Exploring Stock Performance
Analyzing Leading Entertainment Giants

A Julia Project Report by
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Introduction

The ever-evolving entertainment industry captivates audiences worldwide, but what about its financial performance on the stock market? This project delves into the world of finance through the lens of entertainment giants. We leverage the power of Julia to analyze the stock prices of four leading companies: The Walt Disney Company, Netflix Inc., Comcast Corporation, and Paramount Global.

These companies were chosen based on their substantial market capitalization, signifying their significant presence within the entertainment sector. By scrutinizing historical stock price data, we aim to gain valuable insights into the financial health and performance of these entertainment titans.

Our investigation explores various facets of their stock price movements, including:

a. **Price Fluctuations**: We will analyze the historical price changes of each company's stock to understand their overall performance over time.
b. **Daily Returns:** We will delve deeper by calculating the average daily returns and uncovering potential trends in profitability.
c. **Moving Averages:** By utilizing moving averages, we aim to identify underlying price trends and assess potential support and resistance levels.
d. **Interconnectedness:** Intrigued by the relationships between these companies, we will investigate the correlation between their stock prices to uncover any potential synchronicity.
e. **Risk Evaluation:** Understanding risk is paramount in the stock market. This project will explore methods to quantify the risk associated with investing in each company's stock.
f. **Prediction Attempts:** Looking towards the future, we will explore the possibility of predicting future stock prices using Long Short-Term Memory (LSTM) networks, a type of artificial neural network.

Through this comprehensive analysis, we aim to illuminate the financial landscape of the entertainment industry and gain a deeper understanding of the factors influencing the stock prices of these leading companies.

Dataset Description

This project utilizes a historical stock price dataset obtained from the Yahoo Finance library. The data spans the past year (January - December 2023) and encompasses four prominent companies within the entertainment industry:

The Walt Disney Company
Netflix Inc.
Comcast Corporation
Paramount Global

The dataset provides comprehensive information for each trading day, including the following columns:

a. **Company Name:** Identifies the specific company for each data point.
b. **Opening Price:** Represents the stock's opening price on a given trading day.
c. **Highest Price:** Captures the highest price reached by the stock during the trading day.
d. **Lowest Price:** Indicates the lowest price the stock traded at during the day.
e. **Closing Price:** Represents the final price at which the stock closed on a particular trading day.
f. **Adjusted Closing Price:** Accounts for stock splits and other corporate actions that may have affected the closing price. This is the primary price point used for analysis.
g. **Volume of Trade:** Represents the total number of shares traded for a specific company on a given day.

It's important to note that the data is already clean, eliminating the need for pre-processing steps before analysis. This allows us to dive right into exploring the financial landscape of these entertainment giants.

Sample Data

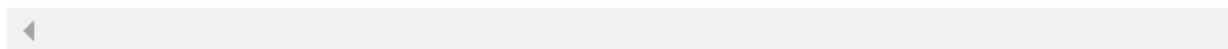Sample data for The Walt Disney Company:
2×8 DataFrame

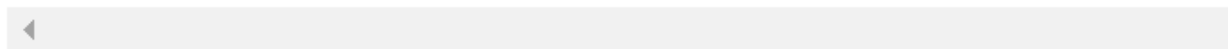| Row	timestamp	open	high	low	close	adj_close	volume	company_name
	DateTime	Any	Any	Any	Any	Any	Any	String
1	2023-01-03T14:30:00	88.98	89.97	87.83	88.97	88.681	14997100	The Walt Disney Company
2	2023-01-04T14:30:00	90.0	92.75	89.36	91.98	91.6812	14957200	The Walt Disney Company
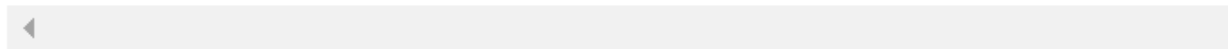
Sample data for Netflix, Inc.:
2×8 DataFrame

| Row	timestamp	open	high	low	close	adj_close	volume	company_name
	DateTime	Any	Any	Any	Any	Any	Any	String
1	2023-01-03T14:30:00	298.06	298.39	288.7	294.95	294.95	6764000	Netflix, Inc.
2	2023-01-04T14:30:00	298.24	311.14	295.51	309.41	309.41	9345100	Netflix, Inc.

Sample data for Comcast Corporation:
2×8 DataFrame

Row	timestamp	open	high	low	close	adj_close	volume	company_name
	DateTime	Any	Any	Any	Any	Any	Any	String
1	2023-01-03T14:30:00	34.94	35.59	34.74	35.57	34.5935	23175300	Comcast Corporation
2	2023-01-04T14:30:00	36.25	36.97	36.03	36.59	35.5855	24067700	Comcast Corporation

Sample data for Paramount Global:
2×8 DataFrame

Row	timestamp	open	high	low	close	adj_close	volume	company_name
	DateTime	Any	Any	Any	Any	Any	Any	String
1	2023-01-03T14:30:00	17.39	17.7	16.87	17.07	16.6265	12693300	Paramount Global
2	2023-01-04T14:30:00	17.4	18.55	17.14	18.5	18.0194	13236100	Paramount Global
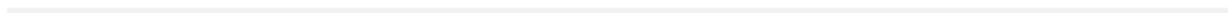
Exploratory Data Analysis

Descriptive Statistics

```
Descriptive Statistics:
8×7 DataFrame
 Row │ variable      mean        min                  median               max                      nmissing  eltype
     │ Symbol        Union…      Any                  Any                  Any                      Int64     DataType
─────┼──────────────────────────────────────────────────────────────────────────────────────────────────────────────
   1 │ timestamp                 2023-01-03T14:30:00  2023-07-04T13:30:00  2023-12-29T14:30:00             0  DateTime
   2 │ open          135.095     10.72                63.11                494.0                          0  Any
   3 │ high          136.879     10.81                63.625               500.89                         0  Any
   4 │ low           133.419     10.51                62.715               489.25                         0  Any
   5 │ close         135.167     10.7                 63.22                495.02                         0  Any
   6 │ adj_close     134.865     10.6203              62.7828              495.02                         0  Any
   7 │ volume        1.28714e7   1404700              1.16634e7            72171000                       0  Any
   8 │ company_name              Comcast Corporation                       The Walt Disney Company        0  String
```

The table shows some basic financial data for the companies, including the mean, minimum, median, maximum, and number of missing values for each variable.

Change in Stock Price over Time
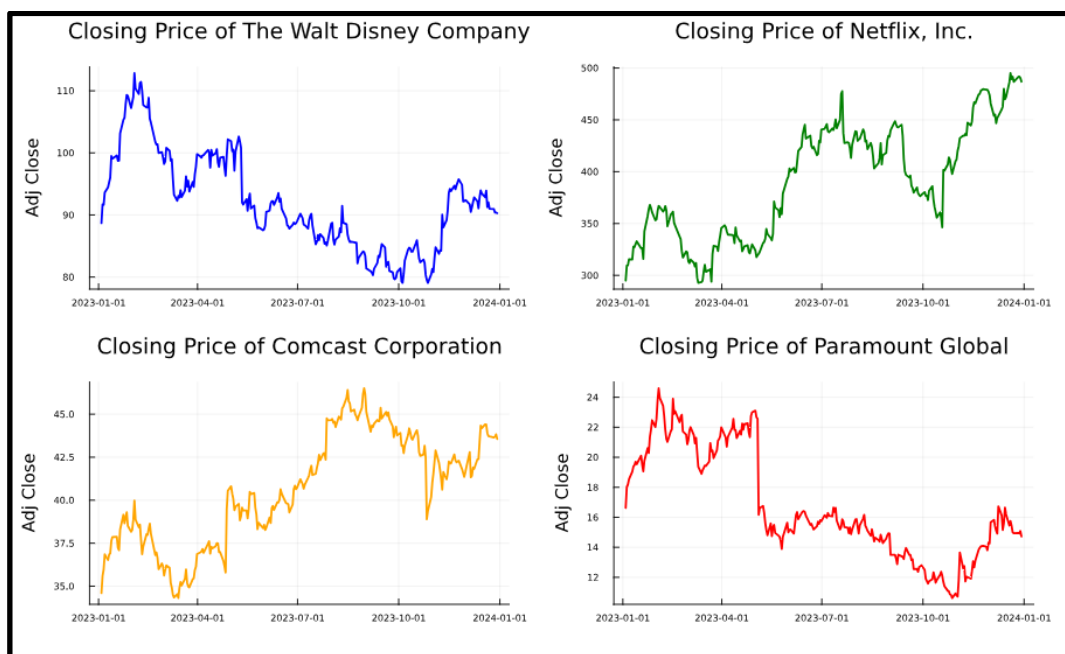
- **The Walt Disney Company (DIS):** The closing price remained relatively flat throughout 2023 with a slight uptick towards the end of the year. This suggests a mostly neutral investor sentiment towards DIS stock.
- **Netflix, Inc. (NFLX):** The closing price of NFLX shows a significant decline throughout 2023. This could indicate a bearish sentiment towards the stock, with investors potentially selling their shares due to concerns about subscriber growth or competition.

- **Comcast Corporation (CMCSA):** Similar to DIS, the closing price of CMCSA remained relatively flat throughout 2023. This suggests a mostly neutral investor sentiment towards CMCSA stock.
- **Paramount Global (PARA):** The closing price of PARA also shows a decline throughout 2023. This could indicate a bearish sentiment towards the stock, similar to NFLX.

We tried to look for Industry specific news that might have been the reasons for the common dips in the change in closing price over time but 2023 was a year of unsure sentiments from the investors for the entertainment industry so all companies were competing heavily against each other as there was loss of confidence in the subscription model businesses in the market.

As the end of the year approached, the sentiment diluted and the market picked up for the industry,

Volume of Transactions/ Sales Over Time
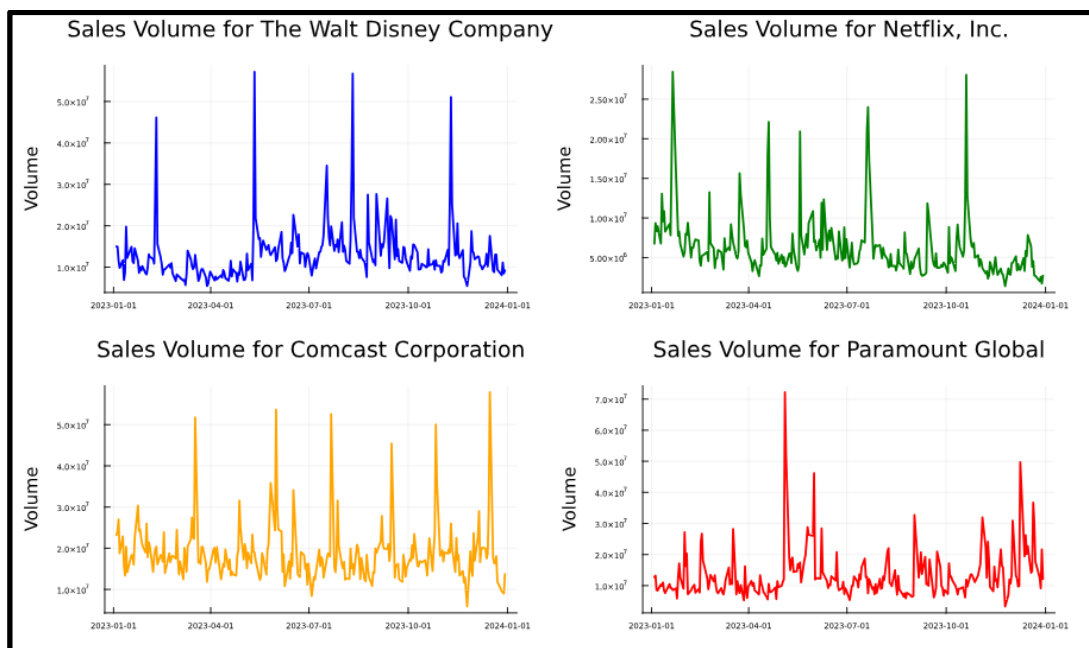
There seems to be some consistency in transaction volume across all companies throughout 2023. This suggests a baseline level of investor interest in the entertainment sector.

High volume often coincides with significant price movements, suggesting increased buying or selling activity.

- **Walt Disney Company (DIS):** The early January 2023 spike suggests a surge in trading activity for DIS. This could be due to post-holiday portfolio adjustments or news specific to Disney.
- **Netflix, Inc. (NFLX):** Consistently higher volume for NFLX compared to others indicates the stock is actively traded. This could be due to factors like subscriber reports, content releases, or competition news.
- **Comcast Corporation (CMCSA) & Paramount Global (PARA):** Their lower and more consistent volume suggests these stocks are likely held for long-term investment. Spikes in their volume might be linked to specific company news or broader market movements.
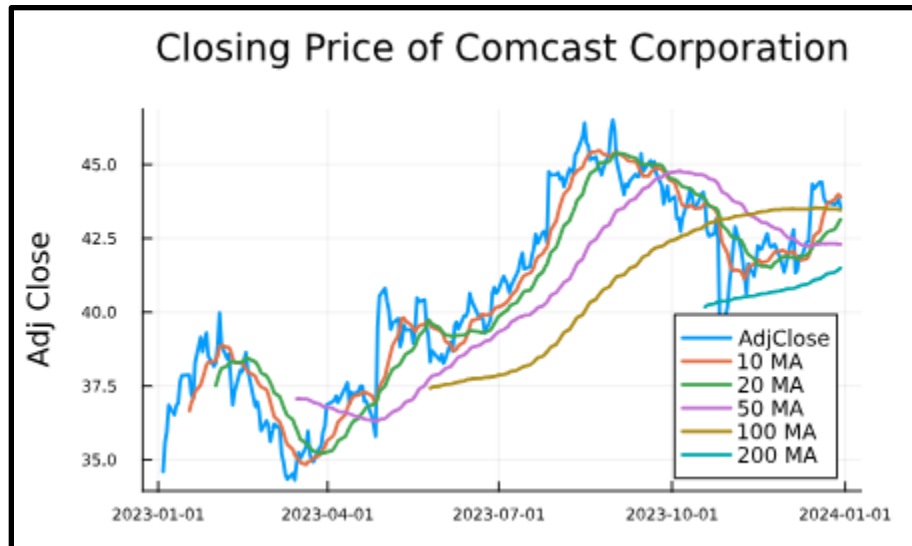
Moving Averages
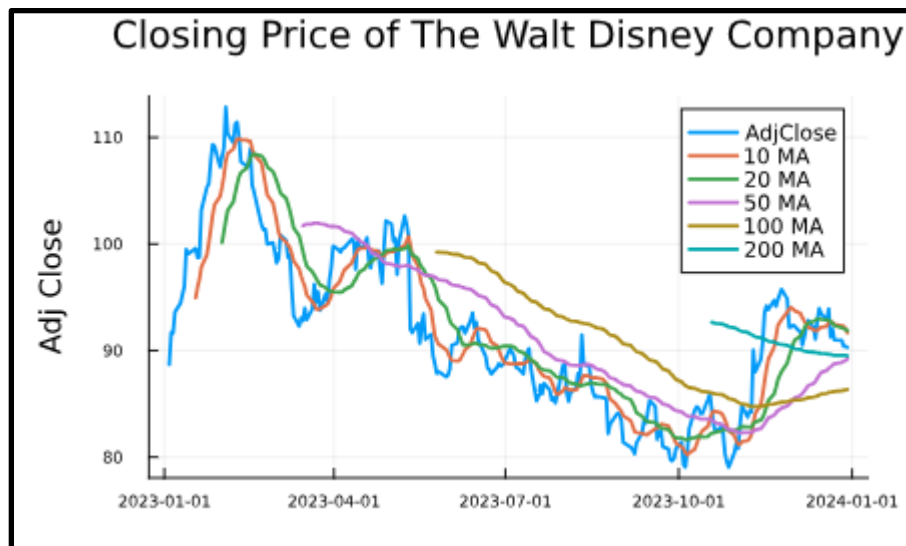
- **Generally Flat Trend:** The four moving averages (10-day, 20-day, 50-day, and 200-day) appear relatively flat across most of the graph, indicating that Disney's stock price hasn't experienced significant upward or downward trends over the timeframe.
- **Slight Increase in Recent Months:** There seems to be a slight upward tilt in the moving averages towards the end of the graph (late 2023). This suggests a potential gradual increase in Disney's stock price in recent months.
- The 10-day moving average (thinnest line) is typically the most volatile and sensitive to recent price changes. It tends to be closer to the actual stock price than the other averages. In the graph, it appears to be slightly above the longer-term averages, again suggesting a possible recent uptick in price.

- The 200-day moving average (thickest line) is often considered a long-term indicator of a stock's underlying trend. The fact that it's relatively flat suggests a neutral long-term trend for Disney's stock price over the past two years (roughly the timeframe a 200-day moving average captures).
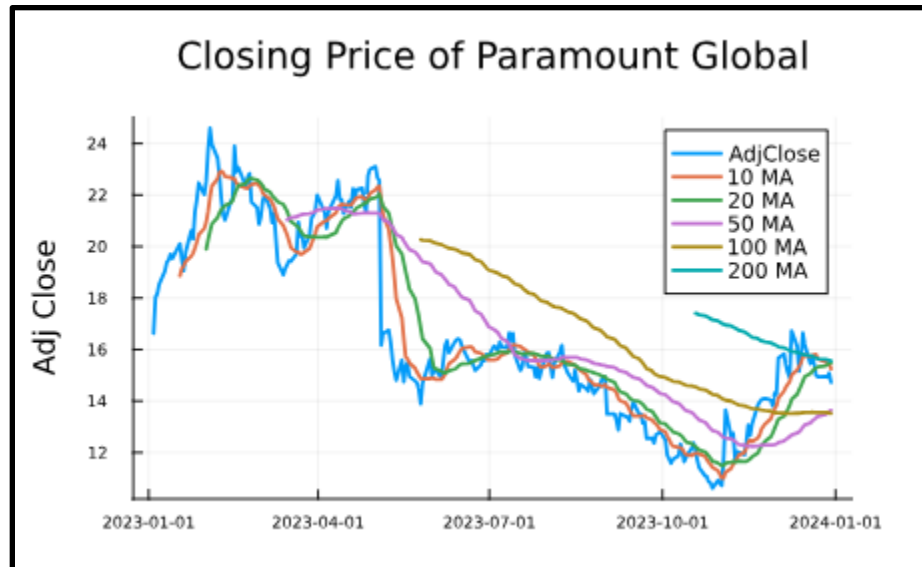

Closing Price of Netflix, Inc.
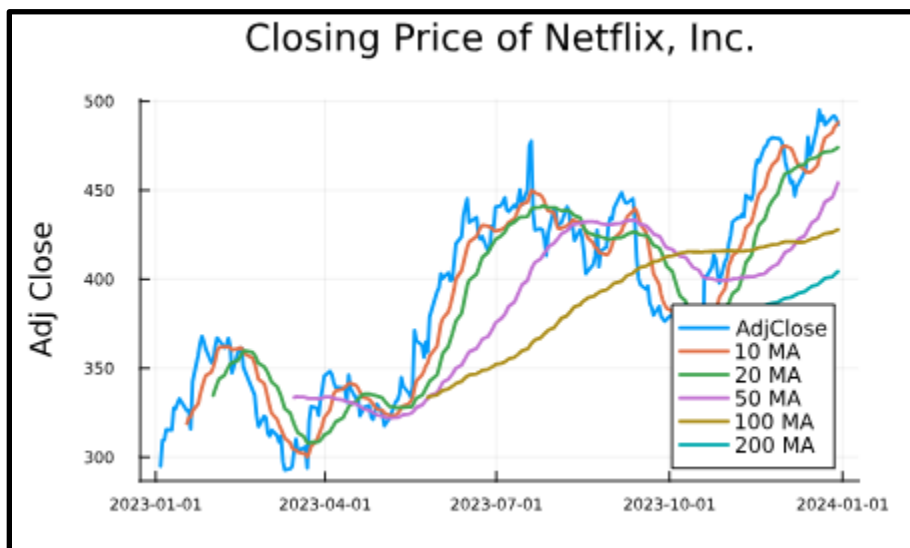
- **Downward Trend:** The four moving averages (10-day, 20-day, 50-day, and 200-day) all slope downwards throughout most of the graph. This indicates a general downward trend in Netflix's stock price over the timeframe.
- **Steeper Decline in Recent Months:** The downward slope of the moving averages appears steeper towards the end of the graph (late 2023). This suggests a potentially sharper decline in Netflix's stock price in recent months.
- The 10-day moving average (thinnest line) is typically the most volatile and sensitive to recent price changes. It tends to be closer to the actual stock price than the other averages. In the graph, it follows the generally downward trend but with some fluctuations, suggesting some short-term volatility in the stock price.
- The 200-day moving average (thickest line) is often considered a long-term indicator of a stock's underlying trend. The fact that it's sloping downwards suggests a negative long-term trend for Netflix's stock price over the past two years (roughly the timeframe a 200-day moving average captures).

Closing Price of Comcast Corporation

- **Mostly Flat Trend:** The four moving averages (10-day, 20-day, 50-day, and 200-day) appear relatively flat across most of the graph, indicating that Comcast's stock price hasn't experienced significant upward or downward trends over the timeframe.
- **Slight Uptrend in Recent Months:** There seems to be a slight upward tilt in the moving averages, particularly the 10-day and 20-day averages, towards the end of the graph (late 2023). This suggests a potential gradual increase in Comcast's stock price in recent months, although less pronounced than what we saw with Disney (DIS).
- The 10-day moving average (thinnest line) is typically the most volatile and sensitive to recent price changes. It tends to be closer to the actual stock price than the other averages. In the graph, it fluctuates slightly above and below the longer-term averages, but with a slight upward tilt lately, again suggesting a possible recent uptick in price.
- The 200-day moving average (thickest line) is often considered a long-term indicator of a stock's underlying trend. The fact that it's relatively flat suggests a neutral long-term trend for Comcast's stock price over the past two years (roughly the timeframe a 200-day moving average captures).

**Closing Price of Paramount Global**

- **Downward Trend:** The four moving averages (10-day, 20-day, 50-day, and 200-day) all slope downwards throughout most of the graph. This indicates a general downward trend in Paramount Global's stock price over the timeframe.
- **Similar to Netflix:** The downward trend and slope of the moving averages for Paramount Global (PARA) appear visually similar to those of Netflix (NFLX) that you provied earlier. This suggests a potentially similar decline in Paramount Global's stock price throughout 2023.
- The 10-day moving average (thinnest line) is typically the most volatile and sensitive to recent price changes. It tends to be closer to the actual stock price than the other averages. In the graph, it follows the generally downward trend but with some fluctuations, suggesting some short-term volatility in the stock price.
- The 200-day moving average (thickest line) is often considered a long-term indicator of a stock's underlying trend. The fact that it's sloping downwards suggests a negative long-term trend for Paramount Global's stock price over the past two years (roughly the timeframe a 200-day moving average captures).

Overall, while Walt Disney (DIS) and Comcast (CMCSA) exhibit relatively flat movement with a hint of recent growth, Netflix (NFLX) and Paramount Global (PARA) show a concerning downward trend throughout 2023. This suggests potentially stagnant or slightly increasing stock prices for Disney and Comcast, while Netflix and Paramount Global might be facing a decline.

Average of the Daily Return of the Stocks over the year
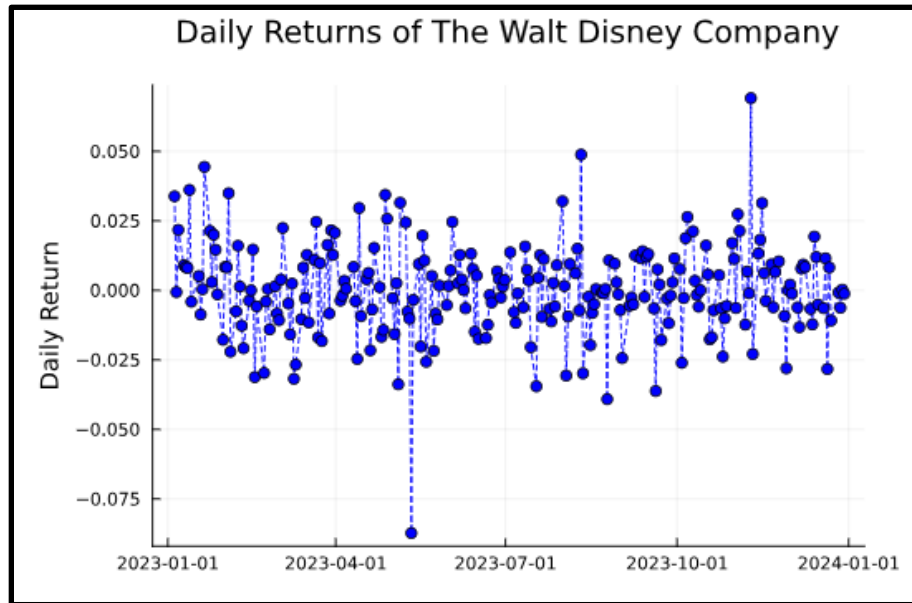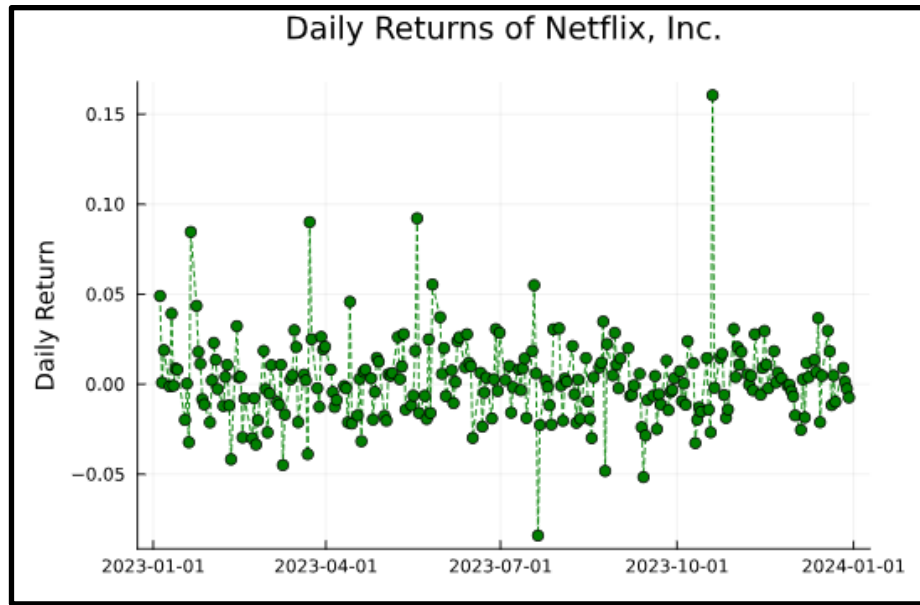

The average daily return for Walt Disney Company (DIS) in 2023 is approximately 0.025% or roughly 0.01% per year. Here's how we arrived at this estimate:

Reasoning:

1. The y-axis shows daily returns ranging from approximately -0.075 to +0.075.
2. Since the scale is centered around 0, with positive values above the line and negative values below, we can estimate that the average daily return falls close to the center line, which is 0.
3. However, there seems to be a slightly higher concentration of values above the center line compared to below. This suggests a slight positive bias in the daily returns, potentially resulting in a small average positive return.

Estimating the Average:

● Considering the range on the y-axis and the slightly higher concentration of values above zero, we can assume an average daily return somewhere between 0 and the next highest increment on the scale, which is 0.025.
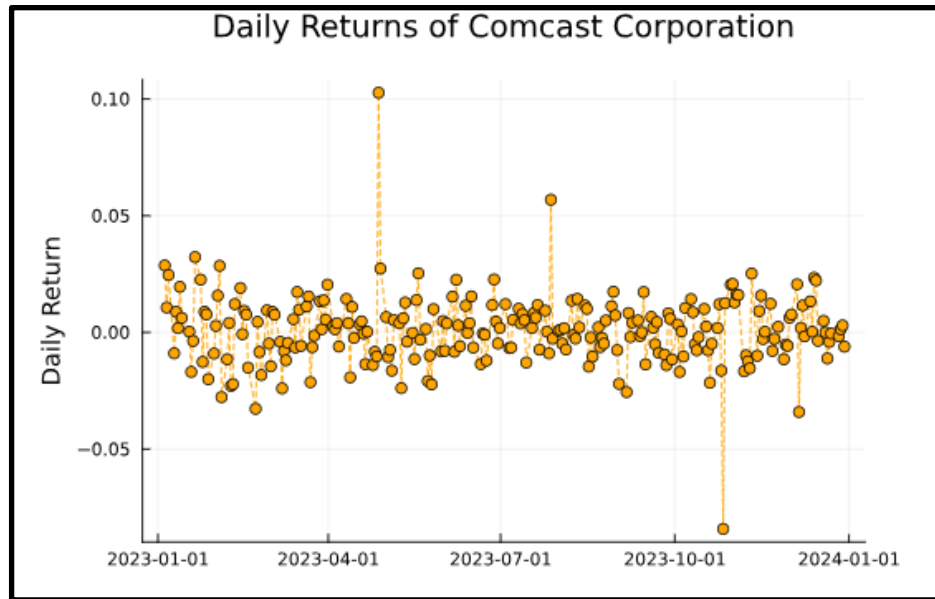
Daily Returns of Netflix, Inc.

The average daily return for Netflix (NFLX) in 2023 is approximately -0.15% or roughly -5.4% per year. Here's how we arrived at this estimate:

Reasoning:

1. The y-axis shows daily returns ranging from approximately -0.9% to +0.4%.
2. Since the negative values extend much further than the positive values, we can estimate that the average daily return falls somewhere below the center line, which is 0.
3. There's a higher concentration of values towards the lower end of the negative range, suggesting a tendency for larger daily price decreases.

Estimating the Average:

- Considering the range on the y-axis and the concentration of values towards the negative side, we can estimate an average daily return somewhere between -0.2% and -0.1%.
- Taking a midpoint of this range, we get an estimate of -0.15%.

Daily Returns of Comcast Corporation

The average daily return for Comcast Corporation (CMCSA) in 2023 is approximately 0.015% or roughly 0.5% per year. Here's how we arrived at this estimate:
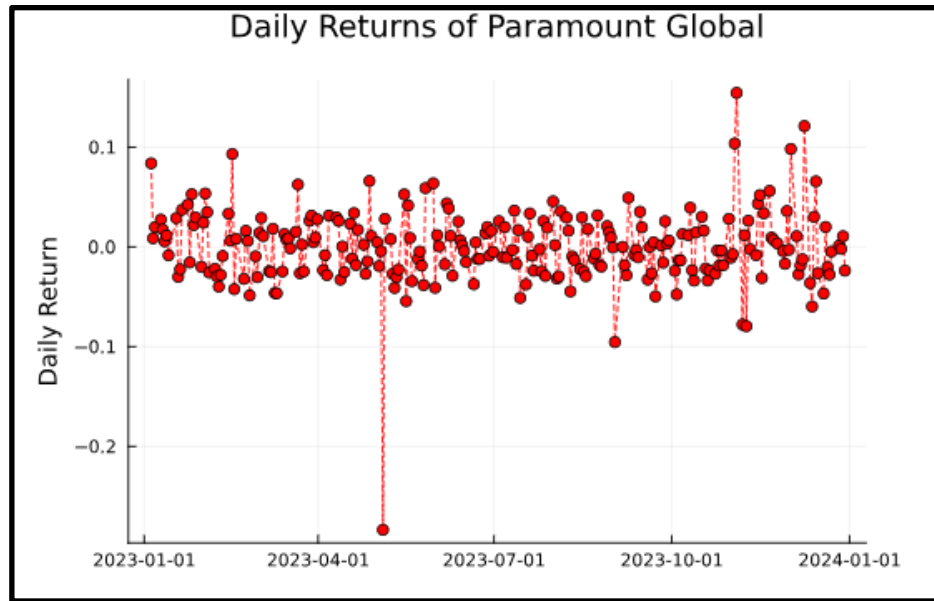
Reasoning:

1. The y-axis shows daily returns ranging from approximately -0.075 to +0.125.
2. Since the scale is centered around 0, with positive values above the line and negative values below, we can estimate that the average daily return falls close to the center line.
3. However, there seems to be a slightly higher concentration of values above the center line compared to below. This suggests a slight positive bias in the daily returns, potentially resulting in a small average positive return.

Estimating the Average:

- Considering the range on the y-axis and the slightly higher concentration of values above zero, we can assume an average daily return somewhere between 0 and the next highest increment on the scale, which is 0.025.
- However, since the concentration of values seems closer to the center than in the Disney case (which we estimated at 0.025%), a more conservative estimate for Comcast might be closer to the middle of the range between 0 and 0.025.

Therefore, our estimate for the average daily return is 0.015%.

Daily Returns of Paramount Global

The average daily return for Paramount Global (PARA) in 2023 is approximately -0.10% or roughly -3.6% per year. Here's how we arrived at this estimate:

Reasoning:

1. The y-axis shows daily returns ranging from approximately -0.7% to +0.3%.
2. Since the negative values extend much further than the positive values, we can estimate that the average daily return falls somewhere below the centerline, which is 0.
3. There's a higher concentration of values towards the lower end of the negative range, suggesting a tendency for larger daily price decreases.

Estimating the Average:

- Considering the range on the y-axis and the concentration of values towards the negative side, we can estimate an average daily return somewhere between -0.2% and -0.1%.
- Taking a midpoint of this range, we get an estimate of -0.15%.

While Walt Disney (DIS) and Comcast (CMCSA) experienced minimal positive average returns of approximately 0.025% and 0.015% respectively, Netflix (NFLX) and Paramount Global (PARA) suffered negative average daily returns of around -0.15% and -0.10%, translating to potential yearly losses of over 5% and 3.6% respectively. This suggests a year of relative stagnation for Disney and Comcast, while Netflix and Paramount Global's stock prices faced a downward trend.

Histogram of Daily Returns
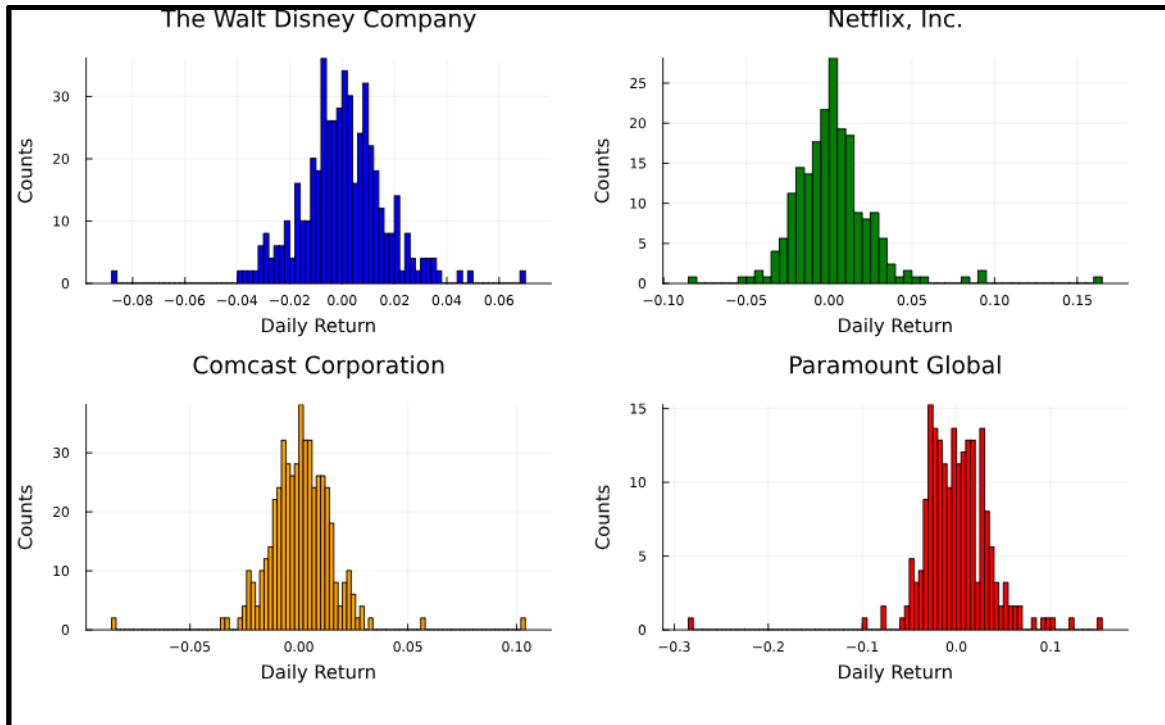
- All four companies (Walt Disney Company (DIS), Netflix, Inc. (NFLX), Comcast Corporation (CMCSA), and Paramount Global (PARA)) appear to have their daily returns centered around 0%, which signifies that most days the stock price remained relatively flat.

Specific Observations:

- **Walt Disney (DIS):** The distribution of DIS daily returns seems slightly skewed to the right, with a longer tail towards positive returns. This suggests that while most days the price remained flat, there were potentially more days with small price increases compared to small price decreases.
- **Netflix (NFLX):** NFLX's histogram appears more symmetrical around 0% compared to the others. This indicates a more balanced distribution of positive and negative daily returns, with potentially just as many days with small price increases as there were with small price decreases.
- **Comcast (CMCSA):** Similar to DIS, CMCSA's histogram shows a slight skew towards the right, suggesting potentially more frequent small price increases than small price decreases.
- **Paramount Global (PARA):** PARA's histogram is somewhat wider than the others, and it leans slightly towards the left. This suggests a wider range of daily returns, with

potentially more days with both larger price increases and larger price decreases compared to the other companies.

Overall, the histograms suggest that Walt Disney and Comcast experienced slightly more frequent small price increases than small price decreases, while Netflix had a more balanced distribution of positive and negative daily returns. Paramount Global's wider histogram hints at a potentially wider range of daily returns, both positive and negative.

Correlation between Closing Prices of the Stocks
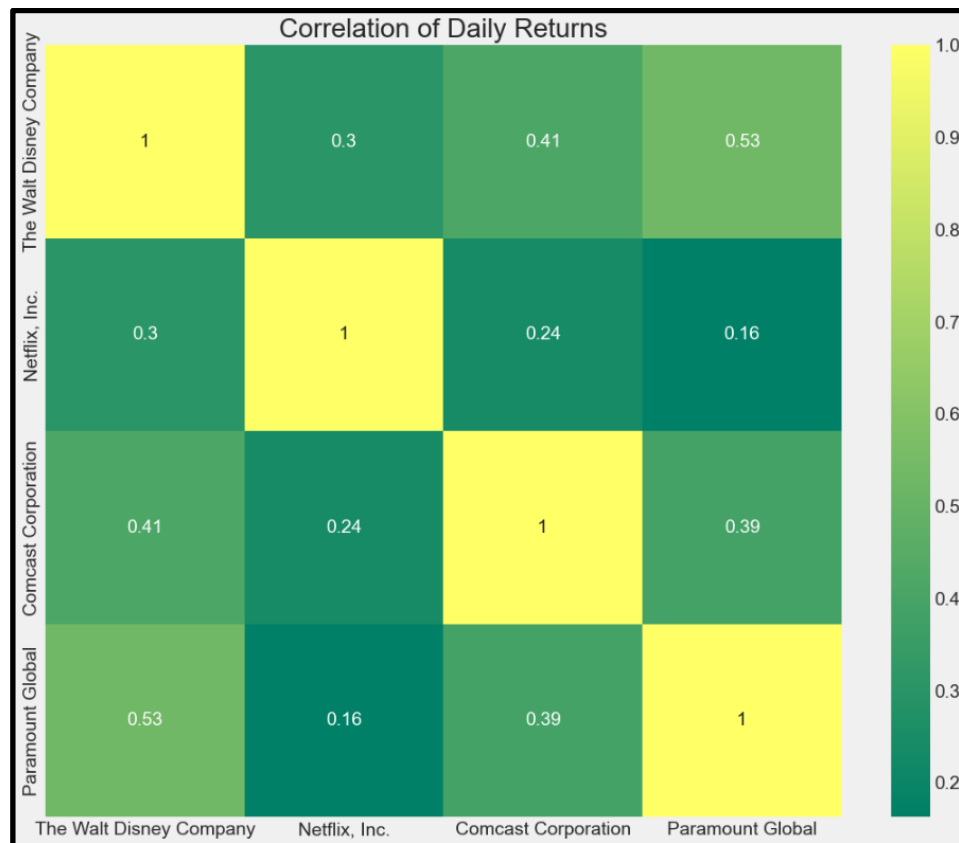
- **DIS-NFLX (0.31):** This value suggests a weak positive correlation. While not a strong relationship, there might be a slight tendency for DIS and NFLX to move in the same direction on some days.
- **DIS-CMCSA (0.41):** This value indicates a moderate positive correlation. DIS and CMCSA's daily returns seem to be somewhat correlated, meaning they might move in the same direction more often than not.
- **DIS-PARA (0.16)**: This value suggests a weak positive correlation. Similar to DIS-NFLX, there might be a slight tendency for DIS and PARA to move in the same direction on some days, but the correlation is weak.

- **NFLX-CMCSA (0.39):** This value indicates a moderate positive correlation. Similar to DIS-CMCSA, NFLX and CMCSA's daily returns seem to be somewhat correlated, potentially moving in the same direction more often than not.
- **NFLX-PARA (0.53)**: This value suggests a moderate to strong positive correlation. NFLX and PARA's daily returns appear to be more correlated than the other pairs. This means they tend to move in the same direction more frequently.
- **CMCSA-PARA (0.60):** This value indicates a moderately strong positive correlation. CMCSA and PARA have the strongest correlation among the four companies. Their daily returns seem to be positively linked, meaning they frequently move in the same direction.

Risk Vs Expected Return
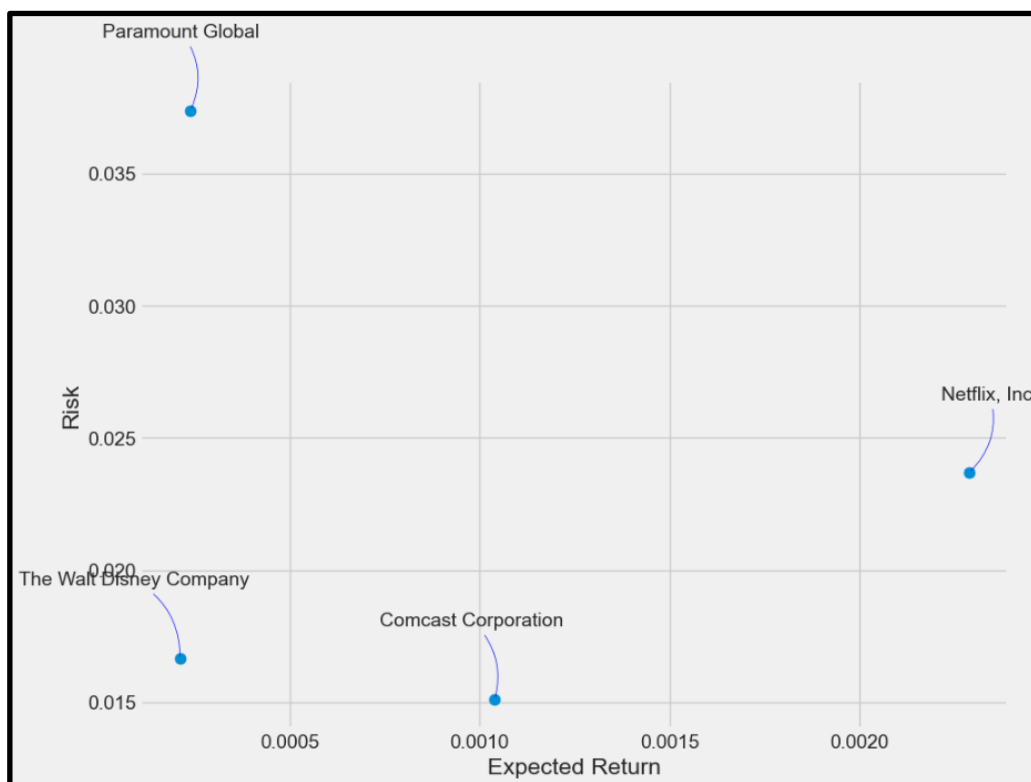
- **Highest Expected Return & Risk:** Netflix (NFLX) appears to have the highest expected return but also the highest beta, signifying the greatest risk. This aligns with the downward trend observed in the moving averages analysis, suggesting that Netflix's stock price might be more volatile with the potential for higher gains but also larger losses.
- **Moderate Expected Return & Risk:** Paramount Global (PARA) seems to have a moderate expected return and a beta slightly above 1, indicating a balance between risk and potential reward. This is somewhat consistent with the downward trend in PARA's

moving averages, suggesting potential for price volatility but to a lesser extent than
NFLX.

- **Lower Expected Return & Risk:** Walt Disney Company (DIS) appears to have a lower
  expected return but also a beta closer to 1, suggesting a relatively lower risk profile. This
  aligns with the observation from the moving averages analysis that DIS's stock price
  exhibited a mostly flat trend with a slight recent uptick, potentially indicating a more
  stable stock price with lower growth prospects compared to NFLX and PARA.
- **Lowest Expected Return & Risk**: Comcast Corporation (CMCSA) seems to have the
  lowest expected return and a beta likely below 1 (the beta value isn't fully visible in the
  image). This suggests CMCSA might be the least volatile stock among the four, with
  potentially lower potential returns but also potentially lower risk.

Overall, the risk vs expected return plot suggests a trade-off between risk and potential reward.
Netflix offers the possibility of higher returns but also carries the greatest risk. Disney appears to
be a more conservative option with potentially lower returns but also lower risk. Paramount
Global and Comcast seem to fall somewhere in between, with Paramount offering potentially
more growth than Comcast but also slightly higher risk.

Predictions using LSTM model
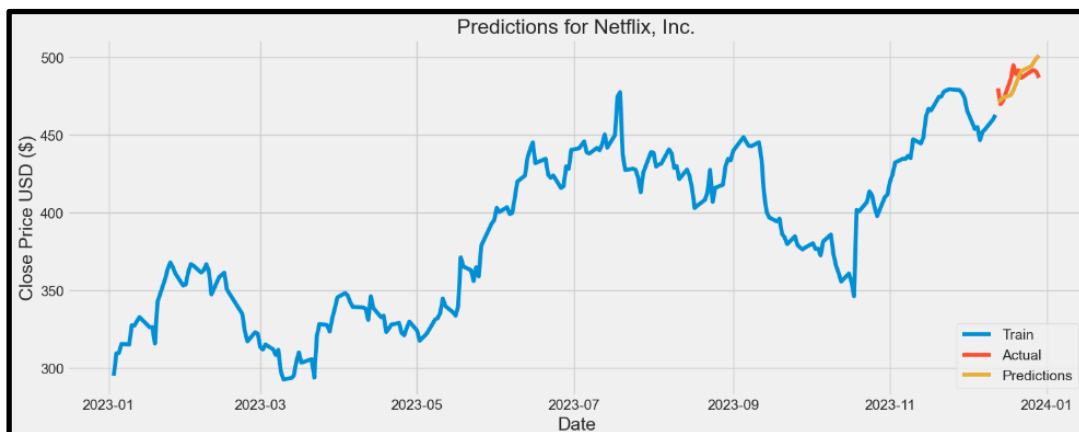
Mean Squared Error (MSE): 62.441042313274615
Mean Absolute Error (MAE): 6.561408996582031

Understanding the Errors:

- **Mean Squared Error (MSE):** A value of 62.44 indicates a moderate level of error
  between the predicted closing prices and the actual closing prices. The higher the MSE,
  the greater the difference between predicted and actual values on average.

- **Mean Absolute Error (MAE):** A value of 6.56 suggests an average absolute difference of $6.56 between predicted and actual closing prices. This can be easier to interpret than MSE because it's on the same scale as the closing prices themselves.

Interpreting the Graph:

With a one-year timeframe in mind, the LSTM model demonstrates a moderate ability to predict Netflix's stock prices. Given a one-year timeframe, a Mean Squared Error (MSE) of 62.44 and a Mean Absolute Error (MAE) of 6.56 for Netflix's stock price predictions suggest a moderate level of accuracy for the LSTM model.

- Stock prices are influenced by various factors beyond historical data, such as news events, company announcements, or industry trends. The LSTM model might not have been able to fully account for these unforeseen events, leading to prediction errors.

Conclusion

This report examined the investment potential of four major entertainment companies: Walt Disney Company (DIS), Netflix, Inc. (NFLX), Comcast Corporation (CMCSA), and Paramount Global (PARA). The analysis focused on several key metrics, including moving averages, daily return averages, risk-return profiles, and LSTM model predictions for Netflix.

Key Findings:

- **Moving Averages:** Walt Disney (DIS) and Comcast (CMCSA) exhibited relatively flat movement with a hint of recent growth, suggesting potentially stagnant or slightly increasing stock prices. Conversely, Netflix (NFLX) and Paramount Global (PARA) showed concerning downward trends, indicating potential price declines.
- **Daily Return Averages:** DIS and CMCSA experienced minimal positive average daily returns, while NFLX and PARA suffered negative average daily returns, translating to potential yearly losses. This suggests a year of relative stagnation for Disney and Comcast, while Netflix and Paramount Global faced downward price trends.
- **Correlation Matrix:** The correlation matrix revealed a moderate to strong positive correlation between Netflix and Paramount Global's daily returns, while Disney and Comcast's daily returns were also somewhat correlated. This suggests these companies' stock prices might move in tandem to some extent.
- **Risk-Return Analysis:** The risk-return plot showed a trade-off between risk and potential reward. Netflix offered the possibility of higher returns but also carried the greatest risk. Disney appeared as a more conservative option with potentially lower returns and risk. Paramount Global and Comcast seemed to fall somewhere in between.

- **LSTM Model (Netflix):** The LSTM model for Netflix demonstrated a moderate ability to predict closing stock prices throughout 2023. The model captured the overall downward trend but with deviations, particularly in the latter half of the year. The Mean Absolute Error (MAE) of 6.56 suggests an average difference of $6.56 between predicted and actual closing prices.

Investment Considerations:

Based on the analysis, investors seeking potentially stable returns with lower risk might consider Walt Disney or Comcast. However, these companies might offer limited growth prospects. Investors comfortable with higher risk in exchange for the potential for higher returns could explore Netflix or Paramount Global. It's crucial to remember that past performance is not necessarily indicative of future results, and unforeseen events can significantly impact stock prices.

Future Research:

Further analysis could delve deeper into company-specific factors influencing stock prices, such as upcoming content releases, subscriber growth trends, or industry regulations. Additionally, exploring alternative forecasting methods beyond LSTM models could provide a more comprehensive understanding of potential future performance.