

Model Performance Analysis

🏆 Best Performing Model: GRU

GRU Analysis:
Mean Absolute Error: \$37.93
Root Mean Square Error: \$95.52
Maximum Error: \$2095.79

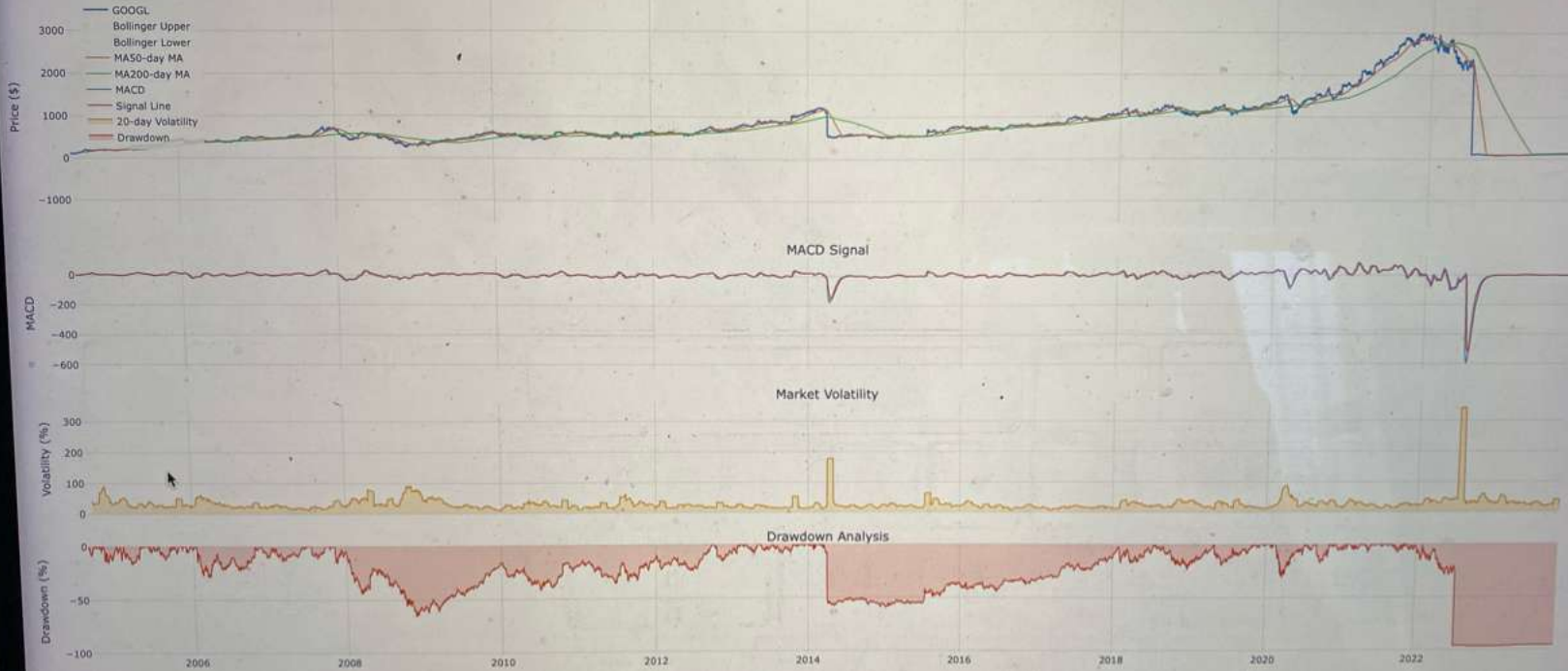
LSTM Analysis:
Mean Absolute Error: \$468.40
Root Mean Square Error: \$615.70
Maximum Error: \$1403.05

RNN Analysis:
Mean Absolute Error: \$122.40
Root Mean Square Error: \$191.27
Maximum Error: \$1918.96

```
# Create comprehensive visualization  
fig = make_subplots()
```

Google Stock Analysis Dashboard

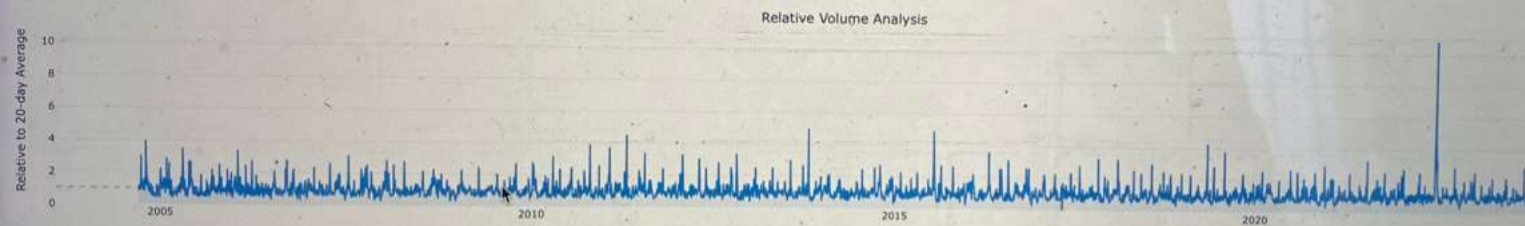
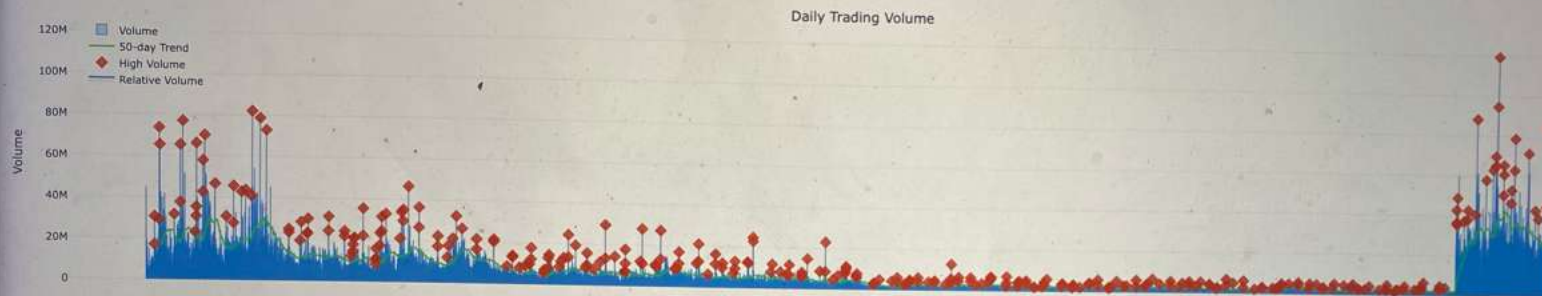
Total Return: 38.0% | Annualized Vol: 39.3% | Max Drawdown: -97.2% | Sharpe Ratio: 0.04
Price Action & Technical Indicators



	Metric	Value
0	Total Return	38.03%
1	Annualized Return	1.69%
2	Annualized Volatility	39.30%
3	Sharpe Ratio	0.04
4	Maximum Drawdown	-97.22%
5	Best Daily Return	19.99%
6	Worst Daily Return	-95.12%
7	Days Above 200MA	67.55%

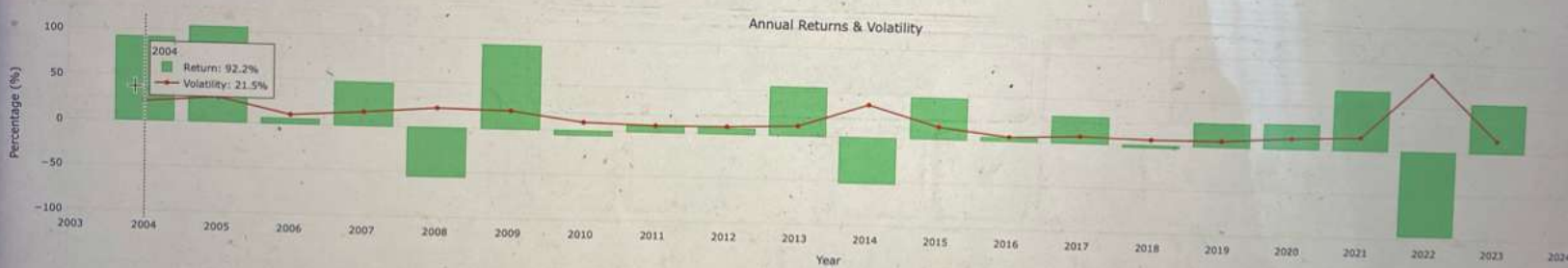
Trading Volume Analysis

Average Daily Volume: 8,178,455 | 20-Day Volume Change: +251.3%



	Metric	Value
0	Average Daily Volume	8,178,455
1	Last 20-Day Average	28,728,027
2	Volume Trend	+251.3%
3	High Volume Days	308 days
4	Volume Volatility	127.9%

Total Return: 300.0% | Average Annual Volatility: 17.5%



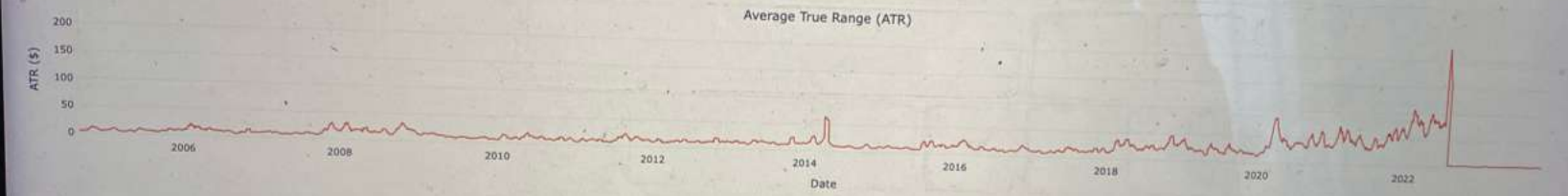
Year	Median Price	Price Range	Annual Return	Volatility
2004	\$167.53	\$100.01 - \$197.60	+92.2%	21.5%
2005	\$286.50	\$174.99 - \$432.04	+104.7%	27.6%
2006	\$402.98	\$337.06 - \$509.65	+5.8%	10.3%
2007	\$511.89	\$438.68 - \$741.79	+47.9%	15.3%
2008	\$473.78	\$257.44 - \$685.33	-55.1%	21.6%
2009	\$427.79	\$282.75 - \$622.87	+93.0%	20.3%
2010	\$534.32	\$436.07 - \$645.90	-5.2%	9.4%
2011	\$577.44	\$474.88 - \$645.90	+6.9%	7.5%
2012	\$632.79	\$559.05 - \$768.05	+4.3%	8.2%
2013	\$876.25	\$702.87 - \$1,120.71	+55.0%	13.2%
2014	\$579.84	\$498.16 - \$1,220.17	-52.3%	37.0%
2015	\$573.88	\$497.06 - \$793.96	+46.9%	14.1%
2016	\$761.75	\$681.14 - \$835.74	+4.3%	4.9%
2017	\$947.55	\$807.77 - \$1,085.09	+30.4%	8.0%
2018	\$1,112.05	\$984.67 - \$1,285.50	-2.6%	6.2%
2019	\$1,189.49	\$1,025.47 - \$1,362.47	+27.0%	6.7%
2020	\$1,479.11	\$1,054.13 - \$1,824.97	+28.1%	11.8%
2021	\$2,496.22	\$1,722.88 - \$2,996.77	+67.8%	14.8%
2022	\$2,178.16	\$83.43 - \$2,960.00	-97.0%	87.6%
2023	\$122.14	\$86.20 - \$140.55	+55.4%	13.6%

138.49 | Overall Change: +38.0

Price Action & Technical Indicators



Average True Range (ATR)

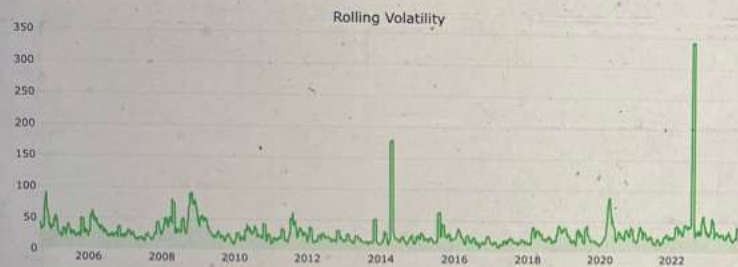
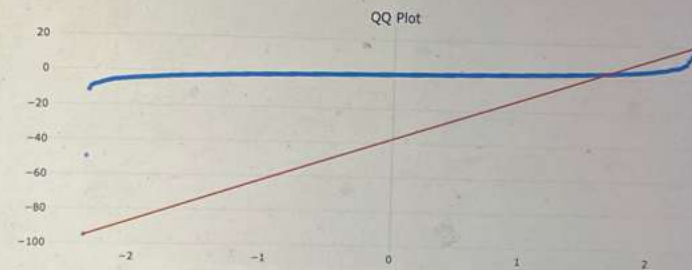
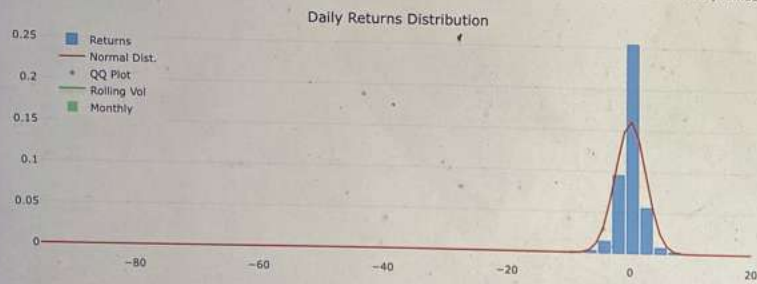


Metric	Value
Current Price	\$138.49
Overall Change	+38.0%
ATR (14-day)	\$2.31
Distance from 200 SMA	+15.8%
Bollinger Band Width	15.4%
52-week High	\$141.22
52-week Low	\$84.86

<ipython-input-12-063a9dda6c9c>:23: UserWarning:

Converting to PeriodArray/Index representation will drop timezone information.

Mean Daily Return: 0.07% | Annual Volatility: 39.3% | Skewness: -13.08 | Excess Kurtosis: 486.15



	Metric	Value
0	Mean Daily Return	0.07%
1	Annual Volatility	39.3%
2	Skewness	-13.08
3	Excess Kurtosis	486.15
4	Best Day	19.99%
5	Worst Day	-95.12%
6	Positive Days	52.3%
7	Value at Risk (95%)	nan

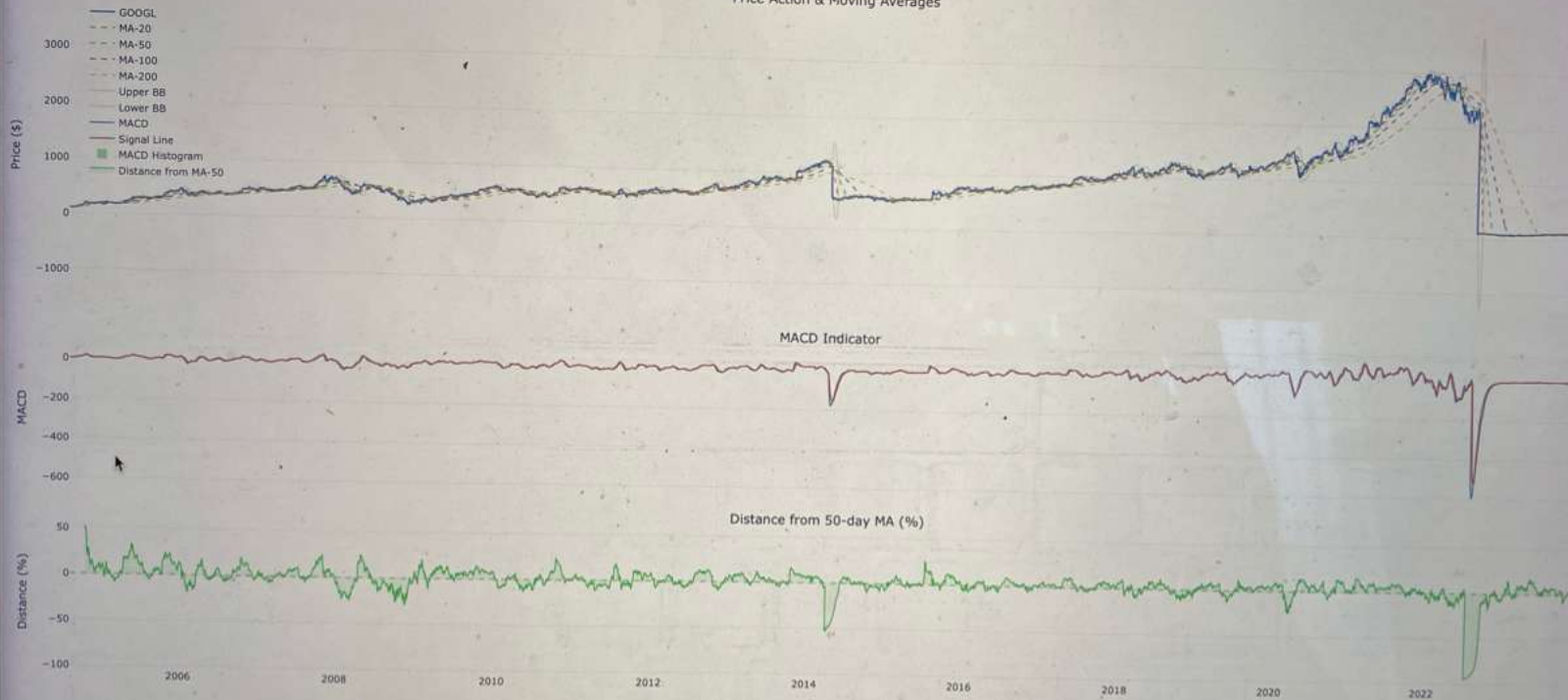
Correlation Analysis Matrix

* p < 0.05, ** p < 0.01



	Variable 1	Variable 2	Correlation	p-Value	Significance
0	open	high	1.000	0.000e+00	**
1	open	low	1.000	0.000e+00	**
2	open	close	1.000	0.000e+00	**
7	high	close	1.000	0.000e+00	**
8	high	low	1.000	0.000e+00	**
13	high	close	1.000	0.000e+00	**
14	low	close	1.000	0.000e+00	**
26	Daily_Return	Price_Change	0.622	0.000e+00	**
14	low	volume	-0.496	1.193e-299	**
18	close	volume	-0.495	1.662e-297	**
3	open	volume	-0.494	6.944e-297	**

Moving Average Analysis Dashboard Current Price: \$138.49 | MA-50 Trend: -0.6% | Distance from MA-50: +3.7% Price Action & Moving Averages



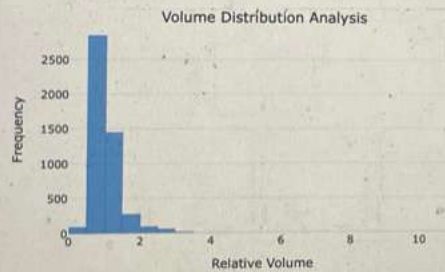
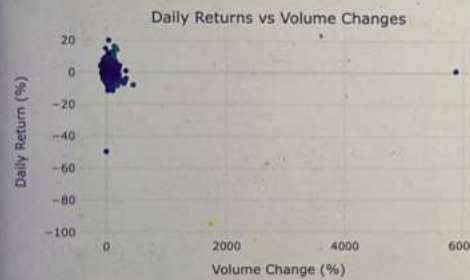
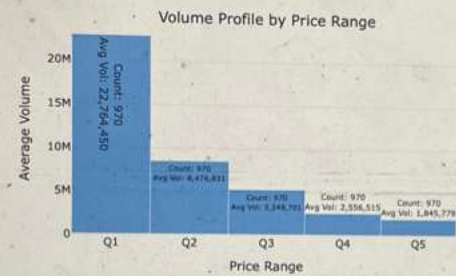
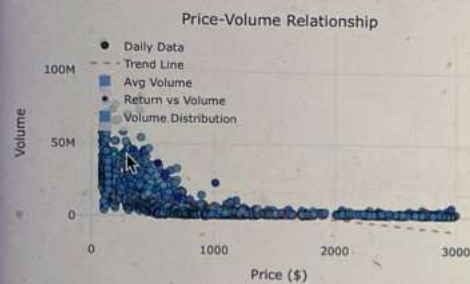
Metric	Value
Current Price	\$138.49
MA-50	\$133.49
Distance from MA-50	+3.7%
MA-50 Trend (20-day)	-0.6%
Above/Below MA-200	Above
MACD Signal	Bullish
Bollinger Band Position	88.2%
Trend Strength	Moderate

<ipython-input-15-d4d16c22ebbc>:98: FutureWarning:

The default of observed=False is deprecated and will be changed to True in a future version of pandas. Pass observed=False to retain current behavior or observed=True to adopt the future default and silence this warning.

Price-Volume Relationship Analysis

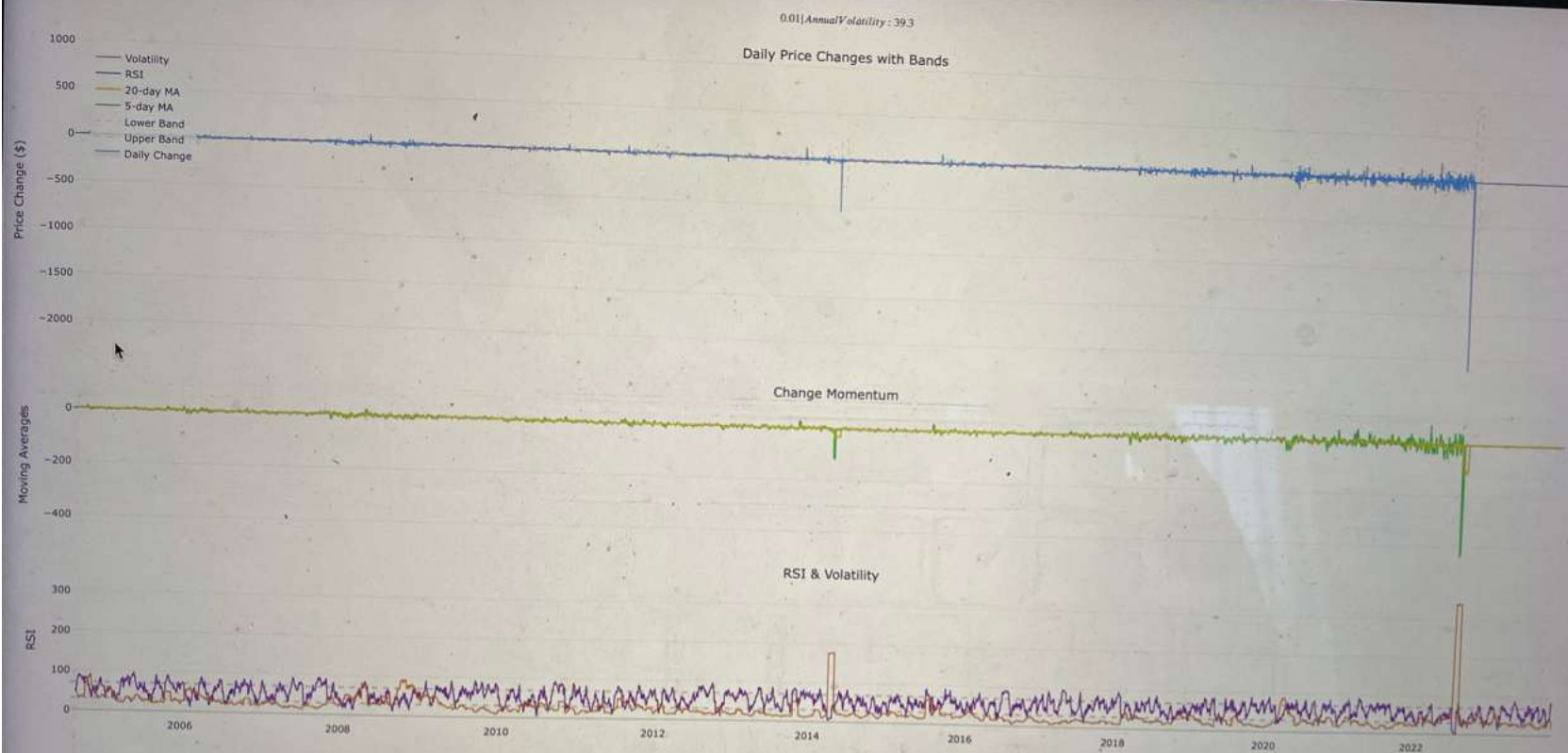
Correlation: -0.49 (p=9.08e-298) | Avg Daily Volume: 8,178,455 | High Volume Days: 308



Relative Volume



	Metric	Value
0	Price-Volume Correlation	-0.495
1	Correlation P-value	9.08e-298
2	Average Daily Volume	8,178,455
3	Volume Volatility	127.9%
4	High Volume Days	308 days
5	Highest Volume Day	2023-02-09
6	Volume Trend	+155.1%
7	Volume-Return Correlation	-0.138

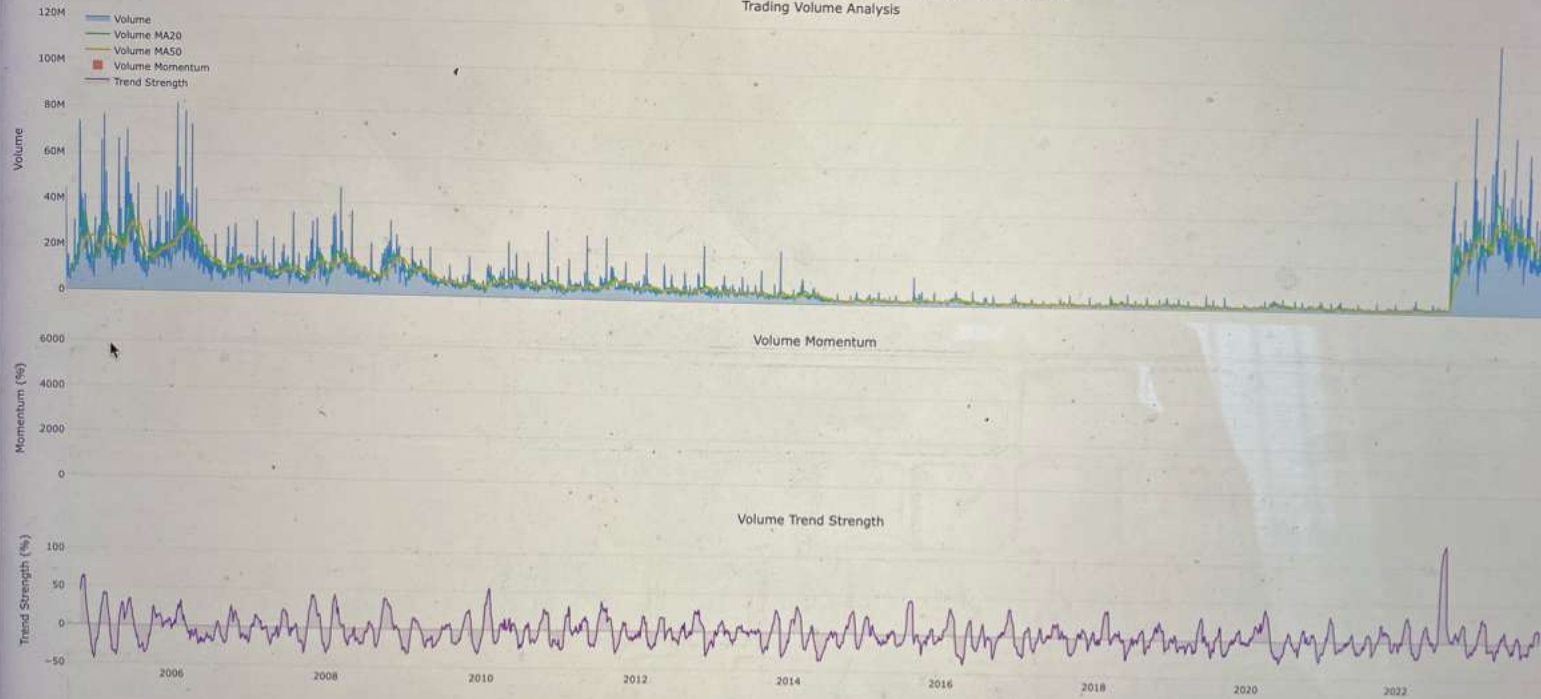


Metric	Value
Average Daily Change	\$0.01
Median Daily Change	\$0.39
Daily Change Volatility	\$36.40
Largest Up Move	\$207.12
Largest Down Move	\$-2126.52
Positive Days Ratio	52.38
Current RSI	79.6
Current Volatility	18.78

Trading Volume Analysis Dashboard

Average Volume: 8,178,455 | Volume Trend: +155.1% | Current Momentum: -21.3%

Trading Volume Analysis



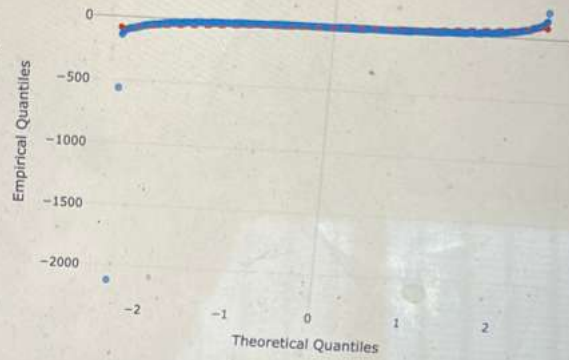
	Metric	Value
0	Current Volume	17,820,456
1	Average Volume	8,178,455
2	Volume Trend (20-day)	+117.9%
3	Volume Volatility	127.9%
4	Current Momentum	-21.3%
5	Trend Strength	+1.6%
6	Above Average Days	39.1%
7	Largest Volume Day	2023-02-09

0.01|Volatility : 36.39|Skewness : -41.88|95

Distribution of Daily Price Changes



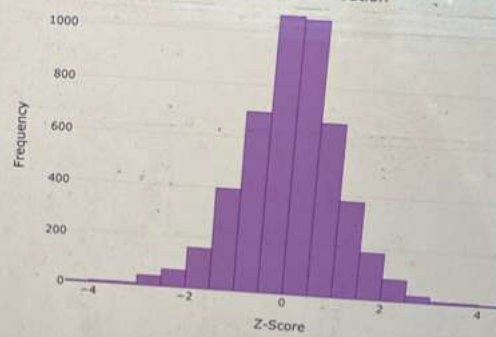
Q-Q Plot



Rolling Volatility



Z-Score Distribution

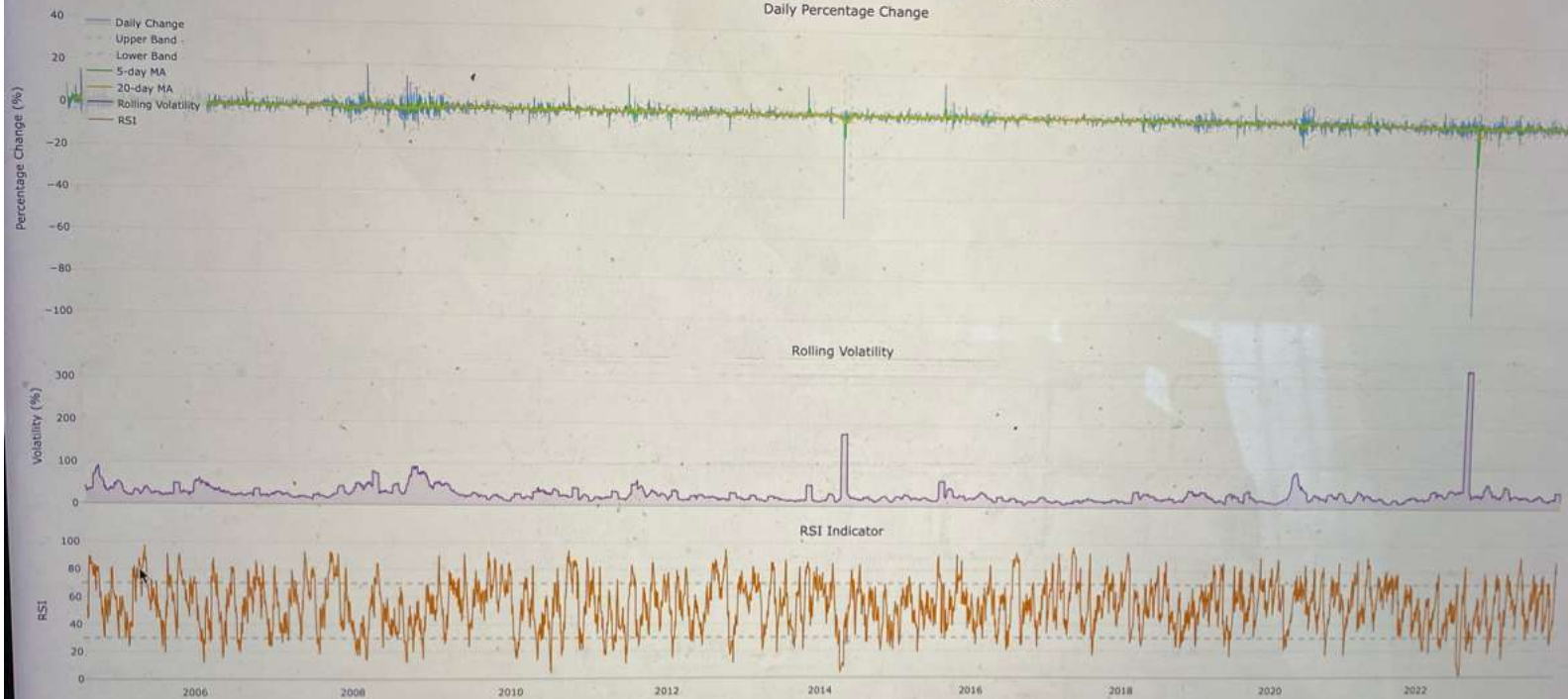


	Metric	Value
0	Mean Daily Change	\$0.008
1	Median Daily Change	\$0.390
2	Standard Deviation	\$36.391
3	Skewness	-41.883
4	Excess Kurtosis	2414.551
5	95% Value at Risk	\$22.500
6	95% Expected Shortfall	\$56.778
7	Normality Test p-value	0.00e+00

Daily Percentage Change Analysis

Avg Daily Change: 0.07% | Annual Volatility: 39.3% | Positive Days: 52.3%

Daily Percentage Change

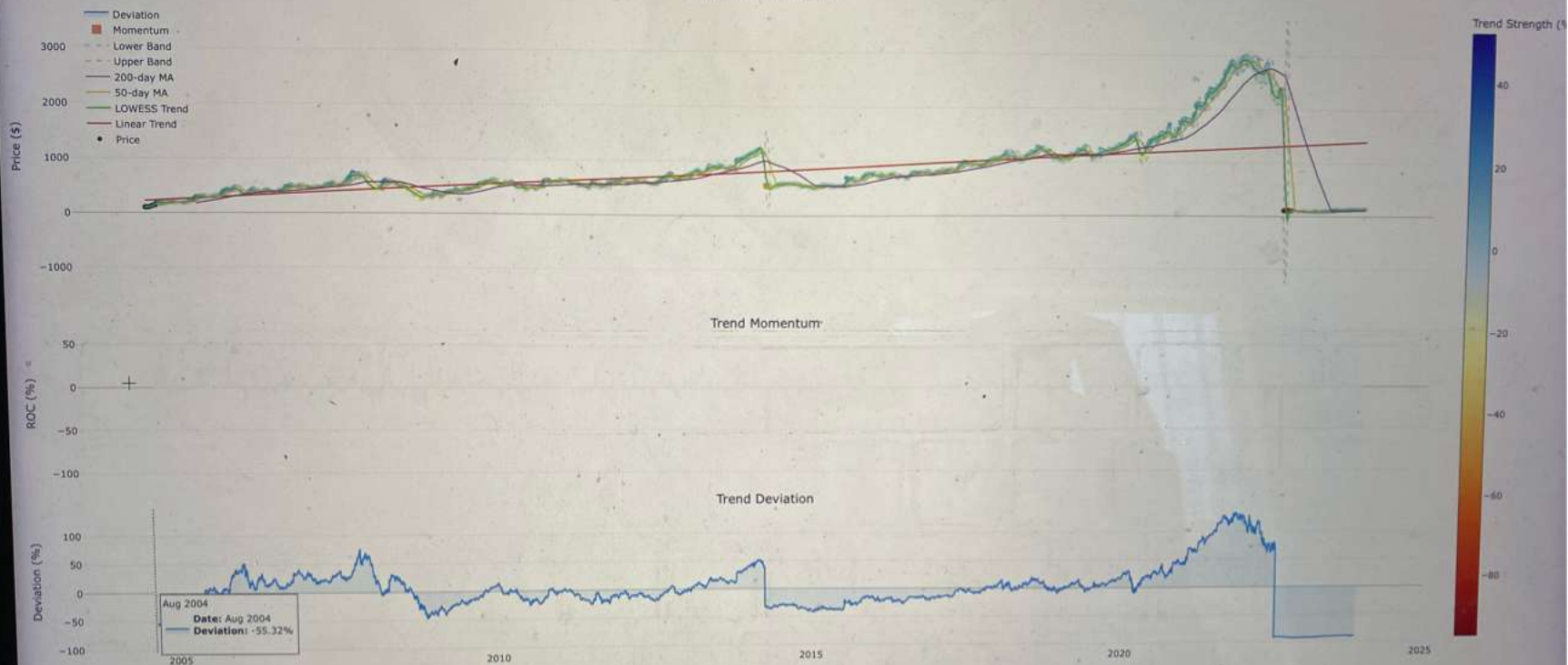


	Metric	Value
0	Average Daily Change	0.07%
1	Median Daily Change	0.08%
2	Annual Volatility	39.3%
3	Largest Gain	19.99%
4	Largest Loss	-95.12%
5	Positive Days Ratio	52.3%
6	Current RSI	79.8
7	Current Volatility	18.7%

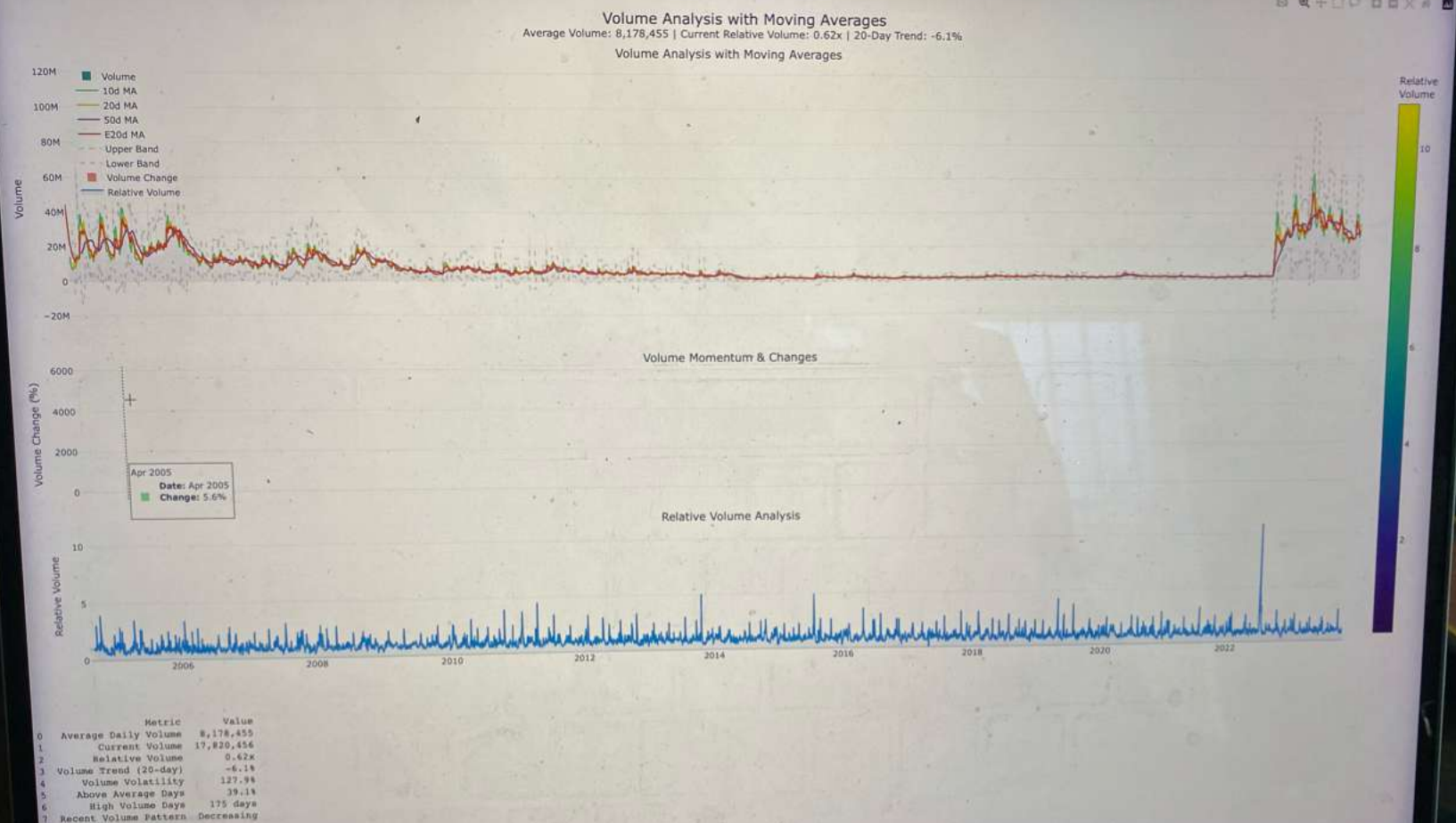
Price Trend Analysis Dashboard

Annual Trend: \$60.89 | Trend Fit (R^2): 0.307 | Current Deviation: -90.09%

Price Action & Trends

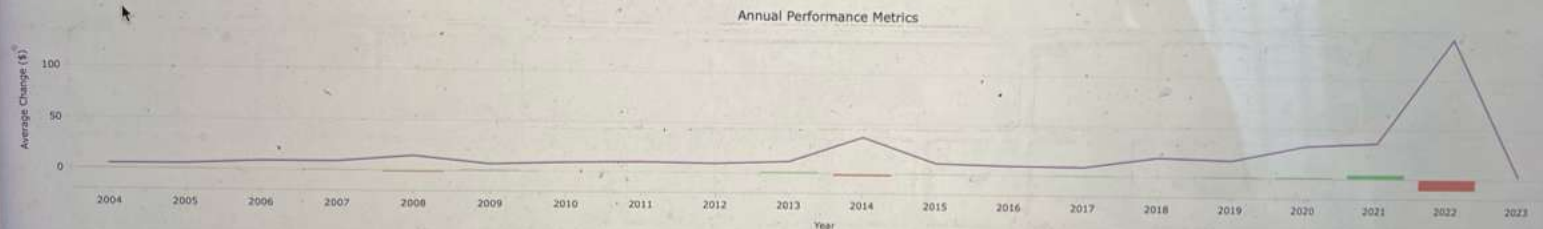


Metric	Value
Annual Trend	\$60.89
Trend Fit (R^2)	0.307
Current Trend Strength	+3.74%
Current Deviation	-90.09%
Momentum (20-day ROC)	+10.25%
Trend Reliability	28.0%
Days Above 200MA	67.5%
Recent Trend	Bullish



Yearly Price Change Analysis

Best Year: 2005 (104.7%) | Worst Year: 2022 (-97.0%)

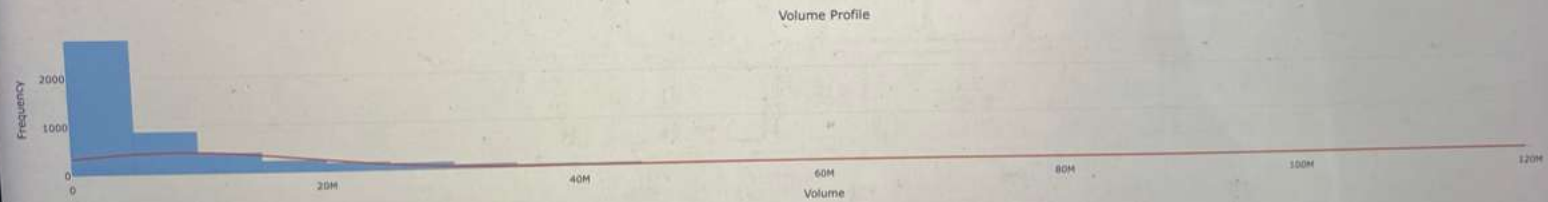
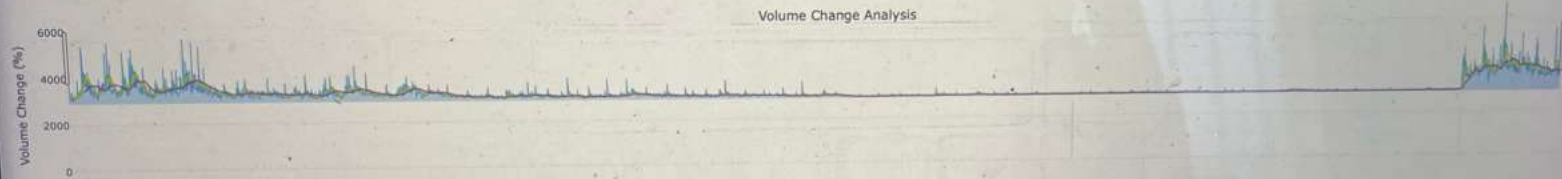
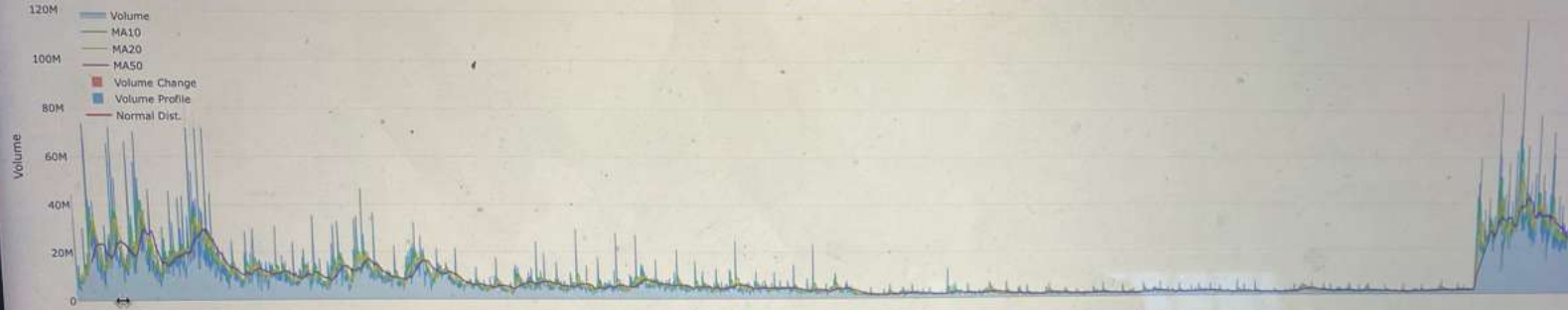


Metric	Value
0 Best Performing Year	2005 (104.7%)
1 Worst Performing Year	2022 (-97.0%)
2 Most Volatile Year	2022 (\$140.97)
3 Most Stable Year	2023 (\$2.24)
4 Average Daily Change	\$0.04
5 Median Daily Change	\$0.76

Interactive Volume Analysis

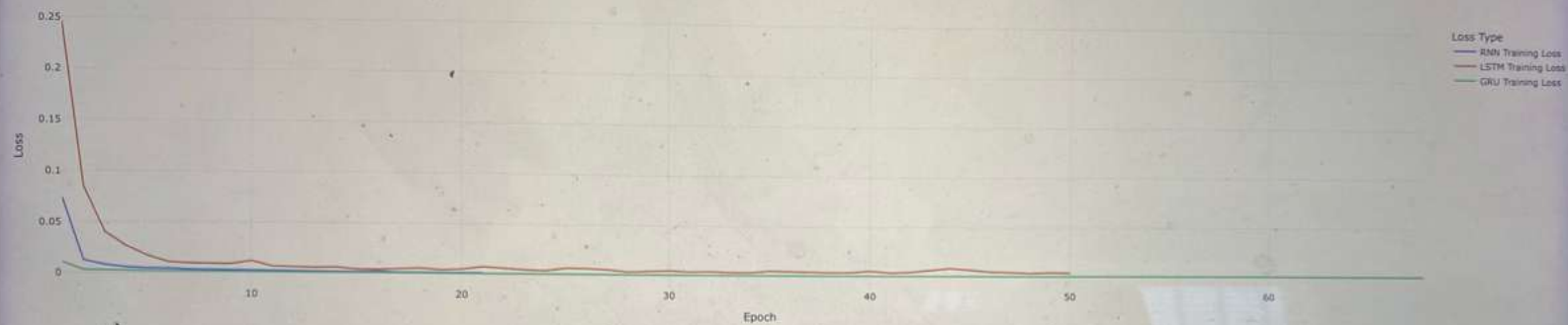
Average Volume: 8,178,455 | Volume Trend: +155.1% | High Volume Days: 308

Volume Analysis with Moving Averages

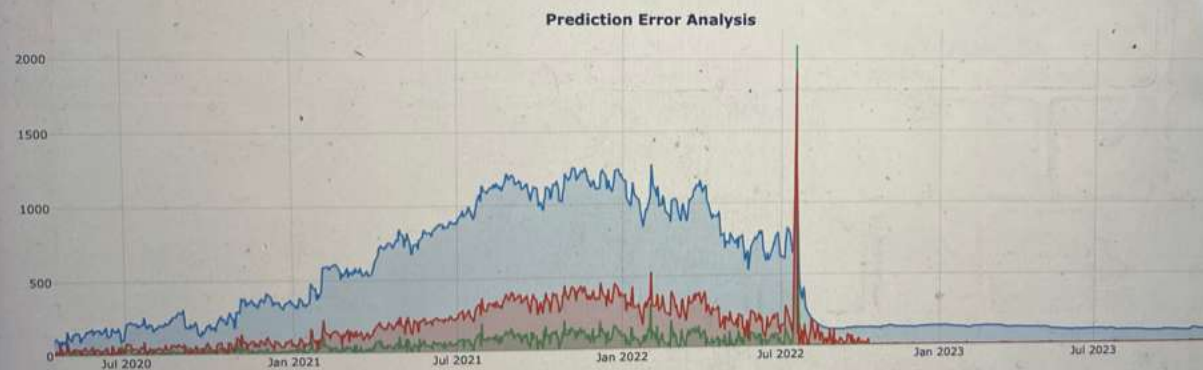


	Metric	Value
0	Average Daily Volume	8,178,455
1	Volume Trend	+155.1%
2	High Volume Days	308 days
3	Low Volume Days	524 days
4	Volume Volatility	127.9%
5	Largest Daily Increase	5867.0%
6	Largest Daily Decrease	-97.9%
7	Above Average Days	39.1%

Training and Validation Loss



Neural Network Models Analysis: Google Stock Price Prediction



Model Performance Analysis

Best Performing Model: GRU

GRU Analysis:

Mean Absolute Error: \$37.93
Root Mean Square Error: \$95.52
Maximum Error: \$2095.79

LSTM Analysis:

Mean Absolute Error: \$468.40
Root Mean Square Error: \$615.70
Maximum Error: \$1403.05