a prime candidate for long-term investment, aligning with growth-oriented investment strategies.

By leveraging **NVDA’s robust financial health and industry leadership, Prime INC** can optimize its investment strategy and achieve sustainable returns.