ANNUAL MARKET ANALYSIS REPORT

Dataset: NIFTY 50_minute_data.csv

Analysis Period: 2015 - 2024

Total Records: 932,334

Report Generated: 2025-12-12 13:40

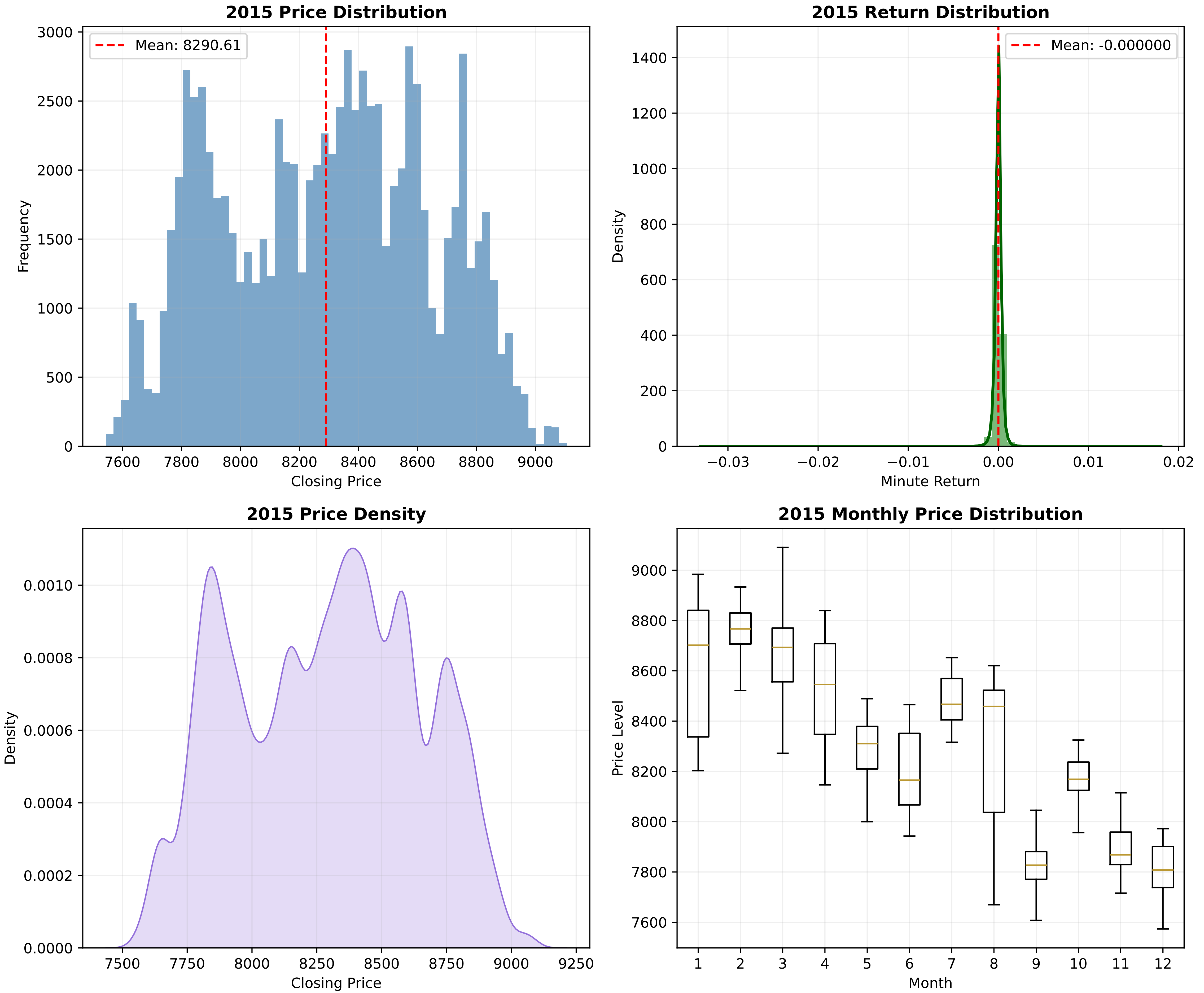
```
2015 MARKET ANALYSIS SUMMARY
========================================

Data Points: 89,906
Trading Days: 357

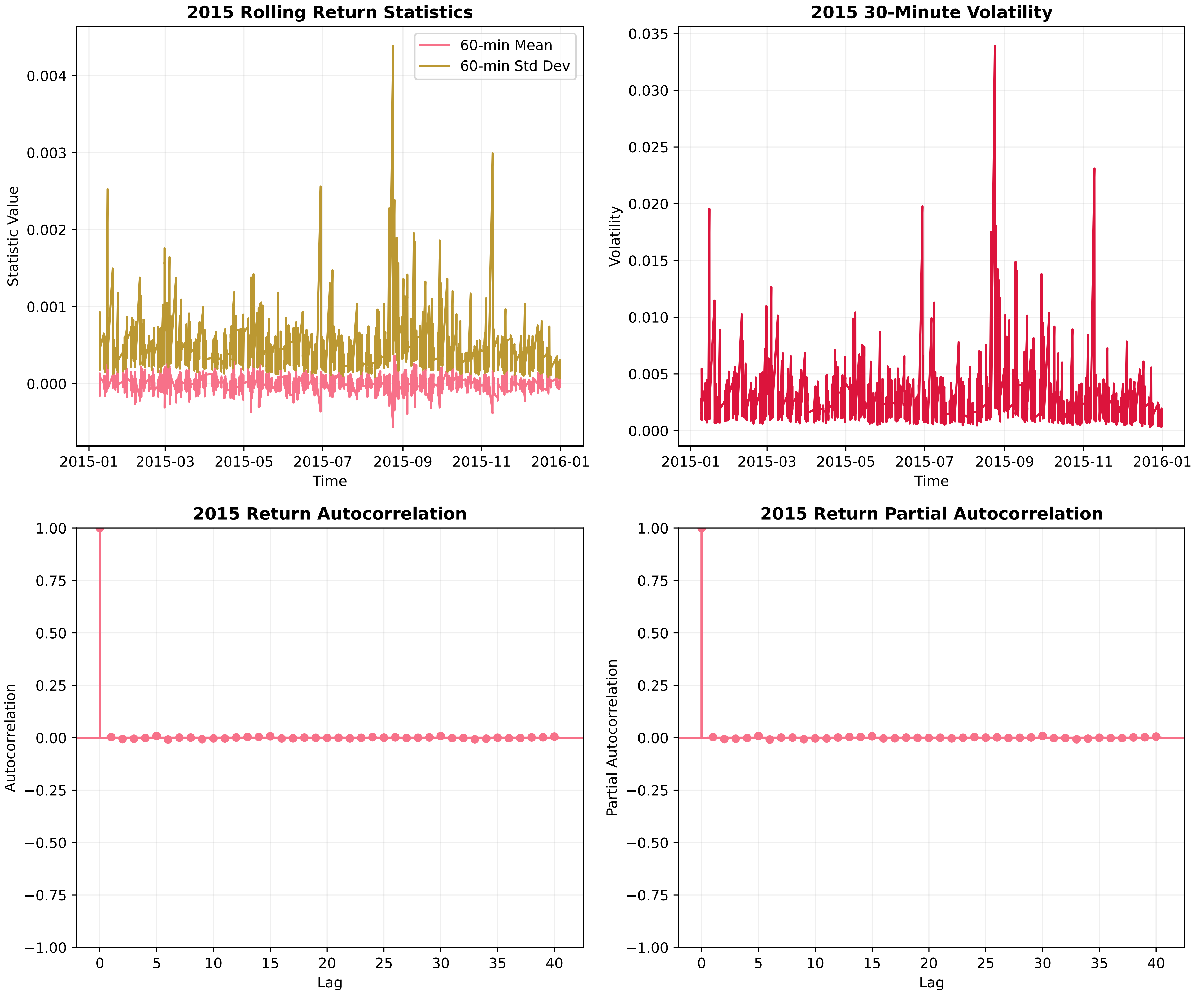
PRICE STATISTICS:
  Average Price: 8290.61
  Price Range: 7543.80 - 9106.50
  Price Volatility: 350.38

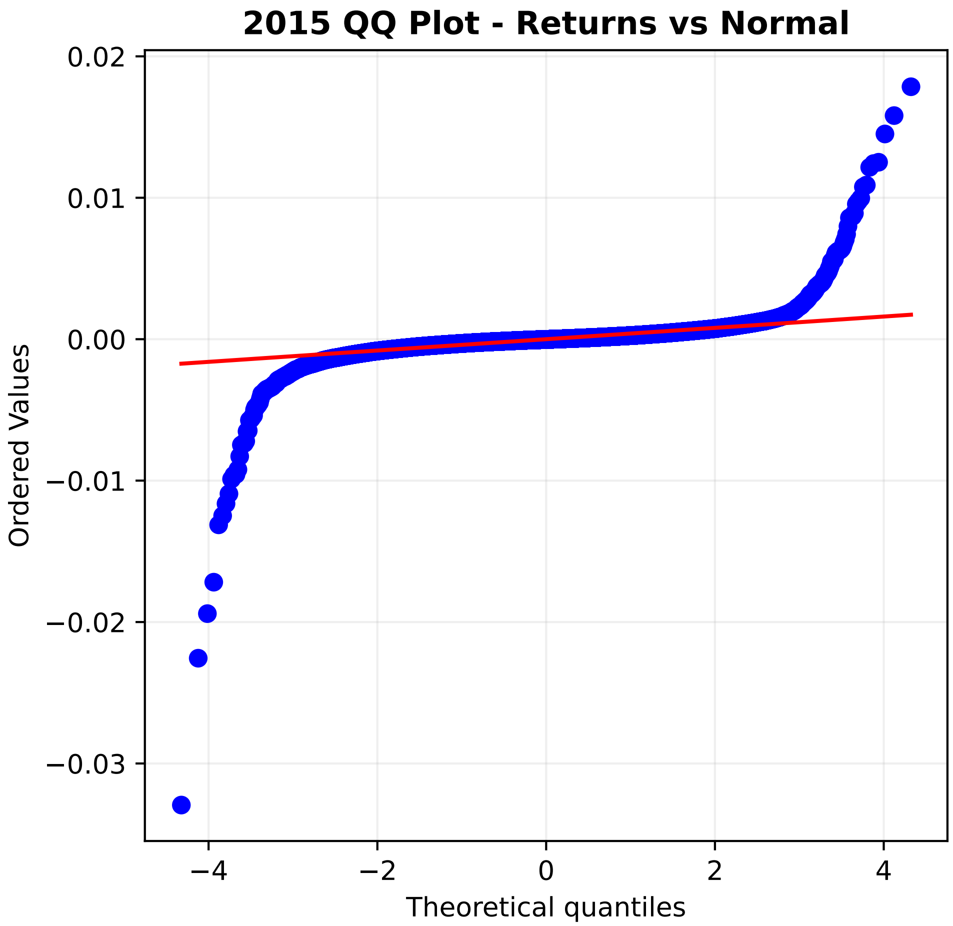
RETURN STATISTICS:
  Average Return: -0.000000
  Return Volatility: 0.000483
  Skewness: -4.183
  Kurtosis: 454.748

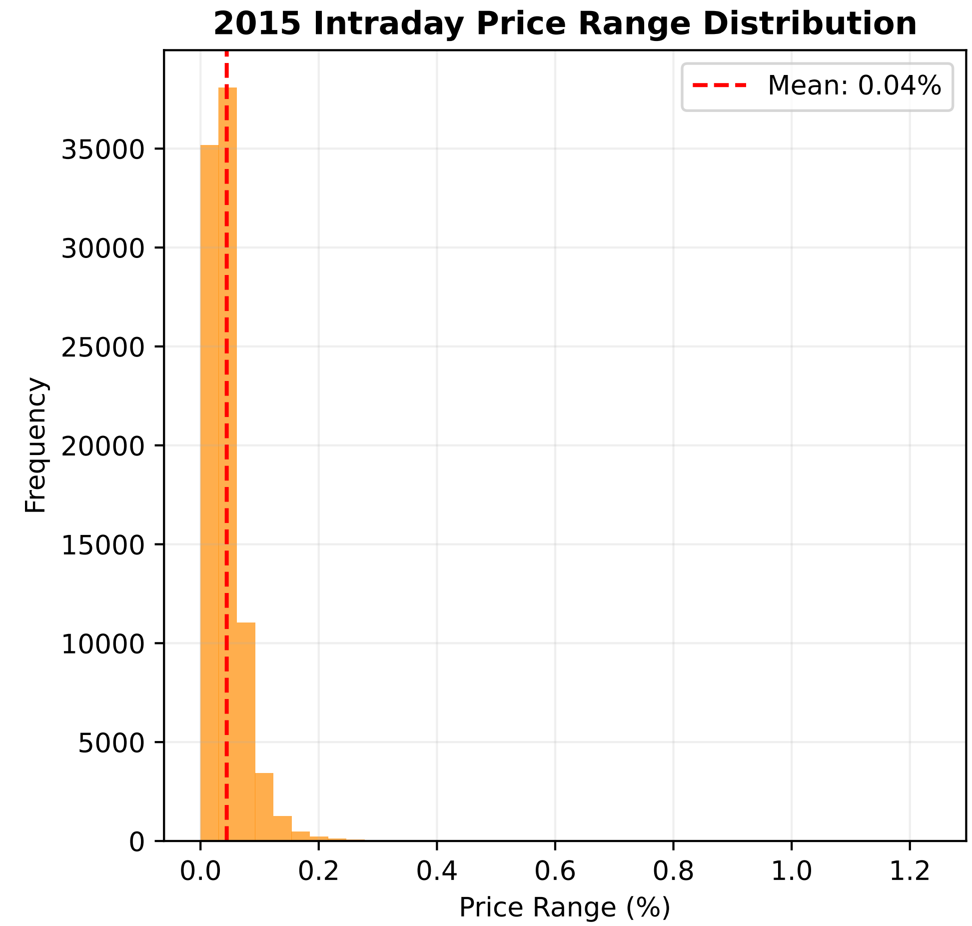
VOLATILITY:
  Average 30-min Volatility: 0.002080
  Max Daily Range: 1.23%
```



2015 Price Distribution
Mean: 8290.61
Frequency
Closing Price
0
500
1000
1500
2000
2500
3000
7600
7800
8000
8200
8400
8600
8800
9000
2015 Return Distribution
Mean: -0.000000
Density
Minute Return
0
200
400
600
800
1000
1200
1400
−0.03
−0.02
−0.01
0.00
0.01
0.02
2015 Price Density
Density
Closing Price
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
7500
7750
8000
8250
8500
8750
9000
9250
2015 Monthly Price Distribution
Price Level
Month
7600
7800
8000
8200
8400
8600
8800
9000
1
2
3
4
5
6
7
8
9
10
11
12


2015 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2015 30-Minute Volatility
Volatility
Time
2015 Return Autocorrelation
Autocorrelation
Lag
2015 Return Partial Autocorrelation
Partial Autocorrelation
Lag



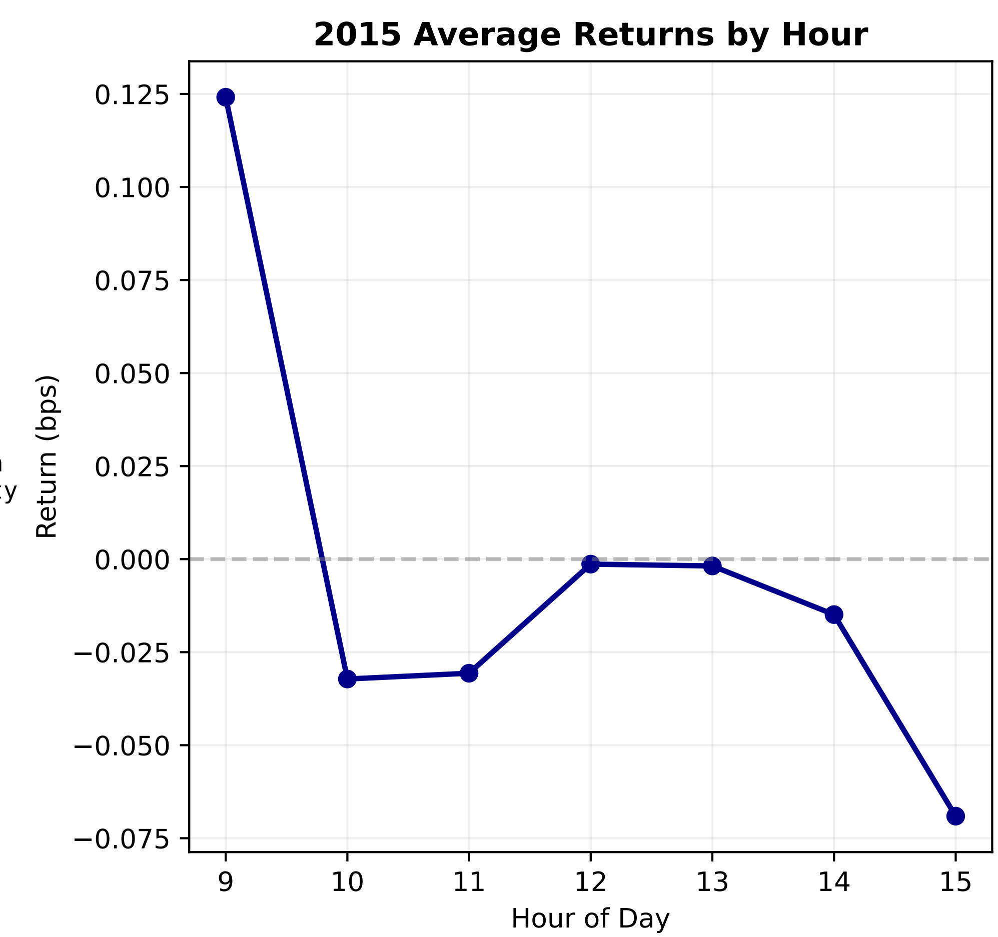


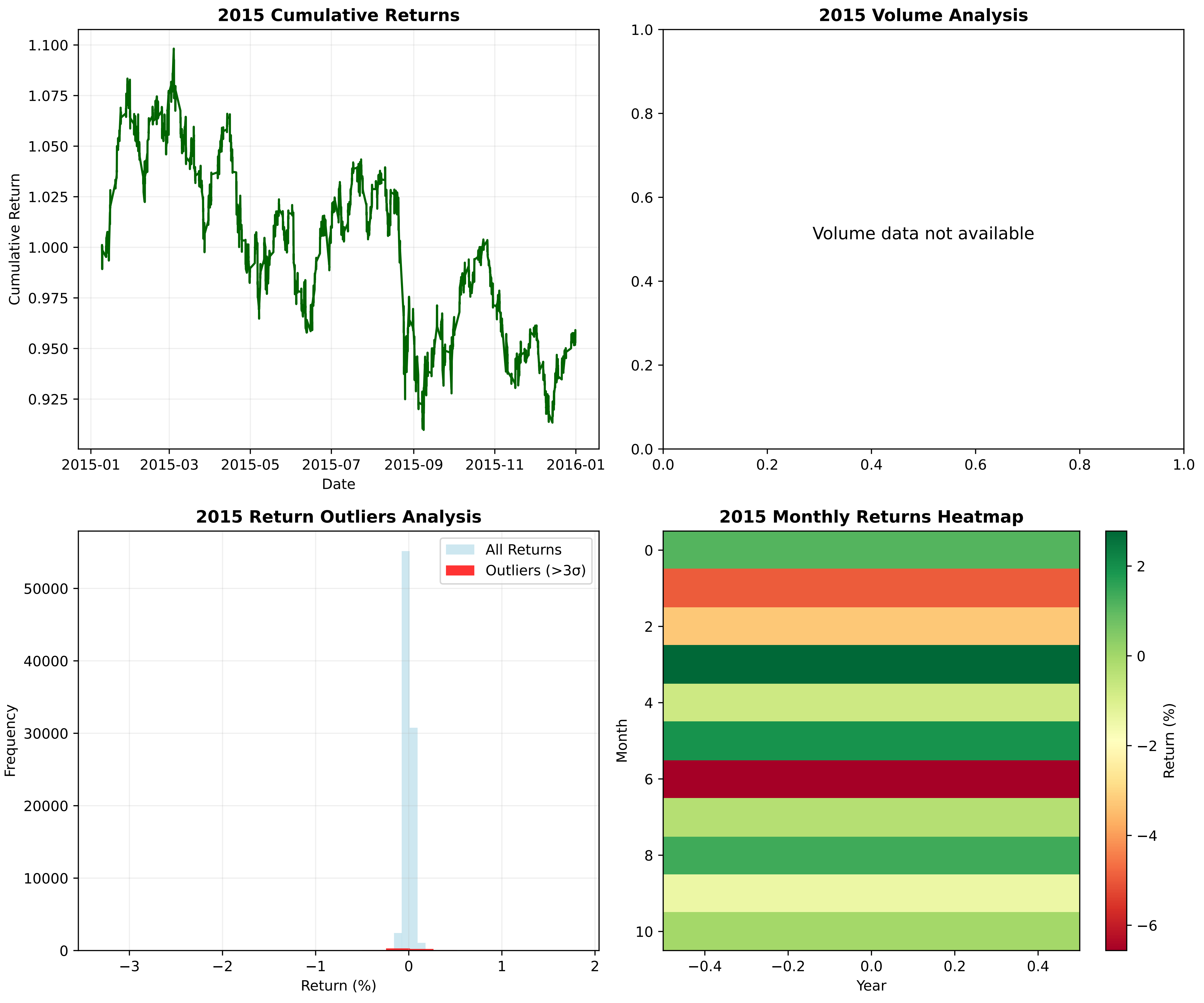

```
STATISTICAL TESTS - 2015
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=24.91, p=0.0055
Lag 20:  Stat=35.53, p=0.0175
Lag 30:  Stat=44.07, p=0.0470

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.7756, p=8.8161e-64

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2015 Cumulative Returns
Cumulative Return
Date
2015-01
2015-03
2015-05
2015-07
2015-09
2015-11
2016-01
2015 Volume Analysis
Volume data not available
2015 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2015 Monthly Returns Heatmap
Month
Year
Return (%)

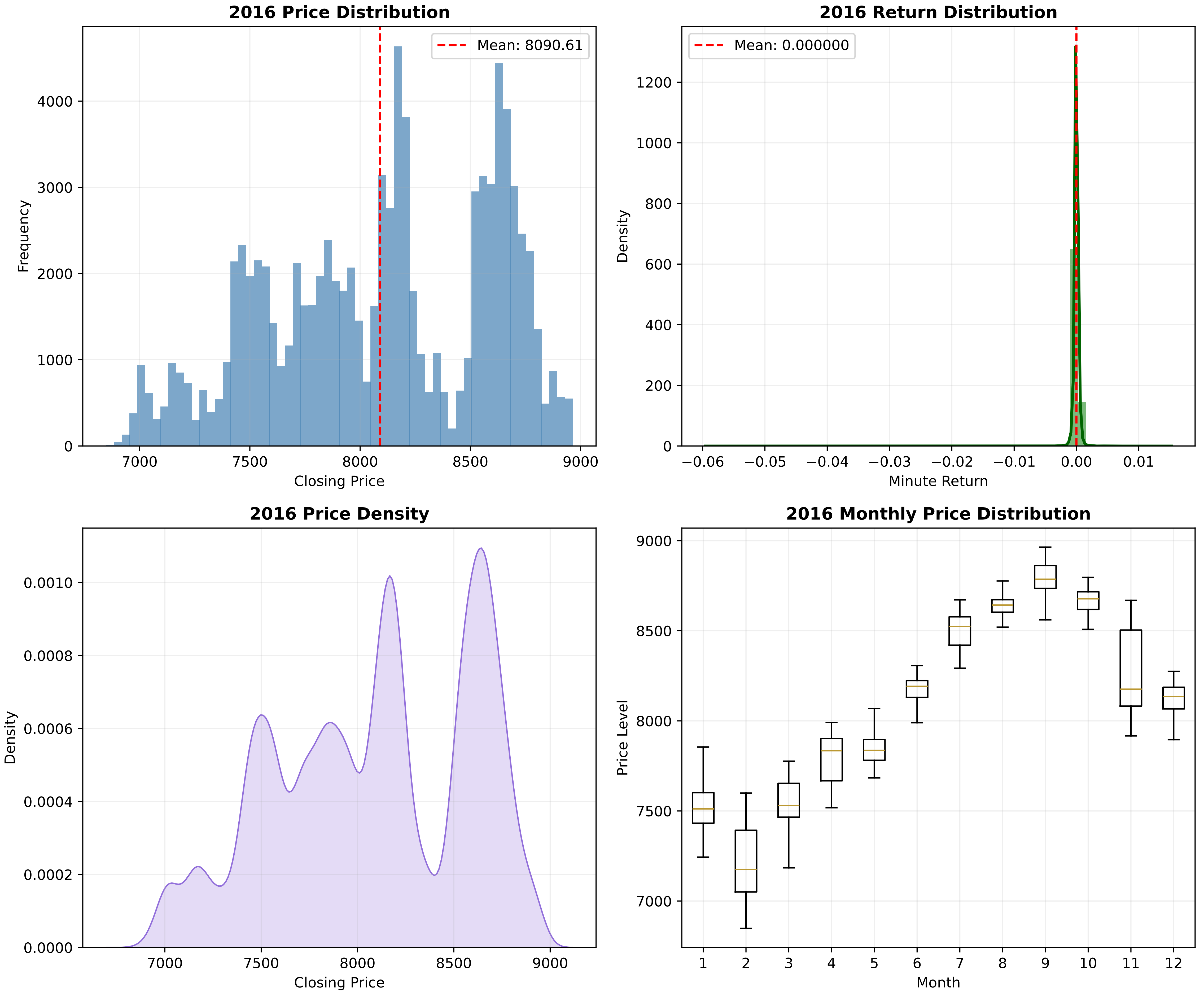
```
2016 MARKET ANALYSIS SUMMARY
========================================

Data Points: 92,250
Trading Days: 365

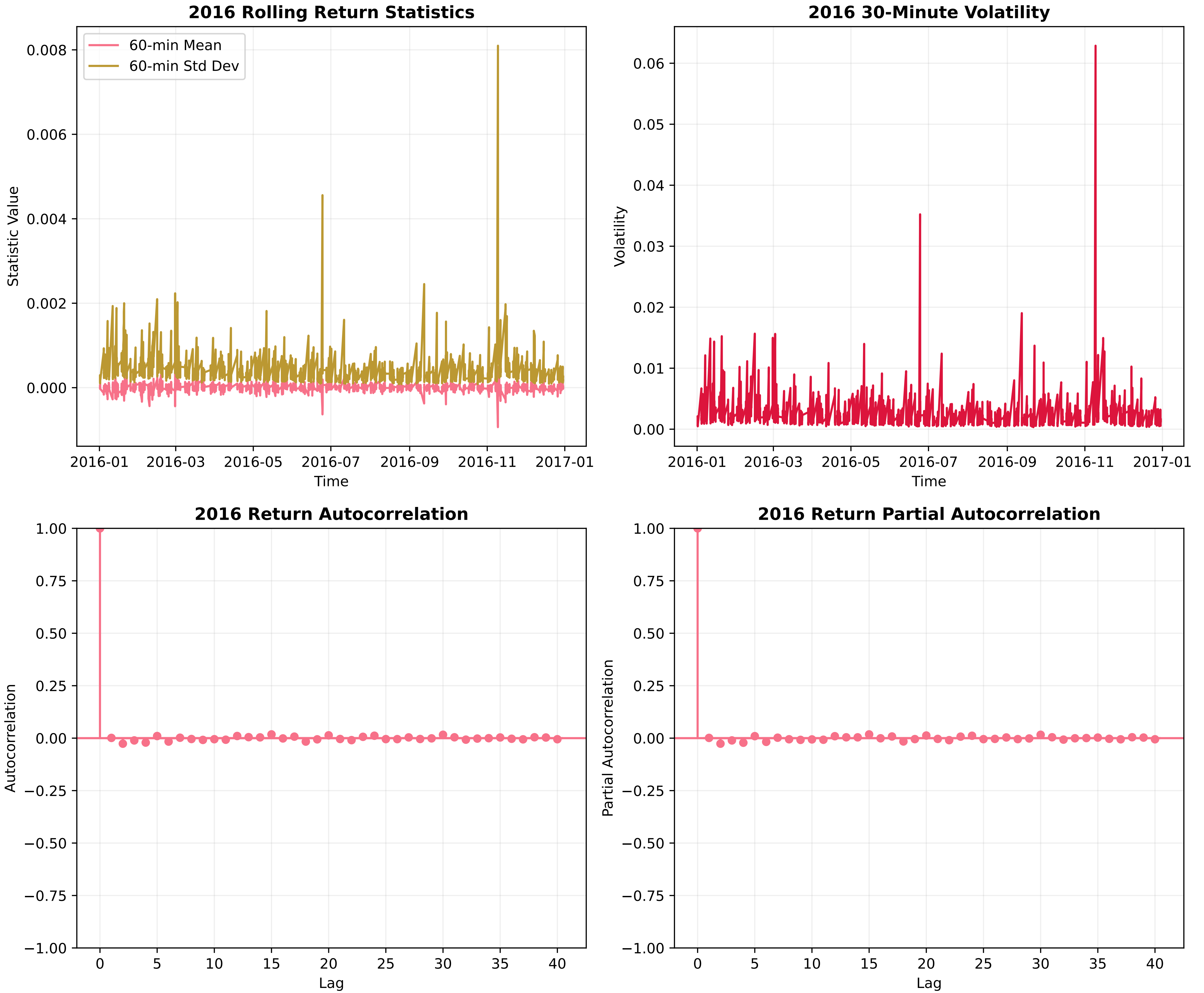
PRICE STATISTICS:
  Average Price: 8090.61
  Price Range: 6848.10 - 8964.25
  Price Volatility: 501.63

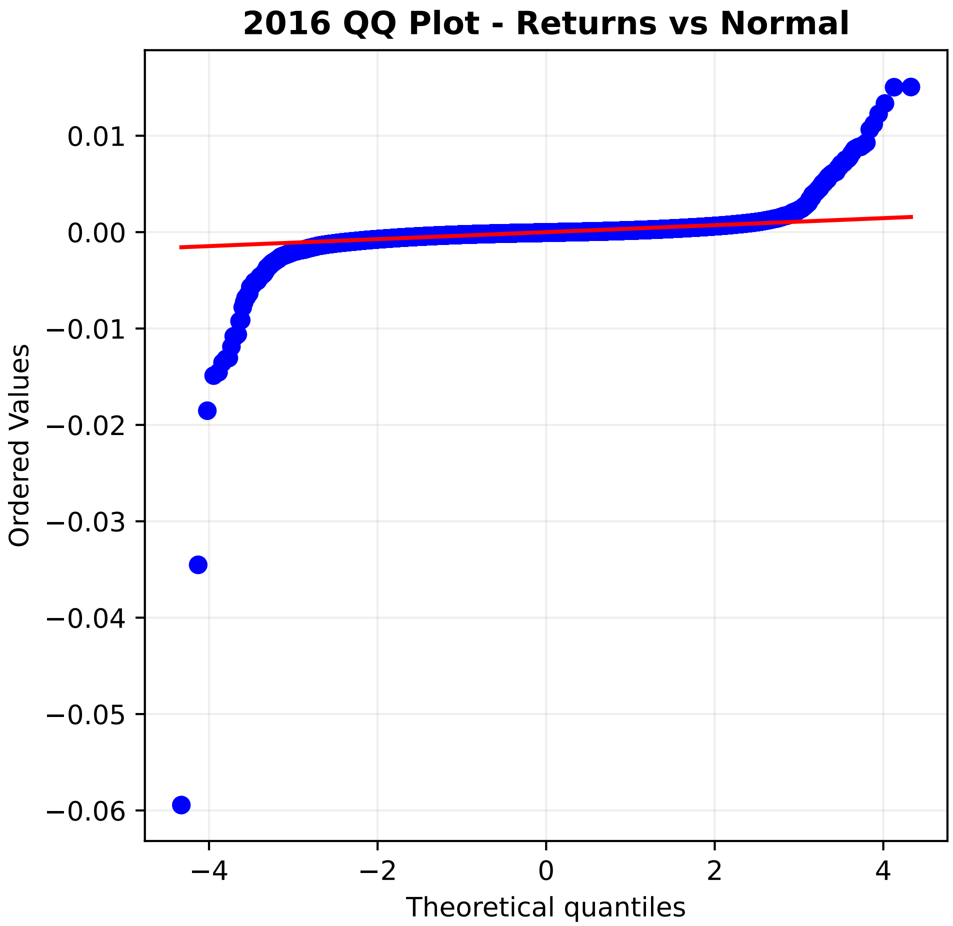
RETURN STATISTICS:
  Average Return: 0.000000
  Return Volatility: 0.000490
  Skewness: -23.185
  Kurtosis: 2741.699

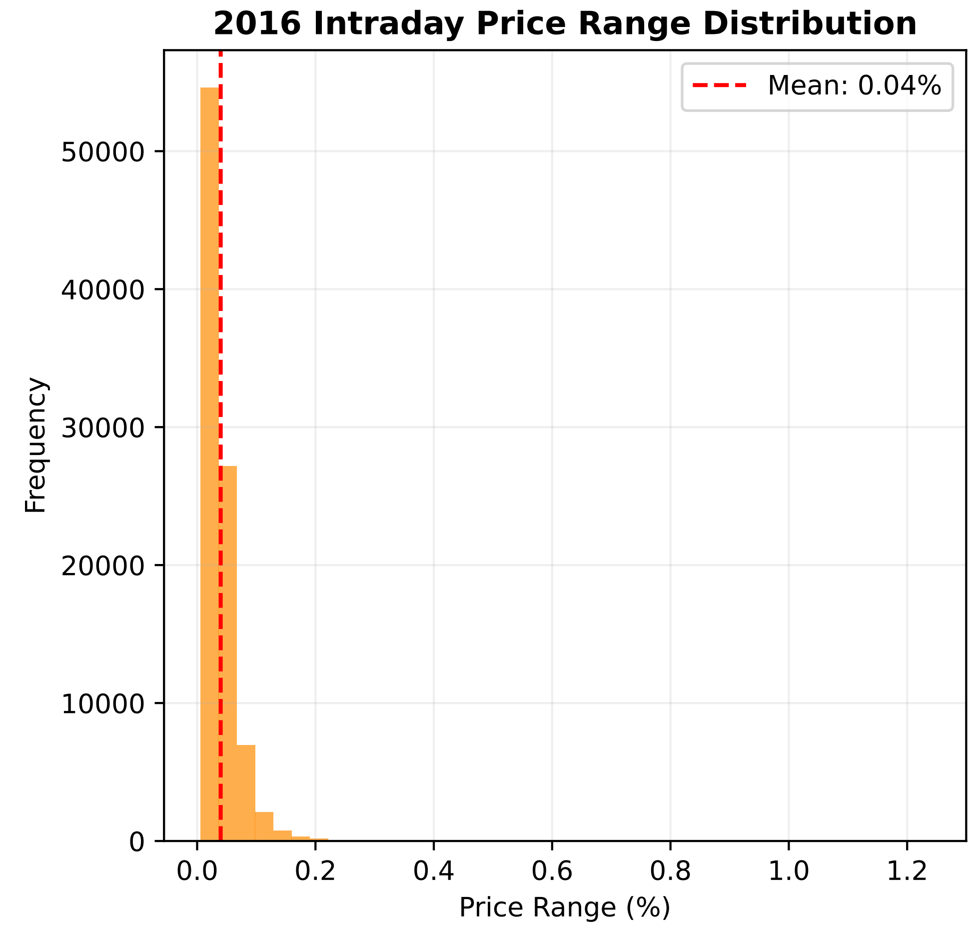
VOLATILITY:
  Average 30-min Volatility: 0.001884
  Max Daily Range: 1.24%
```



2016 Price Distribution
Mean: 8090.61
Frequency
Closing Price
2016 Return Distribution
Mean: 0.000000
Density
Minute Return
2016 Price Density
Density
Closing Price
2016 Monthly Price Distribution
Price Level
Month


2016 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2016 30-Minute Volatility
Volatility
Time
2016 Return Autocorrelation
Autocorrelation
Lag
2016 Return Partial Autocorrelation
Partial Autocorrelation
Lag



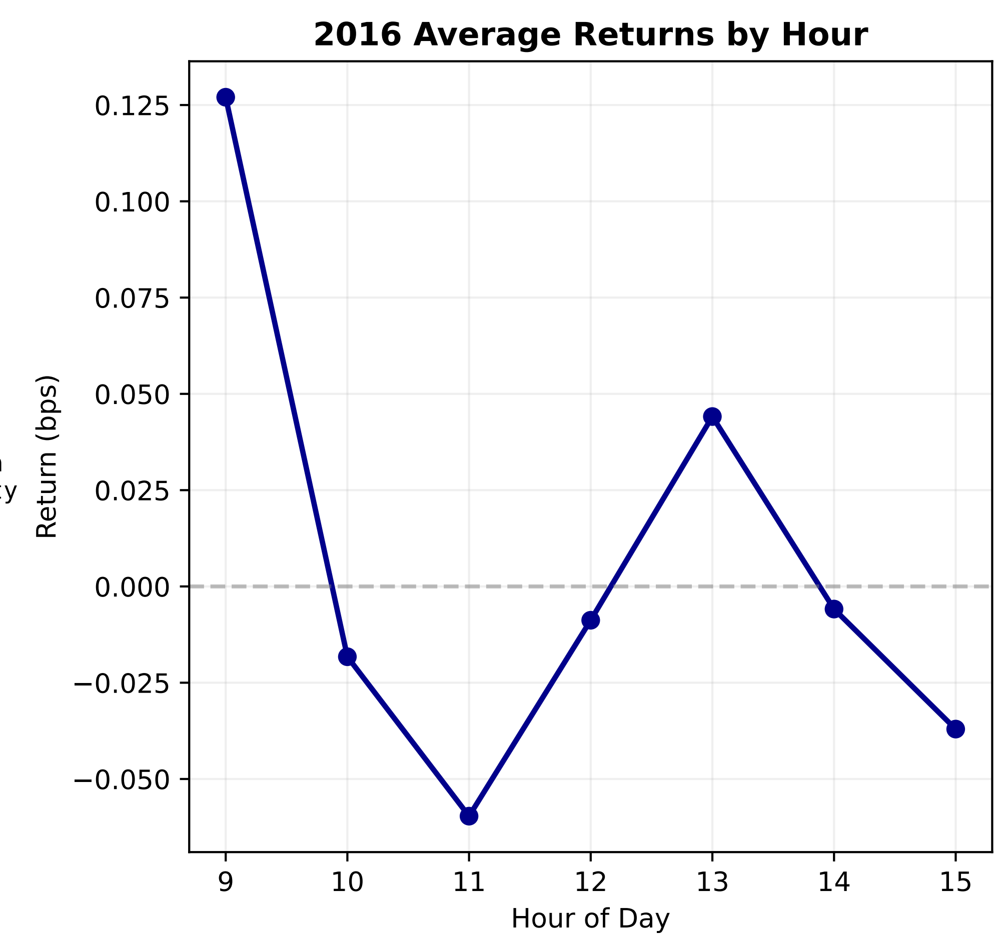


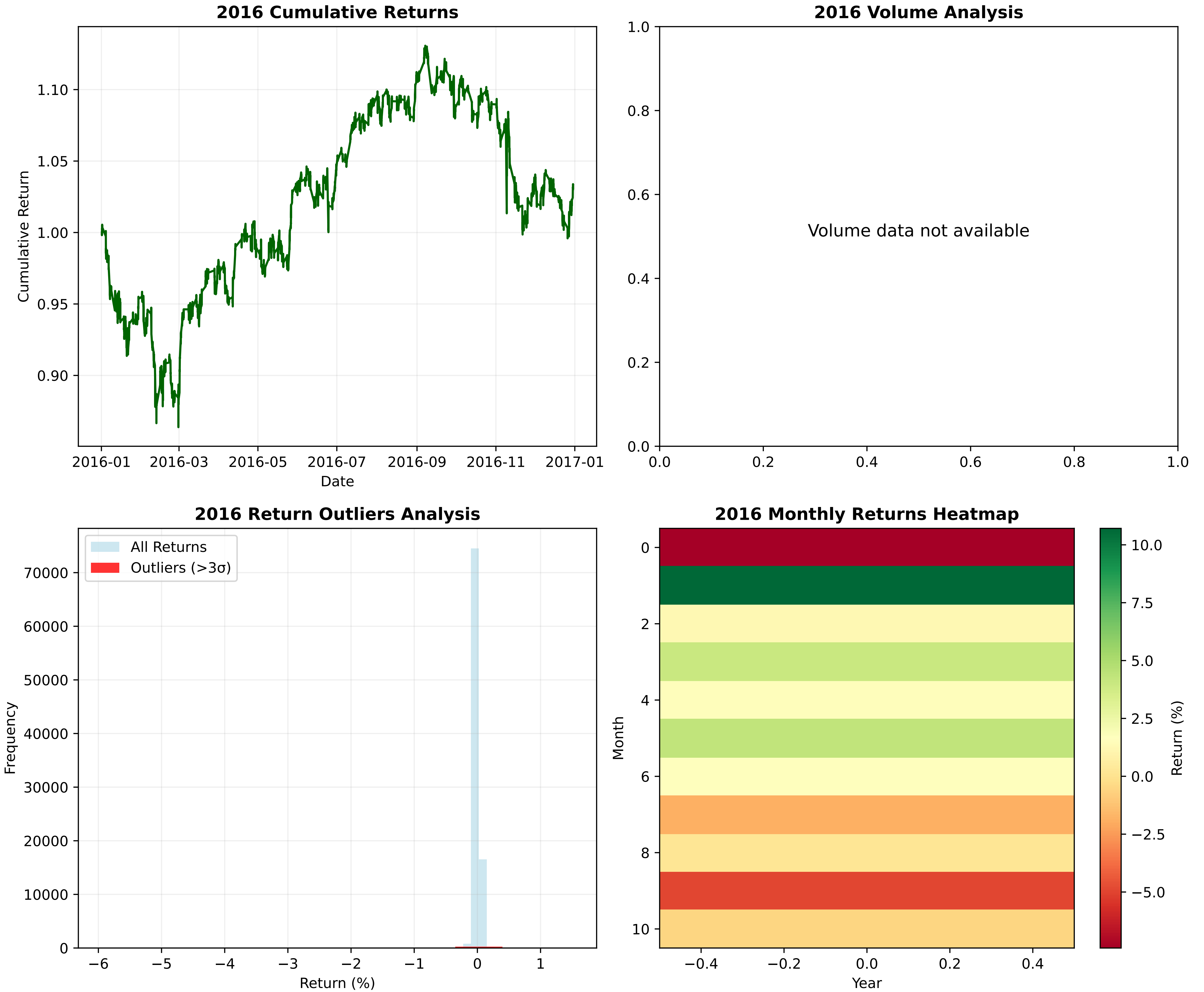

```
STATISTICAL TESTS - 2016
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=160.56, p=0.0000
Lag 20:  Stat=257.69, p=0.0000
Lag 30:  Stat=314.15, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.7711, p=3.6658e-64

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2016 Cumulative Returns
Cumulative Return
Date
1.10
1.05
1.00
0.95
0.90
2016-01
2016-03
2016-05
2016-07
2016-09
2016-11
2017-01
2016 Volume Analysis
Volume data not available
0.0
0.2
0.4
0.6
0.8
1.0
2016 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
70000
60000
50000
40000
30000
20000
10000
0
−6
−5
−4
−3
−2
−1
0
1
2016 Monthly Returns Heatmap
Month
Year
Return (%)
0
2
4
6
8
10
−0.4
−0.2
0.0
0.2
0.4
10.0
7.5
5.0
2.5
0.0
−2.5
−5.0

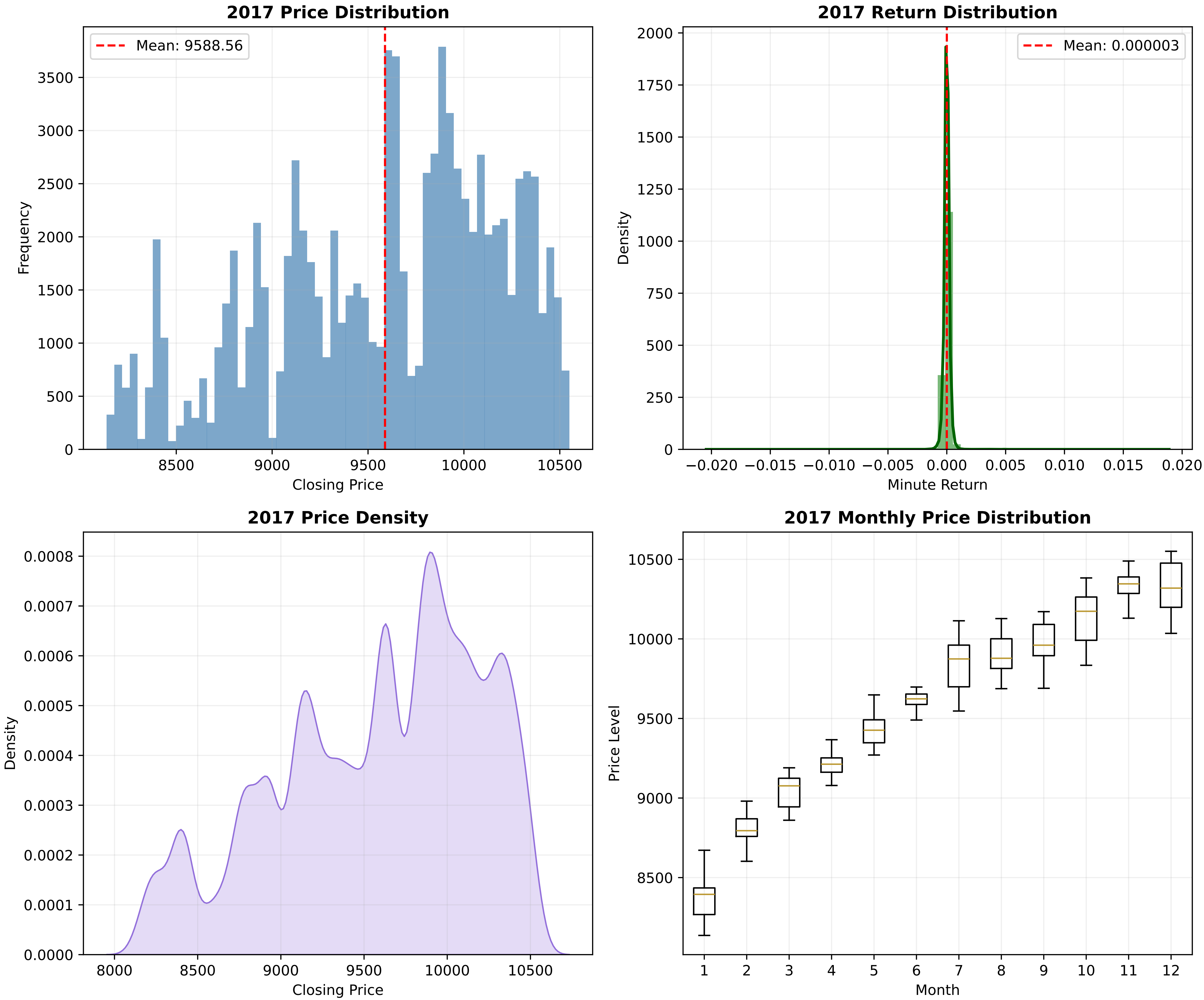
```
2017 MARKET ANALYSIS SUMMARY
========================================

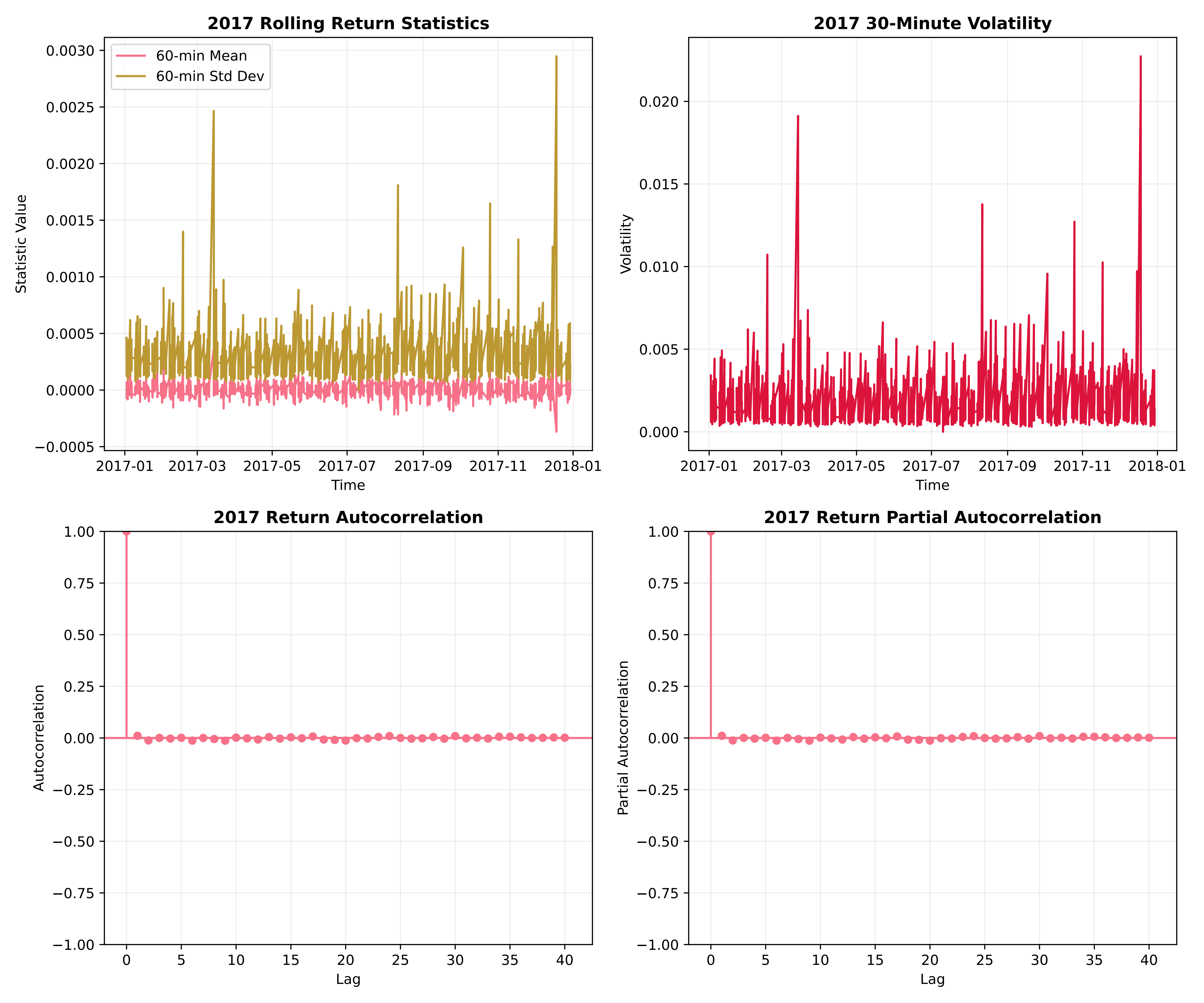
Data Points: 92,586
Trading Days: 362

PRICE STATISTICS:
  Average Price: 9588.56
  Price Range: 8136.55 - 10550.60
  Price Volatility: 604.63

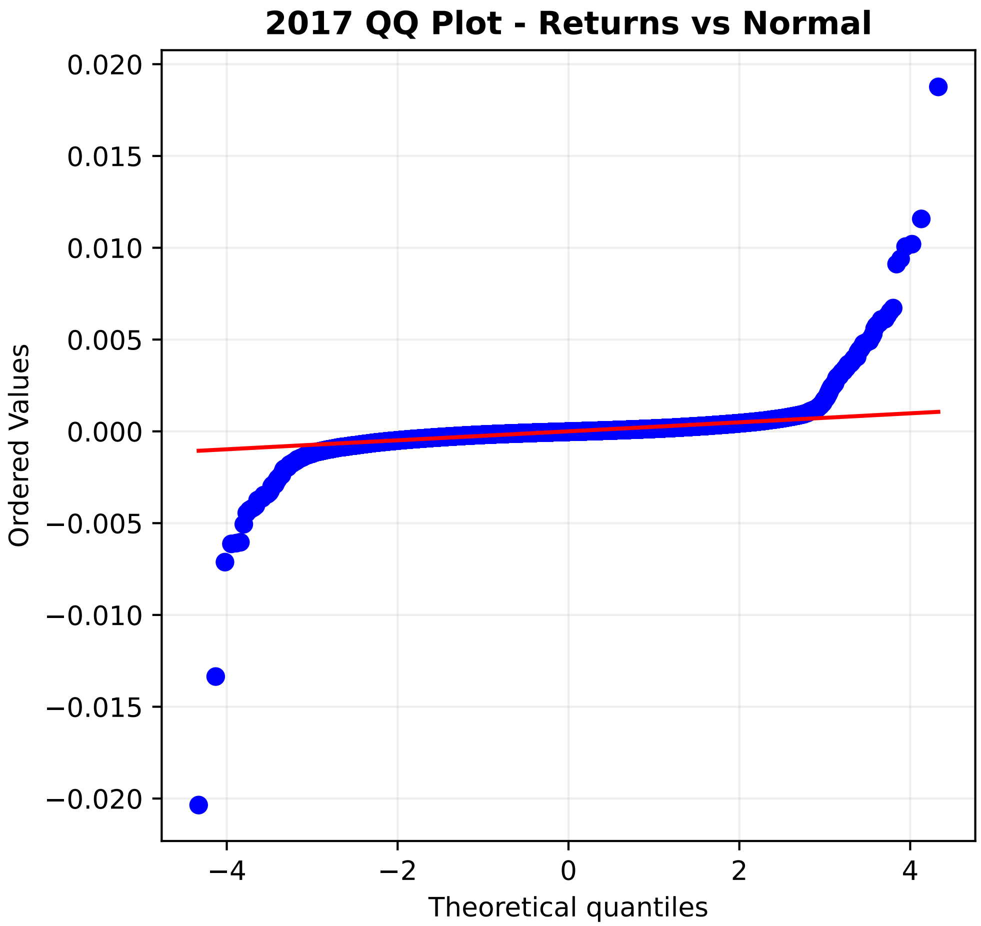
RETURN STATISTICS:
  Average Return: 0.000003
  Return Volatility: 0.000302
  Skewness: 2.072
  Kurtosis: 555.352

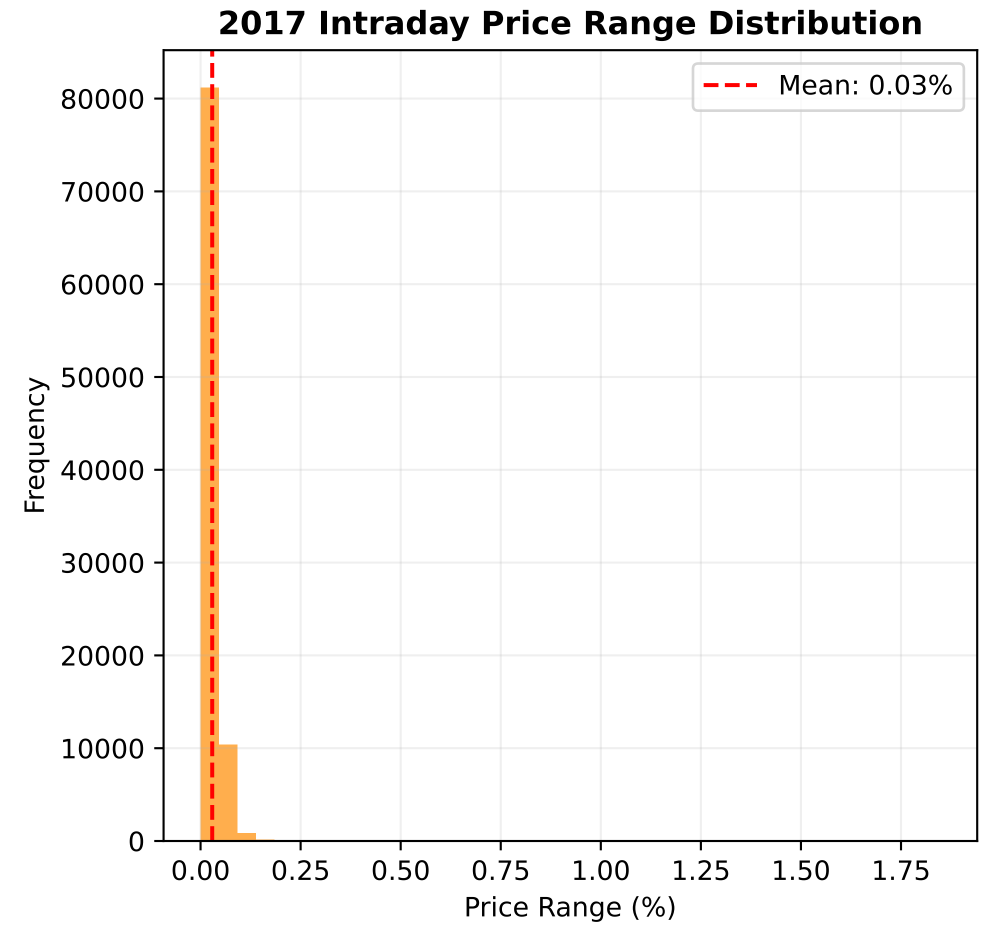
VOLATILITY:
  Average 30-min Volatility: 0.001287
  Max Daily Range: 1.85%
```


2017 Price Distribution
Mean: 9588.56
Frequency
0
500
1000
1500
2000
2500
3000
3500
8500
9000
9500
10000
10500
Closing Price
2017 Return Distribution
Mean: 0.000003
Density
0
250
500
750
1000
1250
1500
1750
2000
−0.020
−0.015
−0.010
−0.005
0.000
0.005
0.010
0.015
0.020
Minute Return
2017 Price Density
Density
0.0000
0.0001
0.0002
0.0003
0.0004
0.0005
0.0006
0.0007
0.0008
8000
8500
9000
9500
10000
10500
Closing Price
2017 Monthly Price Distribution
Price Level
8500
9000
9500
10000
10500
1
2
3
4
5
6
7
8
9
10
11
12
Month



2017 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2017 30-Minute Volatility
Volatility
Time
2017 Return Autocorrelation
Autocorrelation
Lag
2017 Return Partial Autocorrelation
Partial Autocorrelation
Lag



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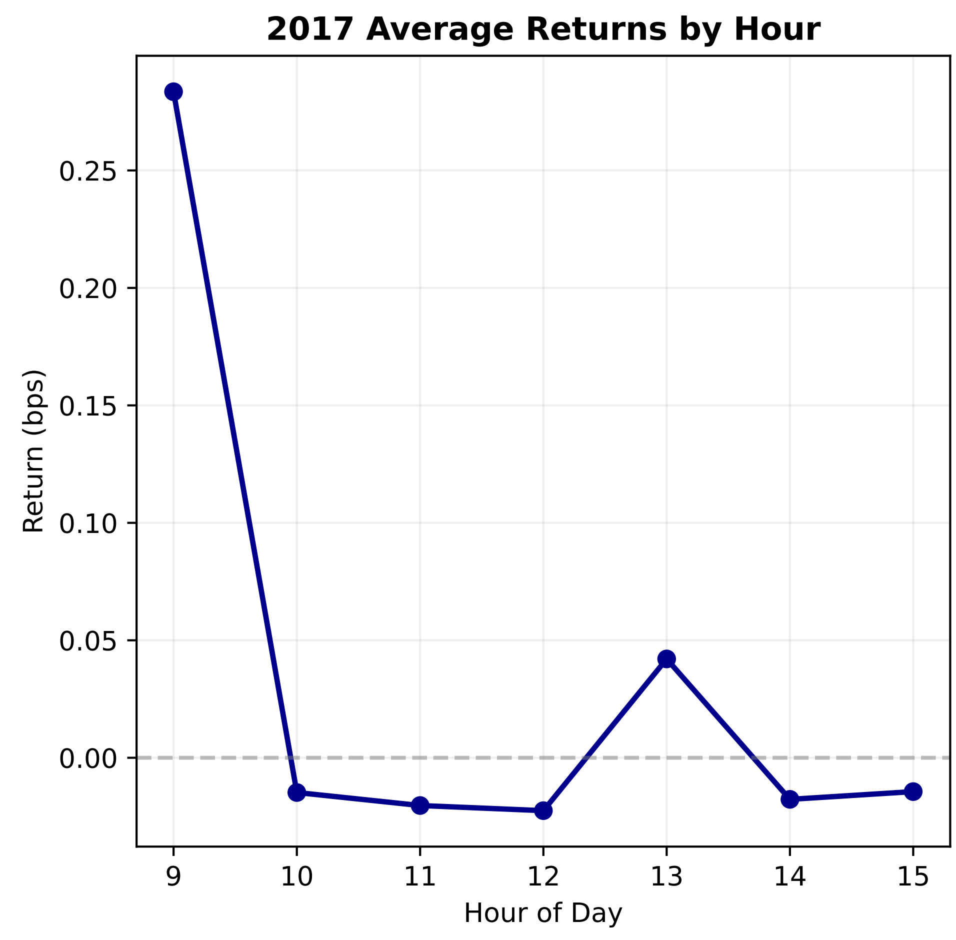
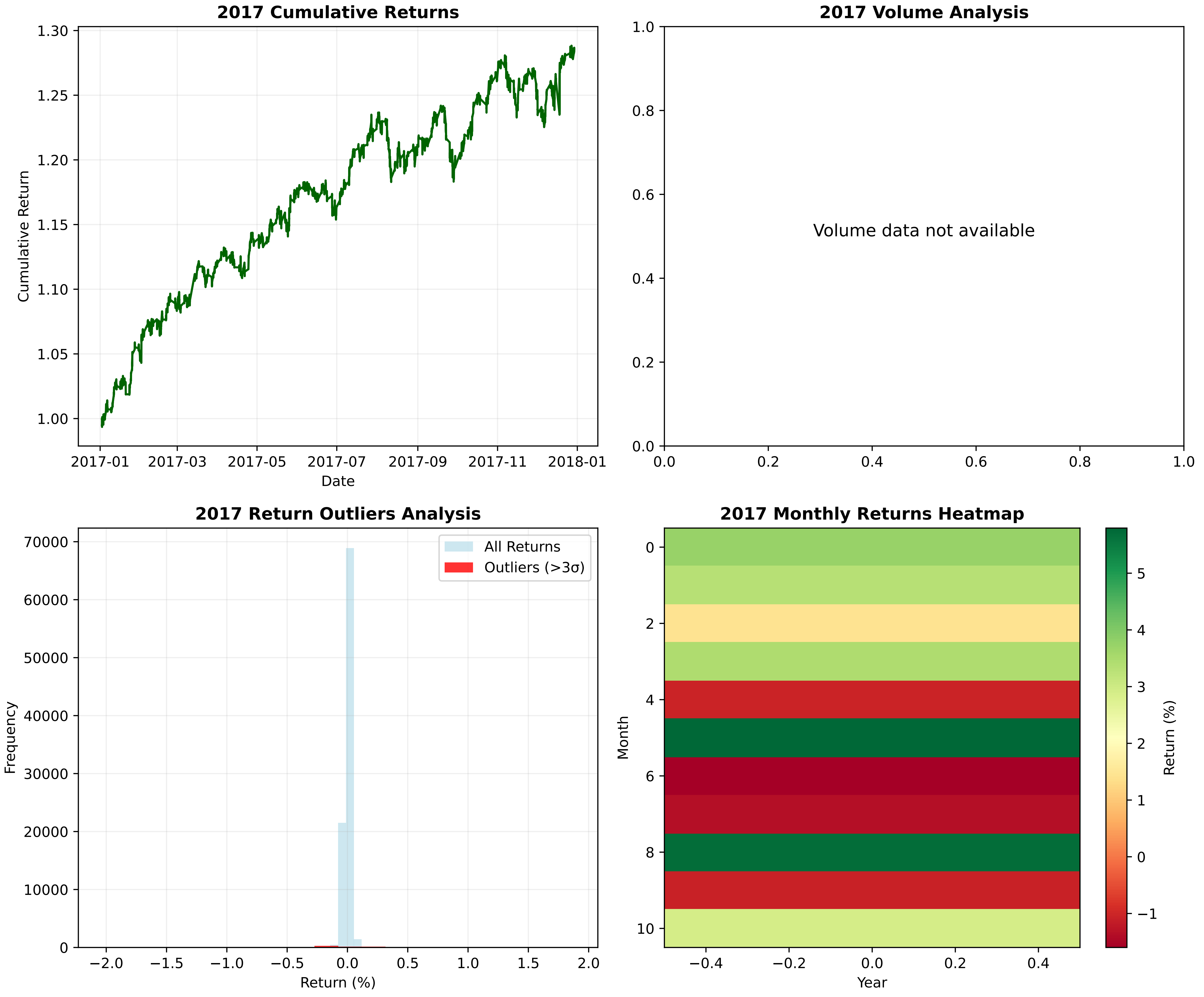
STATISTICAL TESTS - 2017
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=57.51, p=0.0000
Lag 20:  Stat=99.41, p=0.0000
Lag 30:  Stat=122.05, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.3889, p=1.5039e-84

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```





2017 Cumulative Returns
Cumulative Return
Date
1.30
1.25
1.20
1.15
1.10
1.05
1.00
2017-01
2017-03
2017-05
2017-07
2017-09
2017-11
2018-01
2017 Volume Analysis
Volume data not available
0.0
0.2
0.4
0.6
0.8
1.0
2017 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
70000
60000
50000
40000
30000
20000
10000
0
−2.0
−1.5
−1.0
−0.5
0.0
0.5
1.0
1.5
2.0
2017 Monthly Returns Heatmap
Month
Year
Return (%)
0
2
4
6
8
10
−0.4
−0.2
0.0
0.2
0.4
5
4
3
2
1
0
−1

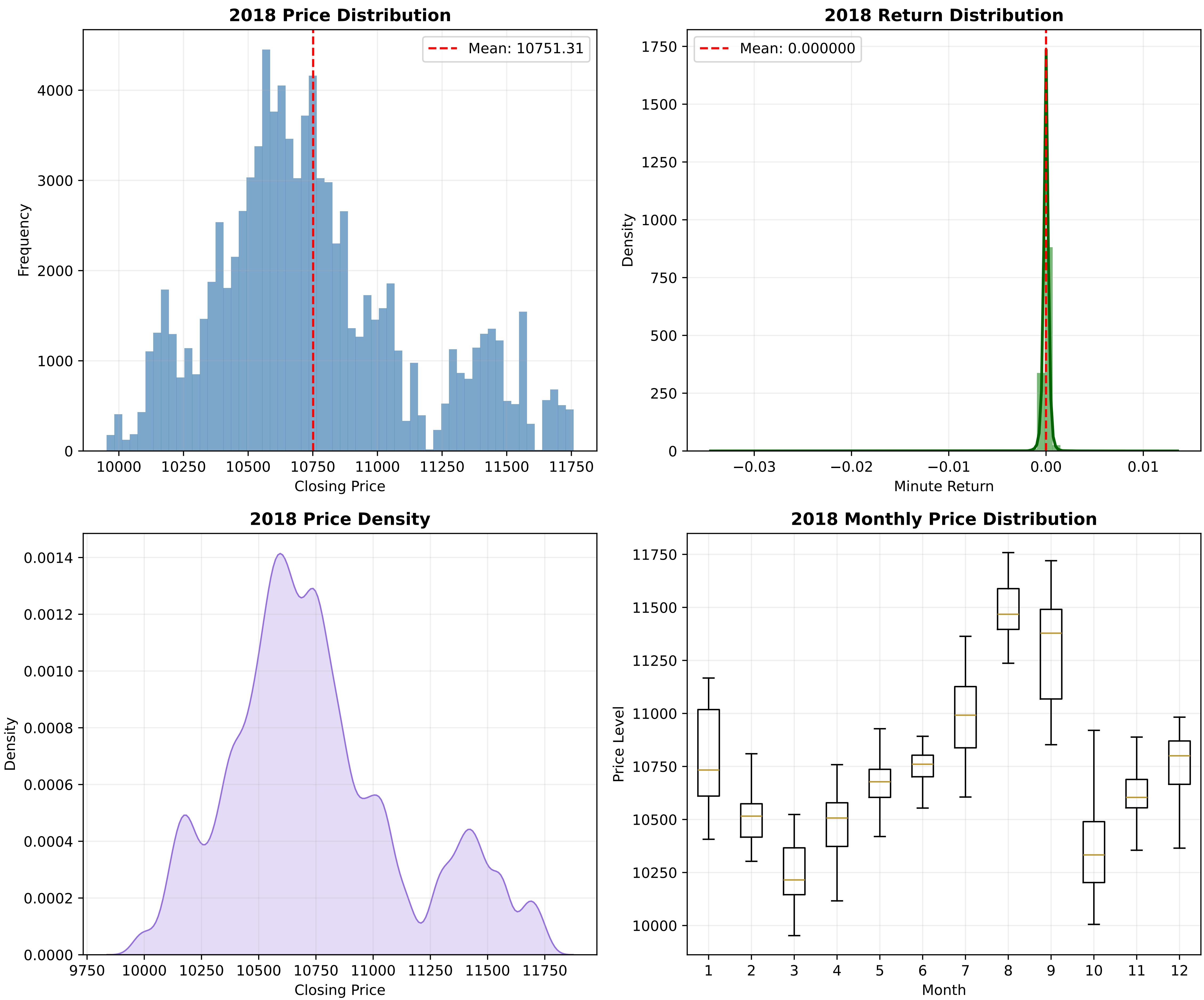
```
2018 MARKET ANALYSIS SUMMARY
========================================

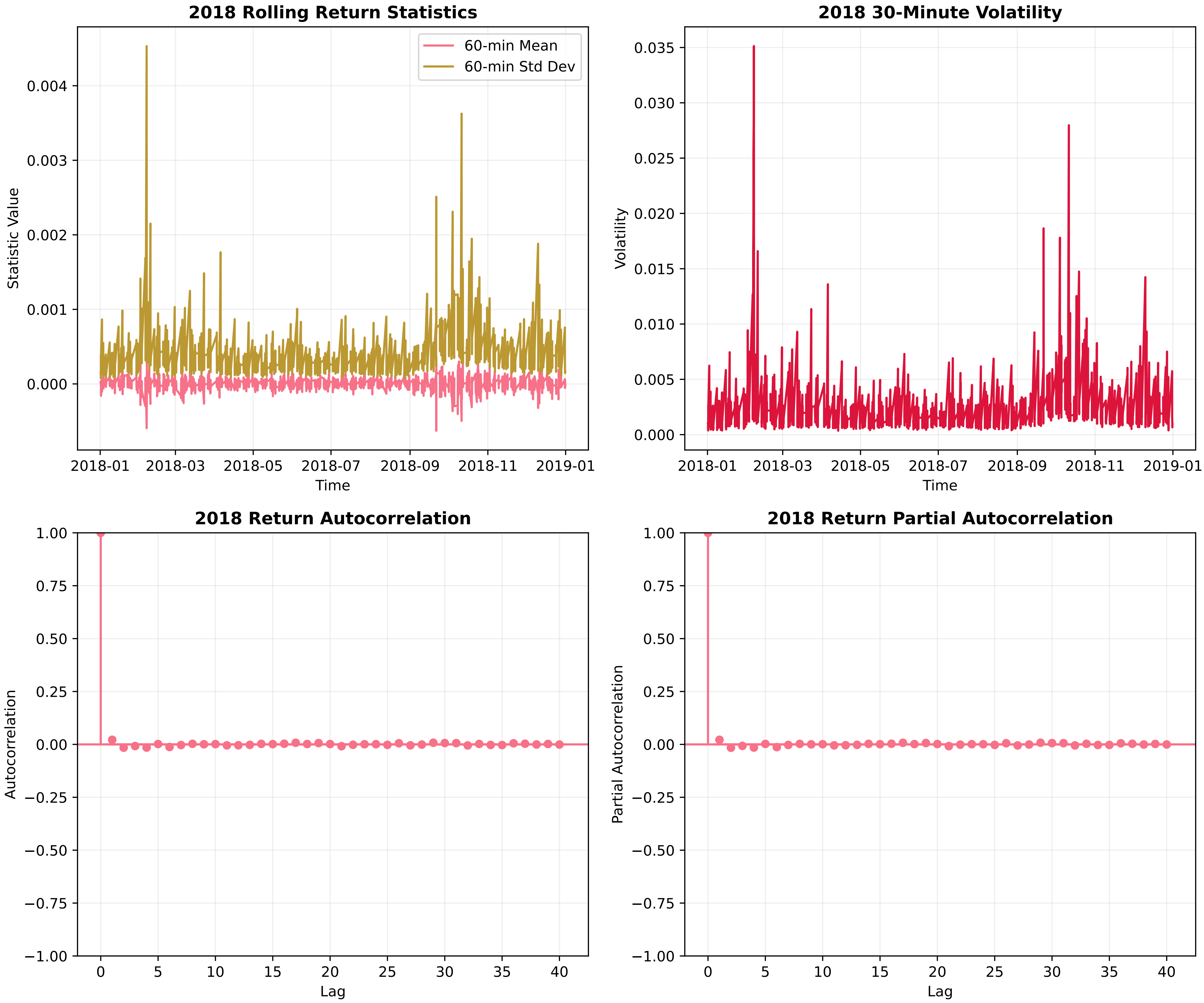
Data Points: 91,875
Trading Days: 365

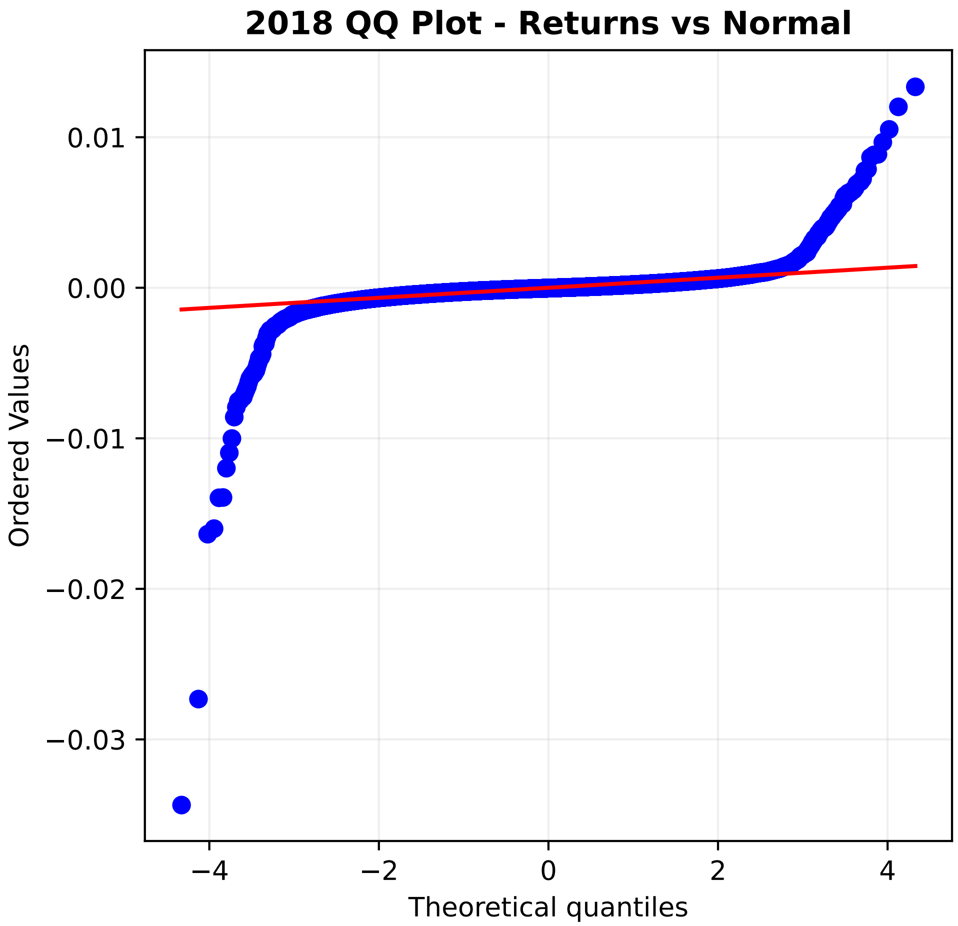
PRICE STATISTICS:
  Average Price: 10751.31
  Price Range: 9952.40 - 11758.40
  Price Volatility: 384.10

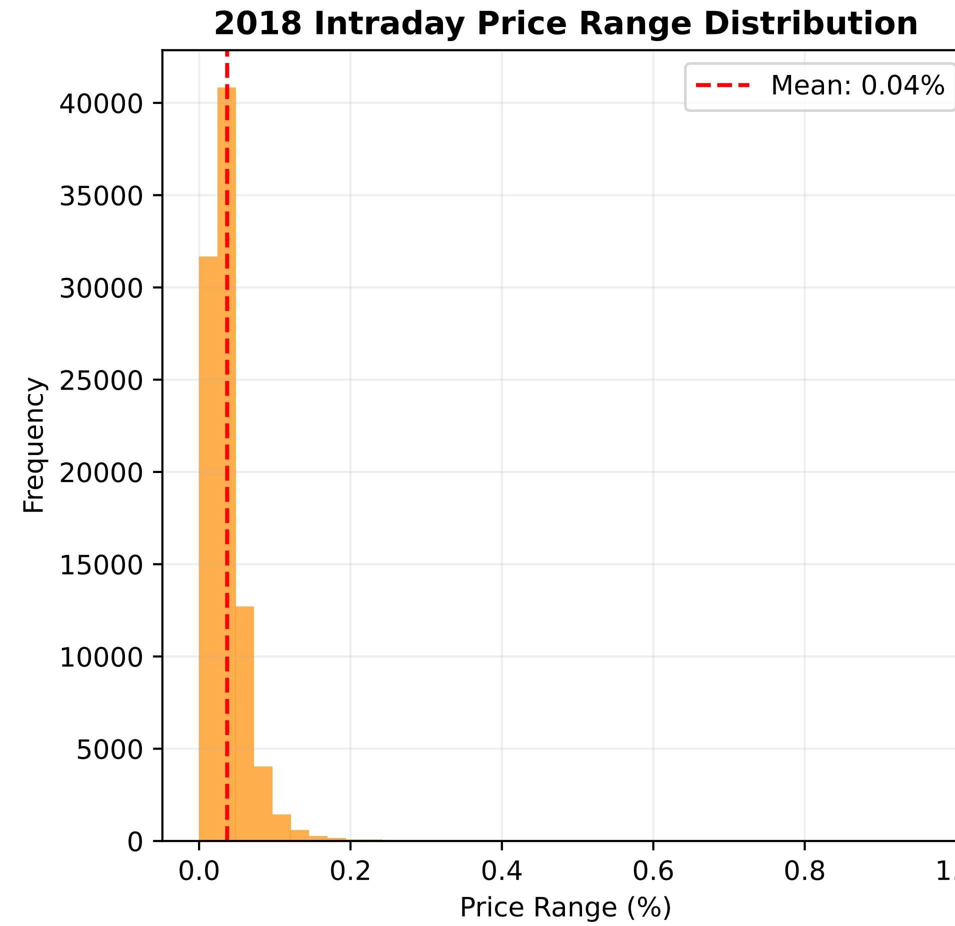
RETURN STATISTICS:
  Average Return: 0.000000
  Return Volatility: 0.000419
  Skewness: -9.997
  Kurtosis: 849.840

VOLATILITY:
  Average 30-min Volatility: 0.001723
  Max Daily Range: 0.97%
```


2018 Price Distribution
Mean: 10751.31
Frequency
0
1000
2000
3000
4000
10000
10250
10500
10750
11000
11250
11500
11750
Closing Price
2018 Return Distribution
Mean: 0.000000
Density
0
250
500
750
1000
1250
1500
1750
−0.03
−0.02
−0.01
0.00
0.01
Minute Return
2018 Price Density
Density
0.0000
0.0002
0.0004
0.0006
0.0008
0.0010
0.0012
0.0014
9750
10000
10250
10500
10750
11000
11250
11500
11750
Closing Price
2018 Monthly Price Distribution
Price Level
10000
10250
10500
10750
11000
11250
11500
11750
1
2
3
4
5
6
7
8
9
10
11
12
Month


2018 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
0.004
0.003
0.002
0.001
0.000
Time
2018-01
2018-03
2018-05
2018-07
2018-09
2018-11
2019-01
2018 30-Minute Volatility
Volatility
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
Time
2018-01
2018-03
2018-05
2018-07
2018-09
2018-11
2019-01
2018 Return Autocorrelation
Autocorrelation
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
Lag
0
5
10
15
20
25
30
35
40
2018 Return Partial Autocorrelation
Partial Autocorrelation
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
Lag
0
5
10
15
20
25
30
35
40



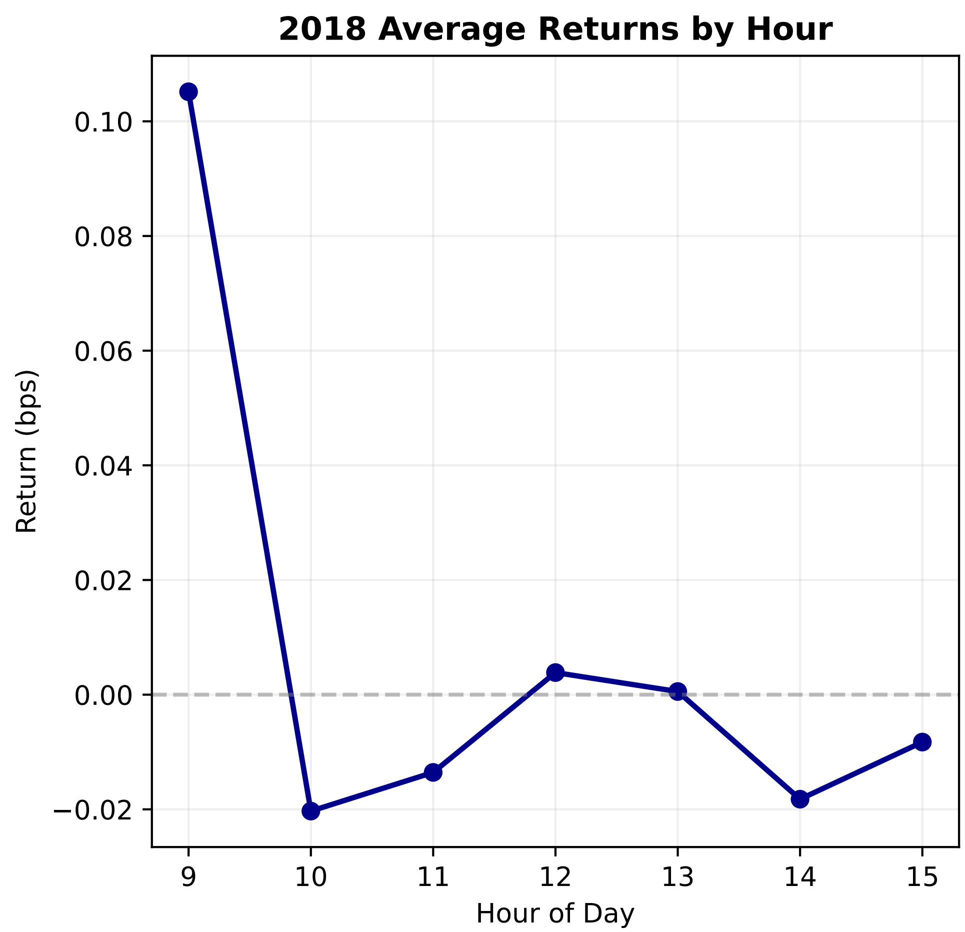


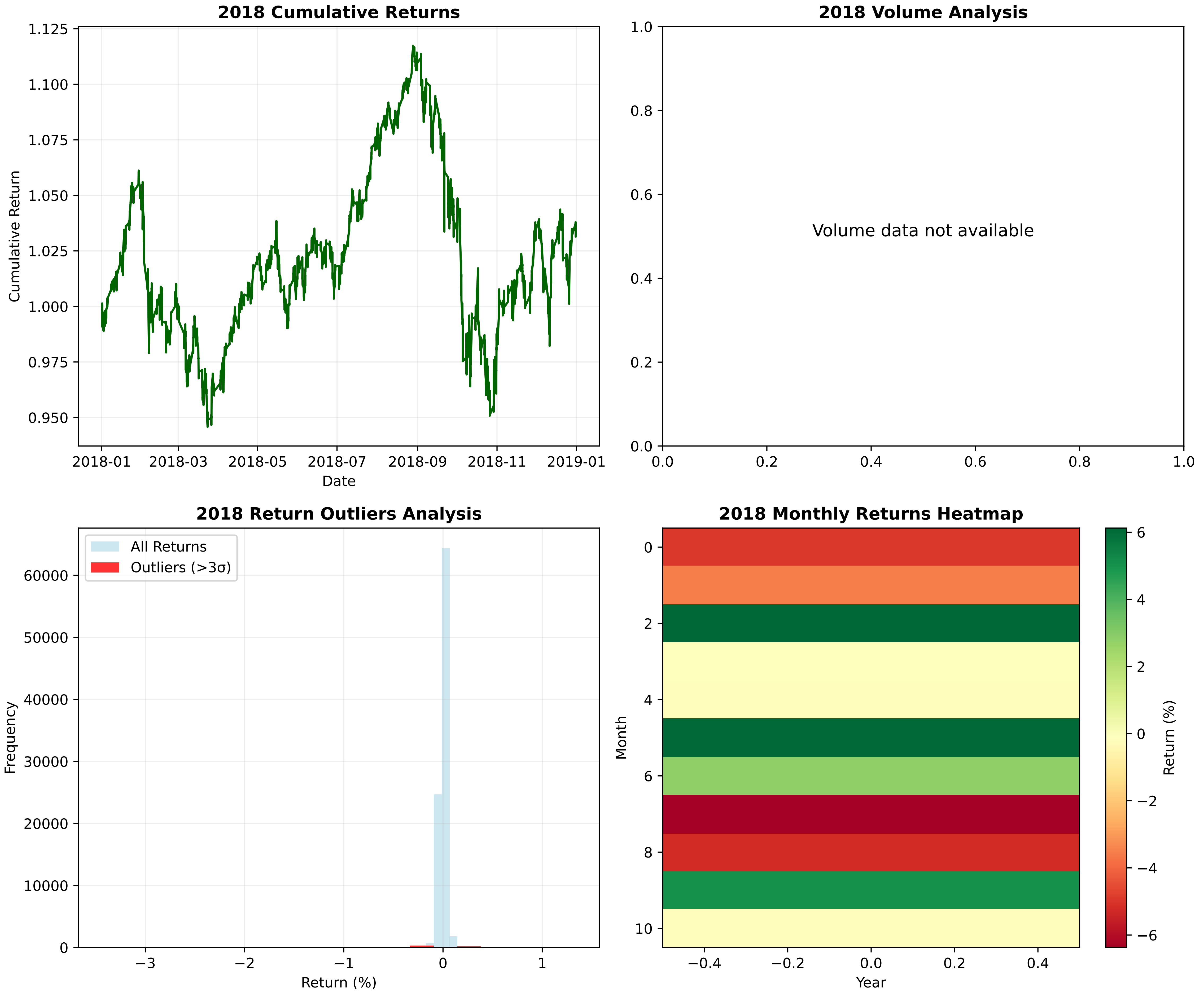

```
STATISTICAL TESTS - 2018
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=107.05, p=0.0000
Lag 20:  Stat=122.15, p=0.0000
Lag 30:  Stat=143.35, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.3349, p=1.9285e-86

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2018 Cumulative Returns
Cumulative Return
Date
2018 Volume Analysis
Volume data not available
2018 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2018 Monthly Returns Heatmap
Month
Year
Return (%)

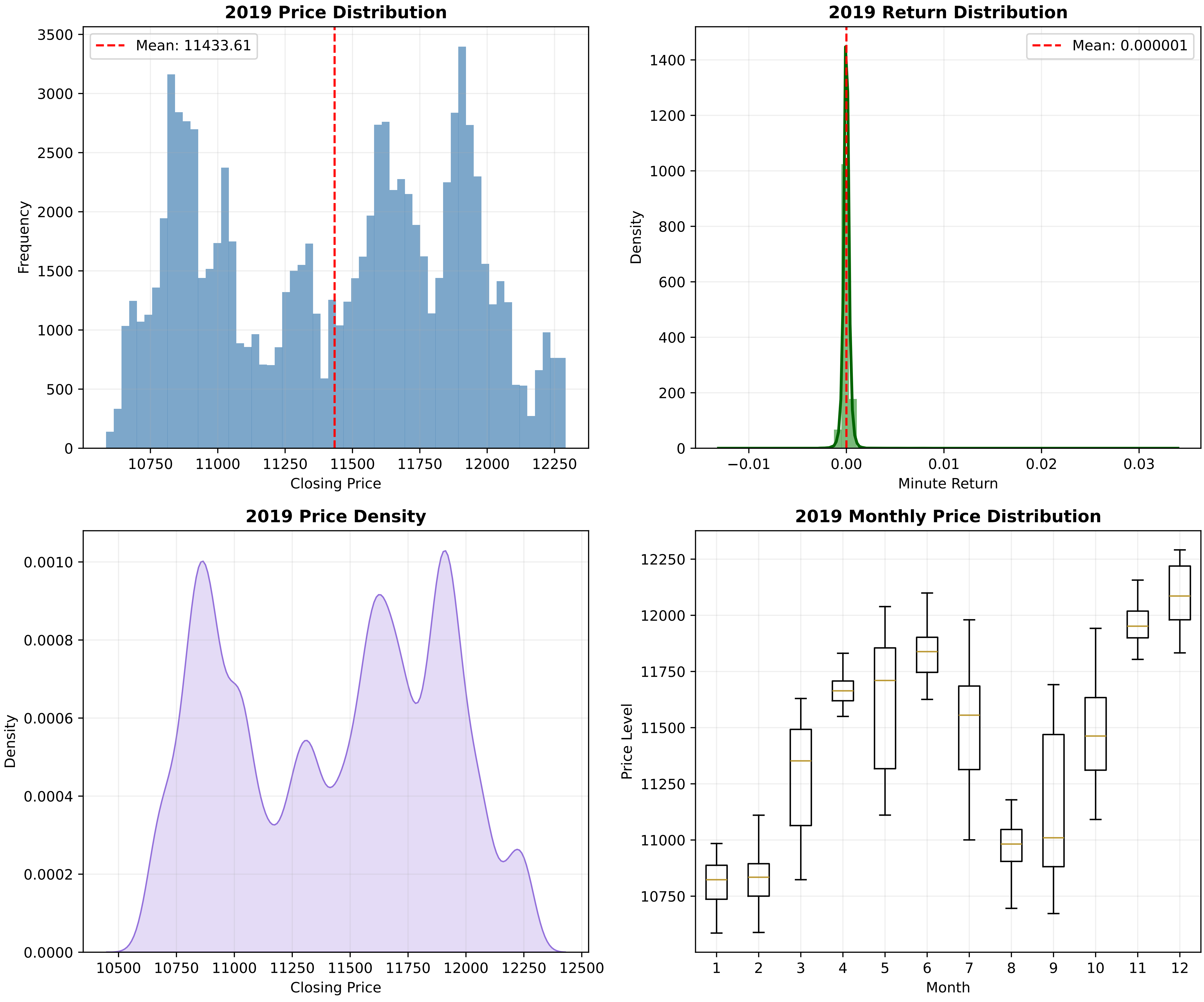
```
2019 MARKET ANALYSIS SUMMARY
========================================

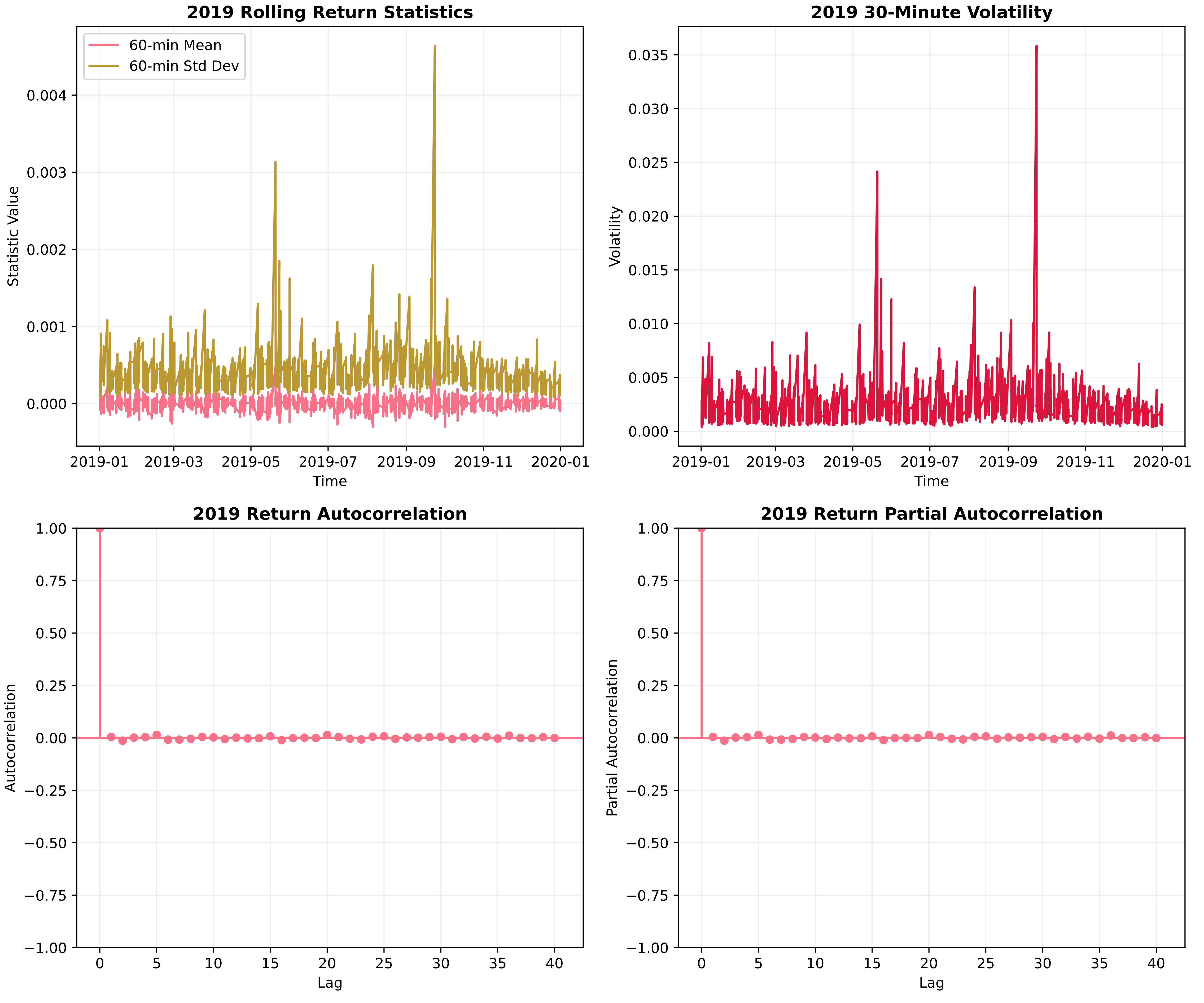
Data Points: 91,481
Trading Days: 365

PRICE STATISTICS:
  Average Price: 11433.61
  Price Range: 10585.80 - 12291.20
  Price Volatility: 455.63

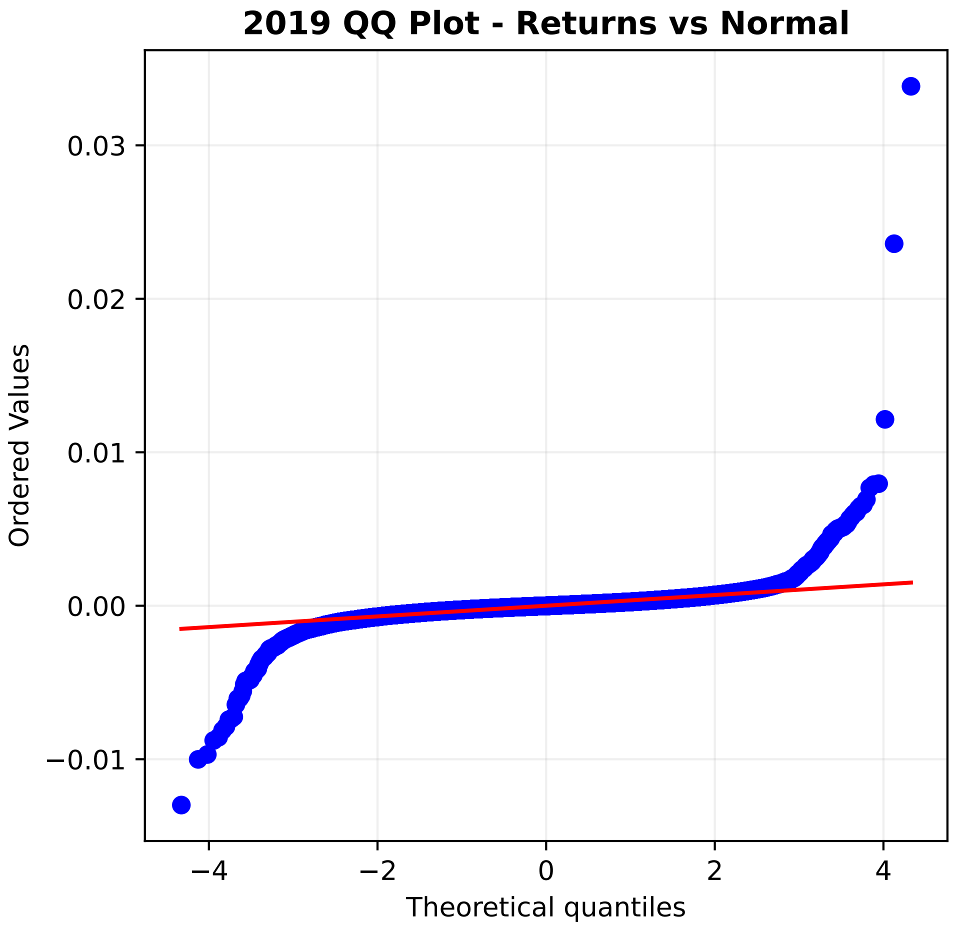
RETURN STATISTICS:
  Average Return: 0.000001
  Return Volatility: 0.000409
  Skewness: 8.092
  Kurtosis: 698.052

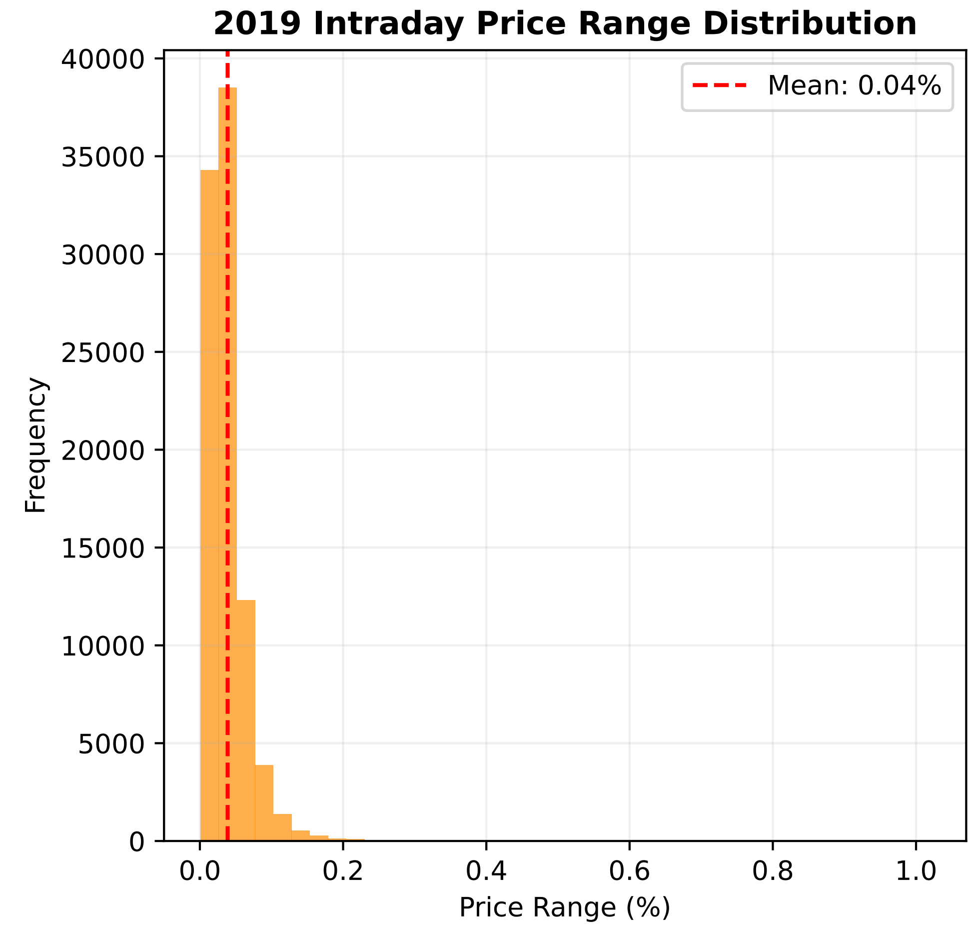
VOLATILITY:
  Average 30-min Volatility: 0.001816
  Max Daily Range: 1.02%
```


2019 Price Distribution
Mean: 11433.61
Frequency
Closing Price
2019 Return Distribution
Mean: 0.000001
Density
Minute Return
2019 Price Density
Density
Closing Price
2019 Monthly Price Distribution
Price Level
Month



2019 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2019 30-Minute Volatility
Volatility
Time
2019 Return Autocorrelation
Autocorrelation
Lag
2019 Return Partial Autocorrelation
Partial Autocorrelation
Lag



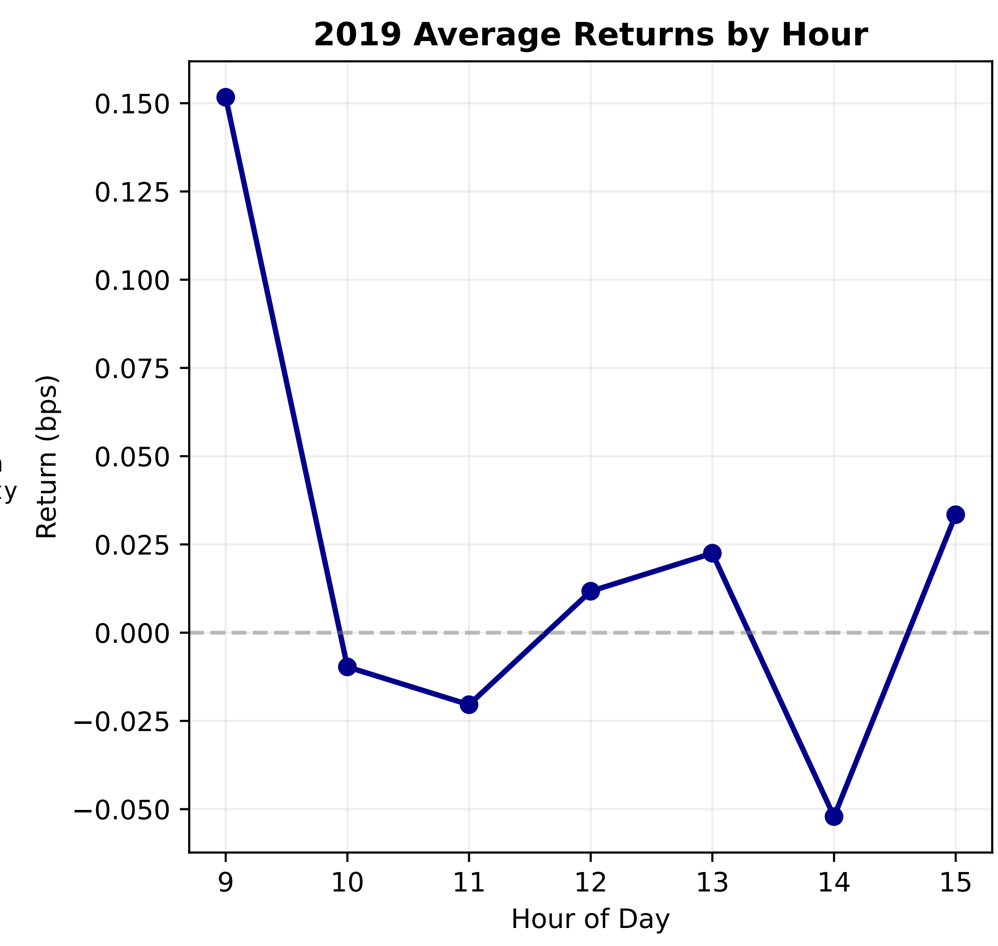


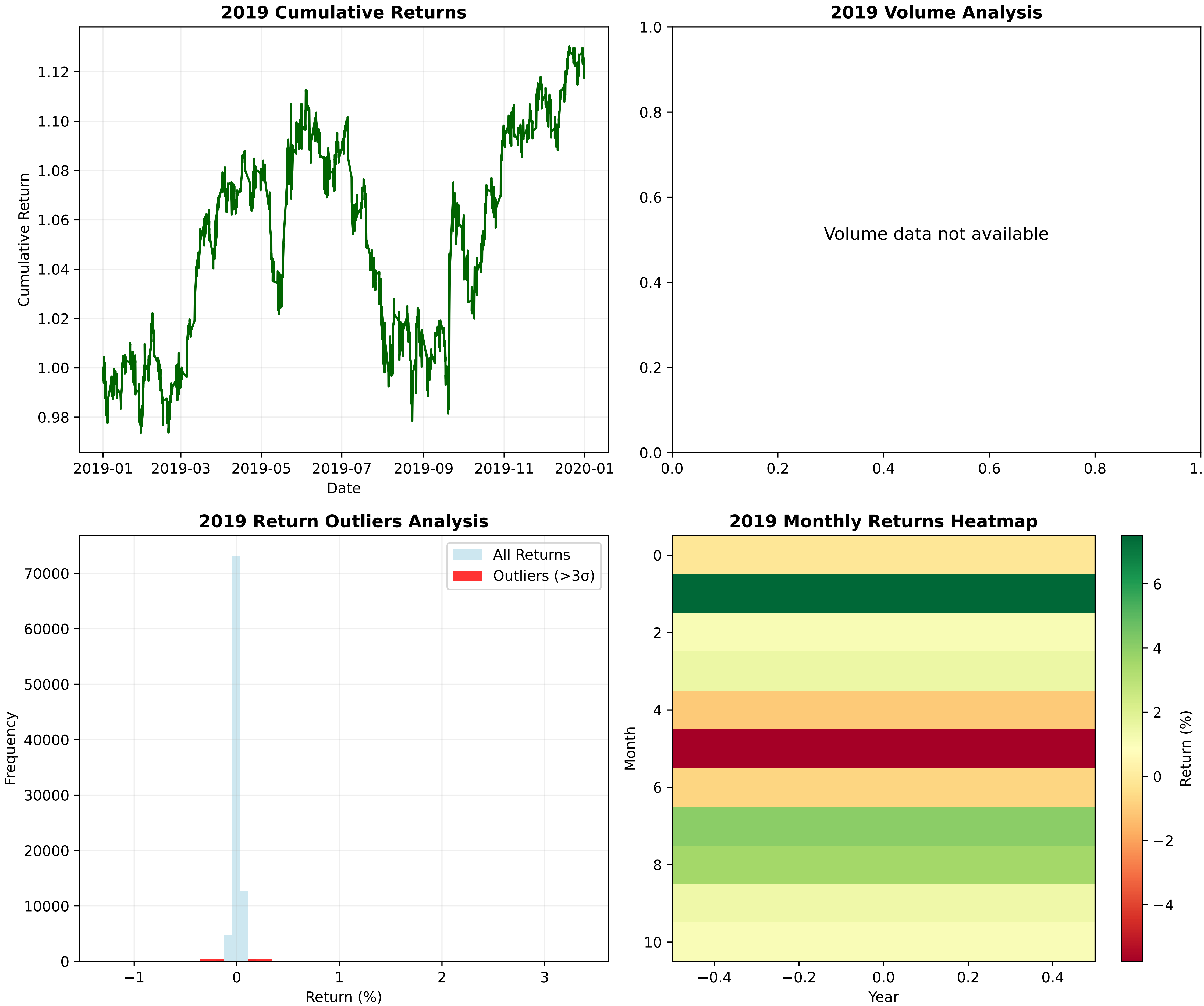

```
STATISTICAL TESTS - 2019
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=55.27, p=0.0000
Lag 20:  Stat=93.41, p=0.0000
Lag 30:  Stat=116.70, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.7629, p=7.5289e-65

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2019 Cumulative Returns
Cumulative Return
Date
2019-01
2019-03
2019-05
2019-07
2019-09
2019-11
2020-01
2019 Volume Analysis
Volume data not available
2019 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2019 Monthly Returns Heatmap
Month
Year
Return (%)

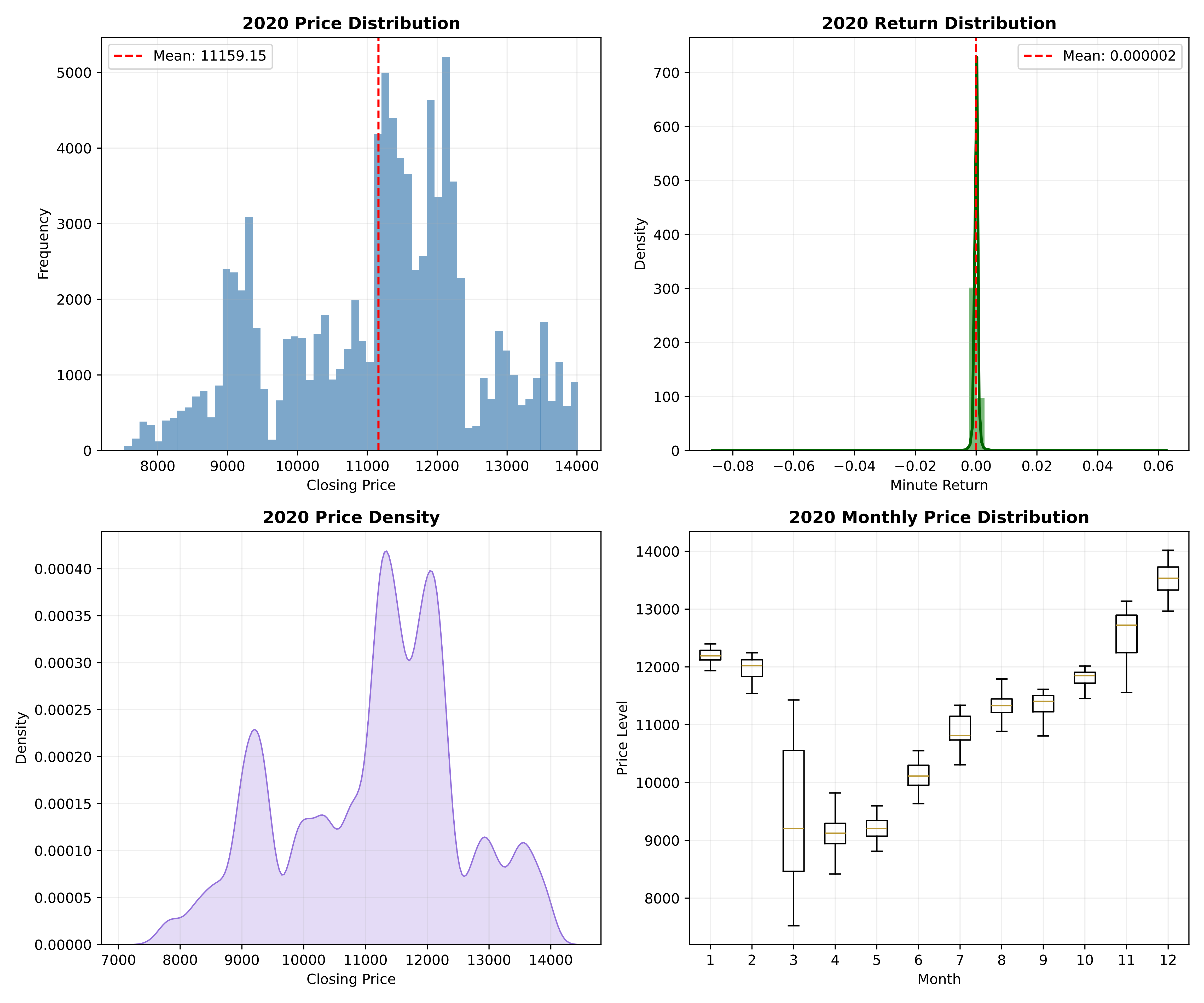
```
2020 MARKET ANALYSIS SUMMARY
========================================

Data Points: 94,120
Trading Days: 366

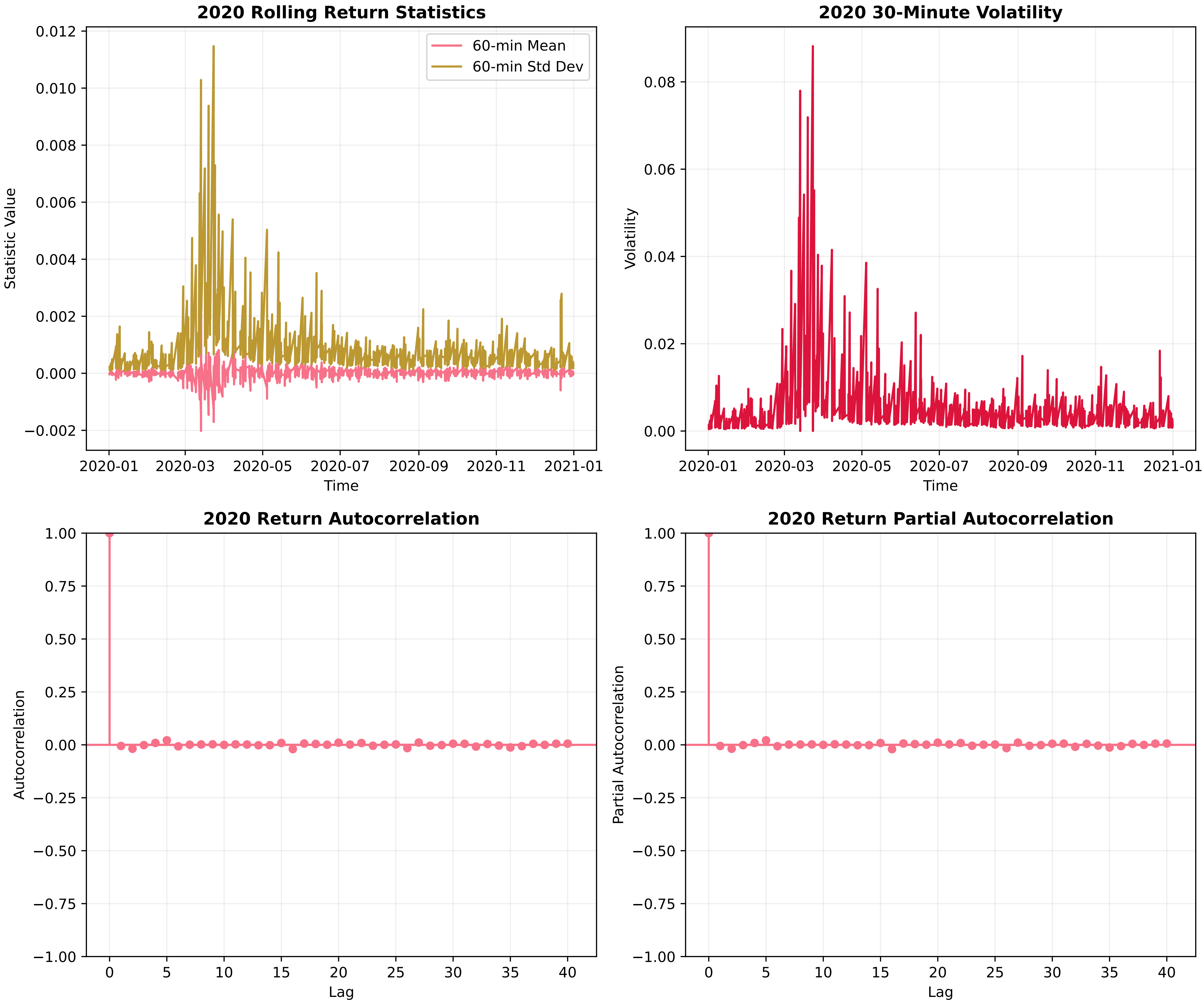
PRICE STATISTICS:
  Average Price: 11159.15
  Price Range: 7522.35 - 14018.90
  Price Volatility: 1403.31

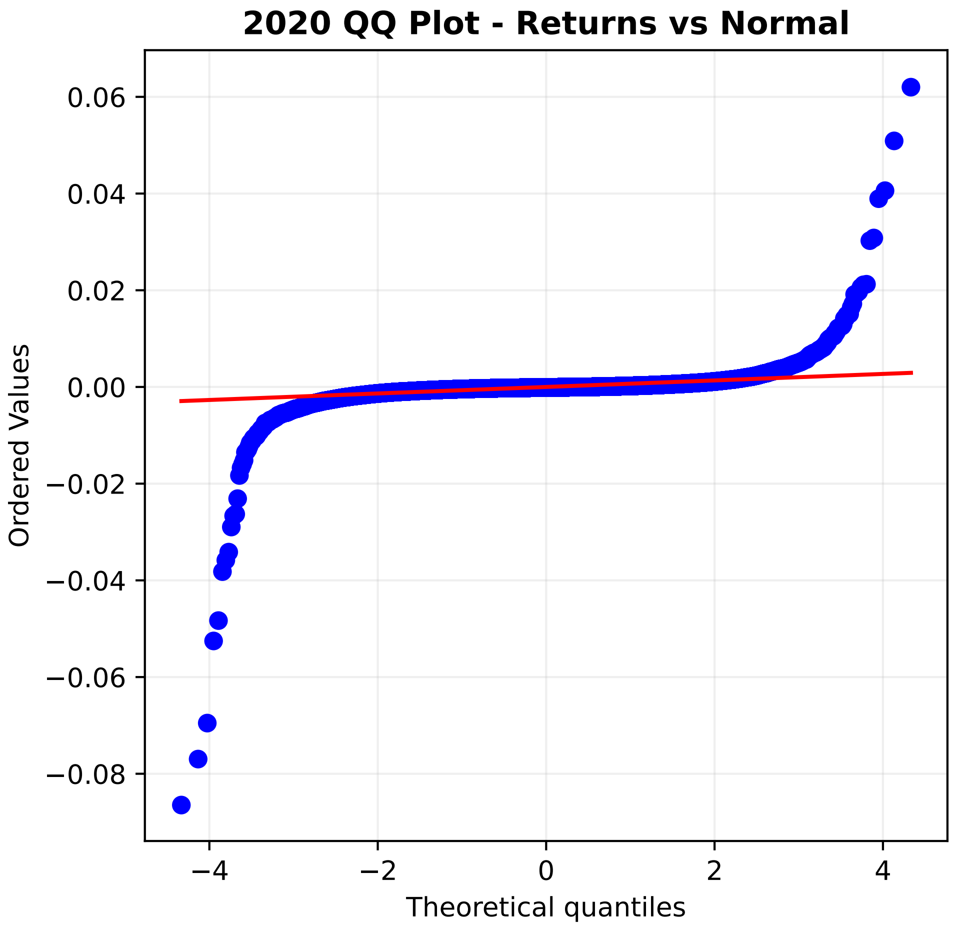
RETURN STATISTICS:
  Average Return: 0.000002
  Return Volatility: 0.001011
  Skewness: -13.071
  Kurtosis: 1686.516

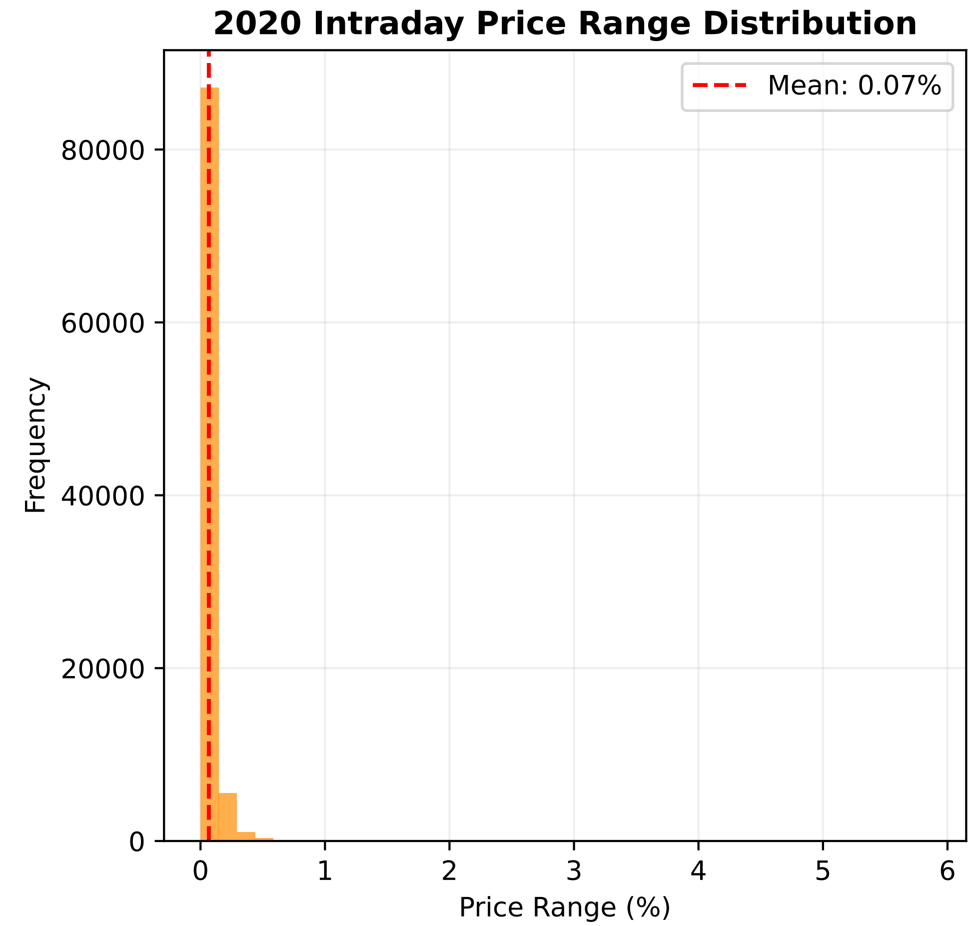
VOLATILITY:
  Average 30-min Volatility: 0.003315
  Max Daily Range: 5.86%
```



2020 Price Distribution
Mean: 11159.15
Frequency
Closing Price
2020 Return Distribution
Mean: 0.000002
Density
Minute Return
2020 Price Density
Density
Closing Price
2020 Monthly Price Distribution
Price Level
Month


2020 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
0.012
0.010
0.008
0.006
0.004
0.002
0.000
−0.002
2020-01
2020-03
2020-05
2020-07
2020-09
2020-11
2021-01
2020 30-Minute Volatility
Volatility
Time
0.08
0.06
0.04
0.02
0.00
2020 Return Autocorrelation
Autocorrelation
Lag
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20
25
30
35
40
2020 Return Partial Autocorrelation
Partial Autocorrelation
Lag



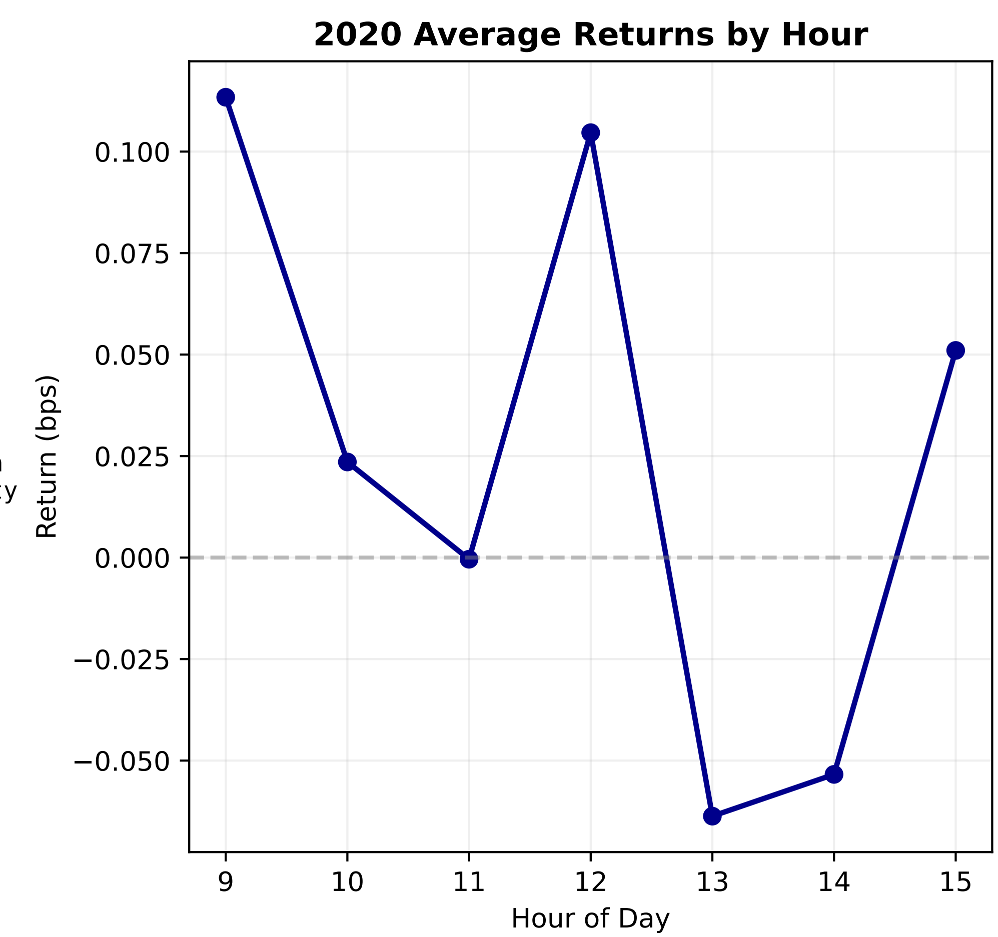


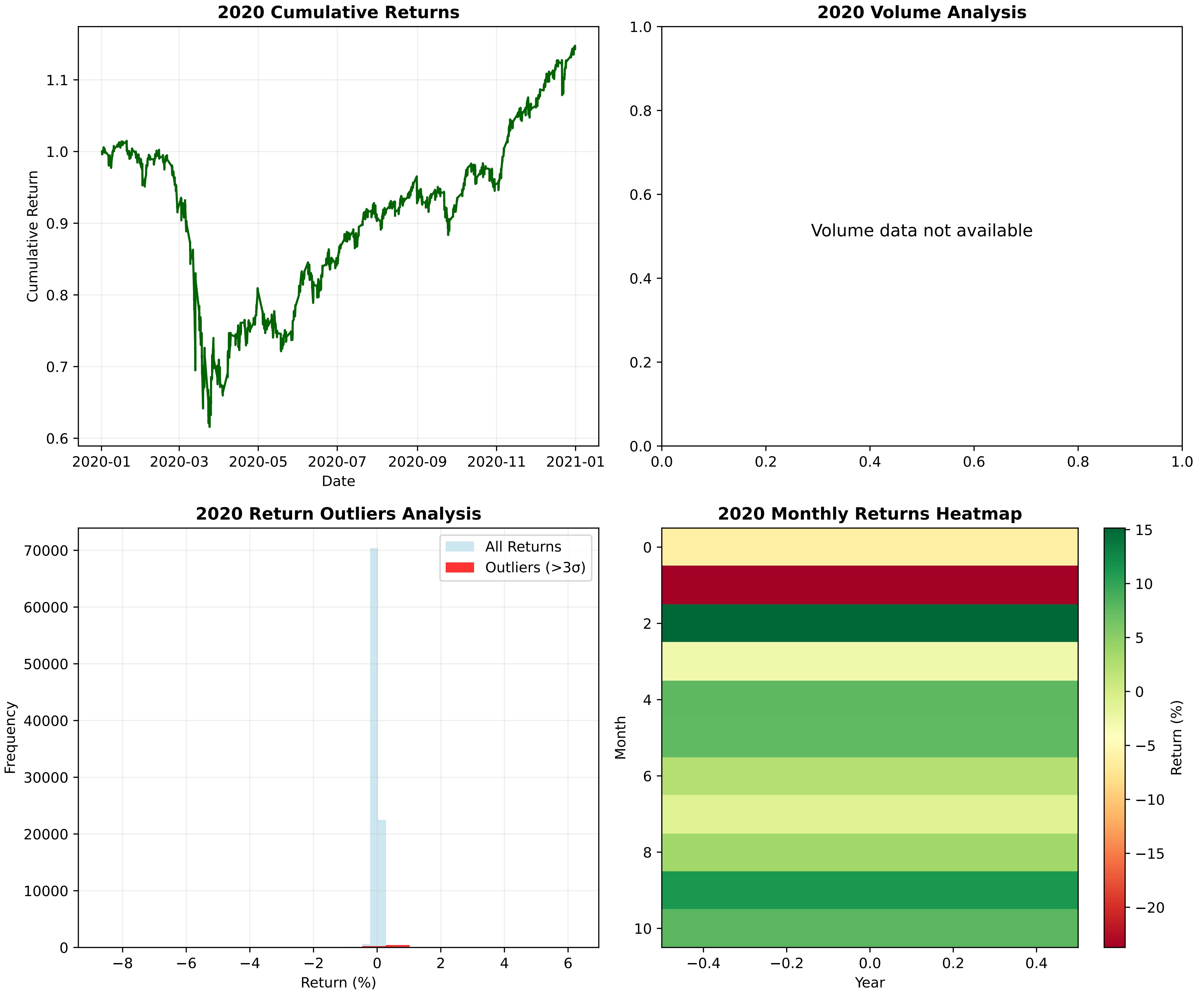

```
STATISTICAL TESTS - 2020
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=90.70, p=0.0000
Lag 20:  Stat=152.56, p=0.0000
Lag 30:  Stat=199.50, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.6988, p=1.4280e-69

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2020 Cumulative Returns
Cumulative Return
Date
2020-01
2020-03
2020-05
2020-07
2020-09
2020-11
2021-01
2020 Volume Analysis
Volume data not available
2020 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2020 Monthly Returns Heatmap
Month
Year
Return (%)

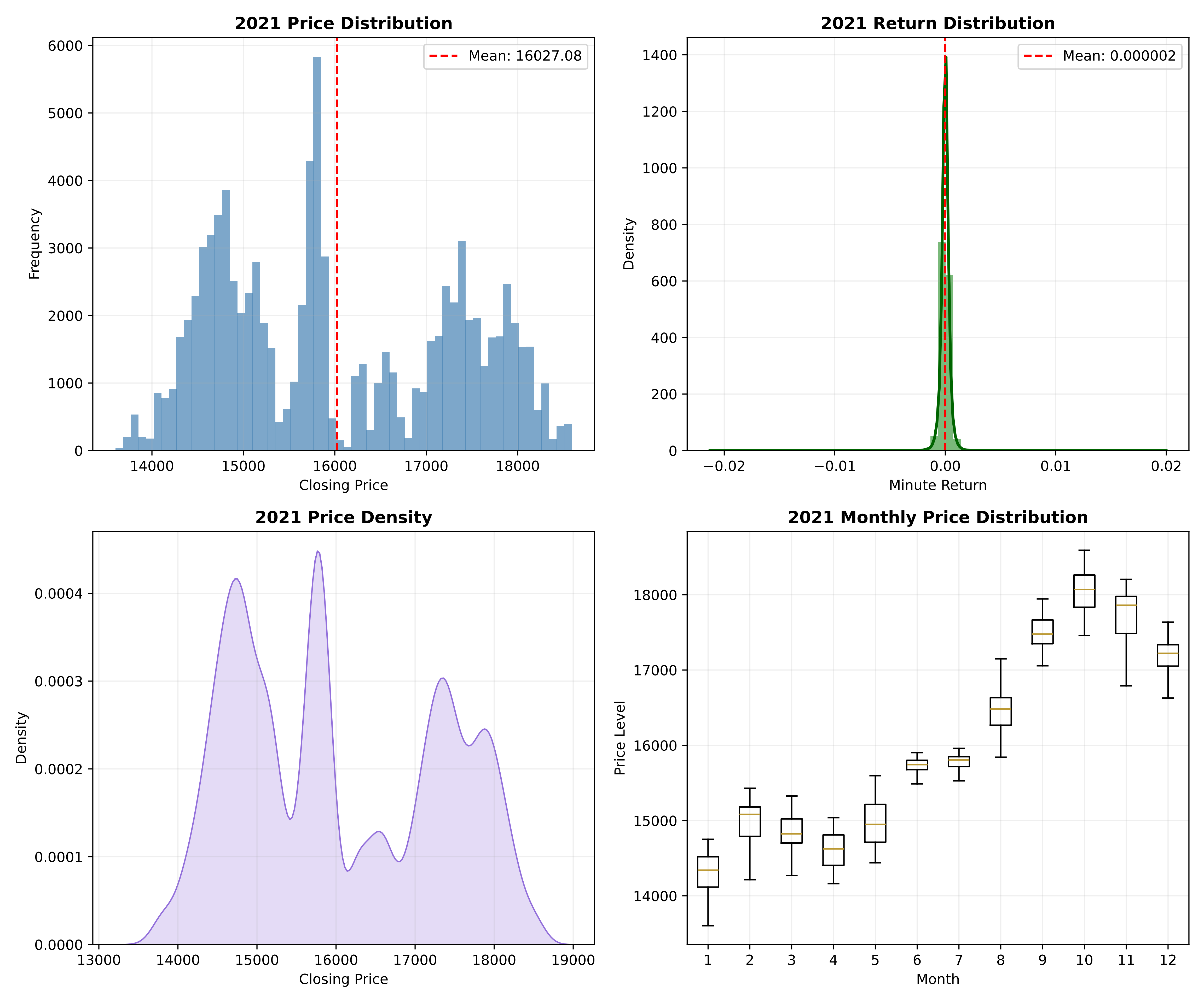
```
2021 MARKET ANALYSIS SUMMARY
========================================

Data Points: 92,303
Trading Days: 365

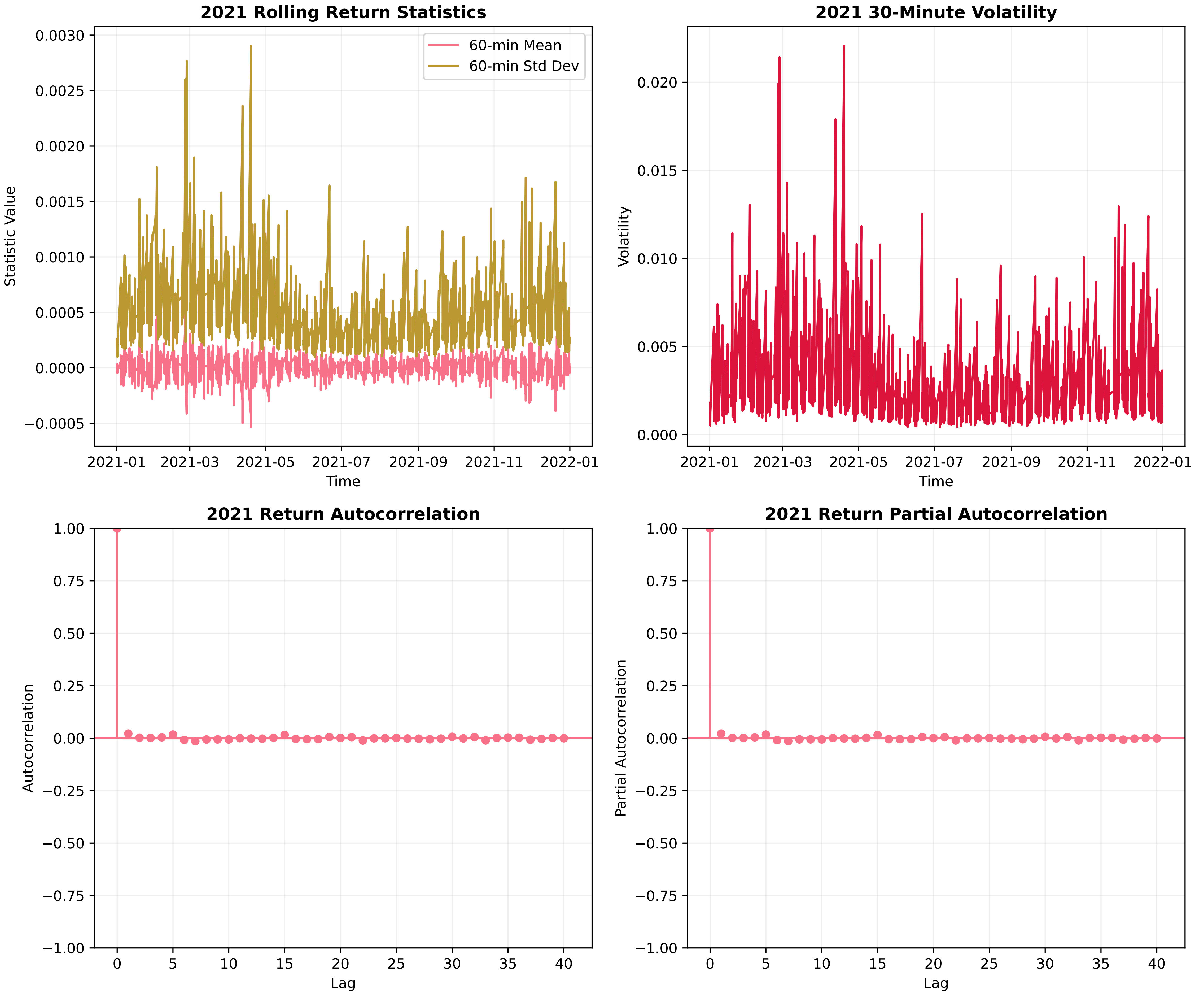
PRICE STATISTICS:
  Average Price: 16027.08
  Price Range: 13602.80 - 18592.15
  Price Volatility: 1282.23

RETURN STATISTICS:
  Average Return: 0.000002
  Return Volatility: 0.000476
  Skewness: -0.493
  Kurtosis: 224.237

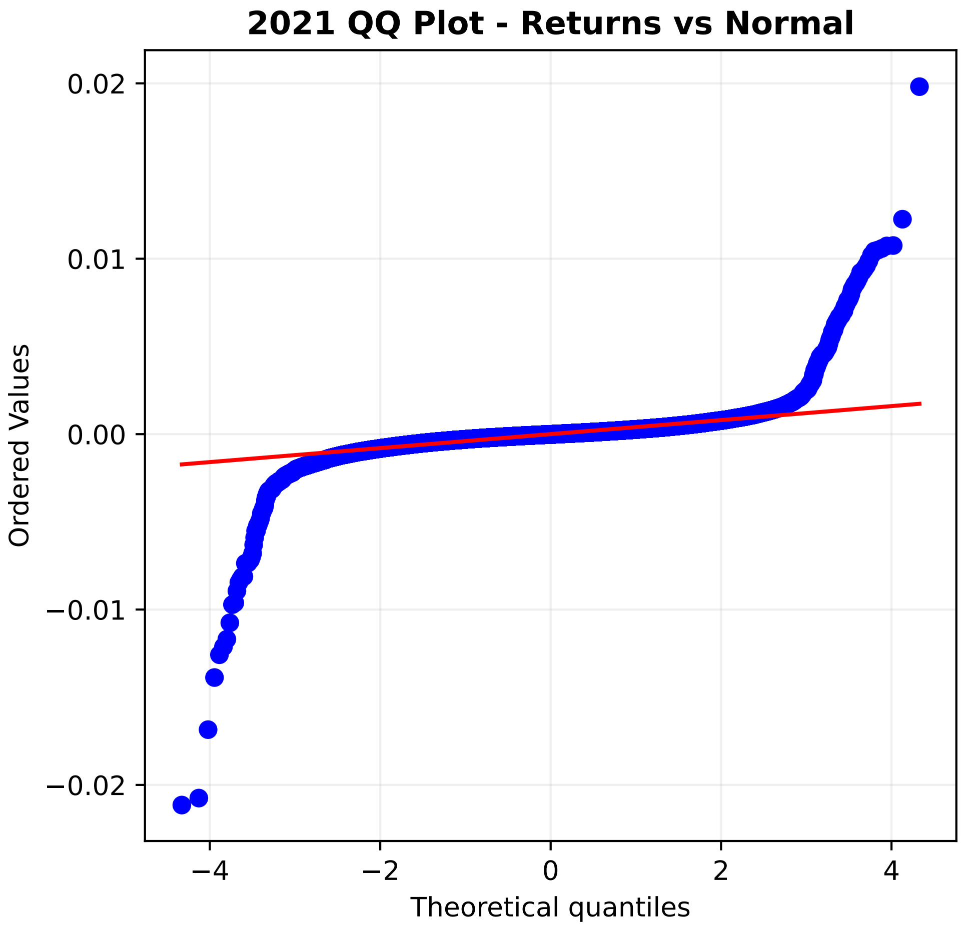
VOLATILITY:
  Average 30-min Volatility: 0.002086
  Max Daily Range: 0.69%
```

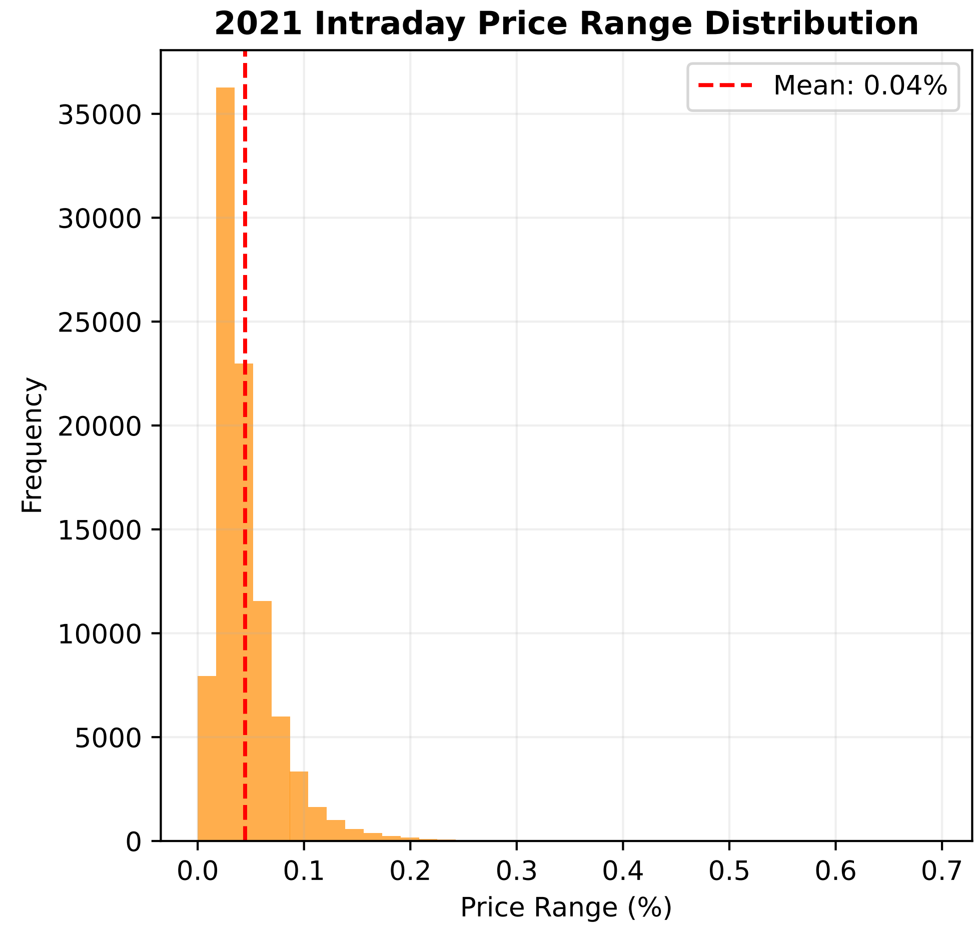


2021 Price Distribution
Mean: 16027.08
Frequency
Closing Price
2021 Return Distribution
Mean: 0.000002
Density
Minute Return
2021 Price Density
Density
Closing Price
2021 Monthly Price Distribution
Price Level
Month



2021 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2021 30-Minute Volatility
Volatility
Time
2021 Return Autocorrelation
Autocorrelation
Lag
2021 Return Partial Autocorrelation
Partial Autocorrelation
Lag



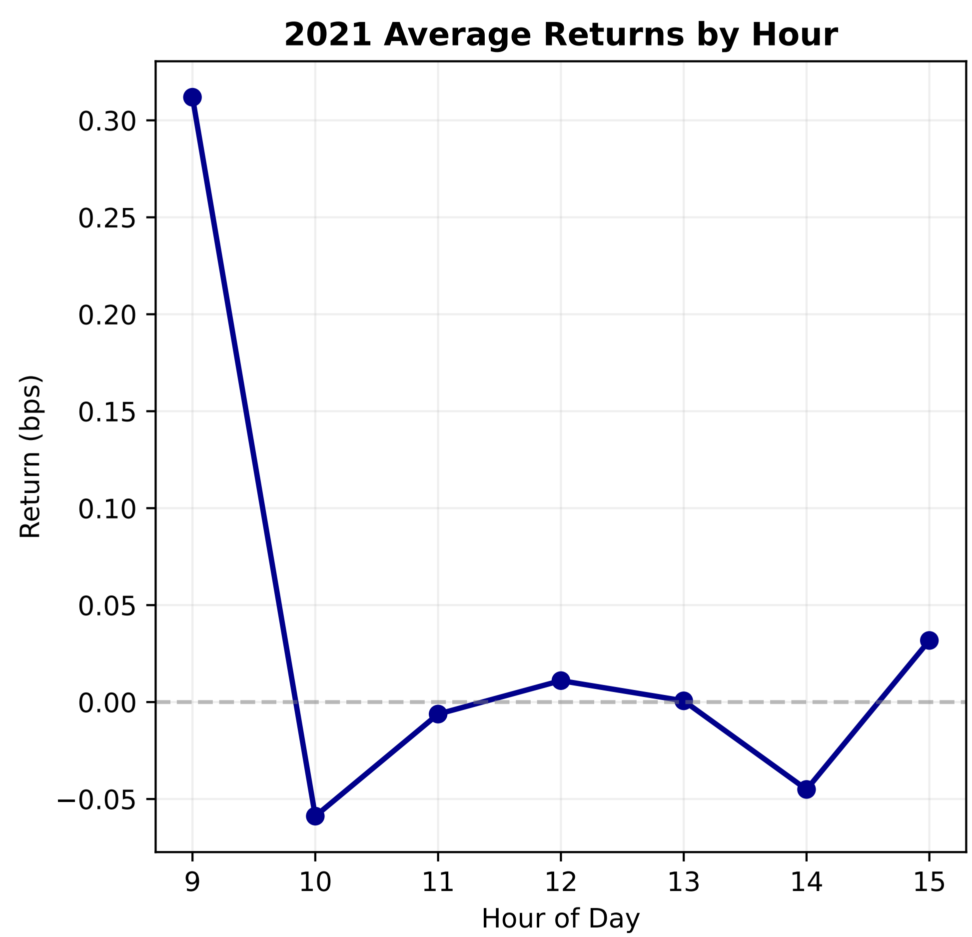


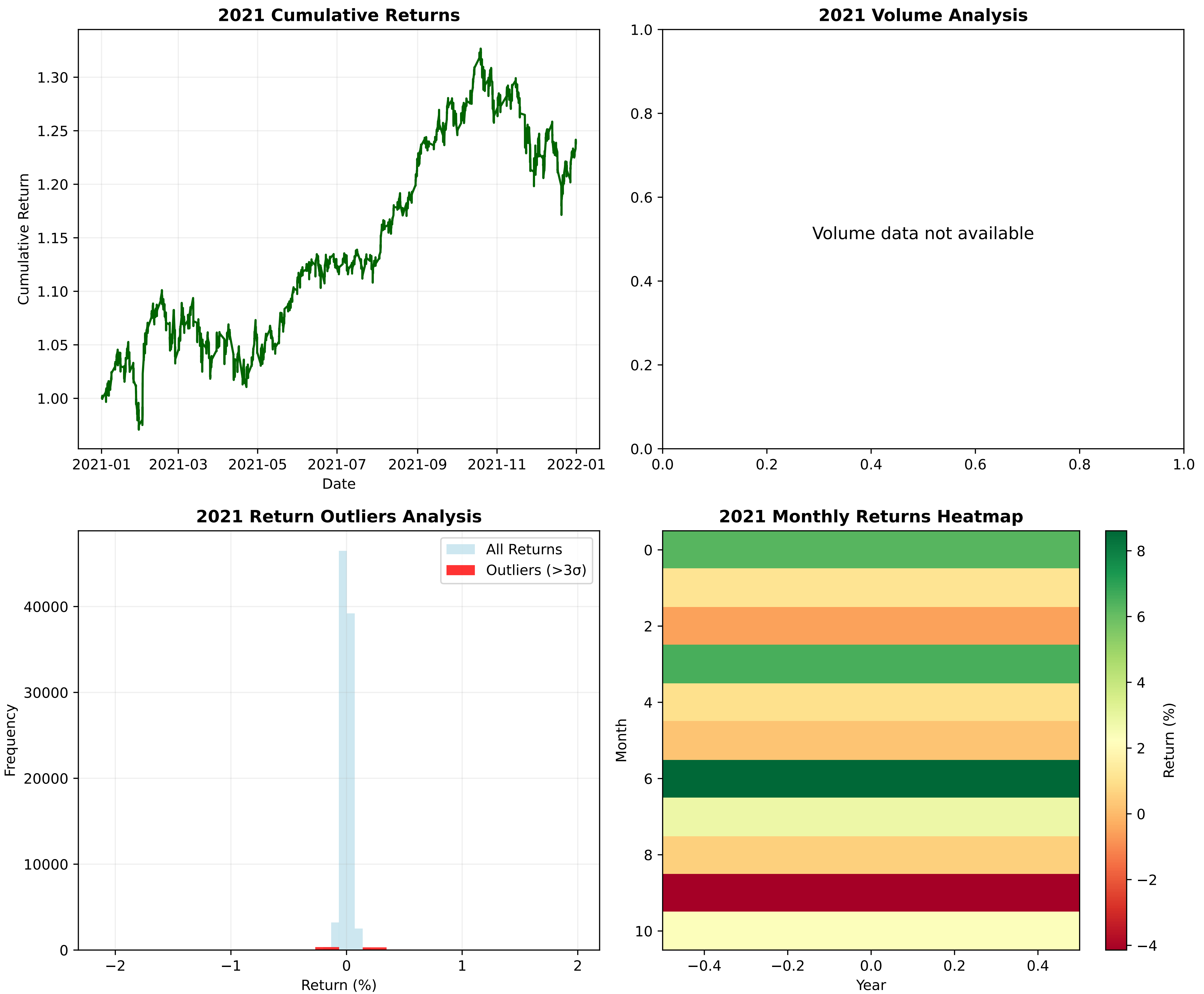

```
STATISTICAL TESTS - 2021
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=109.05, p=0.0000
Lag 20:  Stat=141.17, p=0.0000
Lag 30:  Stat=162.68, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.5837, p=3.0636e-76

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2021 Cumulative Returns
Cumulative Return
Date
2021 Volume Analysis
Volume data not available
2021 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2021 Monthly Returns Heatmap
Month
Year
Return (%)

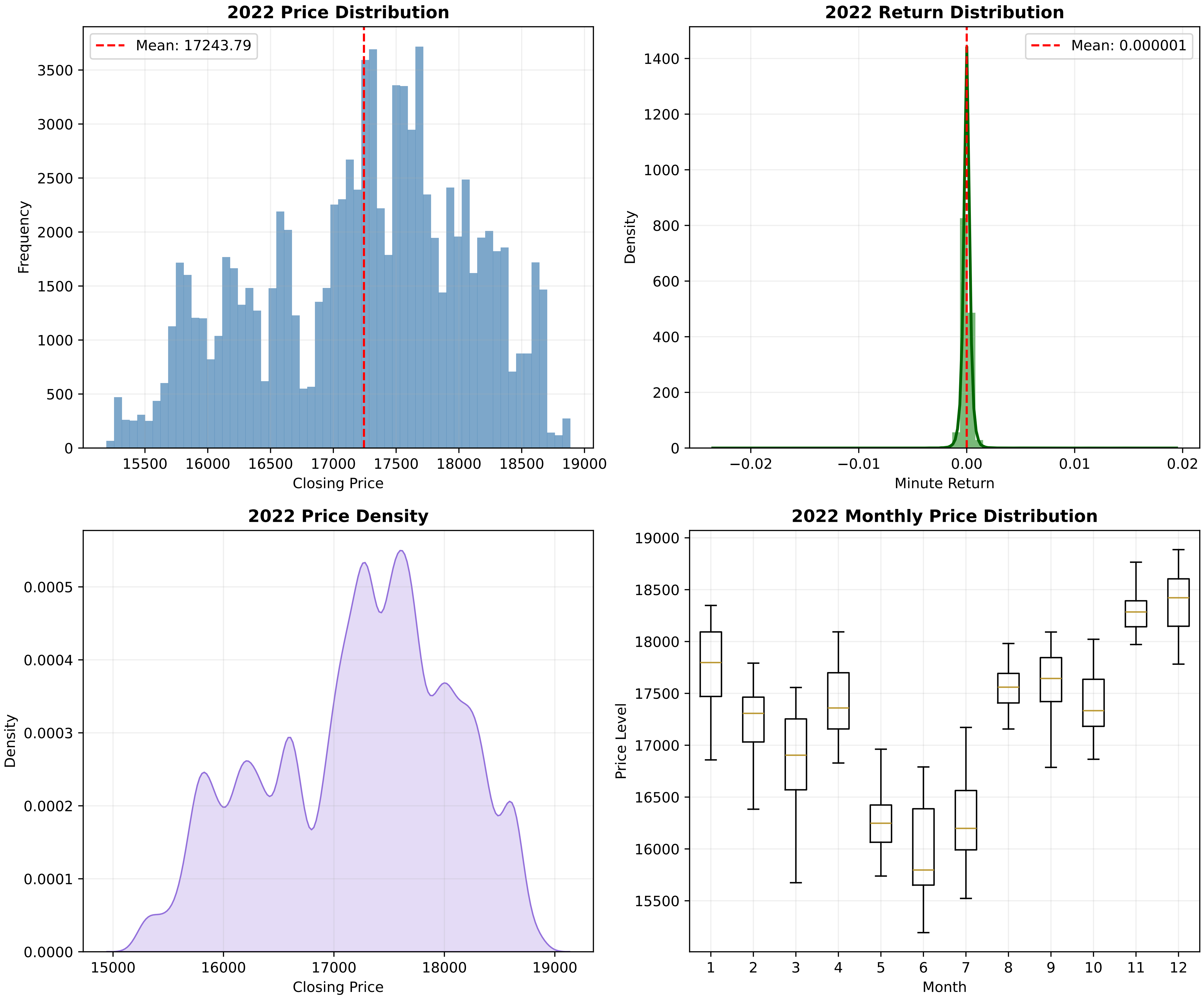
```
2022 MARKET ANALYSIS SUMMARY
========================================

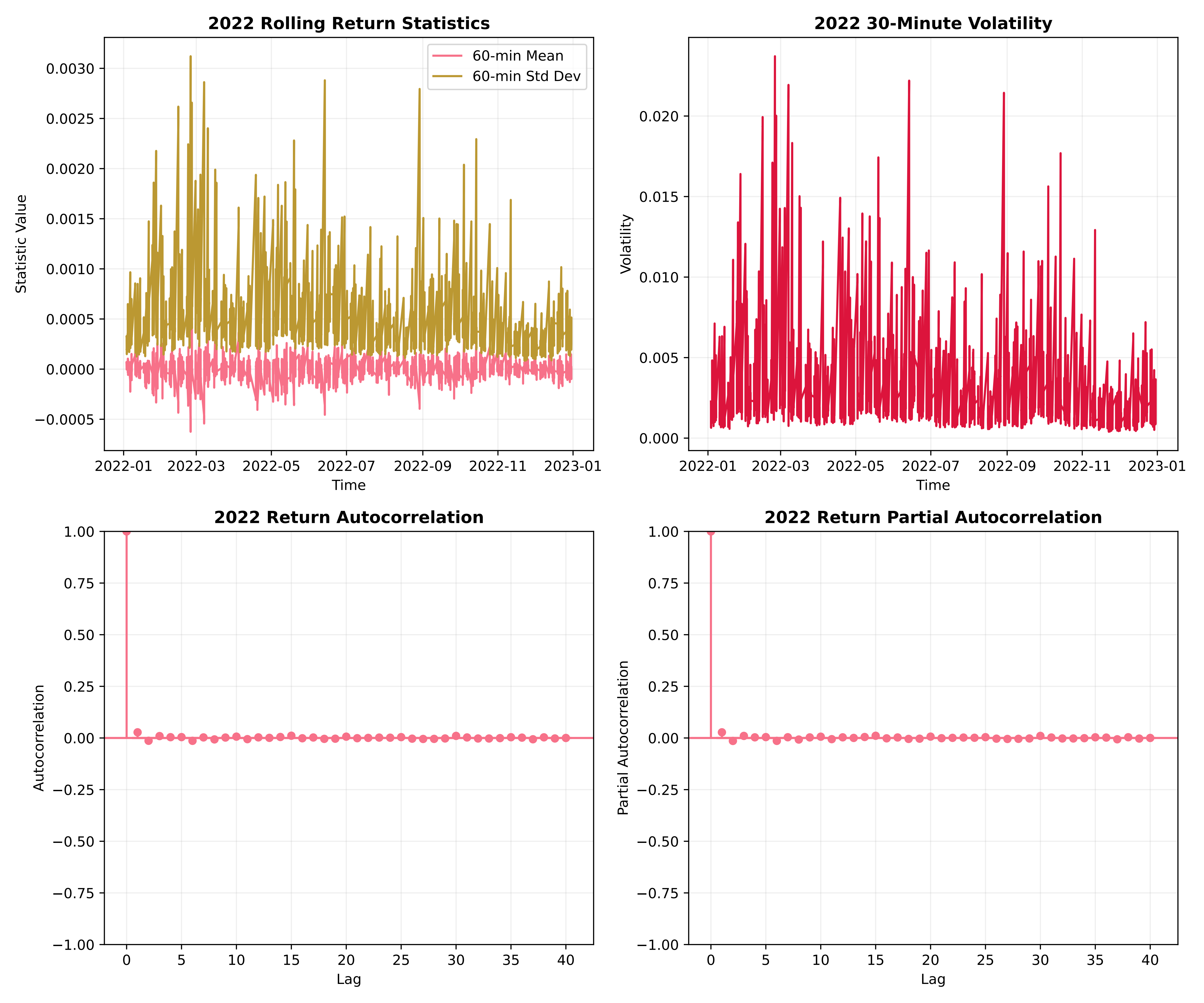
Data Points: 92,622
Trading Days: 362

PRICE STATISTICS:
  Average Price: 17243.79
  Price Range: 15192.90 - 18886.20
  Price Volatility: 830.49

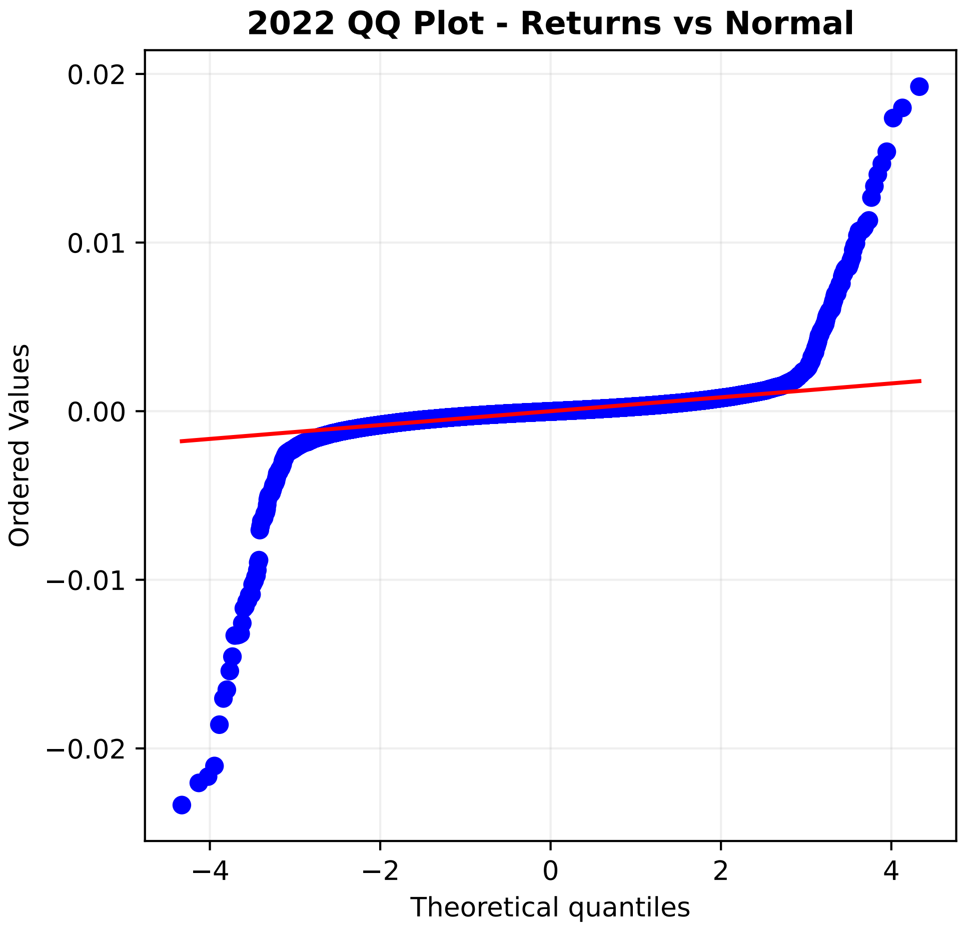
RETURN STATISTICS:
  Average Return: 0.000001
  Return Volatility: 0.000529
  Skewness: -2.715
  Kurtosis: 340.203

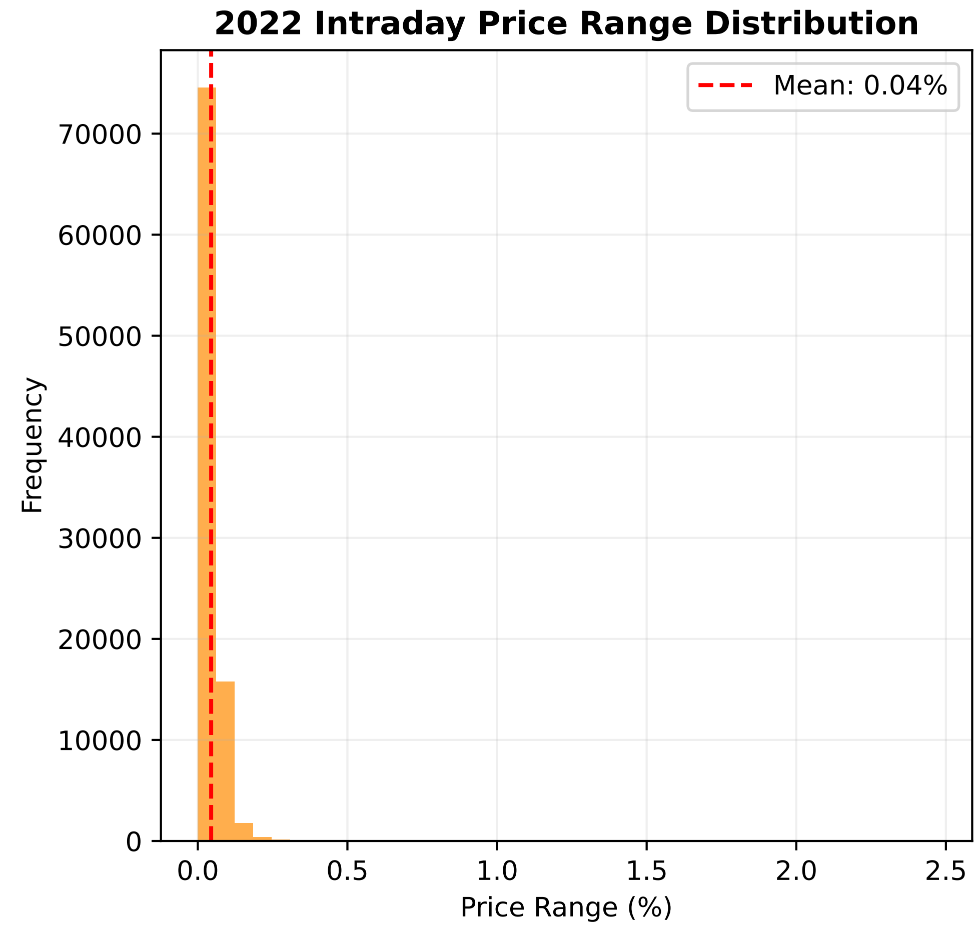
VOLATILITY:
  Average 30-min Volatility: 0.002177
  Max Daily Range: 2.46%
```


2022 Price Distribution
Mean: 17243.79
Frequency
Closing Price
2022 Return Distribution
Mean: 0.000001
Density
Minute Return
2022 Price Density
Density
Closing Price
2022 Monthly Price Distribution
Price Level
Month



2022 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2022 30-Minute Volatility
Volatility
Time
2022 Return Autocorrelation
Autocorrelation
Lag
2022 Return Partial Autocorrelation
Partial Autocorrelation
Lag



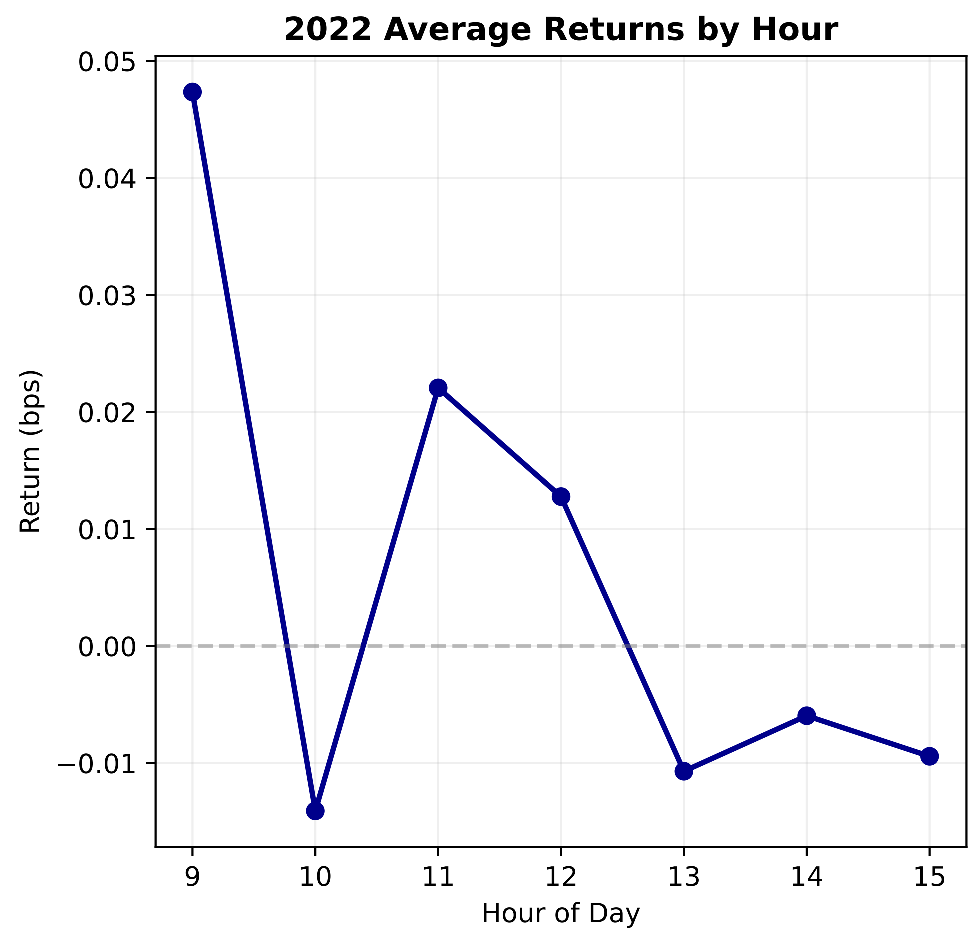


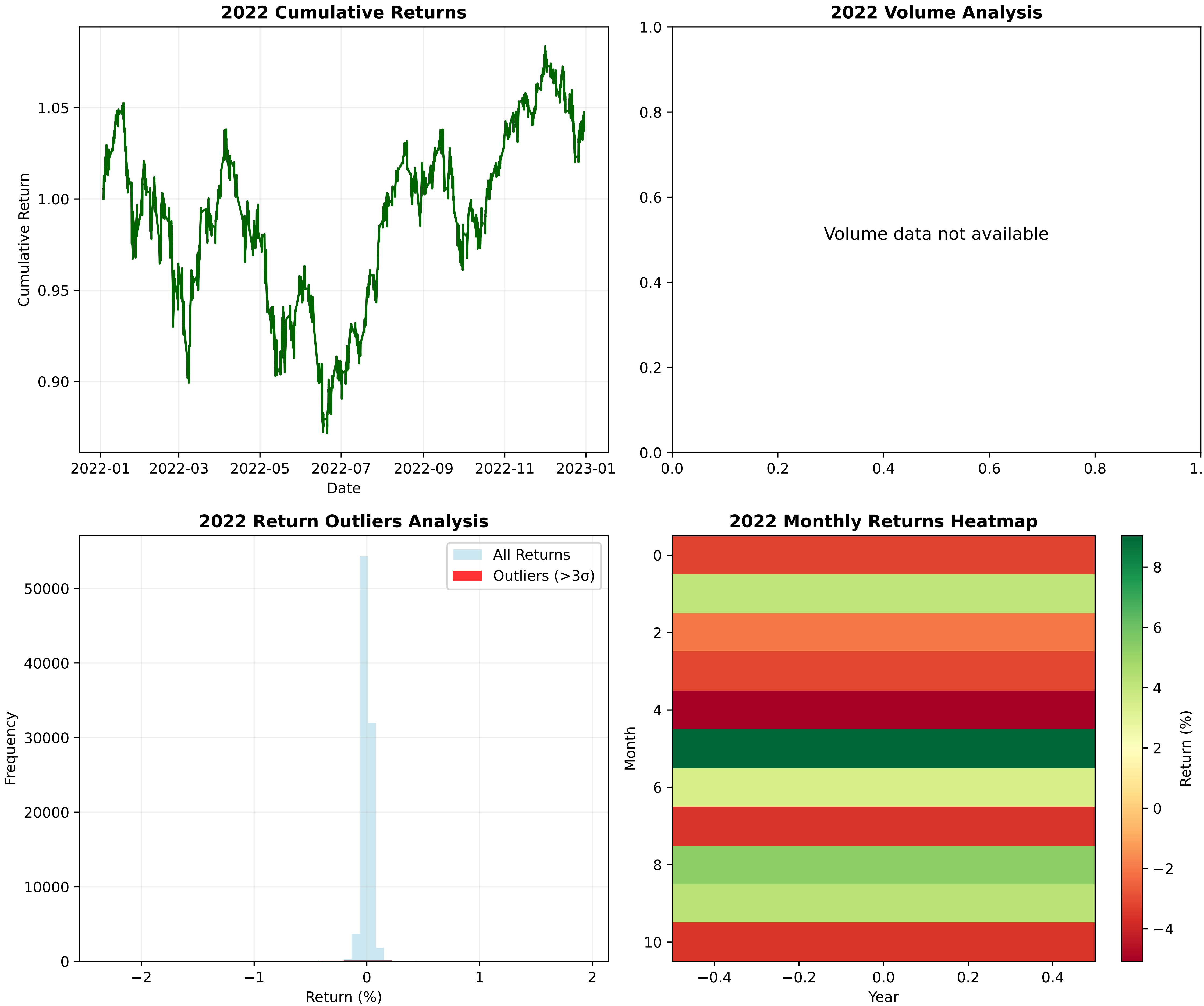

```
STATISTICAL TESTS - 2022
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=124.84, p=0.0000
Lag 20:  Stat=149.18, p=0.0000
Lag 30:  Stat=166.24, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.5271, p=5.9852e-79

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```





2022 Cumulative Returns
Cumulative Return
Date
2022 Volume Analysis
Volume data not available
2022 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2022 Monthly Returns Heatmap
Month
Year
Return (%)

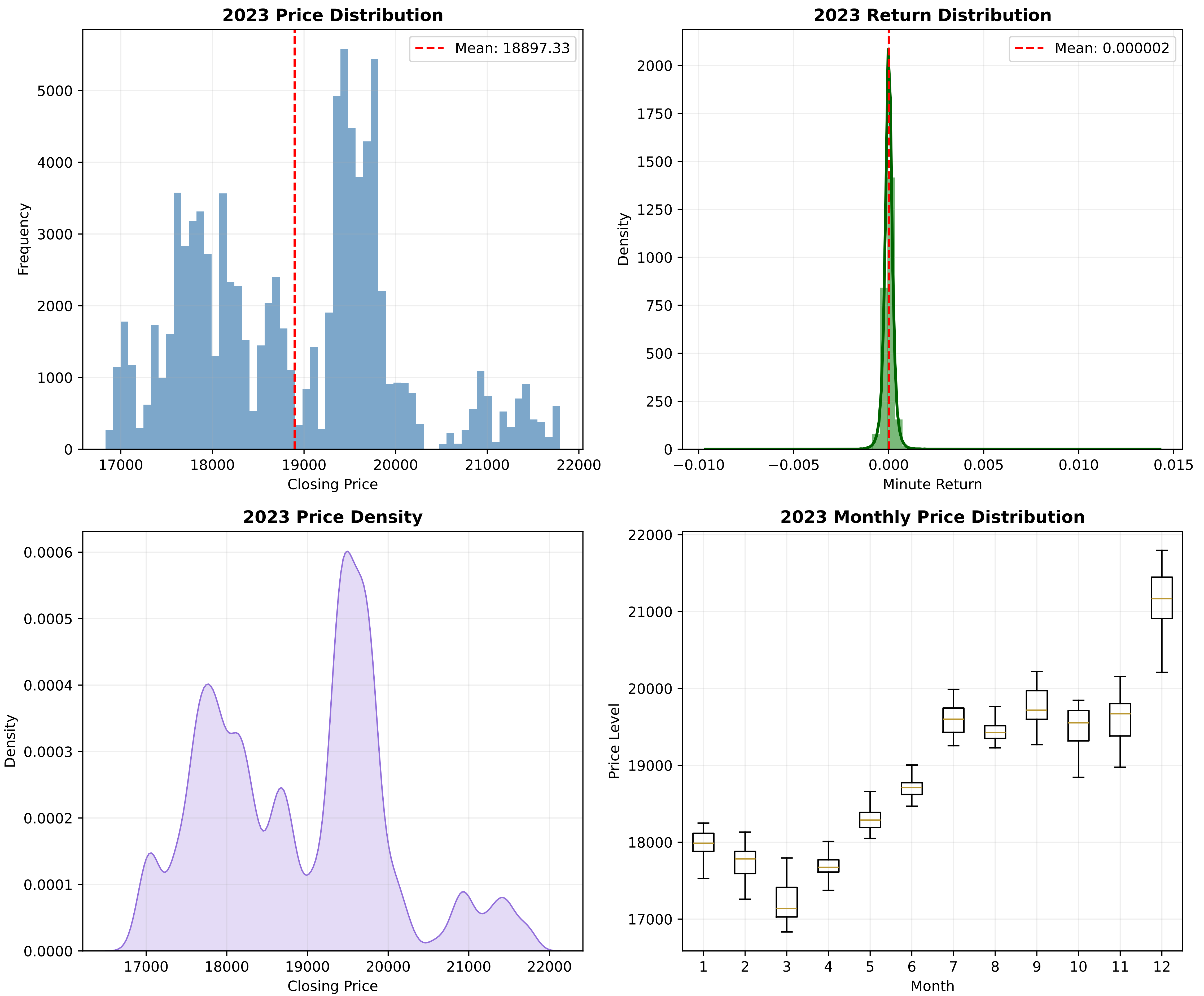
```
2023 MARKET ANALYSIS SUMMARY
========================================

Data Points: 91,862
Trading Days: 362

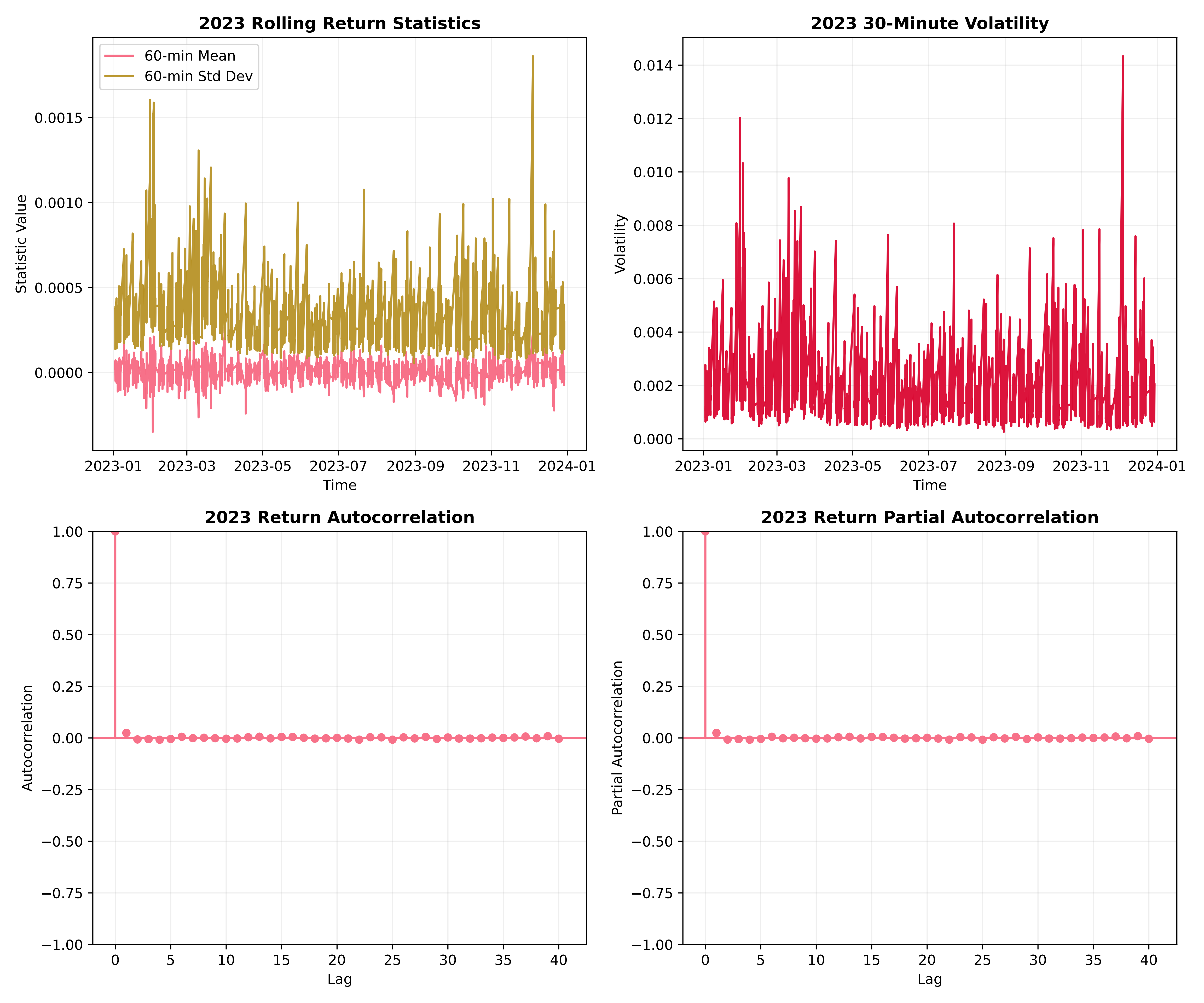
PRICE STATISTICS:
  Average Price: 18897.33
  Price Range: 16833.75 - 21795.80
  Price Volatility: 1104.36

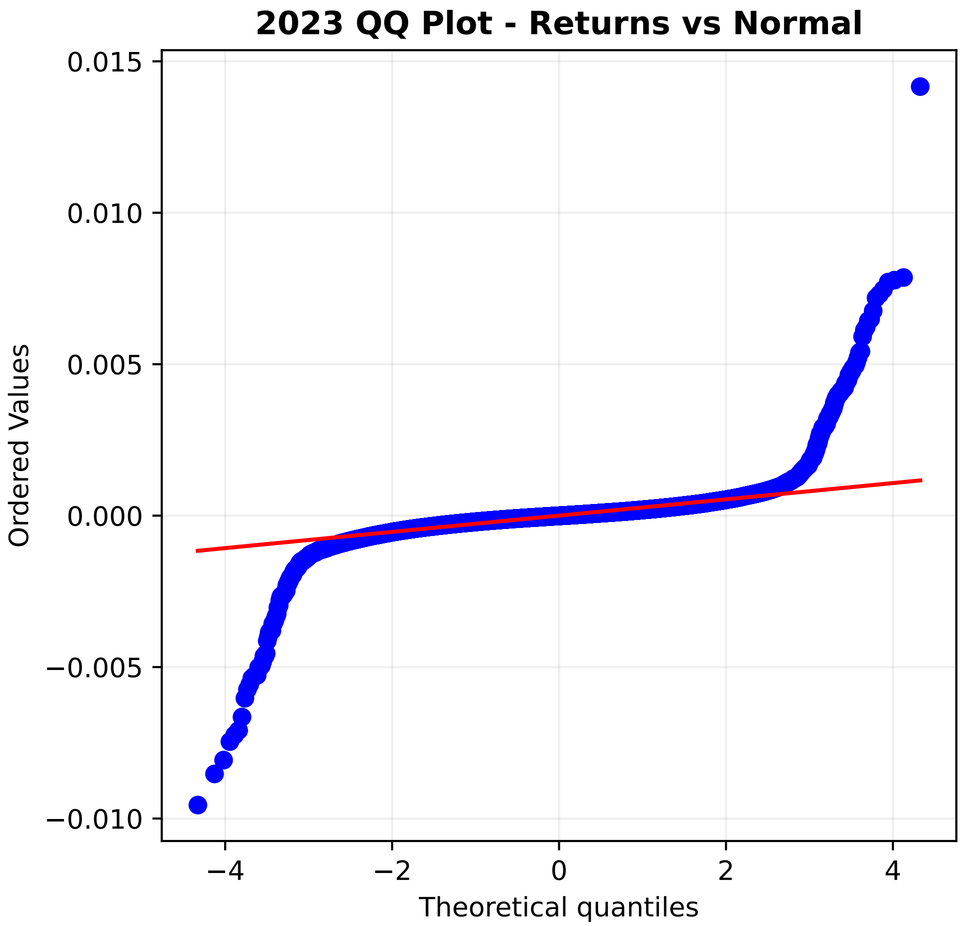
RETURN STATISTICS:
  Average Return: 0.000002
  Return Volatility: 0.000312
  Skewness: 1.693
  Kurtosis: 148.403

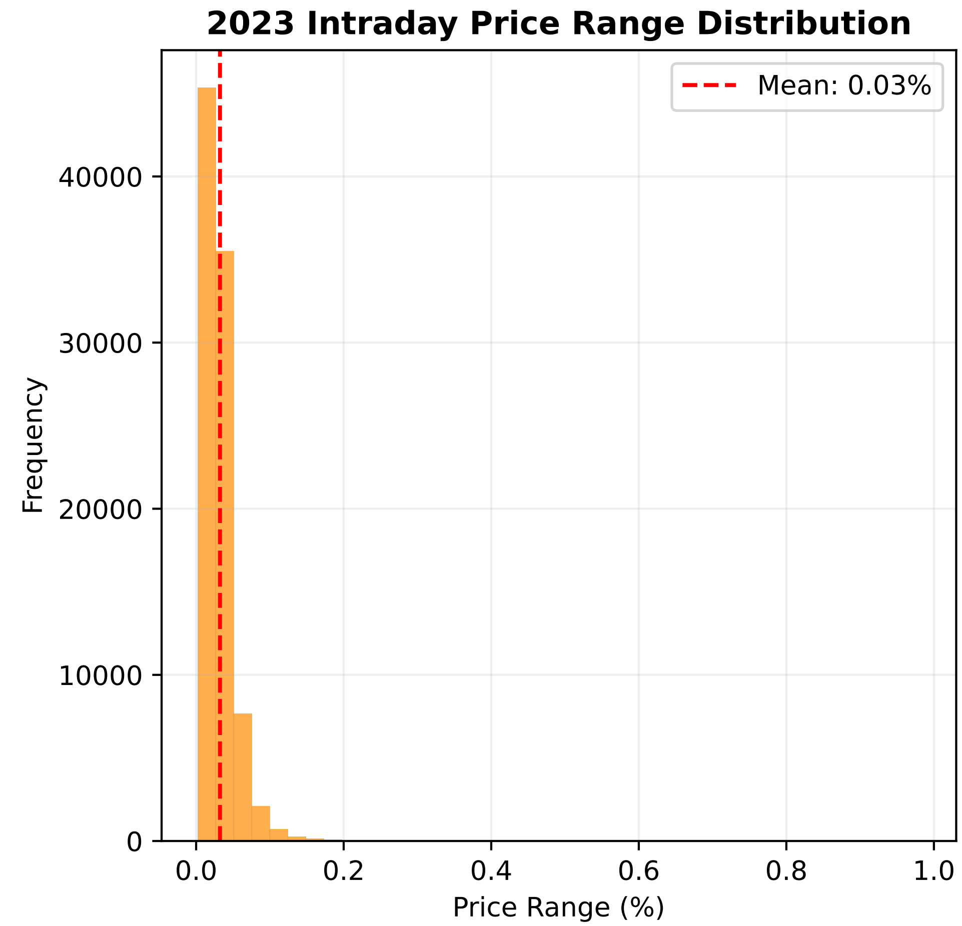
VOLATILITY:
  Average 30-min Volatility: 0.001407
  Max Daily Range: 0.98%
```



2023 Price Distribution
Mean: 18897.33
Frequency
Closing Price
2023 Return Distribution
Mean: 0.000002
Density
Minute Return
2023 Price Density
Density
Closing Price
2023 Monthly Price Distribution
Price Level
Month


2023 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2023 30-Minute Volatility
Volatility
Time
2023 Return Autocorrelation
Autocorrelation
Lag
2023 Return Partial Autocorrelation
Partial Autocorrelation
Lag



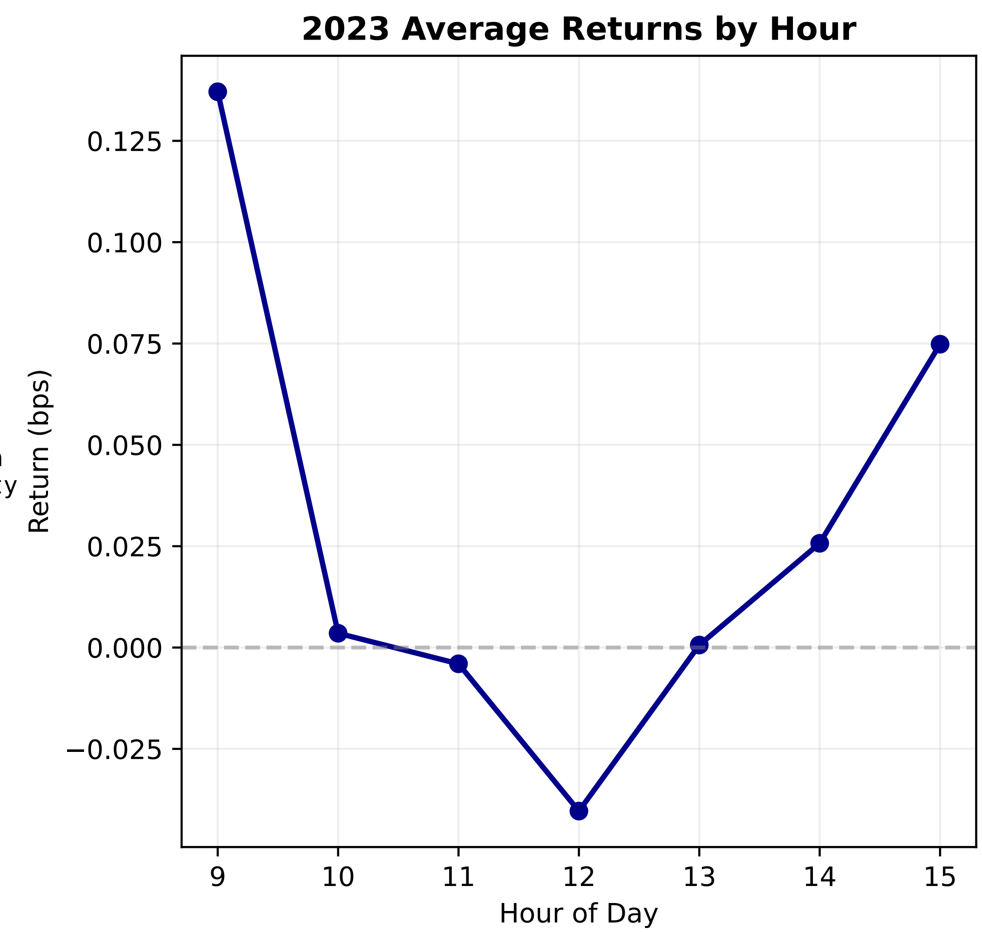


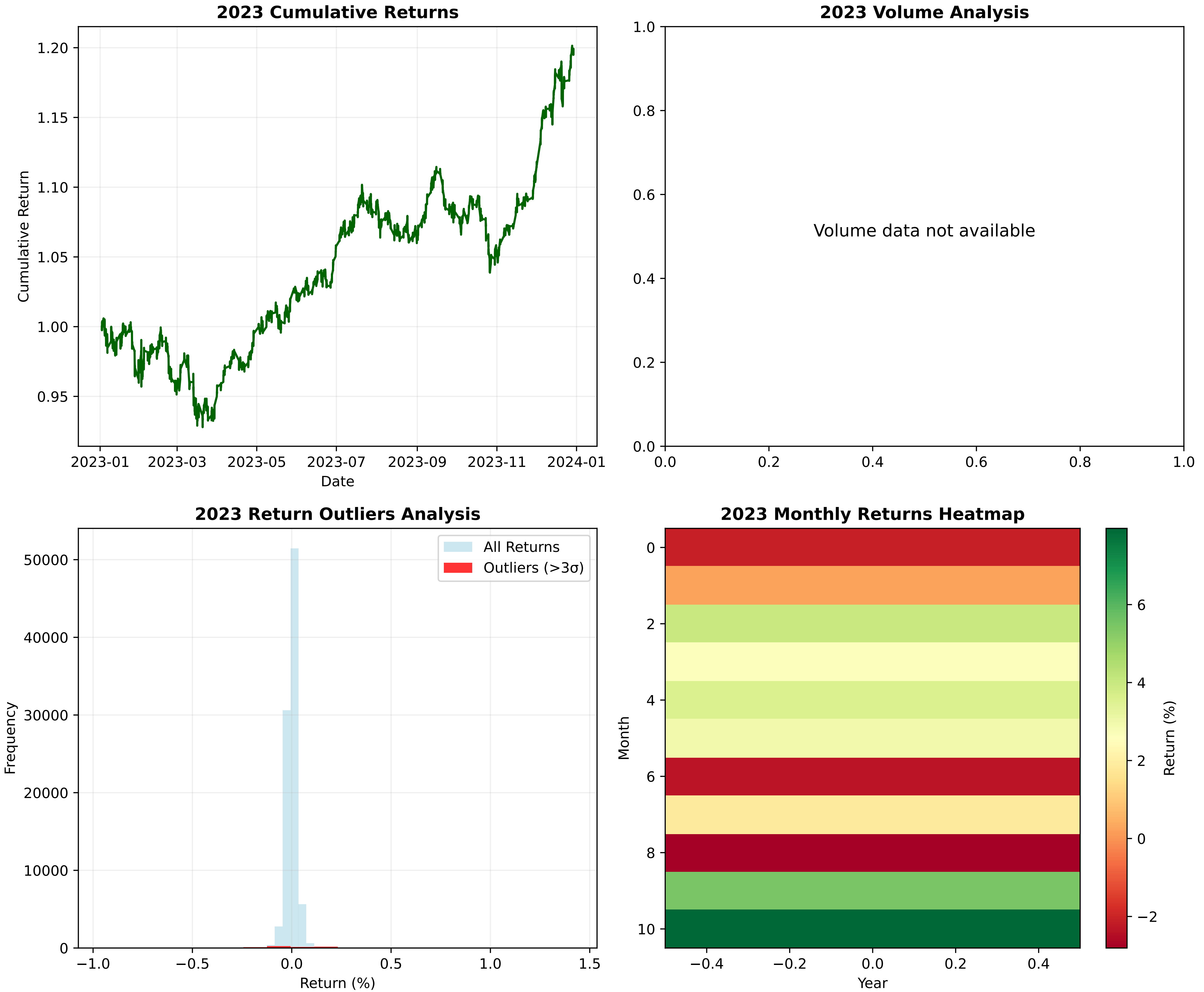

```
STATISTICAL TESTS - 2023
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=76.25, p=0.0000
Lag 20:  Stat=87.92, p=0.0000
Lag 30:  Stat=109.34, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.7542, p=1.5205e-65

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```





2023 Cumulative Returns
Cumulative Return
Date
2023 Volume Analysis
Volume data not available
2023 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2023 Monthly Returns Heatmap
Month
Year
Return (%)

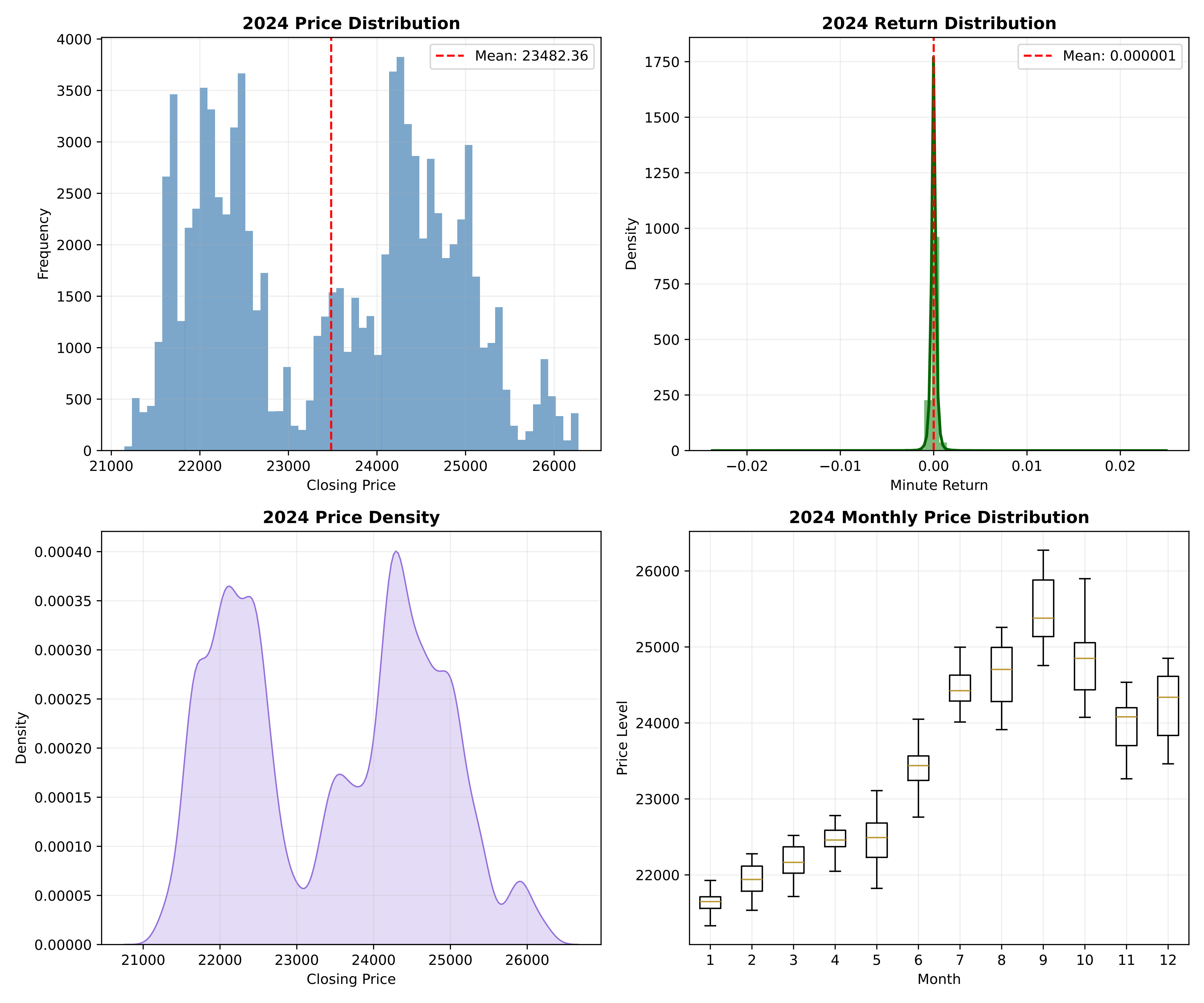
2024 MARKET ANALYSIS SUMMARY
==

Data Points: 92,454
Trading Days: 366

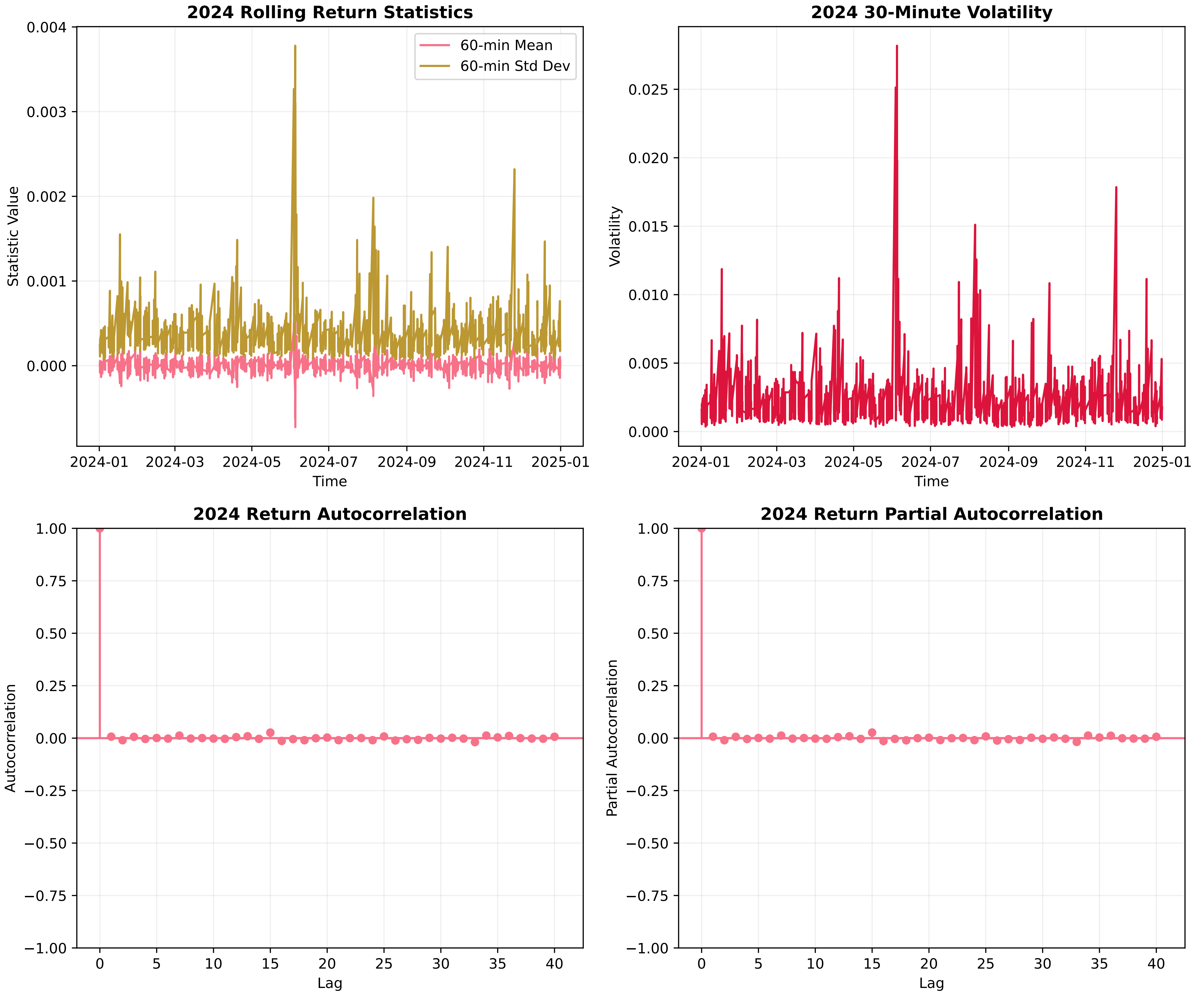
PRICE STATISTICS:
  Average Price: 23482.36
  Price Range: 21146.75 - 26273.45
  Price Volatility: 1287.42

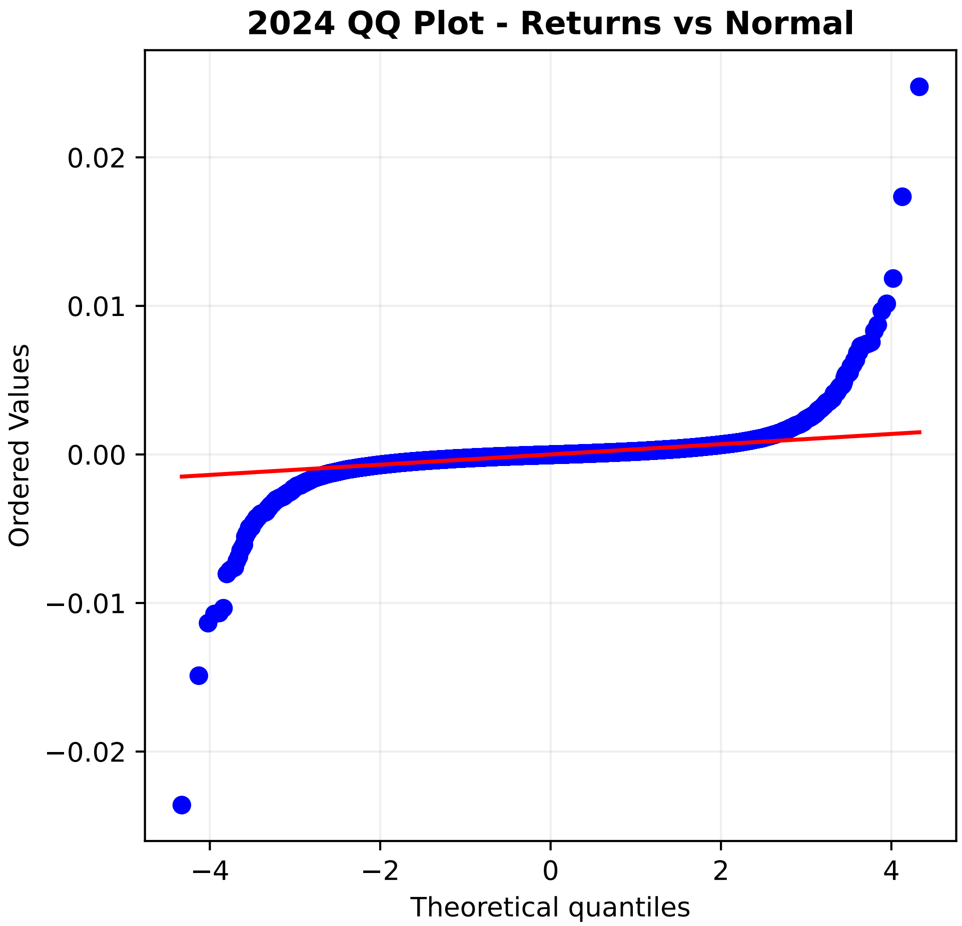
RETURN STATISTICS:
  Average Return: 0.000001
  Return Volatility: 0.000414
  Skewness: 0.860
  Kurtosis: 377.028

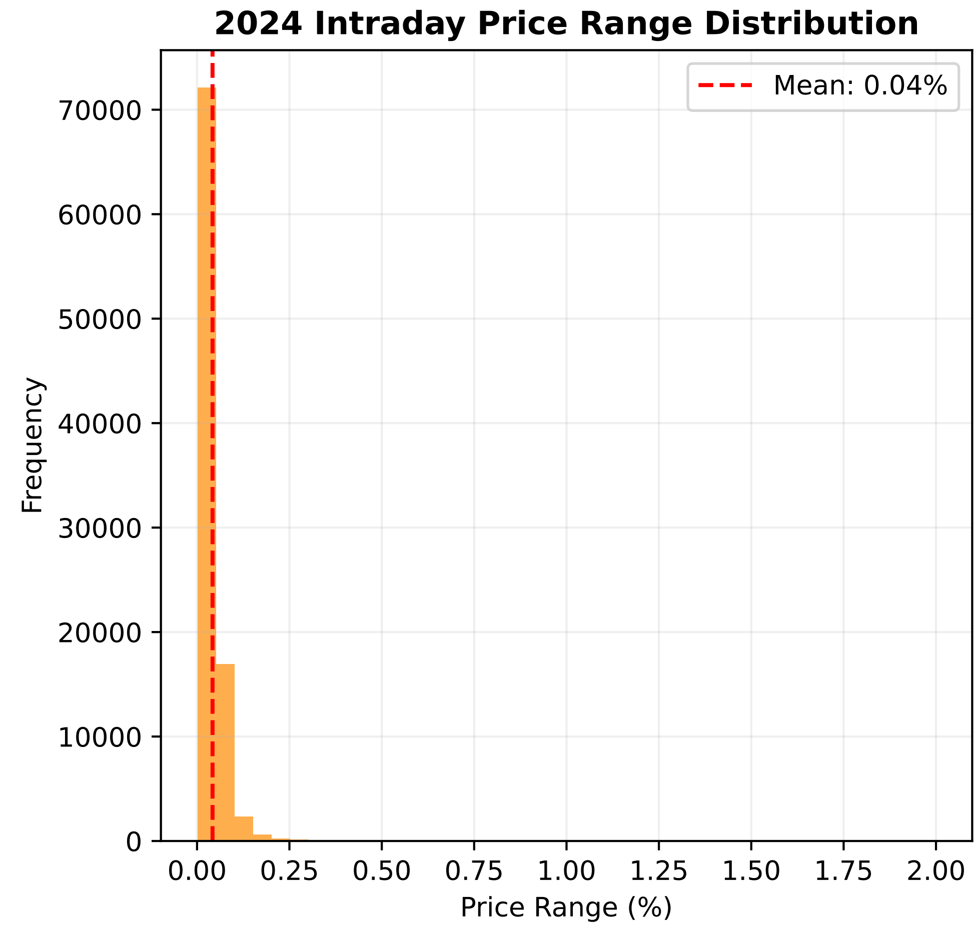
VOLATILITY:
  Average 30-min Volatility: 0.001759
  Max Daily Range: 2.00%



2024 Price Distribution
Mean: 23482.36
Frequency
Closing Price
2024 Return Distribution
Mean: 0.000001
Density
Minute Return
2024 Price Density
Density
Closing Price
2024 Monthly Price Distribution
Price Level
Month


2024 Rolling Return Statistics
60-min Mean
60-min Std Dev
Statistic Value
Time
2024 30-Minute Volatility
Volatility
Time
2024 Return Autocorrelation
Autocorrelation
Lag
2024 Return Partial Autocorrelation
Partial Autocorrelation
Lag



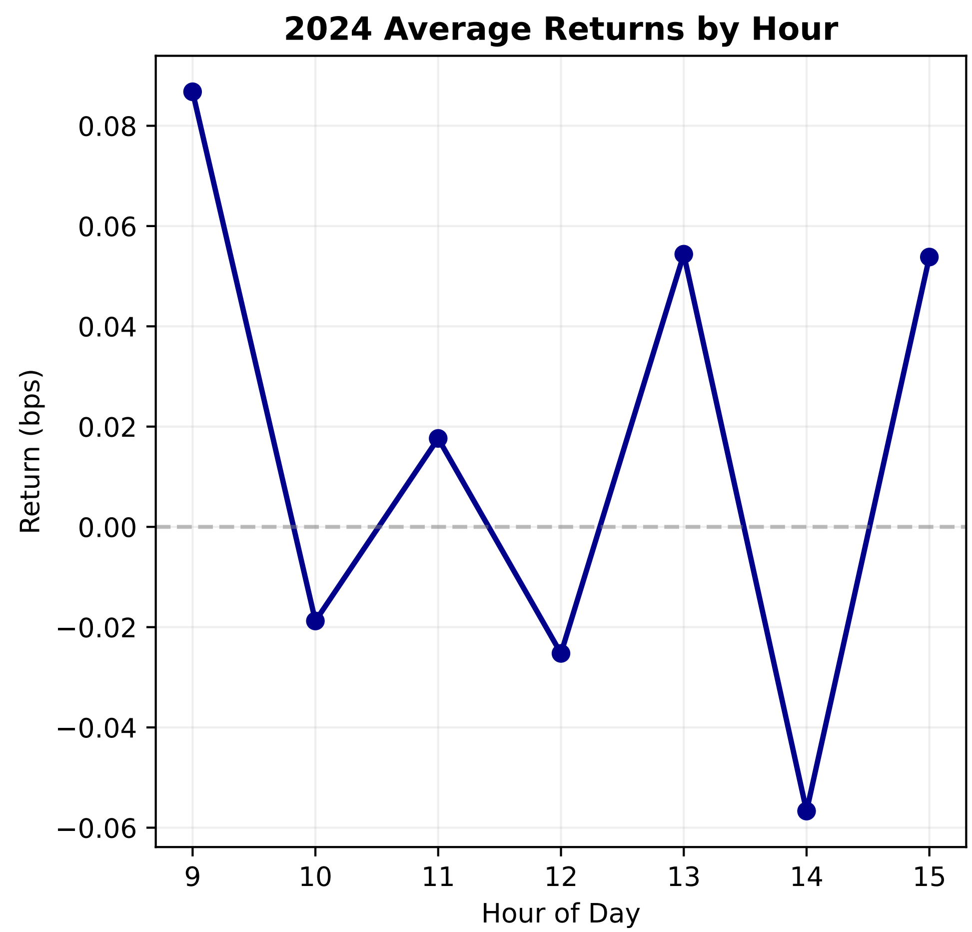


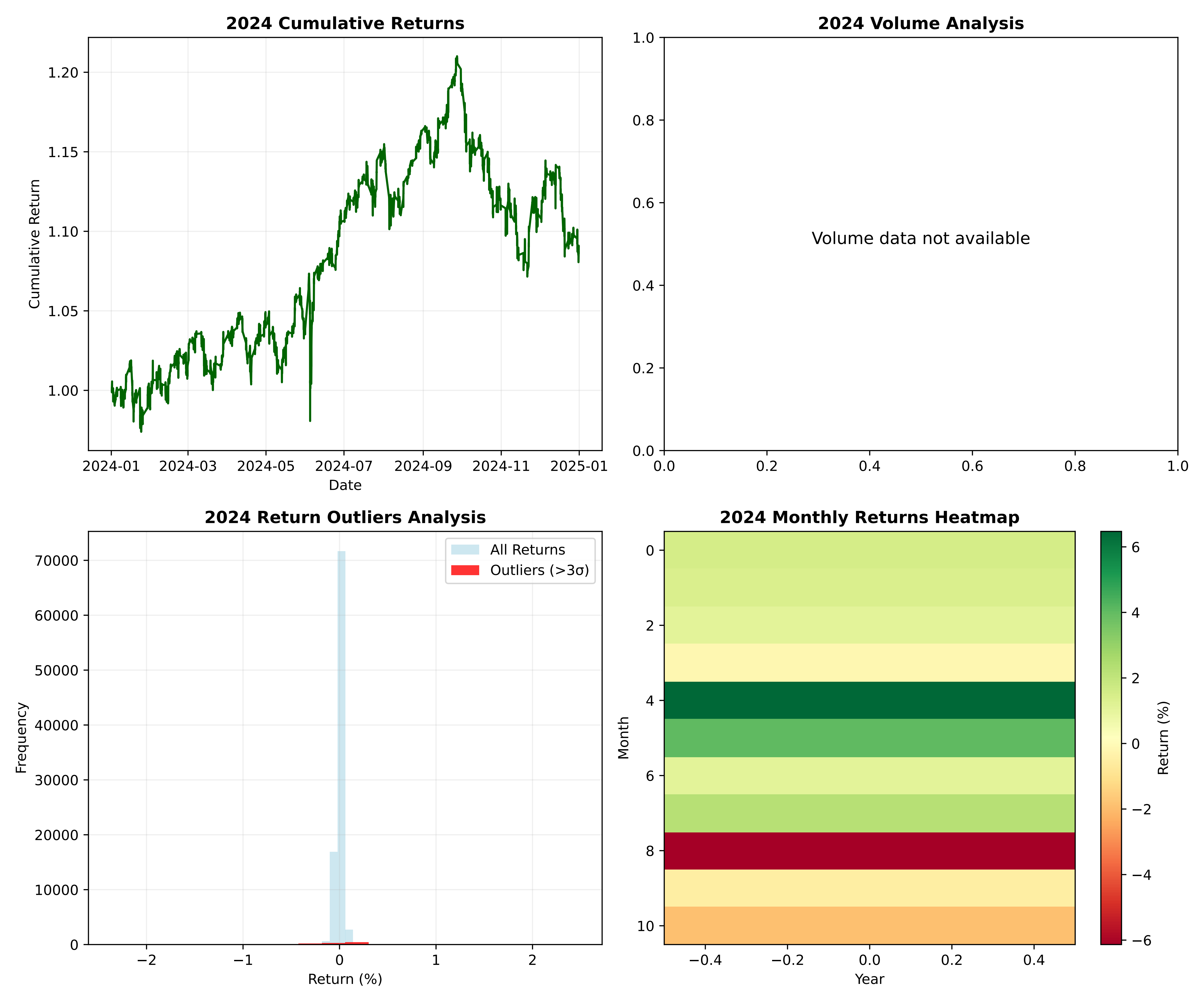

```
STATISTICAL TESTS - 2024
========================================

LJUNG-BOX TEST (Autocorrelation):
Lag 10:  Stat=33.65, p=0.0002
Lag 20:  Stat=138.22, p=0.0000
Lag 30:  Stat=182.38, p=0.0000

NORMALITY TESTS:
Shapiro-Wilk:  Stat=0.4447, p=1.9712e-82

INTERPRETATION:
- Low p-value (<0.05) in Ljung-Box indicates autocorrelation
- Low p-value (<0.05) in Shapiro-Wilk indicates non-normality
```




2024 Cumulative Returns
Cumulative Return
Date
2024 Volume Analysis
Volume data not available
2024 Return Outliers Analysis
All Returns
Outliers (>3σ)
Frequency
Return (%)
2024 Monthly Returns Heatmap
Month
Year
Return (%)