

Investment Strategy

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Task: Use Stock Diversification Principles to decide how J\$50 million JMD will be spent across five (5) stocks namely: Grace Kennedy (GK), Caribbean Cement Company Limited (CCC), 138 Student Living Jamaica Limited (138SL), Jamaica Broilers Group (JBG), & Jamaica Public Service (JPS7).

Overview

Jamaica Stock Exchange Data was collected on Quarterly Stock Data across all the above-mentioned stock options to conduct the Short-Term Investments for the objectives of this challenge. Five (5) ARIMA models were built to forecast the future closing prices of each of the five (5) stocks up until Tuesday Closing Day. Additionally, the investment strategy also incorporates the use of Sentiment analysis as well as other forms of Technical and Fundamental analysis. This included paying attention to recent candlestick patterns and trading volume signals – *which was complemented with intensive research* as well as using data in dividend reports. These methods were all used to make the most informed decision regarding the diversified investments.

Grace Kennedy Stock - (GK)

The ARIMA model for Grace Kennedy Stock (GK) was developed by loading the data, checking for stationarity with the Augmented Dickey Fuller (ADF) Test, and applying differencing once to achieve stationarity. The model parameters were determined by examining the ACF and PACF plots. Different models were evaluated based on AIC, BIC, and MSE, with the BIC model of order (1,1,1) selected for our forecasting requirements. The forecasted Tuesday EOD Closing price under BIC was \$75.49. Additionally, Performance metrics such as MAE, MSE, RMSE, and F1 score were used to assess the quality of our model across training and testing sets which showed no signs of underfitting nor overfitting for the regression metrics. The F1 Score across training and testing scores were a cause for concern and this merited further research.

The model forecasted the same closing price as the Friday EOD Stock Price, which indicates a forecast of no price movement. This suggests that the model failed to capture the price variability for making an accurate Tuesday EOD Stock closing price prediction, signifying signs of model underfitting. As a result of this, other forms of technical and fundamental analysis were employed for a more comprehensive insight into forecasting the price direction for GK Stock.

A recent trading volume spike on the 22nd of November 2023 was observed in the GK stock market. Further research into the likelihood of this revealed that the company declared an Interim Payment dividend on the 15th of December 2023 to stockholders on record at the close of business on the 24th of November. This volume spike may have been attributed to investors buying stocks before the ex-dividend date (Dividend Capture) on the 23rd of November.

The company's register of members will be closed until the 1st of December. This could discourage day-to-day trading due to potential delays in recording stock ownership, possibly resulting in low trading activity this week. Consequently, we have decided to invest **\$10,000,000 JMD** in GK as this week's trading market may not yield significant profits for our investment portfolio. However, we recognize the long-standing quality of this Blue-Chip Stock, which is why this report aims to assign a significant investment.

Caribbean Cement Company - (CCC)

The ARIMA model for Caribbean Cement Stock (CCC) was developed by loading the data into the model. The stationarity of the data was then checked using the Augmented Dickey Fuller (ADF) Test. The p-value obtained from this test was 0.01488, which is less than the significance level (alpha) of 0.05. This indicated that the data was already stationary, and therefore, no differencing was needed.

The parameters for the ARIMA model were determined by examining the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) plots. The ACF plot showed a geometric decay, which suggested that there was no moving average component in the data. The order of the ARIMA model was selected to be (1,0,0). This decision was made after evaluating different models based on their (AIC), (BIC), and (MSE). The options suggested by the grid search under AIC and MSE would have led to over-differencing the data, which can result in the loss of essential information from the stock data. Therefore, the ARIMA(1,0,0) model was retained for our forecasting requirements.

The performance of the ARIMA model was assessed using metrics such as the Mean Absolute Error (MAE), Mean Squared Error (MSE), and Root Mean Squared Error (RMSE). The model predicted that the Tuesday End of Day (EOD) closing price would be \$51.00, which shows a decrease from the Friday EOD stock price of \$51.39. In addition to the ARIMA model, the researcher also used candlestick patterns to predict market movement. The recent price changes formed a bearish engulfing series of candlesticks, indicating selling pressure in the market. An analysis of the three-month market

window suggested that the price has hit a resistance level in the market, confirming our assumptions about the selling pressure in the market. Given the presence of this, the investment decision was made to invest the sum of **\$7,000,000 JMD in CCC**. This decision assumes that the current market won't contribute substantial profits to our investment portfolio.

138 Student Living Jamaica - 138SL

The ARIMA model for 138 Student Living Jamaica was developed by loading the data, checking for stationarity with the Augmented Dickey Fuller (ADF) Test, and applying differencing once. The model parameters were determined by examining ACF and PACF plots. Different models were evaluated based on AIC, BIC, and MSE, with the BIC model of order (1,1,1) selected for our forecasting requirements.

The forecasted Tuesday EOD Closing price was \$4.16. Additionally, Performance metrics such as MAE, MSE, RMSE, and F1 score were used to assess the quality of our model across training and testing sets. The price of \$4.16 shows a decline from Friday's EOD price of \$4.22. As it pertains to the performance metrics, the model showed test scores are slightly lower than the training scores except for the F1 Score. This highlights that the model has generalized well to new data, but the F1 Score showed challenges in generalizing well for classification metrics. Considering this as well as aiming to make the most informed investment decision, the researcher turned to observing other technical analysis data in the stock market for more insights into the future price direction.

The 138SL Stock market revealed a current bearish trend in the stock market as indicated by correction from hitting a 3-week market resistance level. Based on this observation, it is expected that the market price will continue in this bearish trend. This was consistent with the ARIMA model Forecasts.

Based on this observation, our investment decision will be to invest the sum of **\$6,000,000 JMD in JPS7**.

Jamaica Public Service - JPS7

The ARIMA model for Jamaica Public Service (JPS7) was developed by first loading the data into the model. The stationarity of the data was then checked using the Augmented Dickey Fuller (ADF) Test which revealed that the data was already stationary, and therefore, no differencing was applied to the data.

The parameters for the ARIMA model were determined by examining the Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) plots which revealed that the values for p and q were 1 and 1. The order of the ARIMA model was selected to be (1,0,1). This decision was made after evaluating different models based on their

(AIC), (BIC), and (MSE). Additionally, Performance metrics such as MAE, MSE, RMSE, and F1 score were used to assess the quality of our model across training and testing sets. The forecasted Tuesday EOD Closing price was \$46.68 confirming a bullish trend. Additionally, Performance metrics such as MAE, MSE, RMSE, and F1 score were used to assess the quality of our model across training and testing sets. The price of \$46.68 shows an increase from Friday's EOD price of \$46.00.

To make the most informed investment decision, the researcher turned to observing other forms of technical analysis data in the stock market to gain more insights into the future price direction. This involved looking at the most recent Nov 21- Nov 23 candlestick patterns which revealed an Inversed Hammer pattern. This bullish trend indicates an upward trend to test the \$50 level of resistance up from the \$40 level of support in the JPS7 Market. This is consistent with the bullish trend that was forecasted in the ARIMA Model. Considering this and the degree of non-volatile trading volume in the market, our investment decision will be to invest the sum of **\$25,000,000 JMD in JPS7** to make the most returns on our investment portfolio.

Jamaica Broilers Group - JBG

The ARIMA model for Jamaica Broilers Group (JBG) was developed by loading the data, checking for stationarity with the Augmented Dickey Fuller (ADF) Test, and applying differencing once. The model parameters were determined by examining ACF and PACF plots. Different models were evaluated based on AIC, BIC, and MSE, with the BIC model of order (0,1,0) selected for our forecasting requirements. The forecasted Tuesday EOD Closing price was \$34.0. Additionally, Performance metrics such as MAE, MSE, RMSE, and F1 score were used to assess the quality of our model across training and testing sets.

The model predicted the same price as the Friday EOD Stock Price, indicating no price movement. This suggests the model failed to capture the price variability for accurate Tuesday EOD Stock closing price prediction signifying signs of underfitting. As a result of this, the researcher utilized other forms of technical analysis so that a more comprehensive insight into the price direction for JBG Stock could be observed.

Based on the principles of Technical Analysis using Candlestick patterns, JPS7 stock prices in the market showed signs of reversal from the \$35 level of resistance indicating a current bearish trend. It was observed that prices had hit this resistance level on Nov 6th -7th, Nov 10th- Nov 13th, Nov 20th and Nov 23rd and it is currently receding from this zone of resistance. Based on the current market position, our investment decision will be to invest the sum of **\$2,000,000 JMD in JBG**.