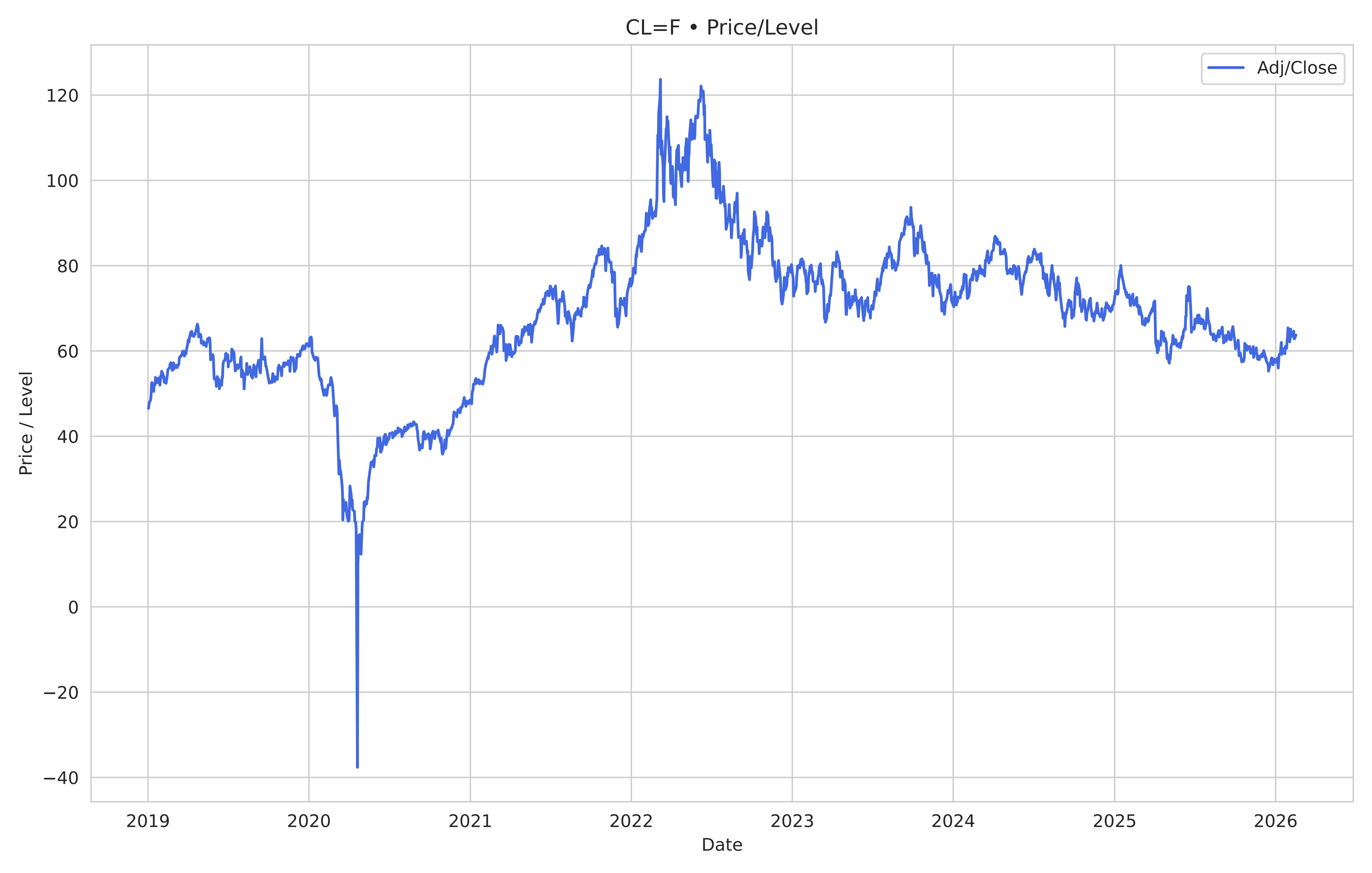
Multi-Asset EDA Report

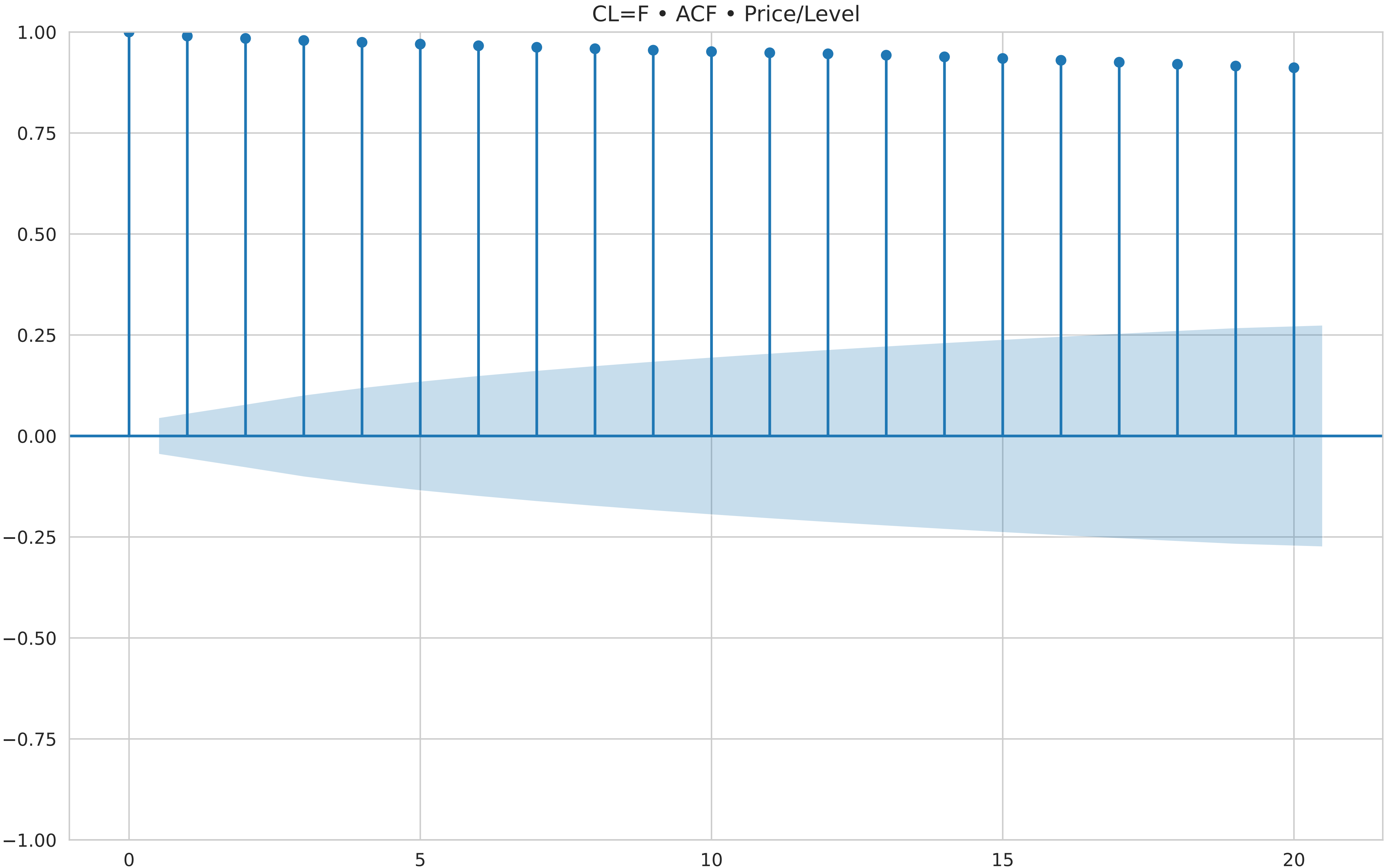
Tickers: CL=F, EUR_USD, GLD, MPC, PSX, SPY, VLO

Contents:

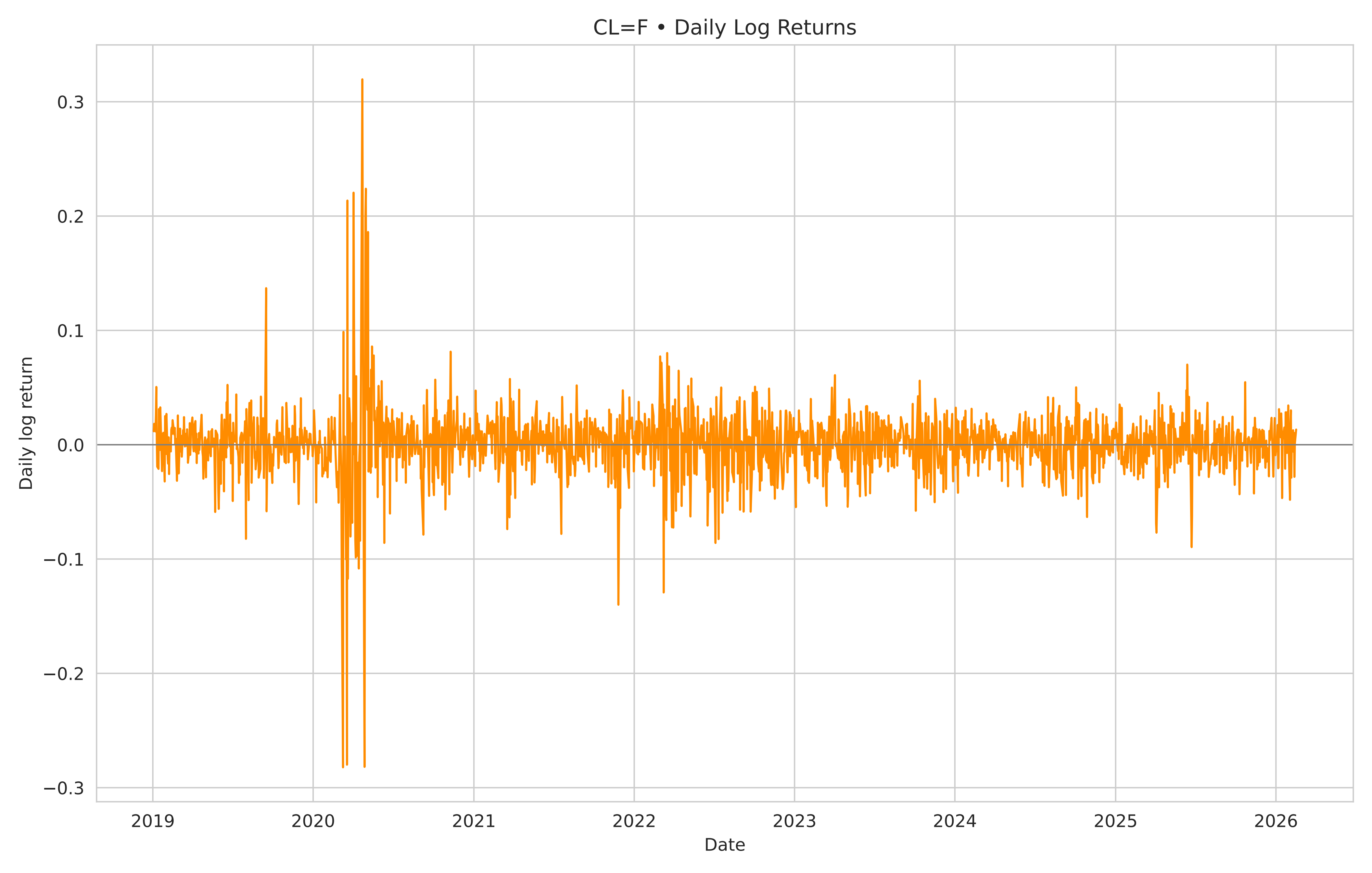
- Price series & ACF(Price), Moving Averages (5/10/20)
- Daily log-returns time series; Histogram+KDE (with Std Dev); Q–Q plot
- ACF(Returns), Rolling Autocorr(Returns)
- Volatility clustering: ACF(|r|) & ACF(r^2)
- Seasonality (from Date index): Monthly/DOW/Quarterly boxplots; Month×Year heatmap; Month-End/Start bars
- Feature distributions (Spreads/MAs/Lags) & correlation heatmaps
- Cross-ticker adjusted/close overlay

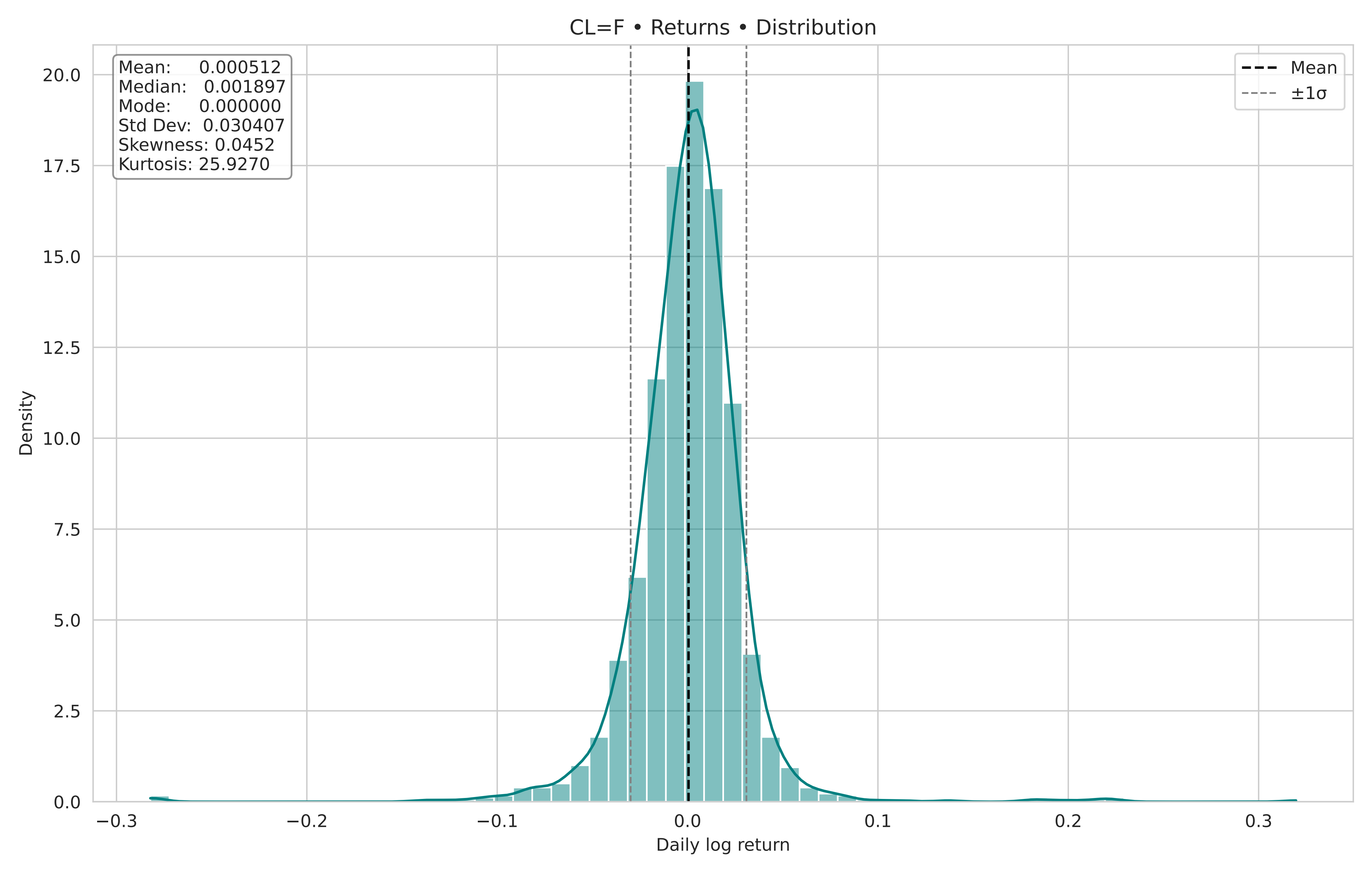


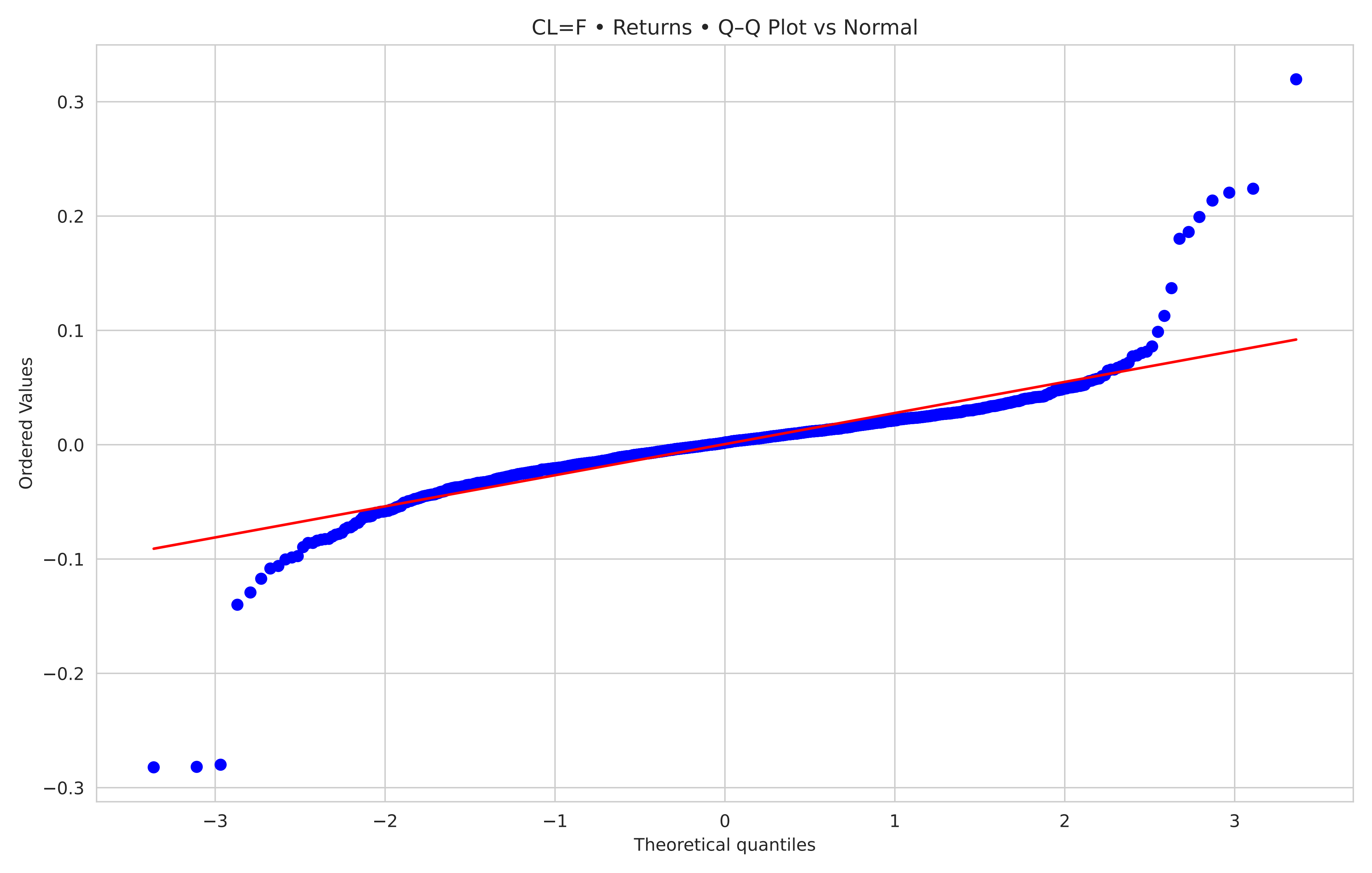
CL=F • Price/Level
Adj/Close
120
100
80
60
40
20
0
−20
−40
Price / Level
2019
2020
2021
2022
2023
2024
2025
2026
Date

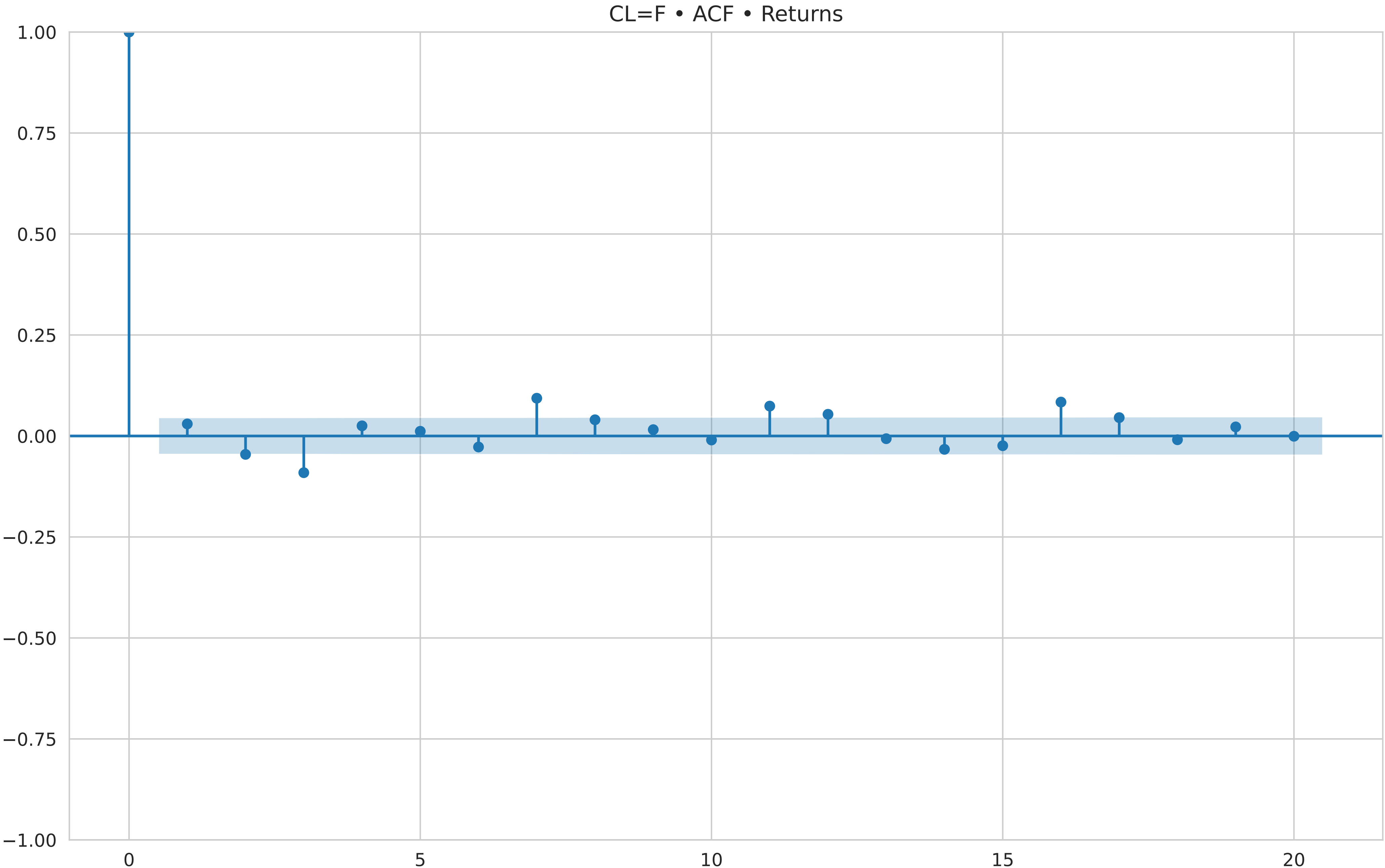

CL=F • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

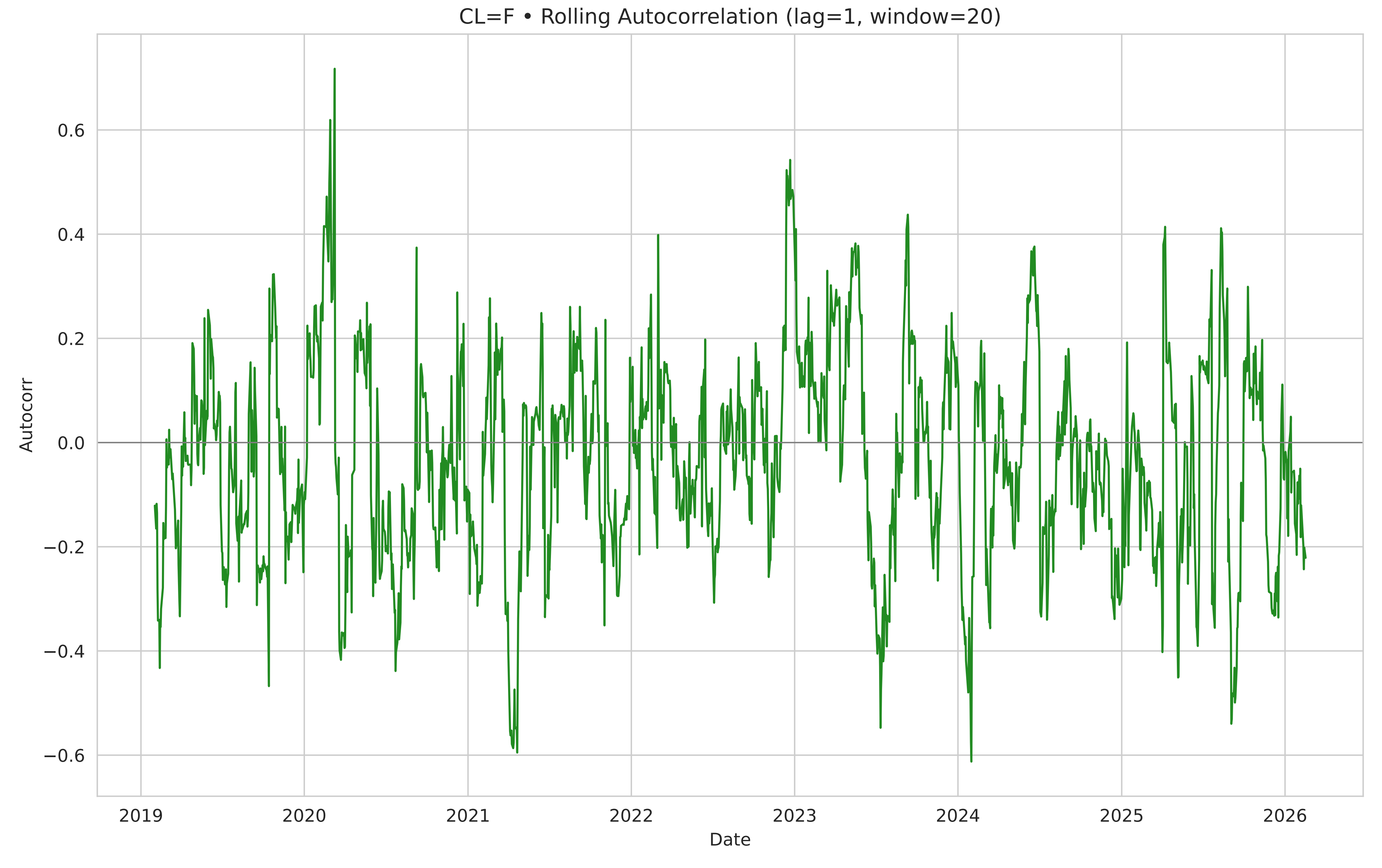
CL=F • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
120
100
80
60
40
20
0
−20
−40
Price / Level
2019
2020
2021
2022
2023
2024
2025
2026
Date


CL=F • Daily Log Returns
Daily log return
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
2019
2020
2021
2022
2023
2024
2025
2026
Date

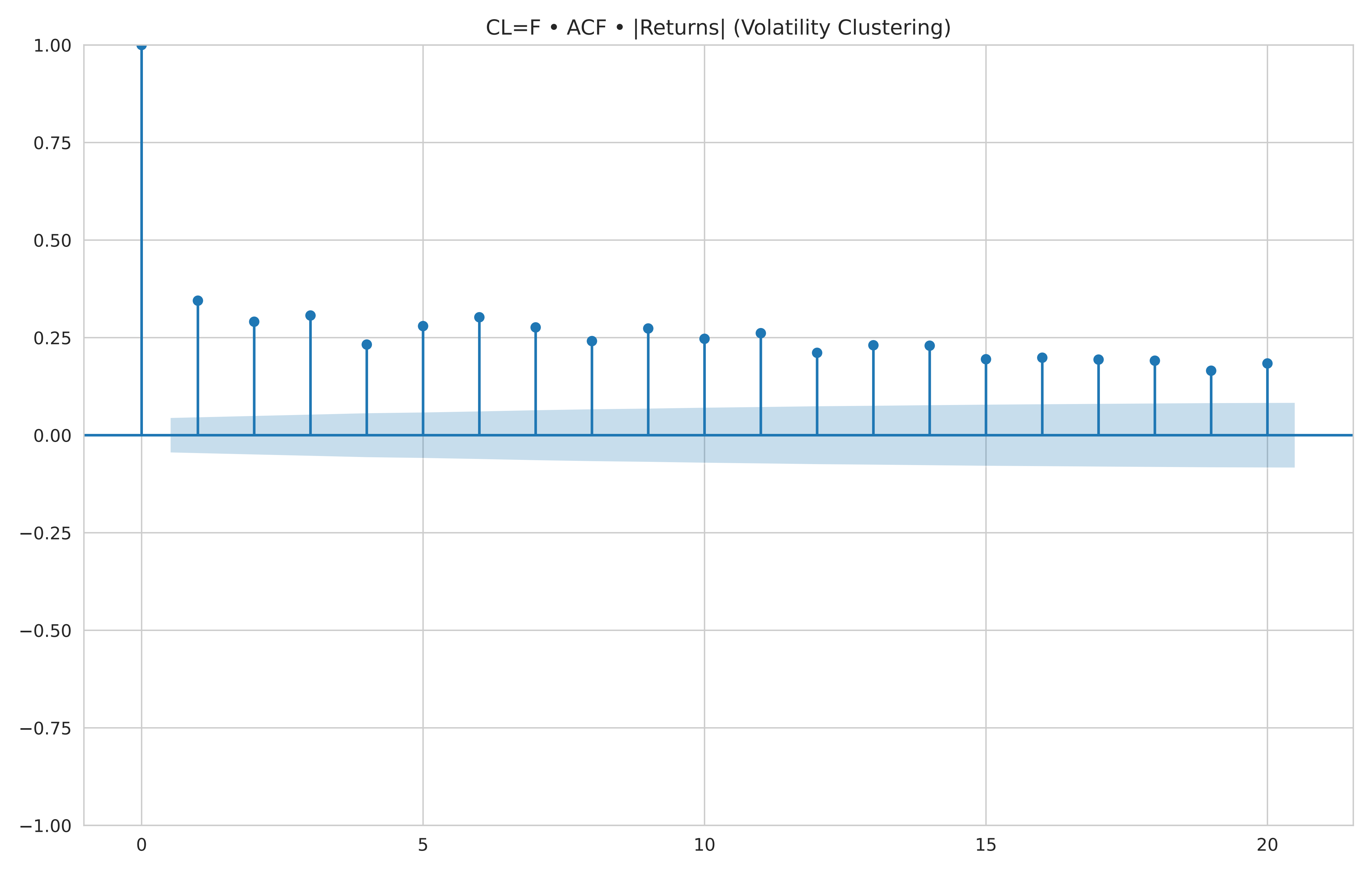

CL=F • Returns • Distribution
Mean: 0.000512
Median: 0.001897
Mode: 0.000000
Std Dev: 0.030407
Skewness: 0.0452
Kurtosis: 25.9270
Mean
±1σ
Density
Daily log return
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0.0
−0.3
−0.2
−0.1
0.0
0.1
0.2
0.3

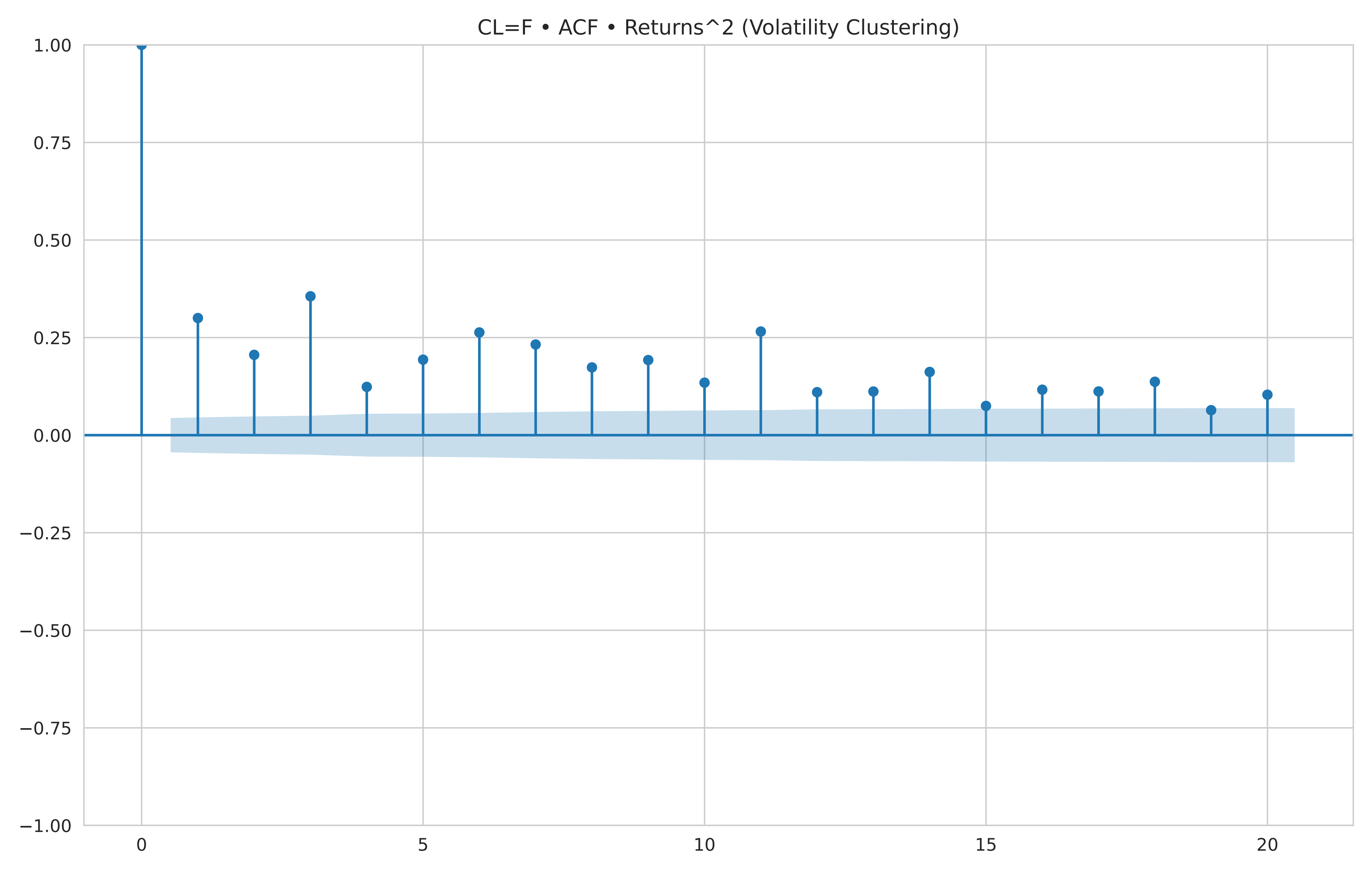

CL=F • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
−3
−2
−1
0
1
2
3

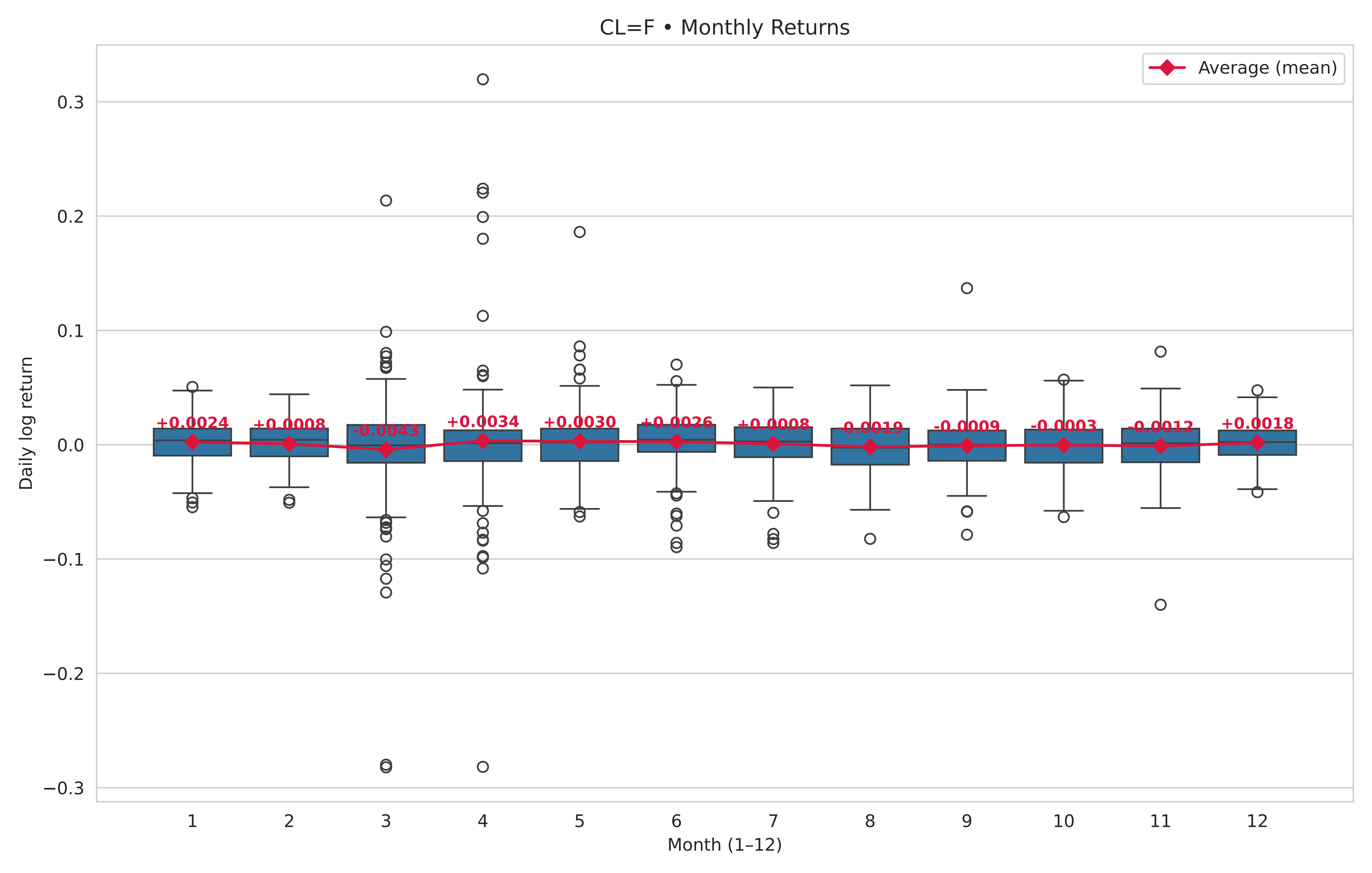

CL=F • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



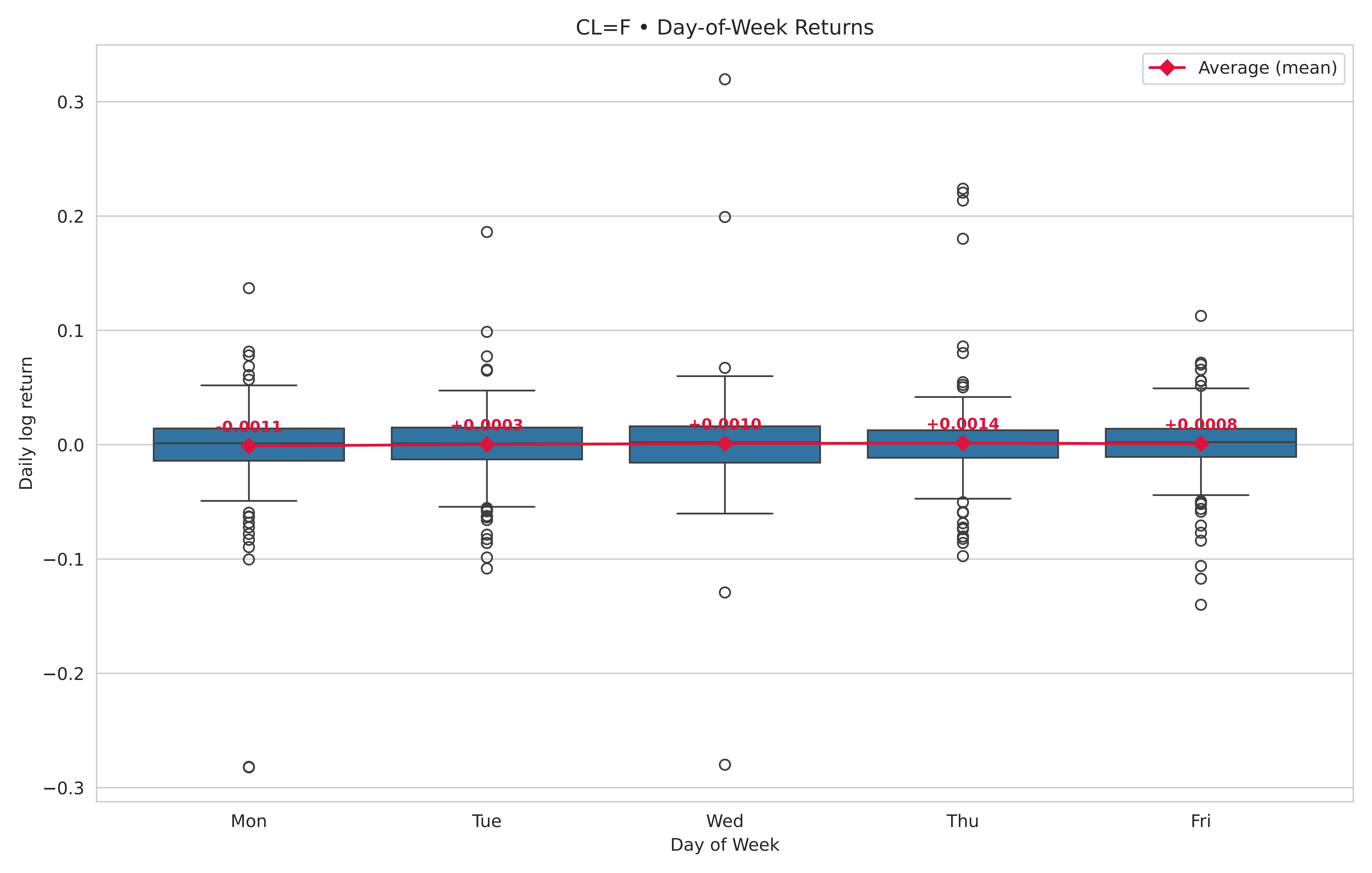
CL=F • Rolling Autocorrelation (lag=1, window=20)
Autocorr
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026
Date


CL=F • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

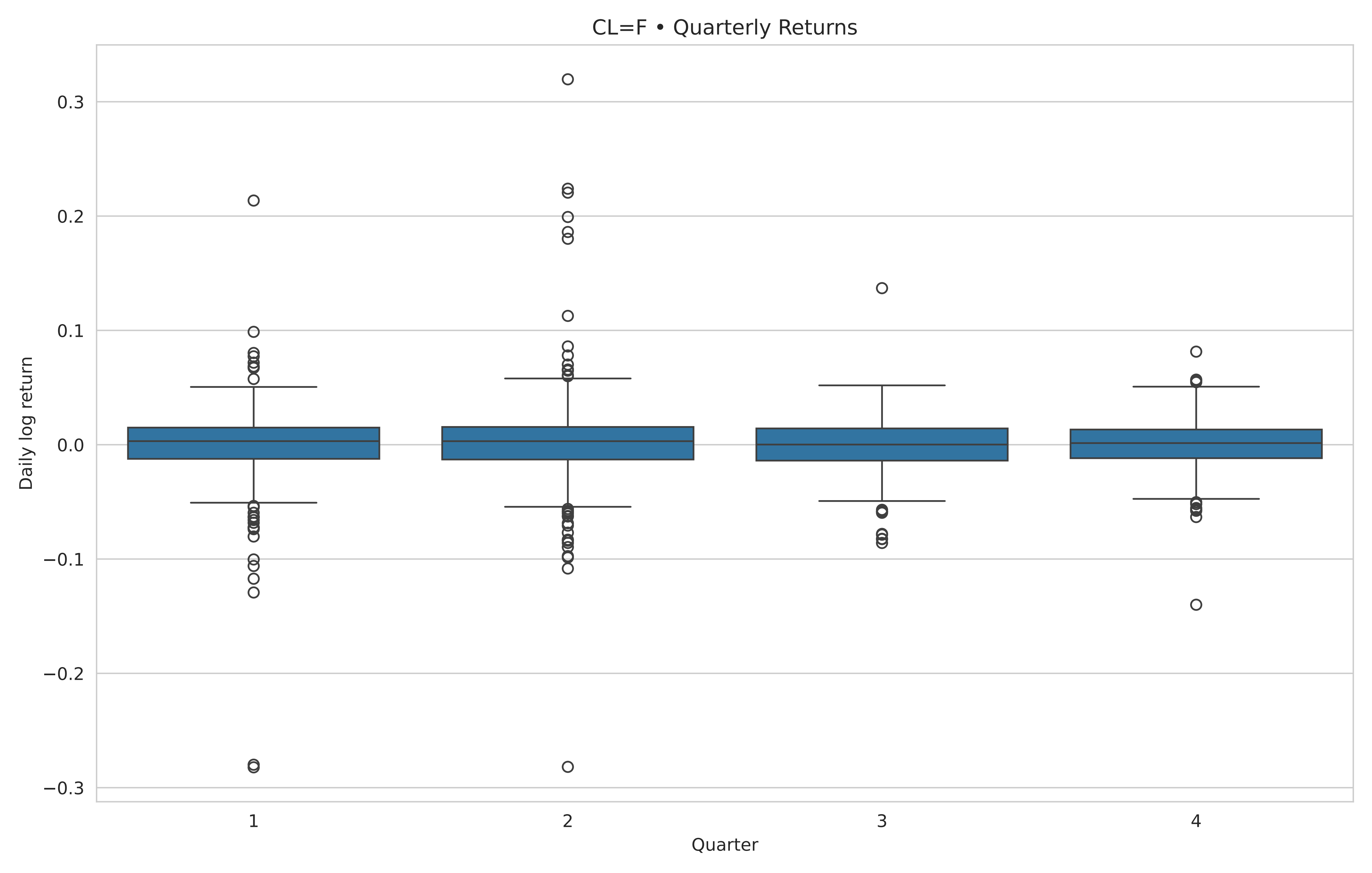

CL=F • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

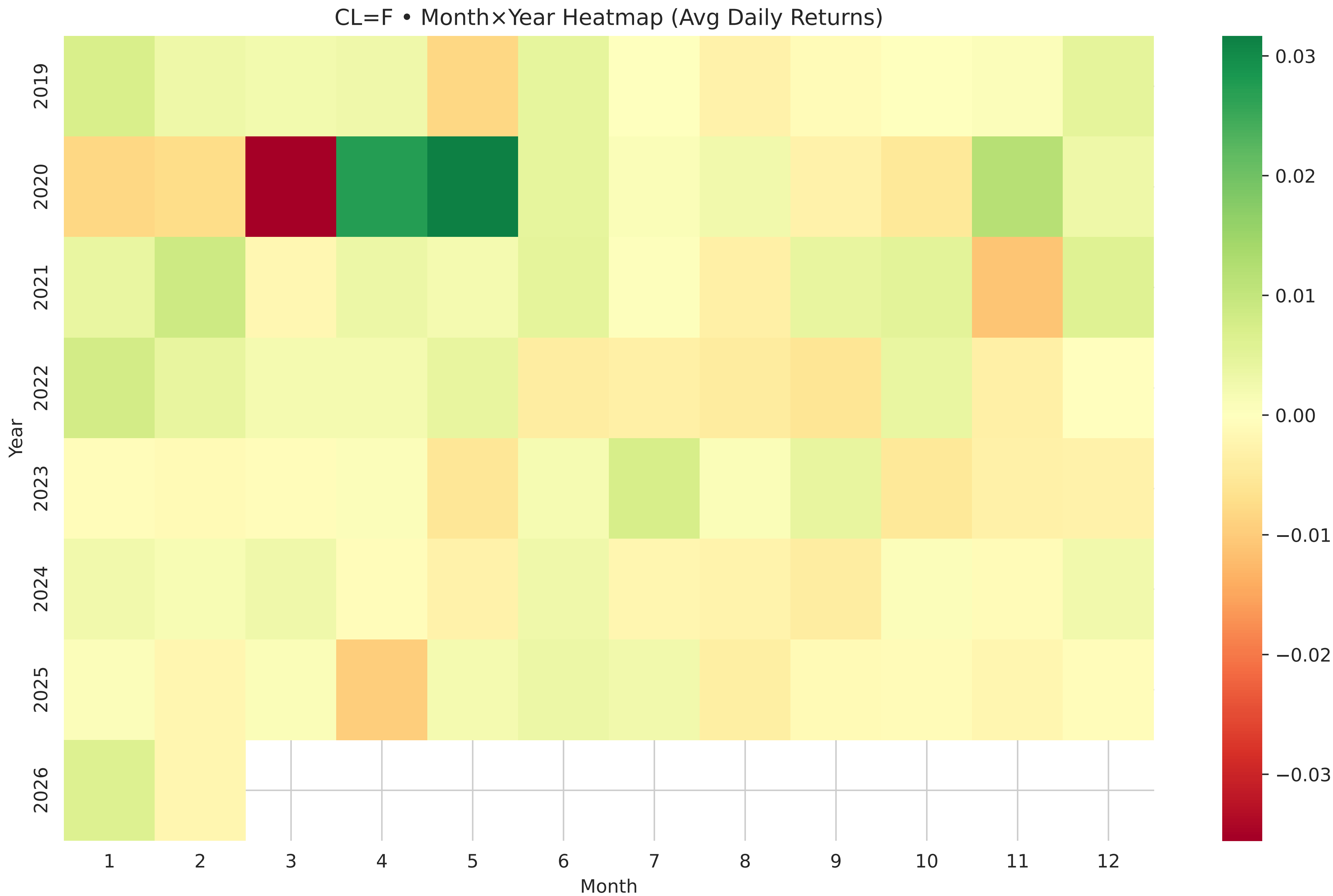


CL=F • Monthly Returns
Average (mean)
Daily log return
Month (1–12)
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
1
2
3
4
5
6
7
8
9
10
11
12
+0.0024
+0.0008
-0.0043
+0.0034
+0.0030
+0.0026
+0.0008
-0.0019
-0.0009
-0.0003
-0.0012
+0.0018

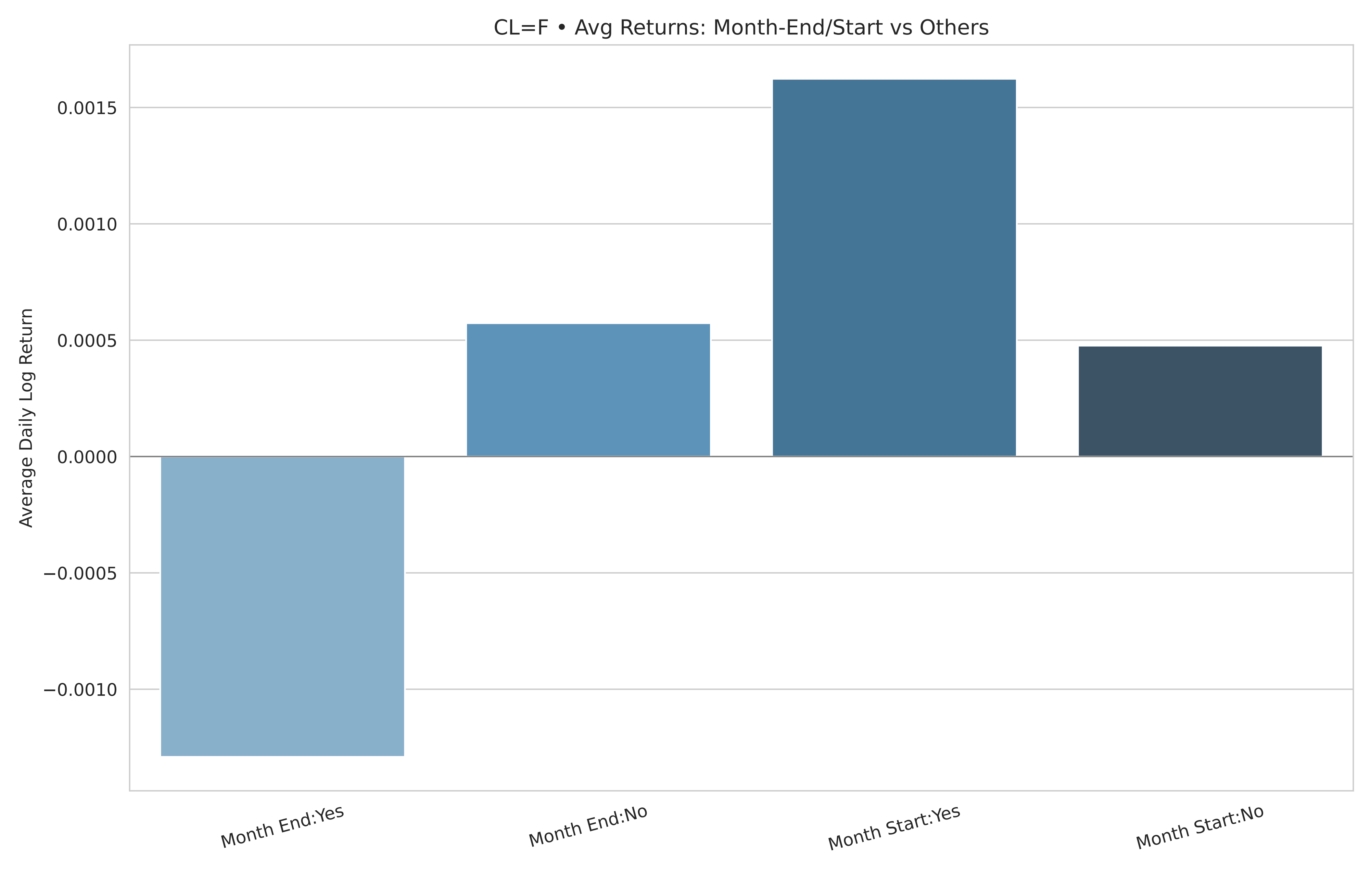


CL=F • Day-of-Week Returns
Average (mean)
Daily log return
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
-0.0011
+0.0003
+0.0010
+0.0014
+0.0008
Mon
Tue
Wed
Thu
Fri
Day of Week

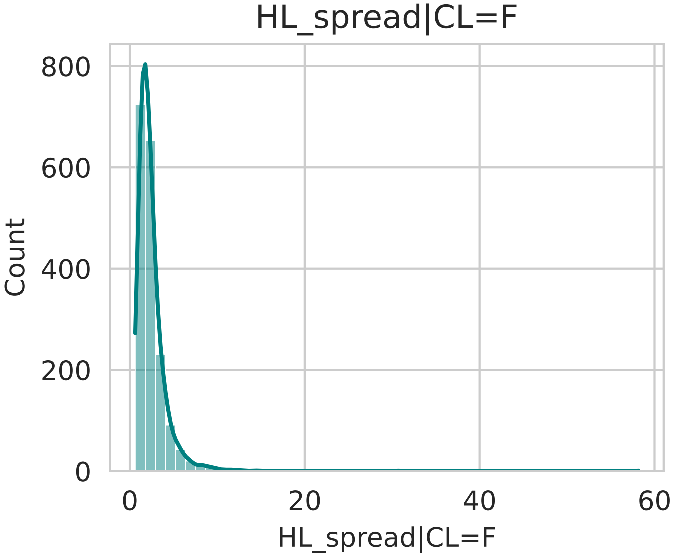

CL=F • Quarterly Returns
Daily log return
0.3
0.2
0.1
0.0
−0.1
−0.2
−0.3
1
2
3
4
Quarter

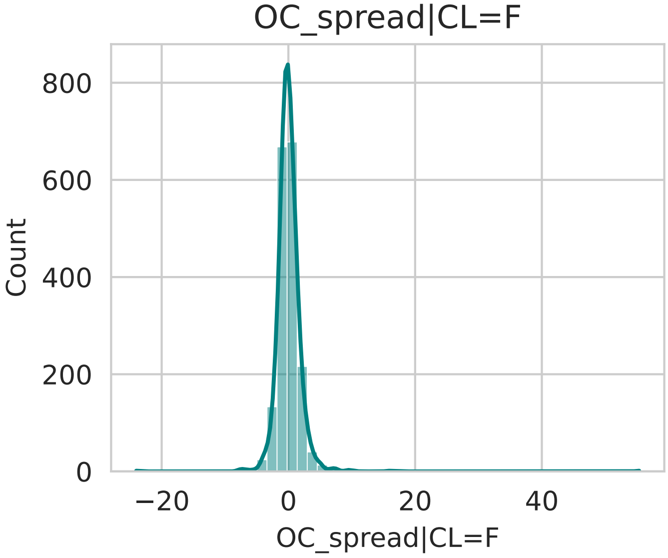


CL=F • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03

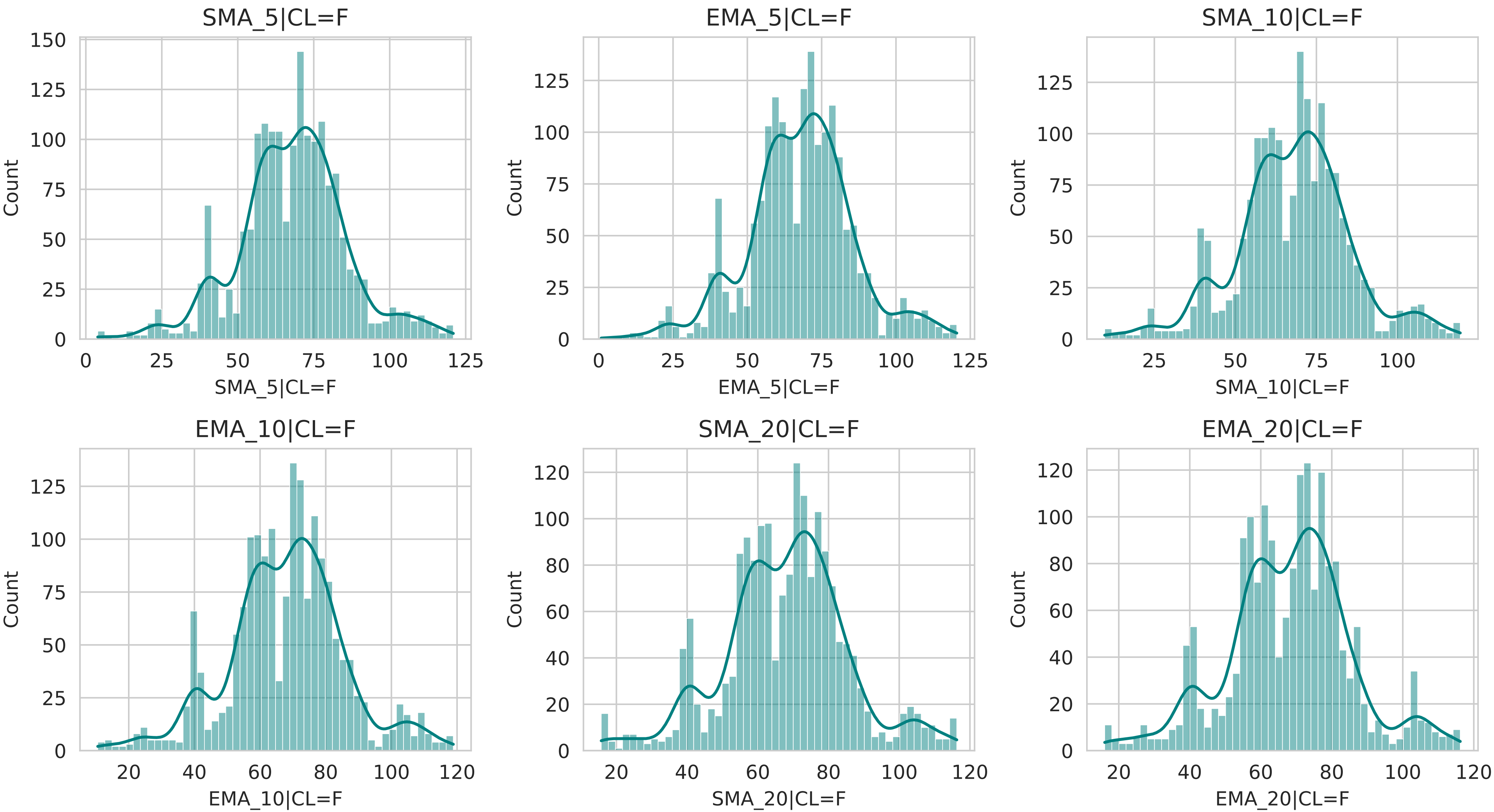

CL=F • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.0015
0.0010
0.0005
0.0000
−0.0005
−0.0010
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

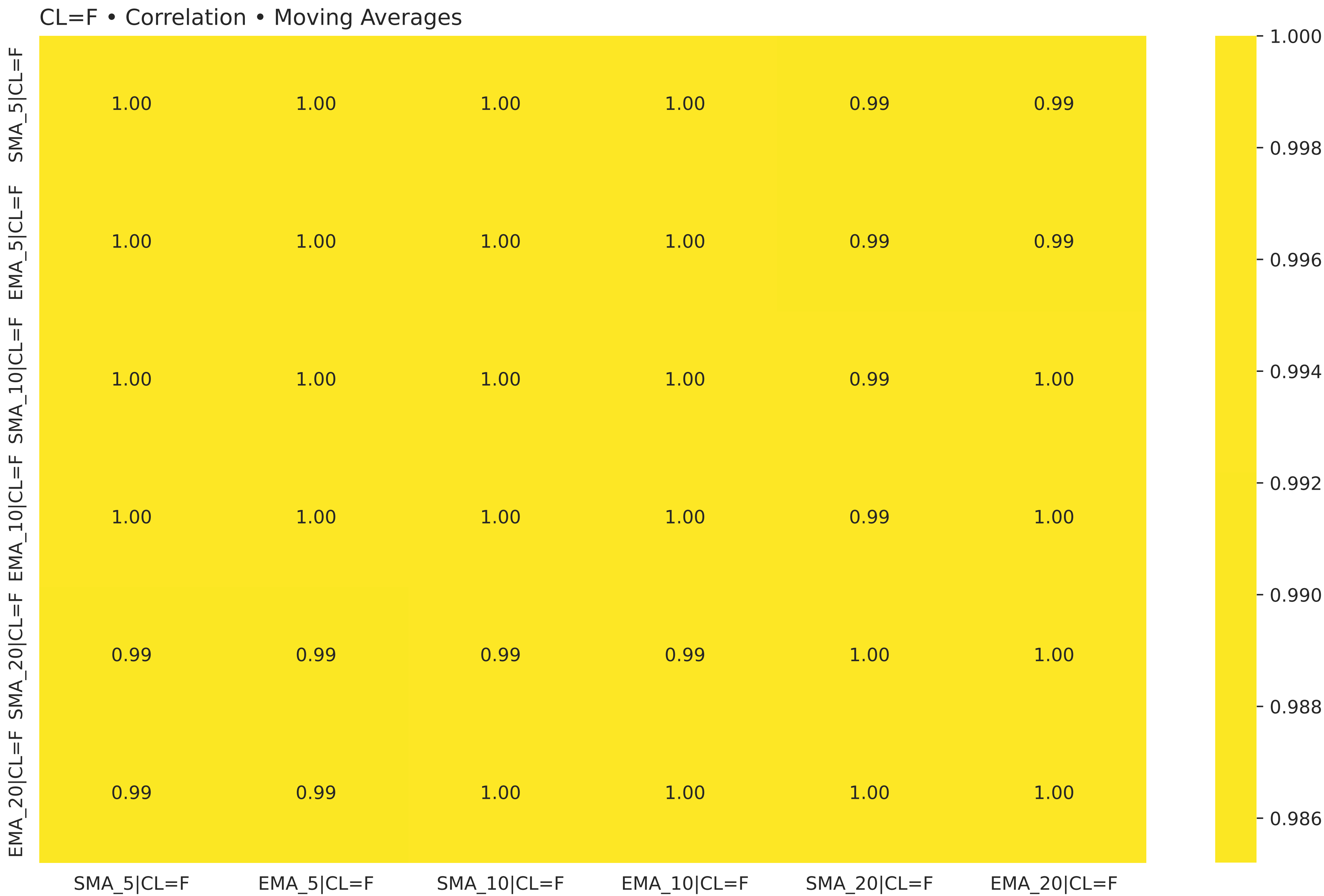
CL=F • Spreads

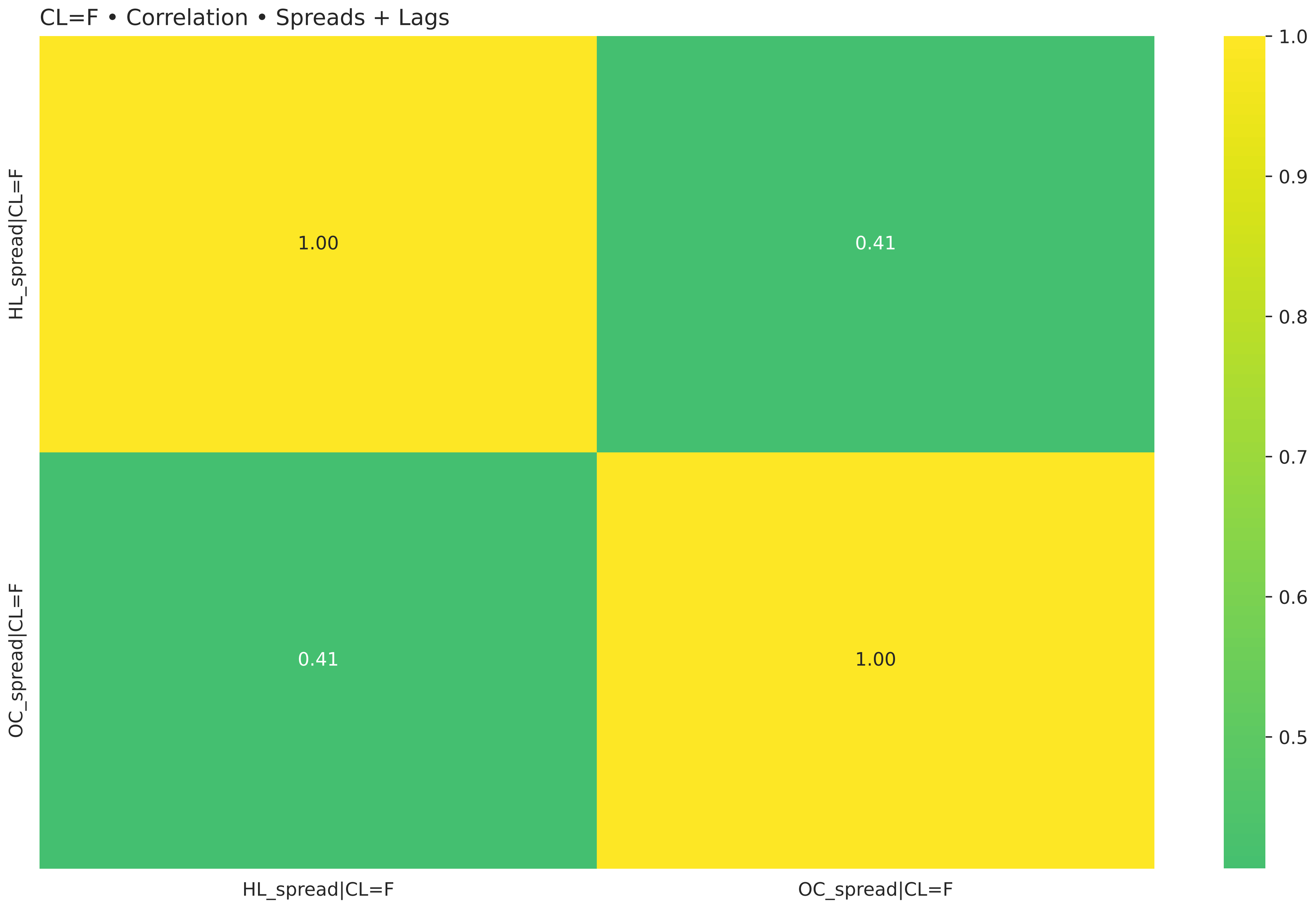

HL_spread|CL=F
Count
800
600
400
200
0
0
20
40
60
HL_spread|CL=F


OC_spread|CL=F
Count
800
600
400
200
0
−20
0
20
40
OC_spread|CL=F

CL=F • Moving Averages / EMAs



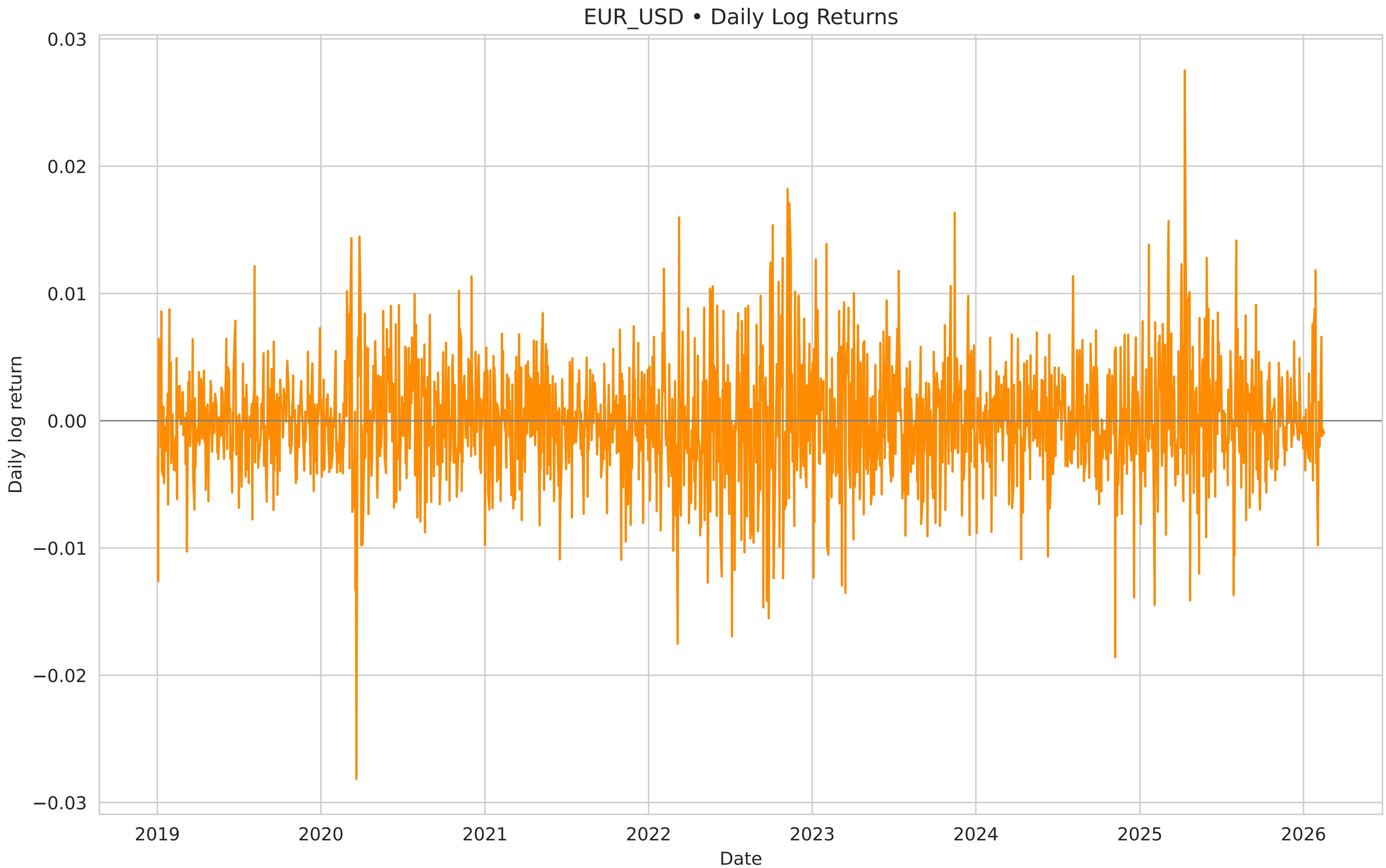

CL=F • Correlation • Moving Averages
SMA_5|CL=F
EMA_5|CL=F
SMA_10|CL=F
EMA_10|CL=F
SMA_20|CL=F
EMA_20|CL=F
1.00 1.00 1.00 1.00 0.99 0.99
1.00 1.00 1.00 1.00 0.99 0.99
1.00 1.00 1.00 1.00 0.99 1.00
1.00 1.00 1.00 1.00 0.99 1.00
0.99 0.99 0.99 0.99 1.00 1.00
0.99 0.99 1.00 1.00 1.00 1.00
1.000
0.998
0.996
0.994
0.992
0.990
0.988
0.986



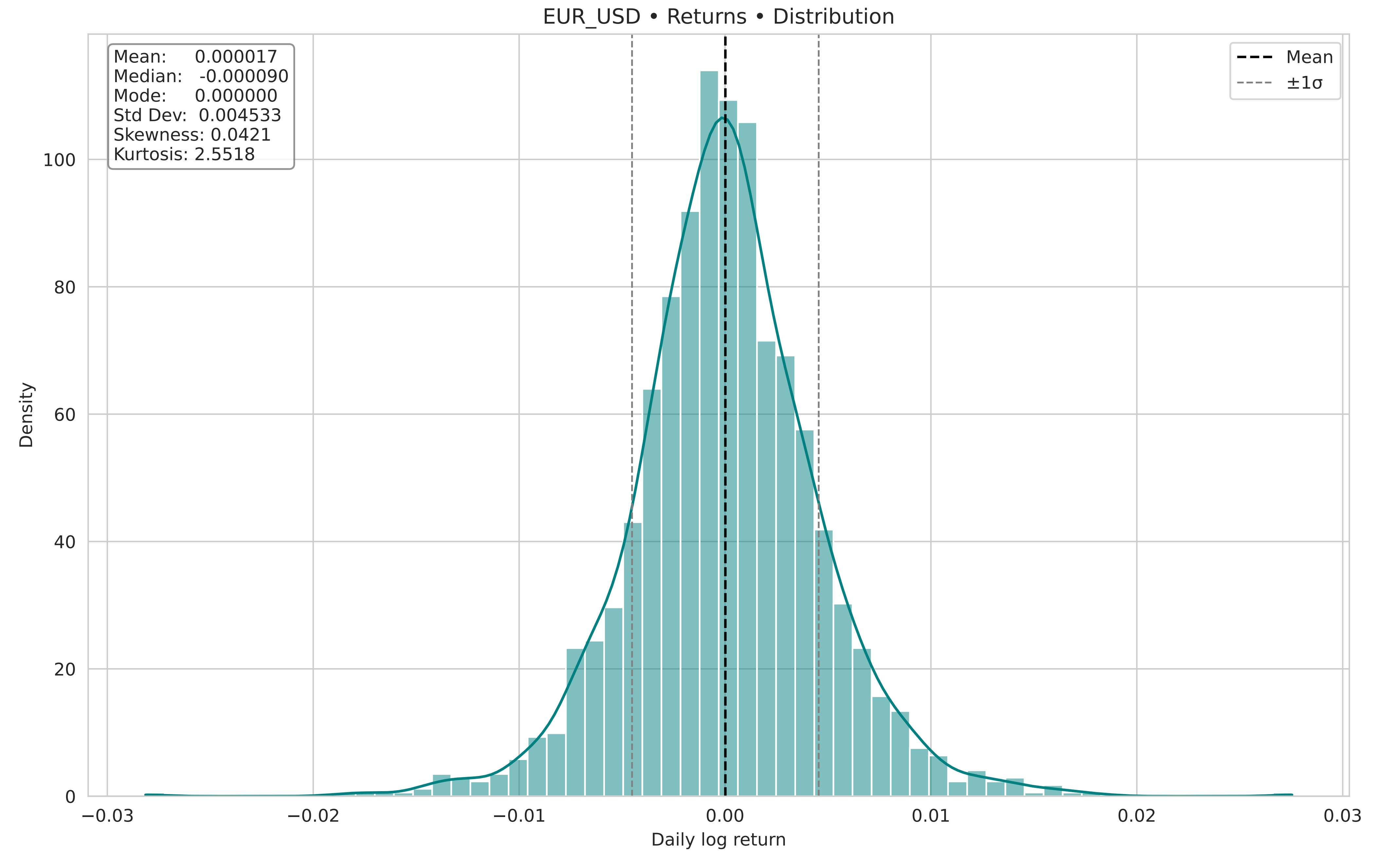
CL=F • Correlation • Spreads + Lags
HL_spread|CL=F
OC_spread|CL=F
1.00
0.41
0.41
1.00
HL_spread|CL=F
OC_spread|CL=F
1.0
0.9
0.8
0.7
0.6
0.5

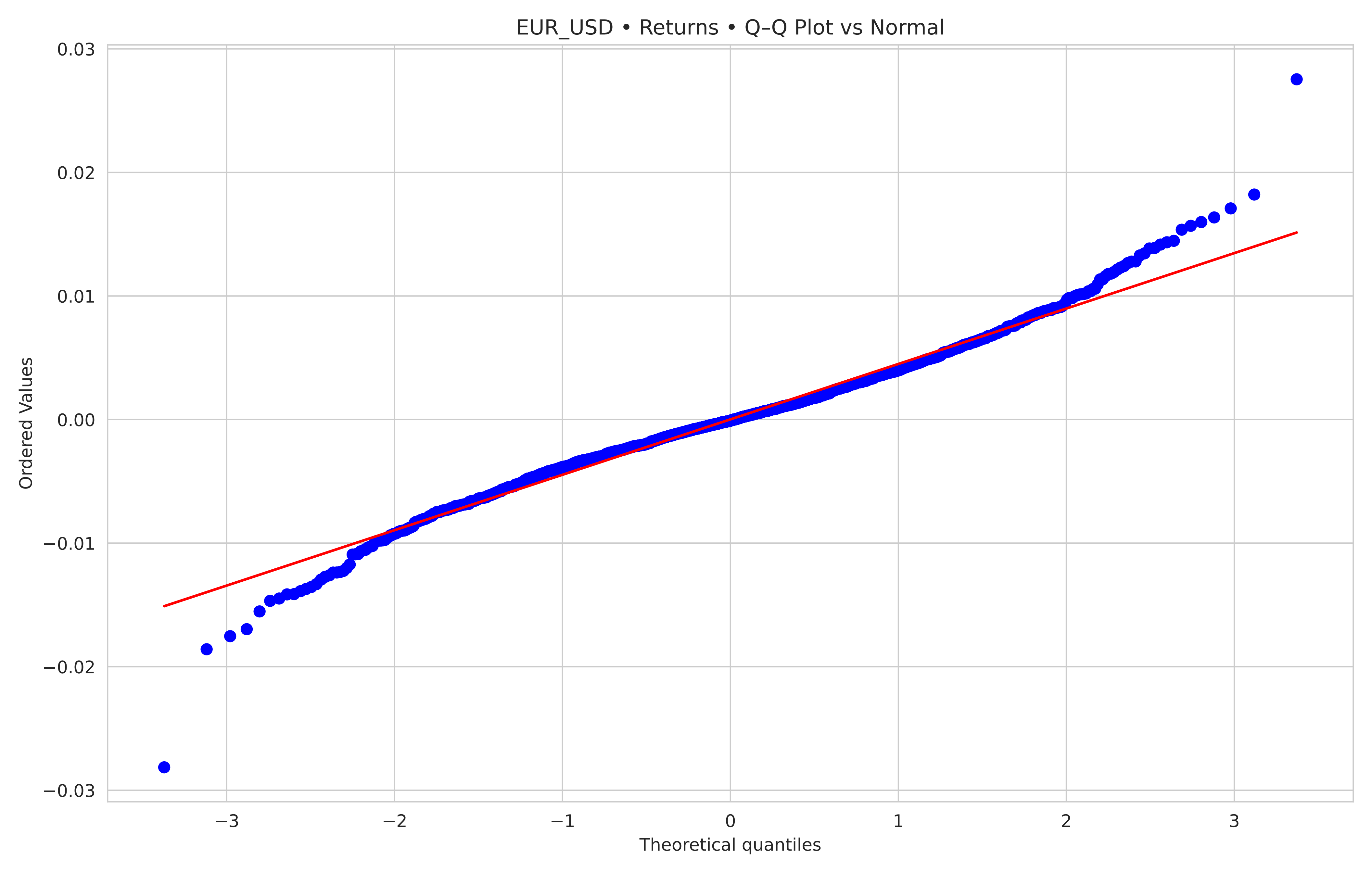
EUR_USD • Price Not Available

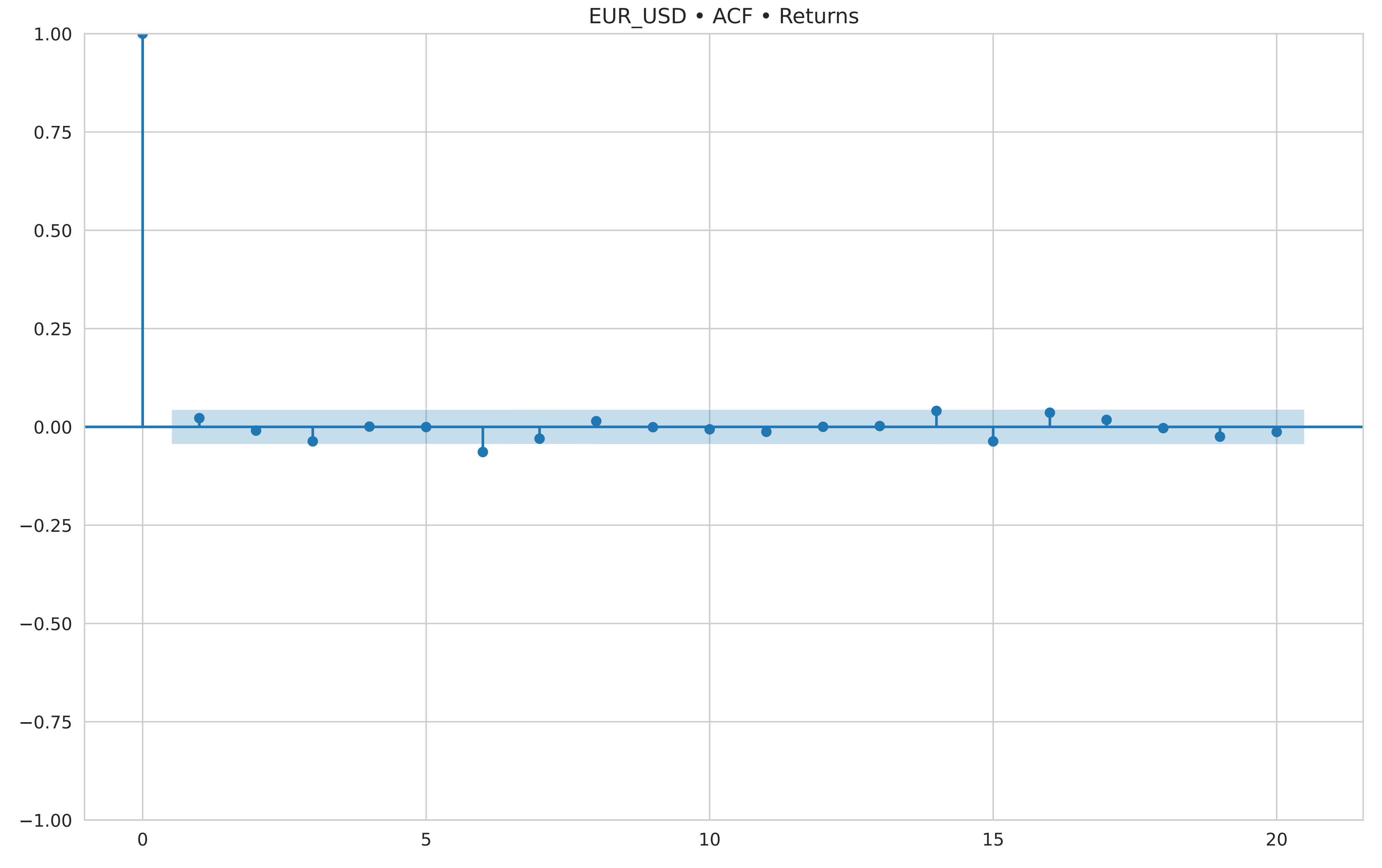
Message
No Adj/Close column found for EUR_USD.

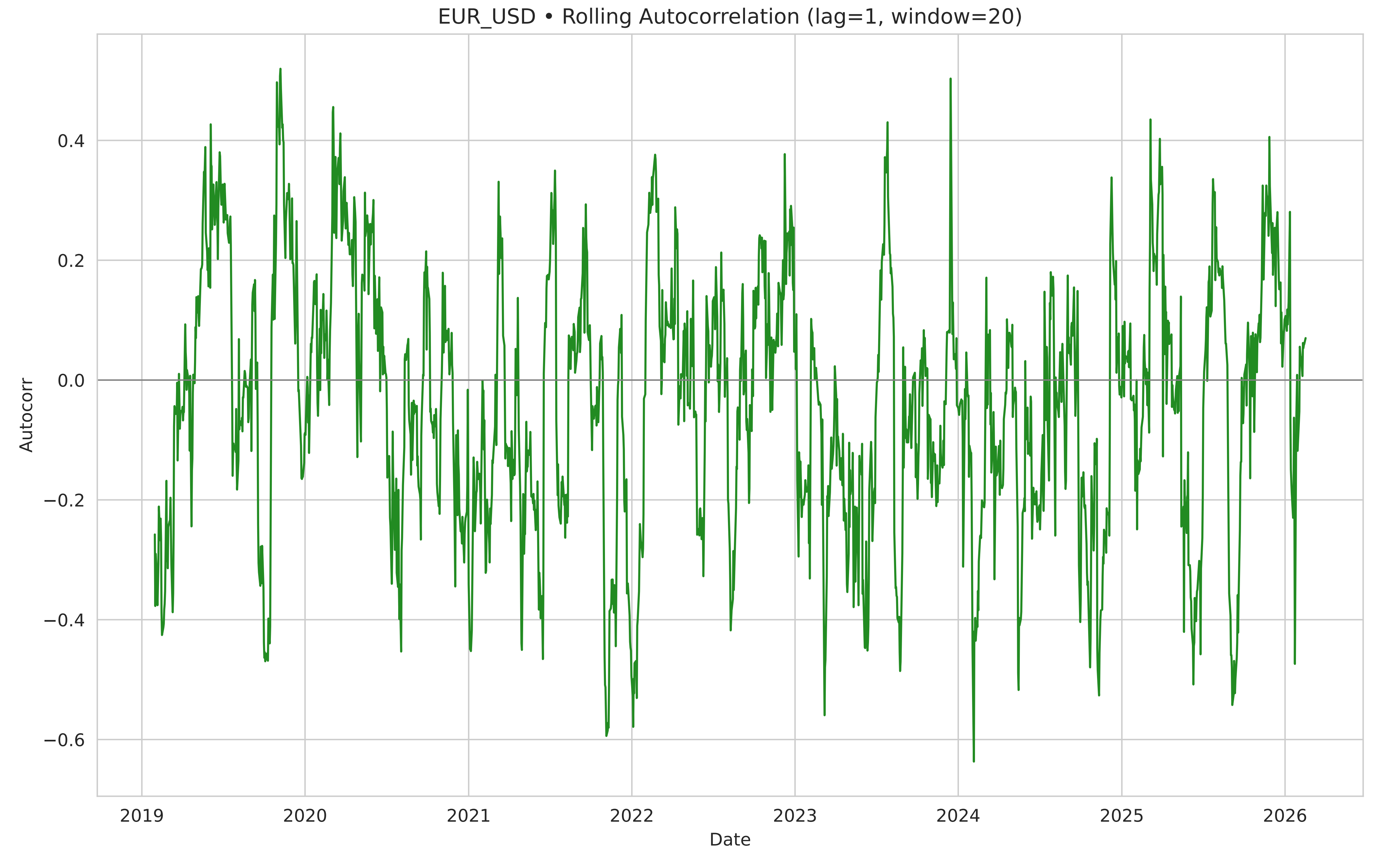


EUR_USD • Daily Log Returns
Daily log return
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03
2019
2020
2021
2022
2023
2024
2025
2026
Date

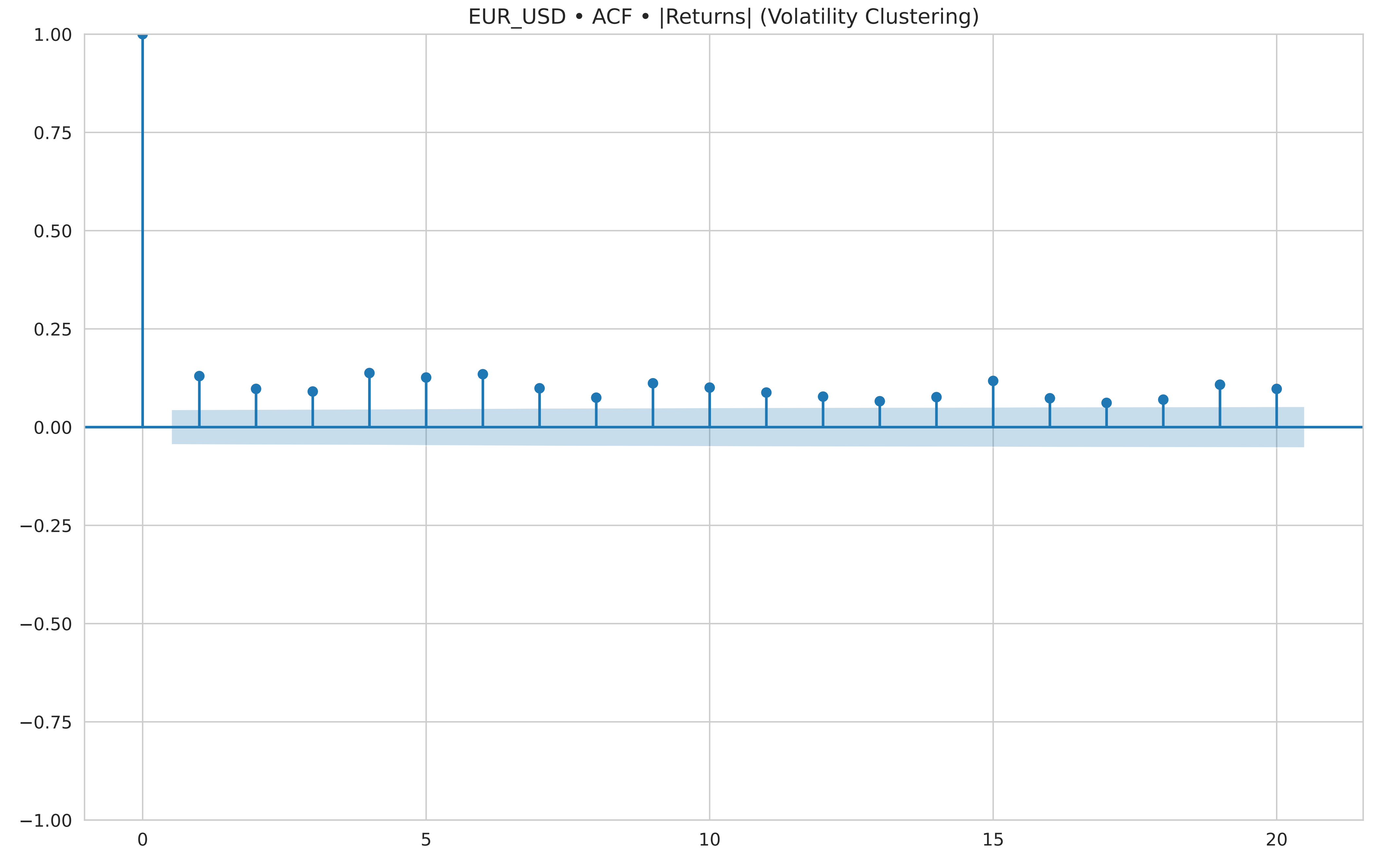

EUR_USD • Returns • Distribution
Mean: 0.000017
Median: -0.000090
Mode: 0.000000
Std Dev: 0.004533
Skewness: 0.0421
Kurtosis: 2.5518
Mean
±1σ
Density
0
20
40
60
80
100
−0.03
−0.02
−0.01
0.00
0.01
0.02
0.03
Daily log return

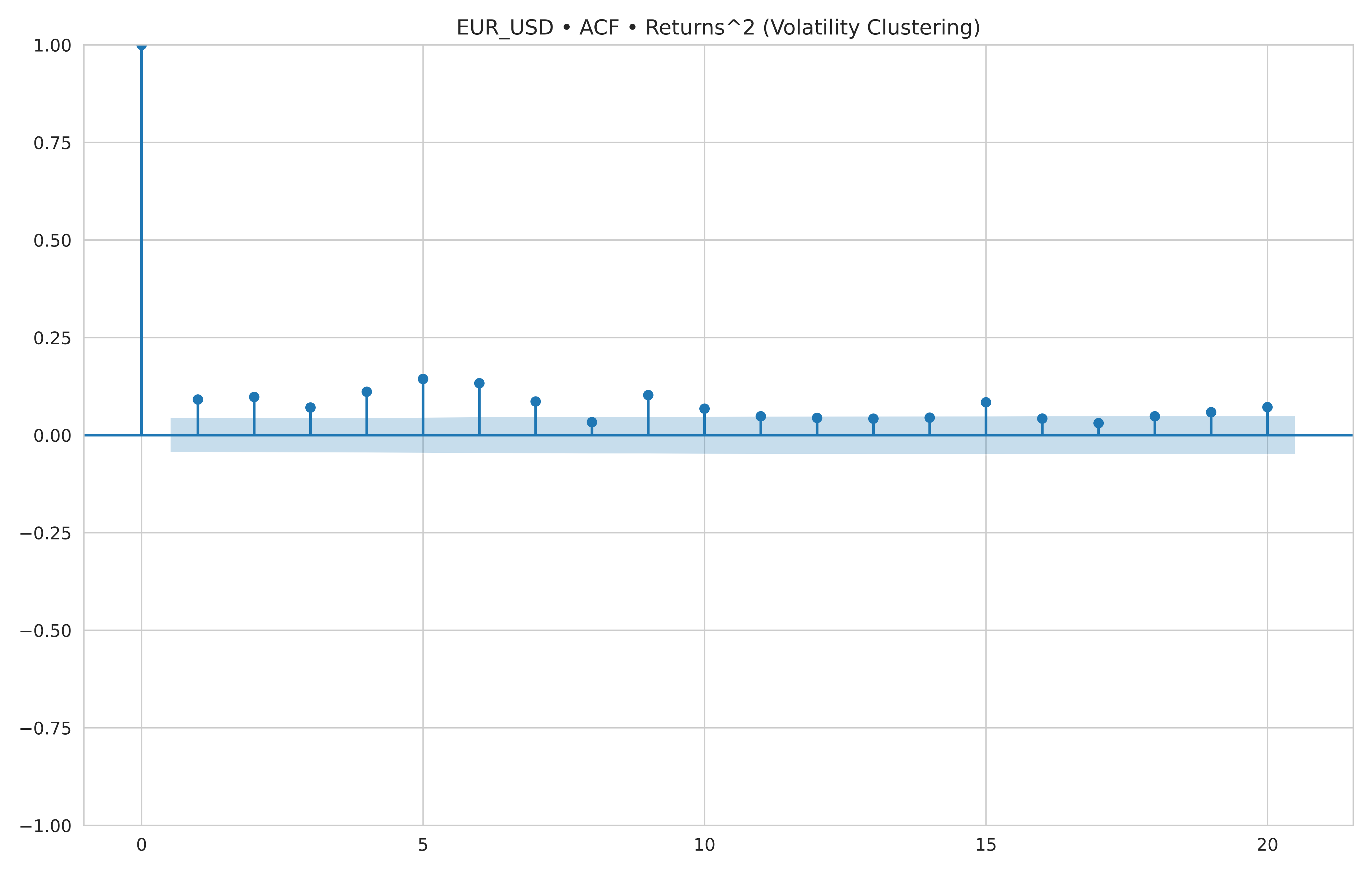

EUR_USD • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03
−3
−2
−1
0
1
2
3

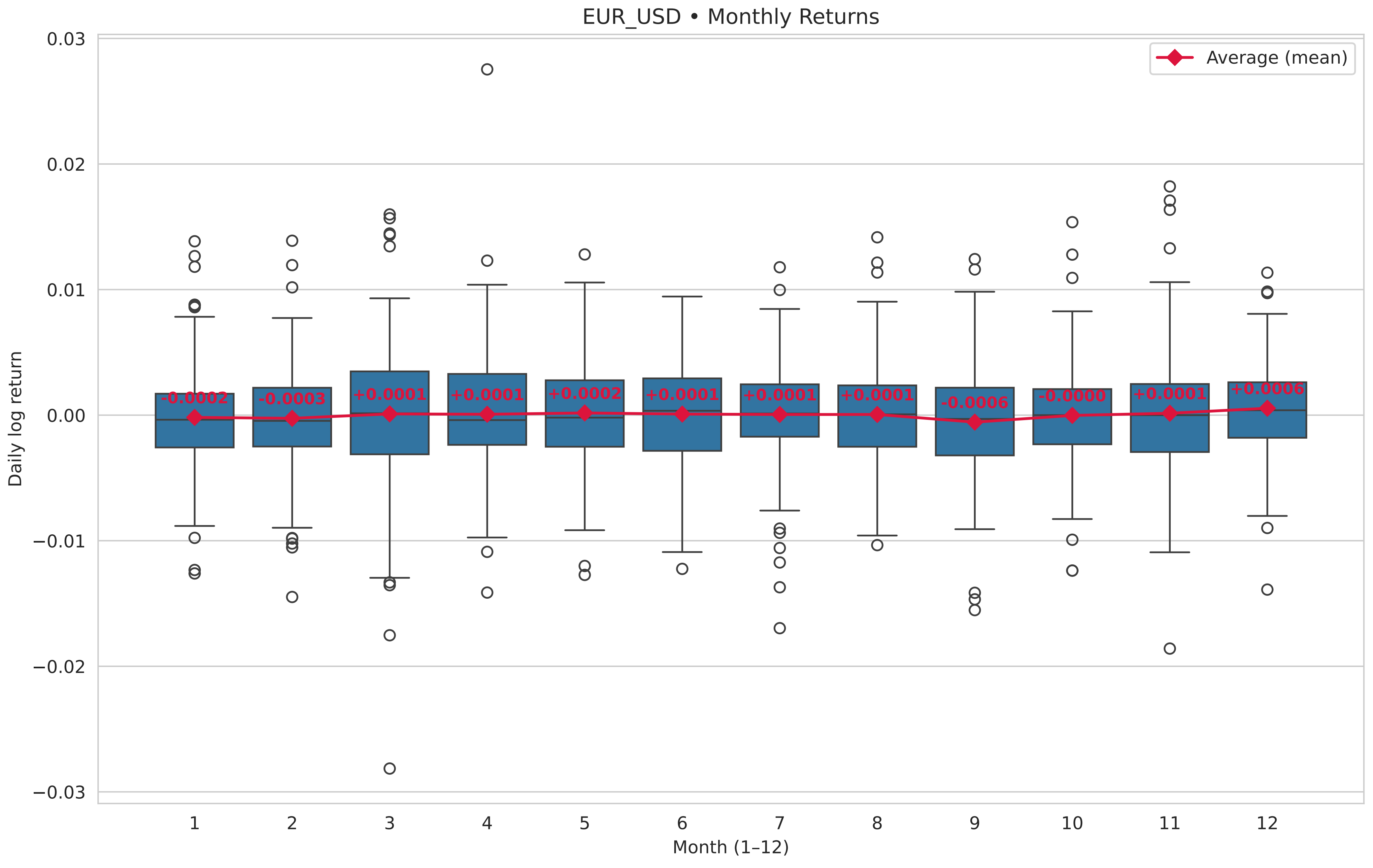

EUR_USD • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



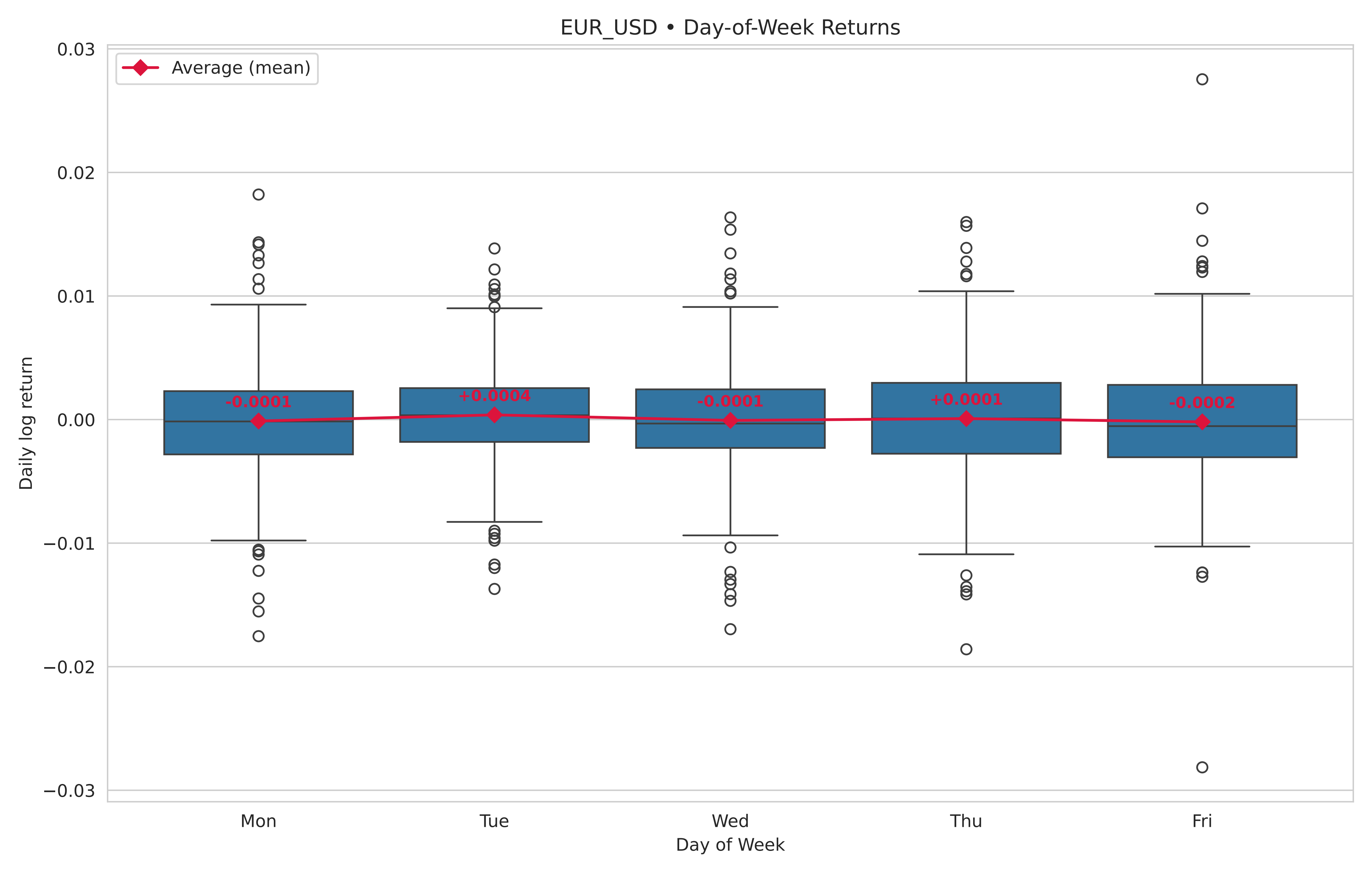
EUR_USD • Rolling Autocorrelation (lag=1, window=20)
Autocorr
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026
Date

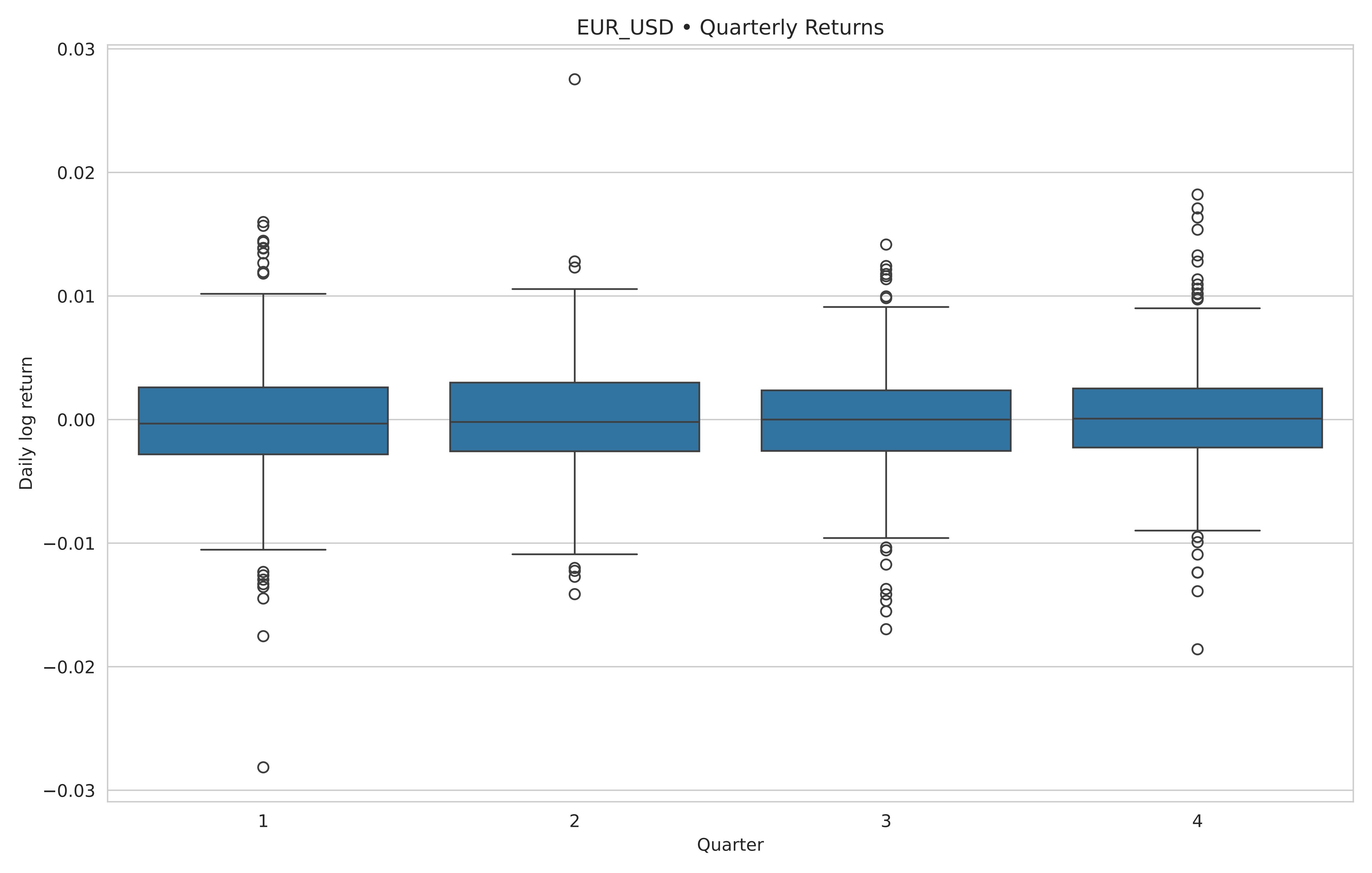

EUR_USD • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

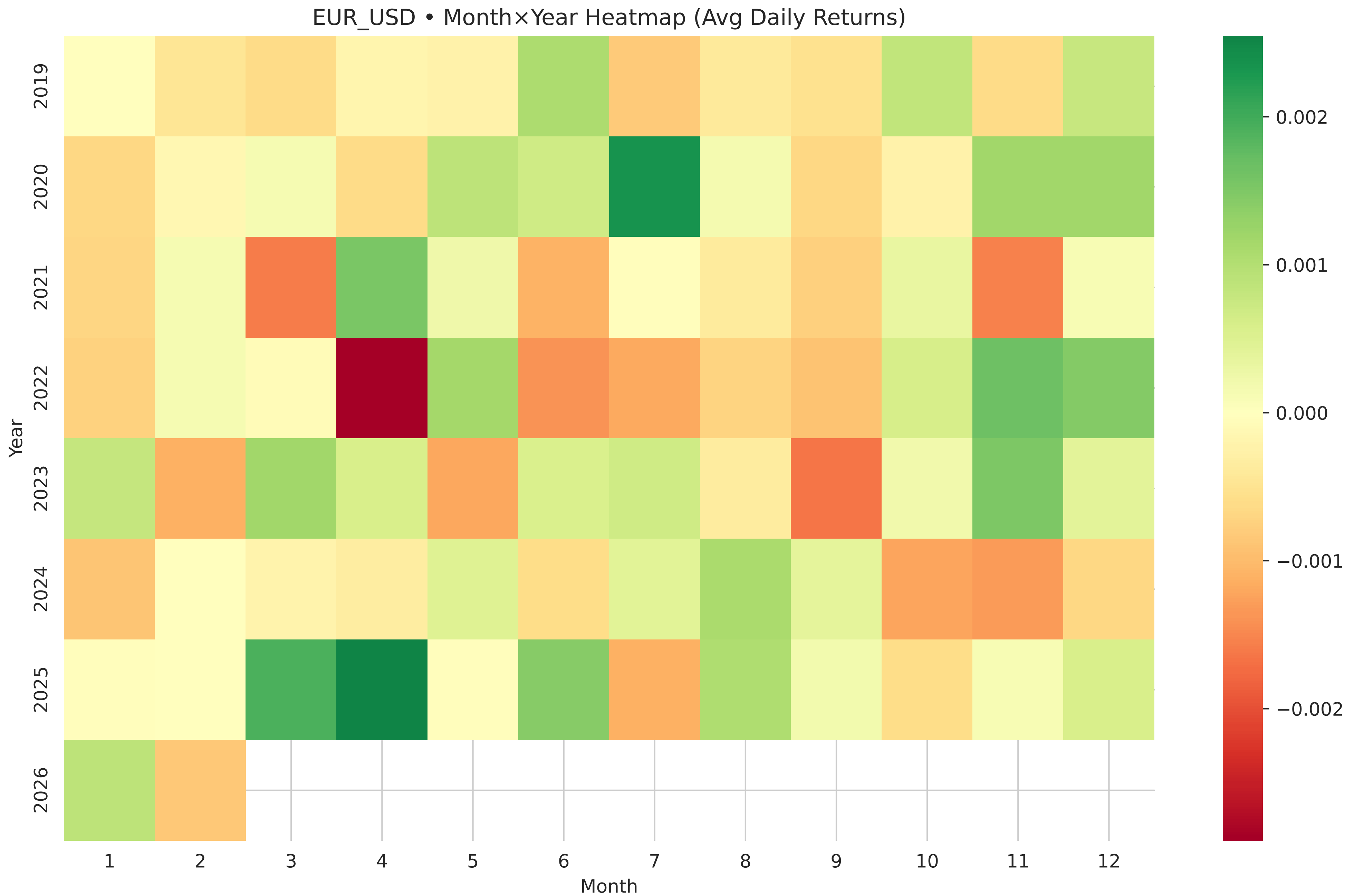

EUR_USD • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

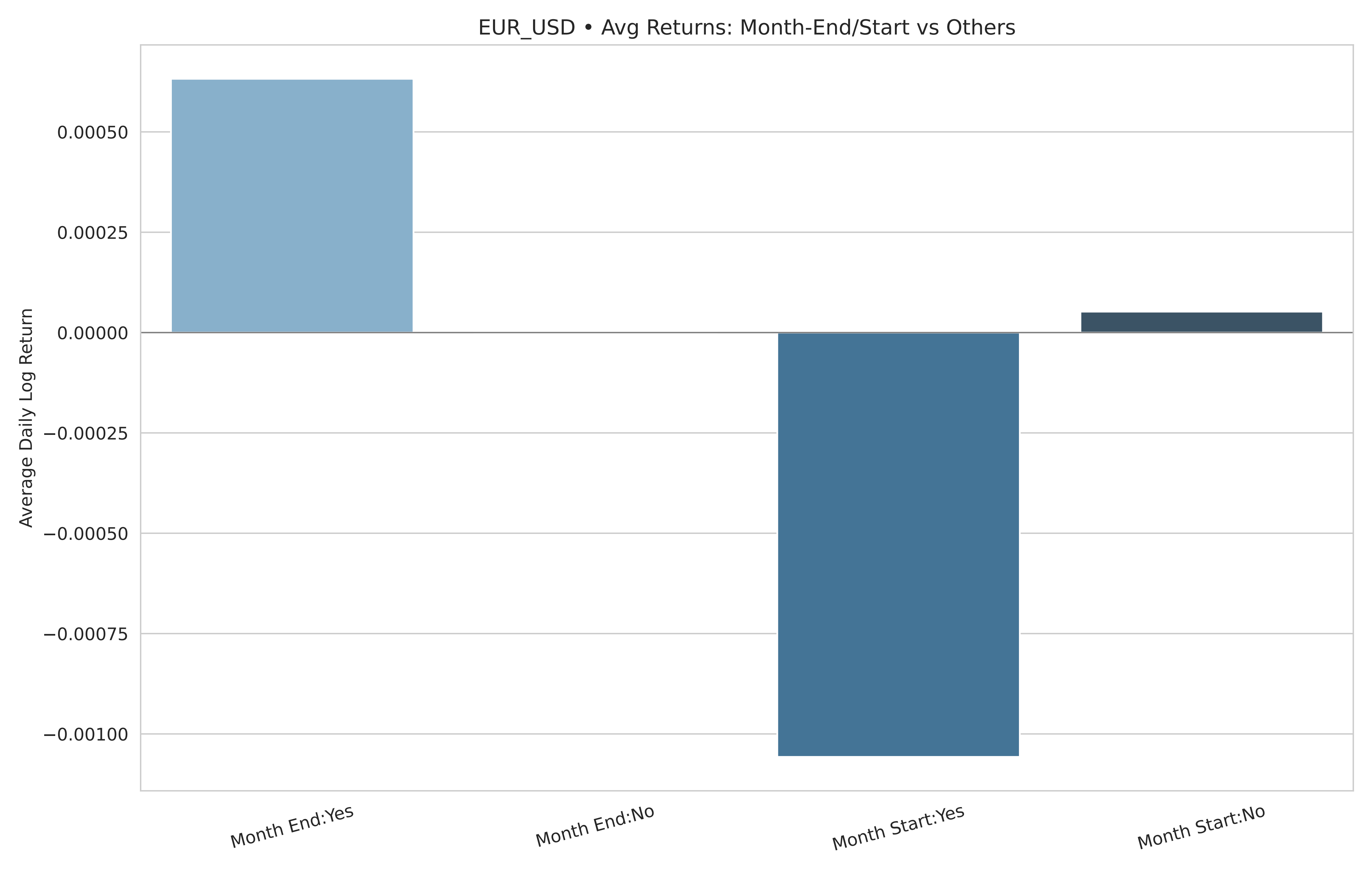


EUR_USD • Monthly Returns
Average (mean)
Daily log return
Month (1–12)
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03
1
2
3
4
5
6
7
8
9
10
11
12
-0.0002
-0.0003
+0.0001
+0.0001
+0.0002
+0.0001
+0.0001
+0.0001
-0.0006
-0.0000
+0.0001
+0.0006


EUR_USD • Day-of-Week Returns
Average (mean)
Daily log return
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03
-0.0001
+0.0004
-0.0001
+0.0001
-0.0002
Mon
Tue
Wed
Thu
Fri
Day of Week

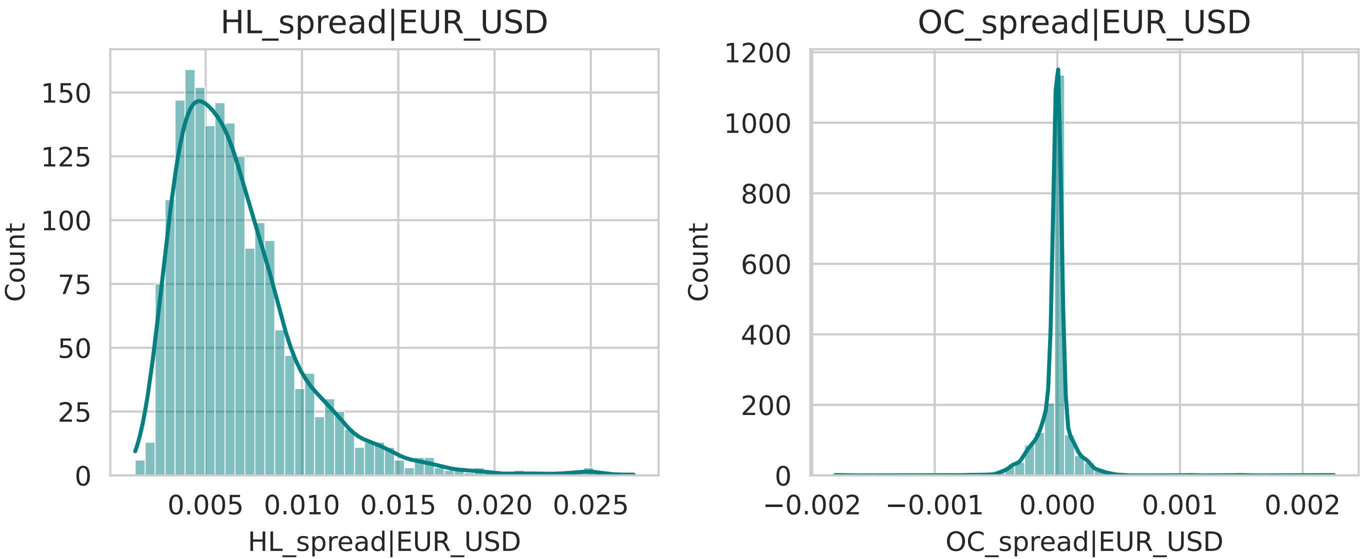

EUR_USD • Quarterly Returns
Daily log return
0.03
0.02
0.01
0.00
−0.01
−0.02
−0.03
1
2
3
4
Quarter


EUR_USD • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.002
0.001
0.000
−0.001
−0.002

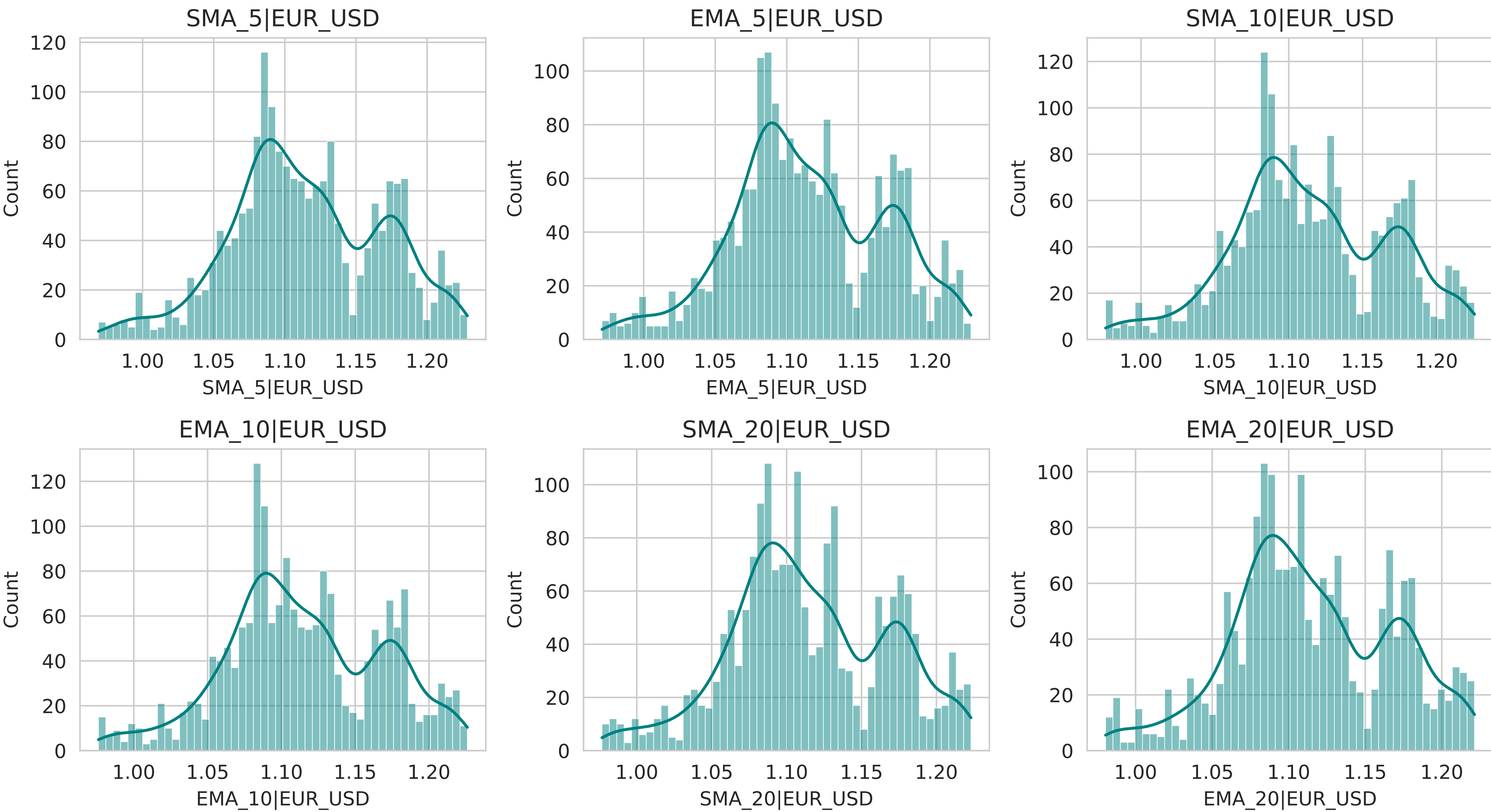


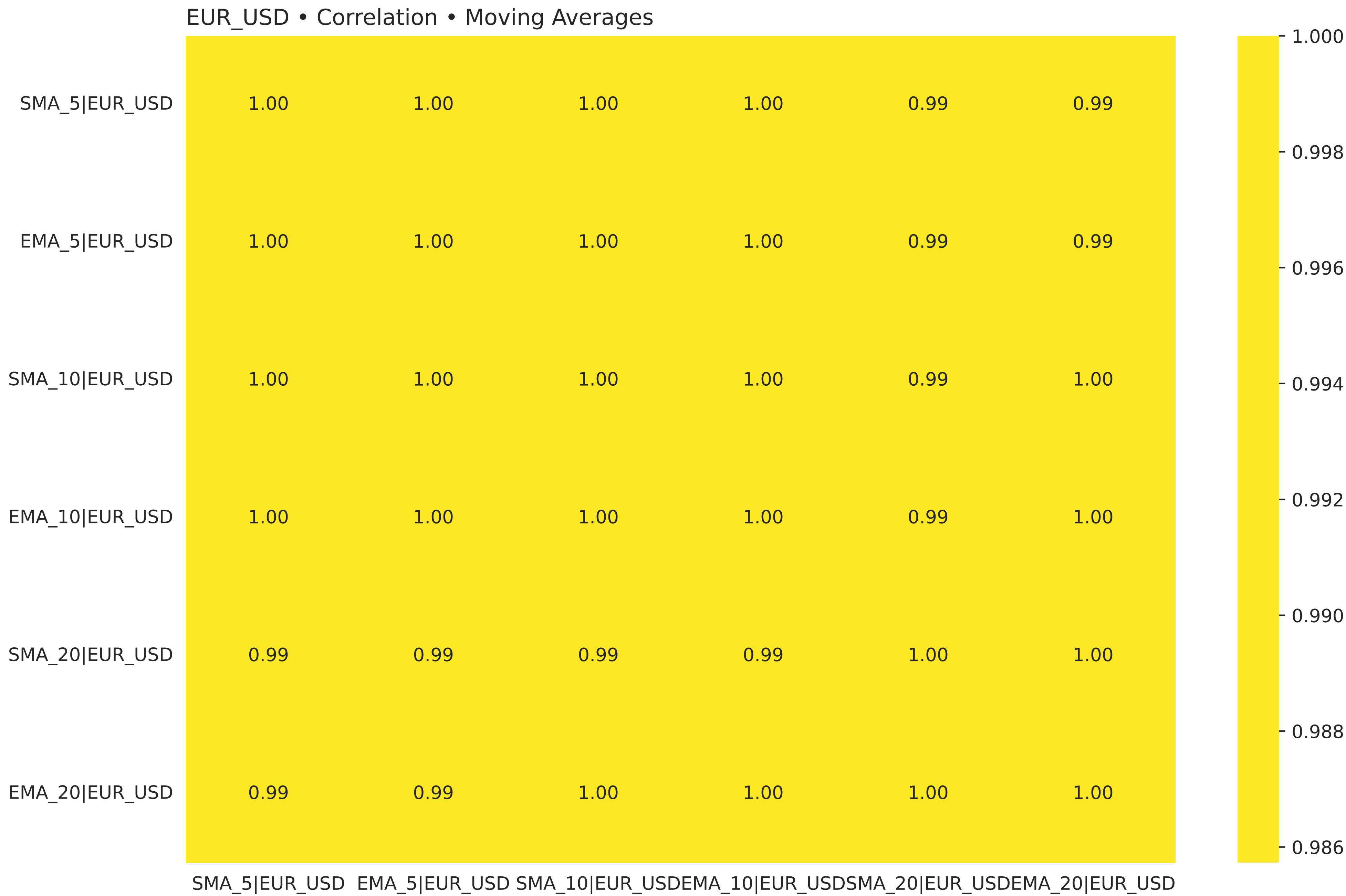
EUR_USD • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.00050
0.00025
0.00000
−0.00025
−0.00050
−0.00075
−0.00100
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

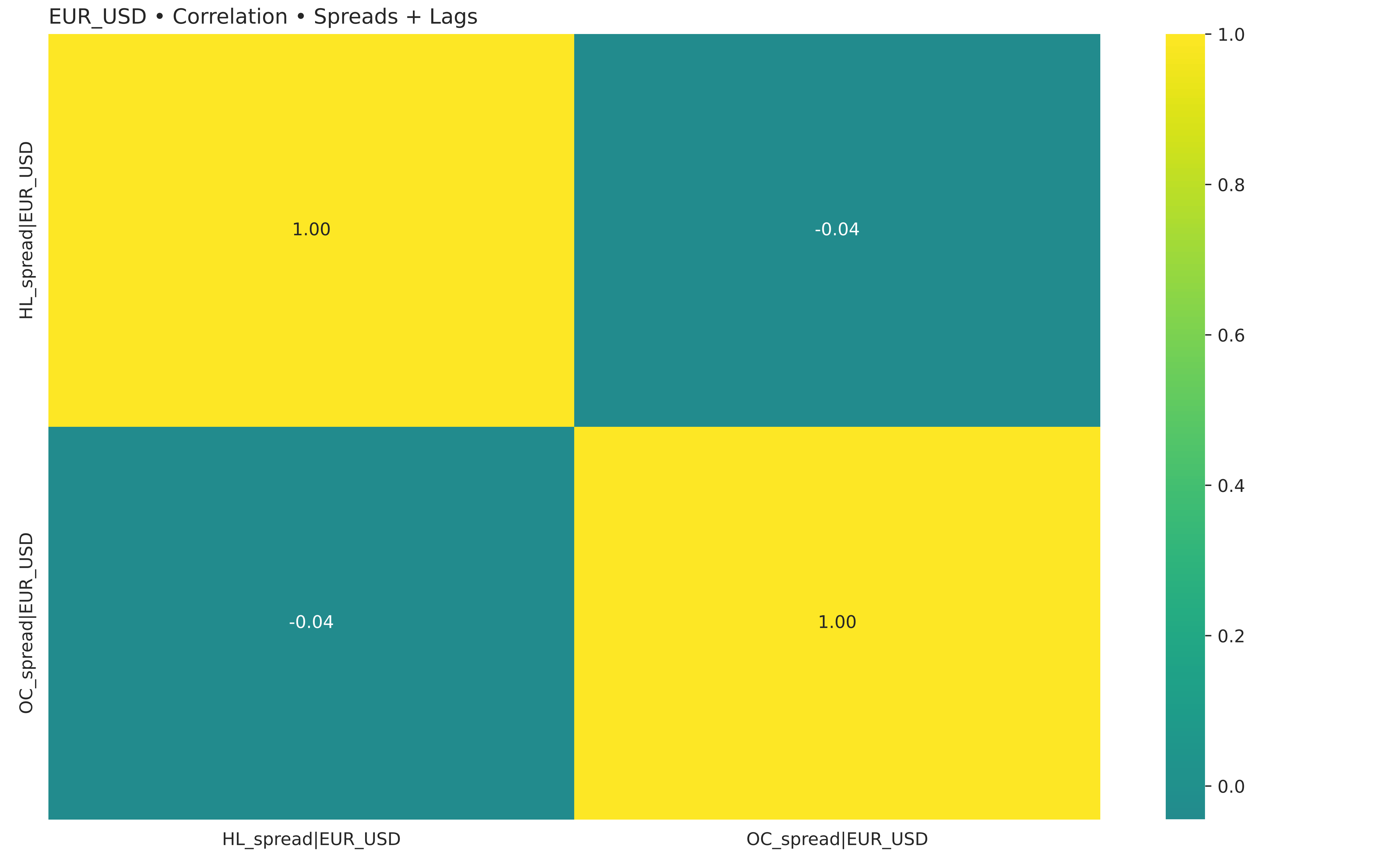
EUR_USD • Spreads

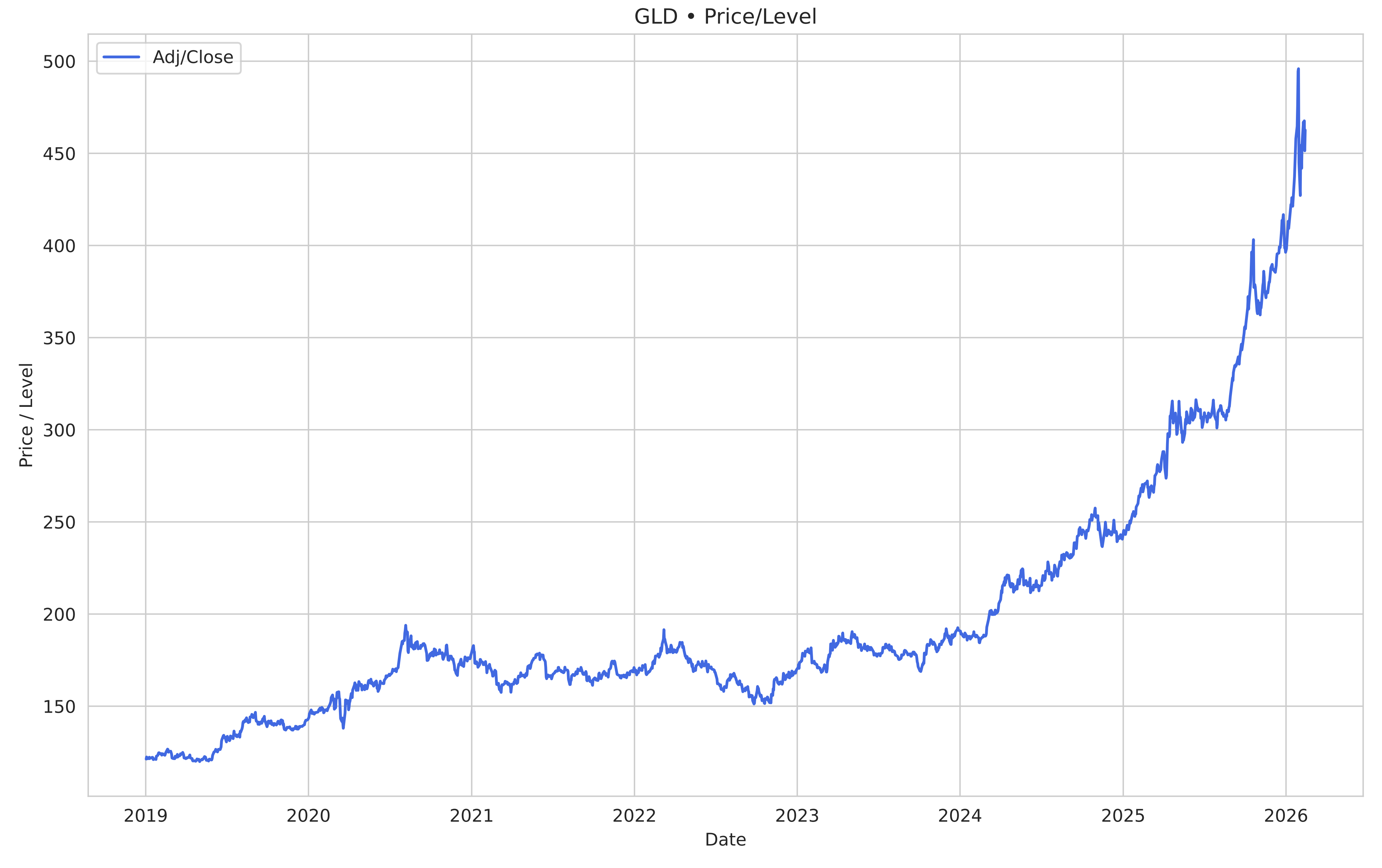


EUR_USD • Moving Averages / EMAs

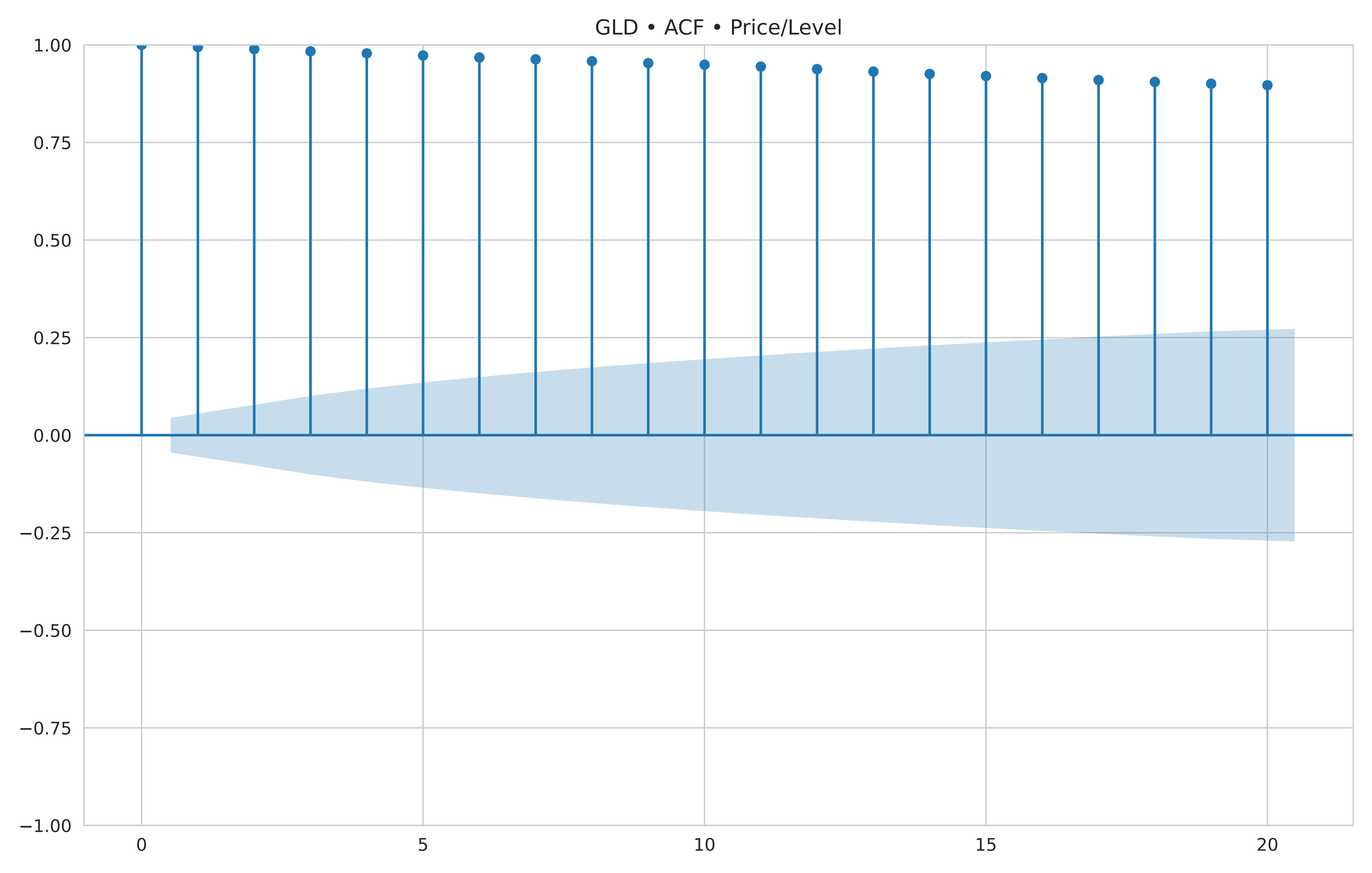



EUR_USD • Correlation • Moving Averages
SMA_5|EUR_USD
EMA_5|EUR_USD
SMA_10|EUR_USD
EMA_10|EUR_USD
SMA_20|EUR_USD
EMA_20|EUR_USD
1.00 1.00 1.00 1.00 0.99 0.99
1.00 1.00 1.00 1.00 0.99 0.99
1.00 1.00 1.00 1.00 0.99 1.00
1.00 1.00 1.00 1.00 0.99 1.00
0.99 0.99 0.99 0.99 1.00 1.00
0.99 0.99 1.00 1.00 1.00 1.00
1.000
0.998
0.996
0.994
0.992
0.990
0.988
0.986

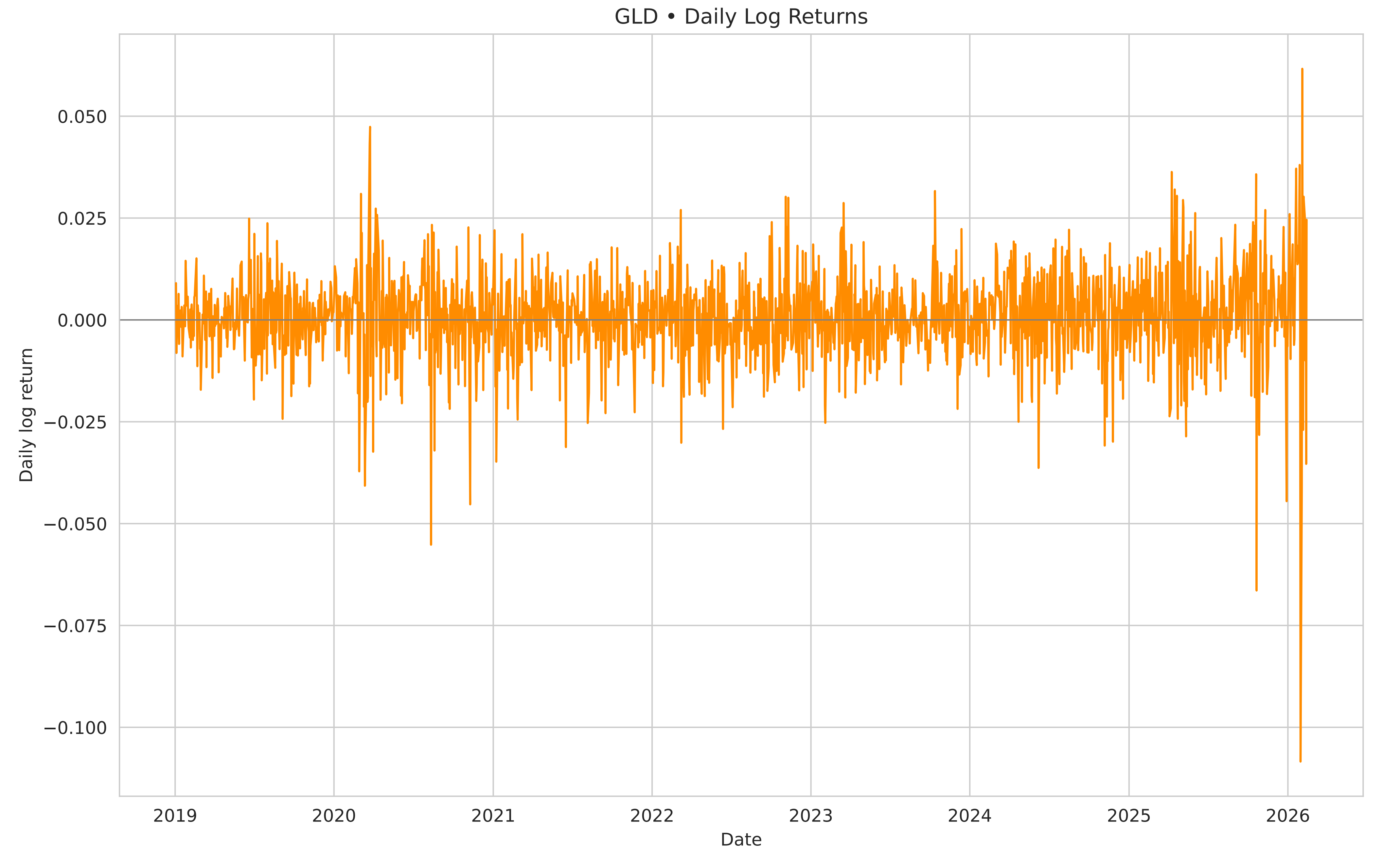

EUR_USD • Correlation • Spreads + Lags
HL_spread|EUR_USD
OC_spread|EUR_USD
1.00
-0.04
-0.04
1.00
HL_spread|EUR_USD
OC_spread|EUR_USD
1.0
0.8
0.6
0.4
0.2
0.0

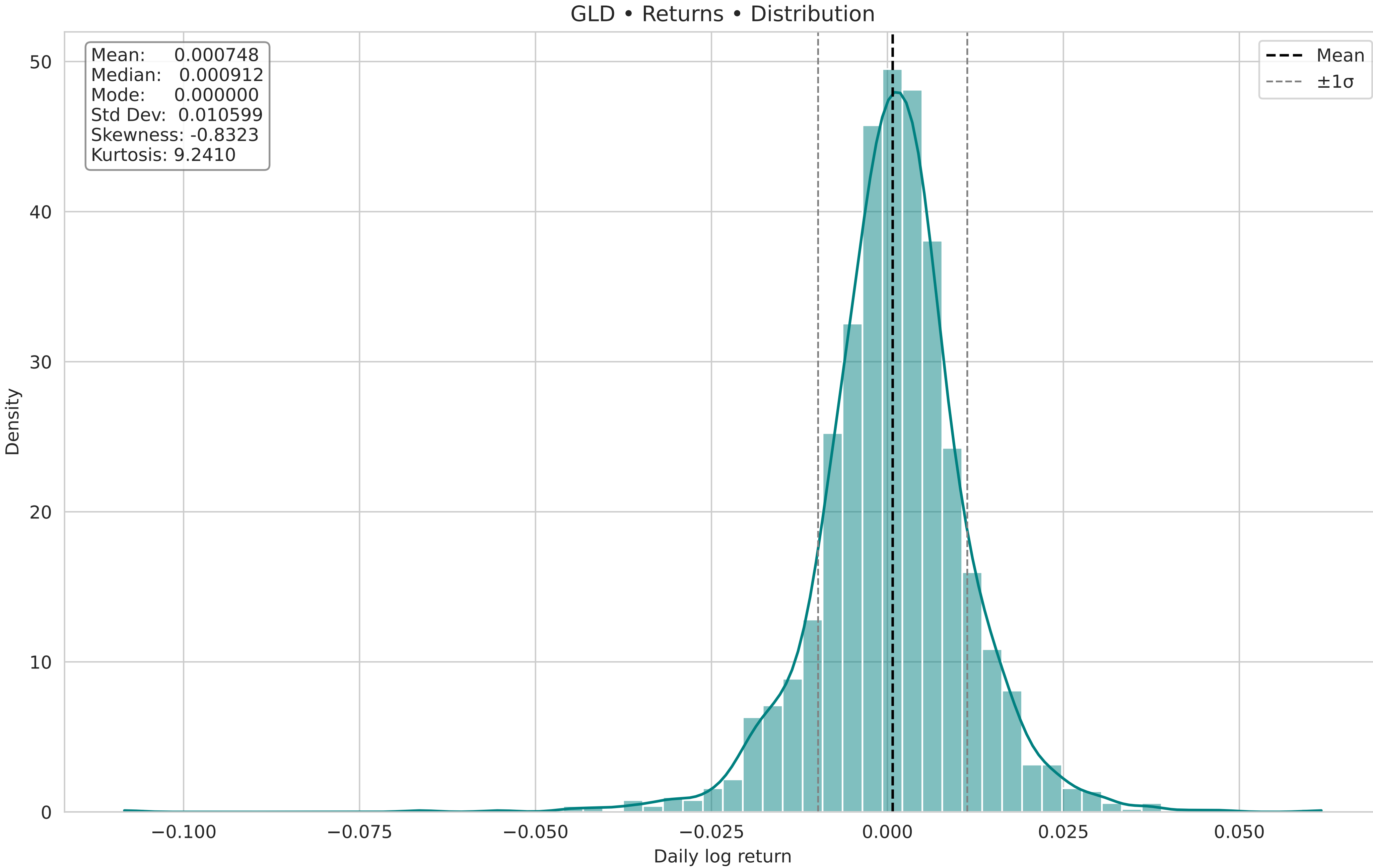


GLD • Price/Level
Adj/Close
Price / Level
500
450
400
350
300
250
200
150
2019
2020
2021
2022
2023
2024
2025
2026
Date

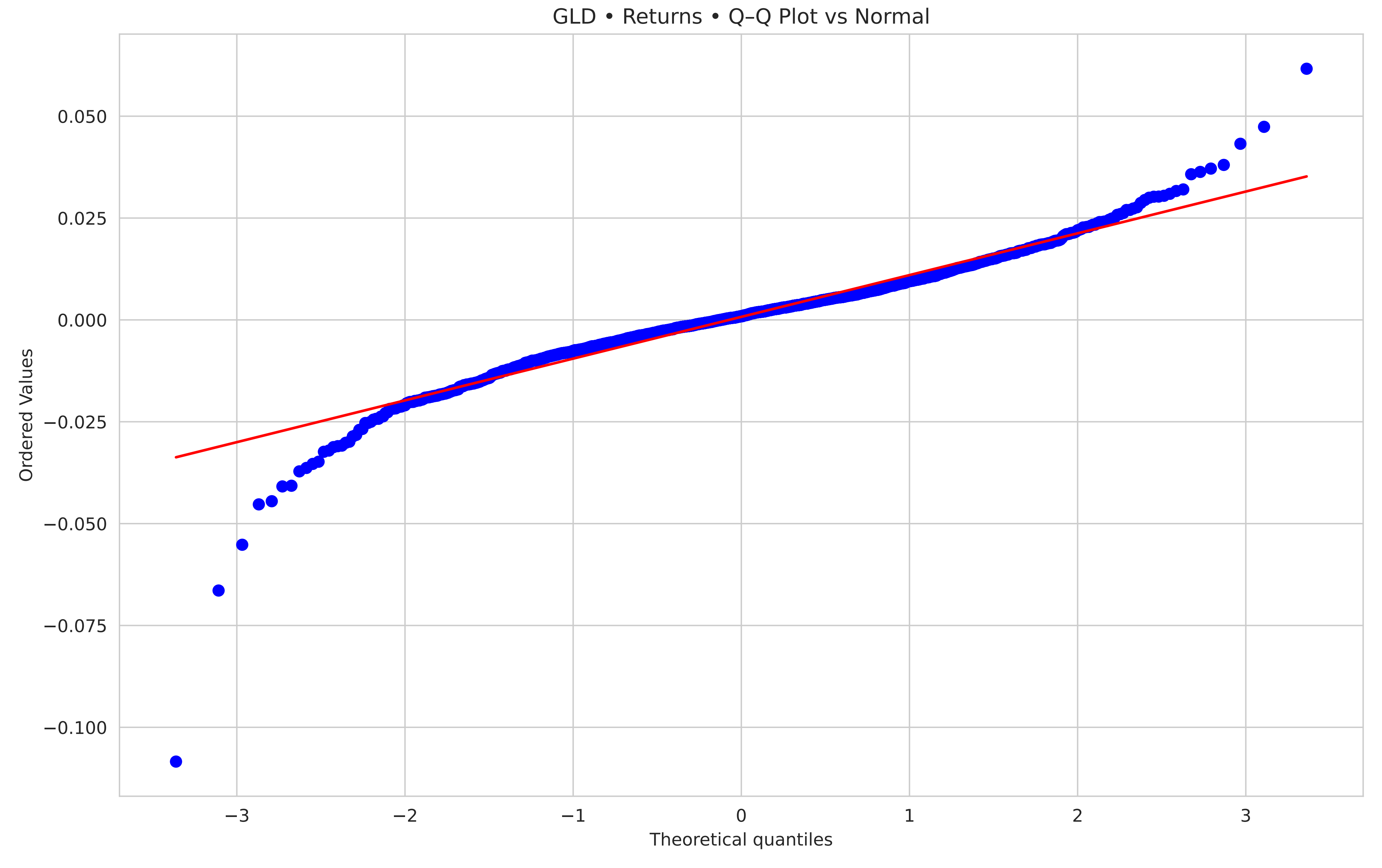

GLD • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

GLD • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
500
450
400
350
300
250
200
150
Price / Level
2019
2020
2021
2022
2023
2024
2025
2026
Date

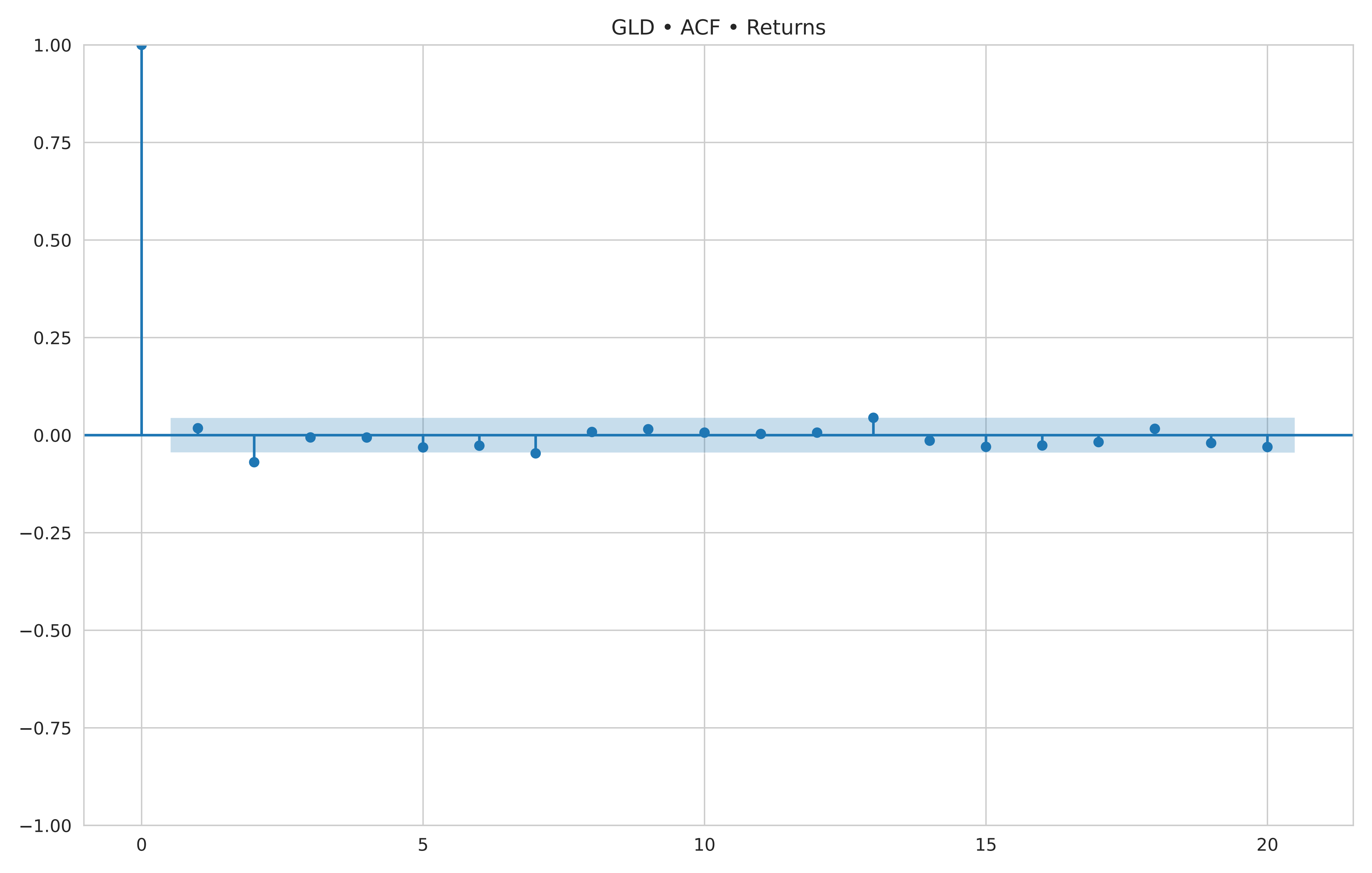

GLD • Daily Log Returns
Daily log return
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
2019
2020
2021
2022
2023
2024
2025
2026
Date

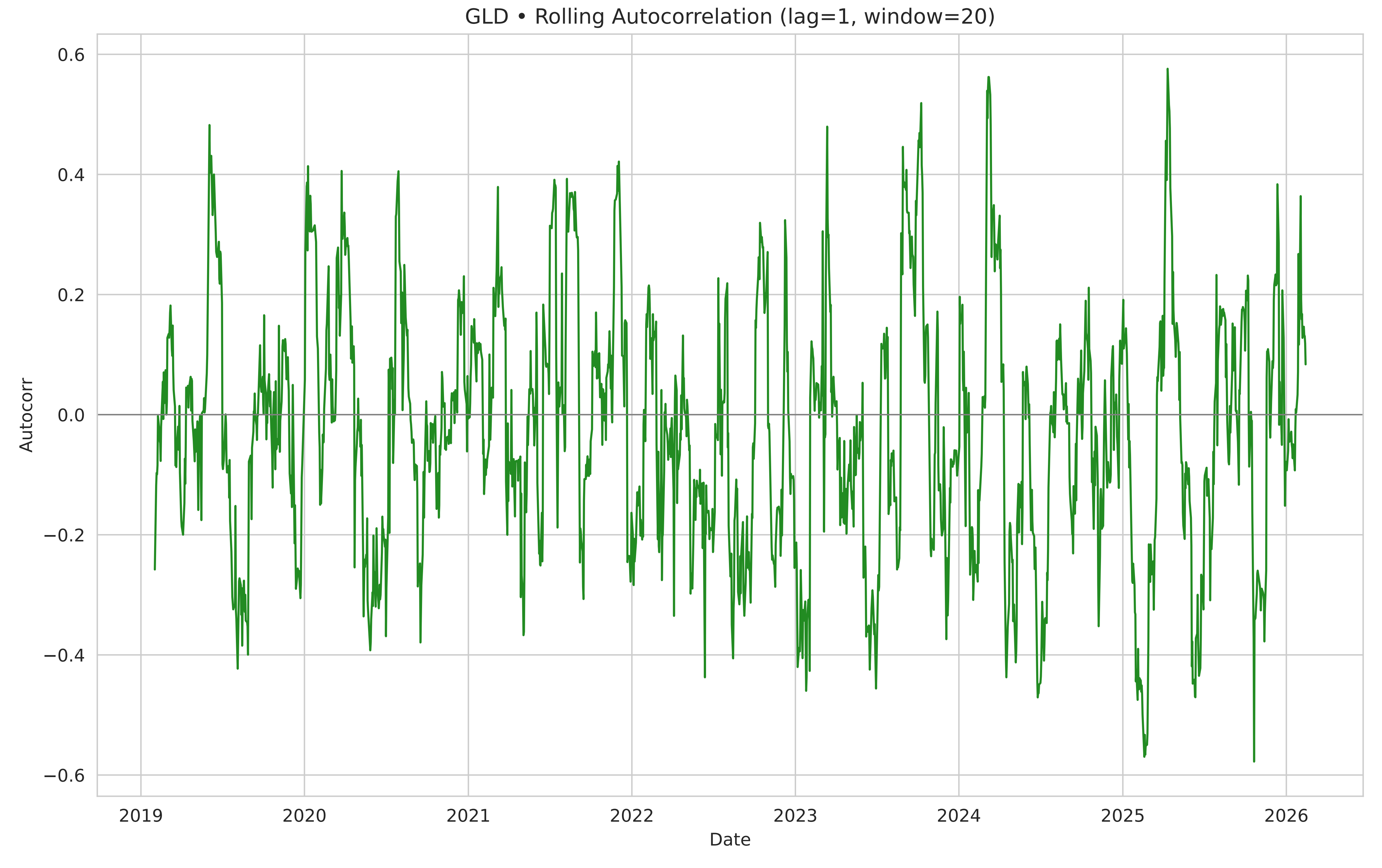


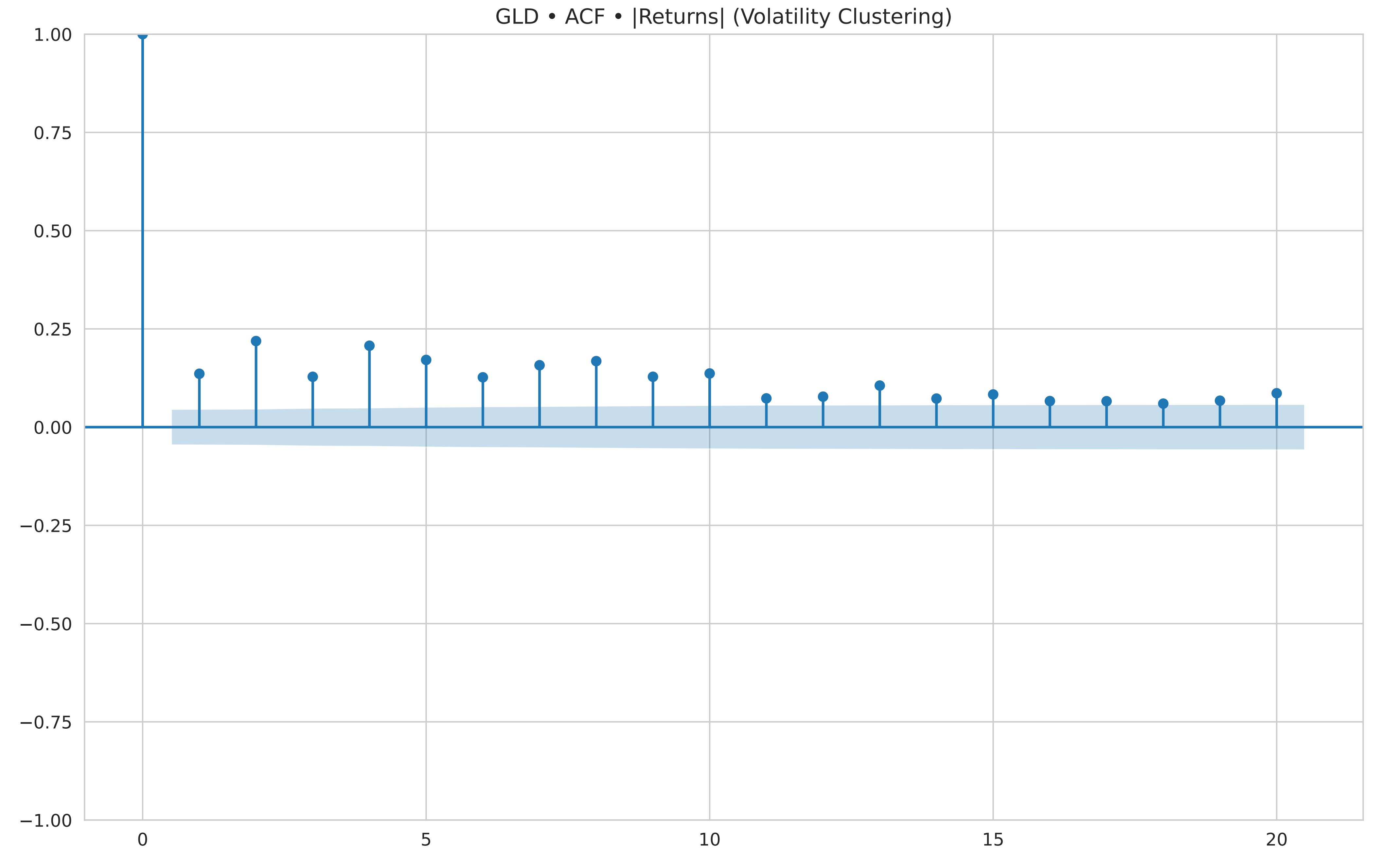
GLD • Returns • Distribution
Mean: 0.000748
Median: 0.000912
Mode: 0.000000
Std Dev: 0.010599
Skewness: -0.8323
Kurtosis: 9.2410
Mean
±1σ
Density
Daily log return
0
10
20
30
40
50
−0.100
−0.075
−0.050
−0.025
0.000
0.025
0.050

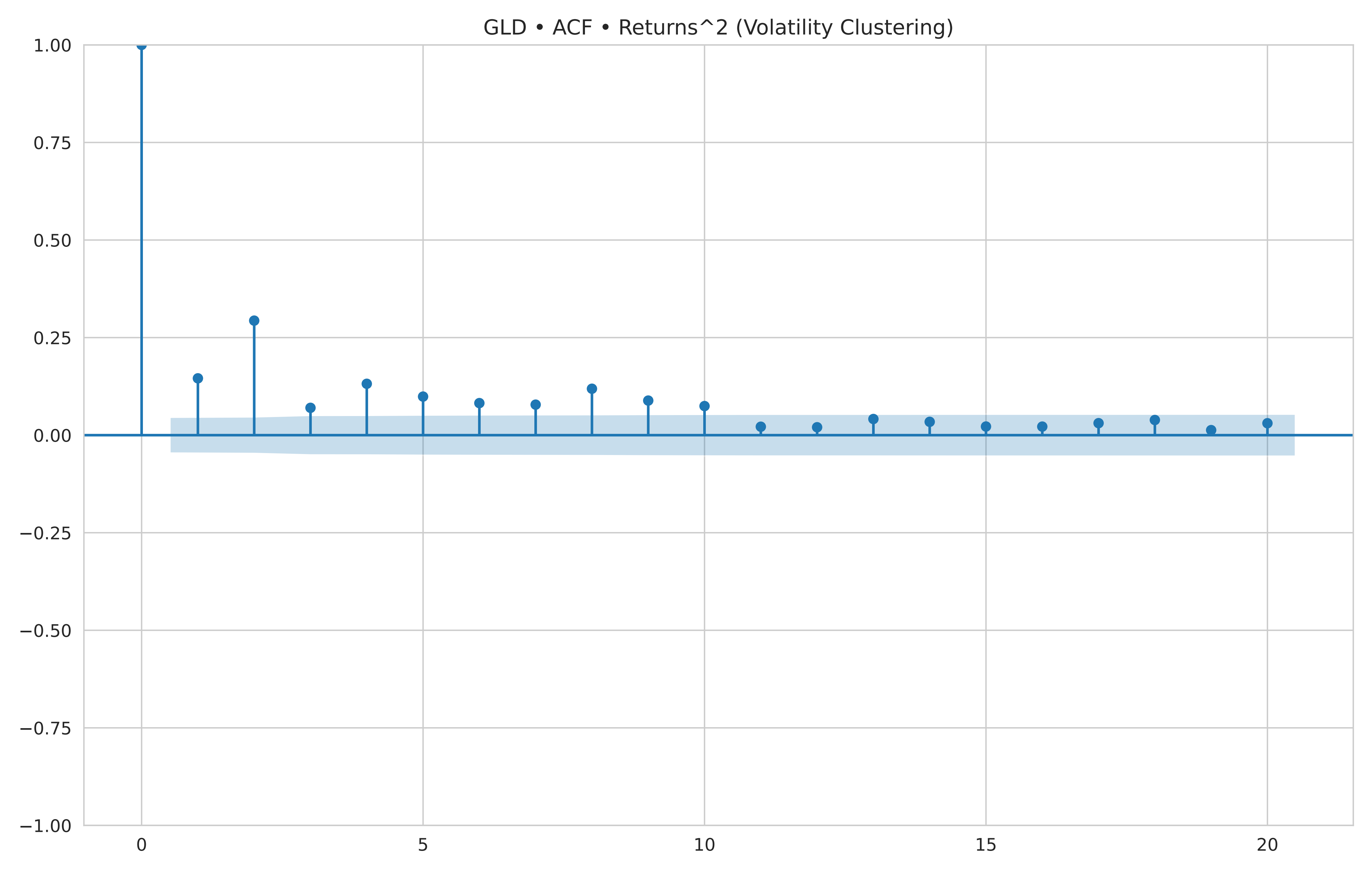


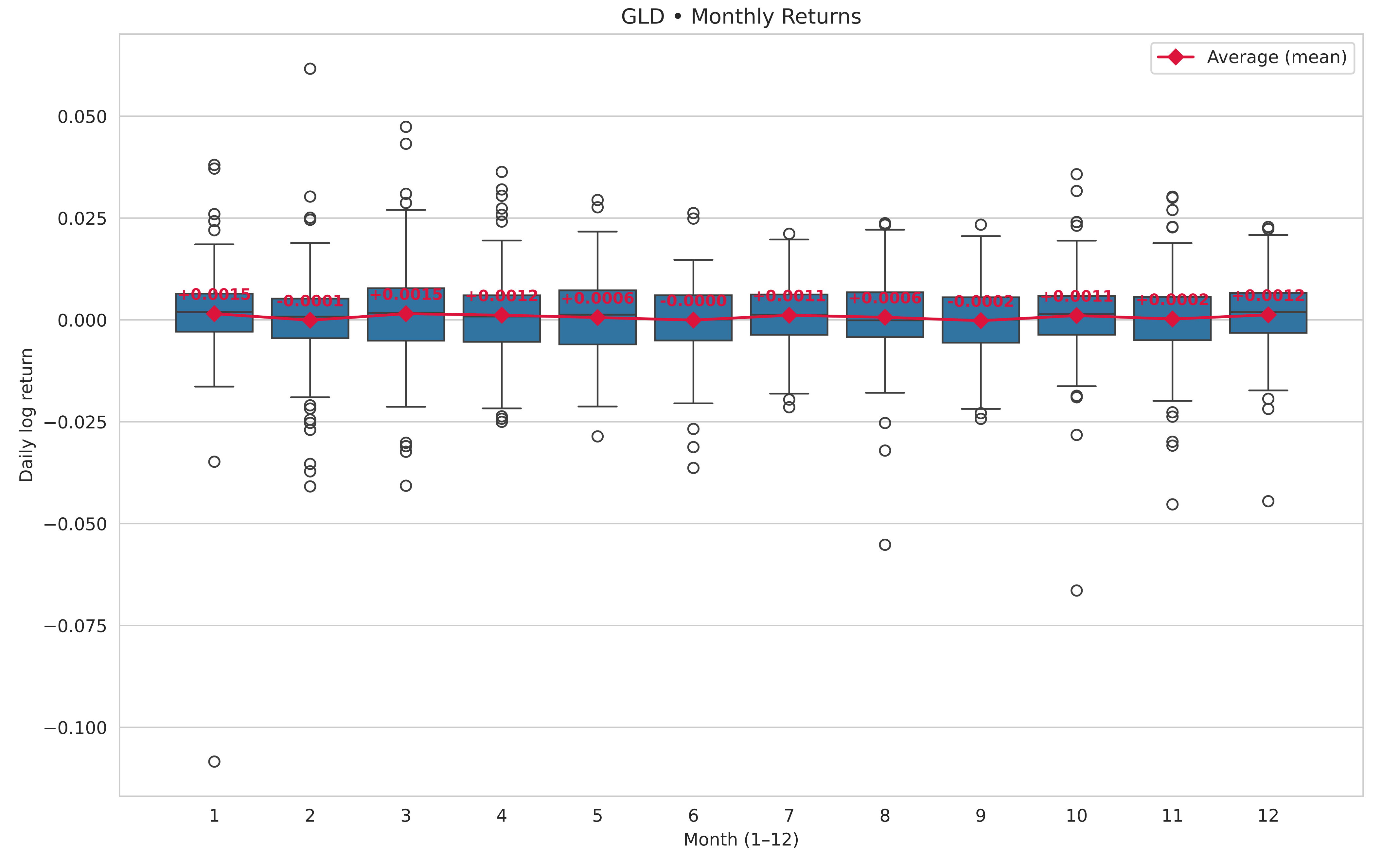
GLD • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−3
−2
−1
0
1
2
3


GLD • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

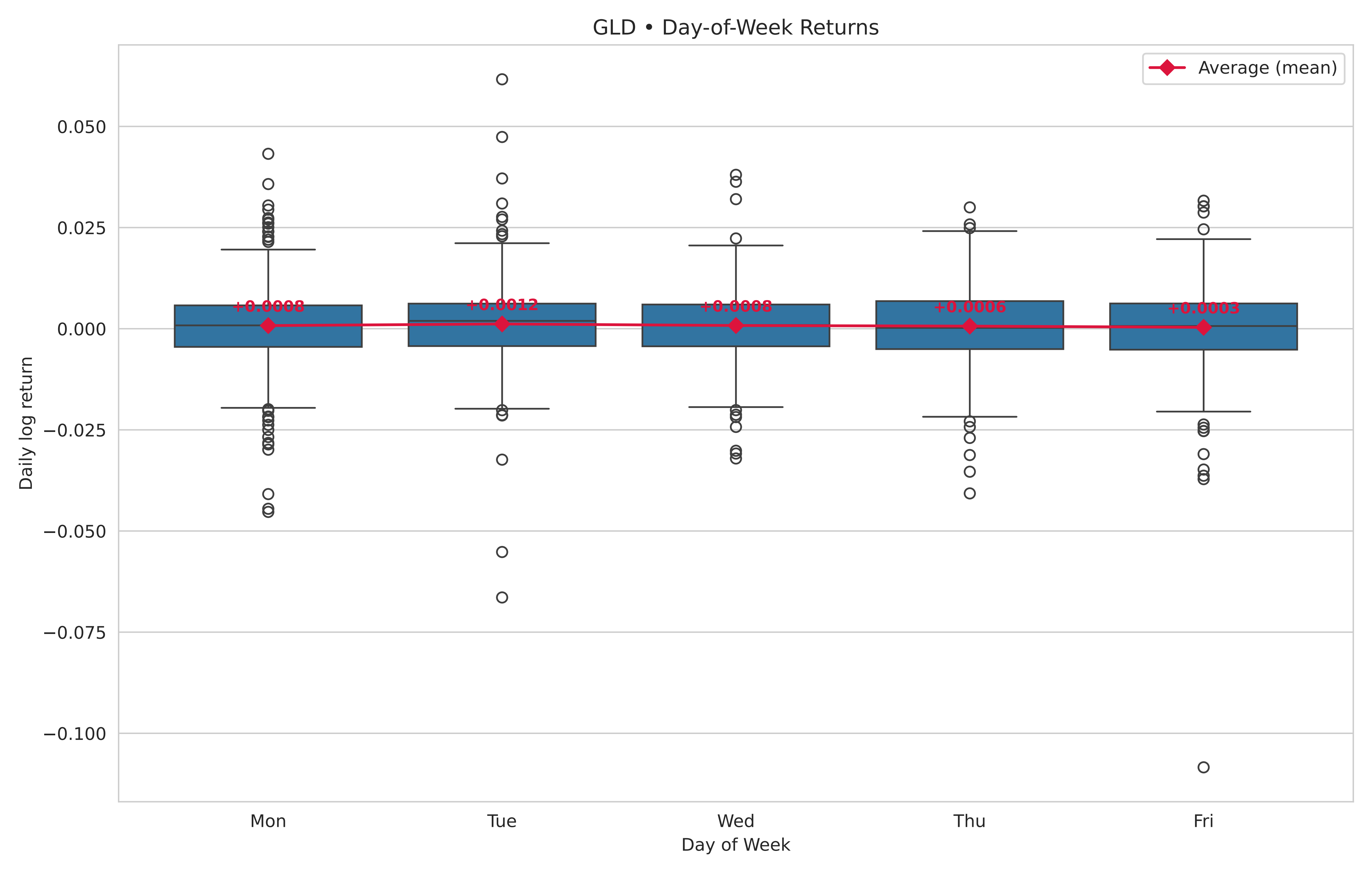

GLD • Rolling Autocorrelation (lag=1, window=20)
Autocorr
Date
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026


GLD • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

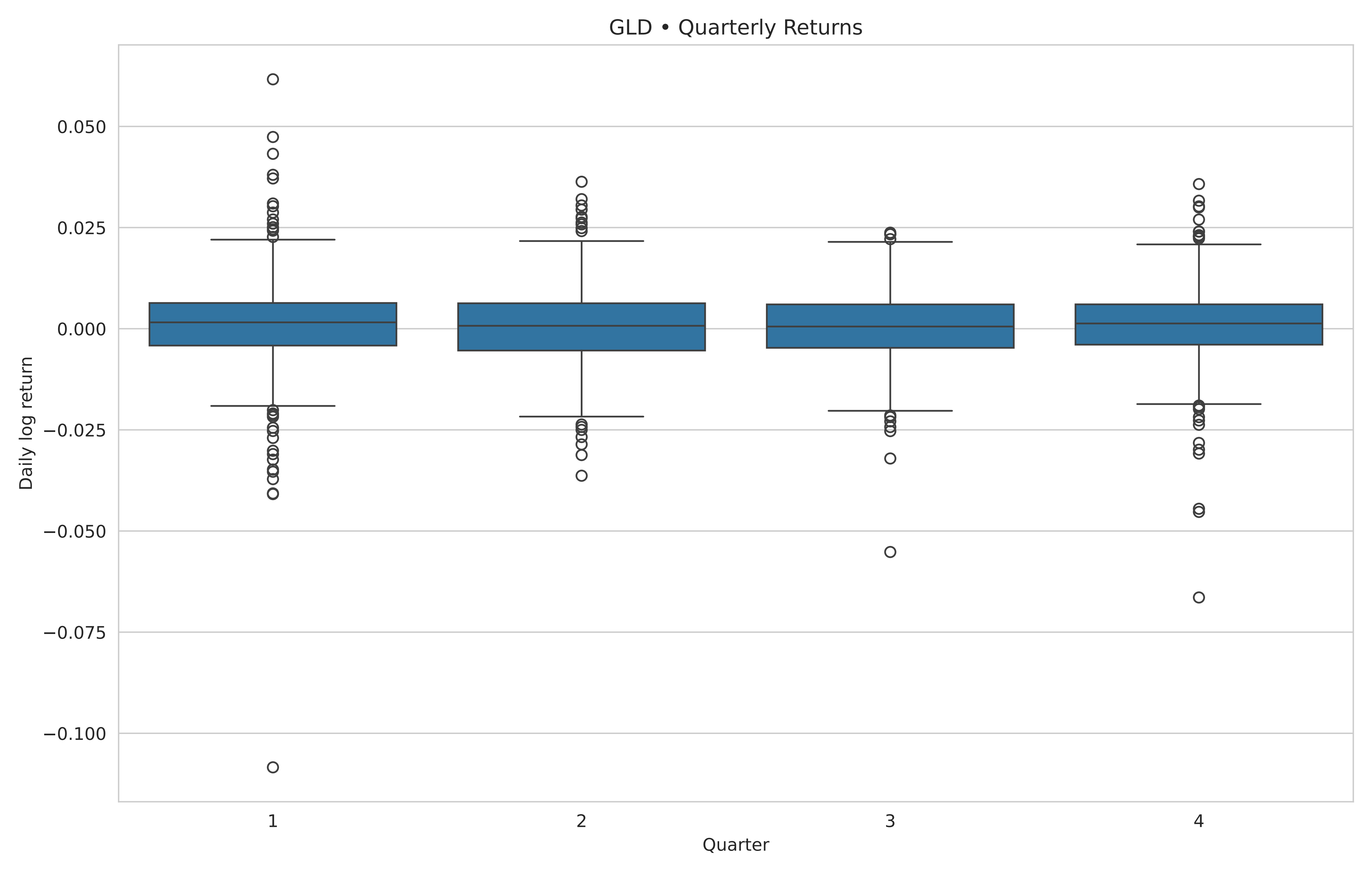

GLD • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



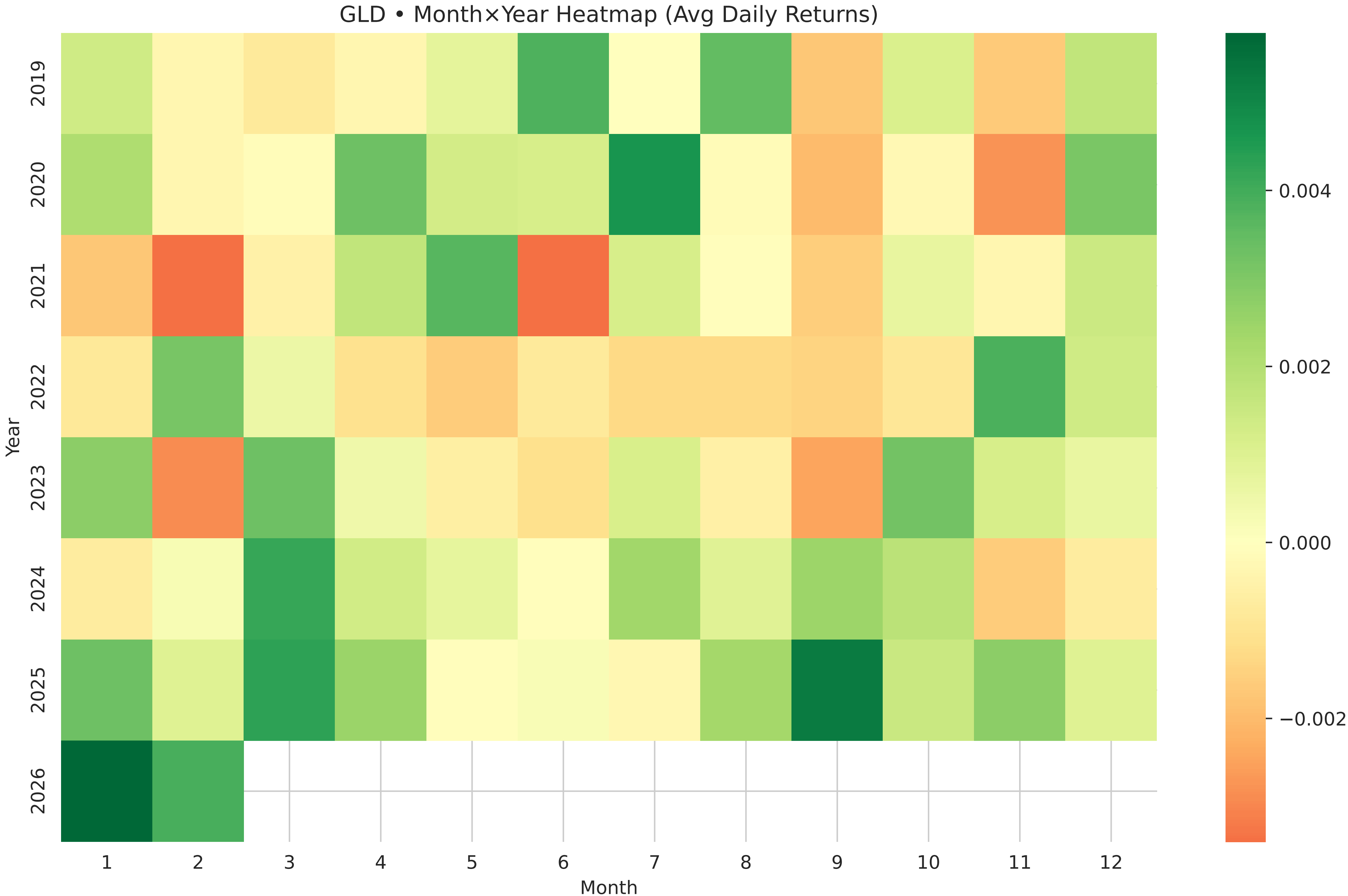
GLD • Monthly Returns
Average (mean)
+0.0015
-0.0001
+0.0015
+0.0012
+0.0006
-0.0000
+0.0011
+0.0006
-0.0002
+0.0011
+0.0002
+0.0012
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
Daily log return
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)



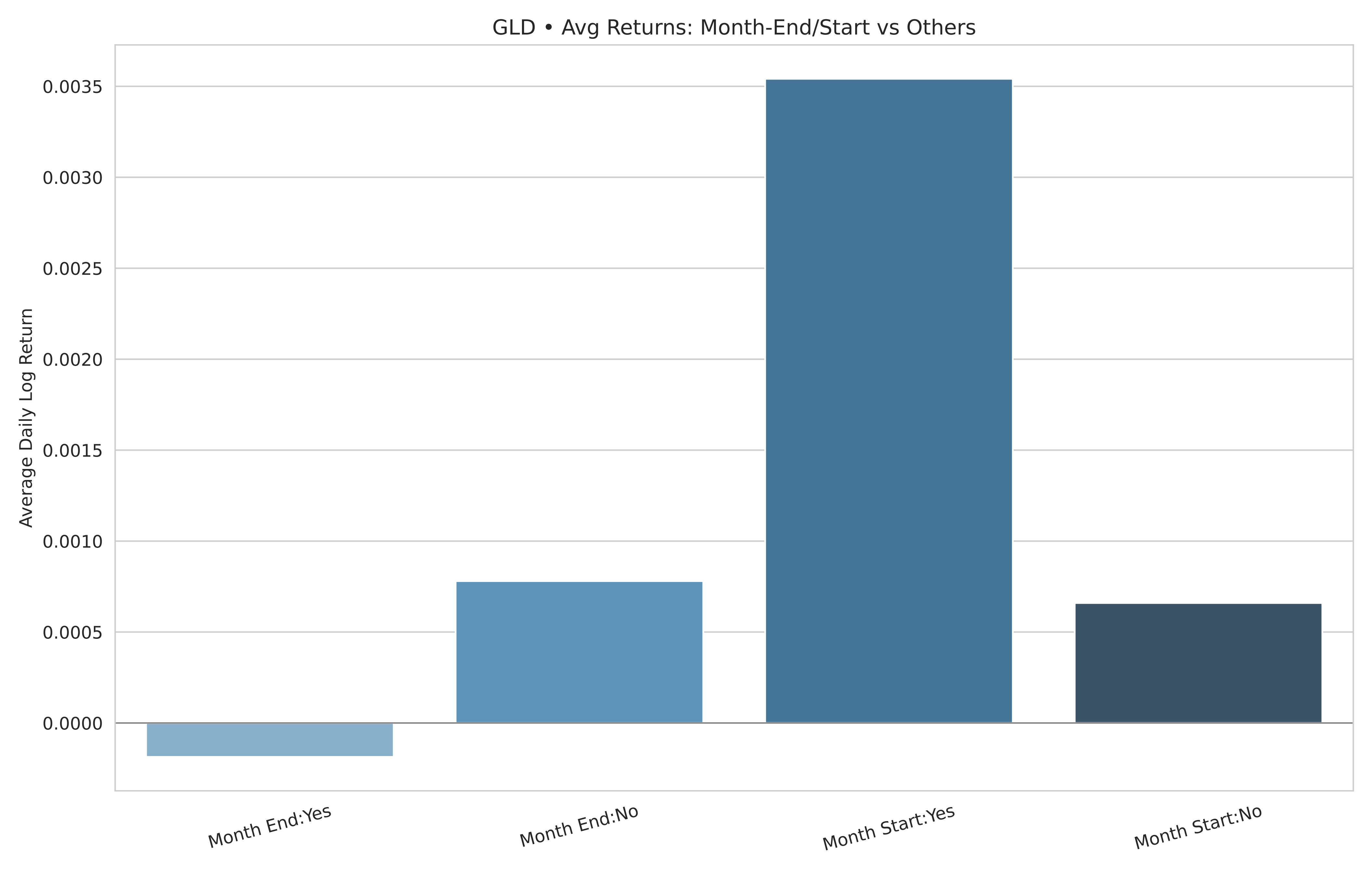
GLD • Day-of-Week Returns
Average (mean)
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
Daily log return
+0.0008
+0.0012
+0.0008
+0.0006
+0.0003
Mon
Tue
Wed
Thu
Fri
Day of Week



GLD • Quarterly Returns
Daily log return
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
1
2
3
4
Quarter

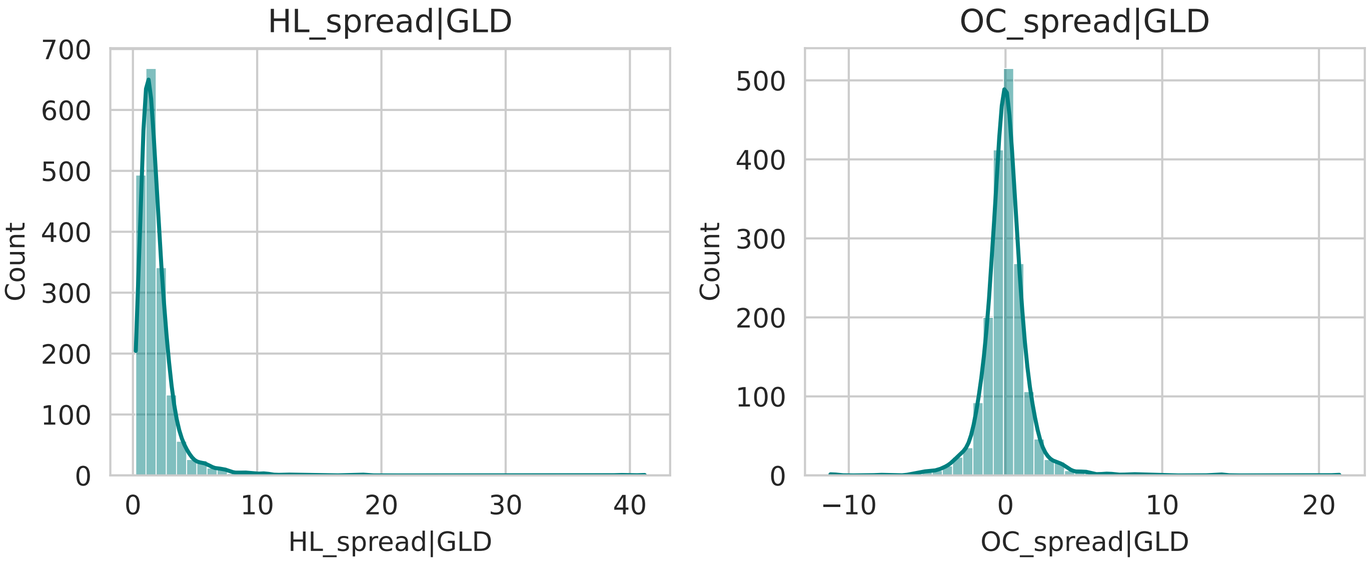


GLD • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.004
0.002
0.000
−0.002



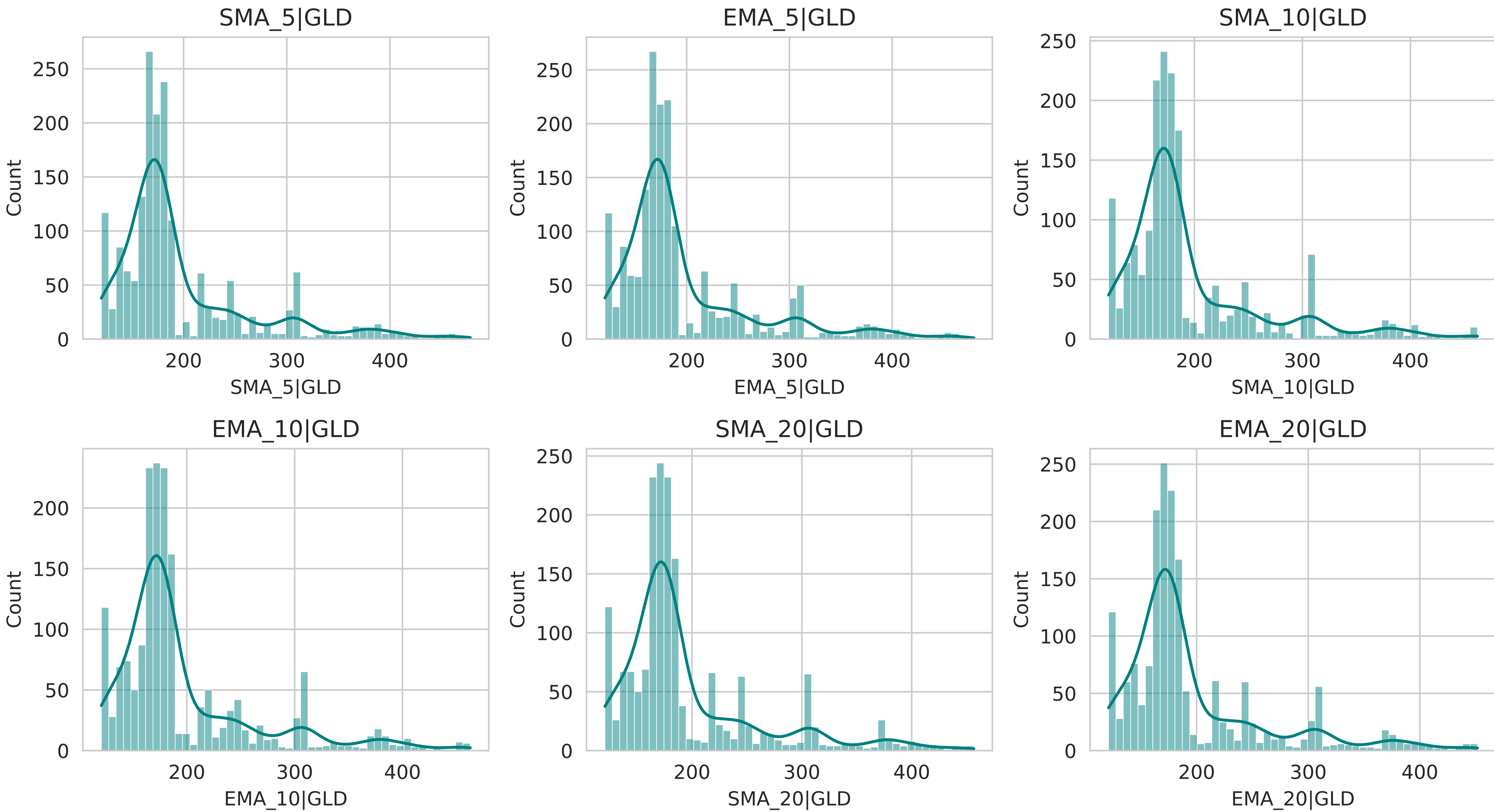
GLD • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.0035
0.0030
0.0025
0.0020
0.0015
0.0010
0.0005
0.0000
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

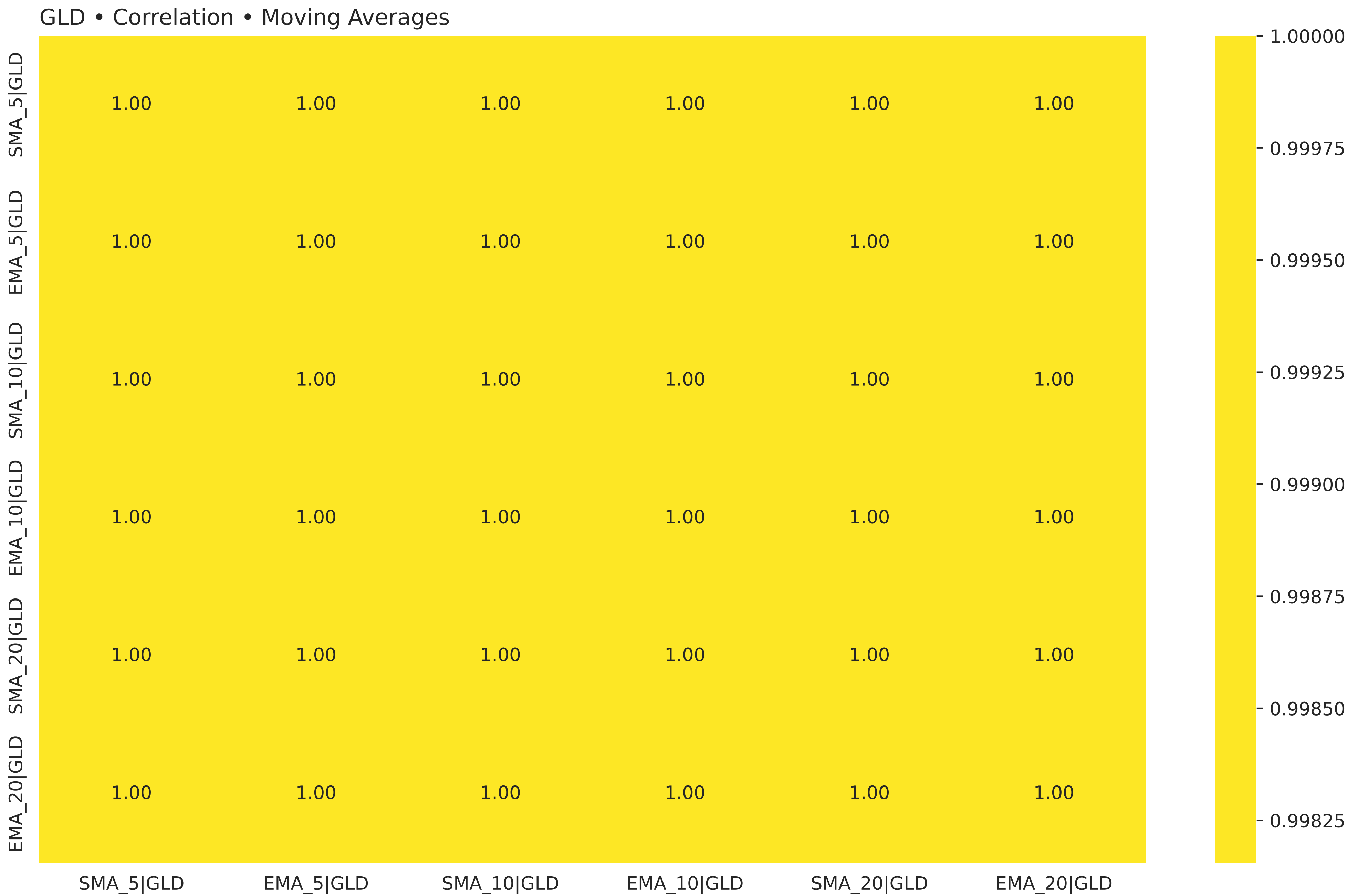
GLD • Spreads



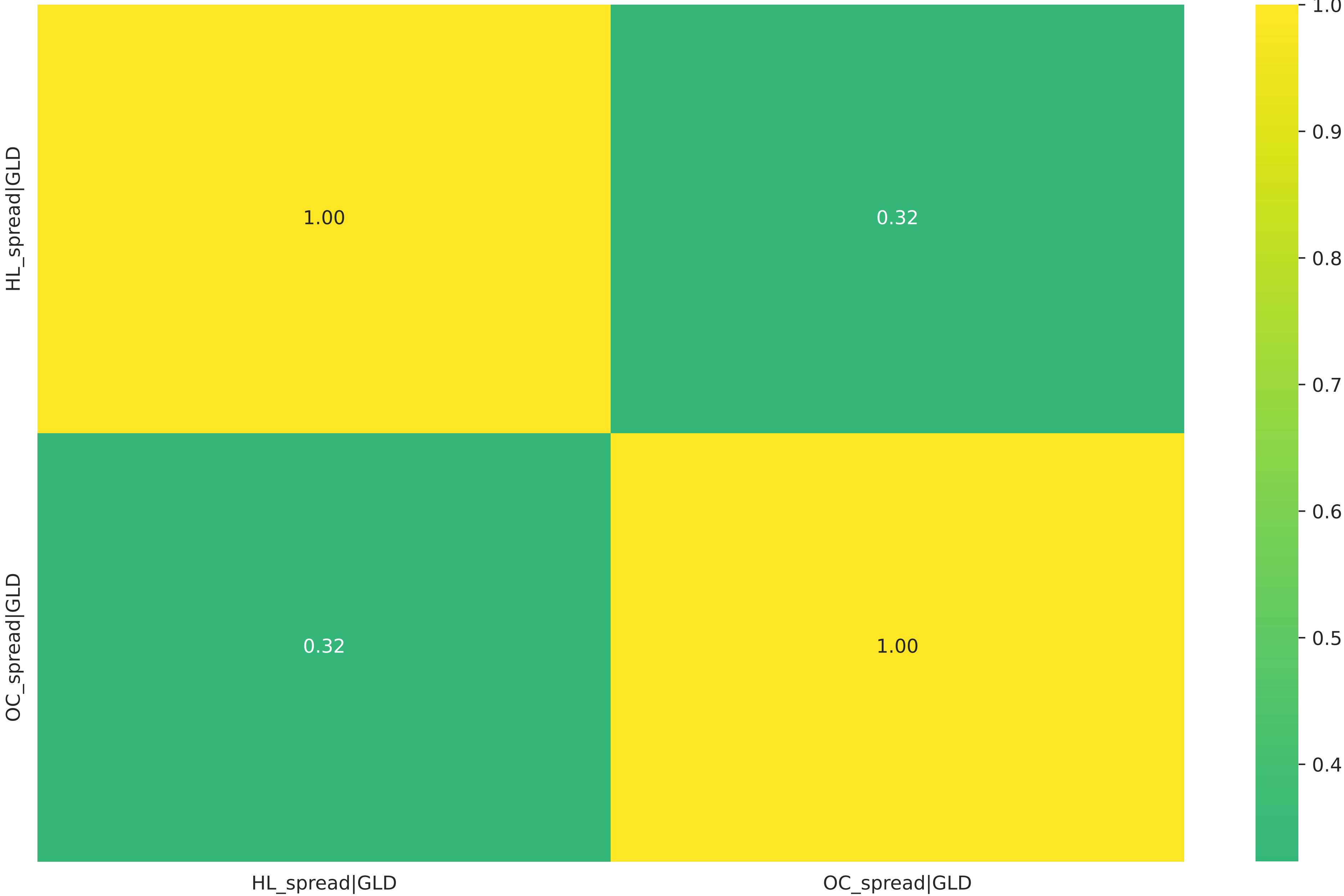
HL_spread|GLD
Count
700
600
500
400
300
200
100
0
0
10
20
30
40
HL_spread|GLD
OC_spread|GLD
Count
500
400
300
200
100
0
−10
0
10
20
OC_spread|GLD

GLD • Moving Averages / EMAs

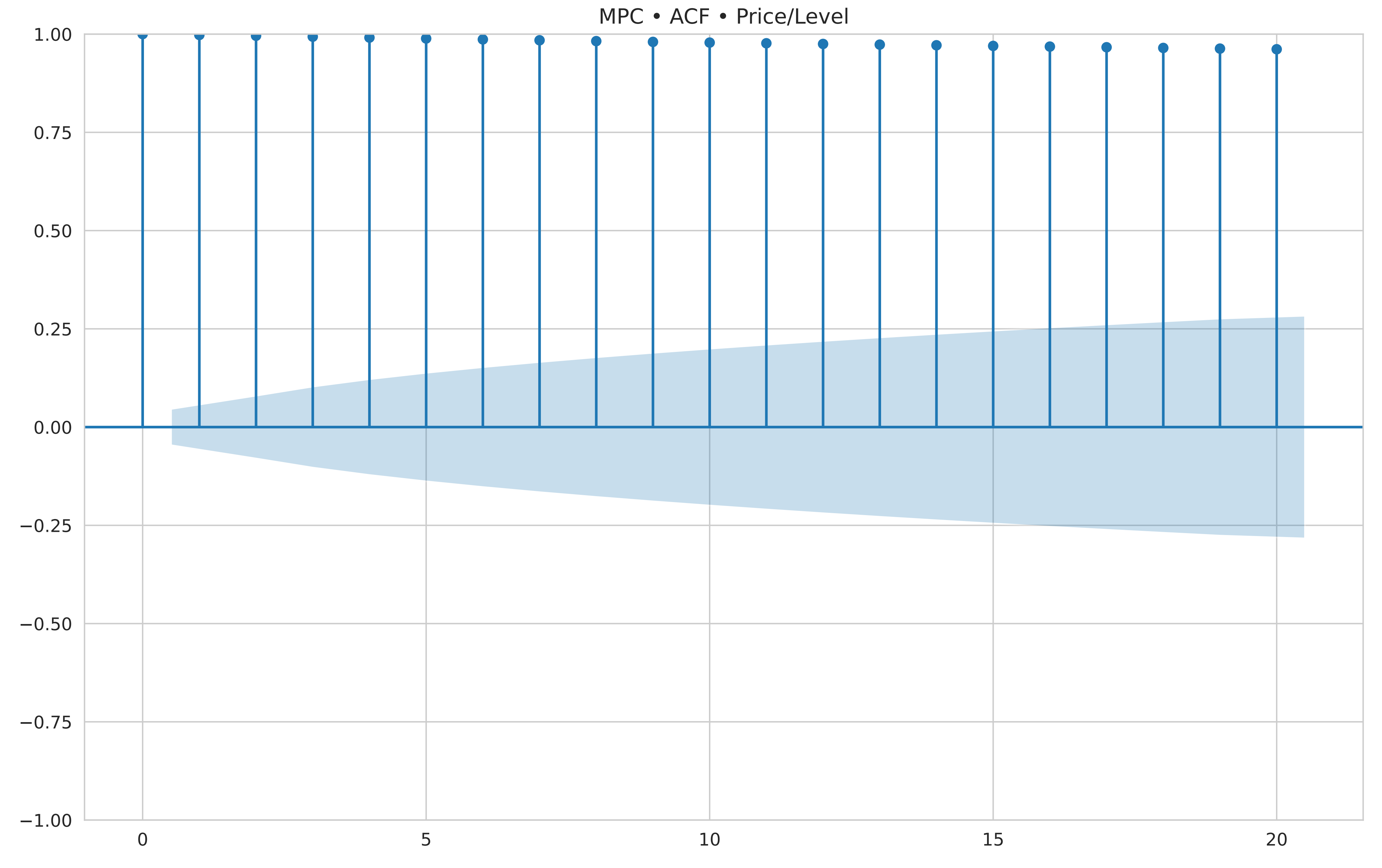



GLD • Correlation • Moving Averages
SMA_5|GLD
EMA_5|GLD
SMA_10|GLD
EMA_10|GLD
SMA_20|GLD
EMA_20|GLD
1.00
1.00000
0.99975
0.99950
0.99925
0.99900
0.99875
0.99850
0.99825

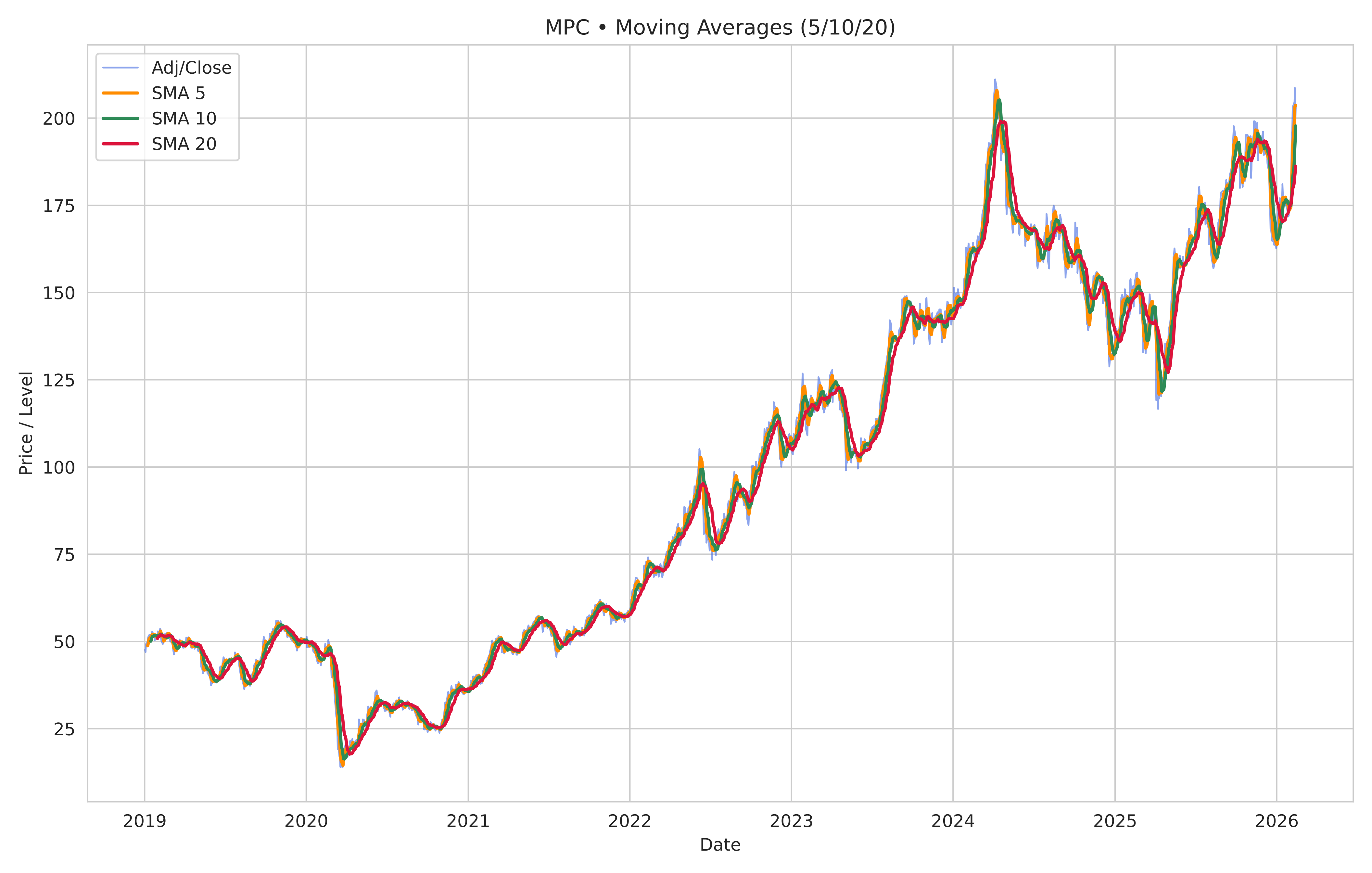
GLD • Correlation • Spreads + Lags

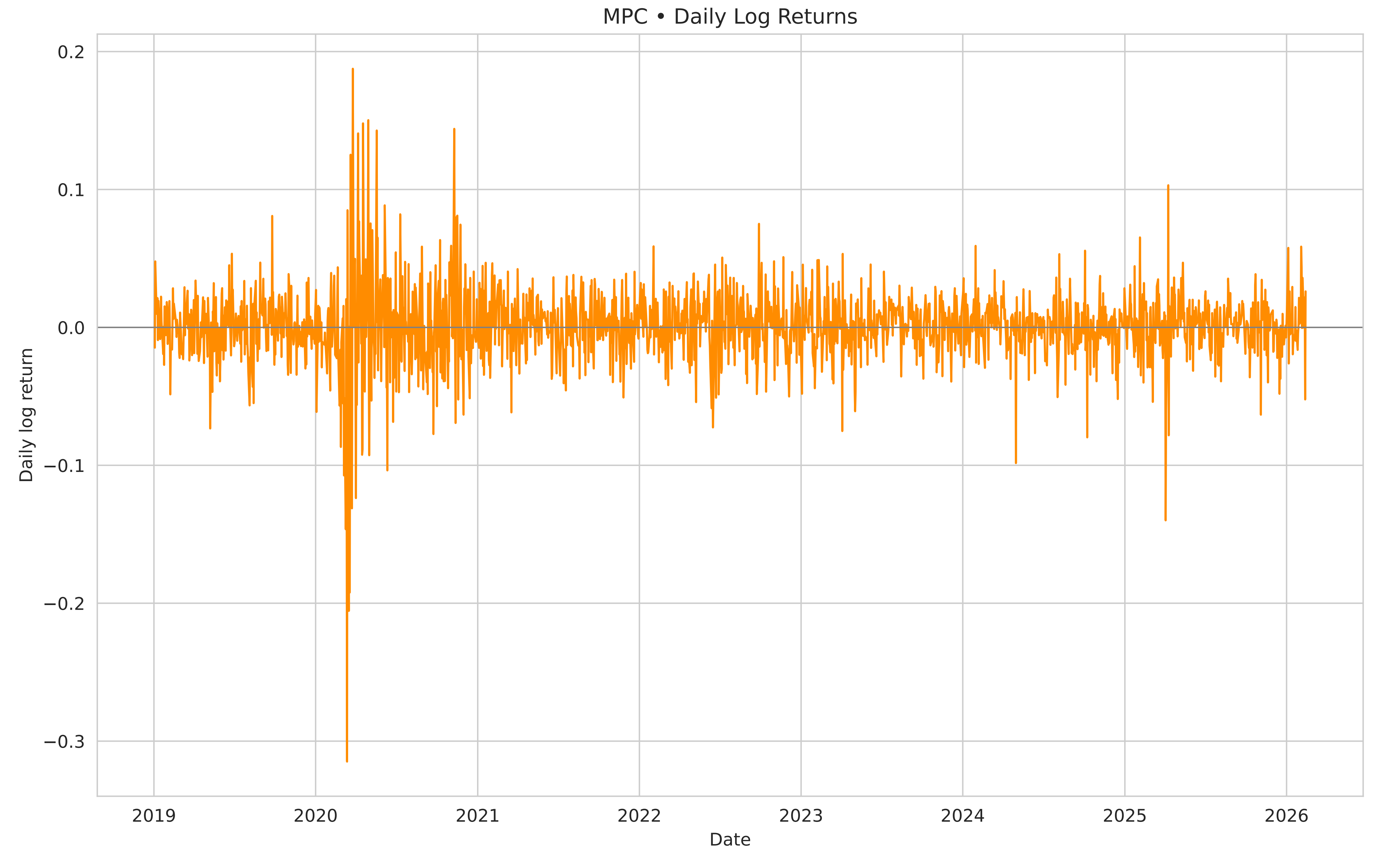


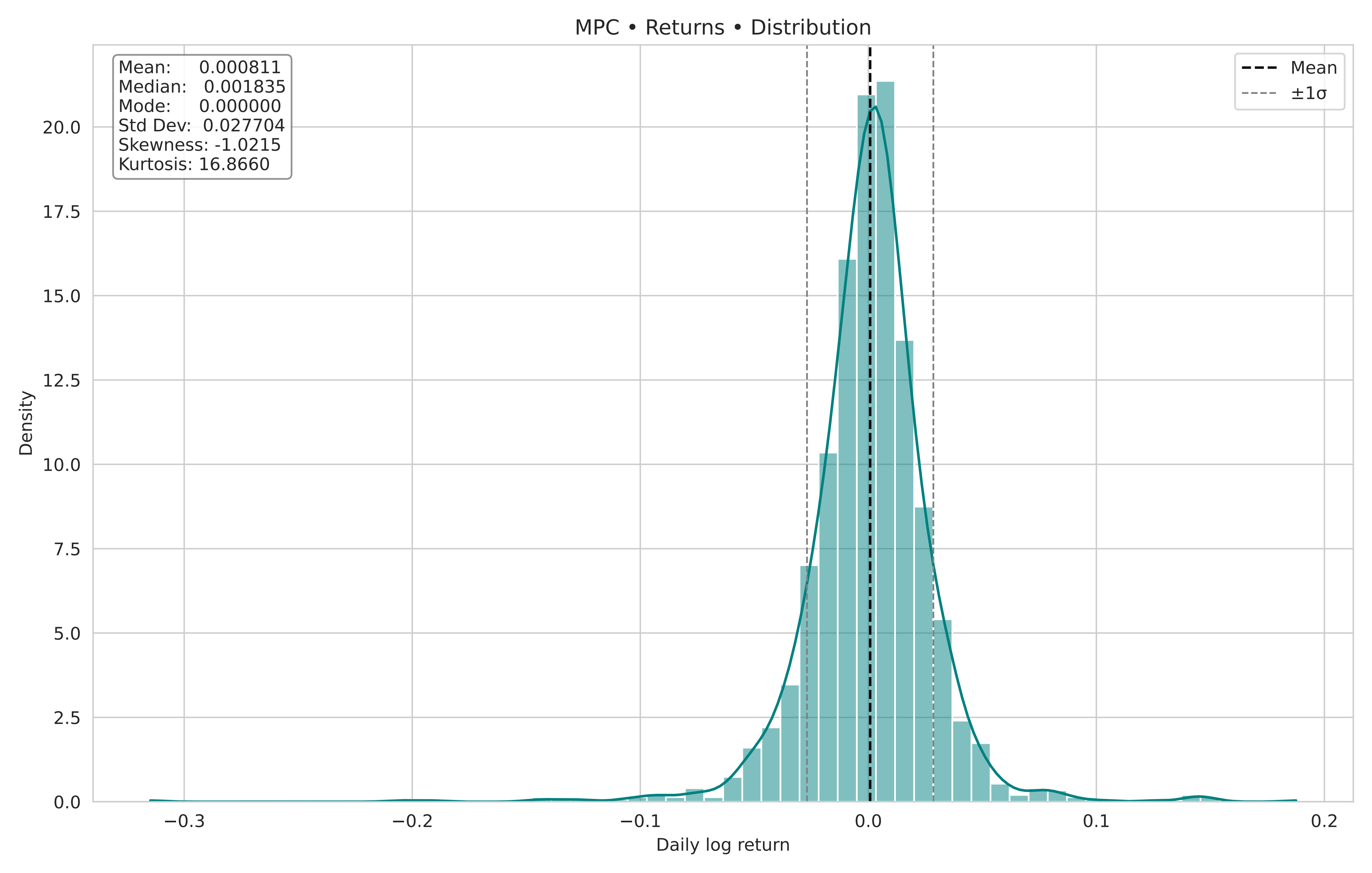
MPC • Price/Level
Adj/Close
Price / Level
Date
200
175
150
125
100
75
50
25
2019
2020
2021
2022
2023
2024
2025
2026



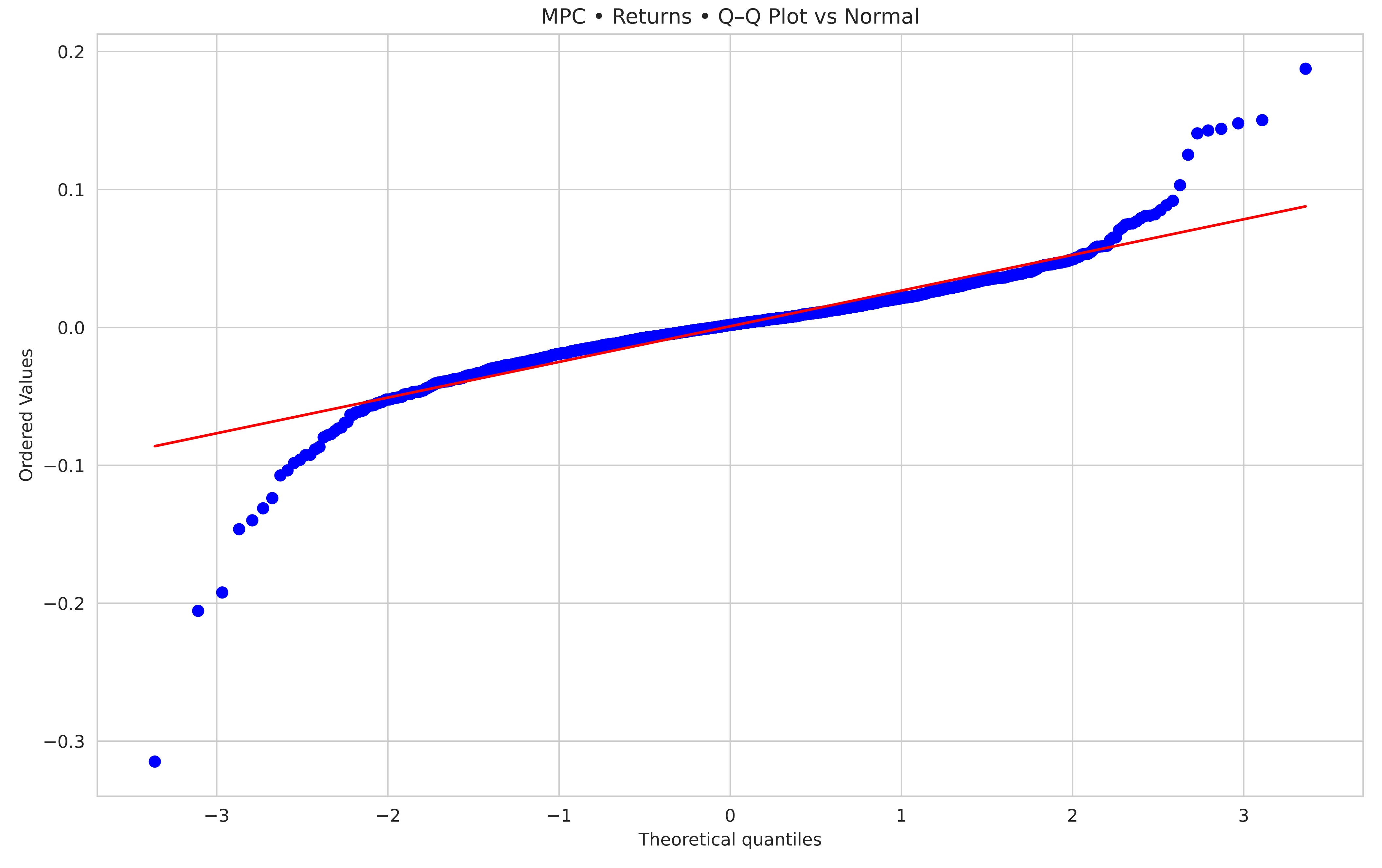
MPC • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20


MPC • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price / Level
200
175
150
125
100
75
50
25
2019
2020
2021
2022
2023
2024
2025
2026
Date

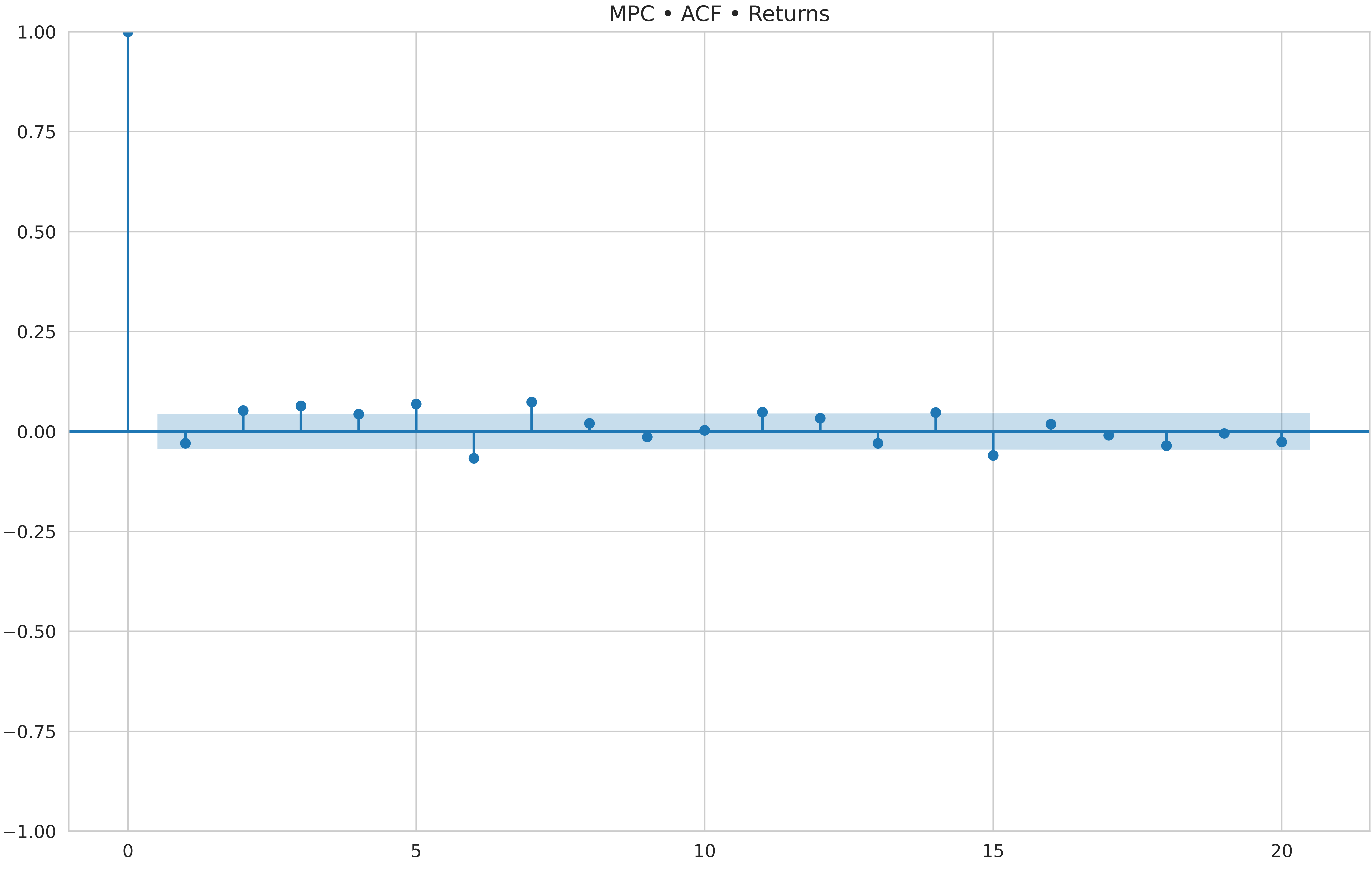

MPC • Daily Log Returns
Daily log return
Date
0.2
0.1
0.0
−0.1
−0.2
−0.3
2019
2020
2021
2022
2023
2024
2025
2026

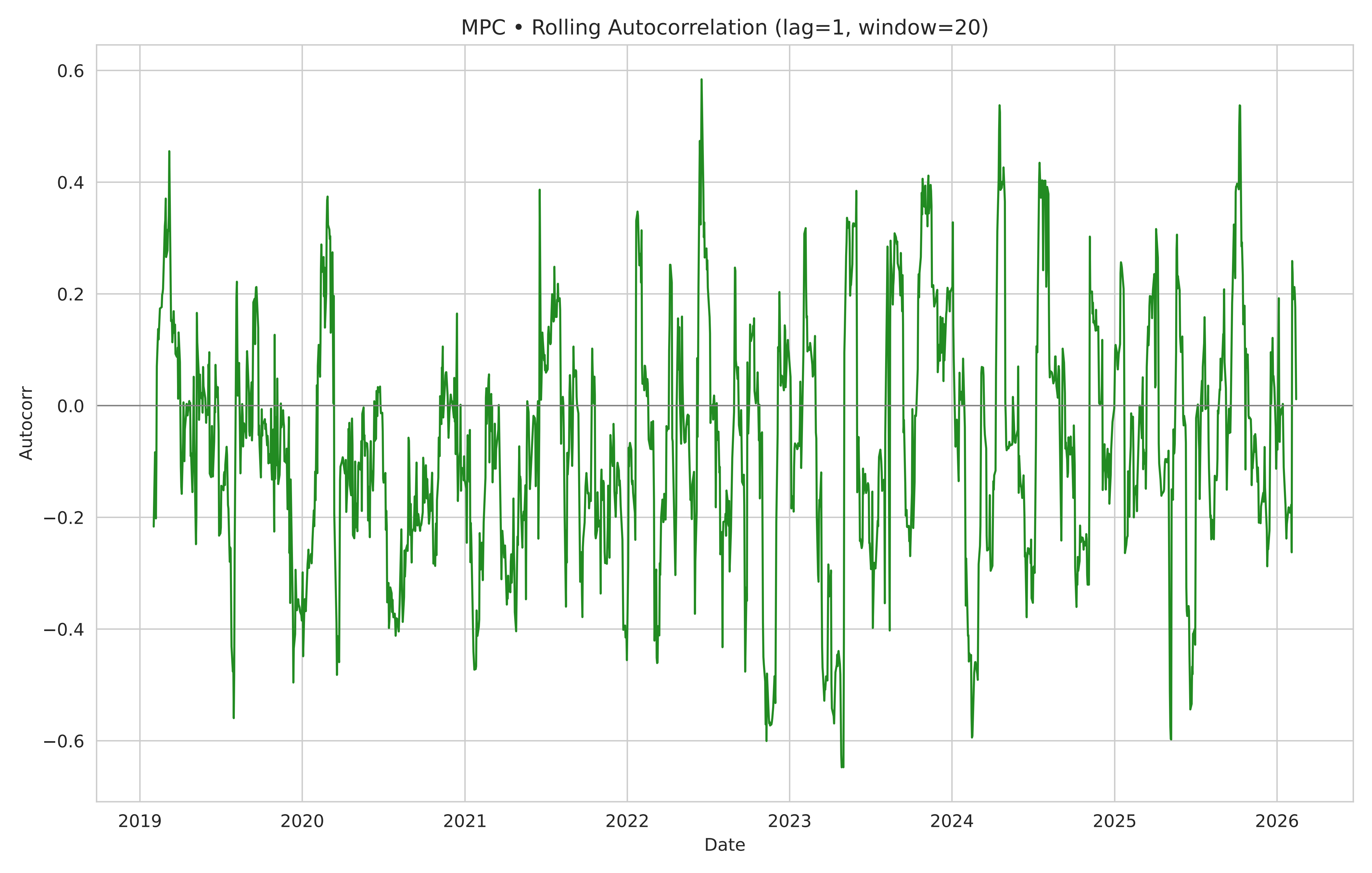


MPC • Returns • Distribution
Mean: 0.000811
Median: 0.001835
Mode: 0.000000
Std Dev: 0.027704
Skewness: -1.0215
Kurtosis: 16.8660
Mean
±1σ
Density
Daily log return
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
−0.3
−0.2
−0.1
0.0
0.1
0.2

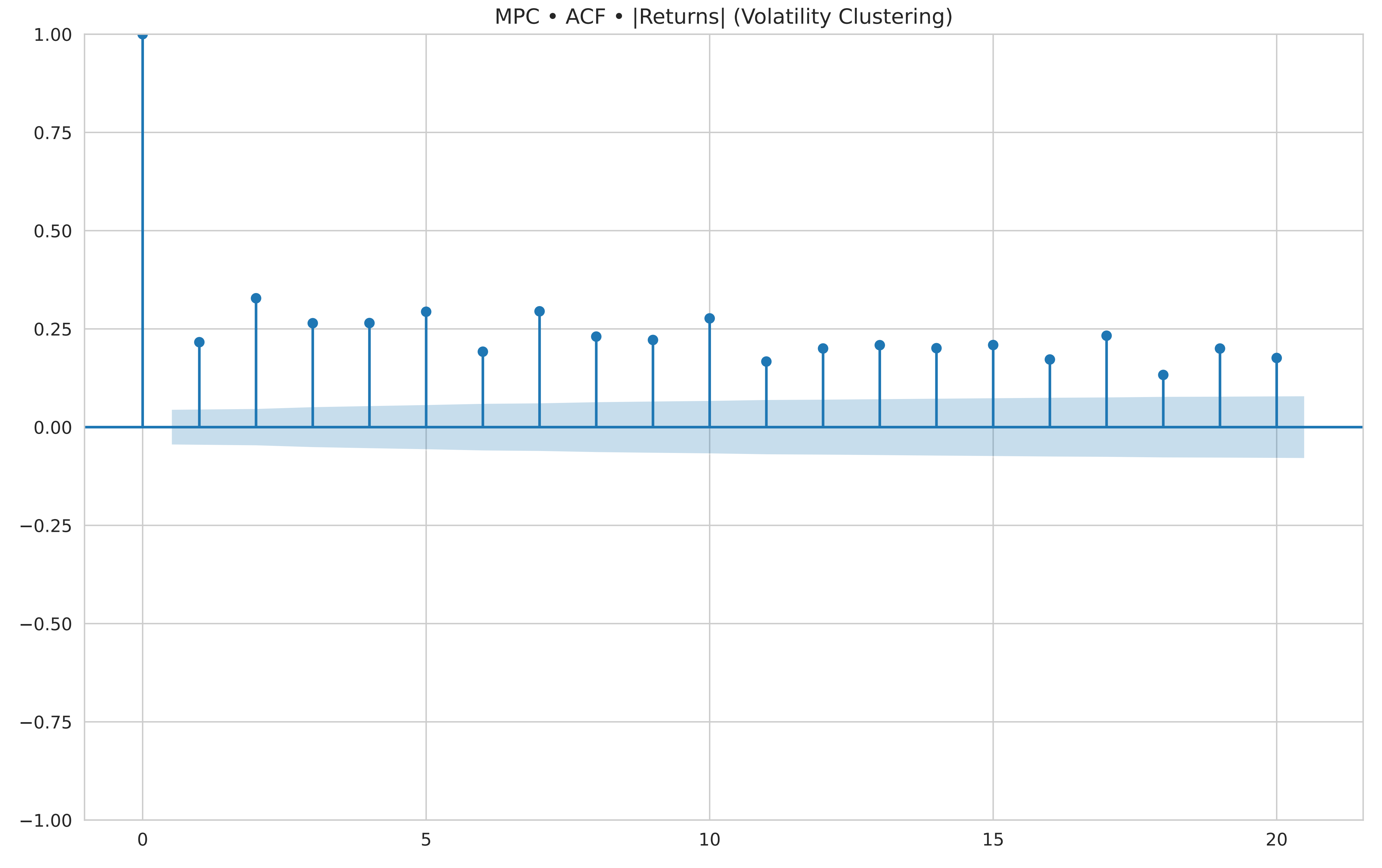


MPC • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.2
0.1
0.0
−0.1
−0.2
−0.3
−3
−2
−1
0
1
2
3

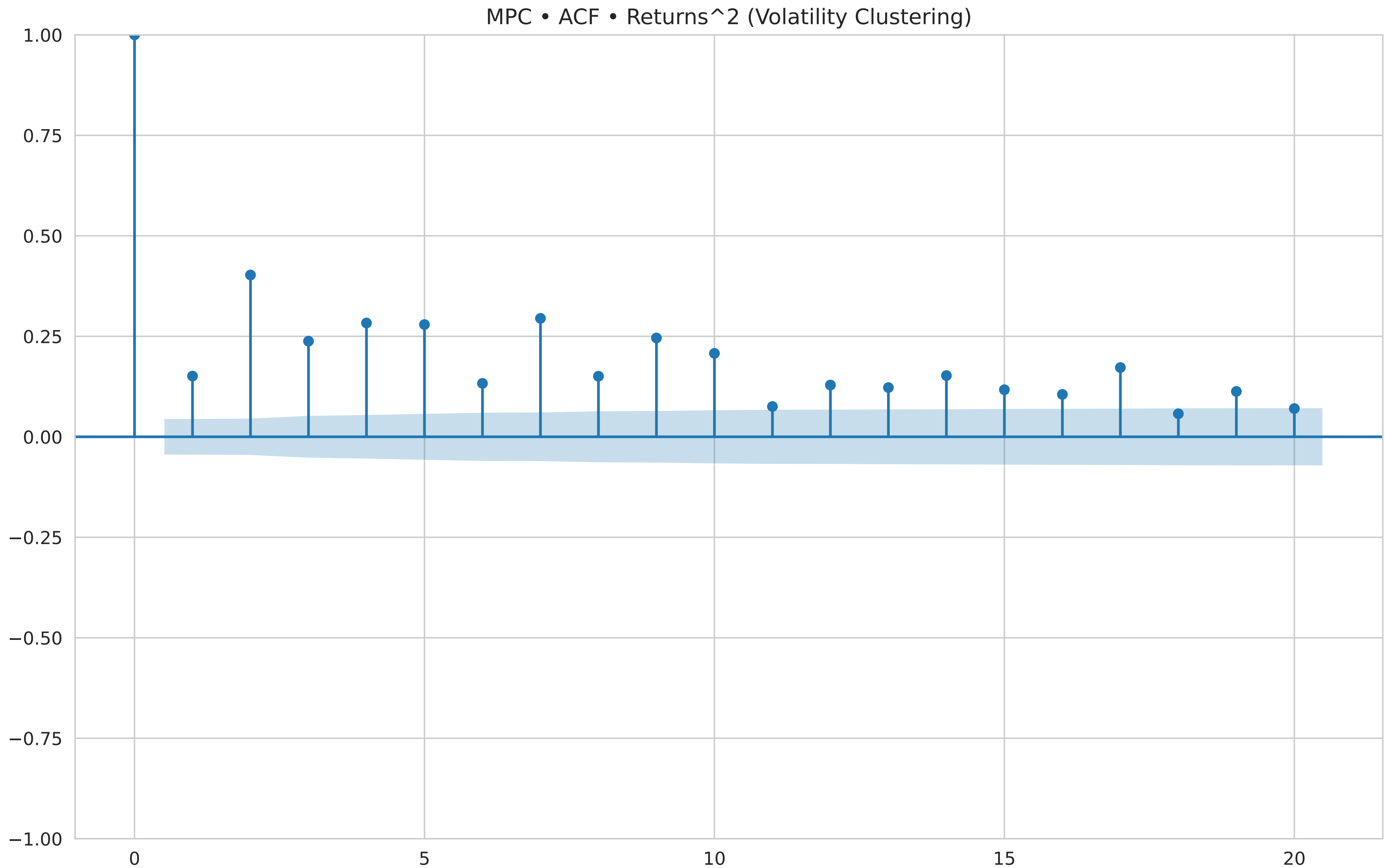

MPC • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



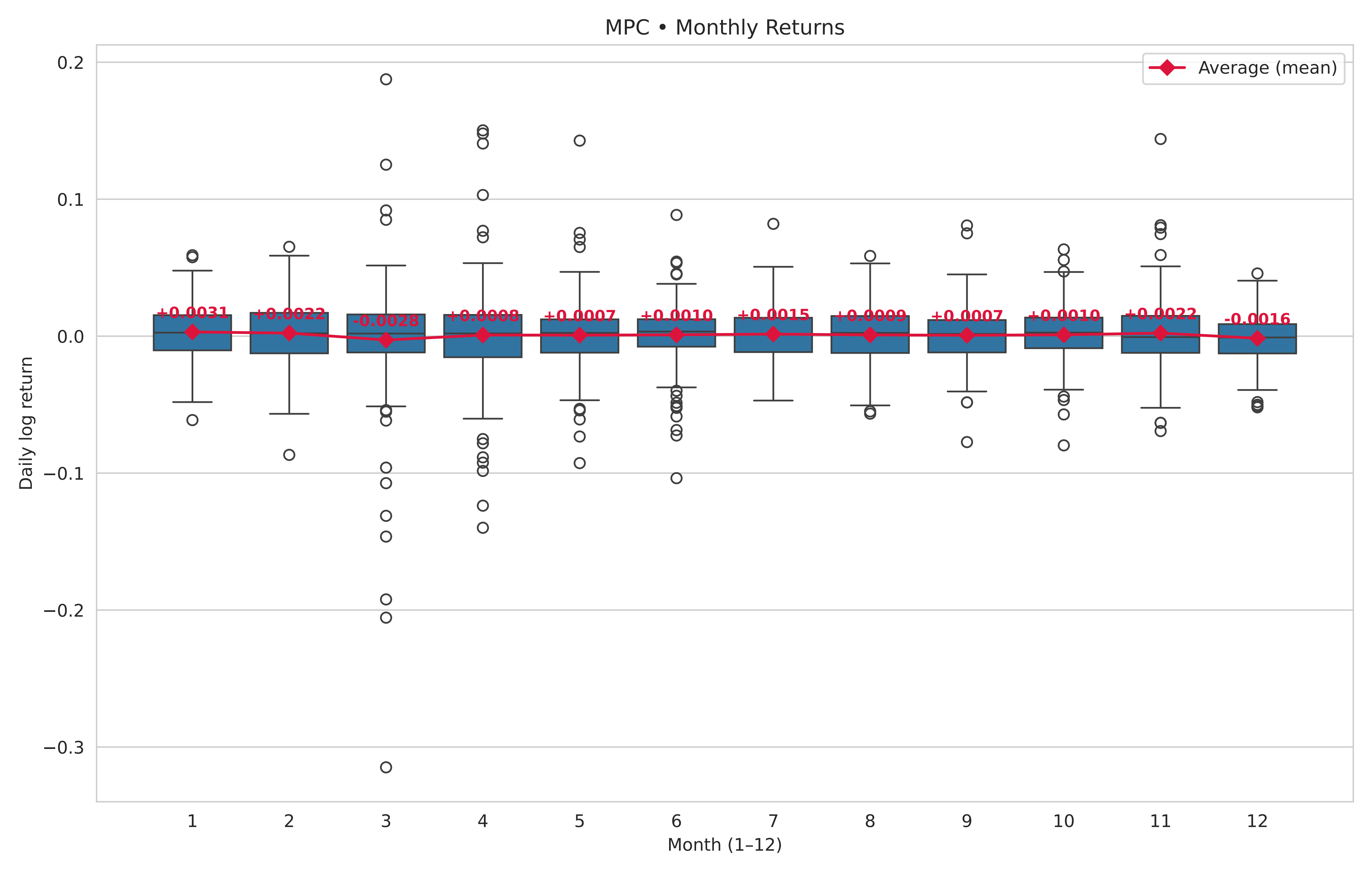
MPC • Rolling Autocorrelation (lag=1, window=20)
Autocorr
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026
Date



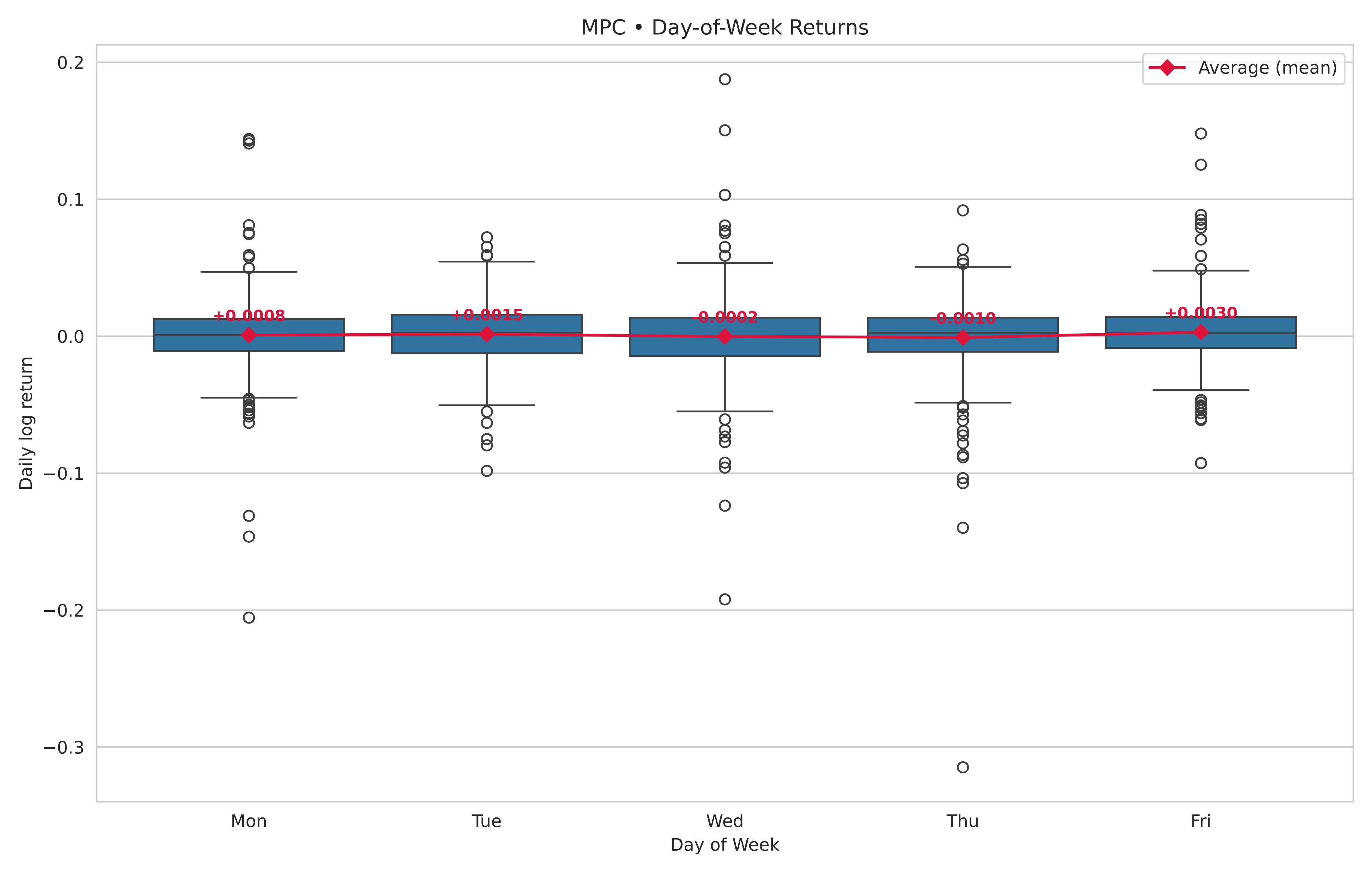
MPC • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

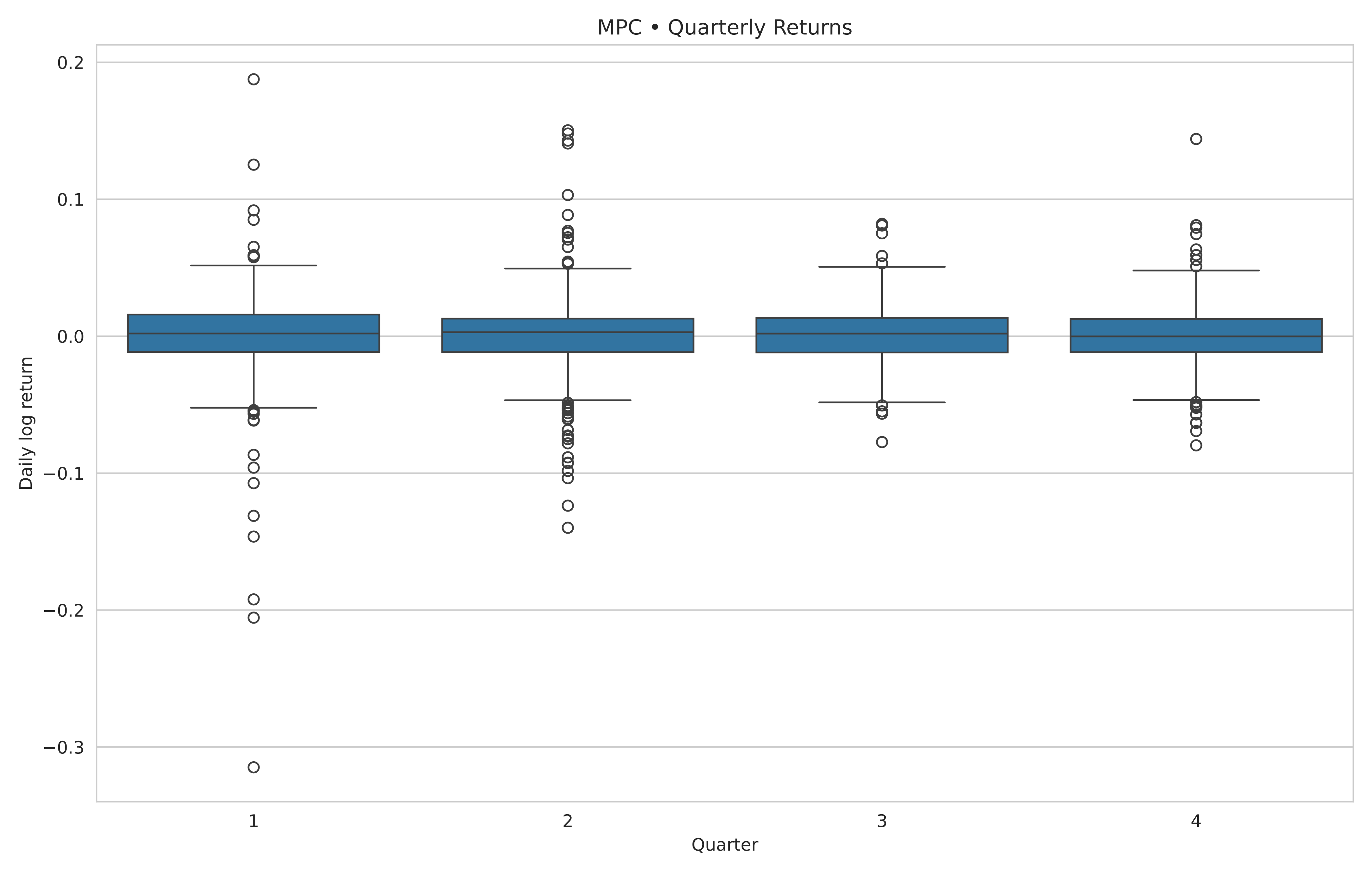


MPC • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

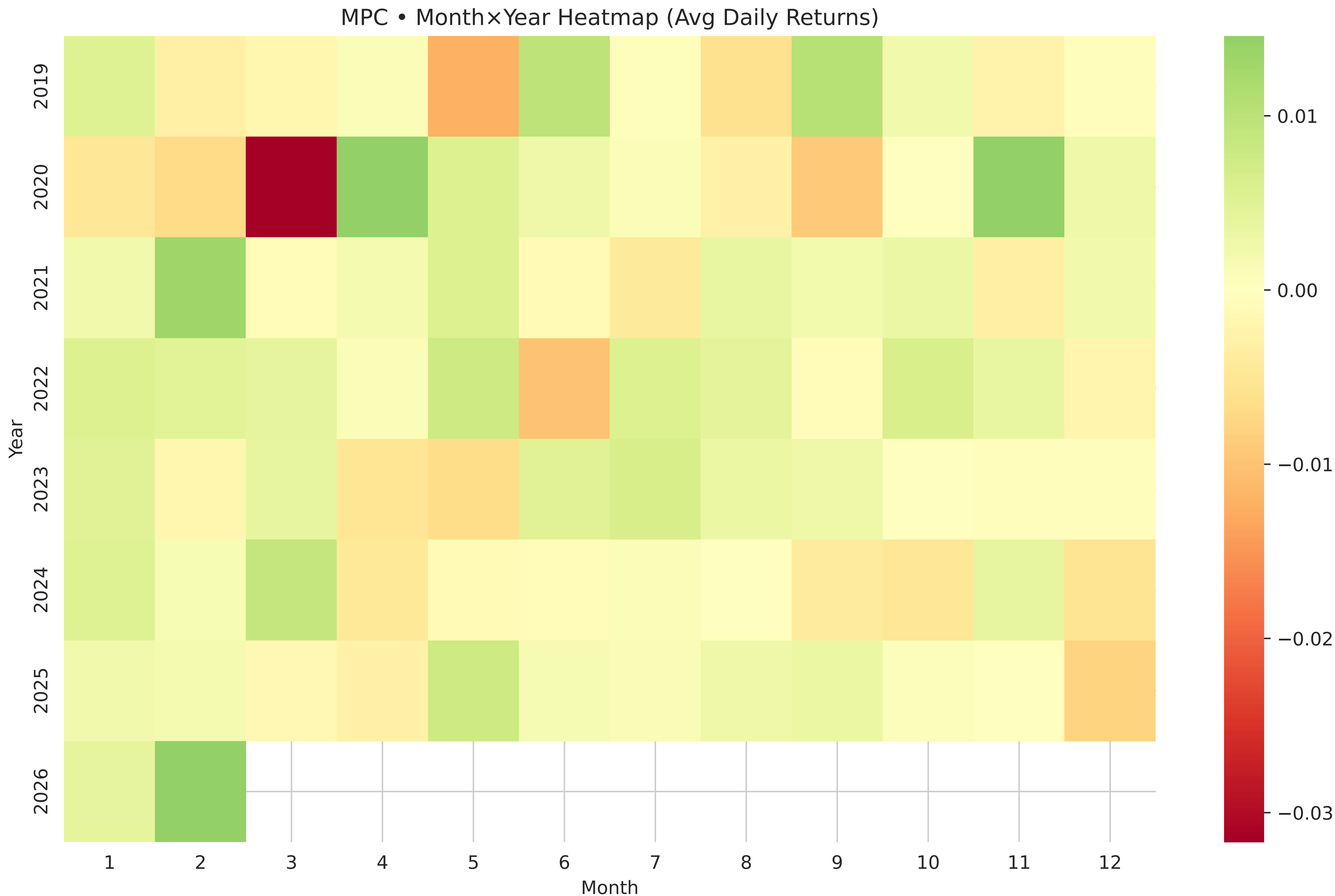


MPC • Monthly Returns
Average (mean)
Daily log return
0.2
0.1
0.0
−0.1
−0.2
−0.3
+0.0031
+0.0022
-0.0028
+0.0008
+0.0007
+0.0010
+0.0015
+0.0009
+0.0007
+0.0010
+0.0022
-0.0016
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)

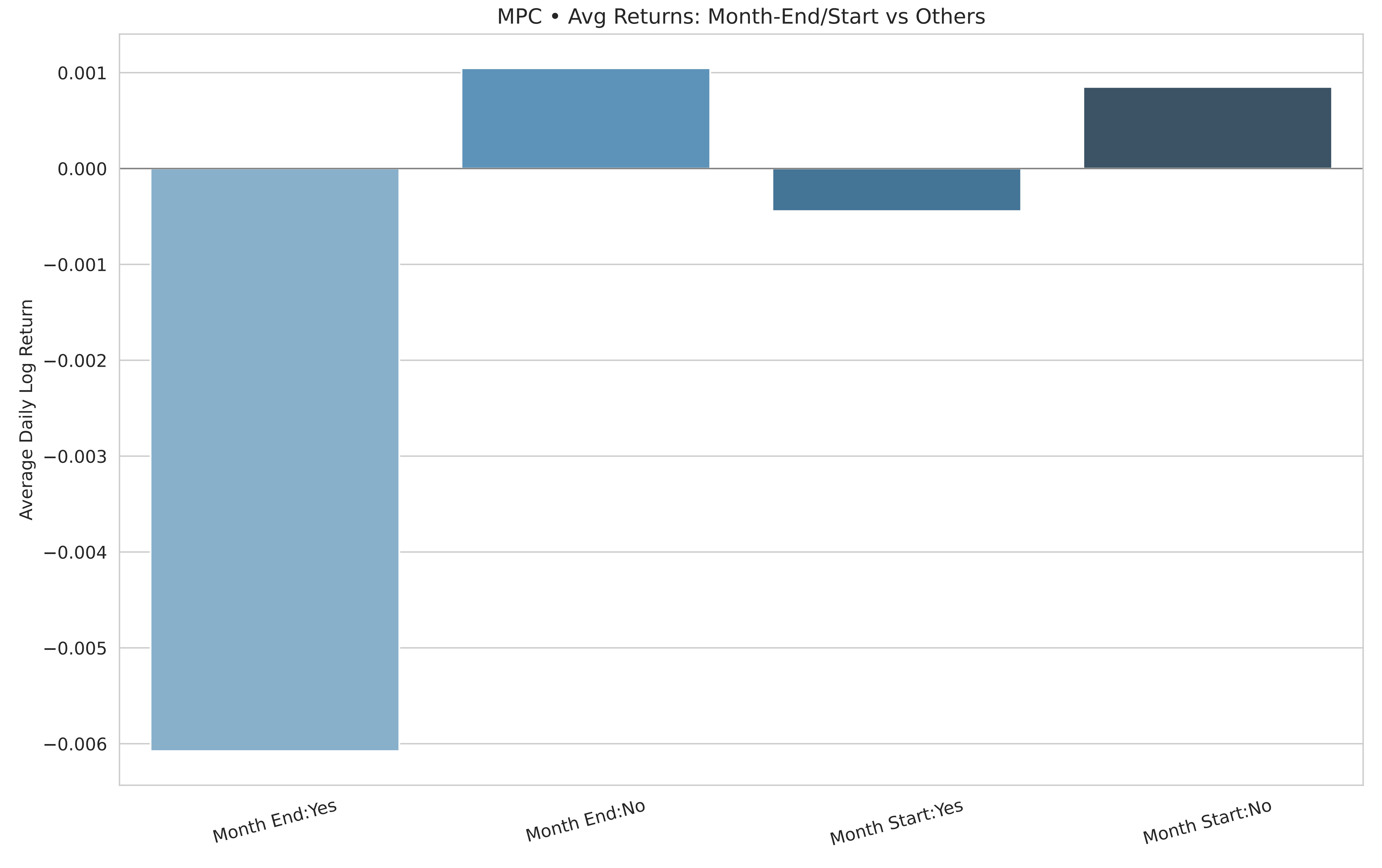

MPC • Day-of-Week Returns
Average (mean)
0.2
0.1
0.0
−0.1
−0.2
−0.3
Daily log return
+0.0008
+0.0015
-0.0002
-0.0010
+0.0030
Mon
Tue
Wed
Thu
Fri
Day of Week



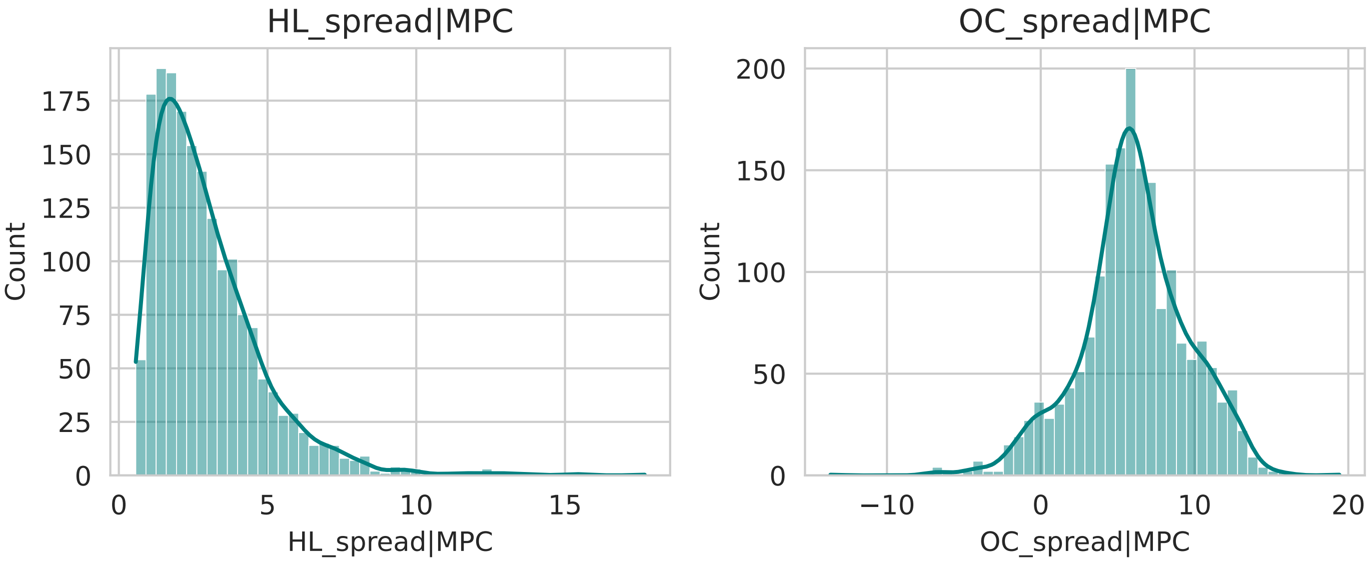
MPC • Quarterly Returns
0.2
0.1
0.0
−0.1
−0.2
−0.3
Daily log return
1
2
3
4
Quarter

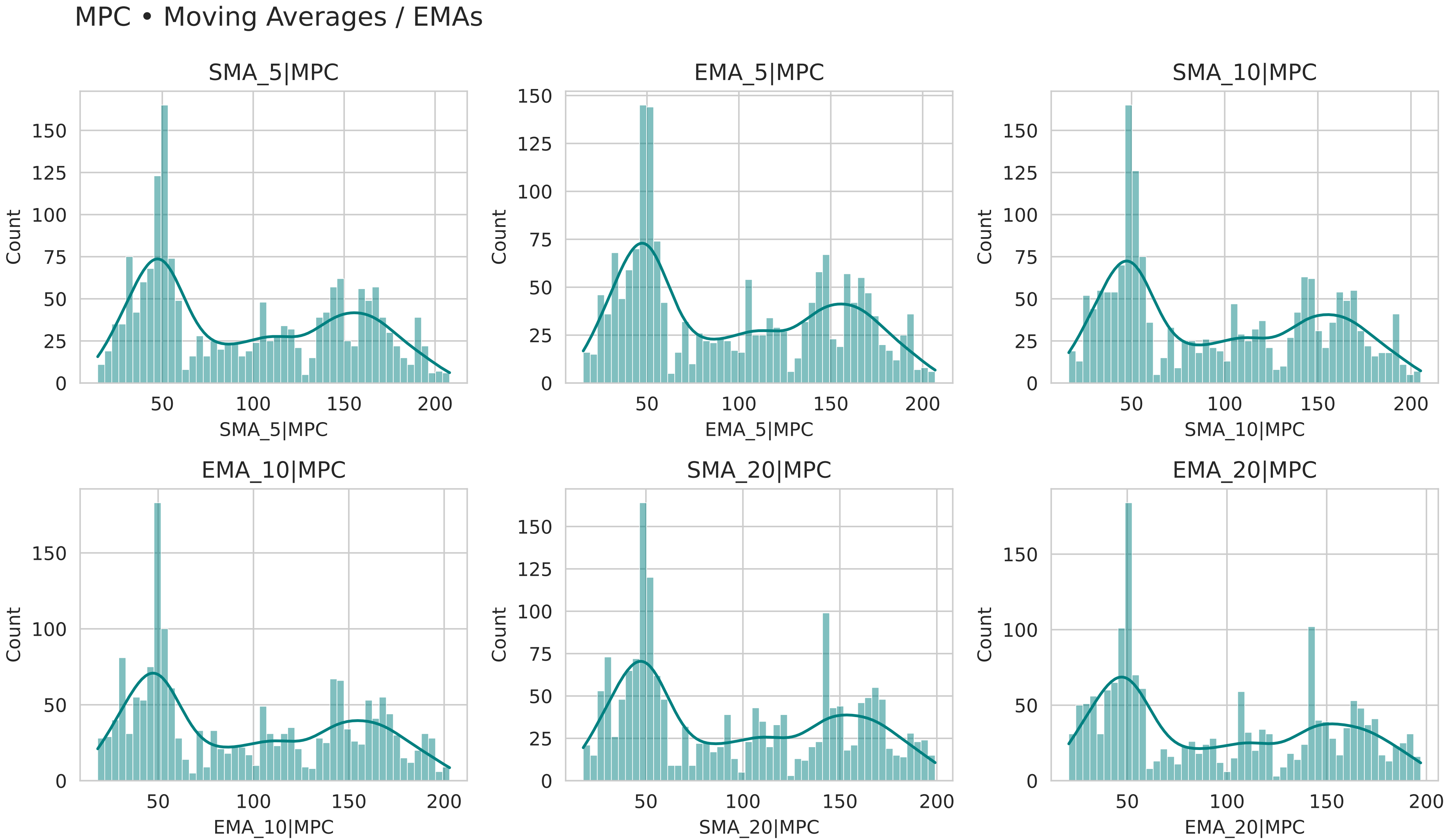


MPC • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.01
0.00
−0.01
−0.02
−0.03

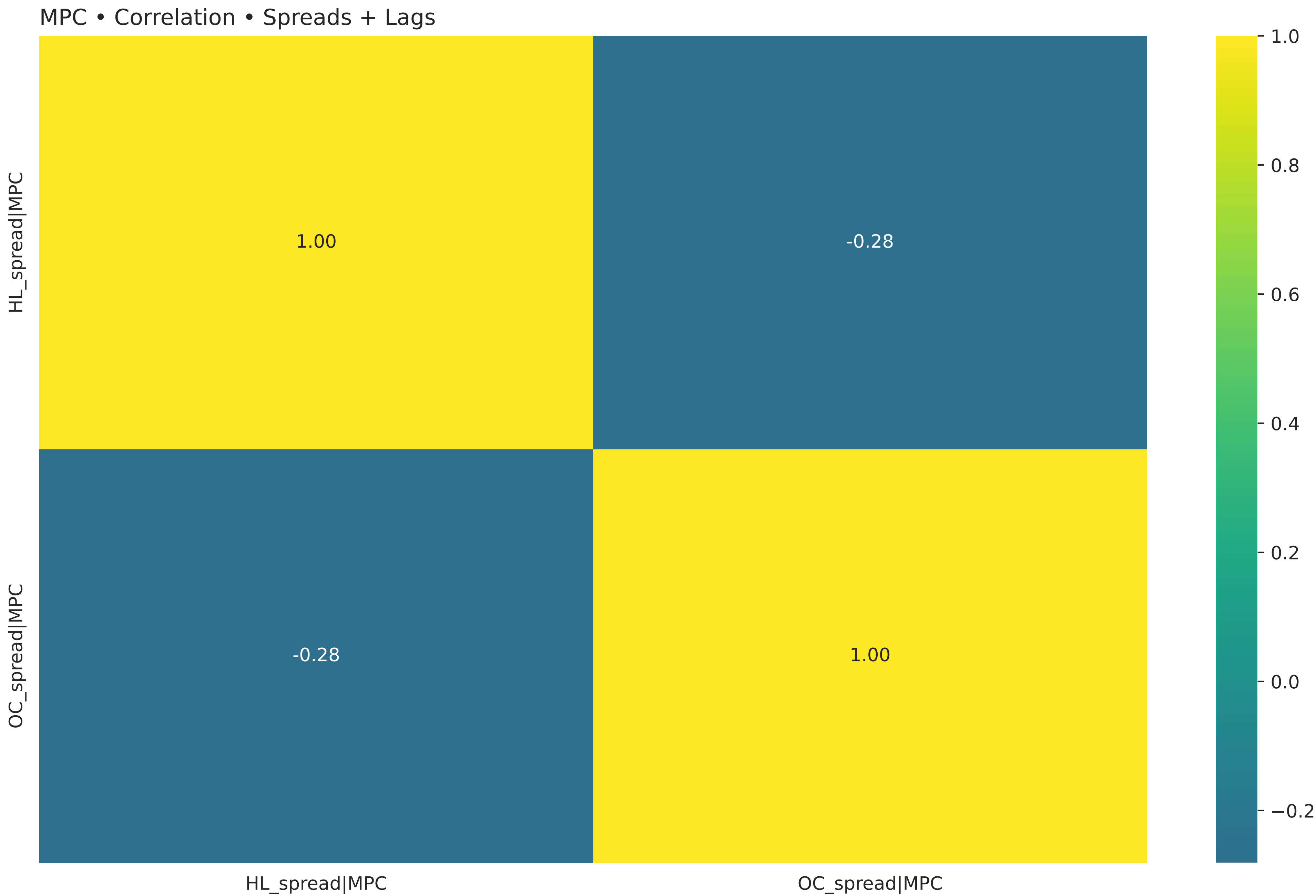

MPC • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.001
0.000
−0.001
−0.002
−0.003
−0.004
−0.005
−0.006
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

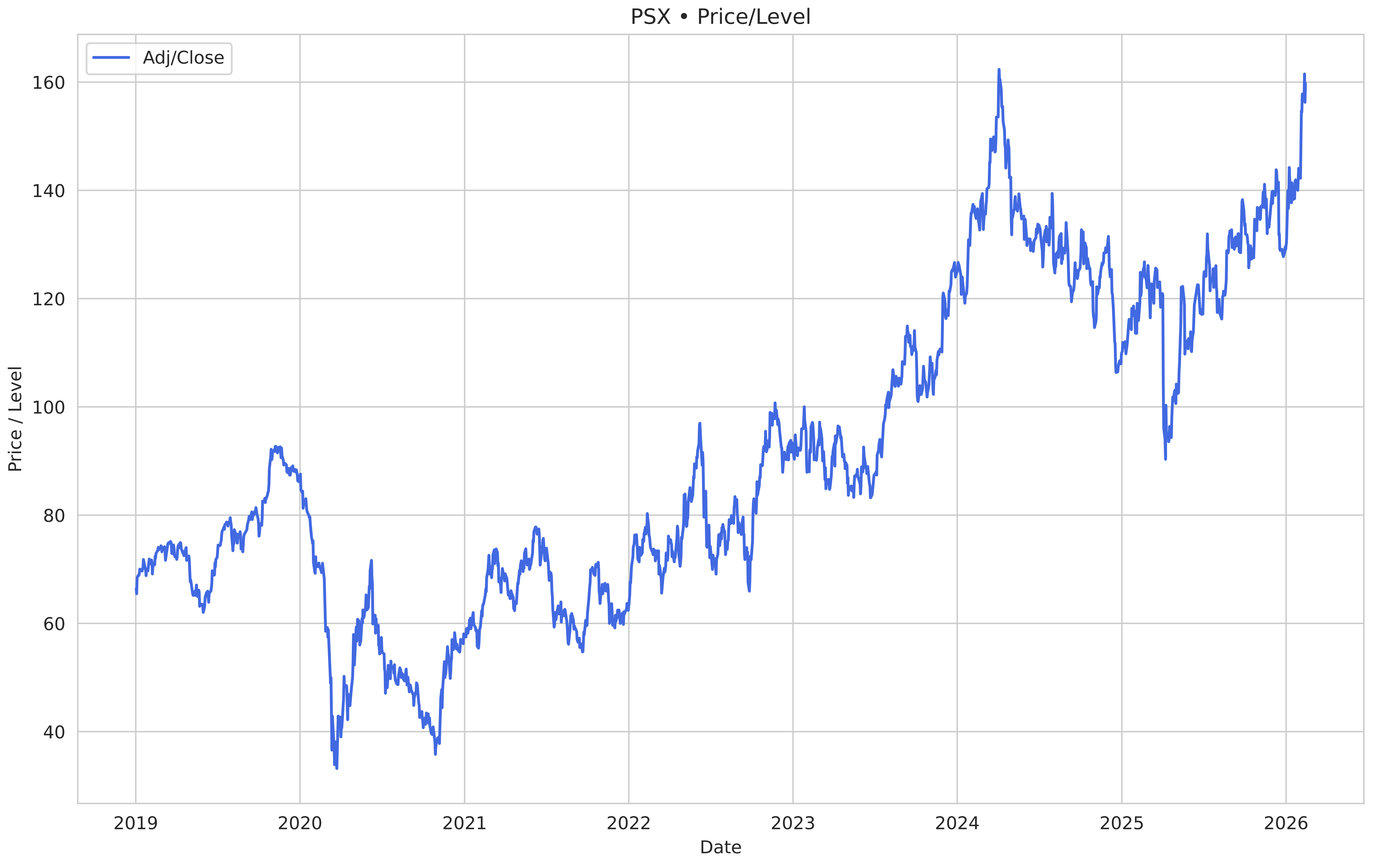
MPC • Spreads

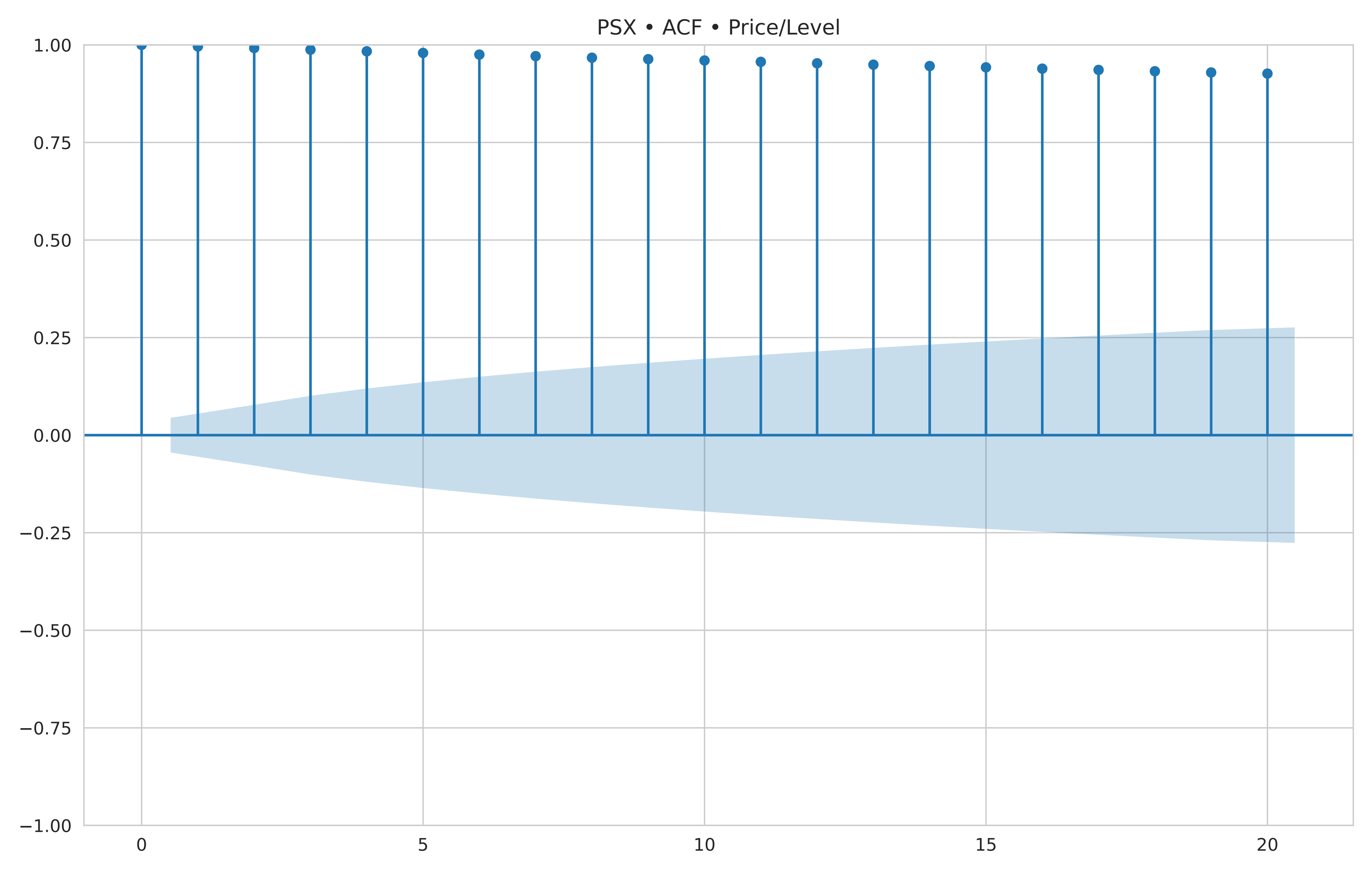

HL_spread|MPC
Count
175
150
125
100
75
50
25
0
0
5
10
15
HL_spread|MPC
OC_spread|MPC
Count
200
150
100
50
0
−10
0
10
20
OC_spread|MPC

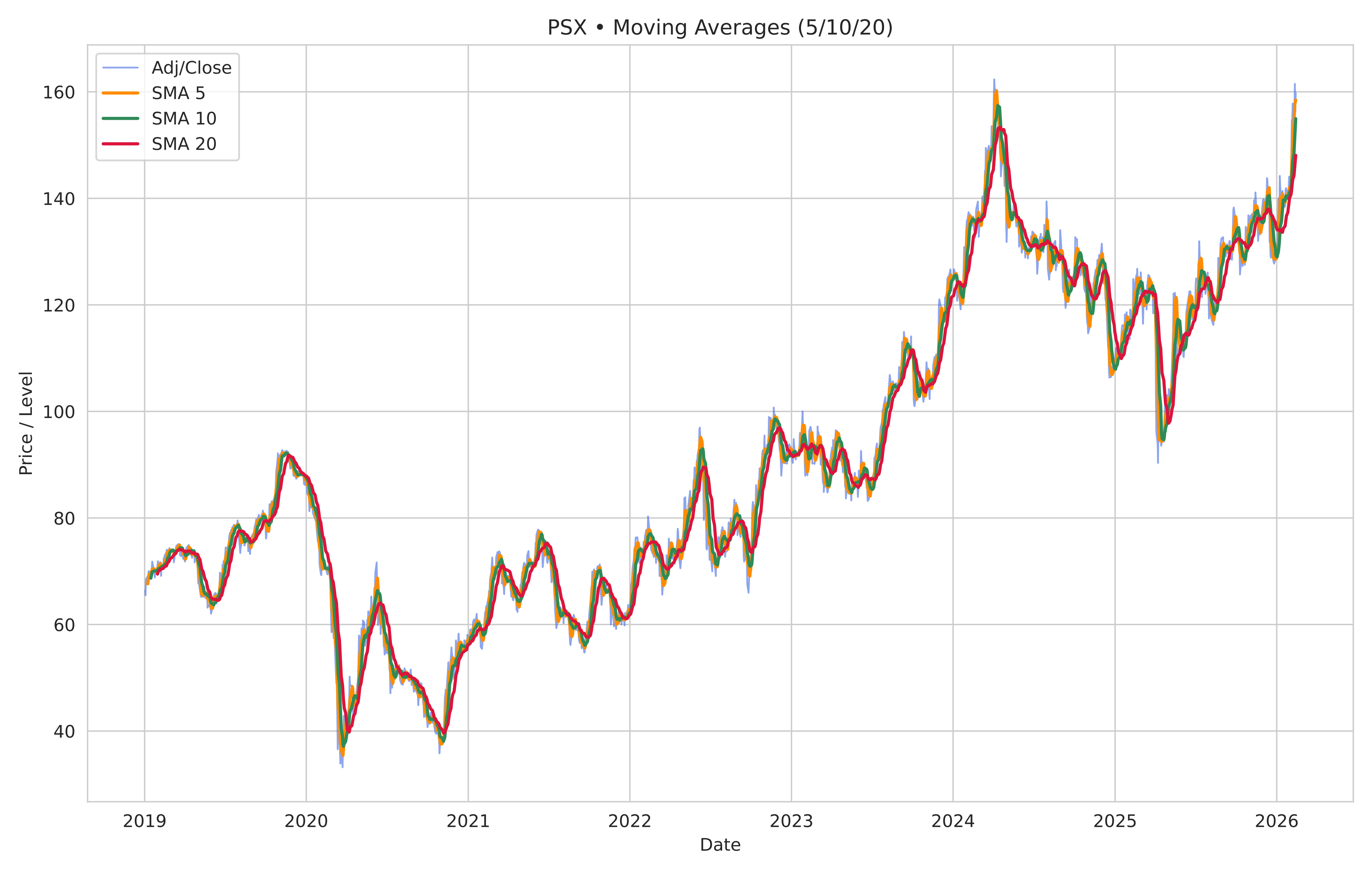

MPC • Moving Averages / EMAs
SMA_5|MPC
EMA_5|MPC
SMA_10|MPC
EMA_10|MPC
SMA_20|MPC
EMA_20|MPC
Count
0
25
50
75
100
125
150
50
100
150
200

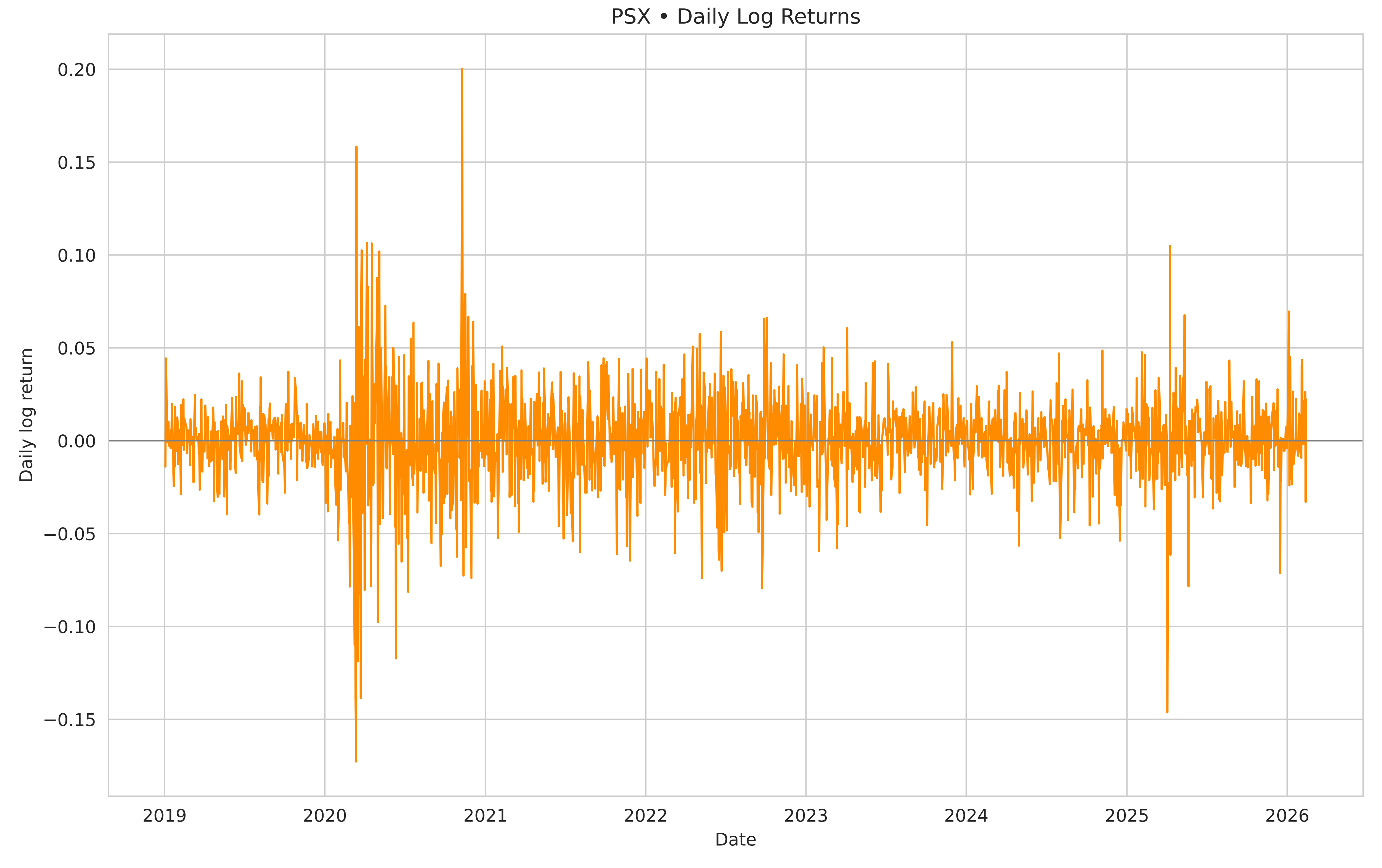

MPC • Correlation • Moving Averages
SMA_5|MPC
EMA_5|MPC
SMA_10|MPC
EMA_10|MPC
SMA_20|MPC
EMA_20|MPC
1.00
1.0000
0.9995
0.9990
0.9985
0.9980
0.9975
0.9970
0.9965


MPC • Correlation • Spreads + Lags
HL_spread|MPC
OC_spread|MPC
1.00
-0.28
-0.28
1.00
HL_spread|MPC
OC_spread|MPC
1.0
0.8
0.6
0.4
0.2
0.0
−0.2

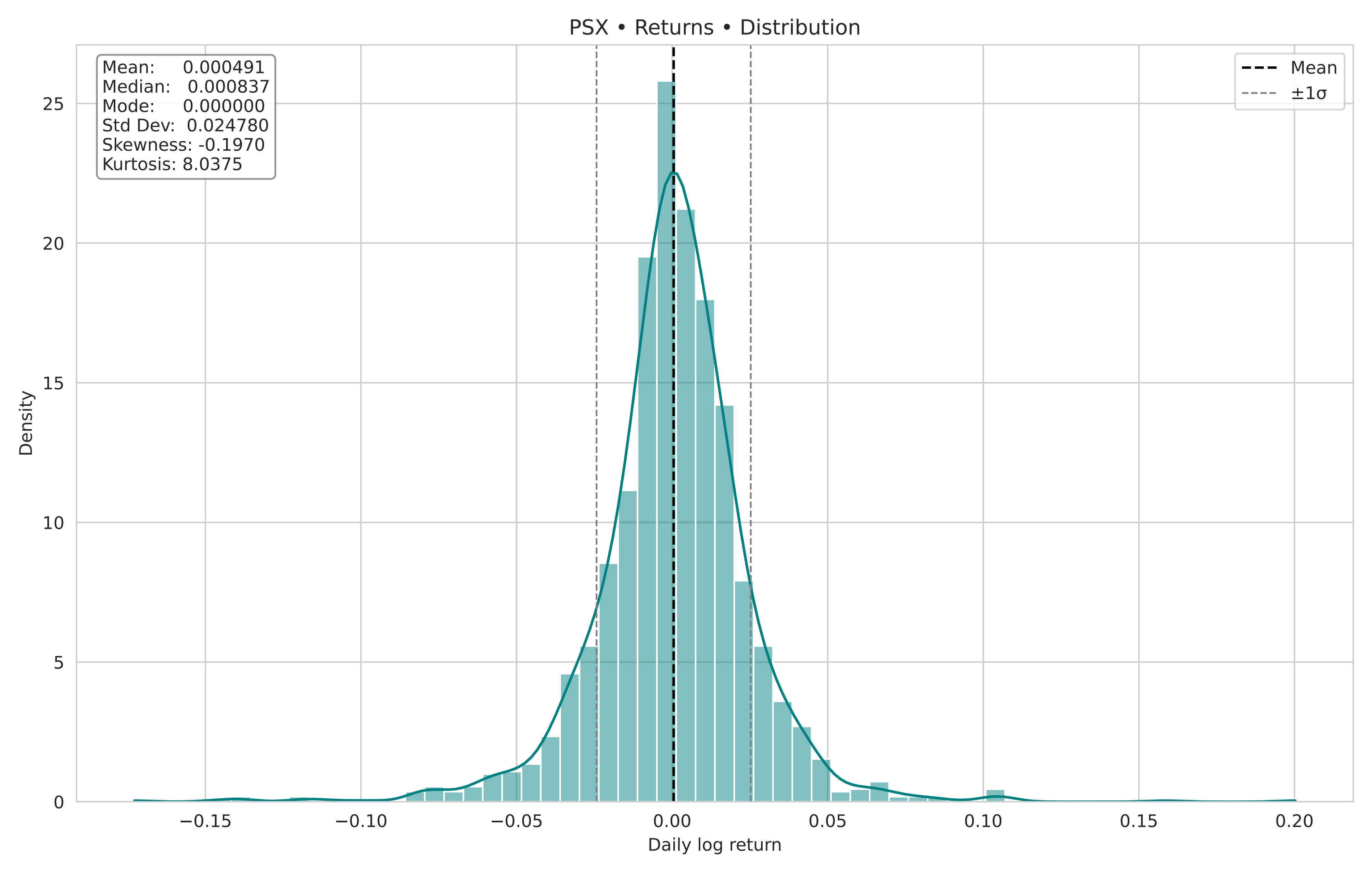

PSX • Price/Level
Adj/Close
Price / Level
Date
160
140
120
100
80
60
40
2019
2020
2021
2022
2023
2024
2025
2026

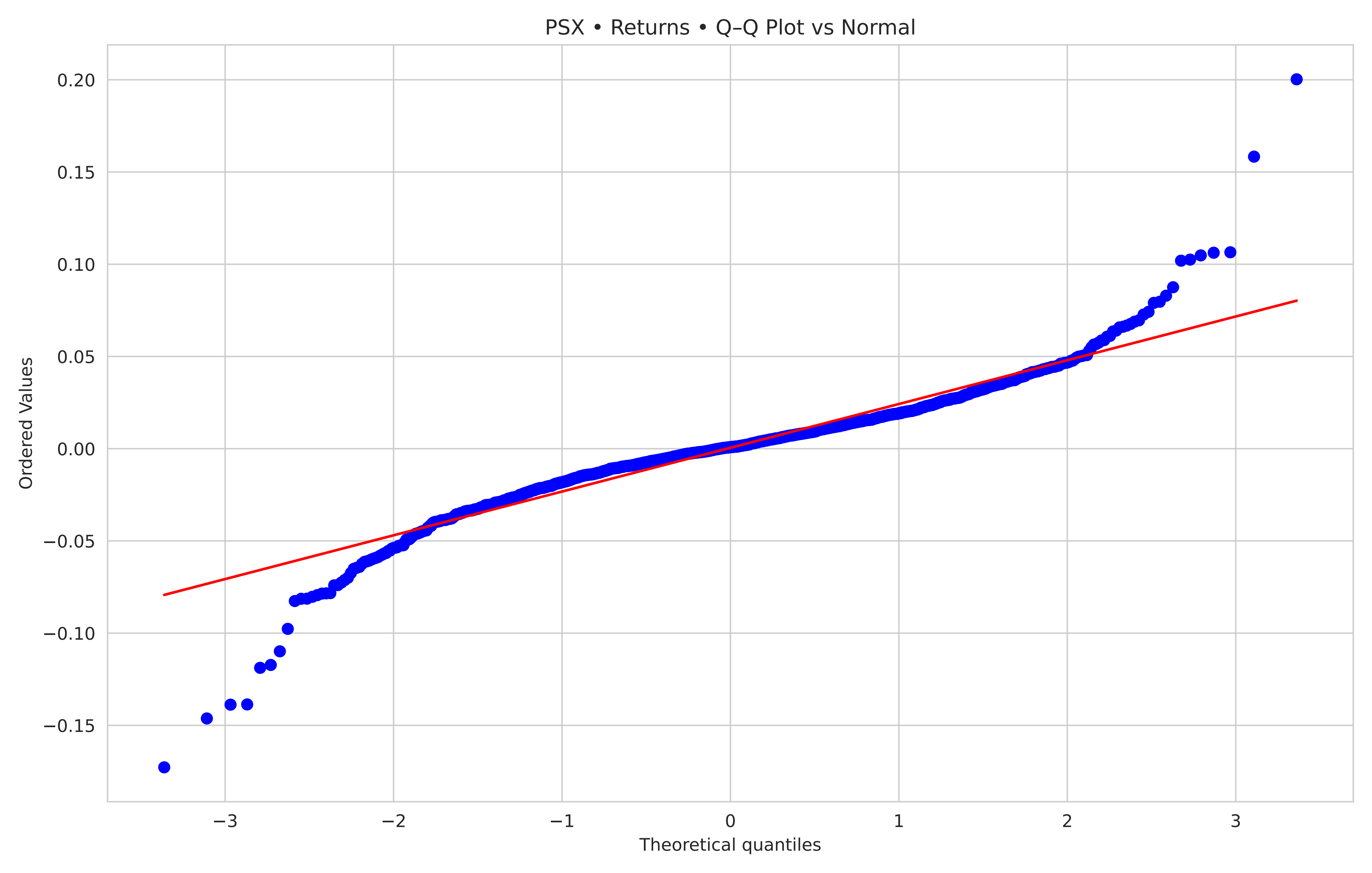

PSX • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

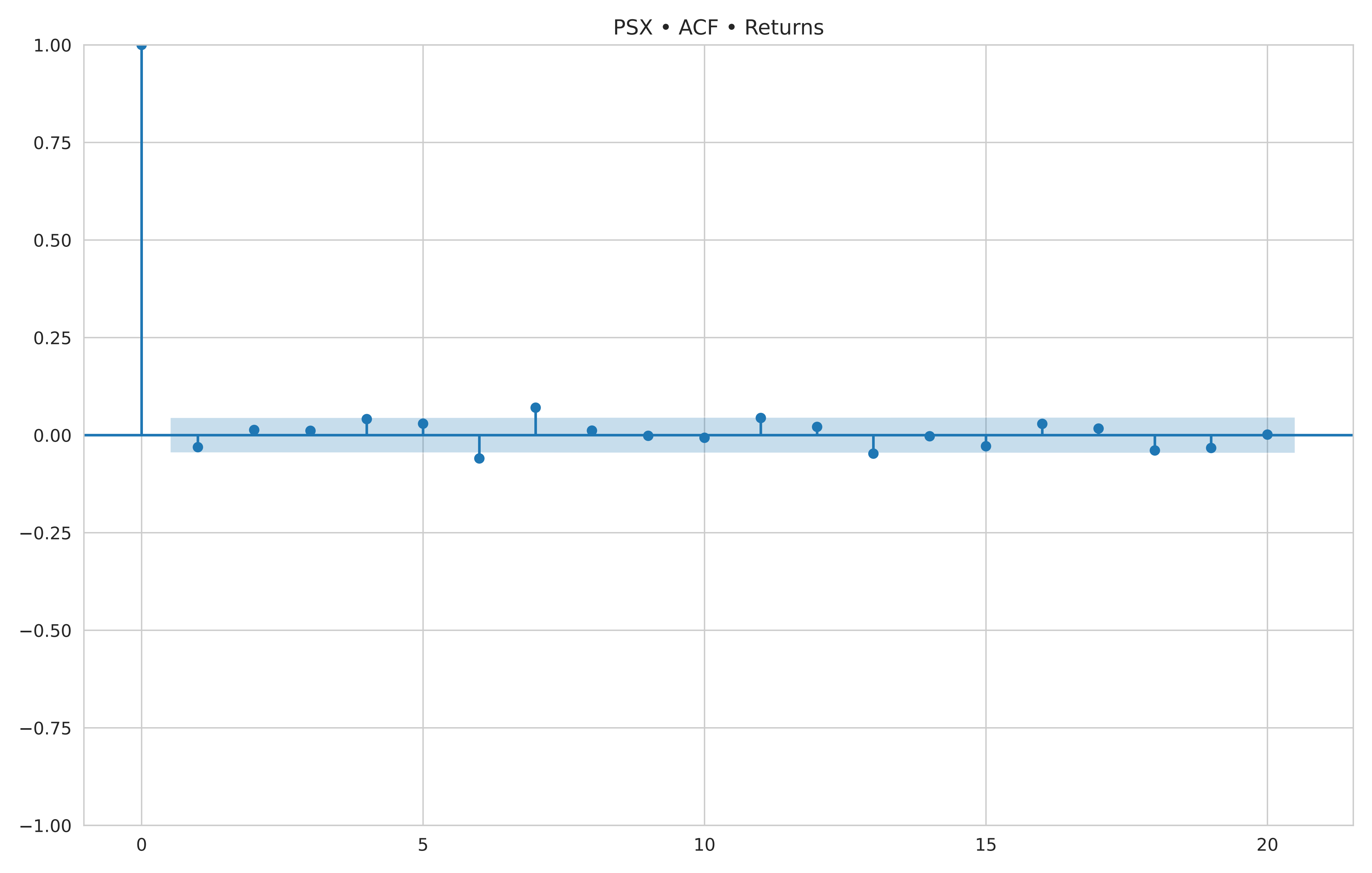

PSX • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price / Level
160
140
120
100
80
60
40
Date
2019
2020
2021
2022
2023
2024
2025
2026

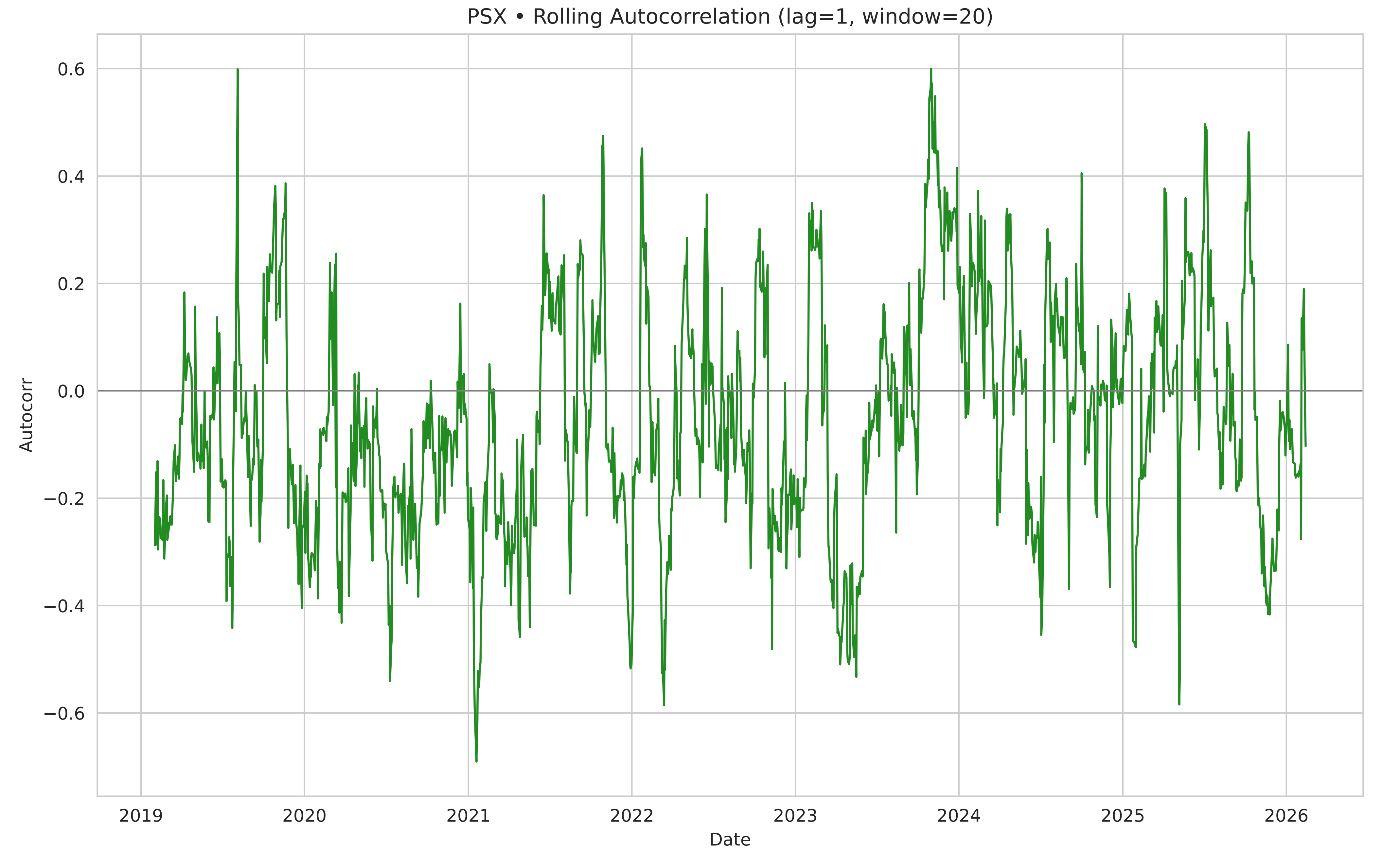


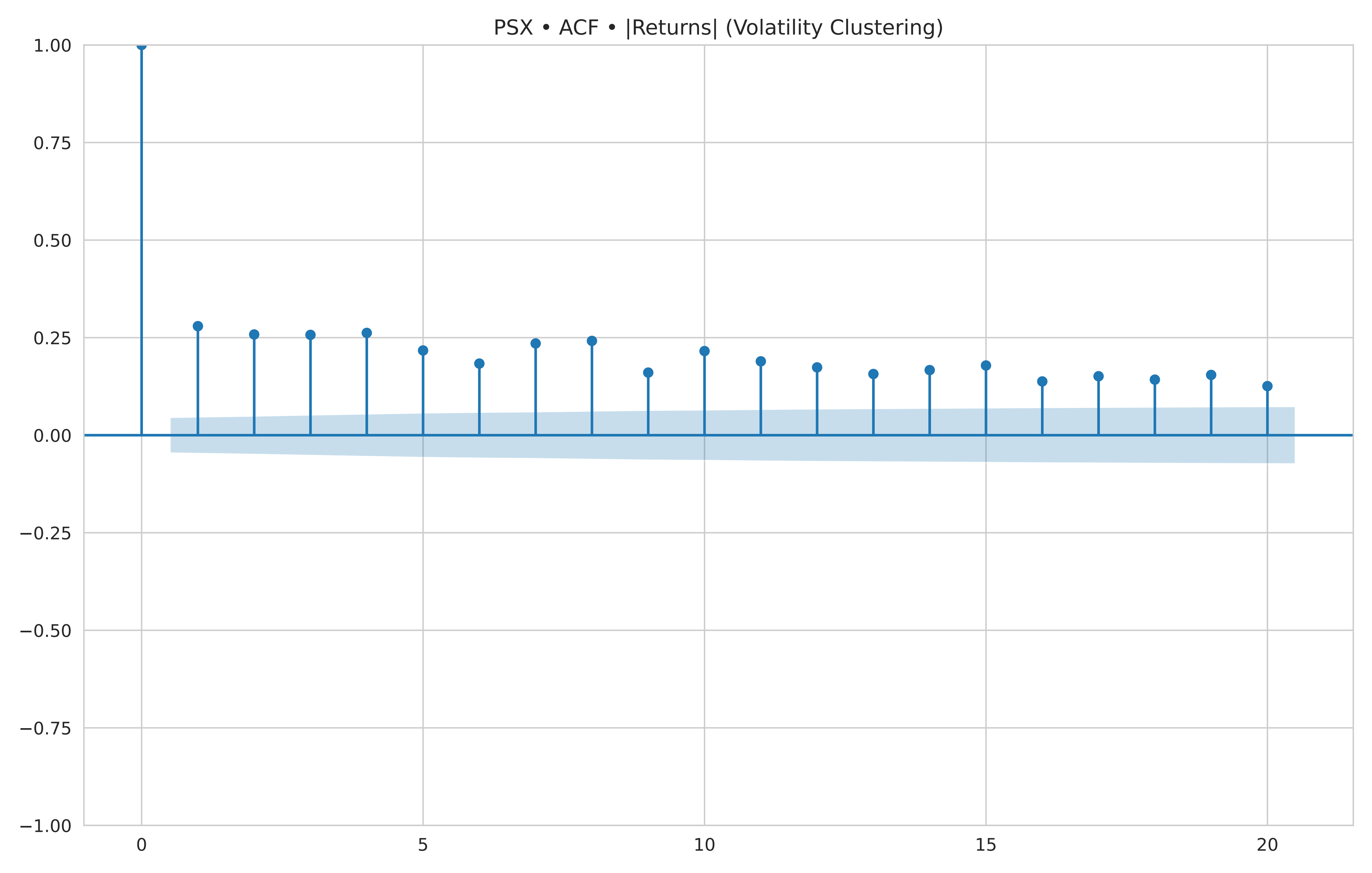
PSX • Daily Log Returns
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
Daily log return
2019
2020
2021
2022
2023
2024
2025
2026
Date

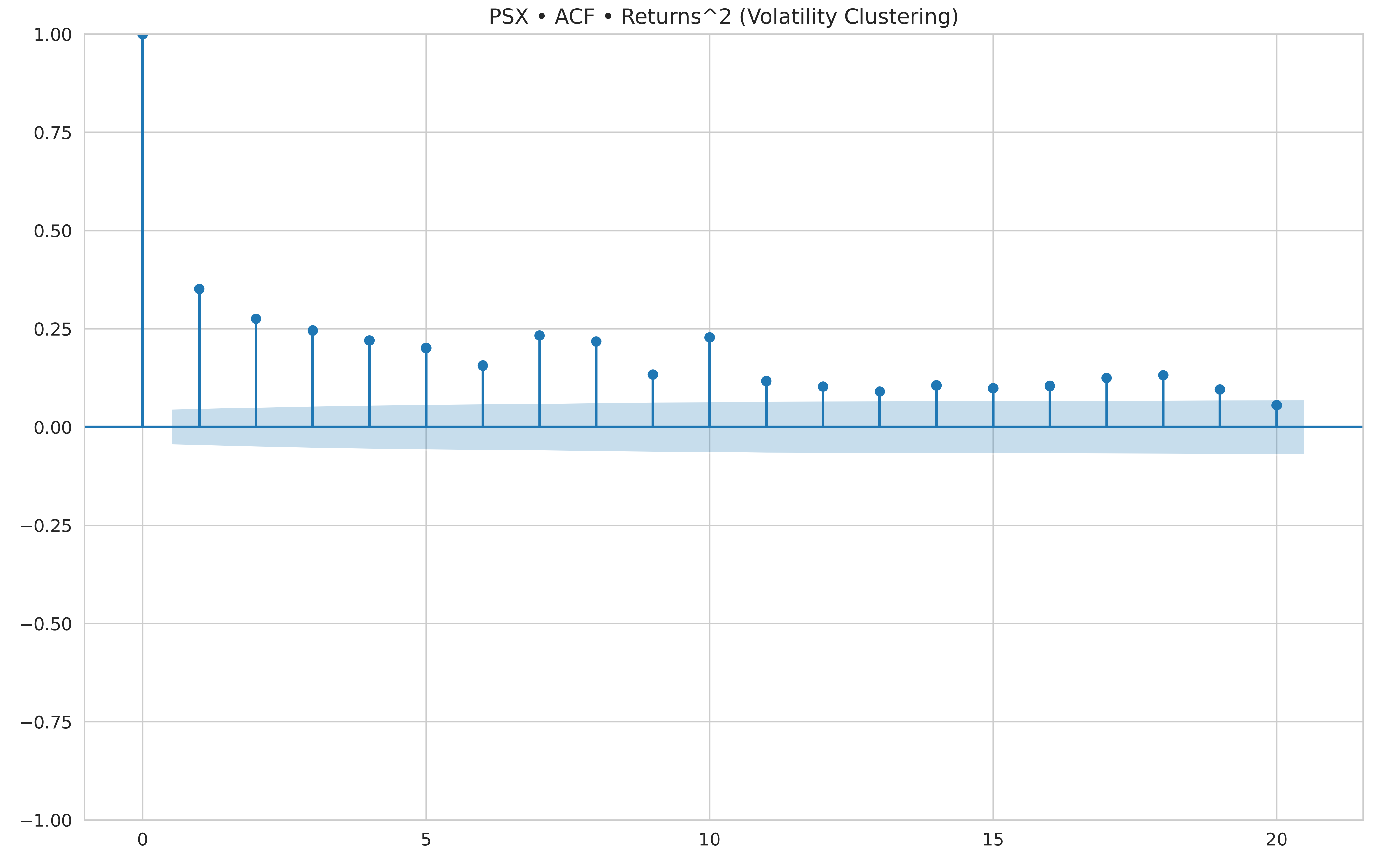

PSX • Returns • Distribution
Mean: 0.000491
Median: 0.000837
Mode: 0.000000
Std Dev: 0.024780
Skewness: -0.1970
Kurtosis: 8.0375
Mean
±1σ
Density
Daily log return
0
5
10
15
20
25
−0.15
−0.10
−0.05
0.00
0.05
0.10
0.15
0.20


PSX • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
−3
−2
−1
0
1
2
3

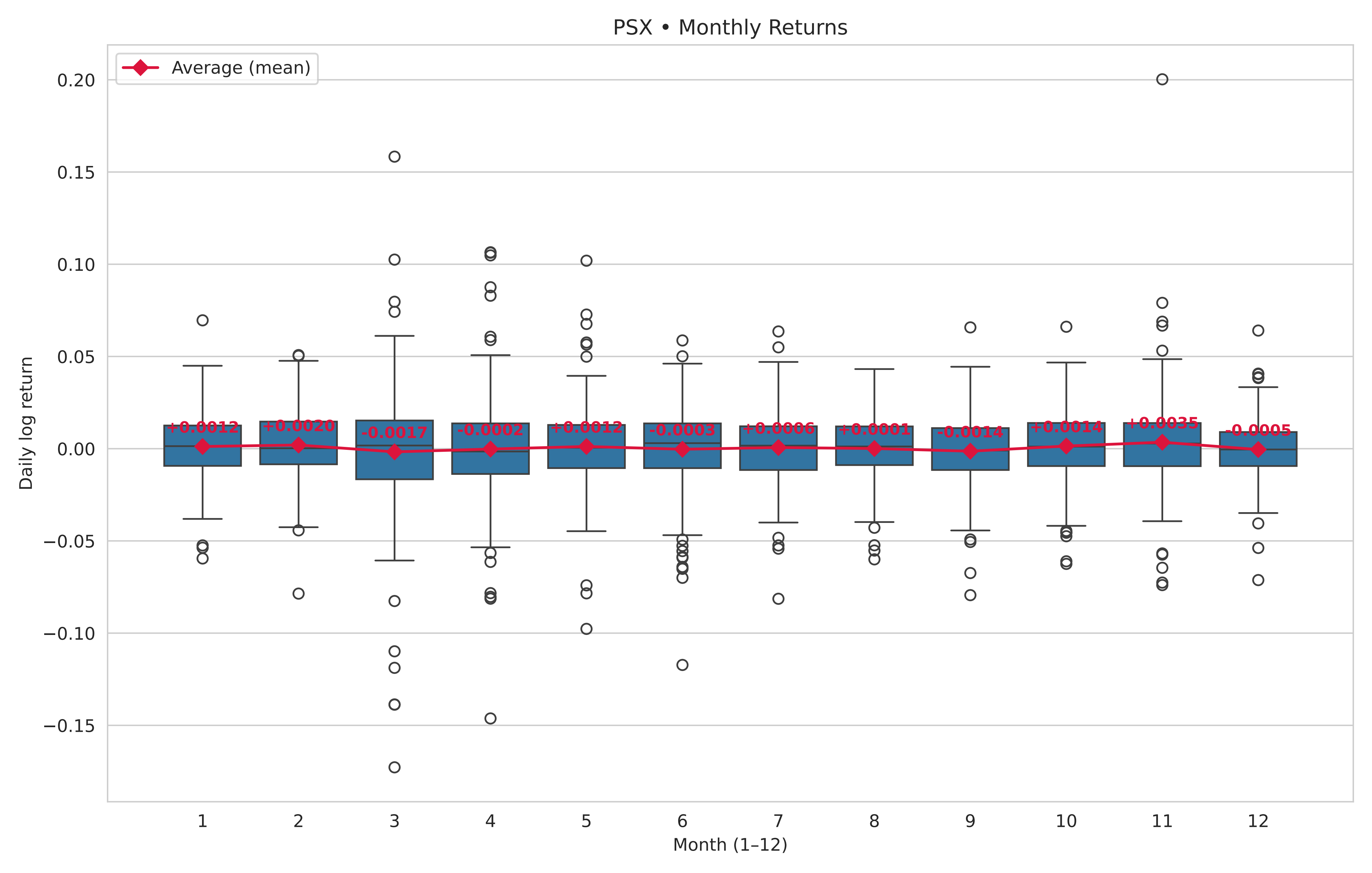

PSX • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

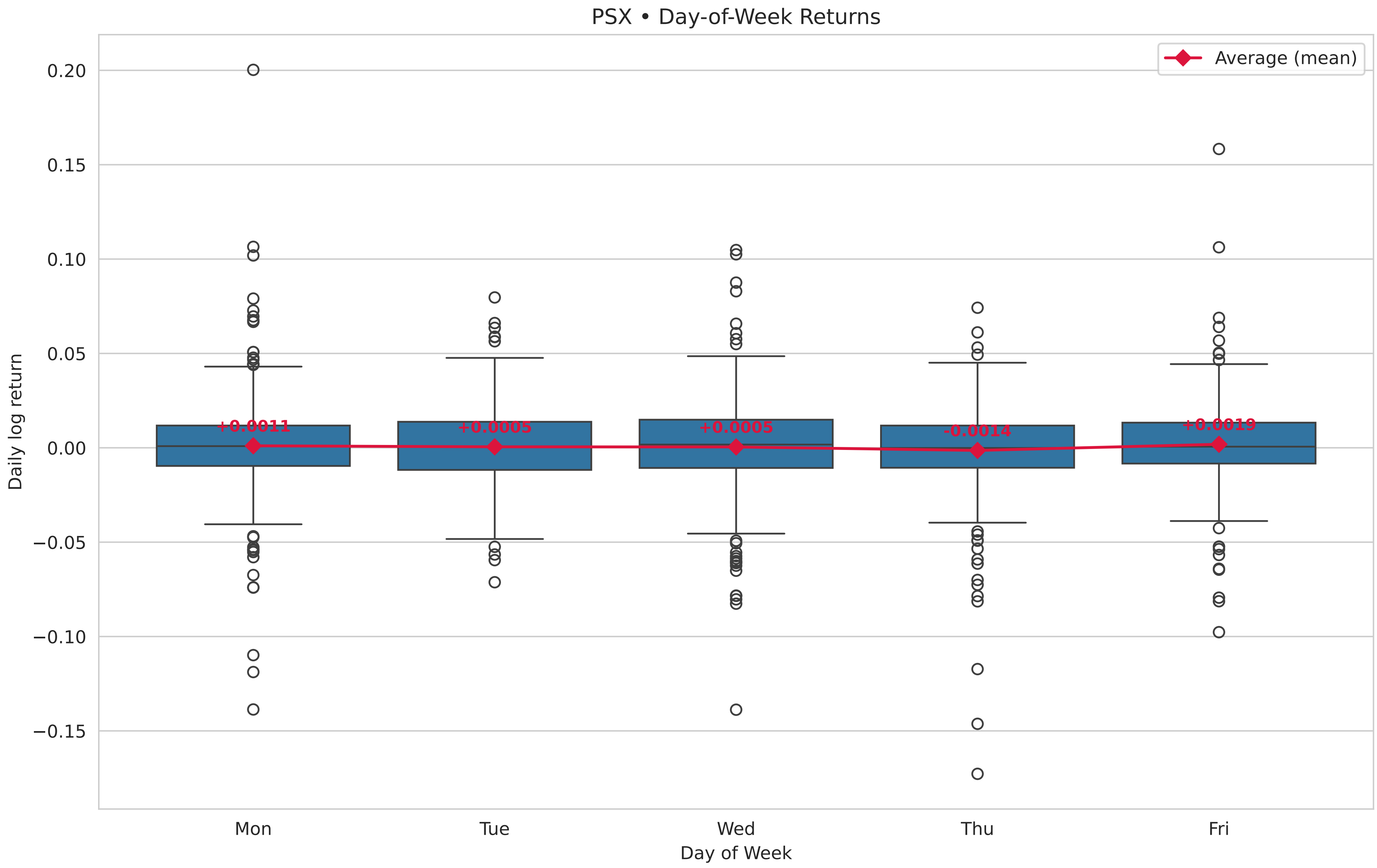

PSX • Rolling Autocorrelation (lag=1, window=20)
Autocorr
Date
0.6
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026


PSX • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

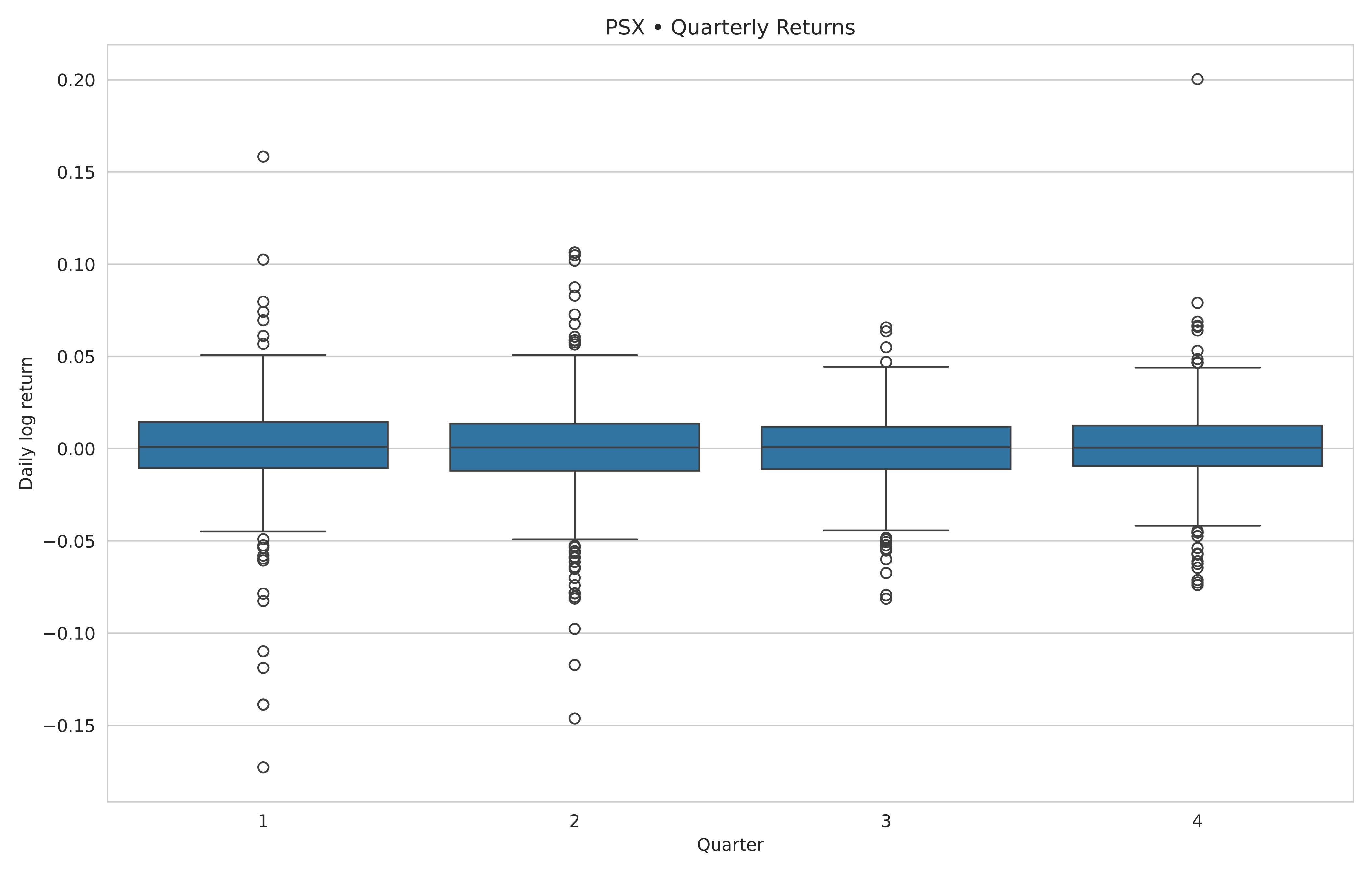


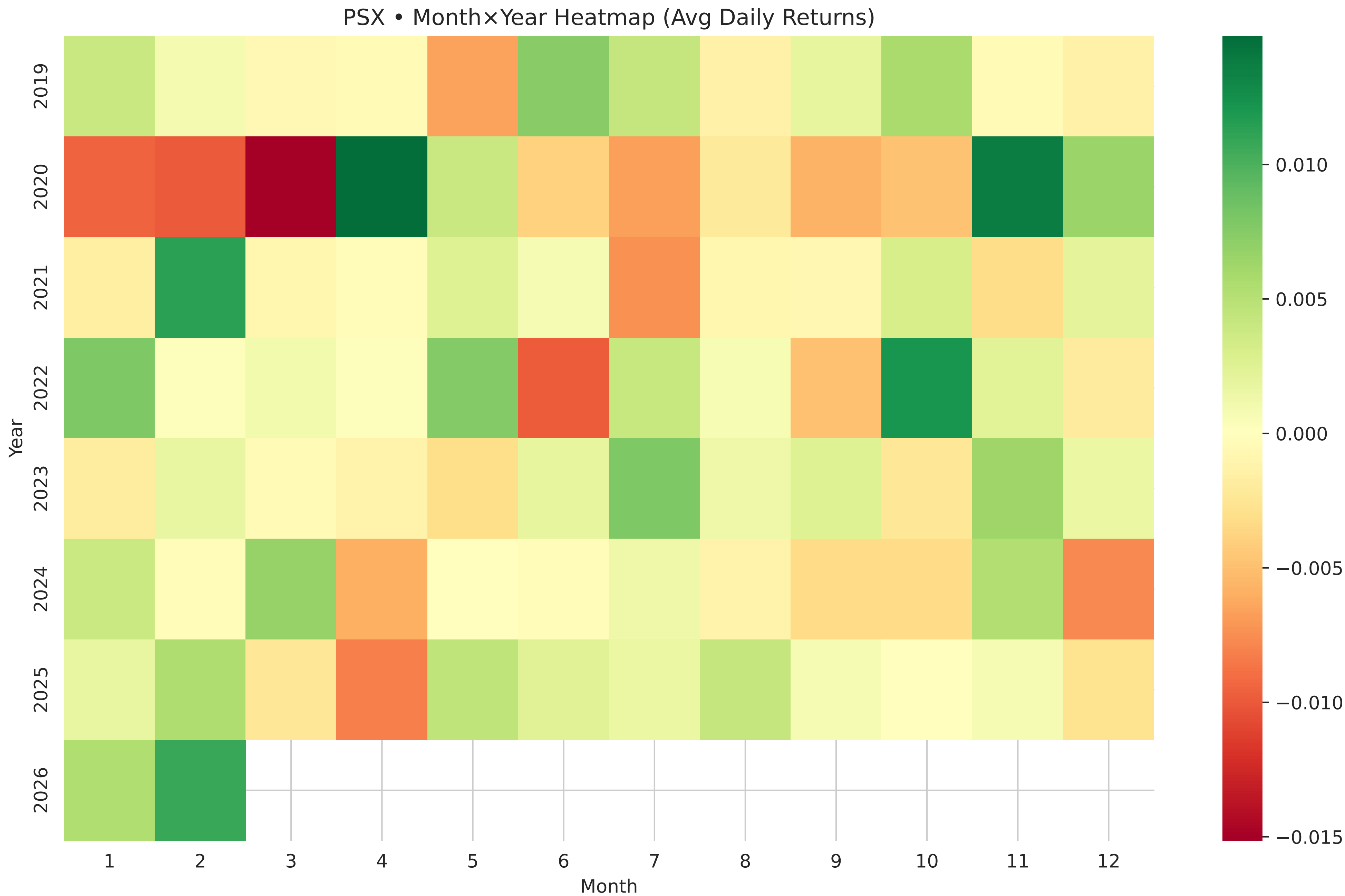
PSX • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20


PSX • Monthly Returns
Average (mean)
Daily log return
Month (1–12)
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
1
2
3
4
5
6
7
8
9
10
11
12
+0.0012
+0.0020
-0.0017
-0.0002
+0.0012
-0.0003
+0.0006
+0.0001
-0.0014
+0.0014
+0.0035
-0.0005

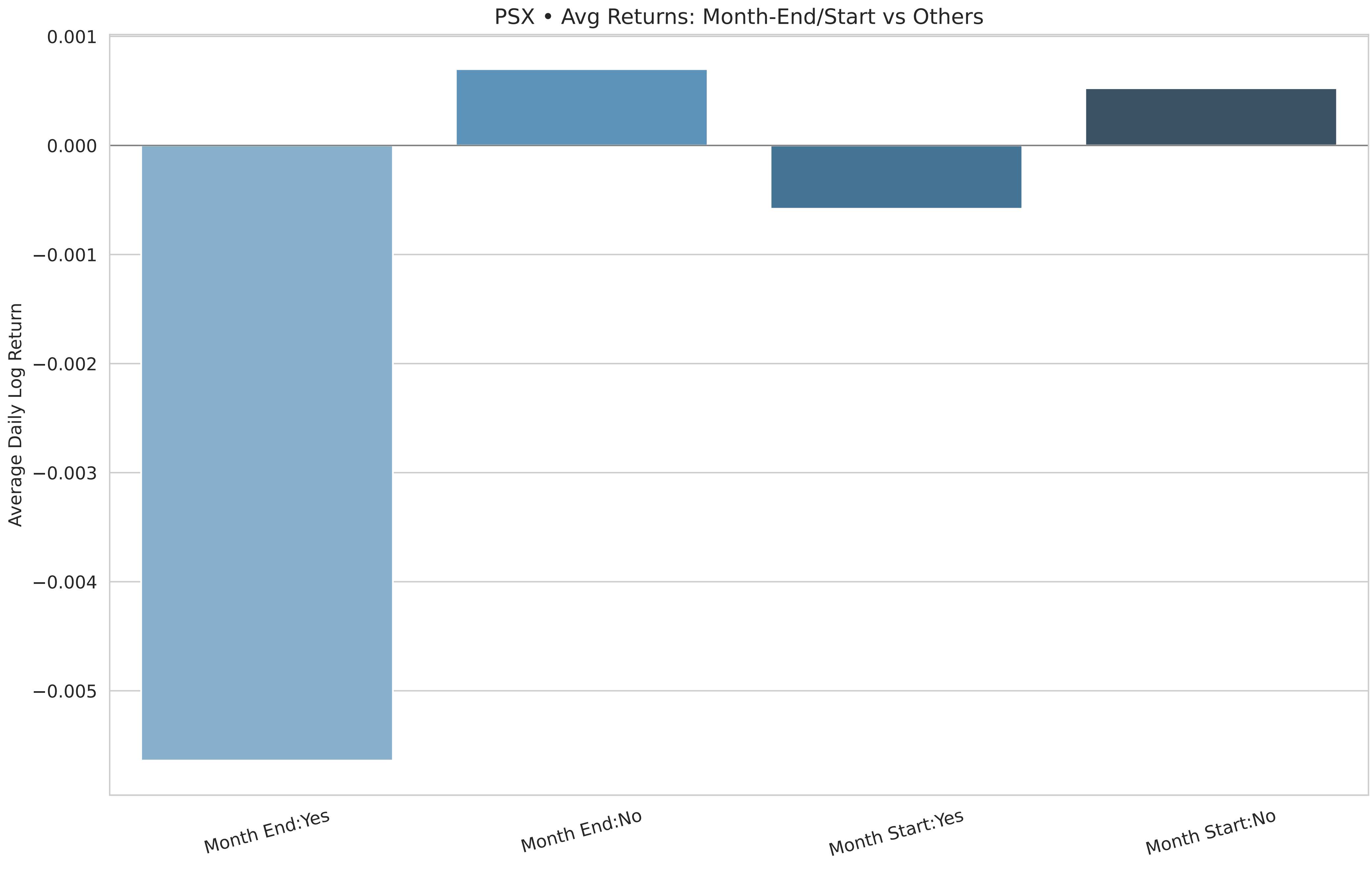


PSX • Day-of-Week Returns
Average (mean)
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
Daily log return
+0.0011
+0.0005
+0.0005
-0.0014
+0.0019
Mon
Tue
Wed
Thu
Fri
Day of Week


PSX • Quarterly Returns
Daily log return
0.20
0.15
0.10
0.05
0.00
−0.05
−0.10
−0.15
1
2
3
4
Quarter

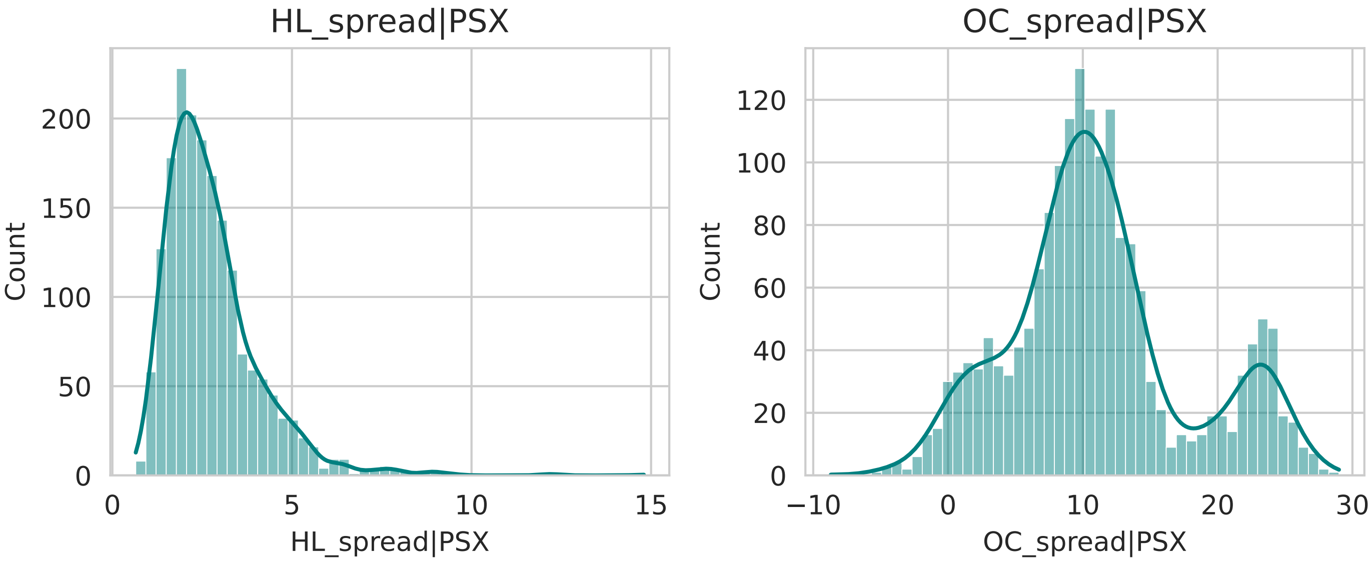


PSX • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.010
0.005
0.000
−0.005
−0.010
−0.015

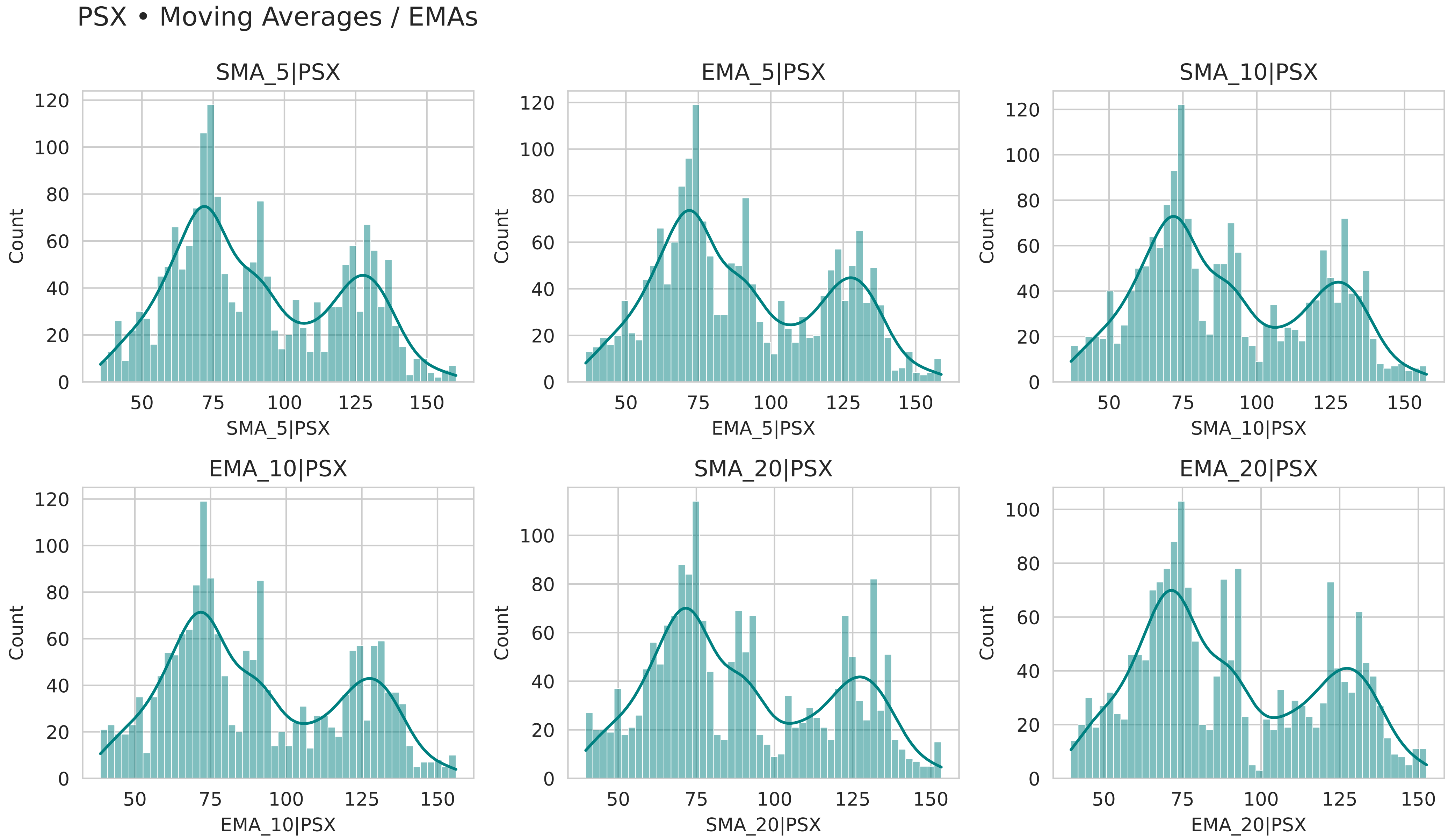


PSX • Avg Returns: Month-End/Start vs Others
0.001
0.000
−0.001
−0.002
−0.003
−0.004
−0.005
Average Daily Log Return
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

PSX • Spreads

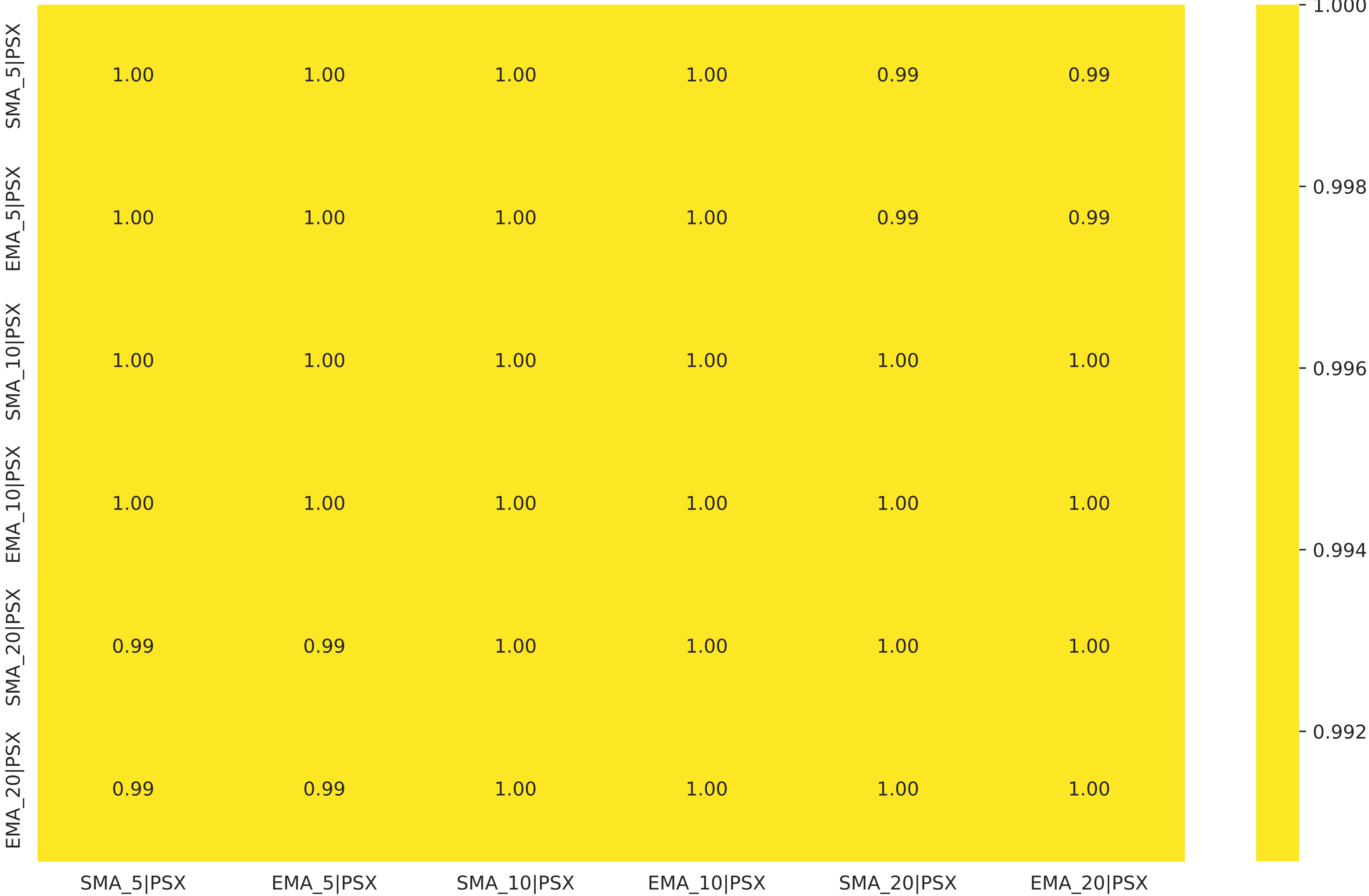


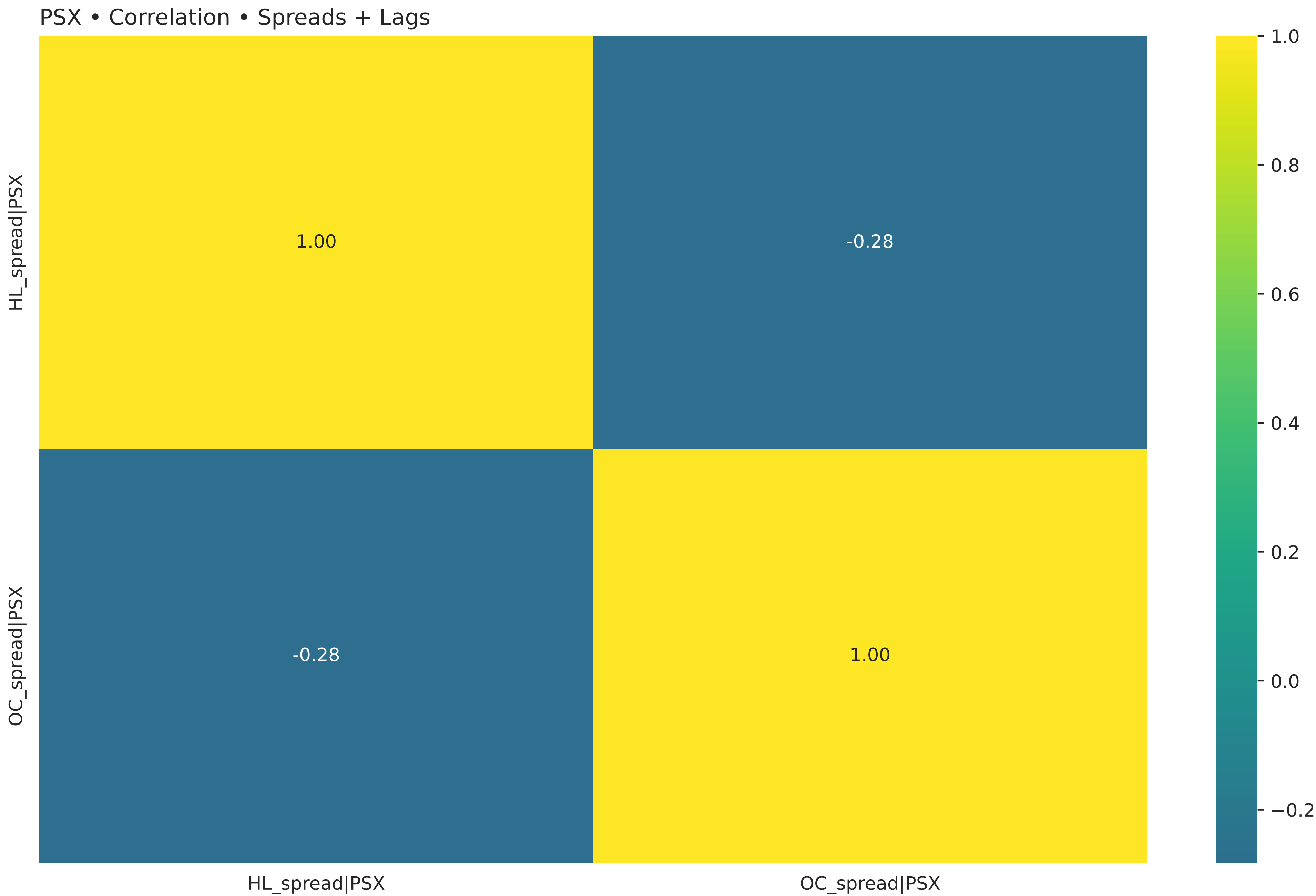
HL_spread|PSX
Count
200
150
100
50
0
0
5
10
15
HL_spread|PSX
OC_spread|PSX
Count
120
100
80
60
40
20
0
−10
0
10
20
30
OC_spread|PSX

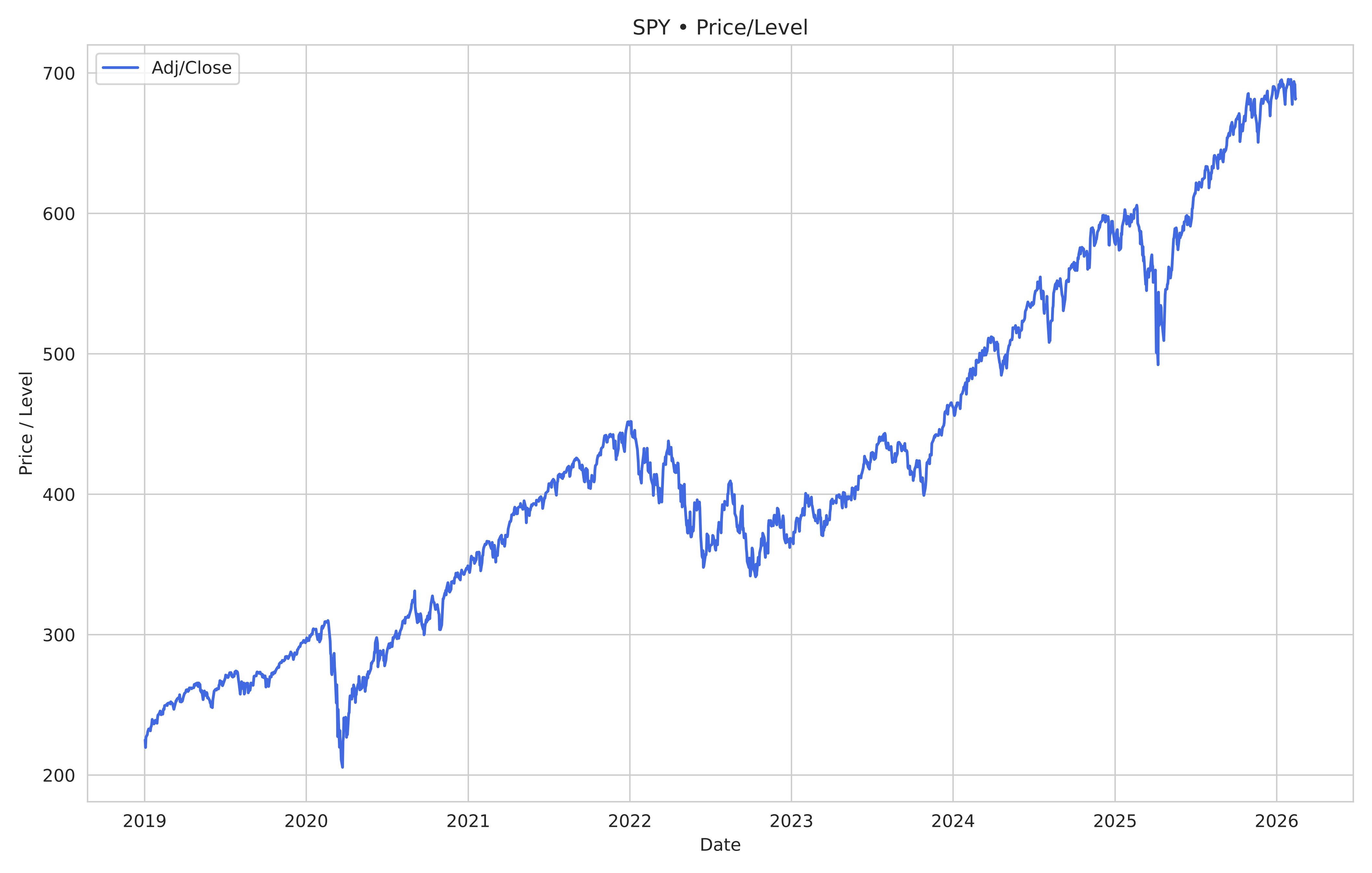


PSX • Moving Averages / EMAs
SMA_5|PSX
EMA_5|PSX
SMA_10|PSX
EMA_10|PSX
SMA_20|PSX
EMA_20|PSX
Count

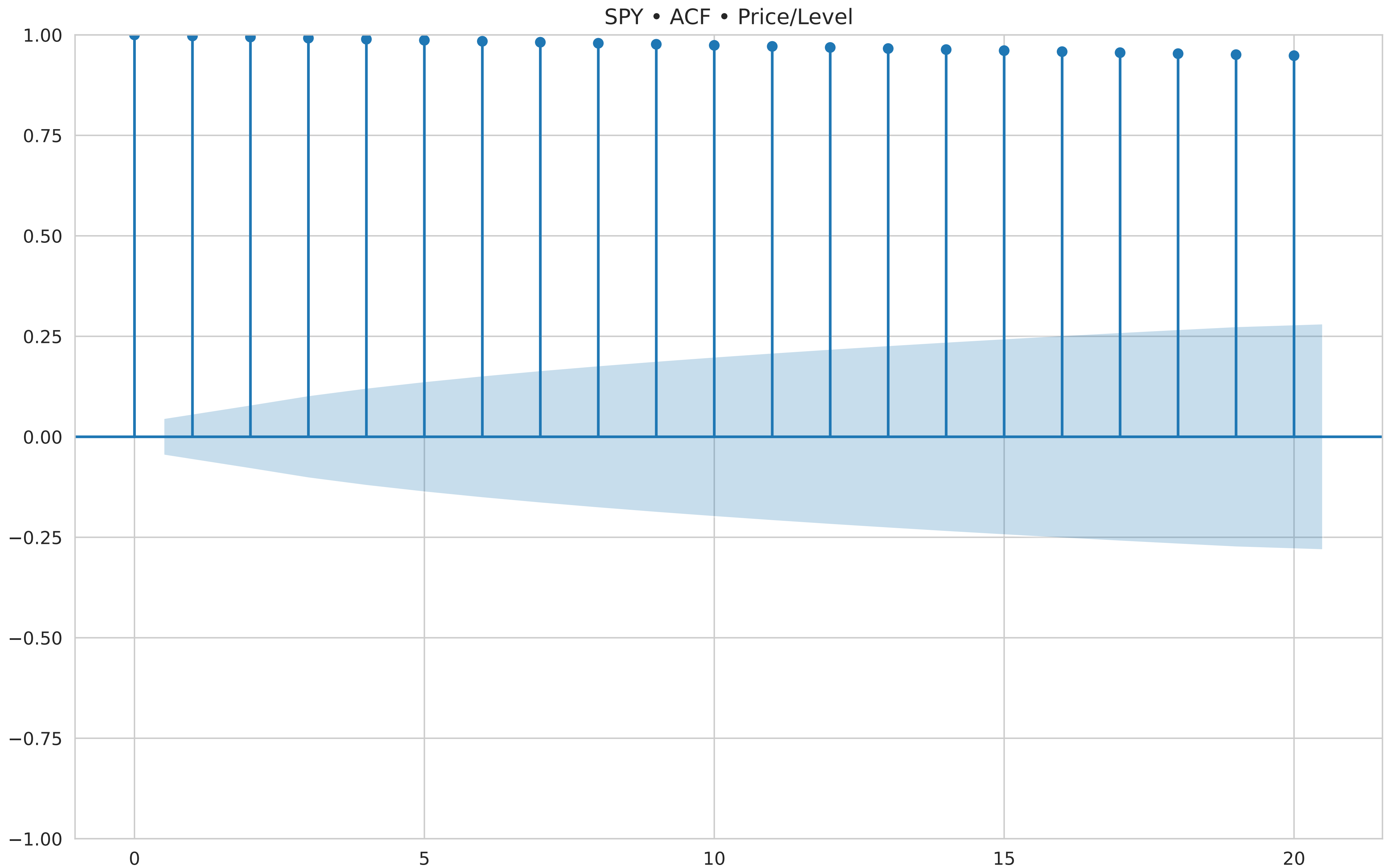
PSX • Correlation • Moving Averages

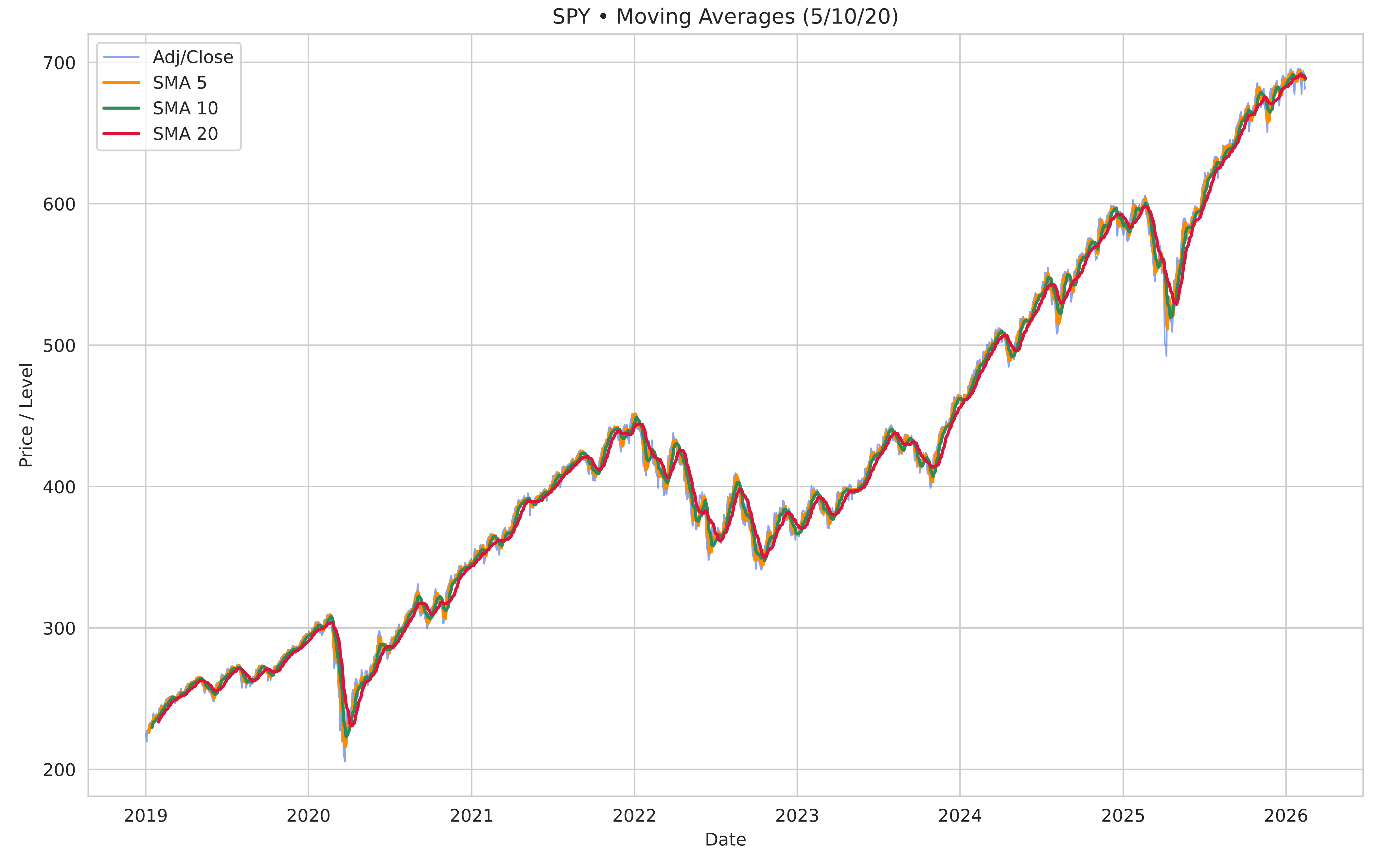


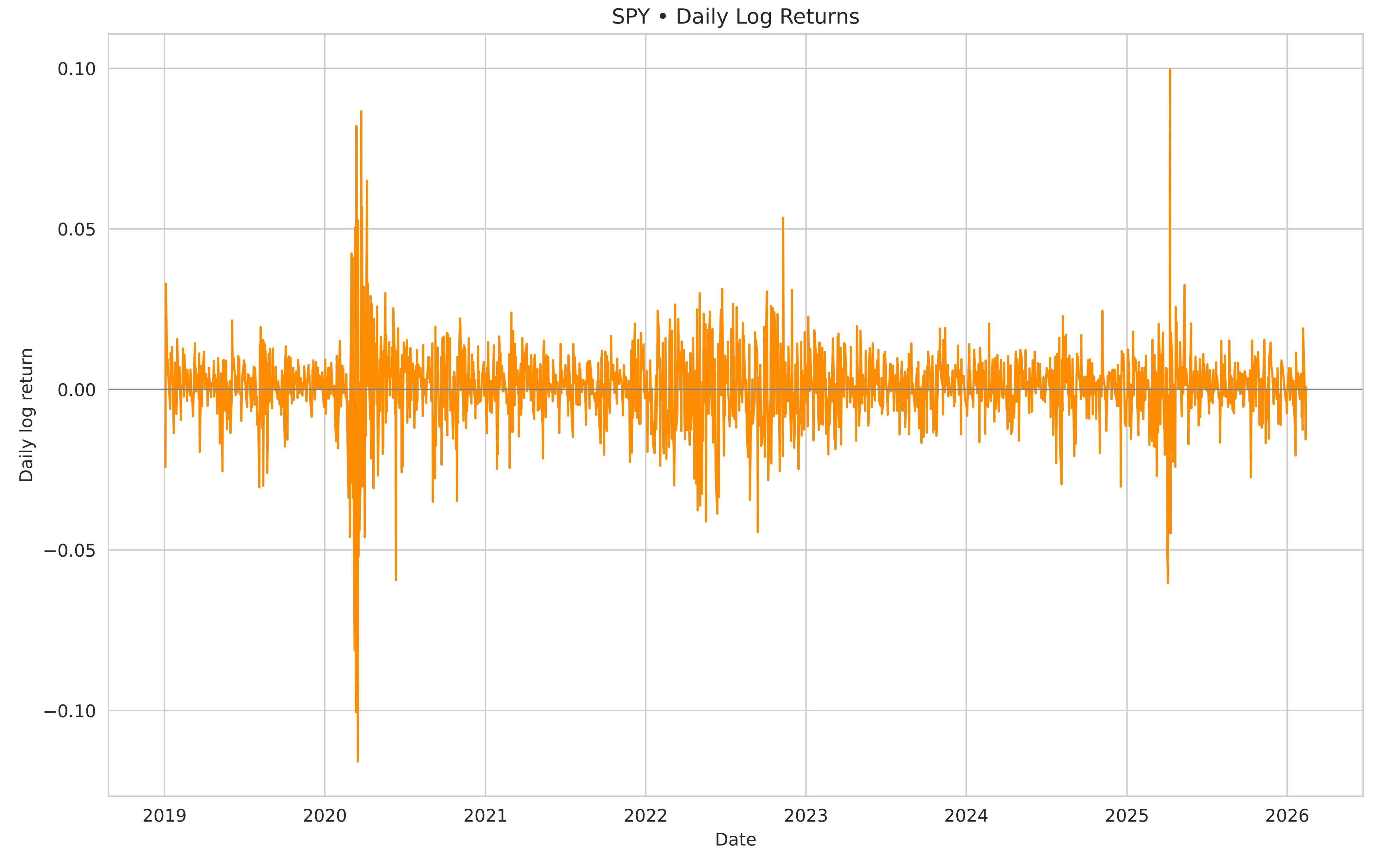

PSX • Correlation • Spreads + Lags
HL_spread|PSX
OC_spread|PSX
1.00
-0.28
-0.28
1.00
HL_spread|PSX
OC_spread|PSX
1.0
0.8
0.6
0.4
0.2
0.0
−0.2

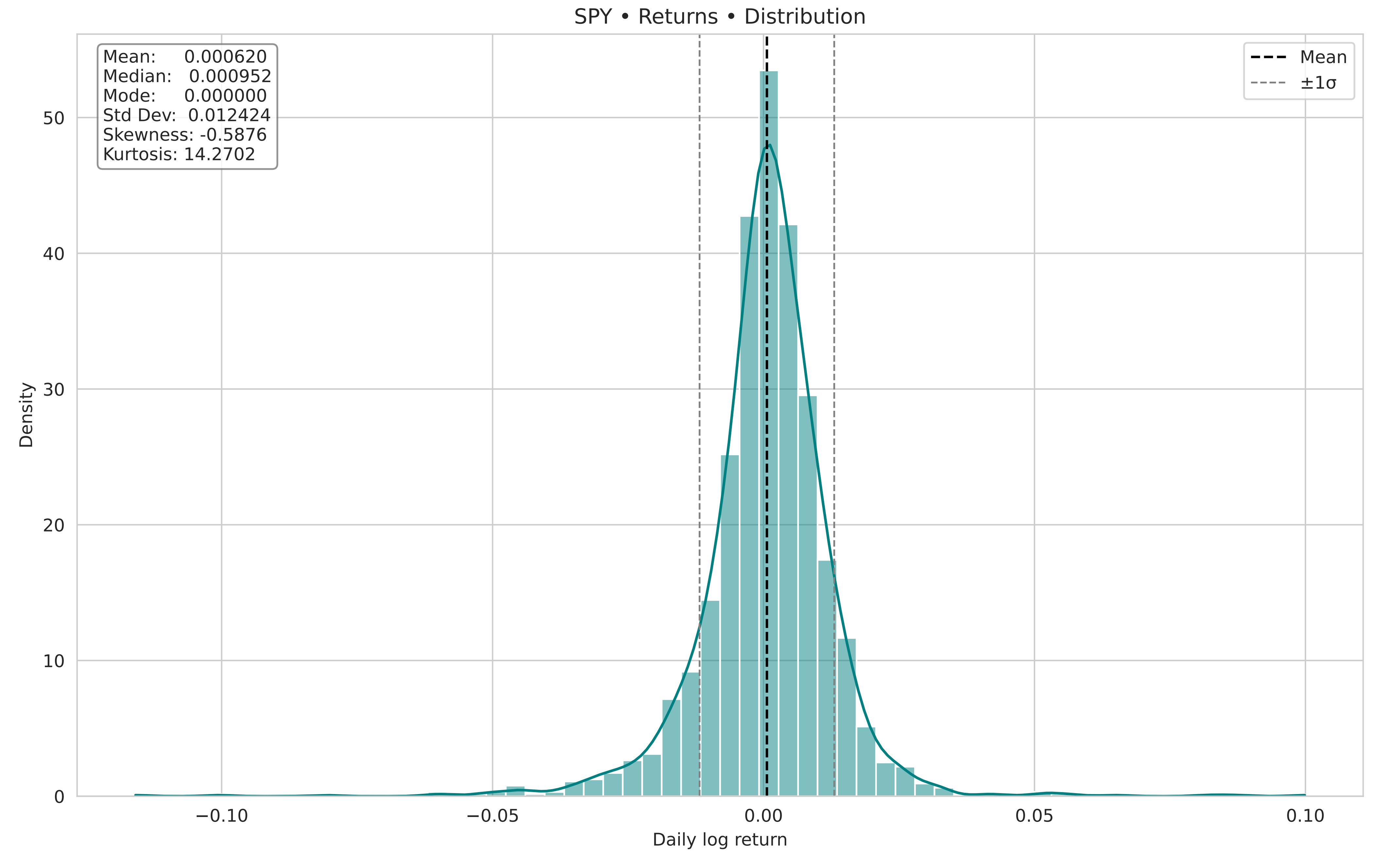


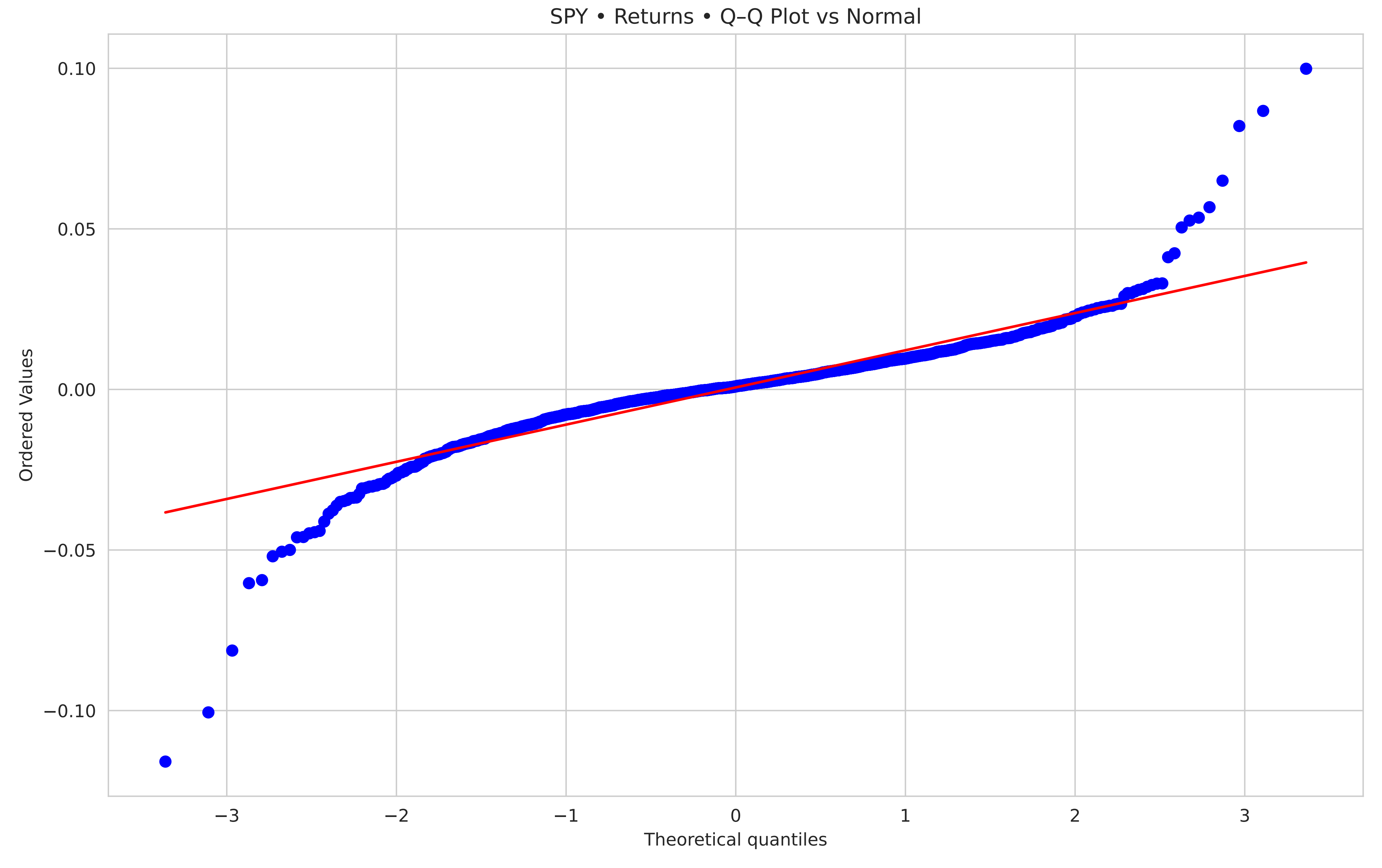
SPY • Price/Level
Adj/Close
Price / Level
700
600
500
400
300
200
2019
2020
2021
2022
2023
2024
2025
2026
Date

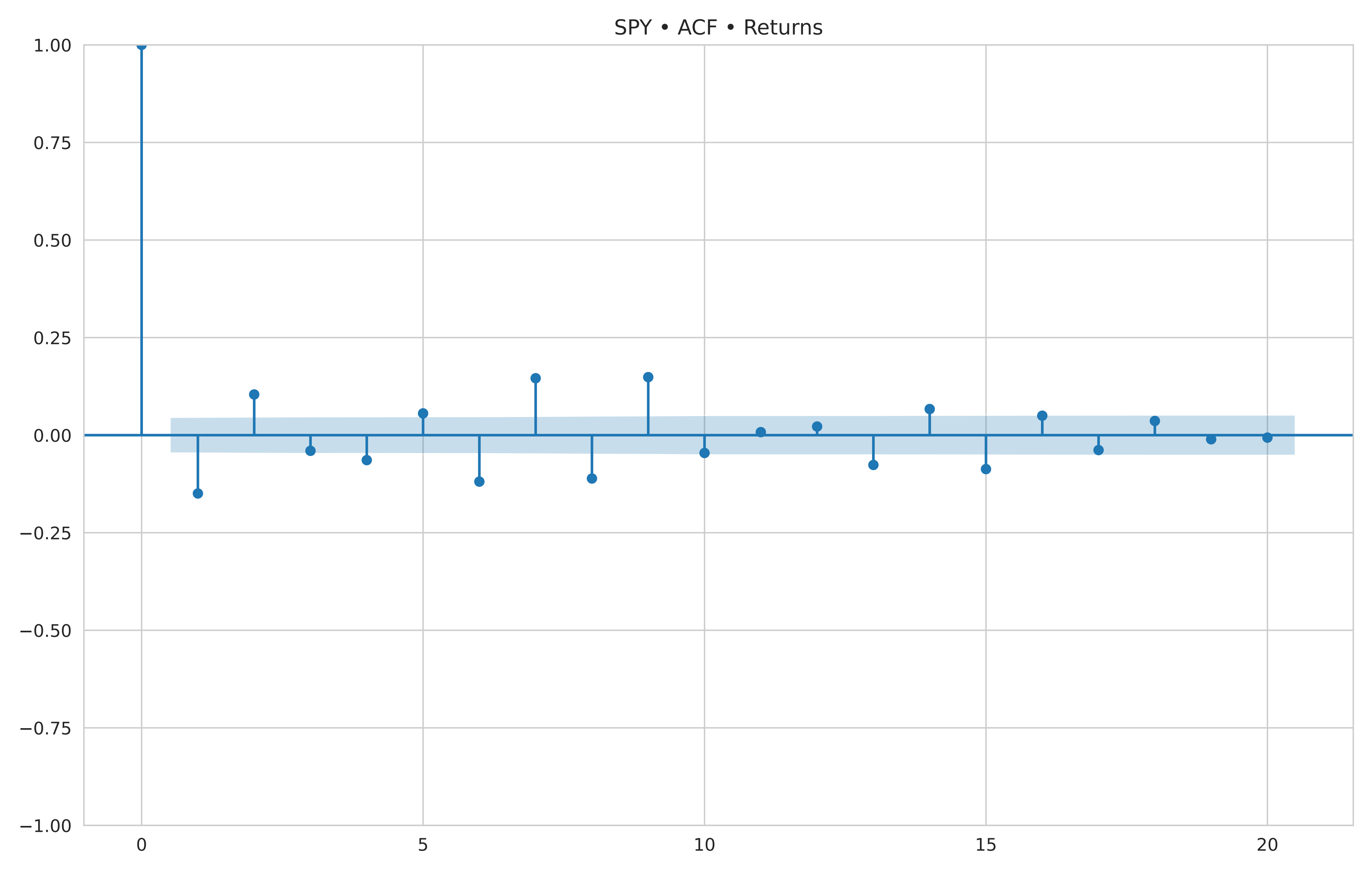

SPY • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

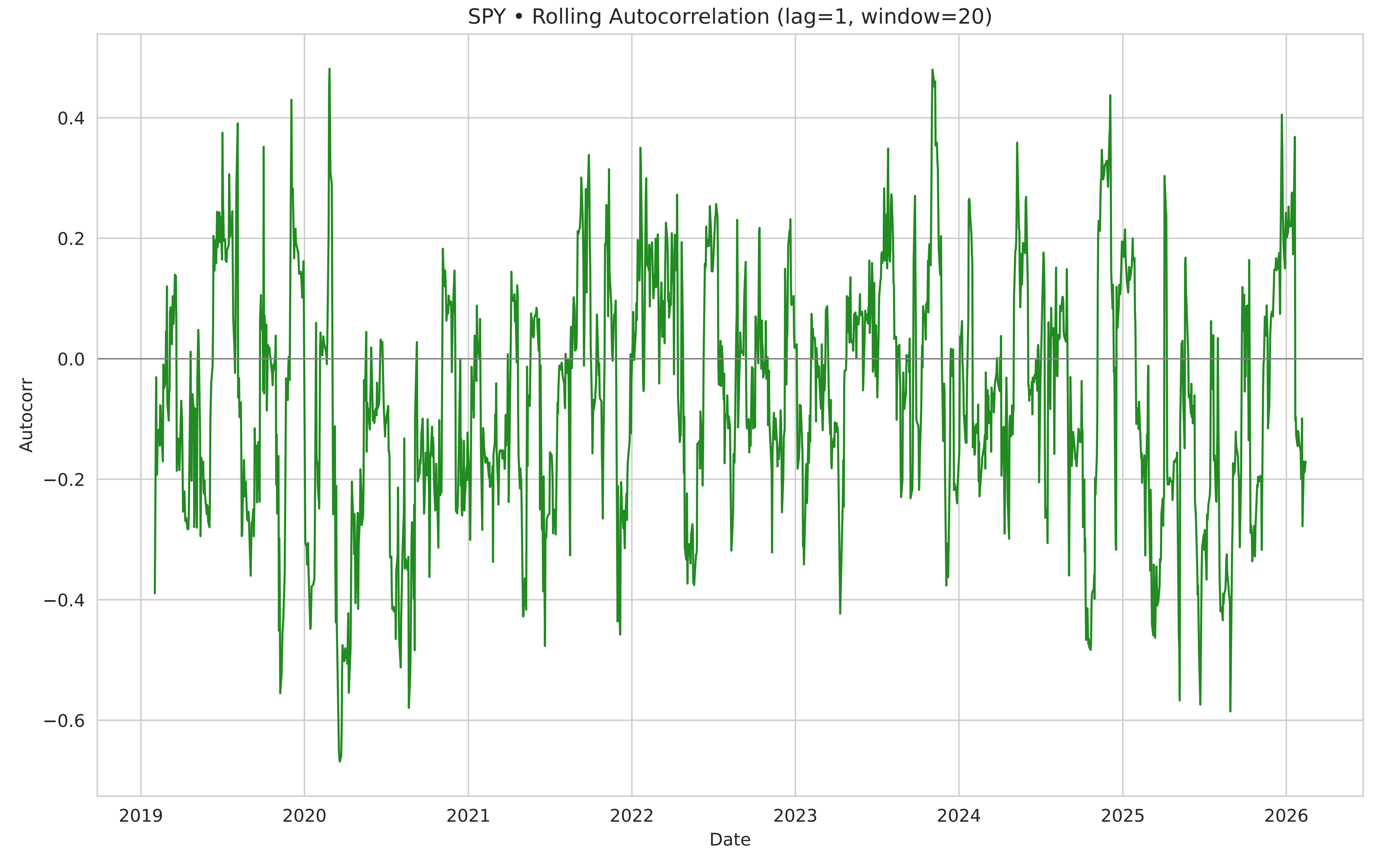

SPY • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price / Level
700
600
500
400
300
200
2019
2020
2021
2022
2023
2024
2025
2026
Date

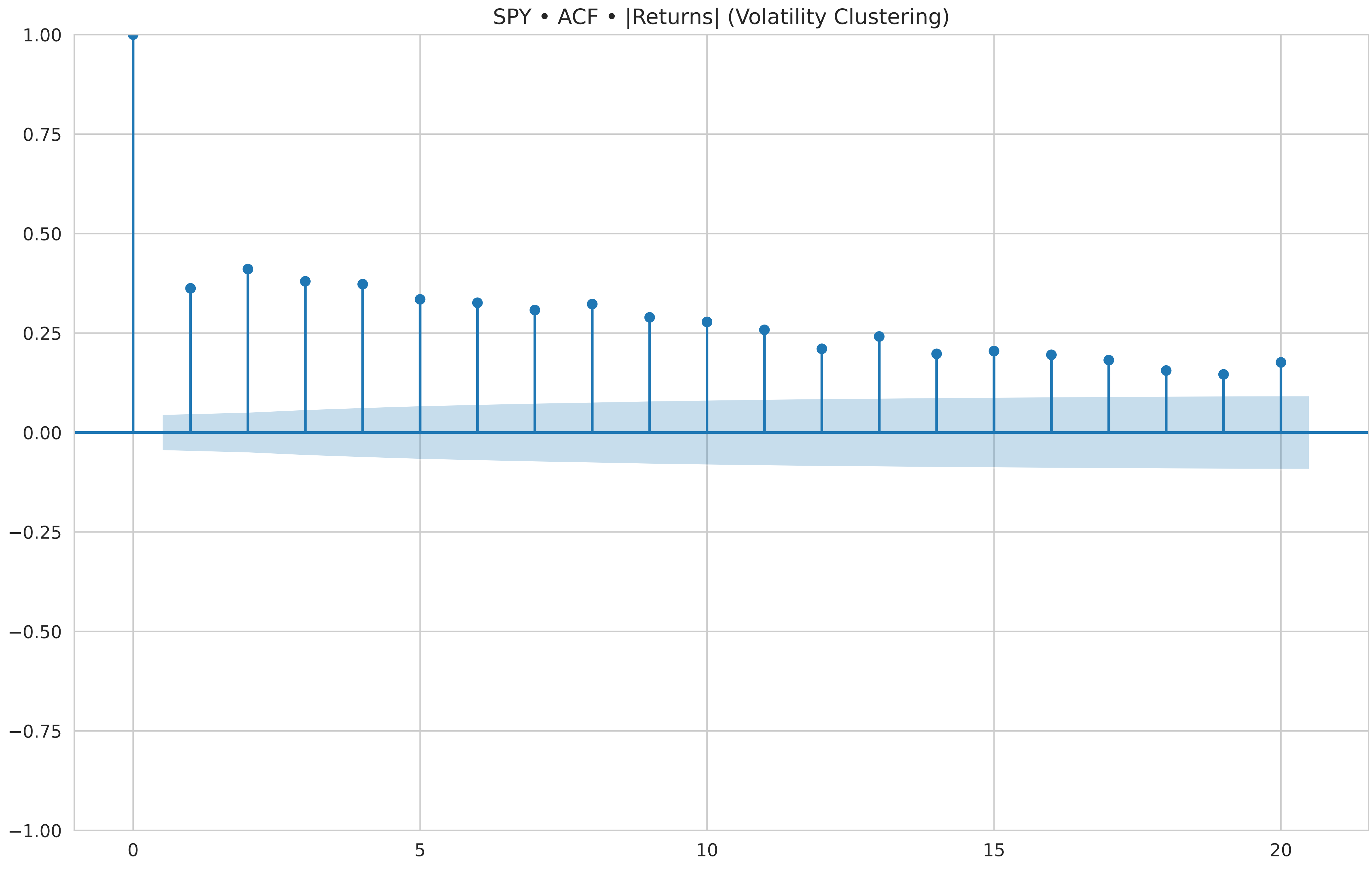

SPY • Daily Log Returns
Daily log return
0.10
0.05
0.00
−0.05
−0.10
2019
2020
2021
2022
2023
2024
2025
2026
Date


SPY • Returns • Distribution
Mean: 0.000620
Median: 0.000952
Mode: 0.000000
Std Dev: 0.012424
Skewness: -0.5876
Kurtosis: 14.2702
Mean
±1σ
Density
Daily log return
0
10
20
30
40
50
−0.10
−0.05
0.00
0.05
0.10

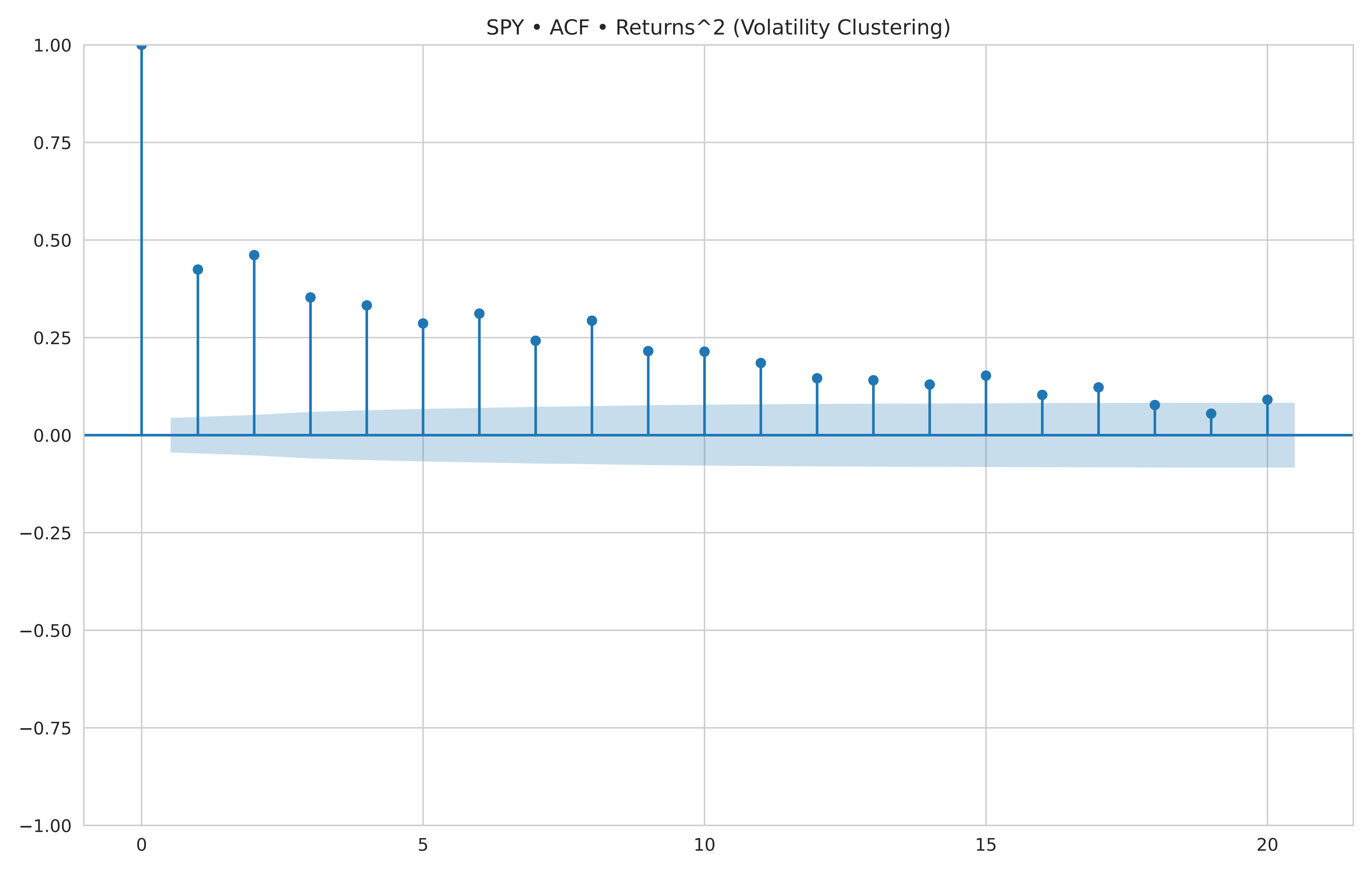

SPY • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.10
0.05
0.00
−0.05
−0.10
−3
−2
−1
0
1
2
3

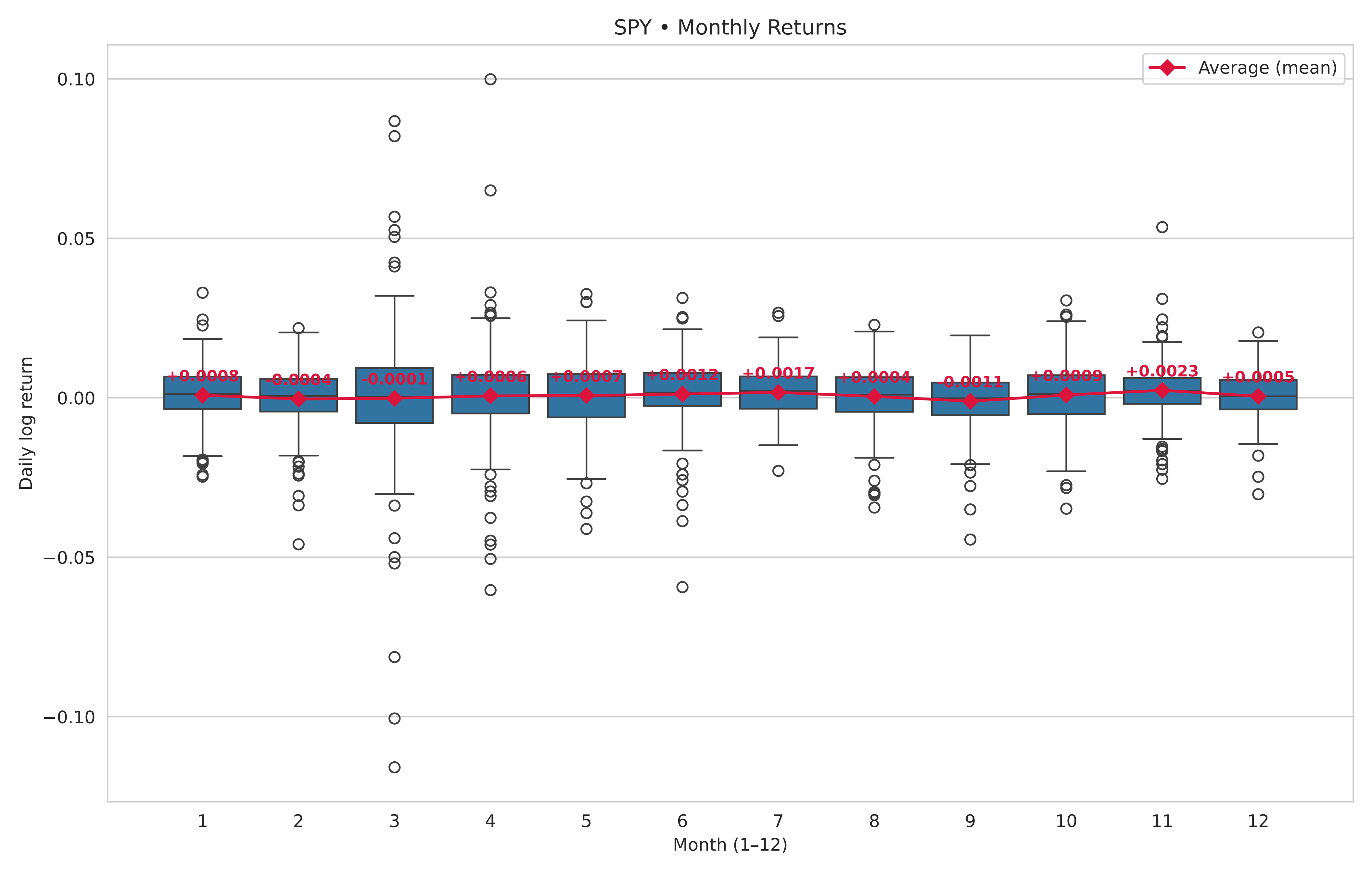

SPY • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20


SPY • Rolling Autocorrelation (lag=1, window=20)
Autocorr
Date
0.4
0.2
0.0
−0.2
−0.4
−0.6
2019
2020
2021
2022
2023
2024
2025
2026

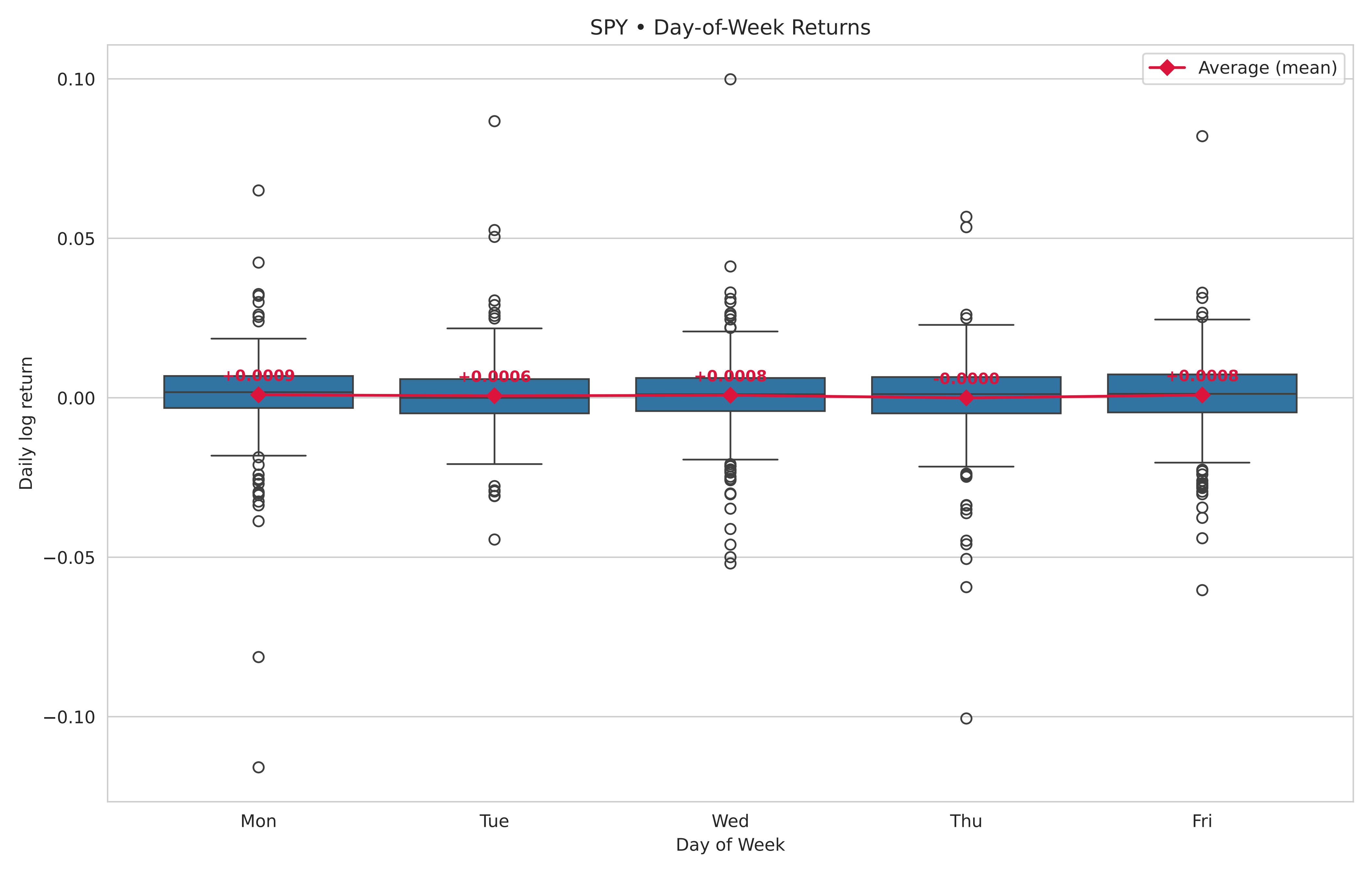


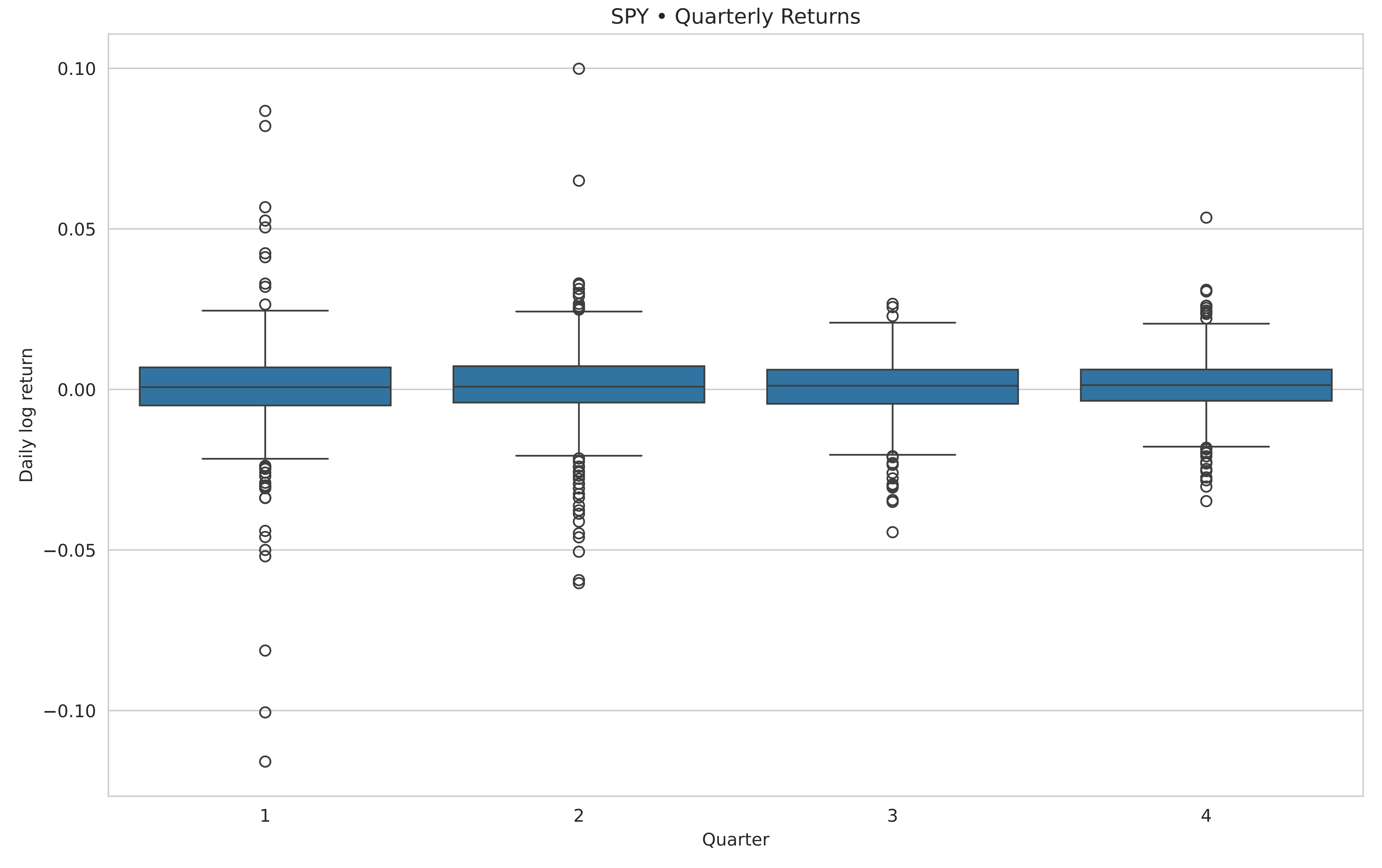
SPY • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

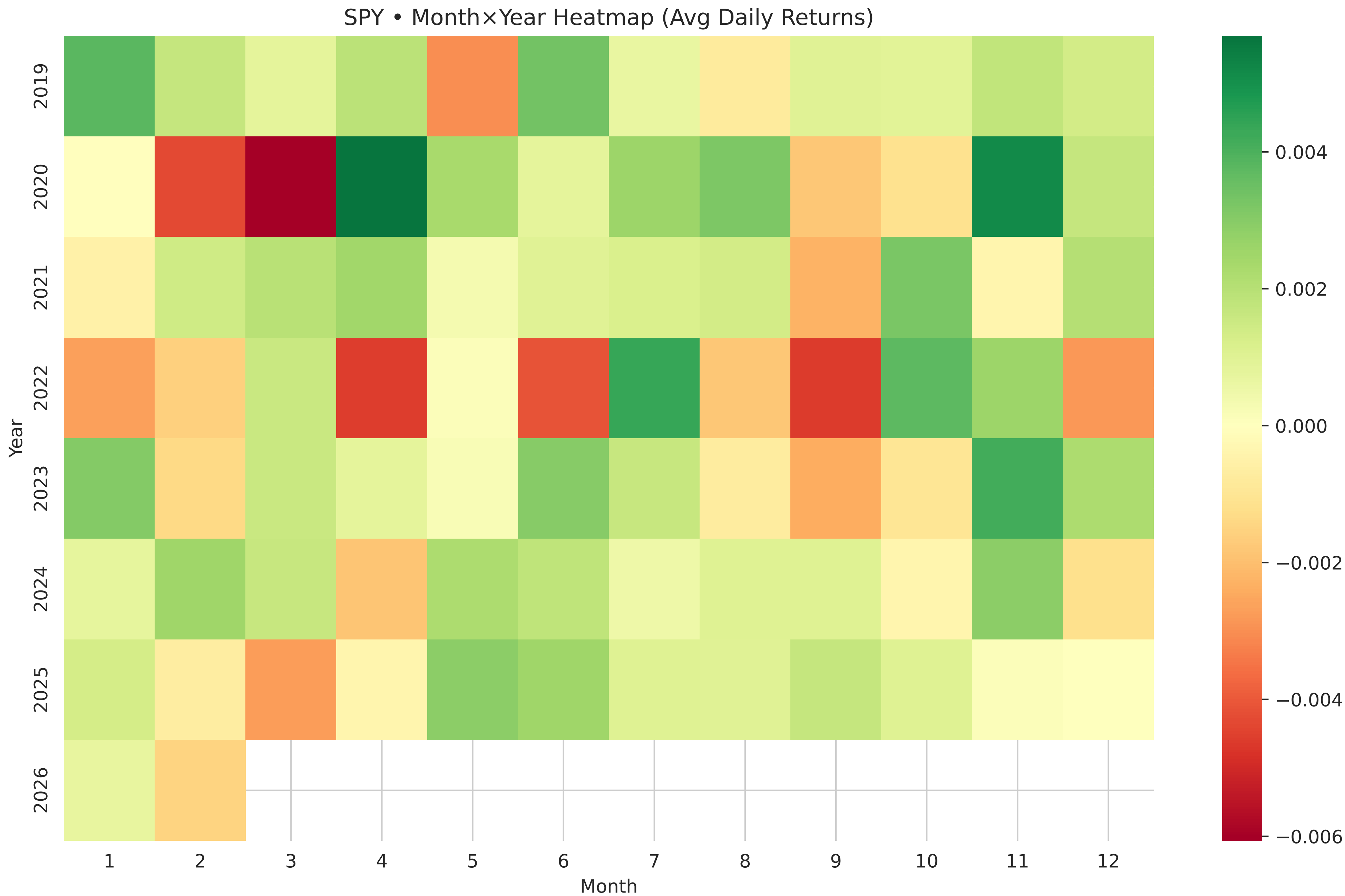

SPY • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



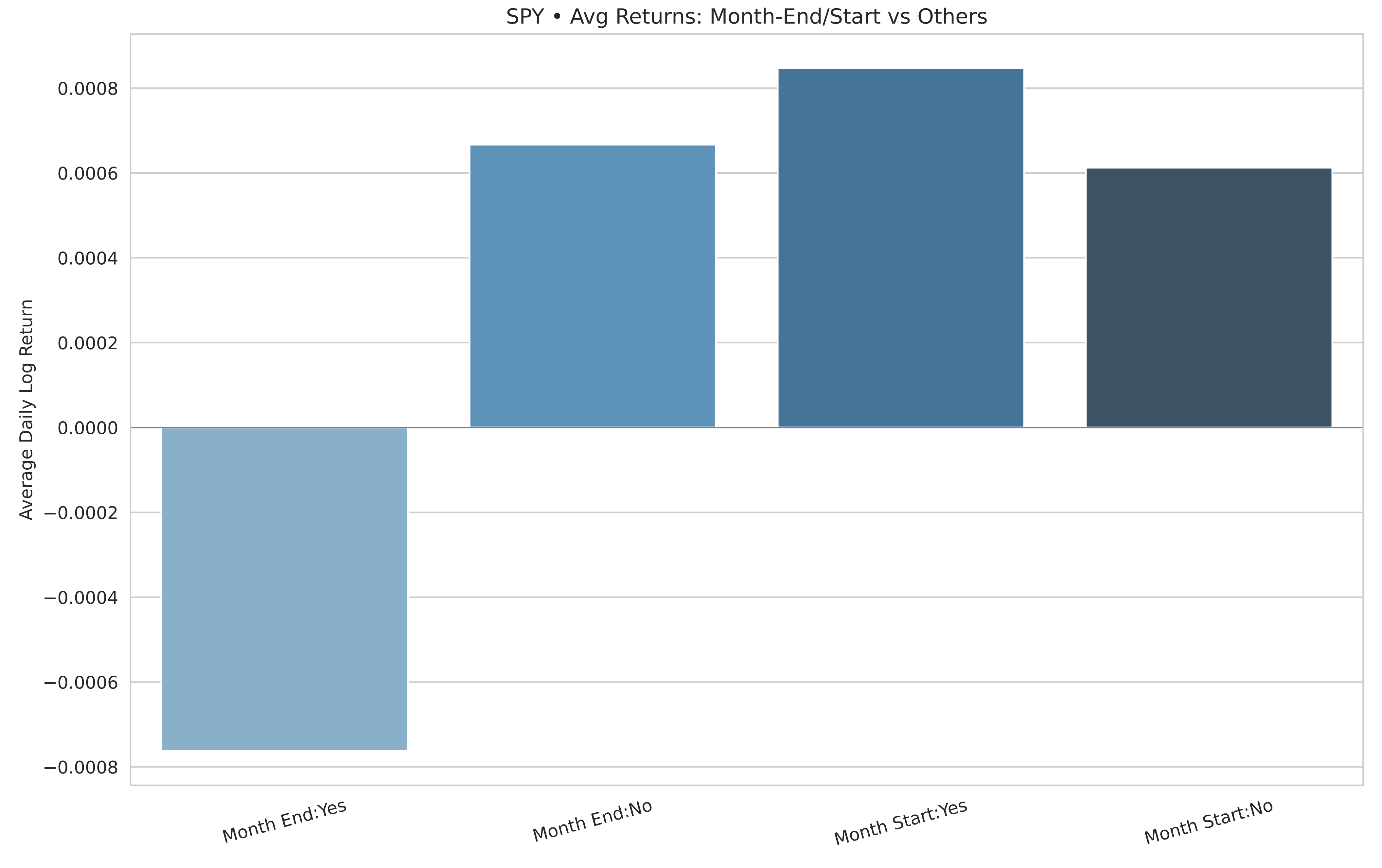
SPY • Monthly Returns
Average (mean)
0.10
0.05
0.00
−0.05
−0.10
Daily log return
+0.0008
-0.0004
-0.0001
+0.0006
+0.0007
+0.0012
+0.0017
+0.0004
-0.0011
+0.0009
+0.0023
+0.0005
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)


SPY • Day-of-Week Returns
Average (mean)
0.10
0.05
0.00
−0.05
−0.10
Daily log return
+0.0009
+0.0006
+0.0008
-0.0000
+0.0008
Mon
Tue
Wed
Thu
Fri
Day of Week

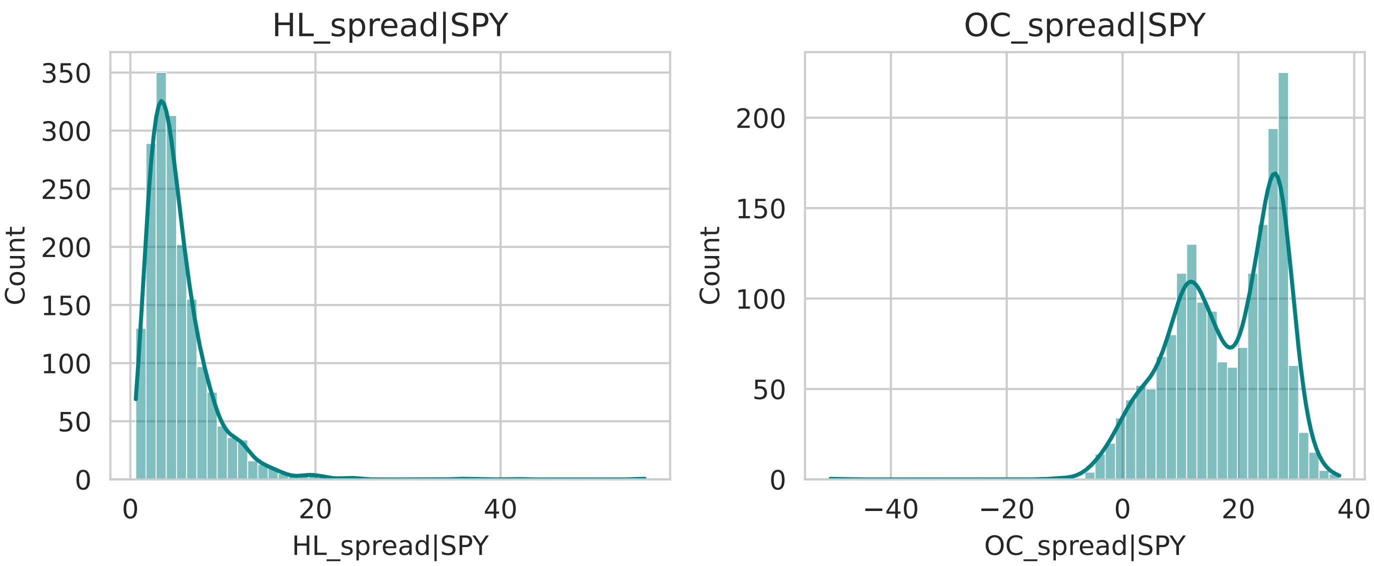

SPY • Quarterly Returns
Daily log return
0.10
0.05
0.00
−0.05
−0.10
1
2
3
4
Quarter



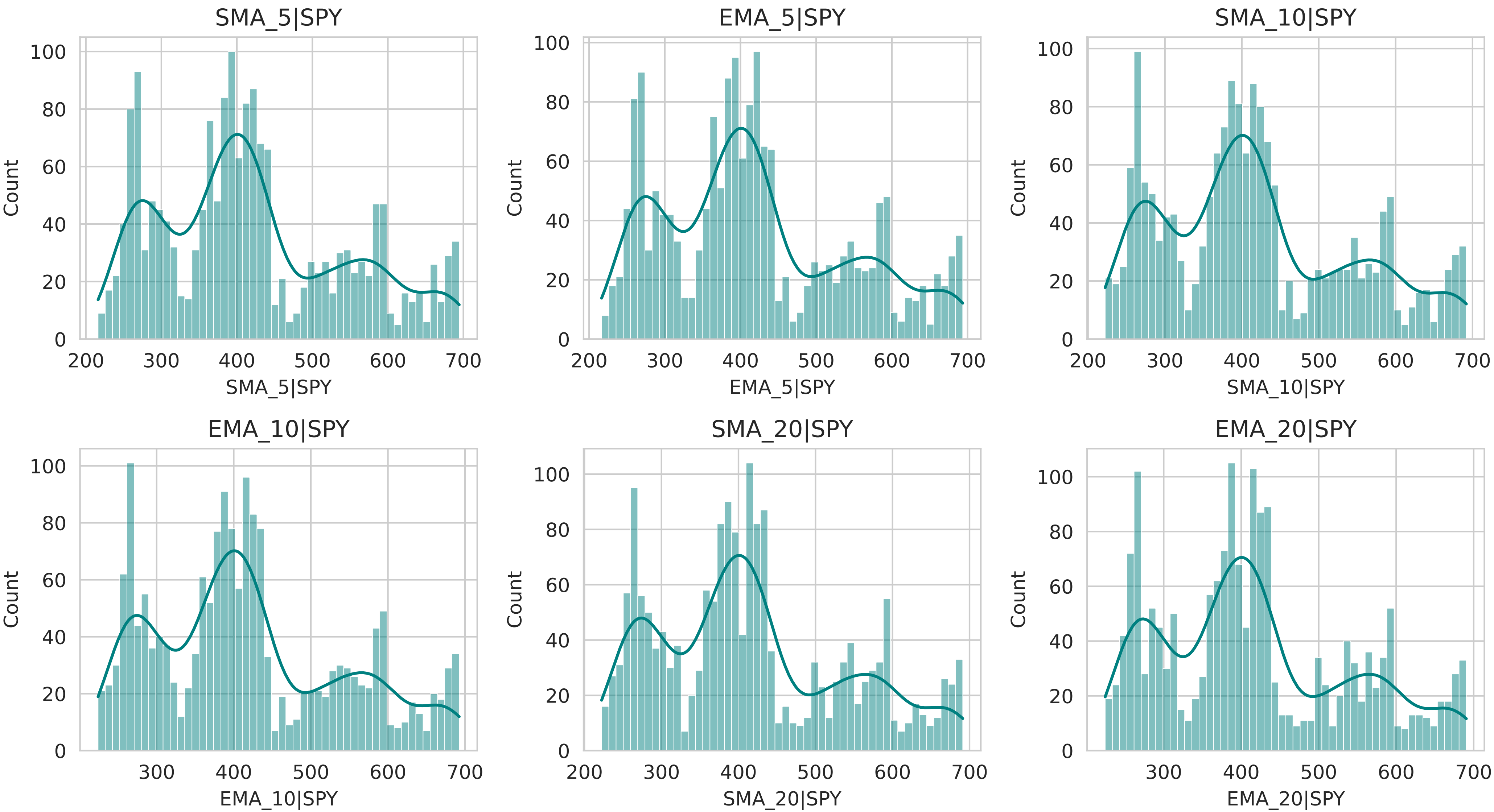
SPY • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.004
0.002
0.000
−0.002
−0.004
−0.006


SPY • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.0008
0.0006
0.0004
0.0002
0.0000
−0.0002
−0.0004
−0.0006
−0.0008
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

SPY • Spreads

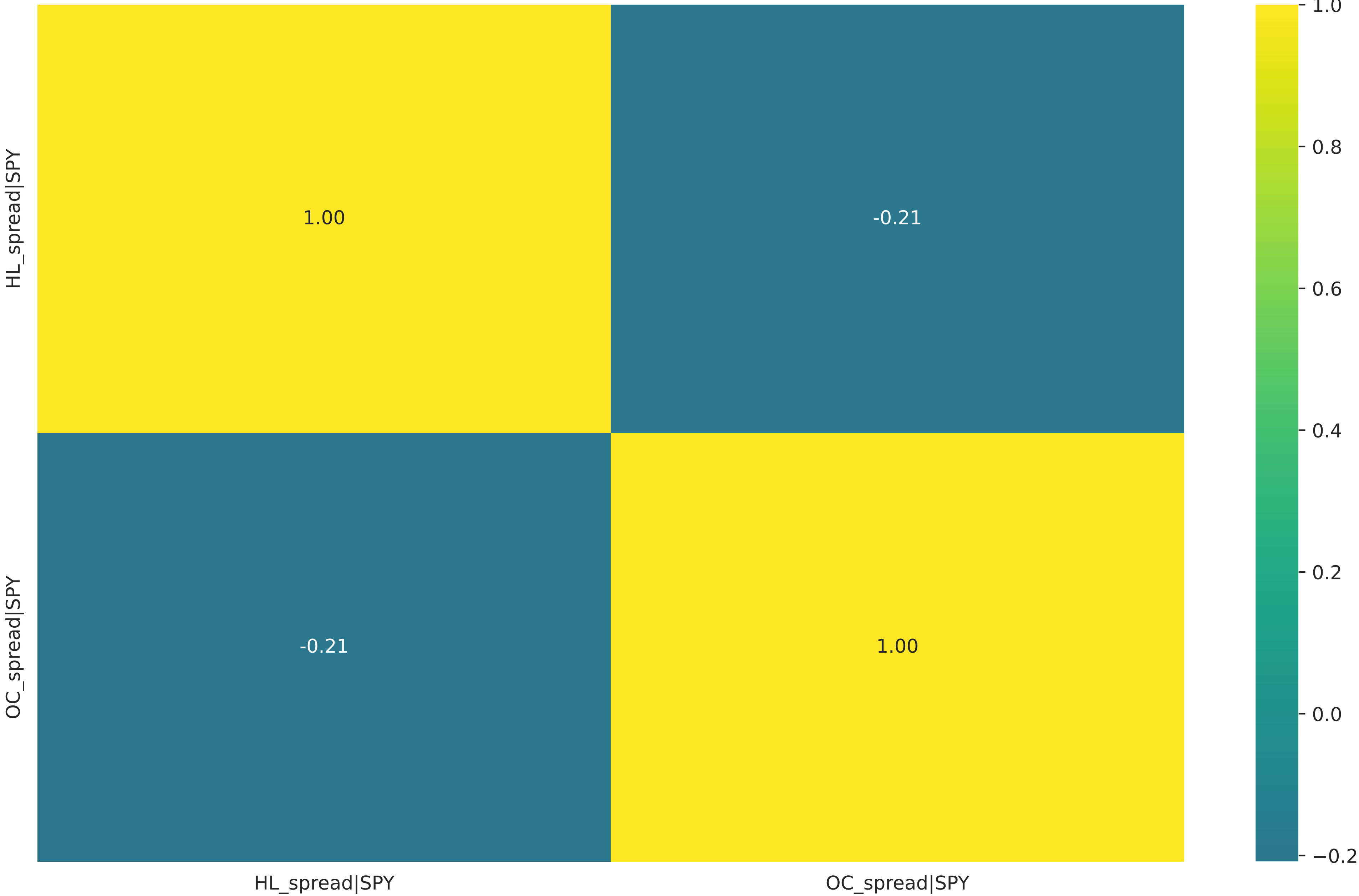

HL_spread|SPY
Count
350
300
250
200
150
100
50
0
0
20
40
HL_spread|SPY
OC_spread|SPY
Count
200
150
100
50
0
−40
−20
0
20
40
OC_spread|SPY

SPY • Moving Averages / EMAs

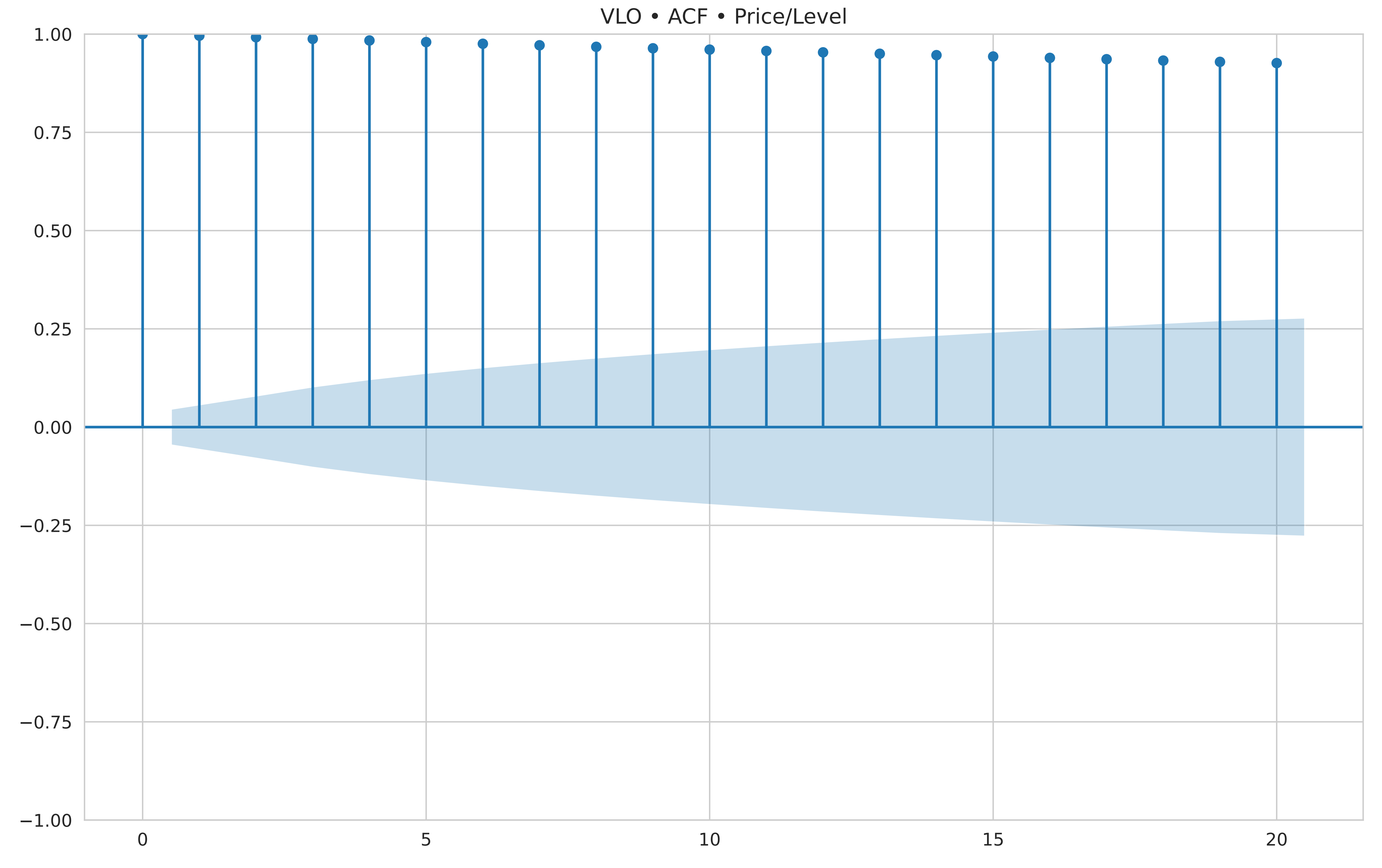



SPY • Correlation • Moving Averages
SMA_5|SPY
EMA_5|SPY
SMA_10|SPY
EMA_10|SPY
SMA_20|SPY
EMA_20|SPY
1.00
1.00000
0.99975
0.99950
0.99925
0.99900
0.99875
0.99850
0.99825
0.99800

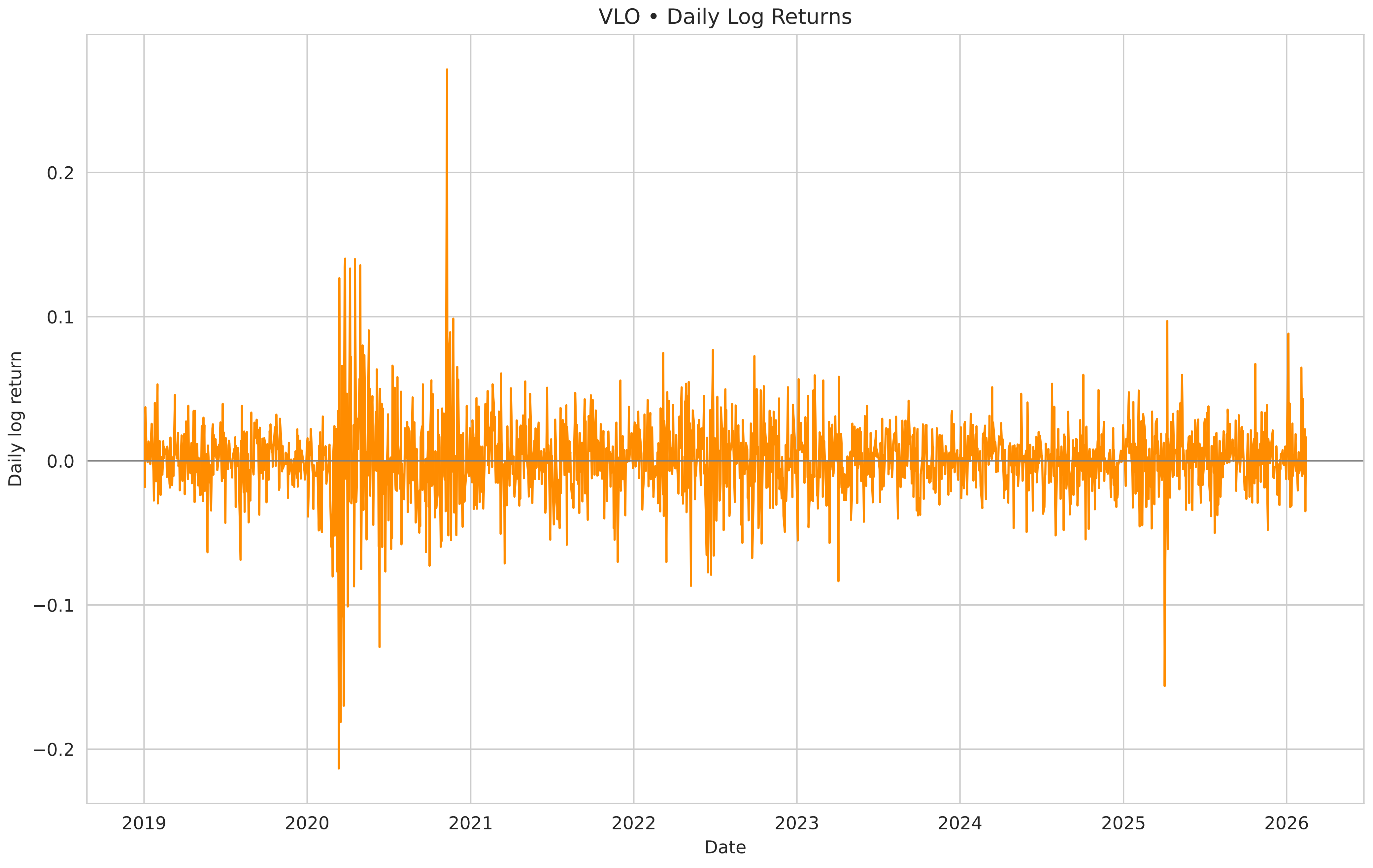
SPY • Correlation • Spreads + Lags



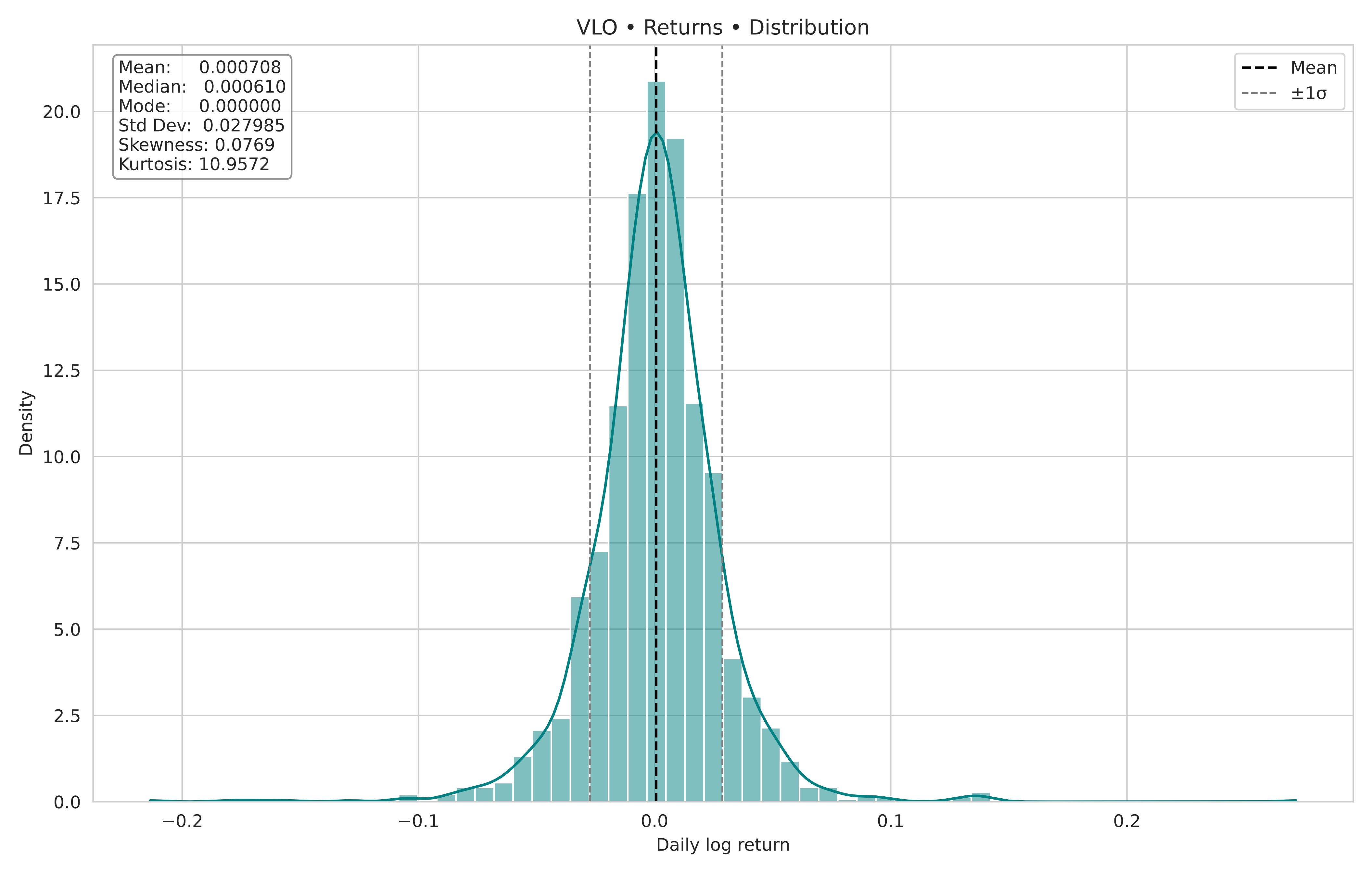

VLO • Price/Level
Adj/Close
200
175
150
125
100
75
50
25
Price / Level
2019
2020
2021
2022
2023
2024
2025
2026
Date


VLO • ACF • Price/Level
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

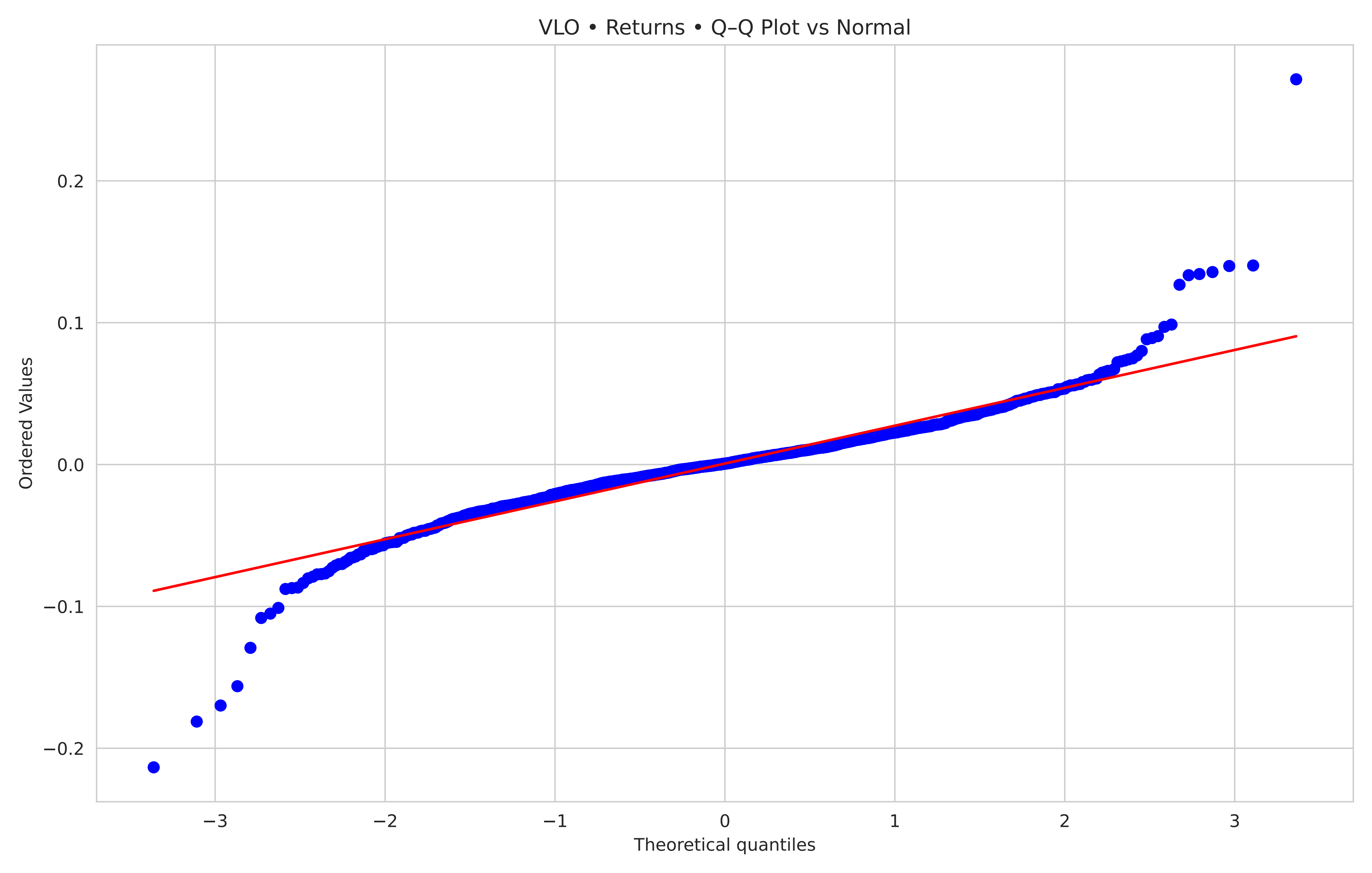
VLO • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price / Level
Date
200
175
150
125
100
75
50
25
2019
2020
2021
2022
2023
2024
2025
2026



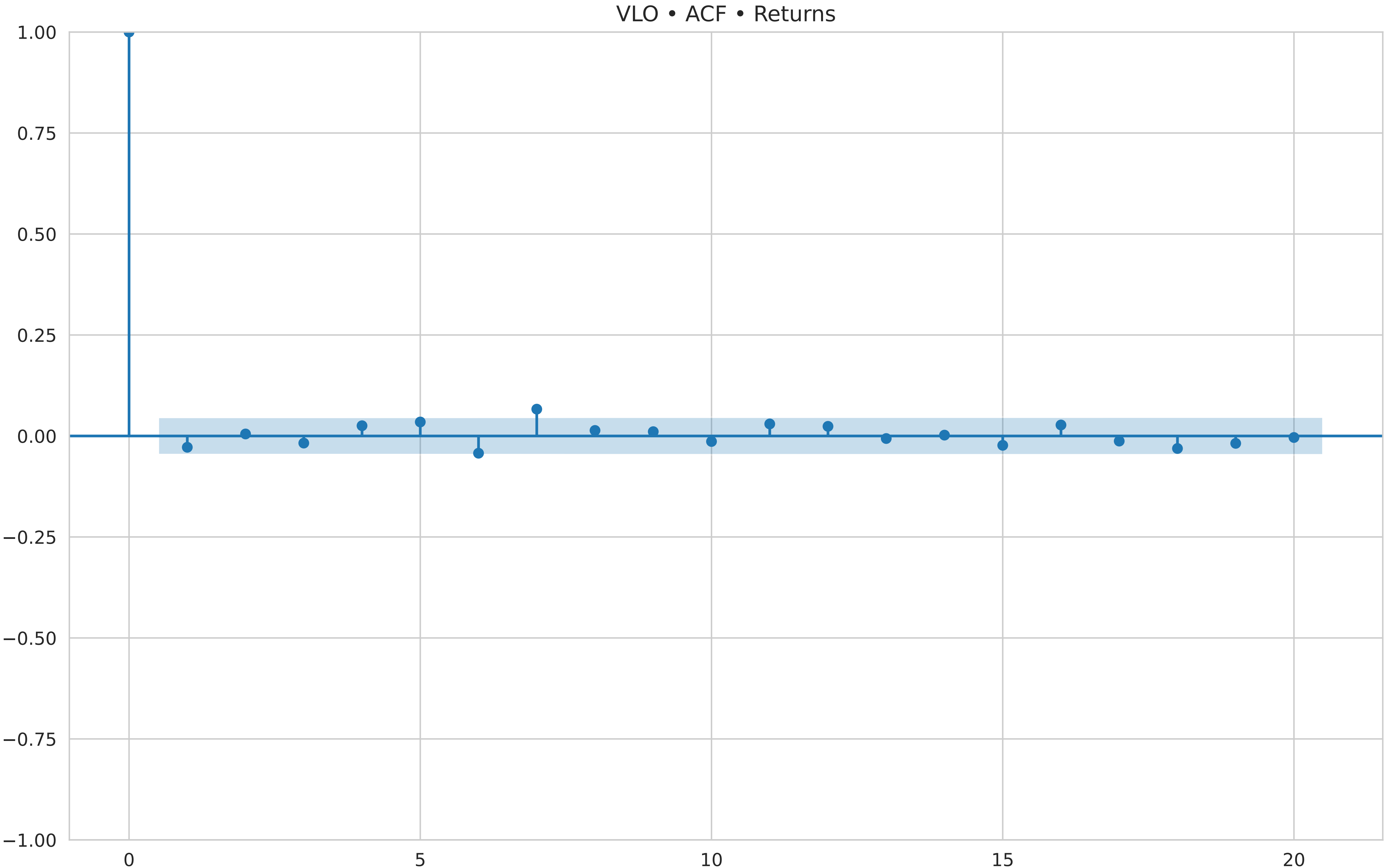
VLO • Daily Log Returns
0.2
0.1
0.0
−0.1
−0.2
Daily log return
2019
2020
2021
2022
2023
2024
2025
2026
Date

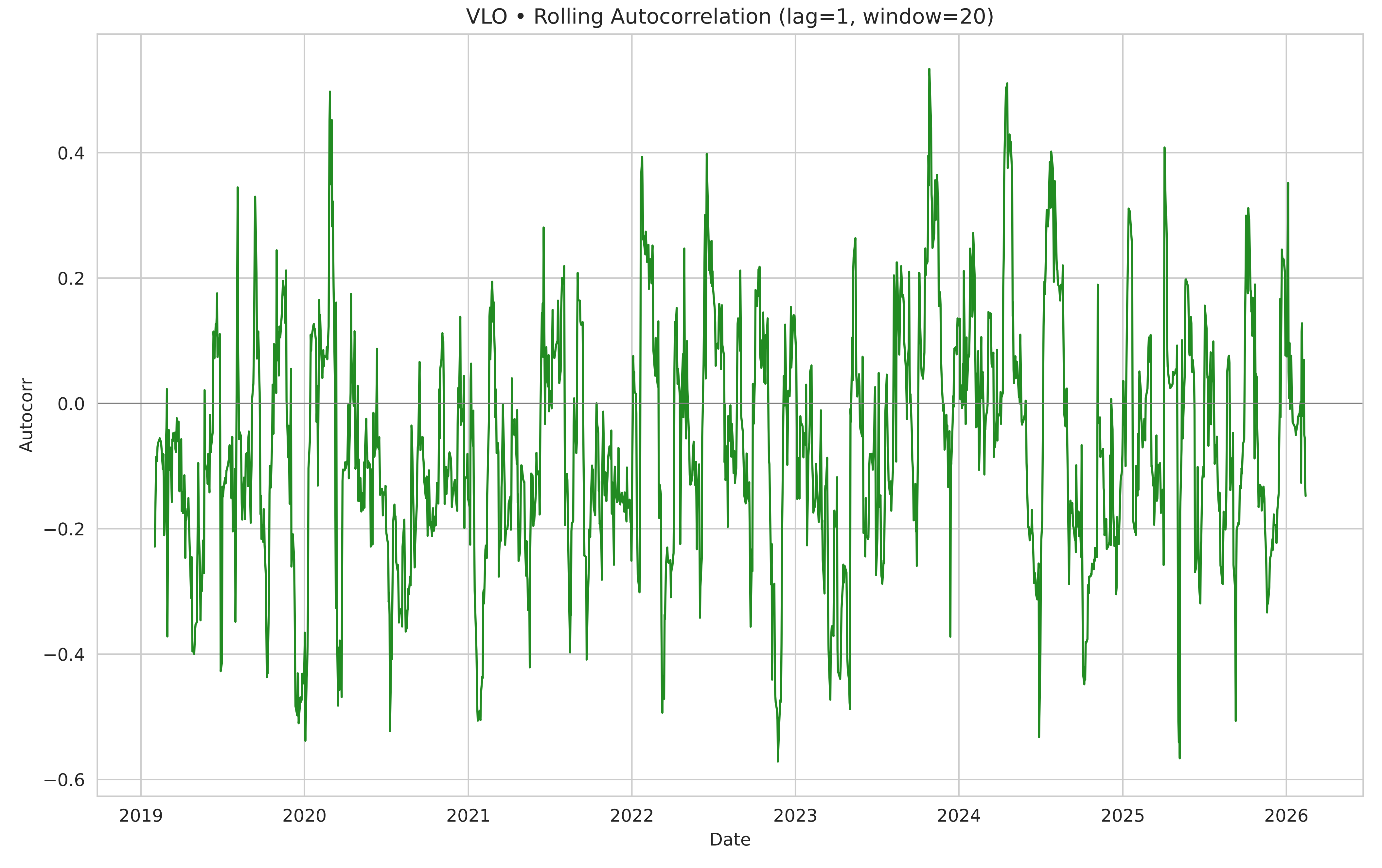


VLO • Returns • Distribution
Mean: 0.000708
Median: 0.000610
Mode: 0.000000
Std Dev: 0.027985
Skewness: 0.0769
Kurtosis: 10.9572
Mean
±1σ
Density
Daily log return
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
−0.2
−0.1
0.0
0.1
0.2

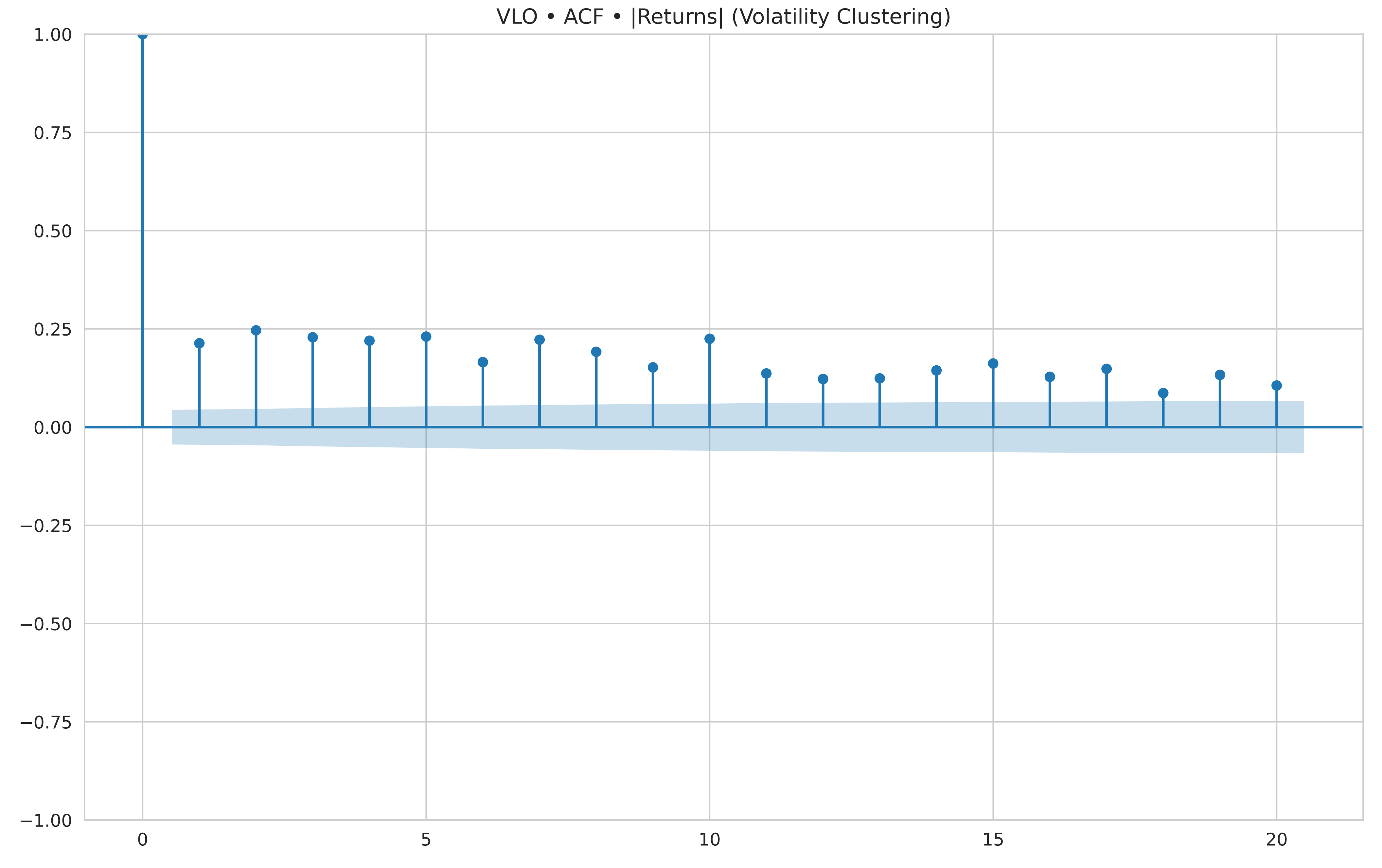


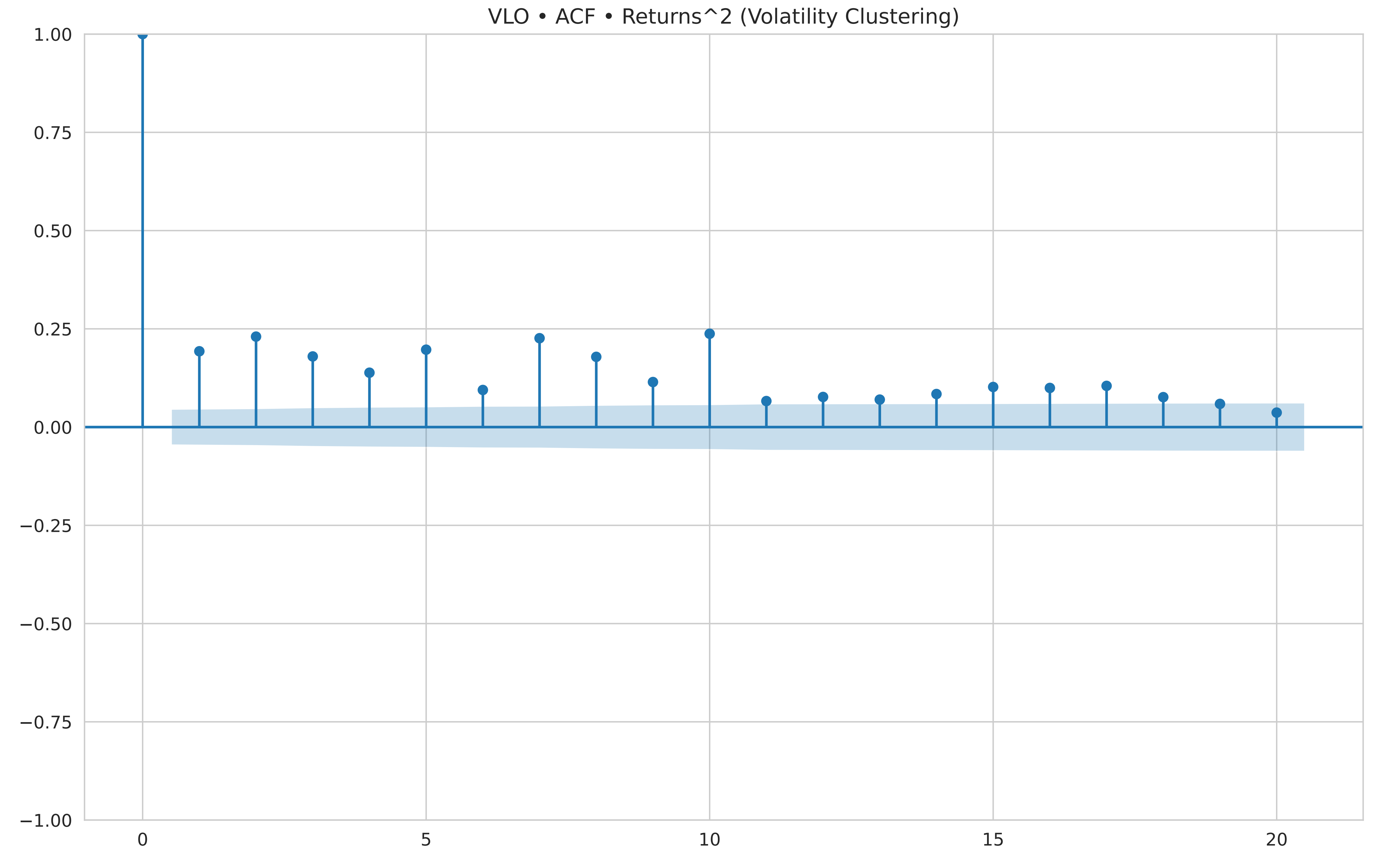
VLO • Returns • Q–Q Plot vs Normal
Ordered Values
0.2
0.1
0.0
−0.1
−0.2
Theoretical quantiles
−3
−2
−1
0
1
2
3

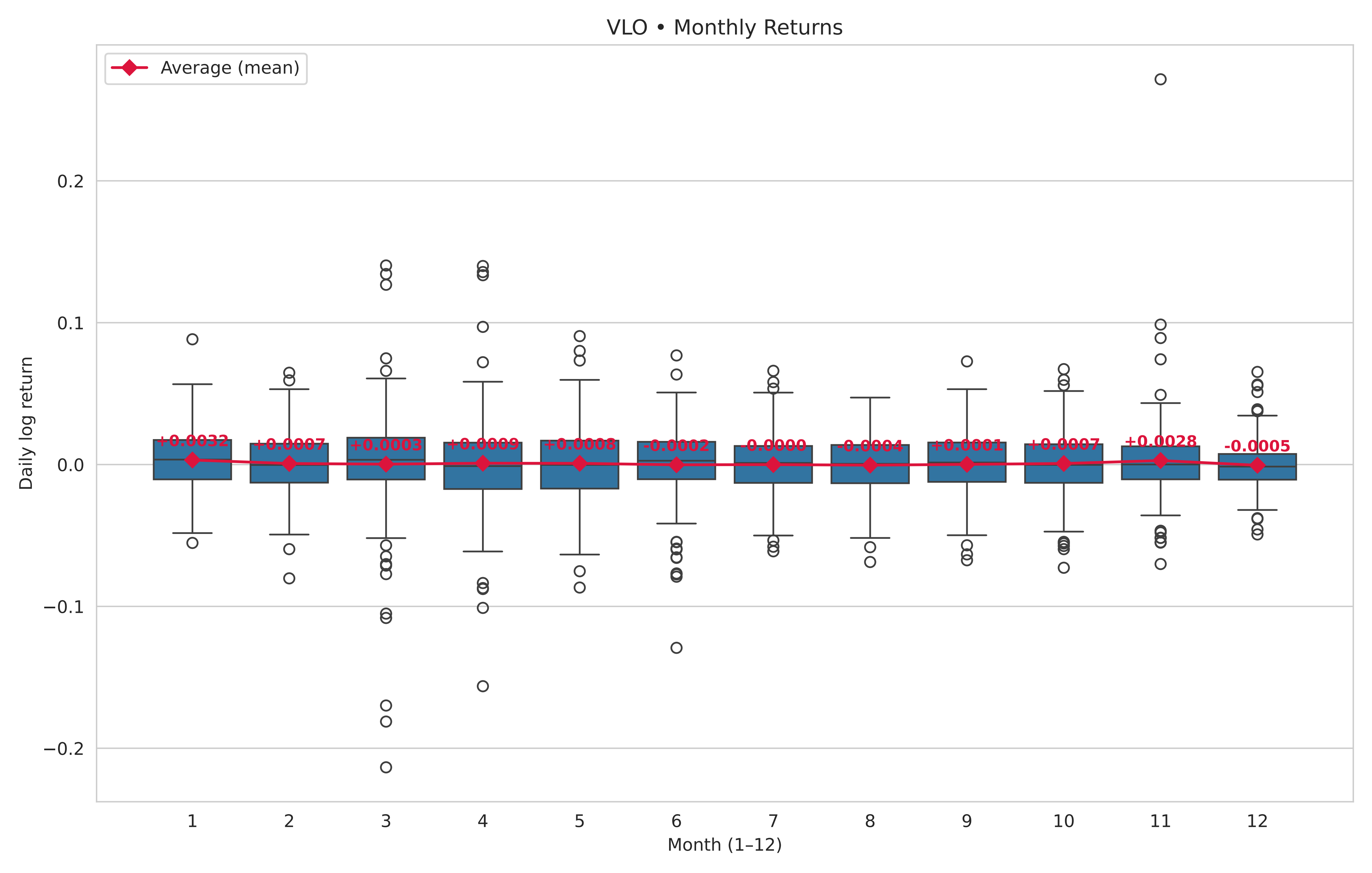

VLO • ACF • Returns
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20



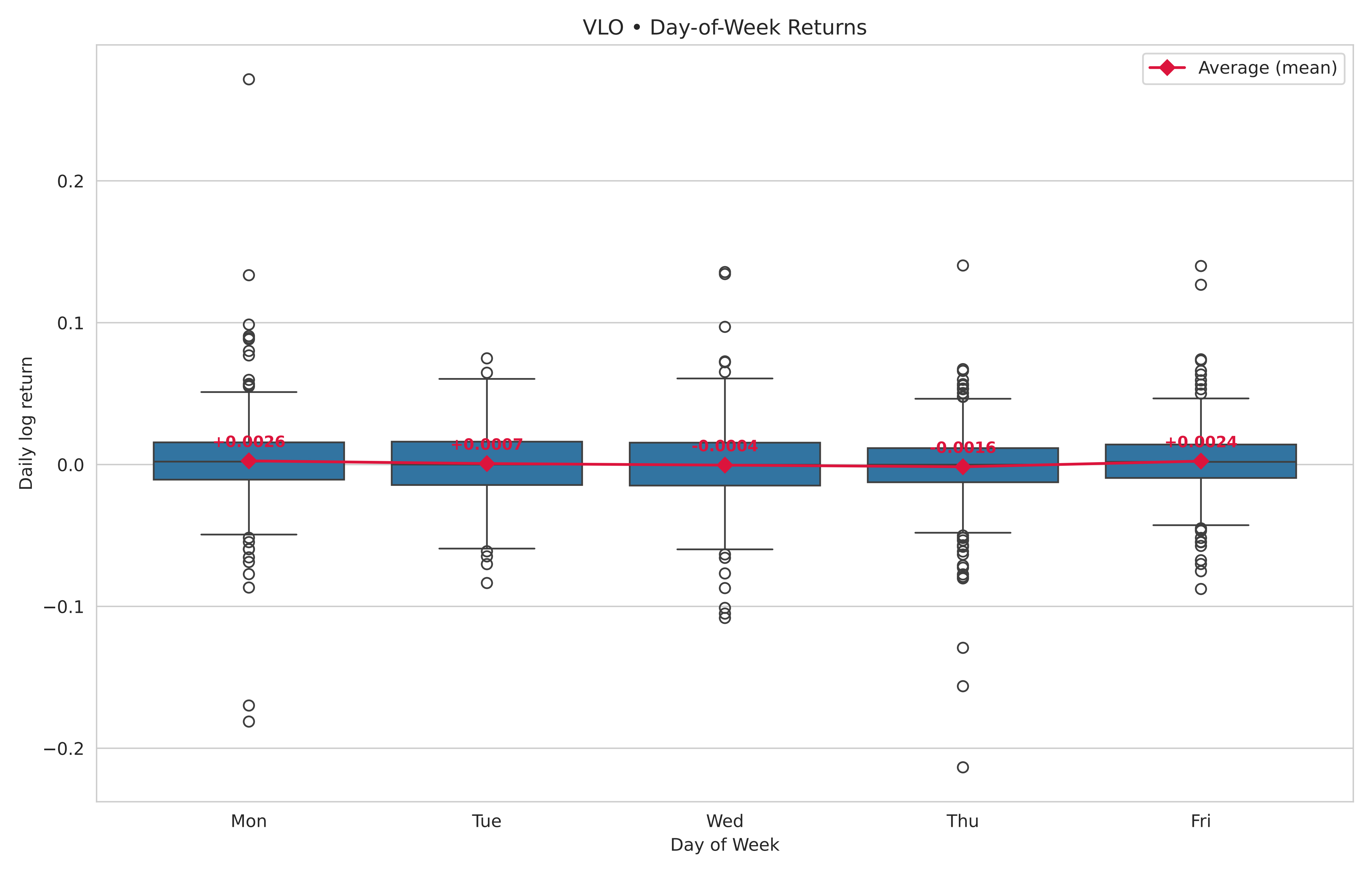
VLO • Rolling Autocorrelation (lag=1, window=20)
0.4
0.2
0.0
−0.2
−0.4
−0.6
Autocorr
2019
2020
2021
2022
2023
2024
2025
2026
Date

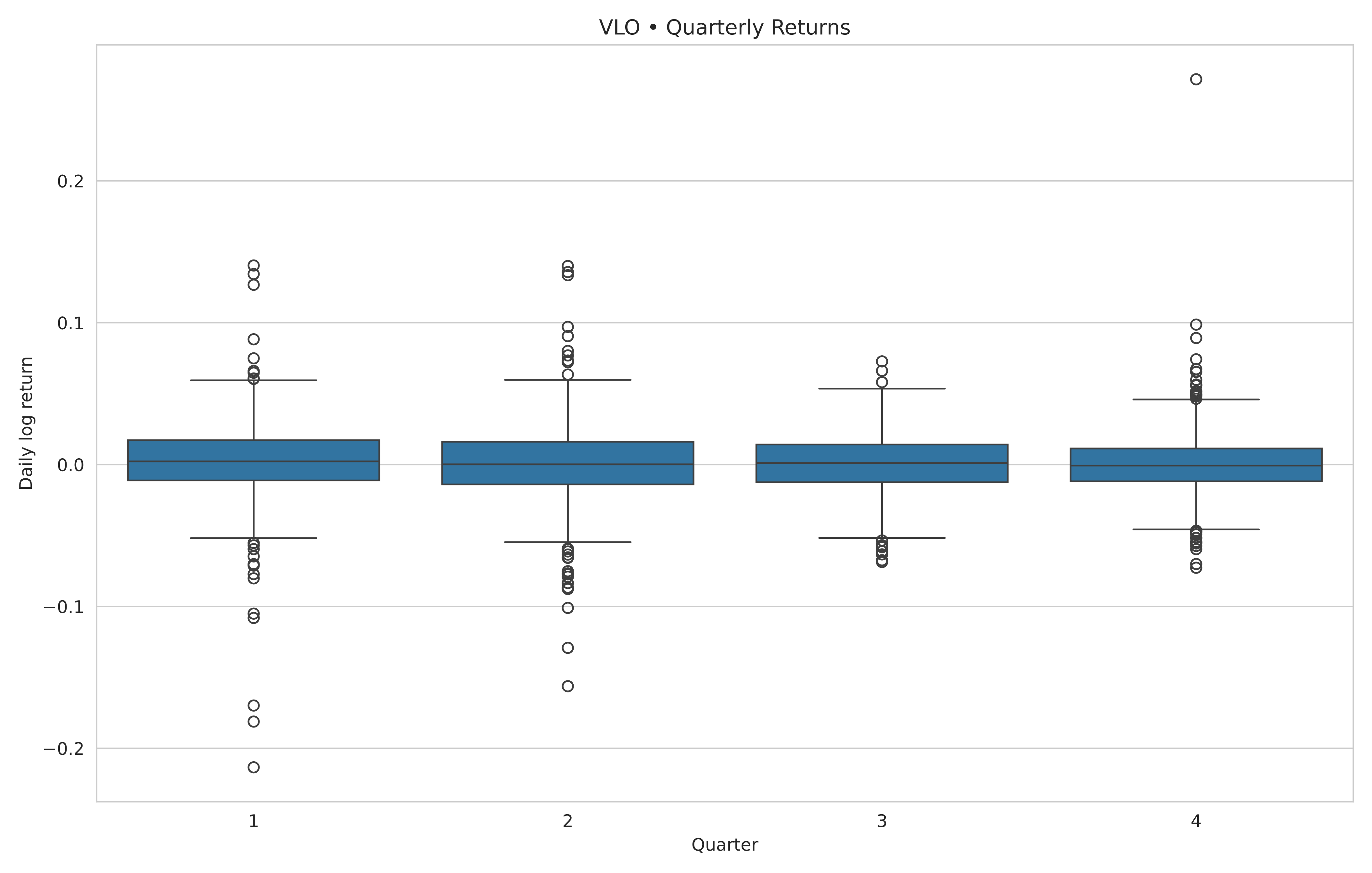

VLO • ACF • |Returns| (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

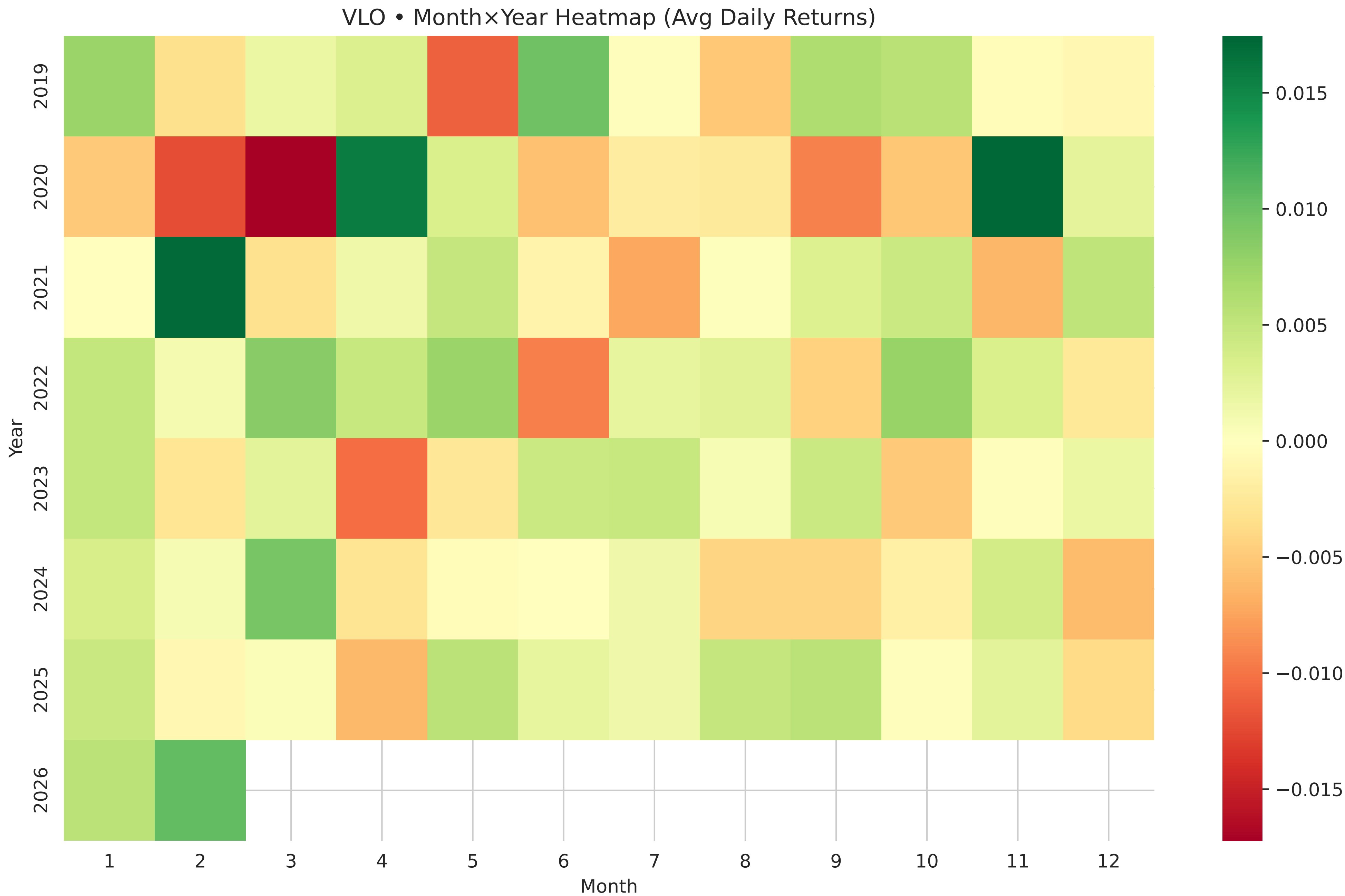

VLO • ACF • Returns^2 (Volatility Clustering)
1.00
0.75
0.50
0.25
0.00
−0.25
−0.50
−0.75
−1.00
0
5
10
15
20

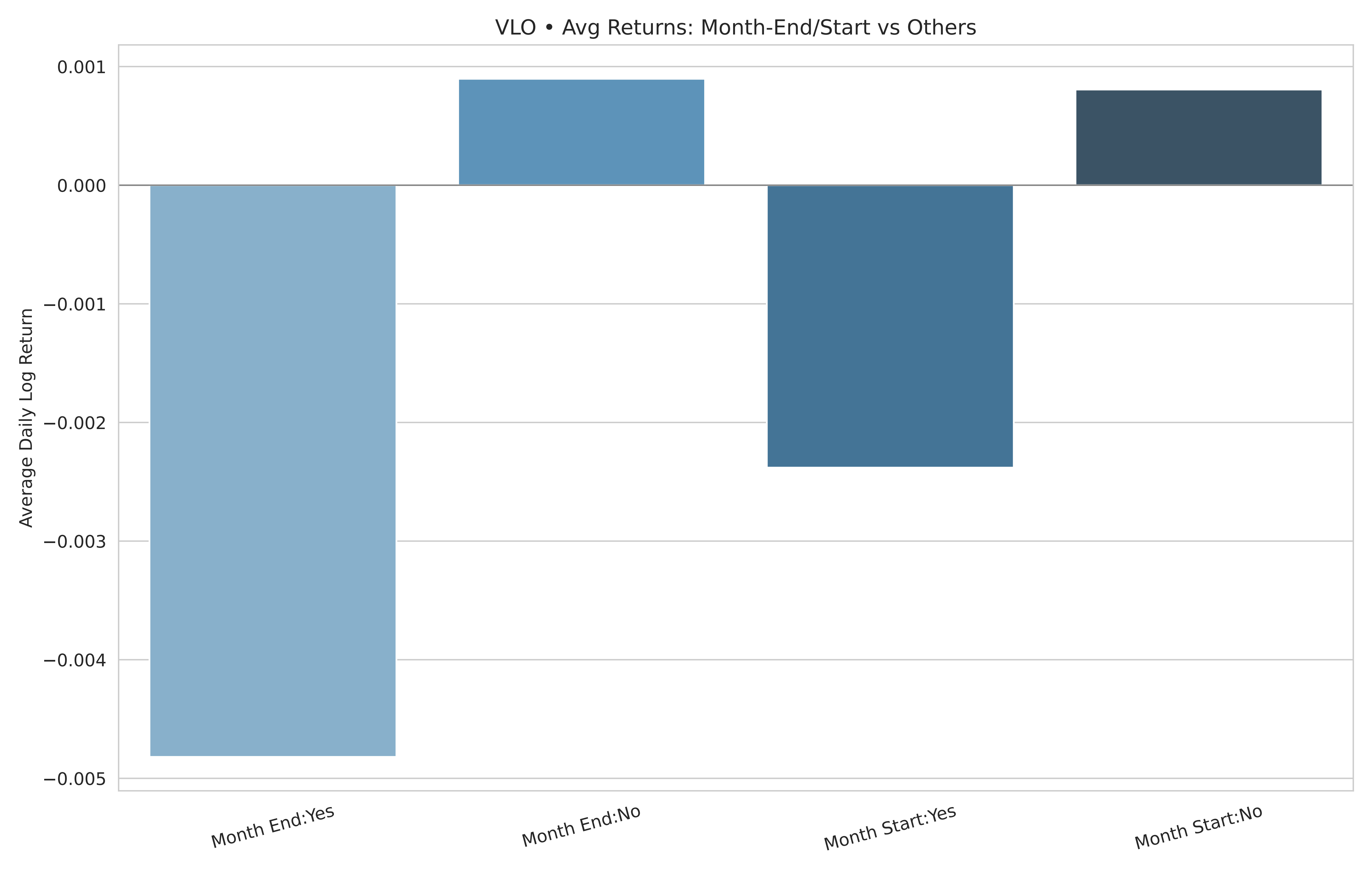


VLO • Monthly Returns
Average (mean)
Daily log return
0.2
0.1
0.0
−0.1
−0.2
+0.0032
+0.0007
+0.0003
+0.0009
+0.0008
-0.0002
-0.0000
-0.0004
+0.0001
+0.0007
+0.0028
-0.0005
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)

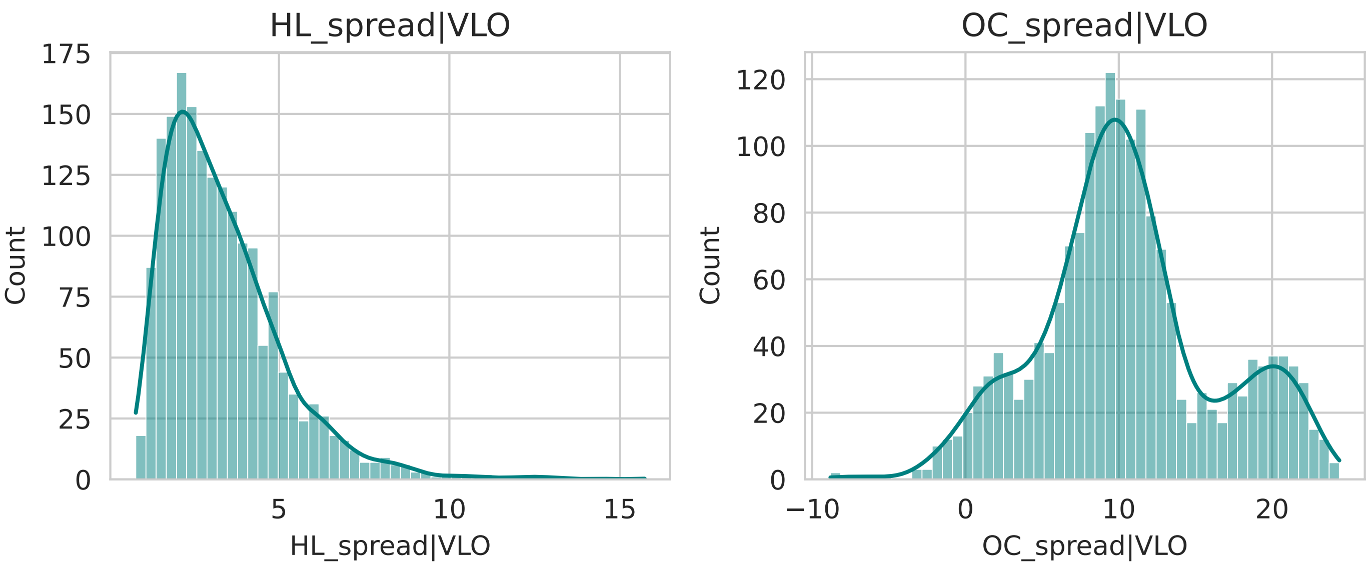

VLO • Day-of-Week Returns
Average (mean)
Daily log return
0.2
0.1
0.0
−0.1
−0.2
+0.0026
+0.0007
-0.0004
-0.0016
+0.0024
Mon
Tue
Wed
Thu
Fri
Day of Week


VLO • Quarterly Returns
Daily log return
0.2
0.1
0.0
−0.1
−0.2
1
2
3
4
Quarter


VLO • Month×Year Heatmap (Avg Daily Returns)
Year
2019
2020
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.015
0.010
0.005
0.000
−0.005
−0.010
−0.015

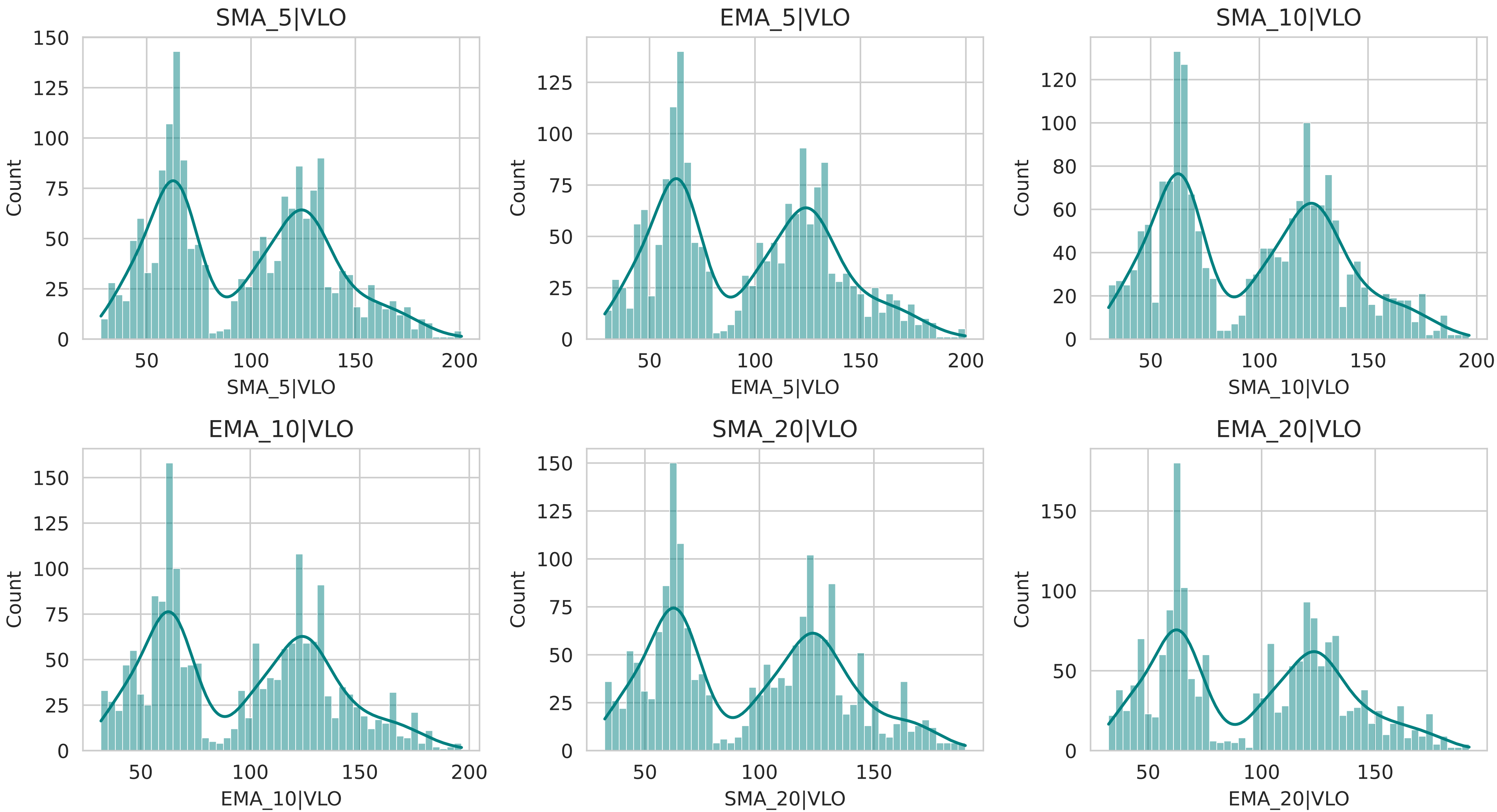

VLO • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.001
0.000
−0.001
−0.002
−0.003
−0.004
−0.005
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

VLO • Spreads



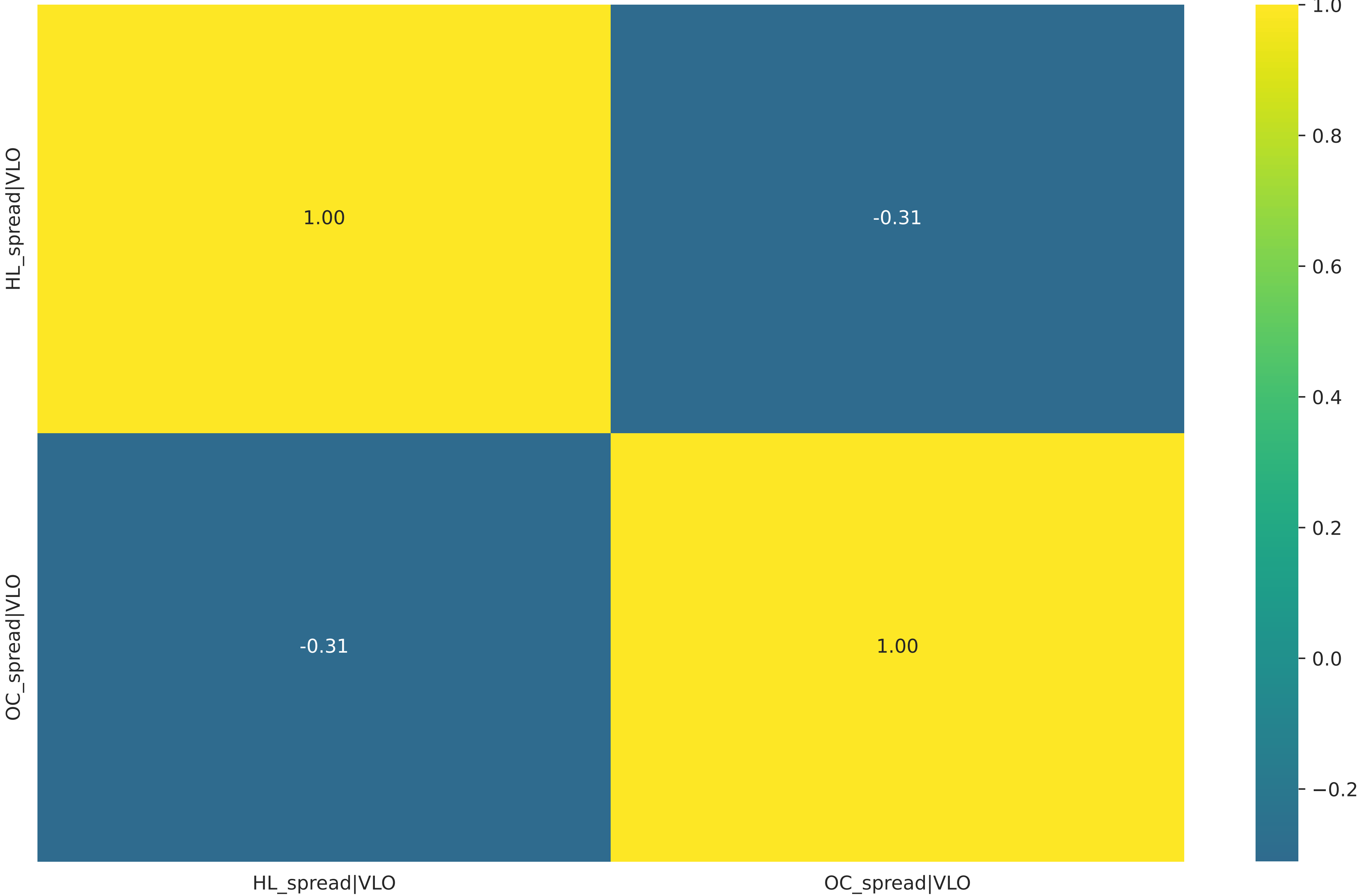
HL_spread|VLO
Count
175
150
125
100
75
50
25
0
5
10
15
HL_spread|VLO
OC_spread|VLO
Count
120
100
80
60
40
20
0
−10
0
10
20
OC_spread|VLO

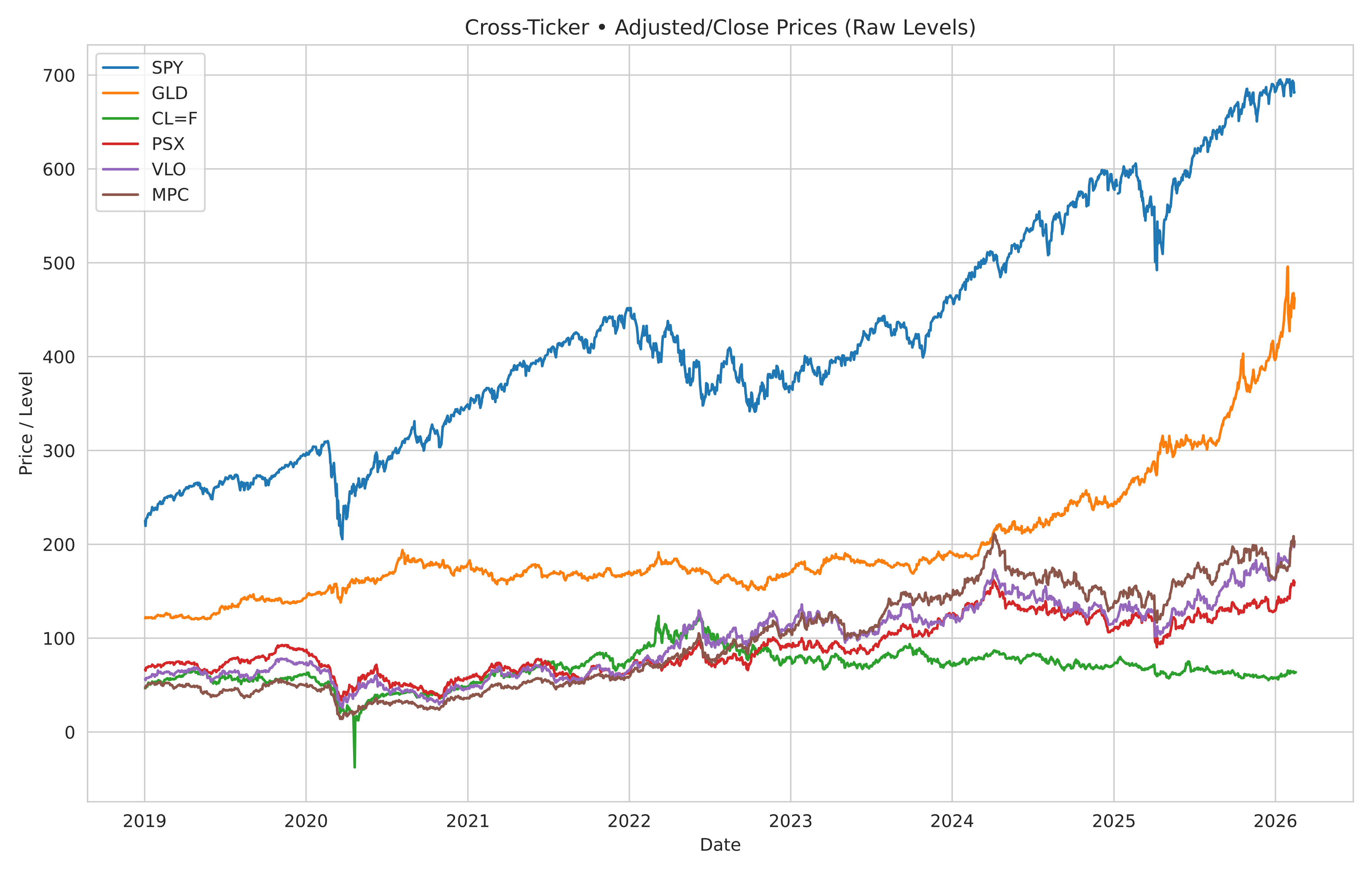
VLO • Moving Averages / EMAs




VLO • Correlation • Moving Averages
SMA_5|VLO
EMA_5|VLO
SMA_10|VLO
EMA_10|VLO
SMA_20|VLO
EMA_20|VLO
1.00 1.00 1.00 1.00 0.99 1.00
1.00 1.00 1.00 1.00 0.99 1.00
1.00 1.00 1.00 1.00 1.00 1.00
1.00 1.00 1.00 1.00 1.00 1.00
0.99 0.99 1.00 1.00 1.00 1.00
1.00 1.00 1.00 1.00 1.00 1.00
1.000
0.999
0.998
0.997
0.996
0.995
0.994
0.993

VLO • Correlation • Spreads + Lags




Cross-Ticker • Adjusted/Close Prices (Raw Levels)
SPY
GLD
CL=F
PSX
VLO
MPC
Price / Level
700
600
500
400
300
200
100
0
2019
2020
2021
2022
2023
2024
2025
2026
Date