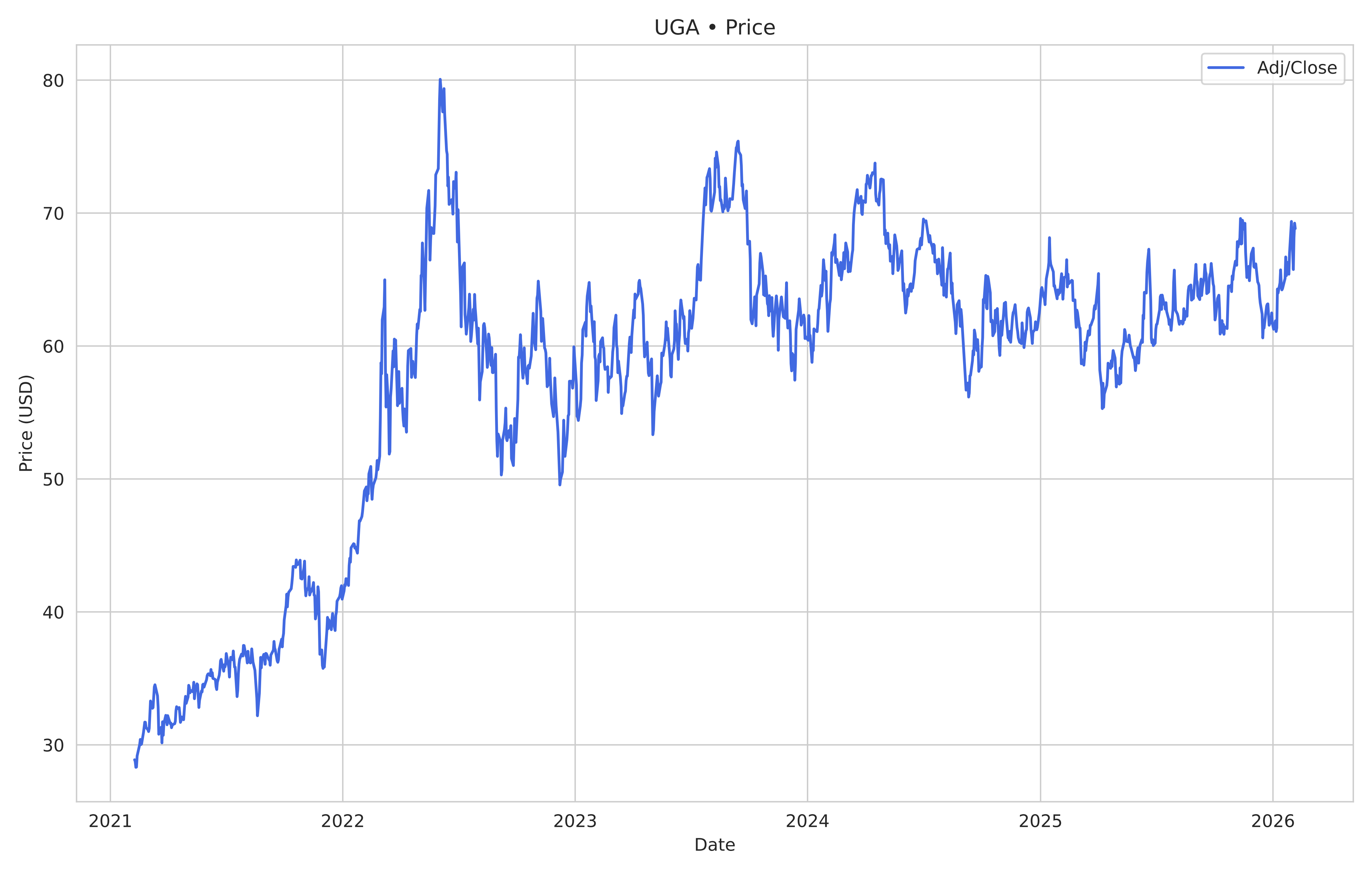
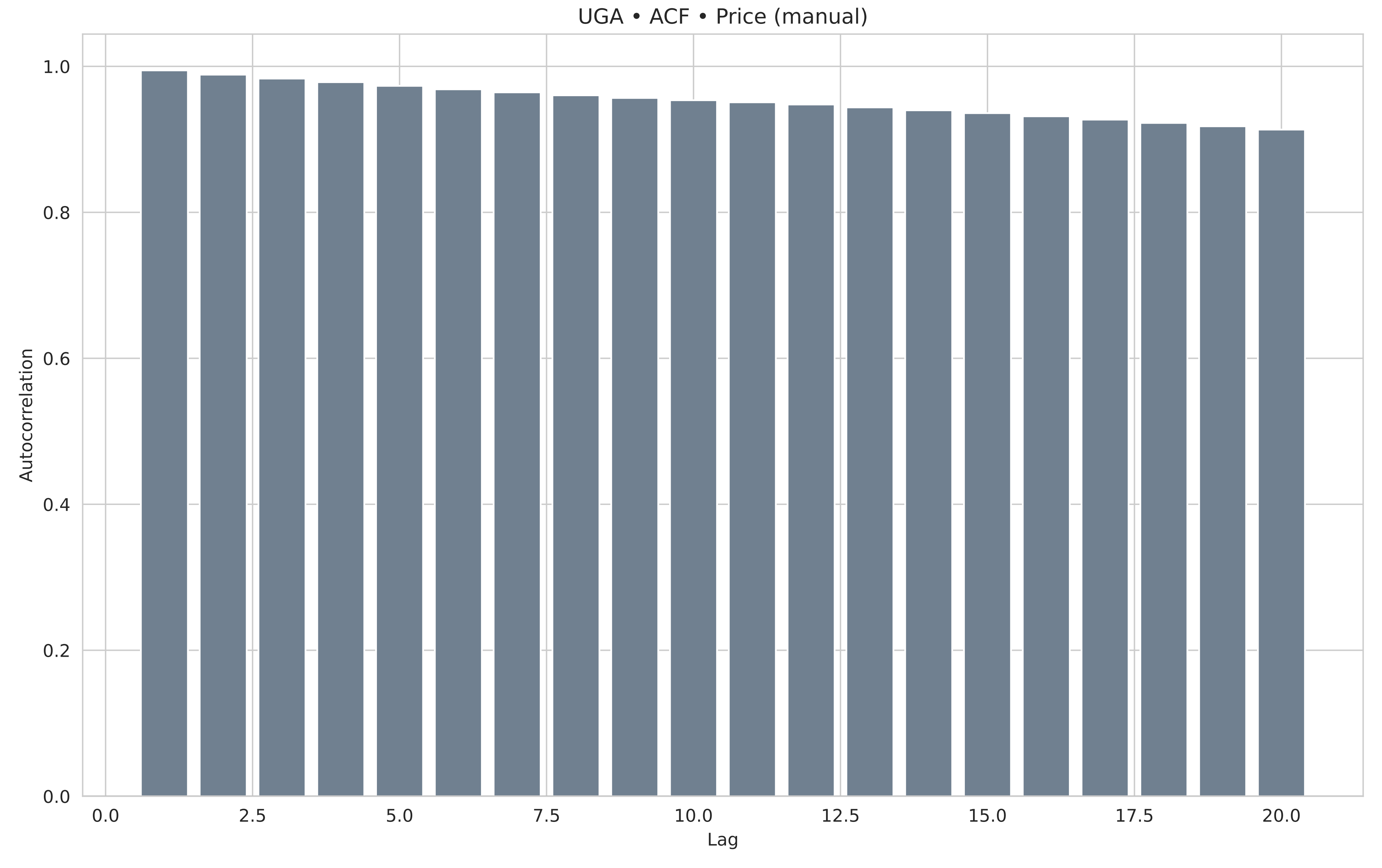
EDA Energy ETF Report

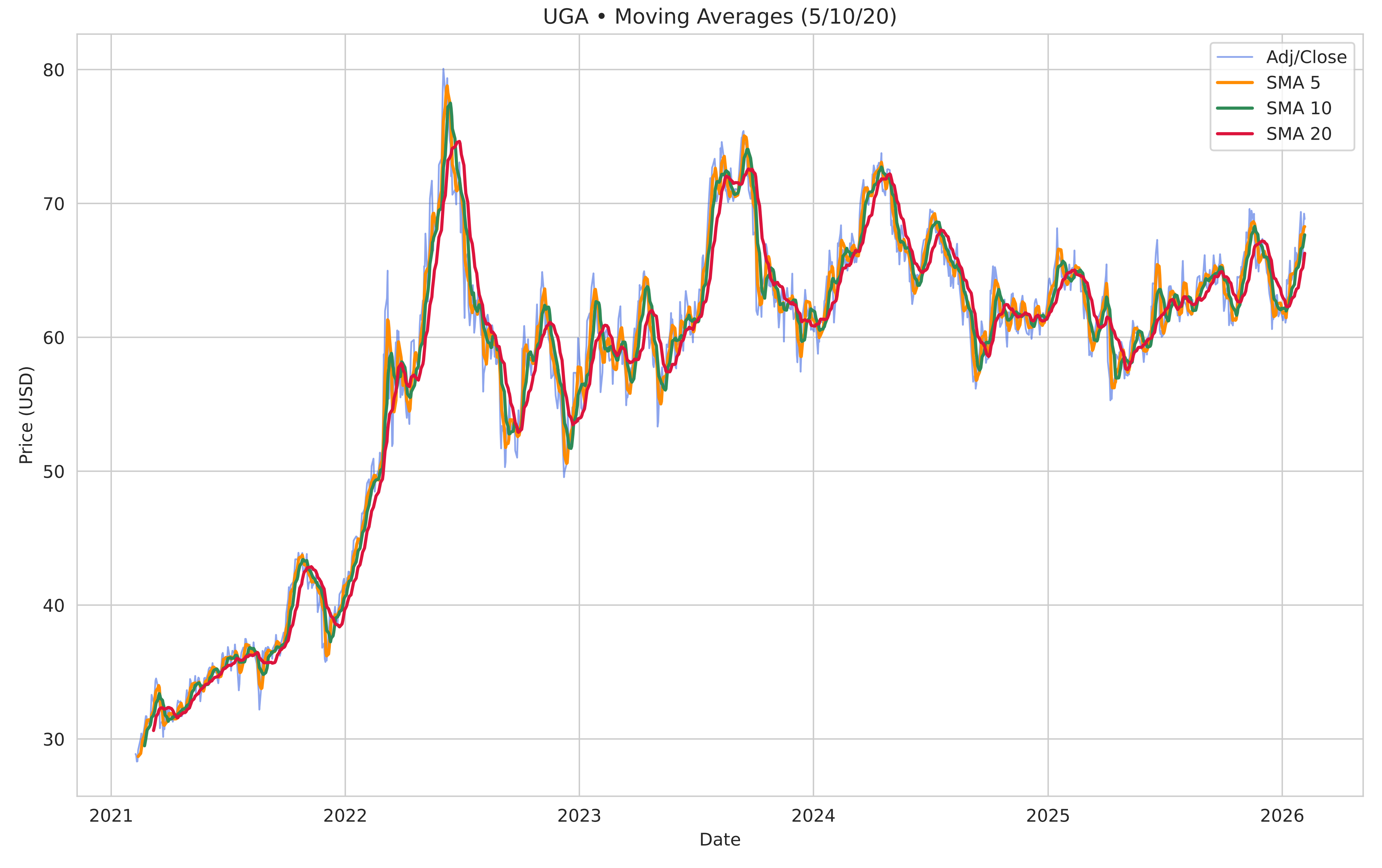
Tickers: UGA, UNG, USO

Contents:

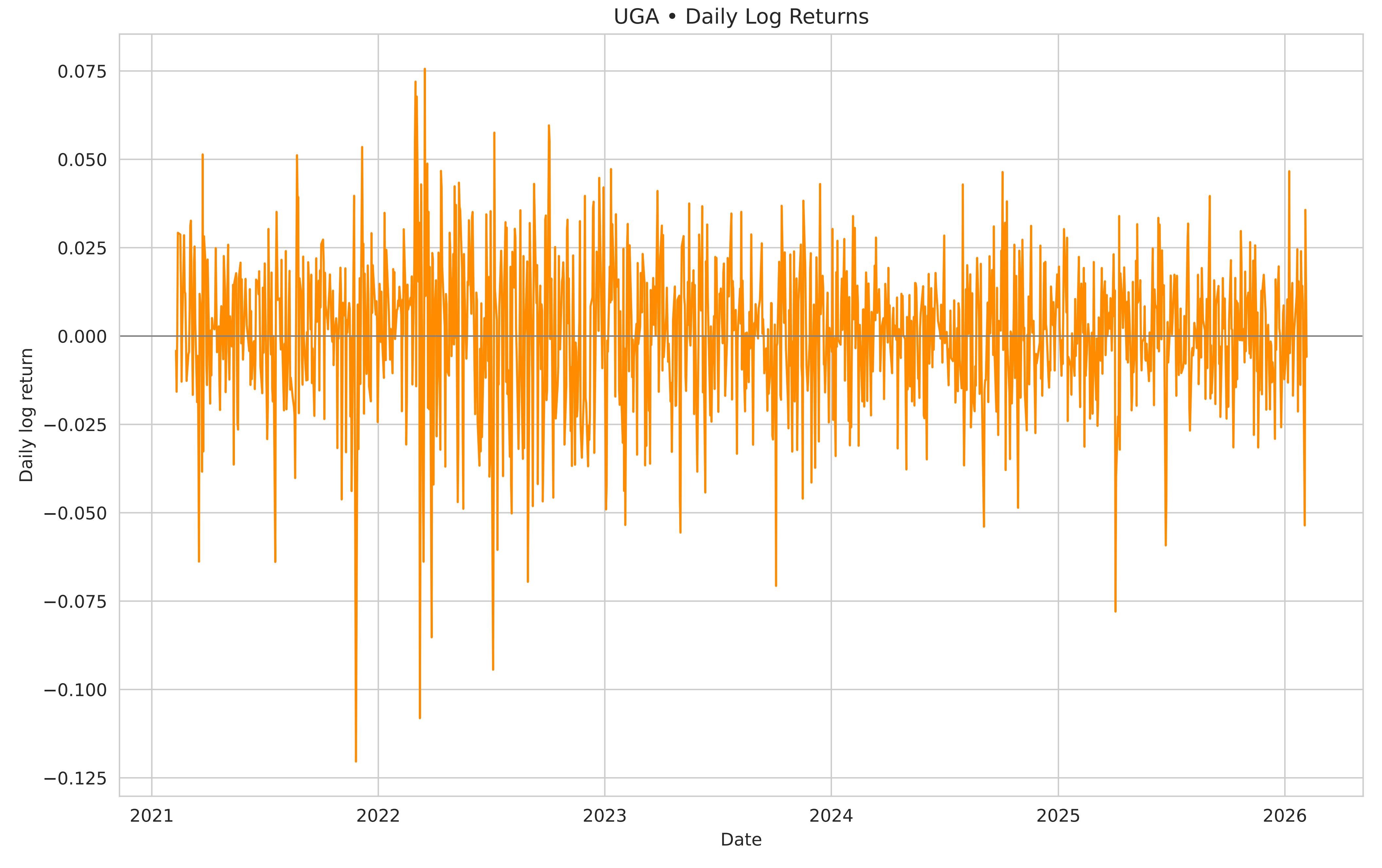
- Price series & ACF(Price), Moving Averages (5/10/20)
- Daily log-returns time series; Histogram+KDE (with Std Dev); Q–Q plot
- ACF(Returns), Rolling Autocorr(Returns)
- Volatility clustering: ACF(|r|) & ACF(r^2)
- Seasonality (from Date index): Monthly/DOW/Quarterly boxplots; Month×Year heatmap; Month-End/Start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

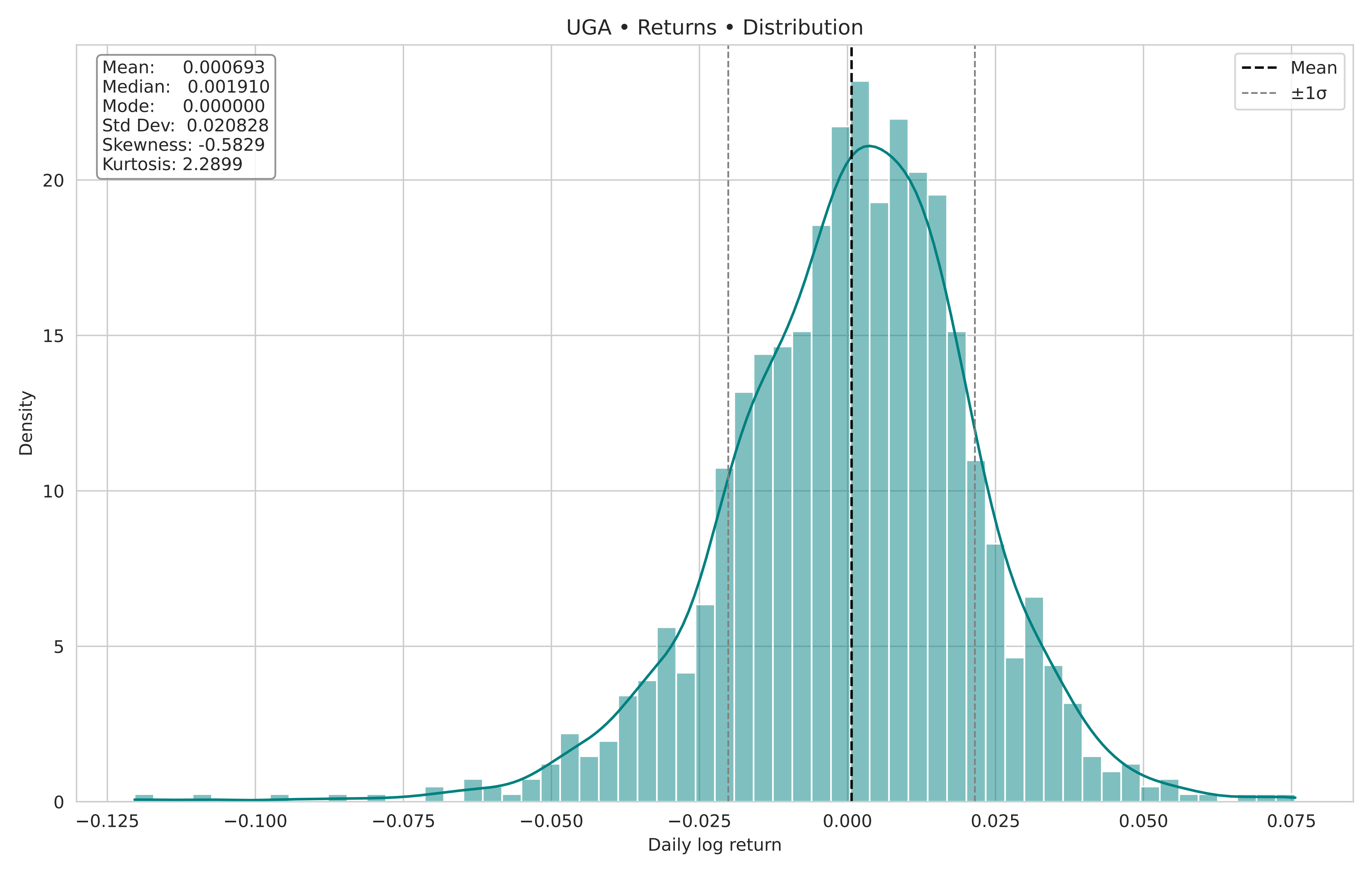

UGA • Price
Adj/Close
Price (USD)
80
70
60
50
40
30
2021
2022
2023
2024
2025
2026
Date

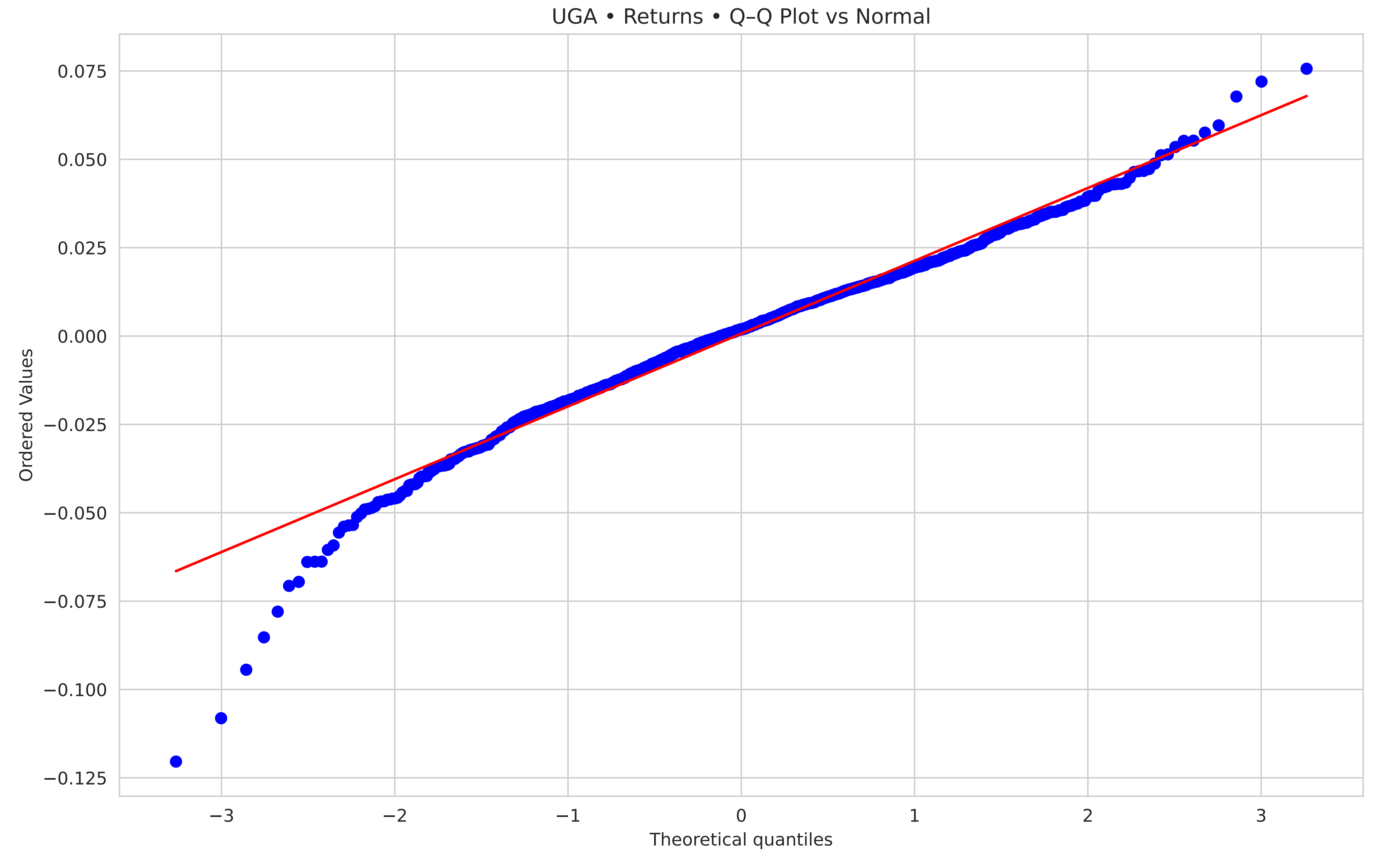

UGA • ACF • Price (manual)
Autocorrelation
Lag
0.0
0.2
0.4
0.6
0.8
1.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

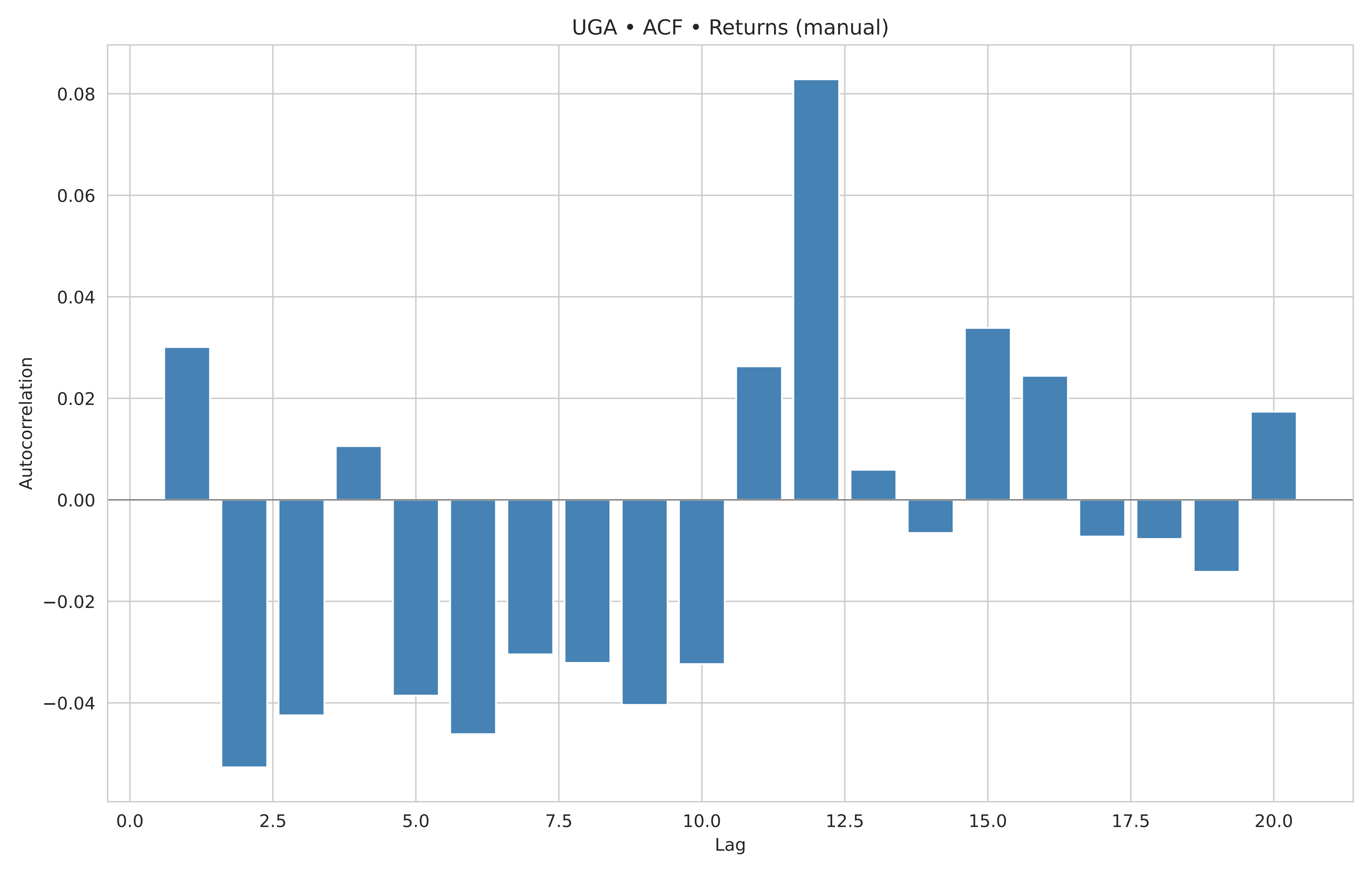


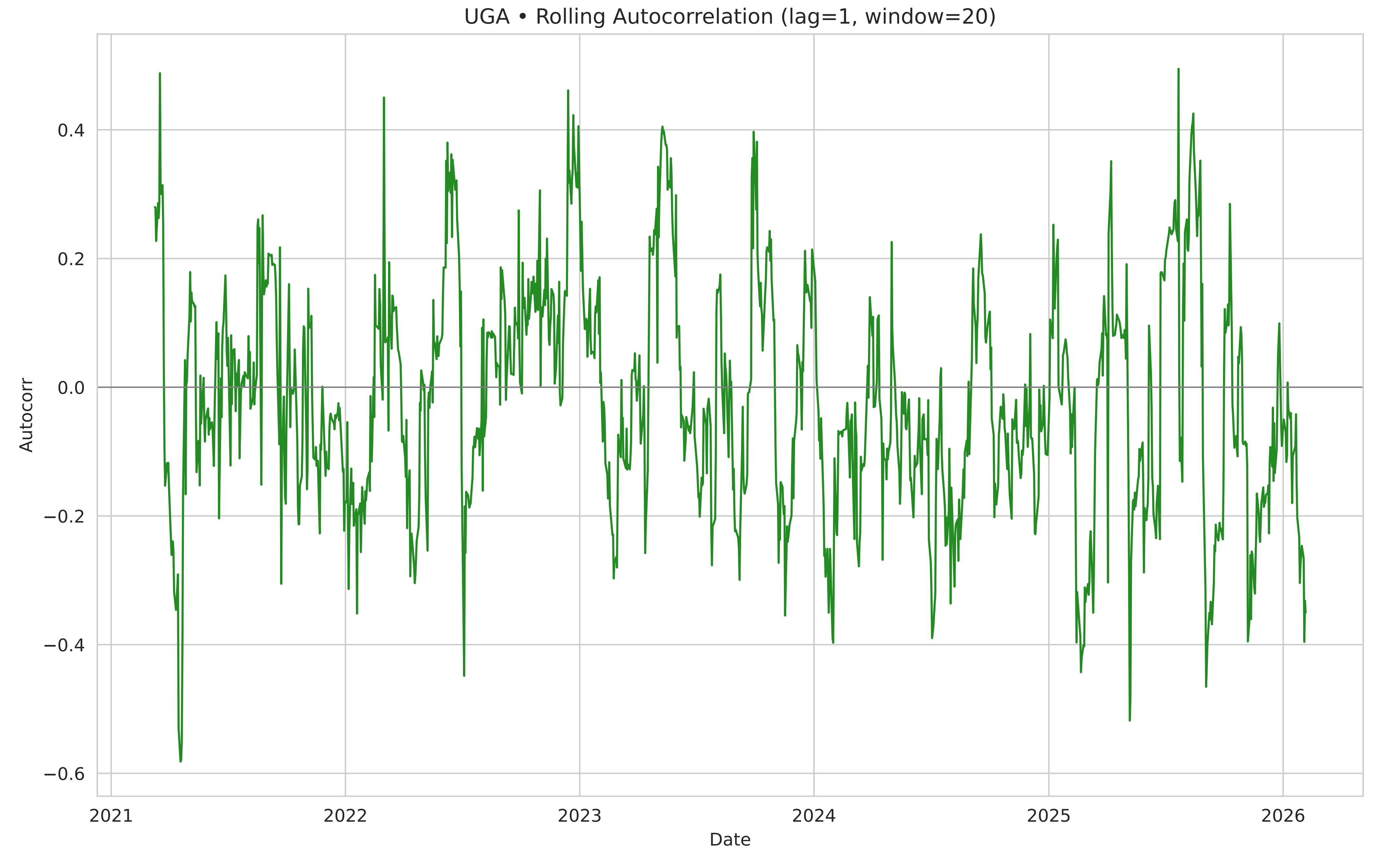
UGA • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
80
70
60
50
40
30
Price (USD)
2021
2022
2023
2024
2025
2026
Date


UGA • Daily Log Returns
Daily log return
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
2021
2022
2023
2024
2025
2026
Date

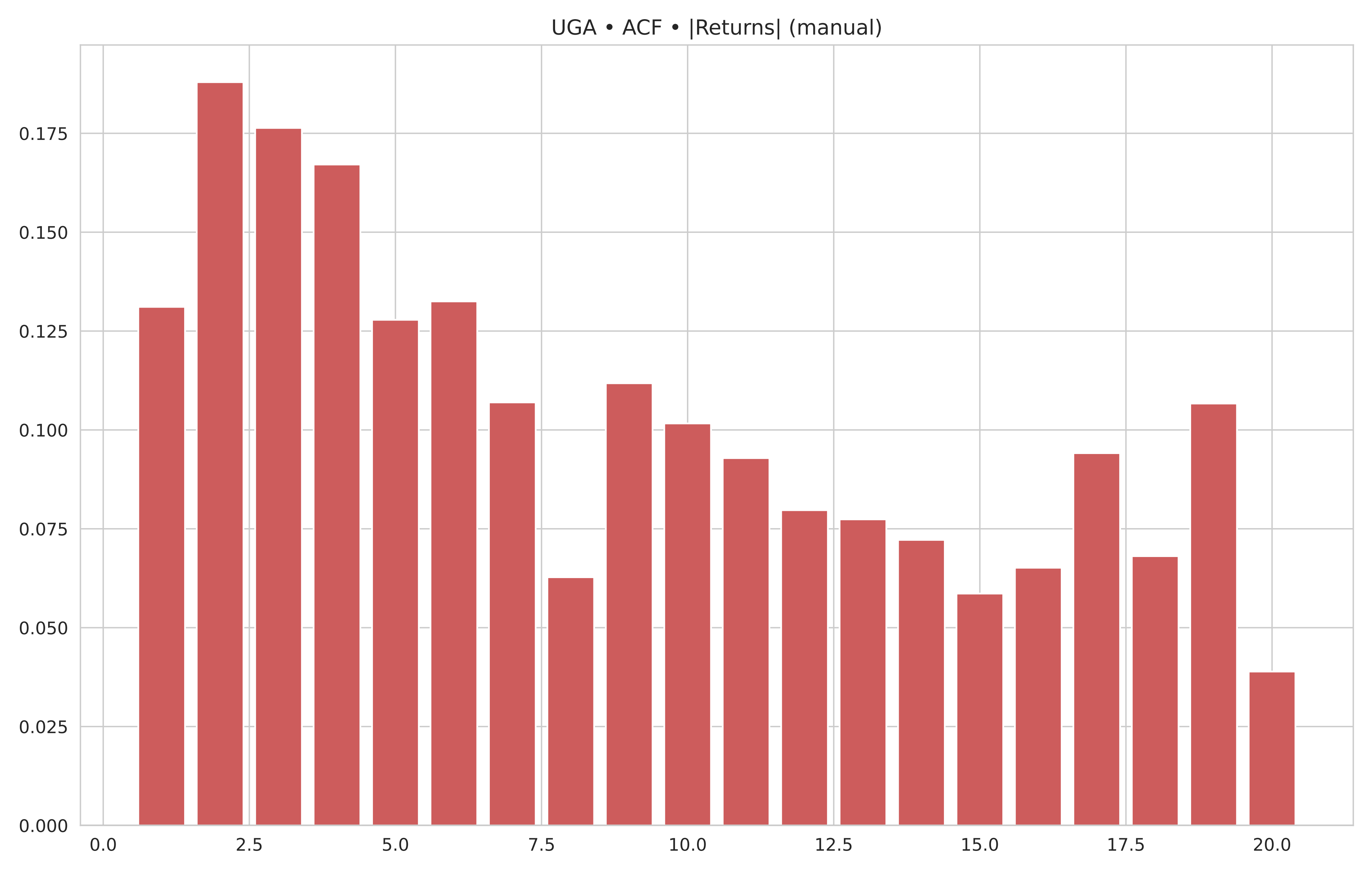

UGA • Returns • Distribution
Mean: 0.000693
Median: 0.001910
Mode: 0.000000
Std Dev: 0.020828
Skewness: -0.5829
Kurtosis: 2.2899
Mean
±1σ
Density
Daily log return
0
5
10
15
20
−0.125
−0.100
−0.075
−0.050
−0.025
0.000
0.025
0.050
0.075

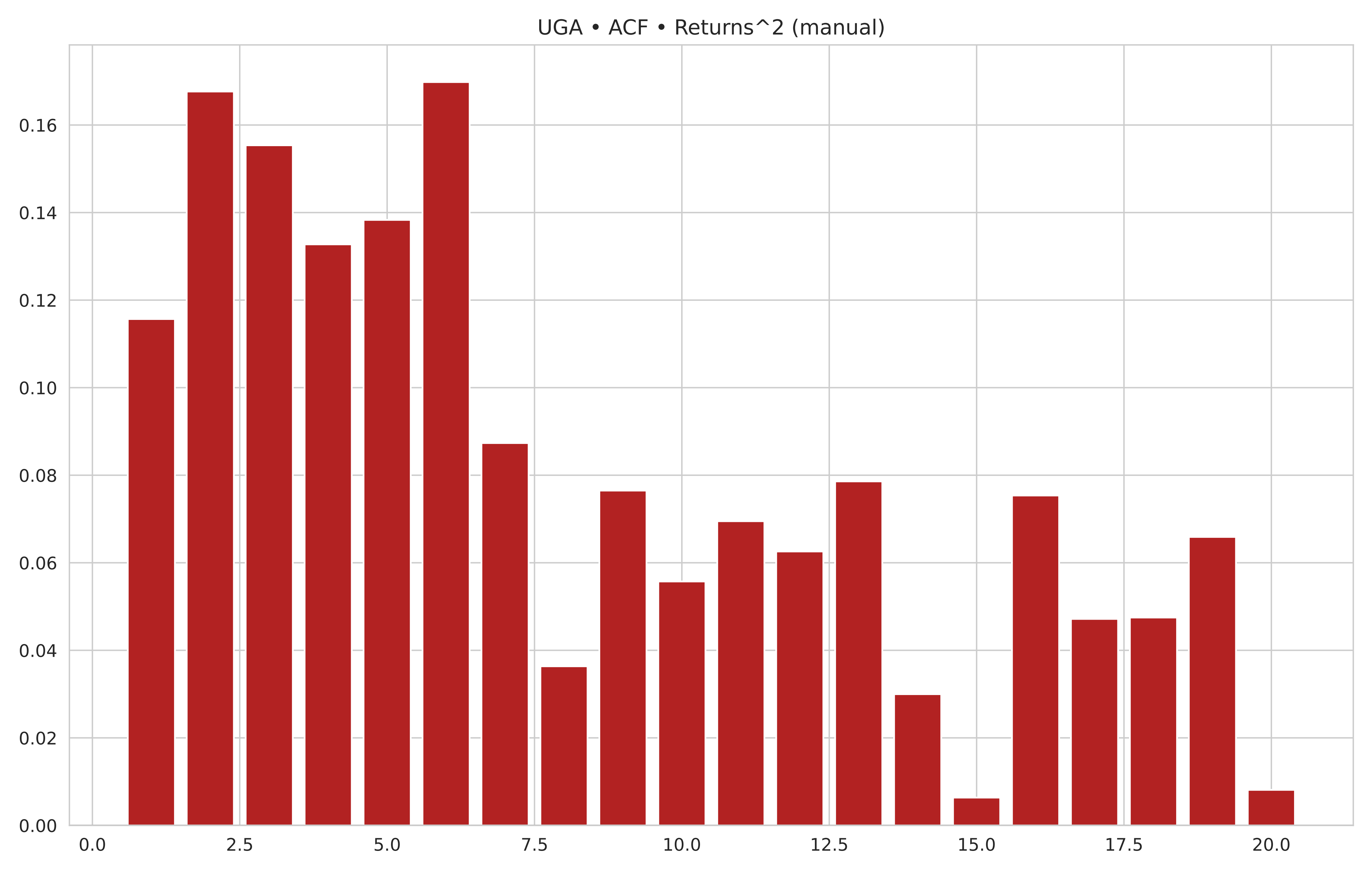

UGA • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
−3
−2
−1
0
1
2
3

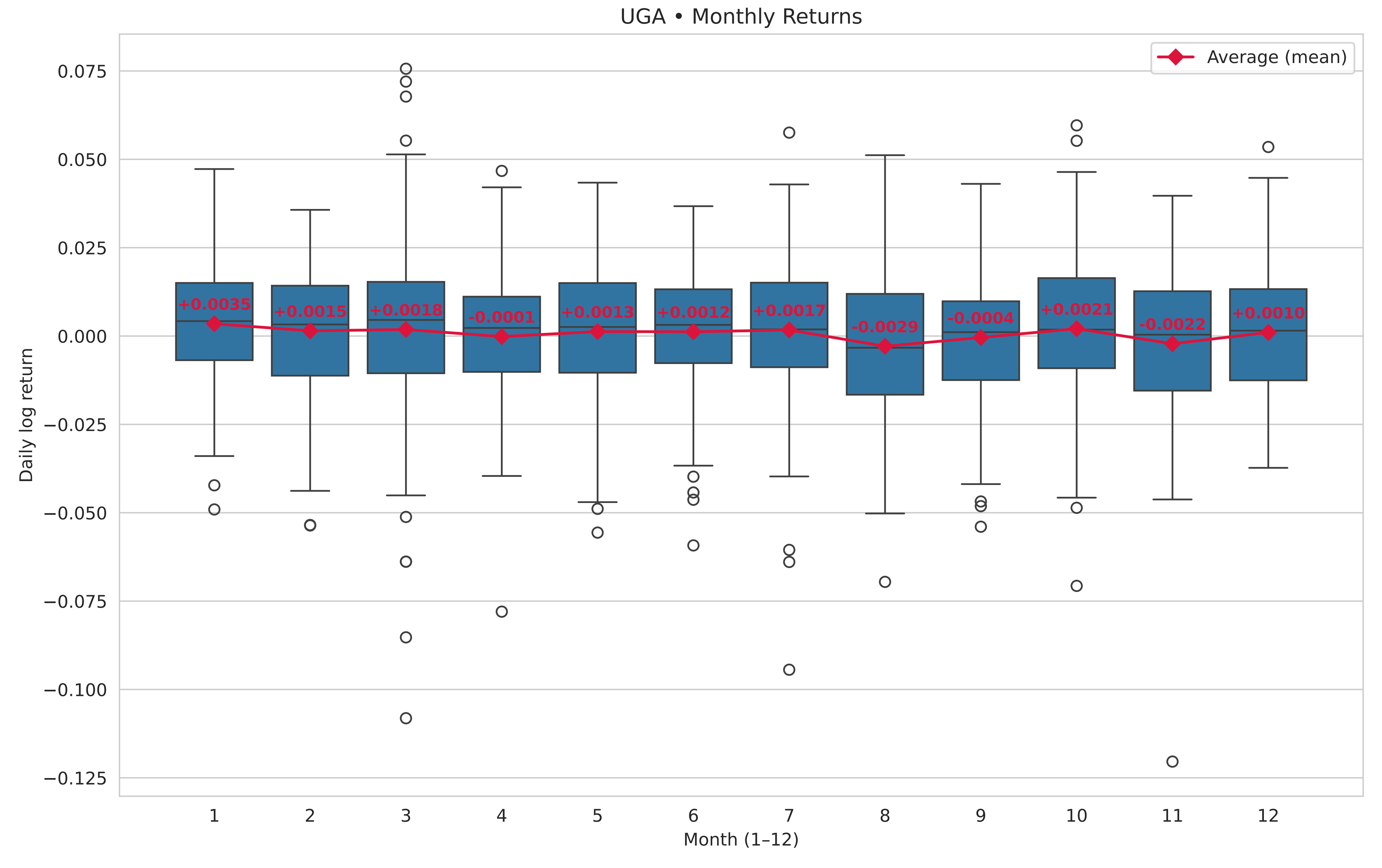

UGA • ACF • Returns (manual)
Autocorrelation
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Lag



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

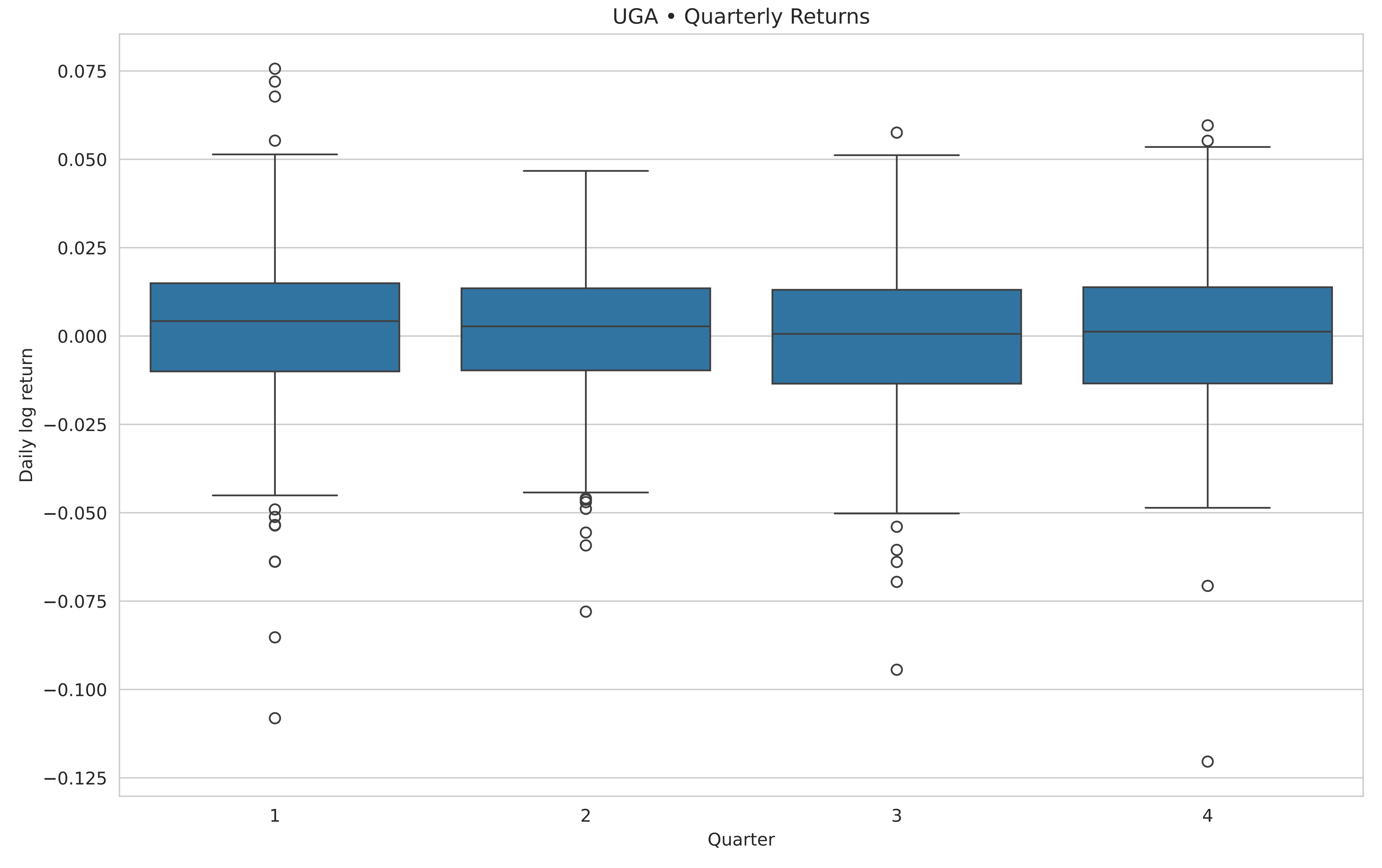

UGA • ACF • |Returns| (manual)
0.000
0.025
0.050
0.075
0.100
0.125
0.150
0.175
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

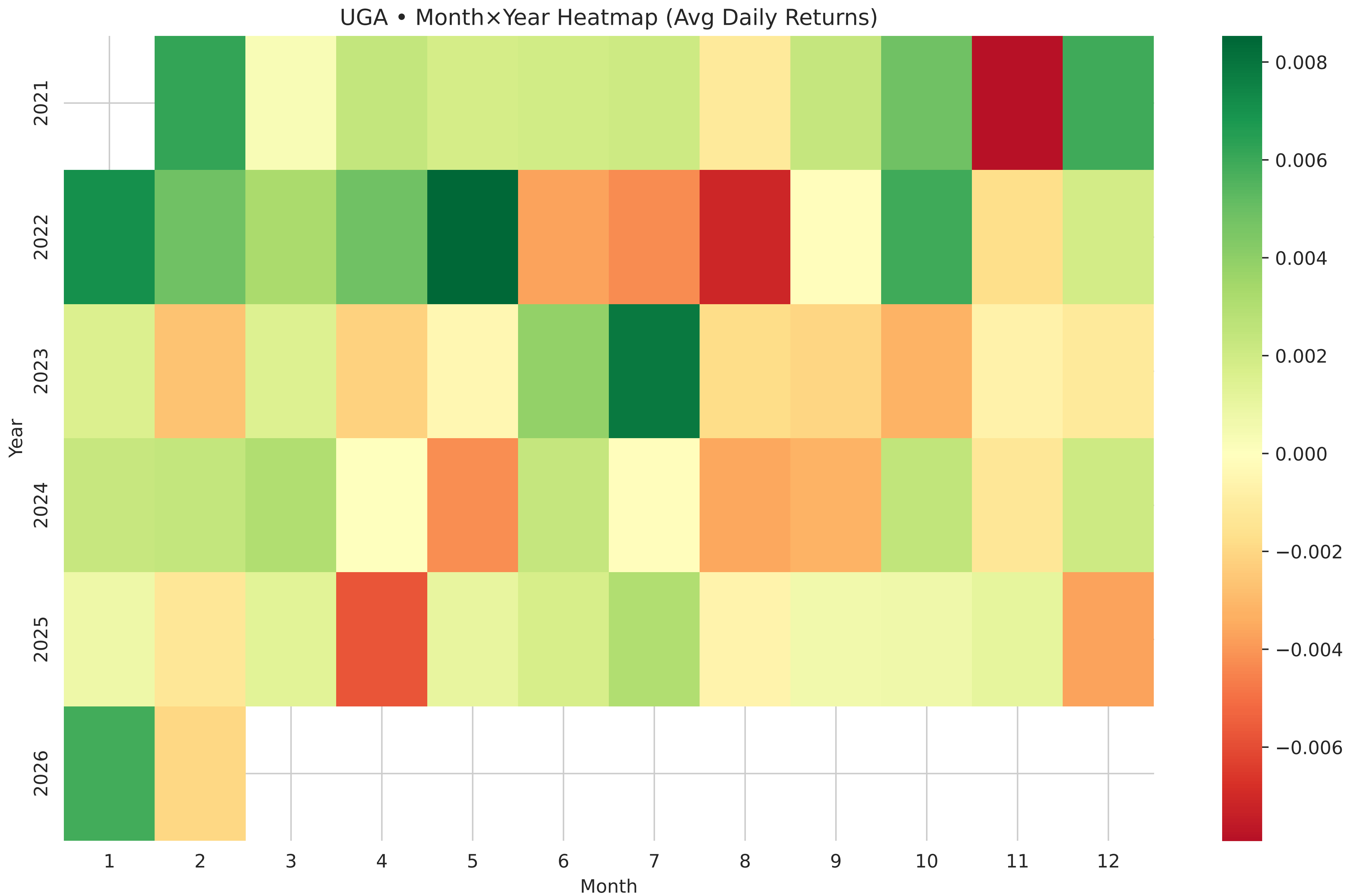

UGA • ACF • Returns^2 (manual)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0



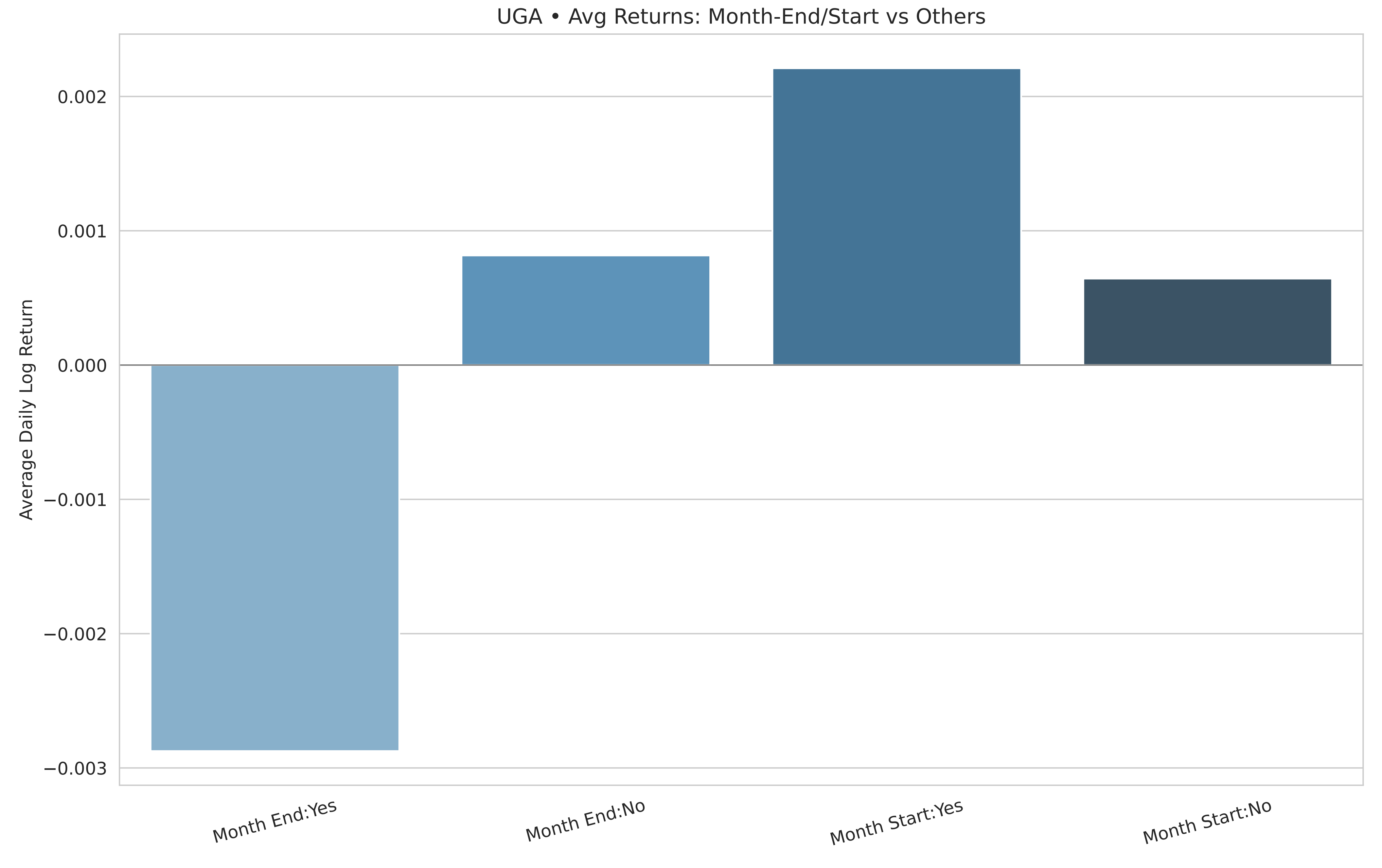
UGA • Monthly Returns
Average (mean)
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
Daily log return
+0.0035
+0.0015
+0.0018
-0.0001
+0.0013
+0.0012
+0.0017
-0.0029
-0.0004
+0.0021
-0.0022
+0.0010
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)

UGA • Day-of-Week Returns
Average (mean)
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
Daily log return
+0.0010
+0.0001
-0.0001
+0.0008
+0.0017
Mon
Tue
Wed
Thu
Fri
Day of Week

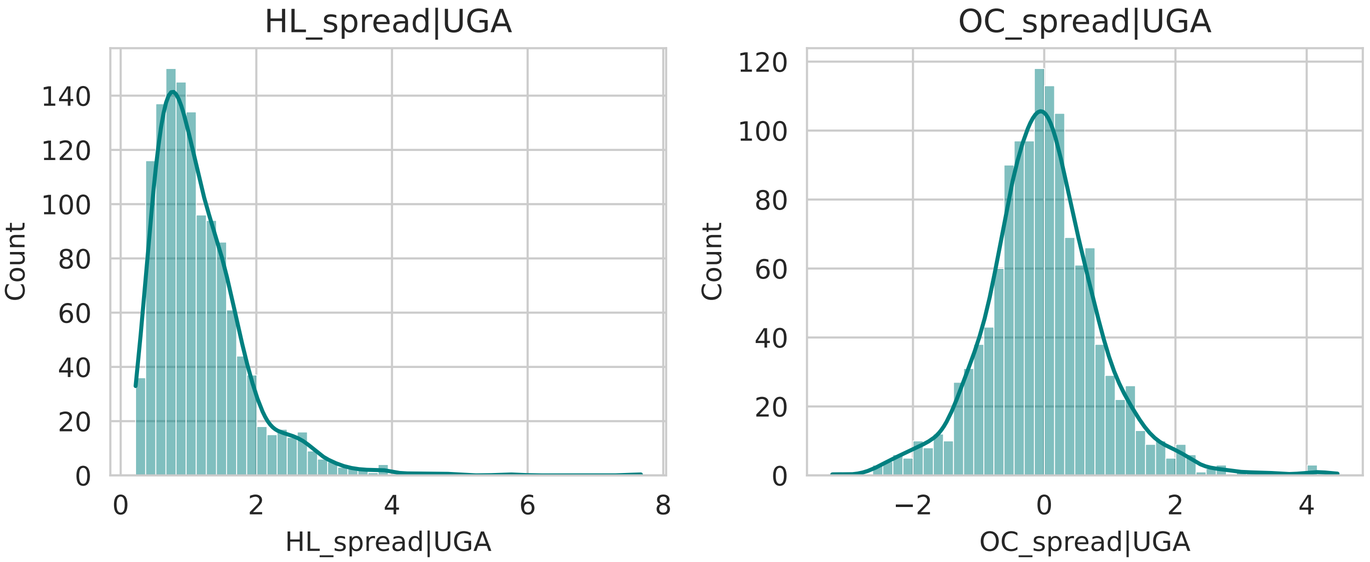

UGA • Quarterly Returns
Daily log return
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
1
2
3
4
Quarter



UGA • Month×Year Heatmap (Avg Daily Returns)
Year
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.008
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006

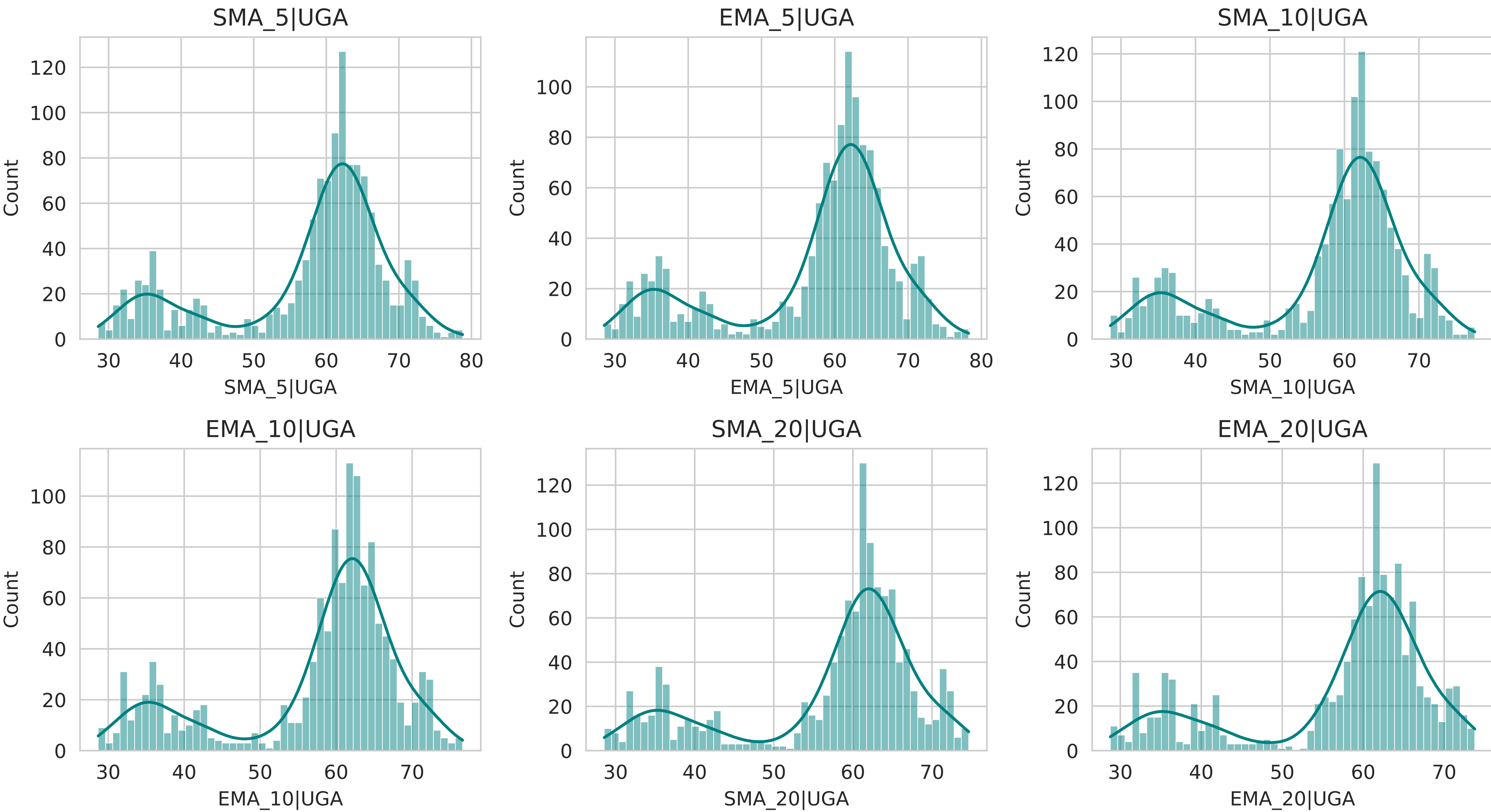

UGA • Avg Returns: Month-End/Start vs Others
Average Daily Log Return
0.002
0.001
0.000
−0.001
−0.002
−0.003
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

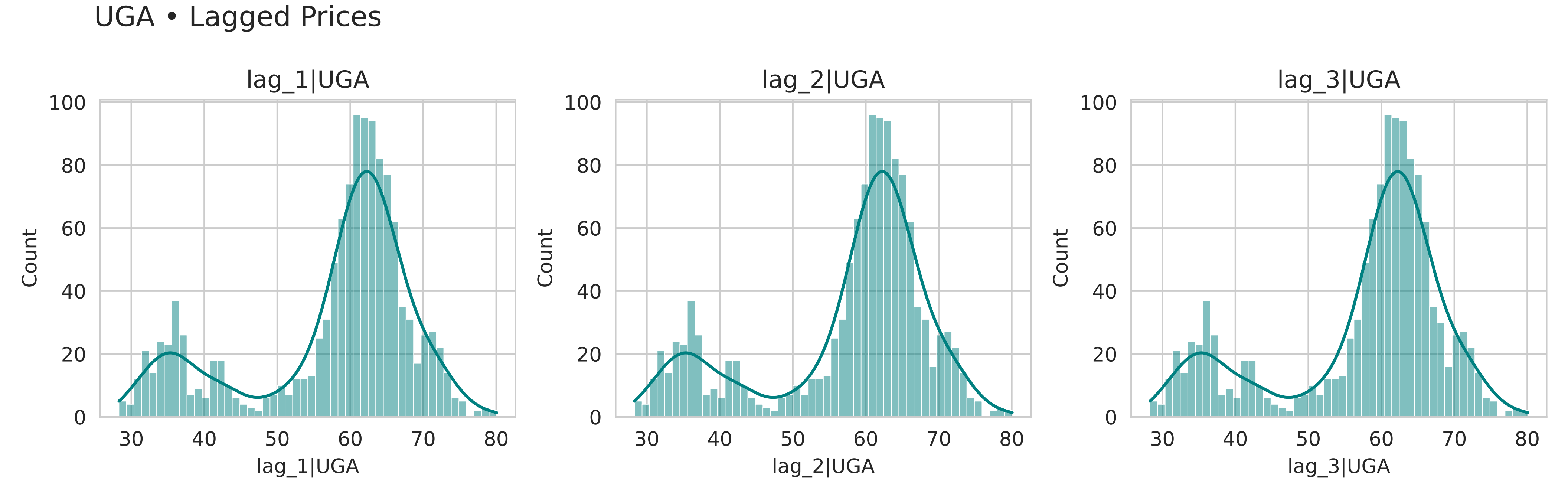
UGA • Spreads



HL_spread|UGA
Count
0
20
40
60
80
100
120
140
0
2
4
6
8
HL_spread|UGA
OC_spread|UGA
Count
0
20
40
60
80
100
120
−2
0
2
4
OC_spread|UGA

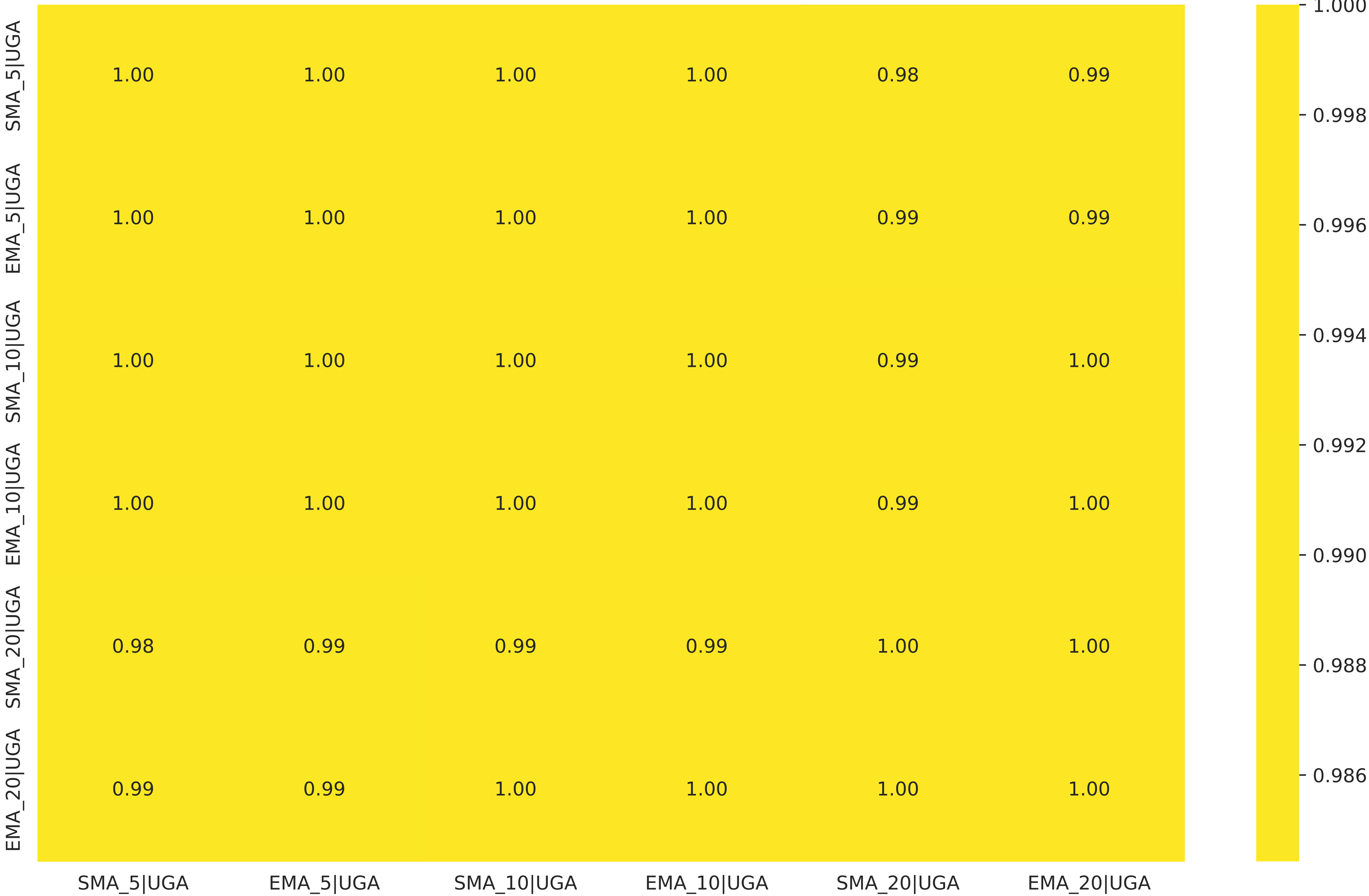
UGA • Moving Averages / EMAs

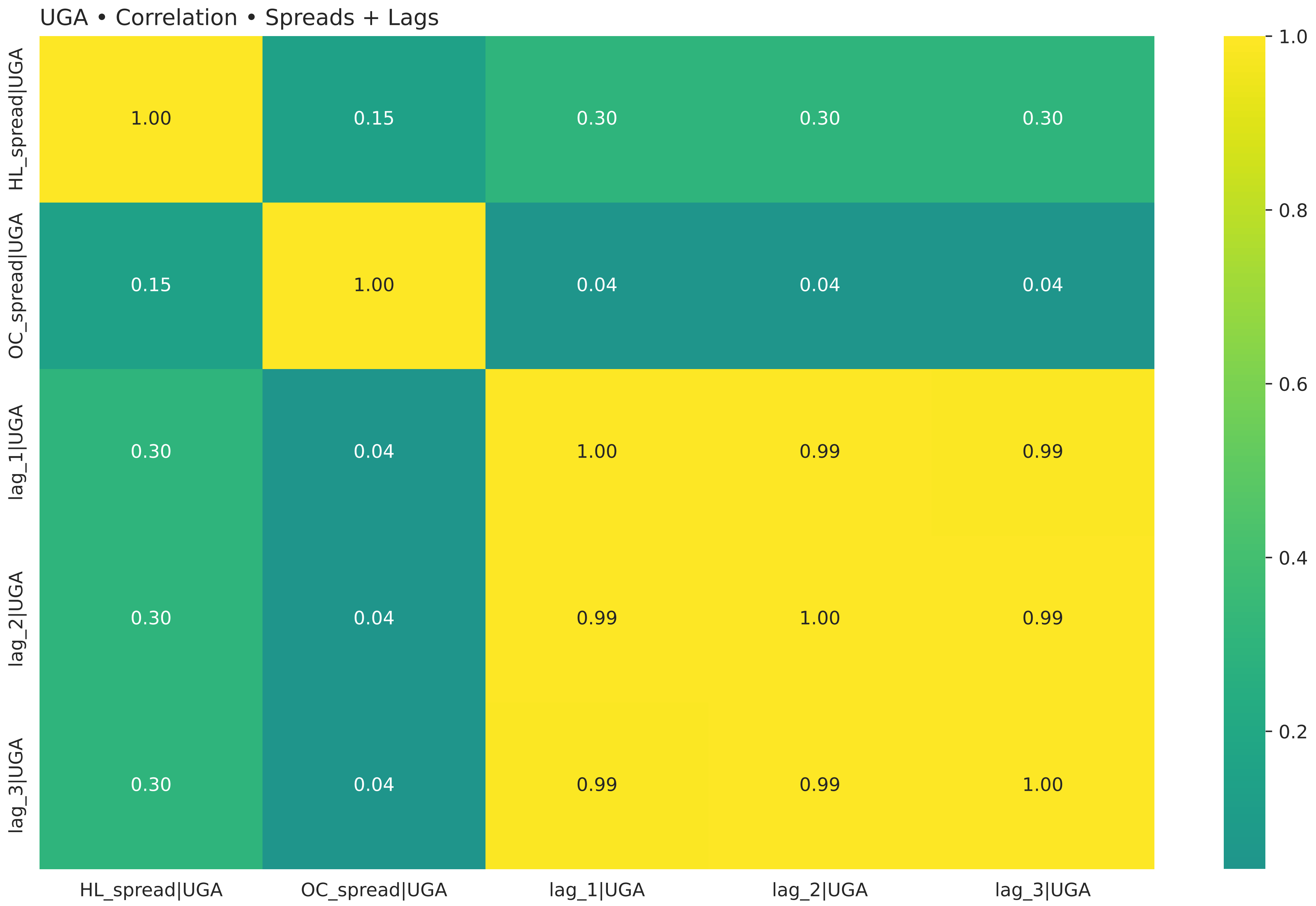




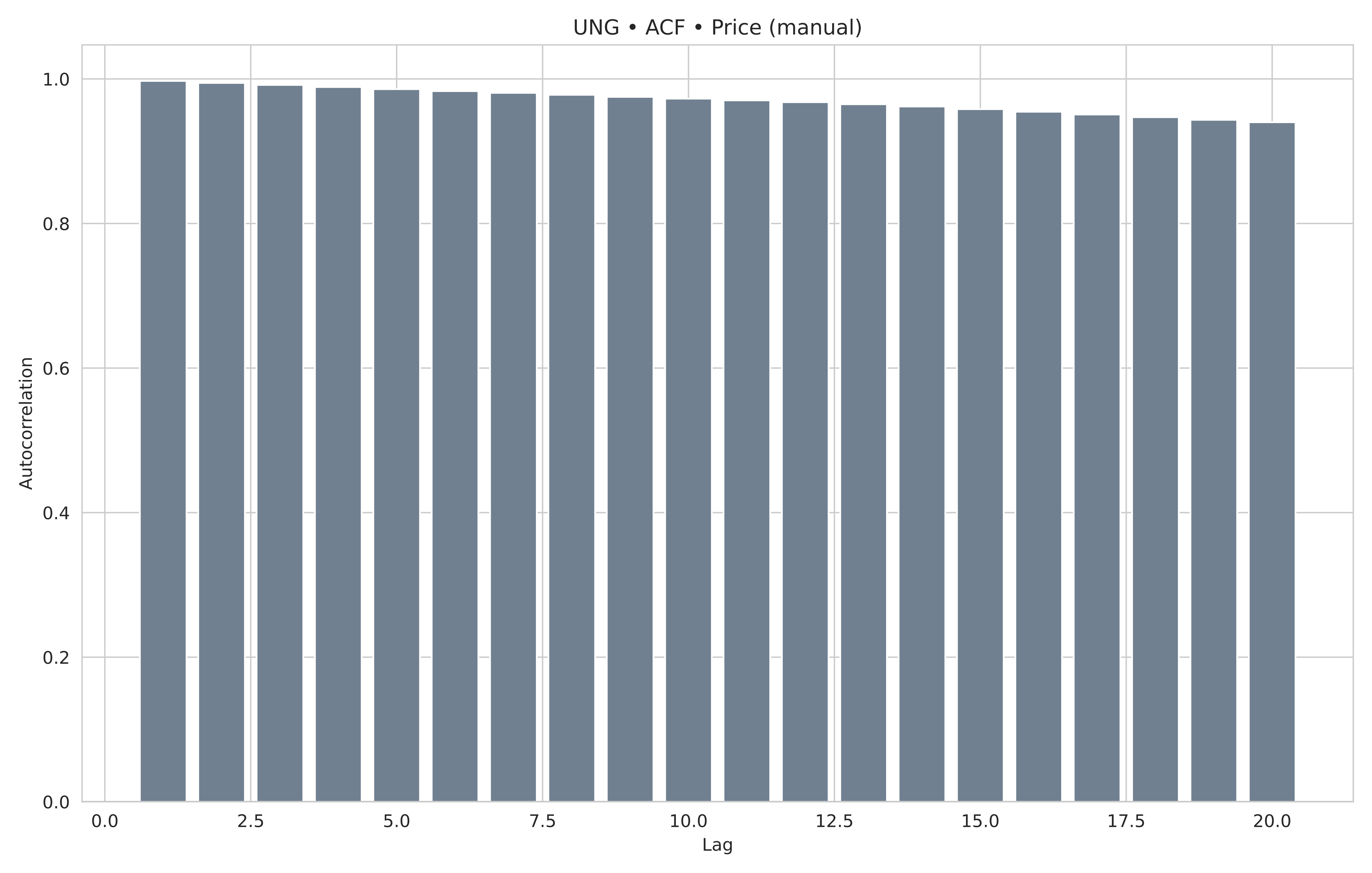
UGA • Lagged Prices
lag_1|UGA
lag_2|UGA
lag_3|UGA
Count
0
20
40
60
80
100
30
40
50
60
70
80
lag_1|UGA
lag_2|UGA
lag_3|UGA

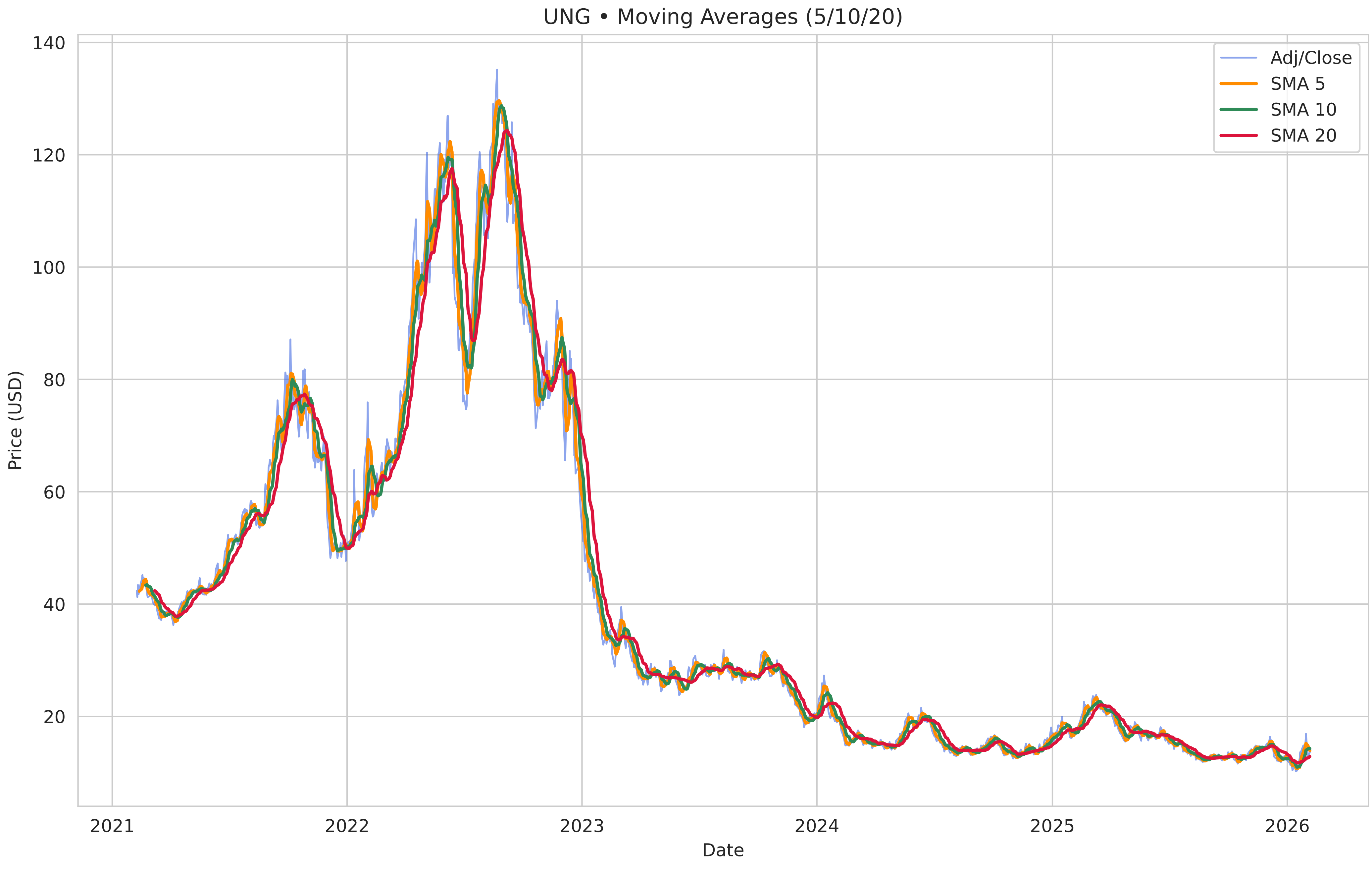
UGA • Correlation • Moving Averages

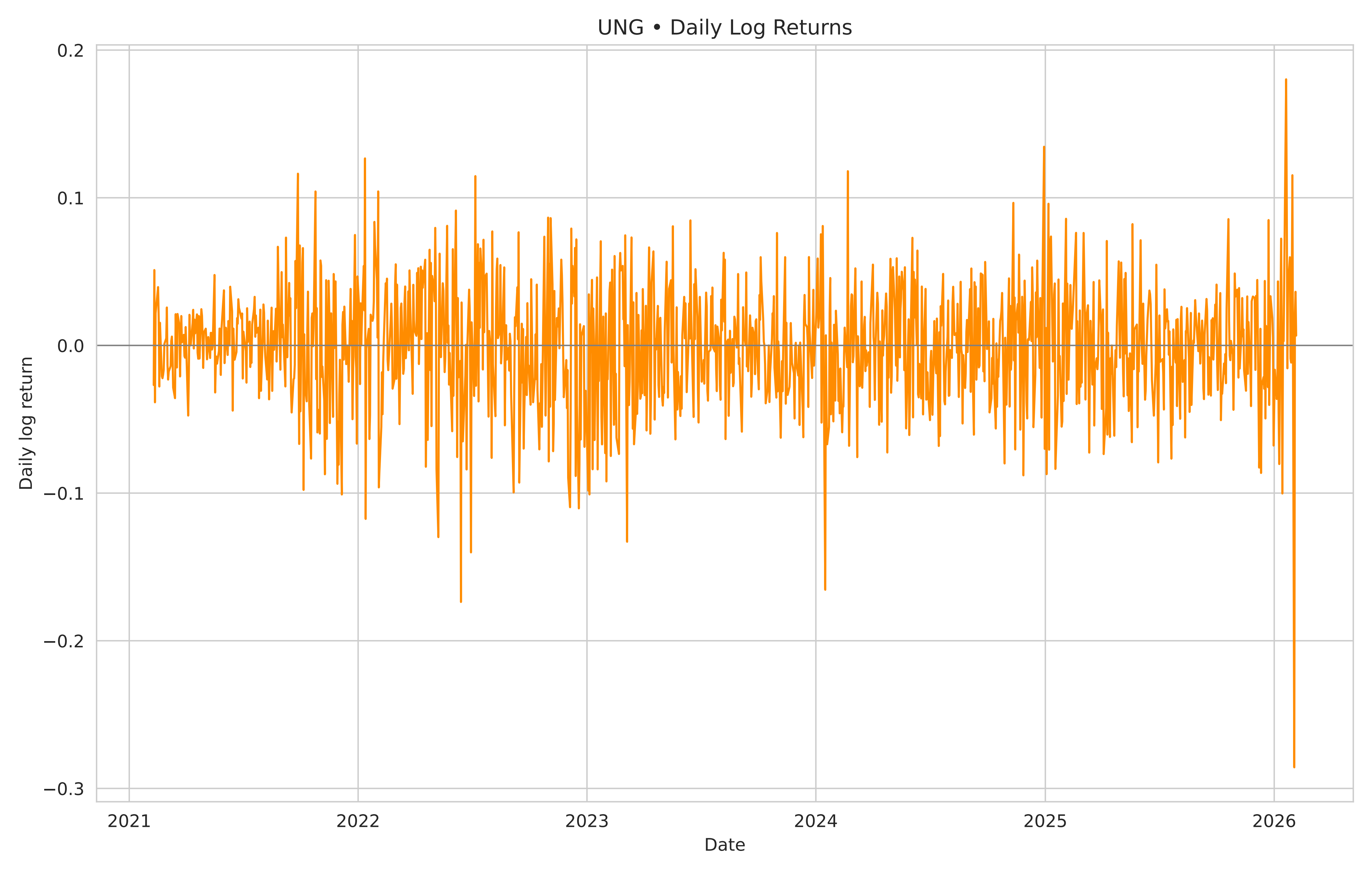


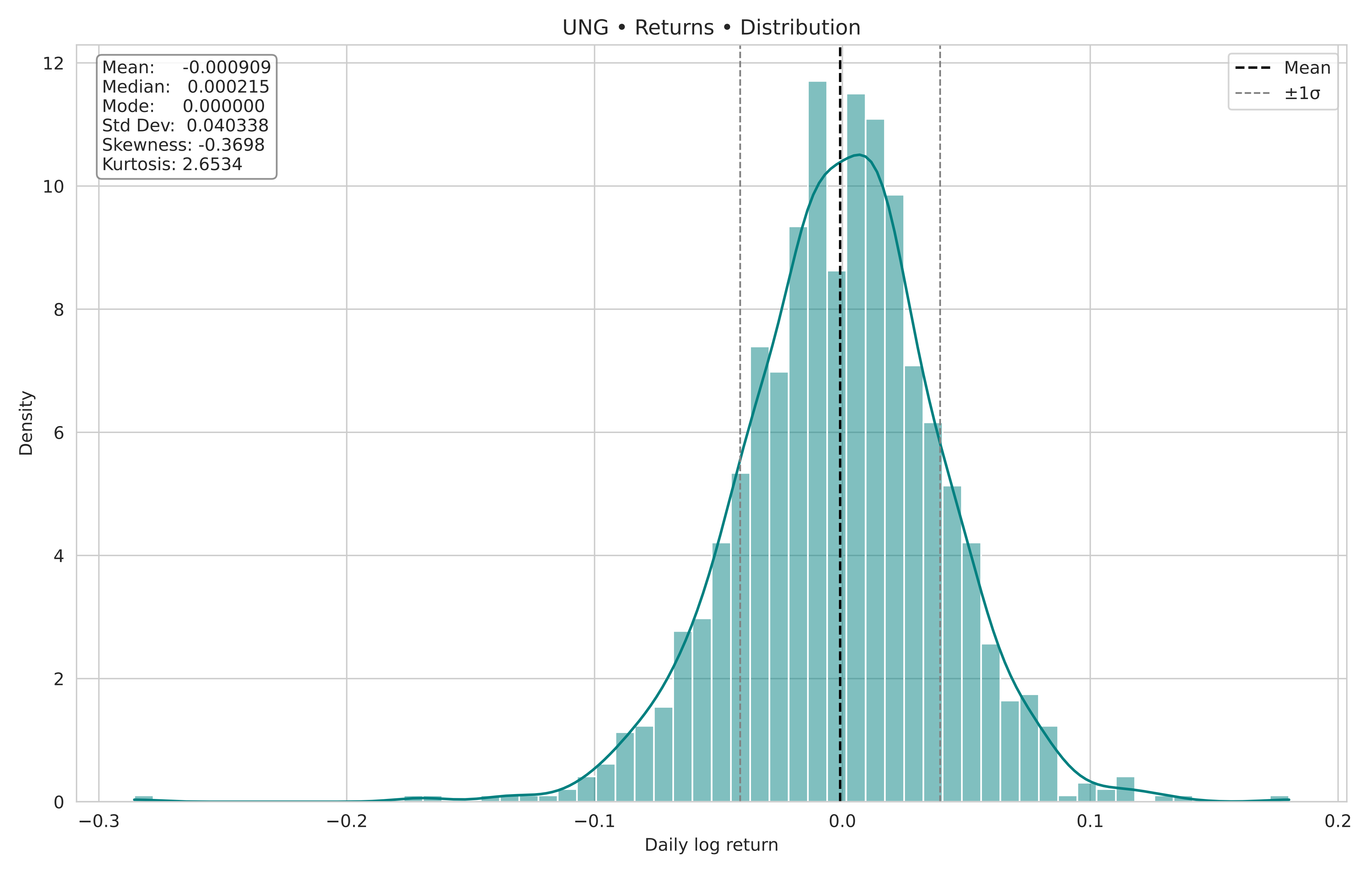

UGA • Correlation • Spreads + Lags
HL_spread|UGA
OC_spread|UGA
lag_1|UGA
lag_2|UGA
lag_3|UGA
1.00
0.15
0.30
0.30
0.30
0.15
1.00
0.04
0.04
0.04
0.30
0.04
1.00
0.99
0.99
0.30
0.04
0.99
1.00
0.99
0.30
0.04
0.99
0.99
1.00
1.0
0.8
0.6
0.4
0.2


UNG • Price
Adj/Close
Price (USD)
Date
140
120
100
80
60
40
20
2021
2022
2023
2024
2025
2026

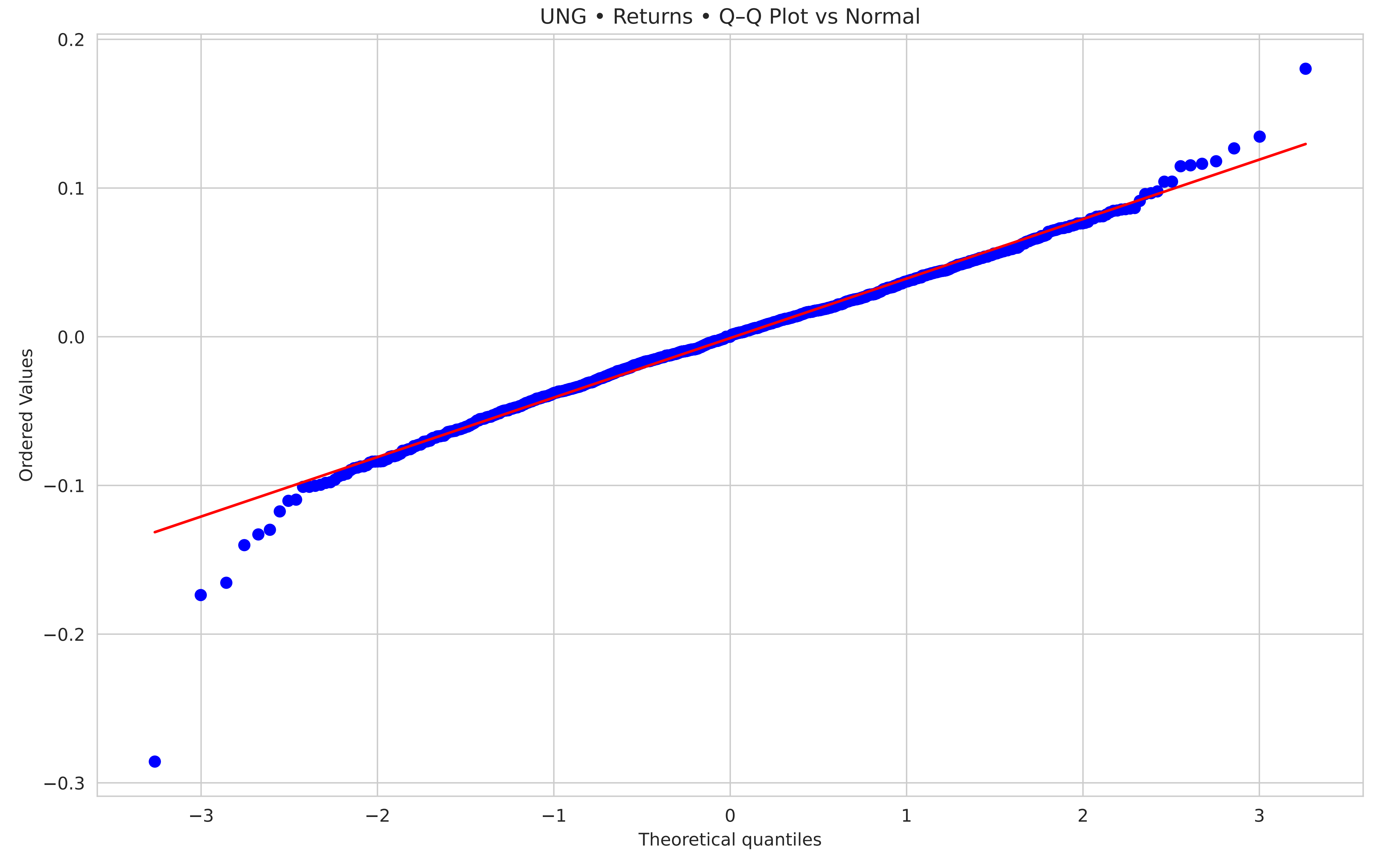

UNG • ACF • Price (manual)
Autocorrelation
Lag
0.0
0.2
0.4
0.6
0.8
1.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

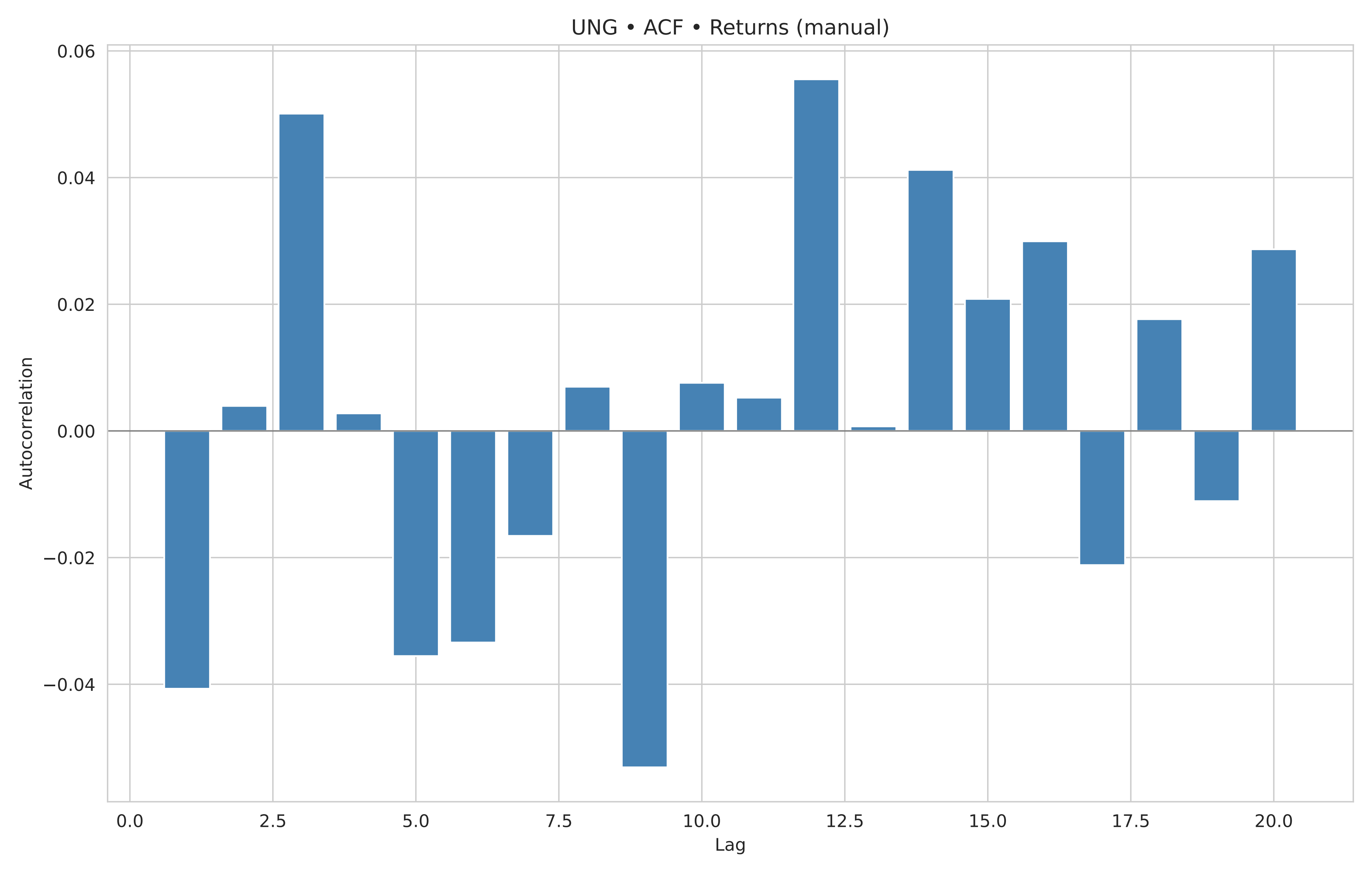

UNG • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price (USD)
140
120
100
80
60
40
20
2021
2022
2023
2024
2025
2026
Date

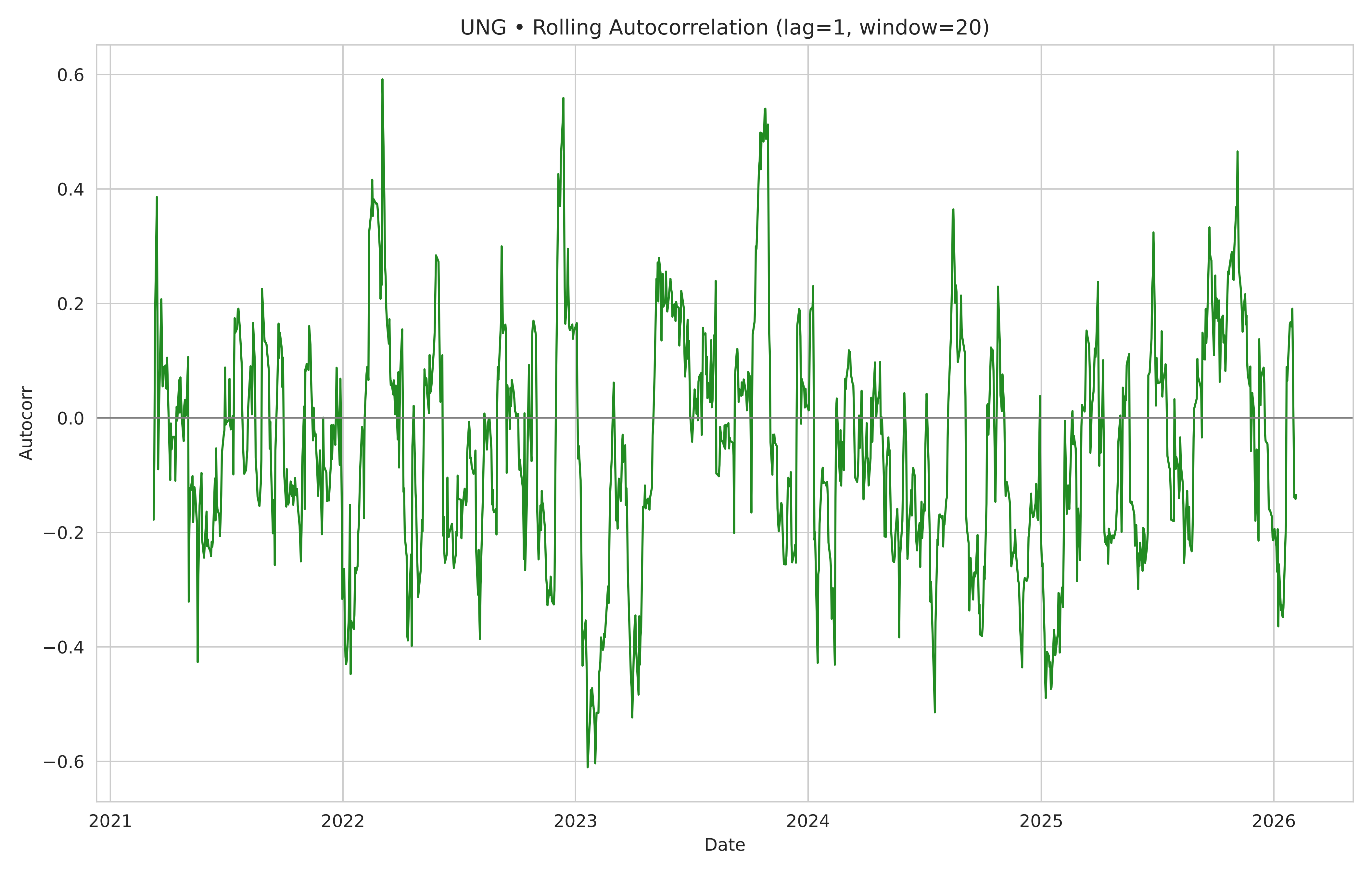

UNG • Daily Log Returns
Daily log return
Date
0.2
0.1
0.0
−0.1
−0.2
−0.3
2021
2022
2023
2024
2025
2026

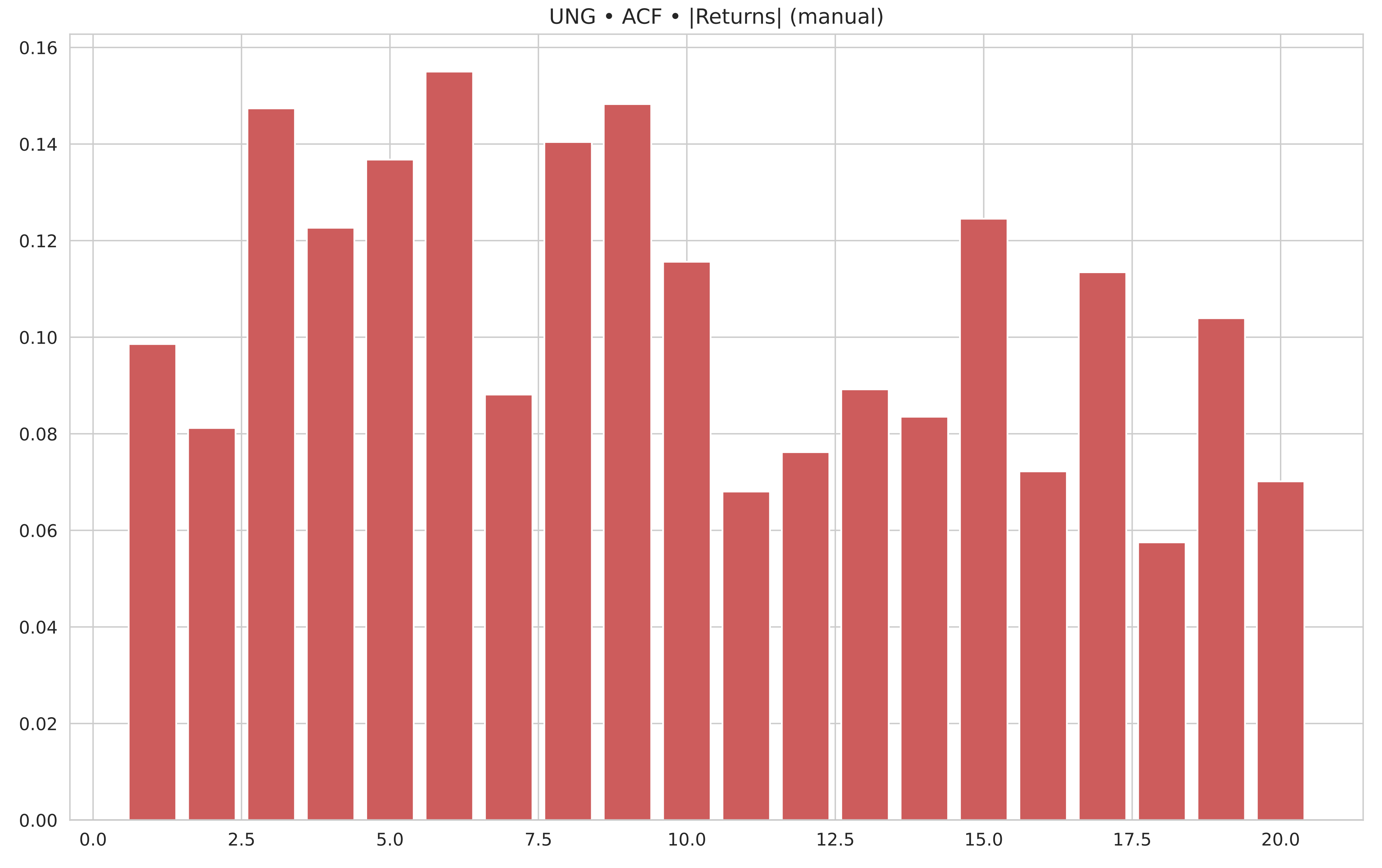


UNG • Returns • Distribution
Mean: -0.000909
Median: 0.000215
Mode: 0.000000
Std Dev: 0.040338
Skewness: -0.3698
Kurtosis: 2.6534
Mean
±1σ
Density
Daily log return
0
2
4
6
8
10
12
−0.3
−0.2
−0.1
0.0
0.1
0.2

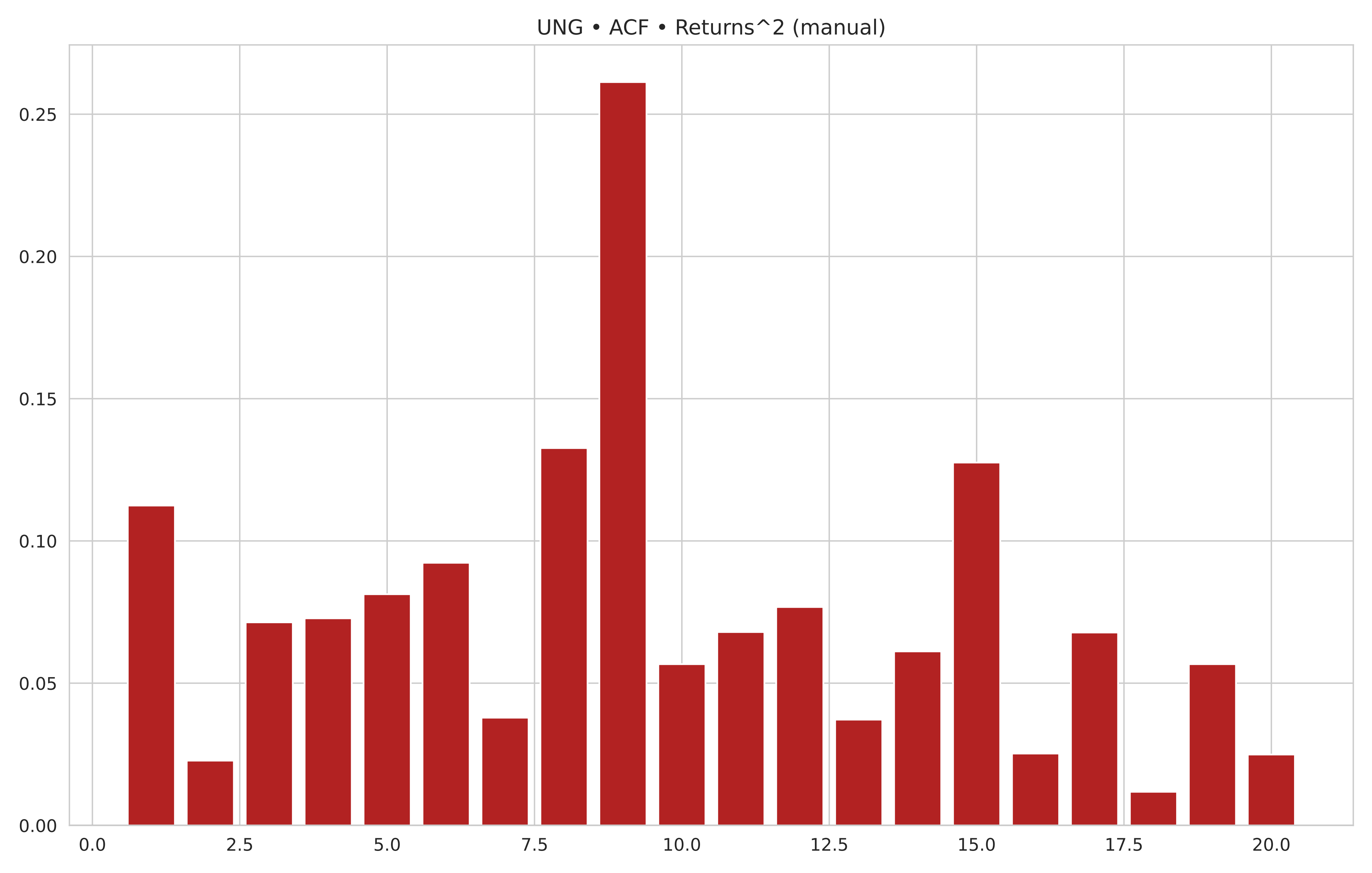

UNG • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.2
0.1
0.0
−0.1
−0.2
−0.3
−3
−2
−1
0
1
2
3

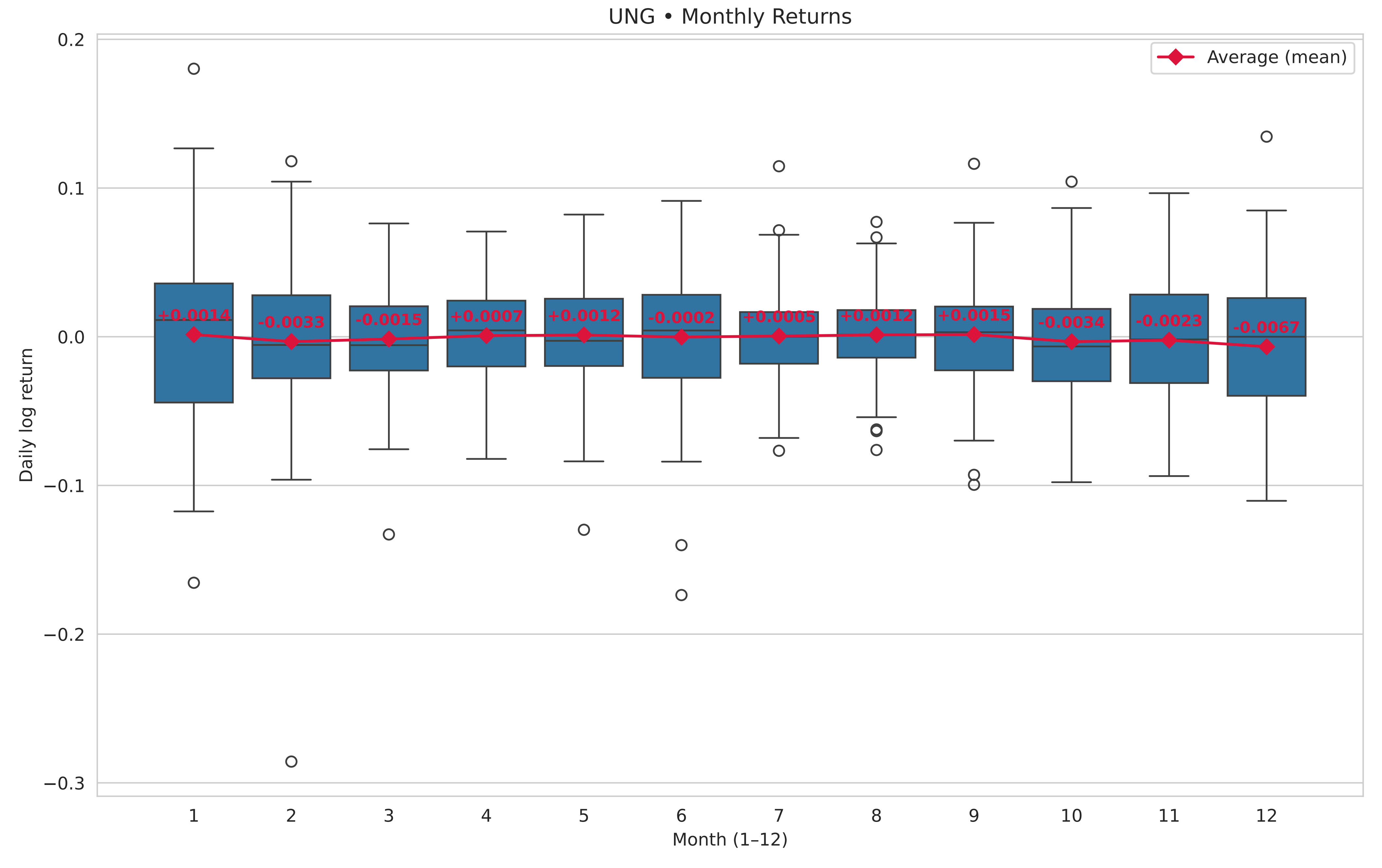

UNG • ACF • Returns (manual)
Autocorrelation
Lag
0.06
0.04
0.02
0.00
−0.02
−0.04
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


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

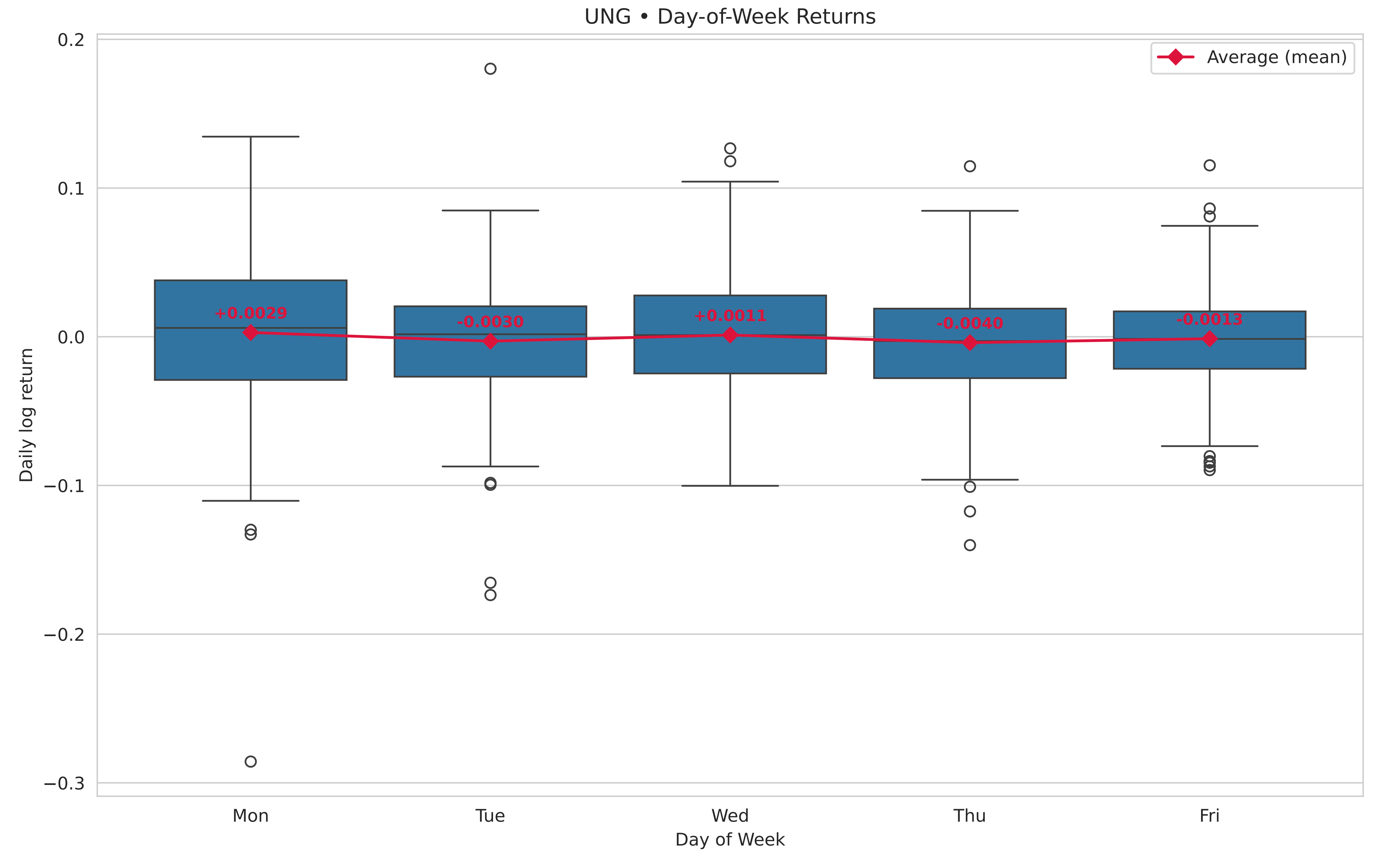


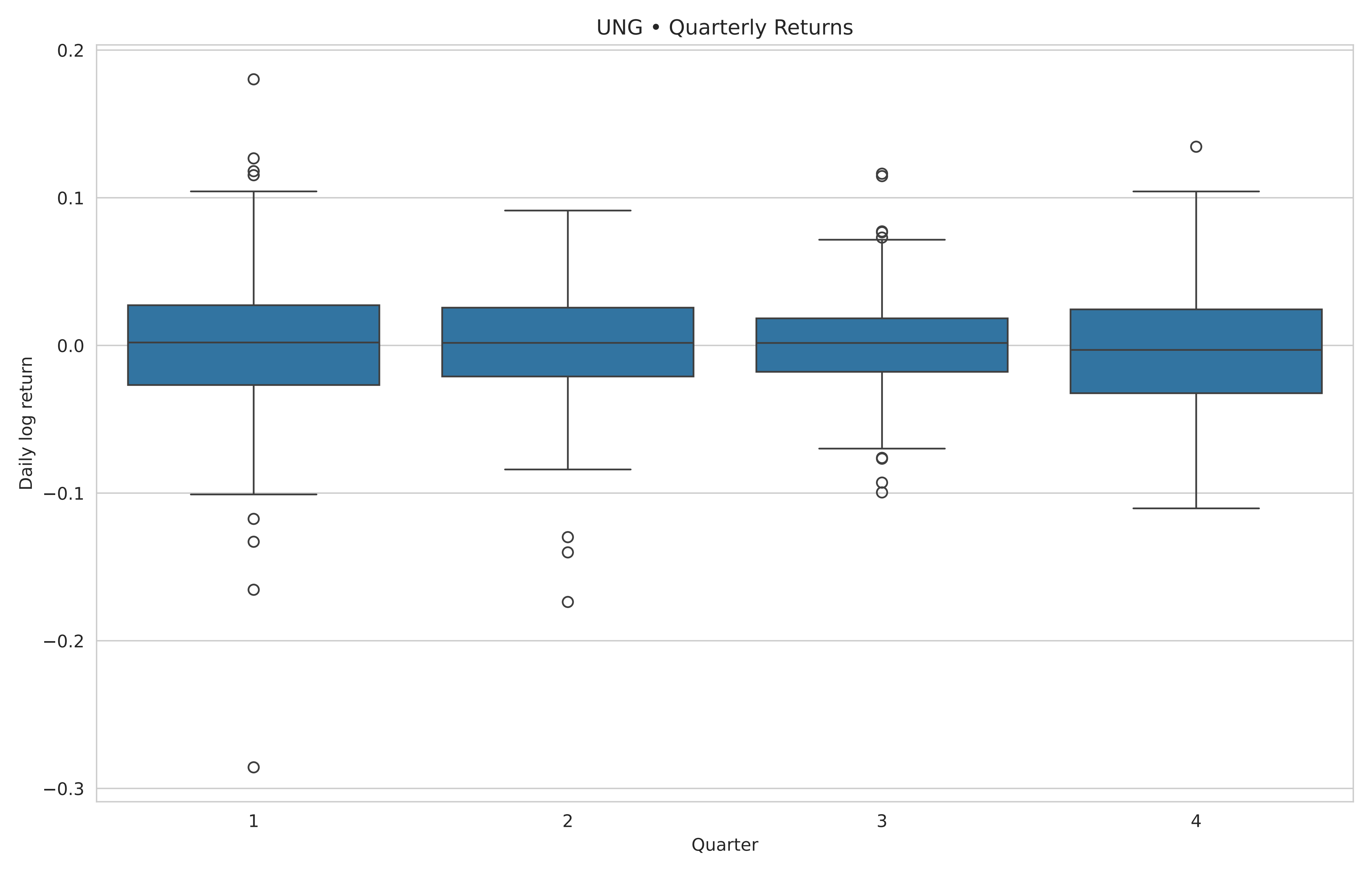
UNG • ACF • |Returns| (manual)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

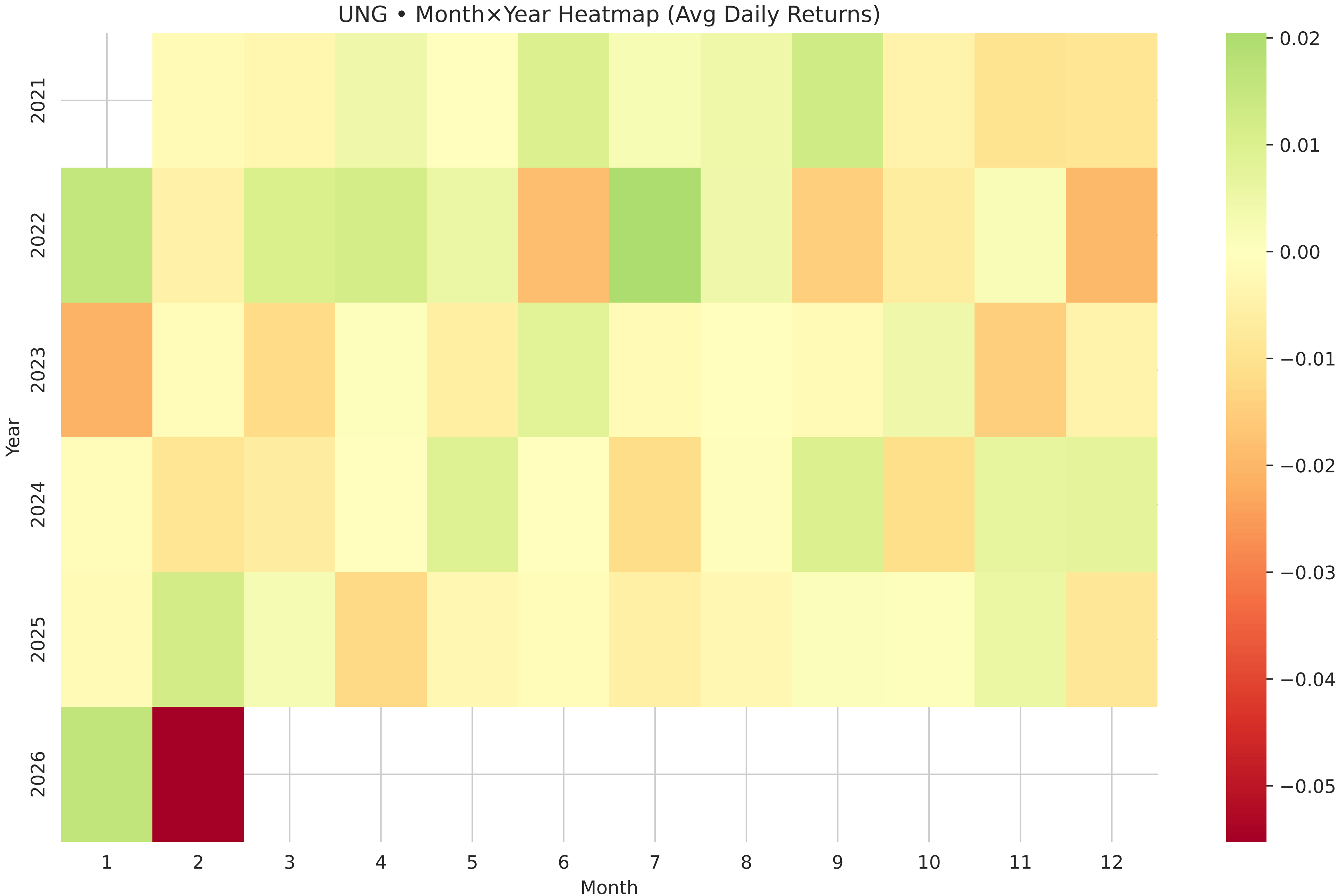

UNG • ACF • Returns^2 (manual)
0.25
0.20
0.15
0.10
0.05
0.00
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

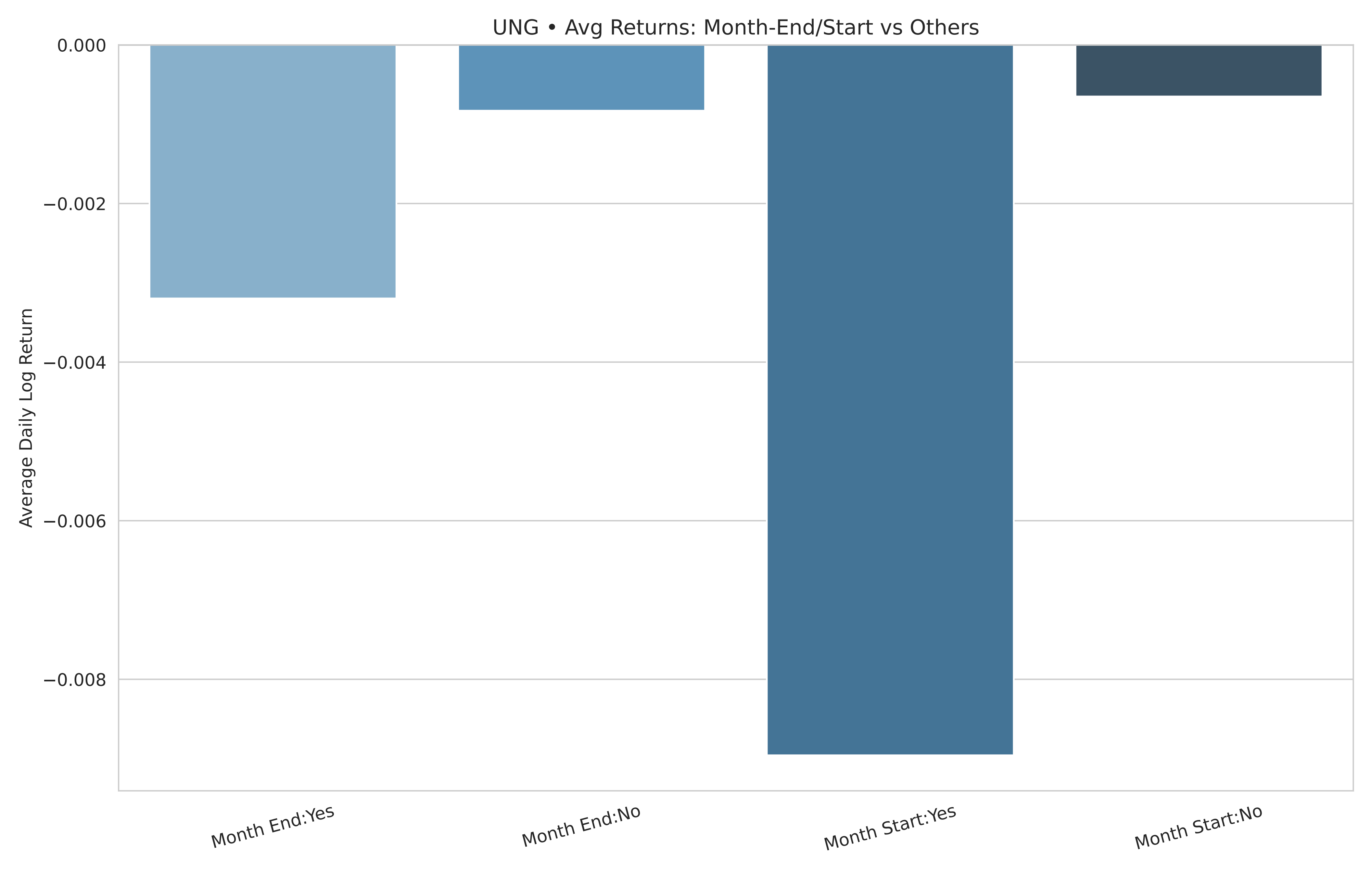


UNG • Monthly Returns
Average (mean)
Daily log return
Month (1–12)
0.2
0.1
0.0
−0.1
−0.2
−0.3
1
2
3
4
5
6
7
8
9
10
11
12
+0.0014
-0.0033
-0.0015
+0.0007
+0.0012
-0.0002
+0.0005
+0.0012
+0.0015
-0.0034
-0.0023
-0.0067

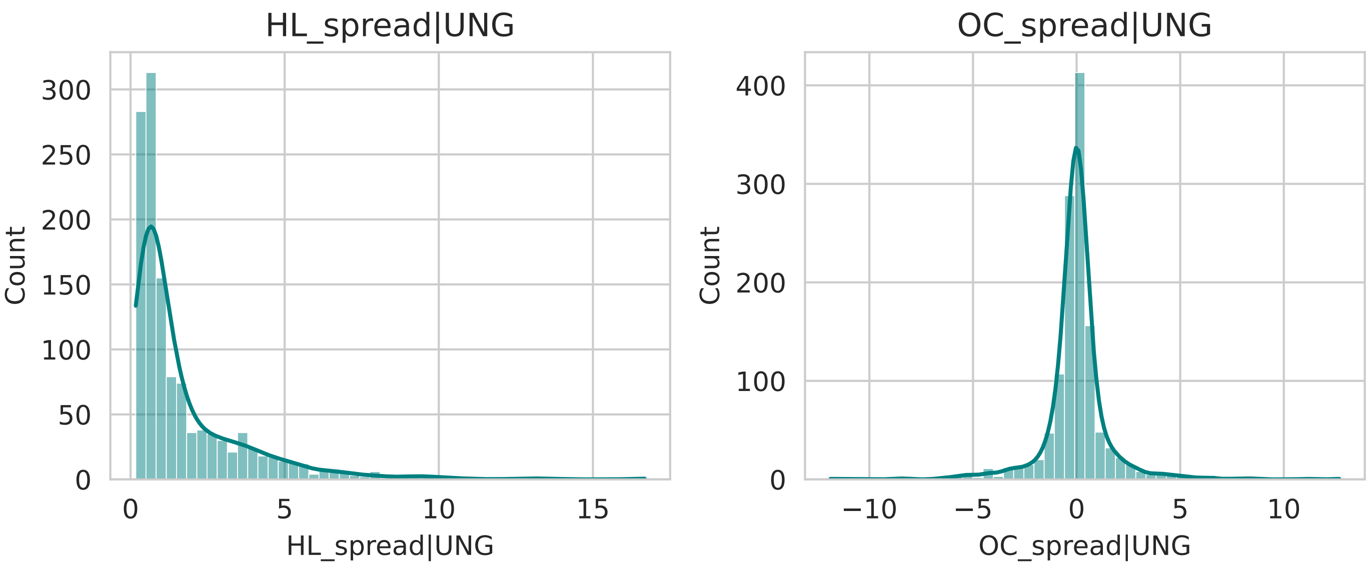

UNG • Day-of-Week Returns
Average (mean)
0.2
0.1
0.0
−0.1
−0.2
−0.3
Daily log return
+0.0029
-0.0030
+0.0011
-0.0040
-0.0013
Mon
Tue
Wed
Thu
Fri
Day of Week


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


UNG • Month×Year Heatmap (Avg Daily Returns)
Year
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.02
0.01
0.00
−0.01
−0.02
−0.03
−0.04
−0.05

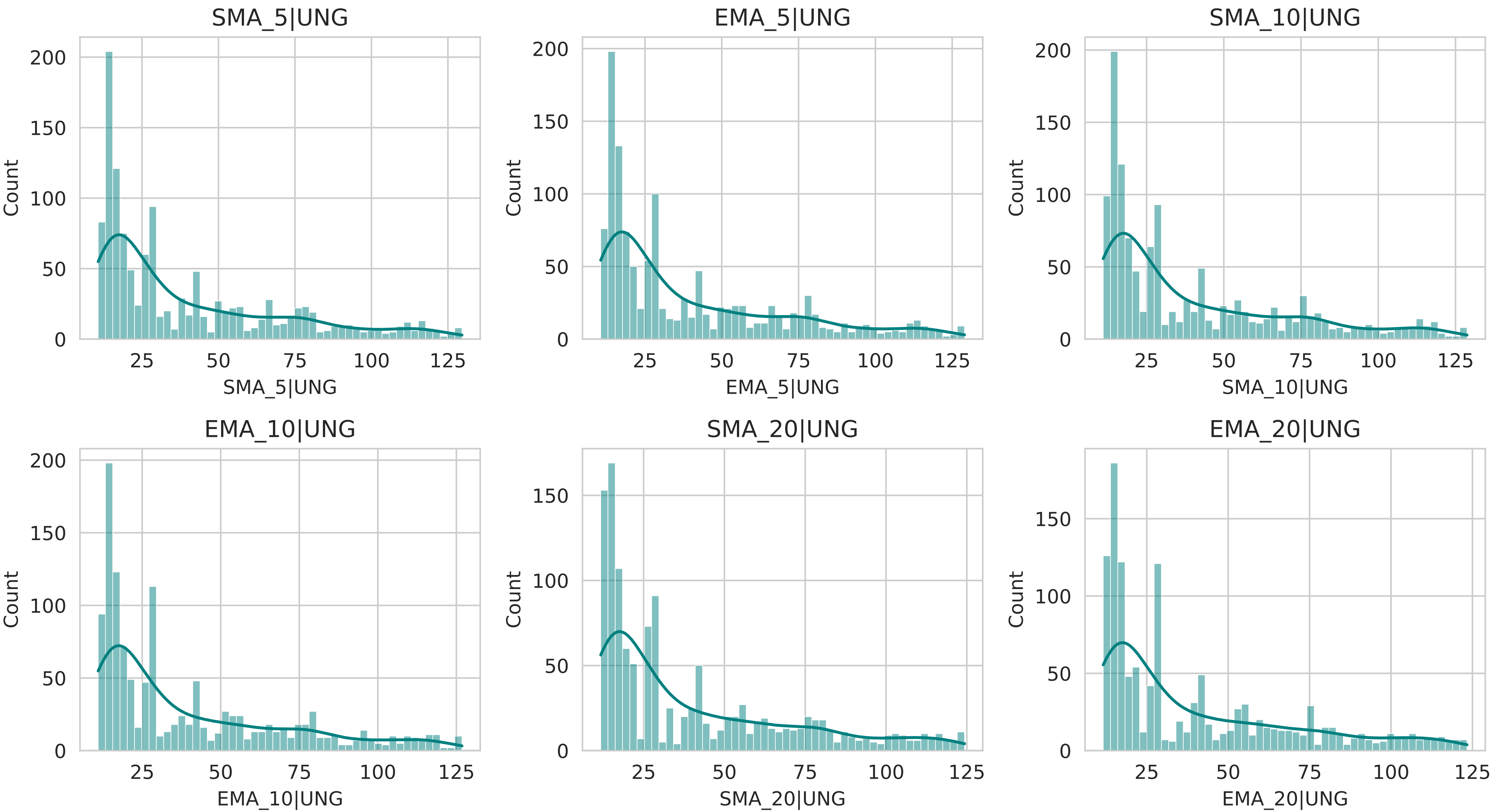

UNG • Avg Returns: Month-End/Start vs Others
0.000
−0.002
−0.004
−0.006
−0.008
Average Daily Log Return
Month End:Yes
Month End:No
Month Start:Yes
Month Start:No

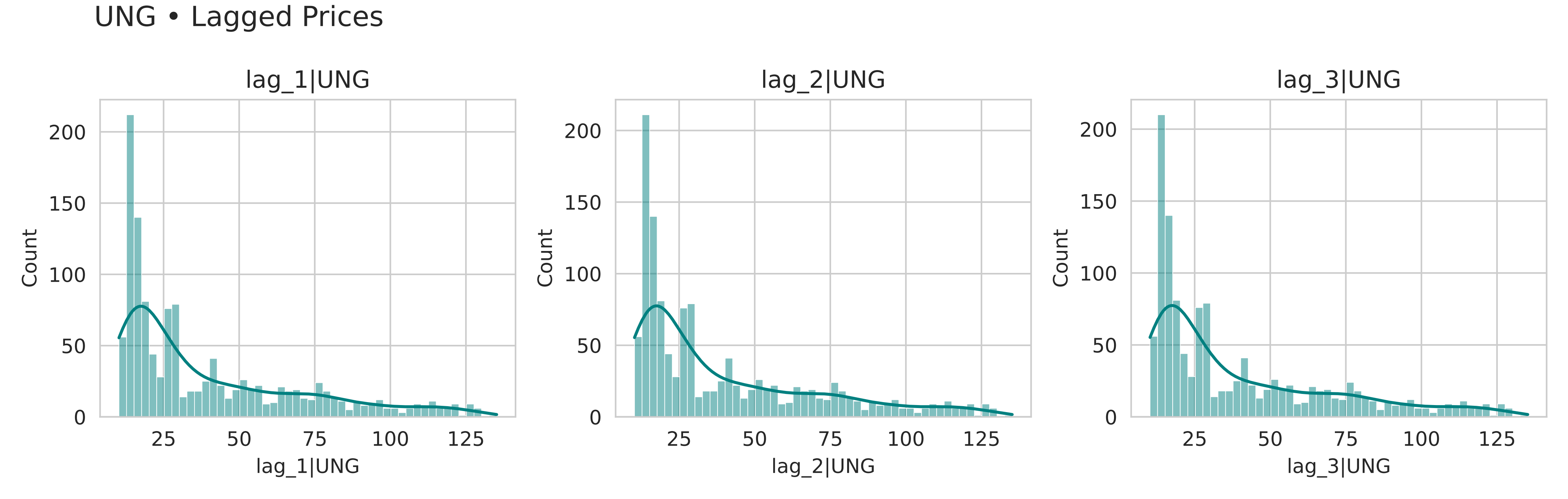
UNG • Spreads



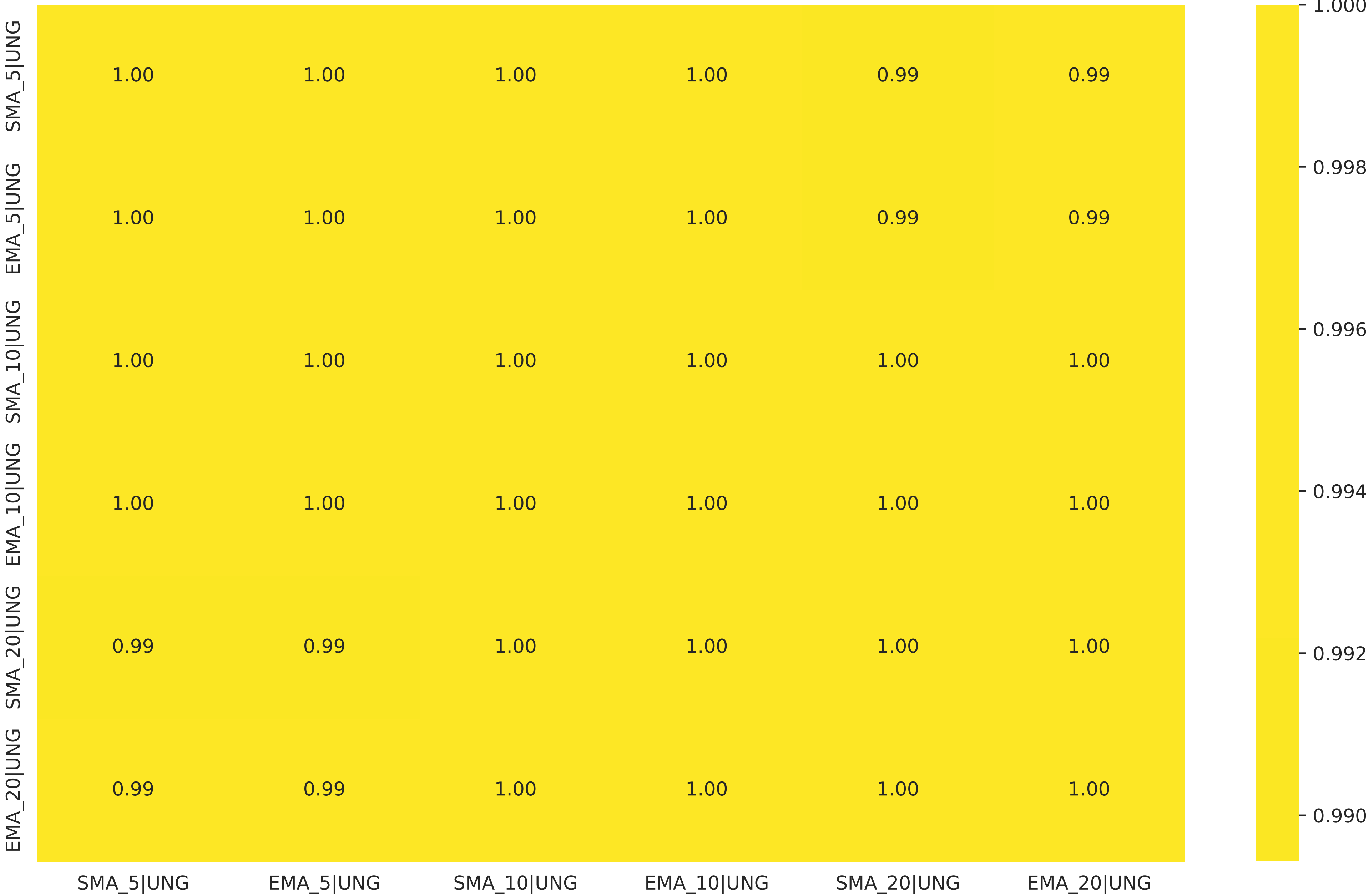
HL_spread|UNG
OC_spread|UNG
Count
300
250
200
150
100
50
0
400
0
5
10
15
−10
−5

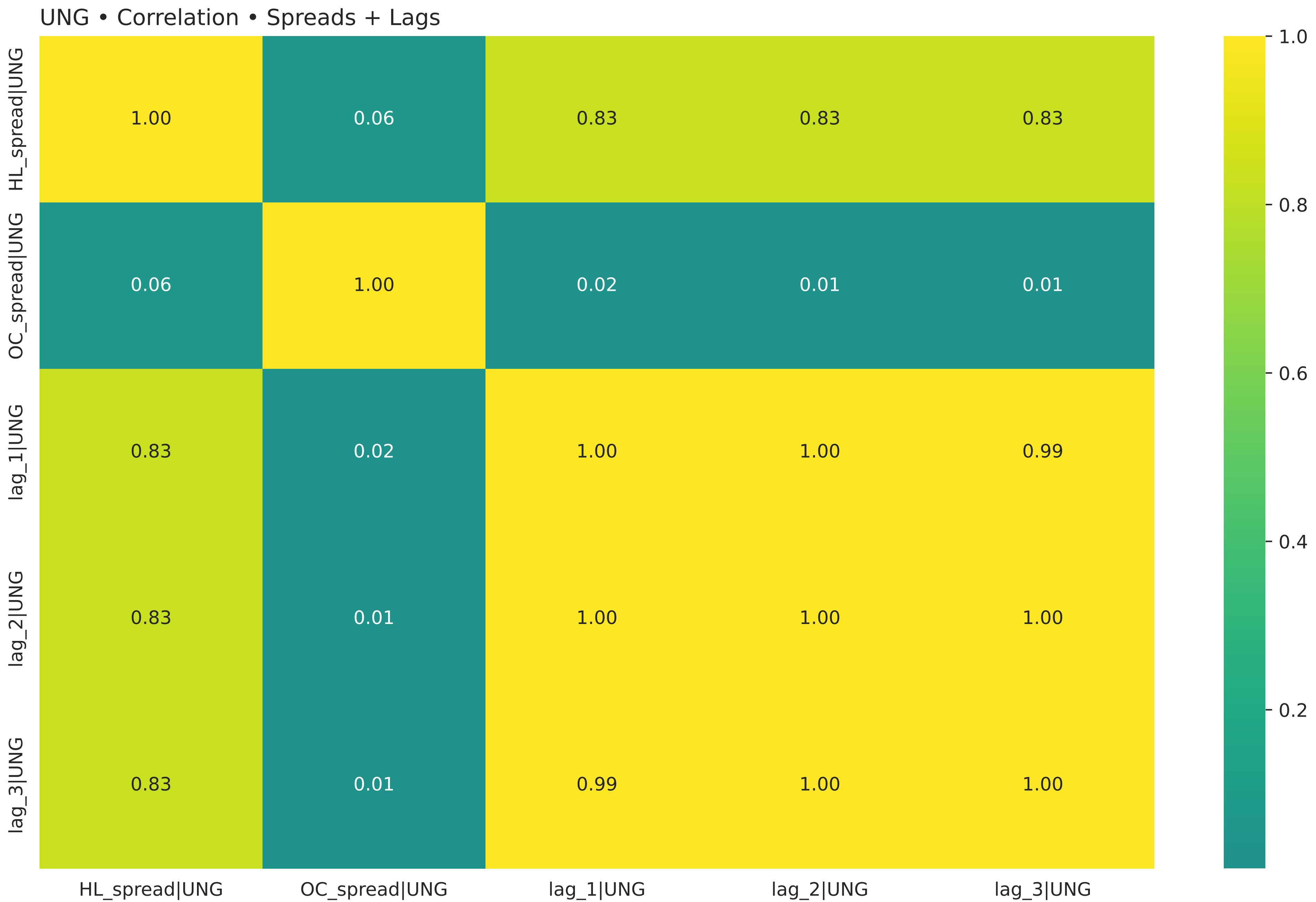
UNG • Moving Averages / EMAs



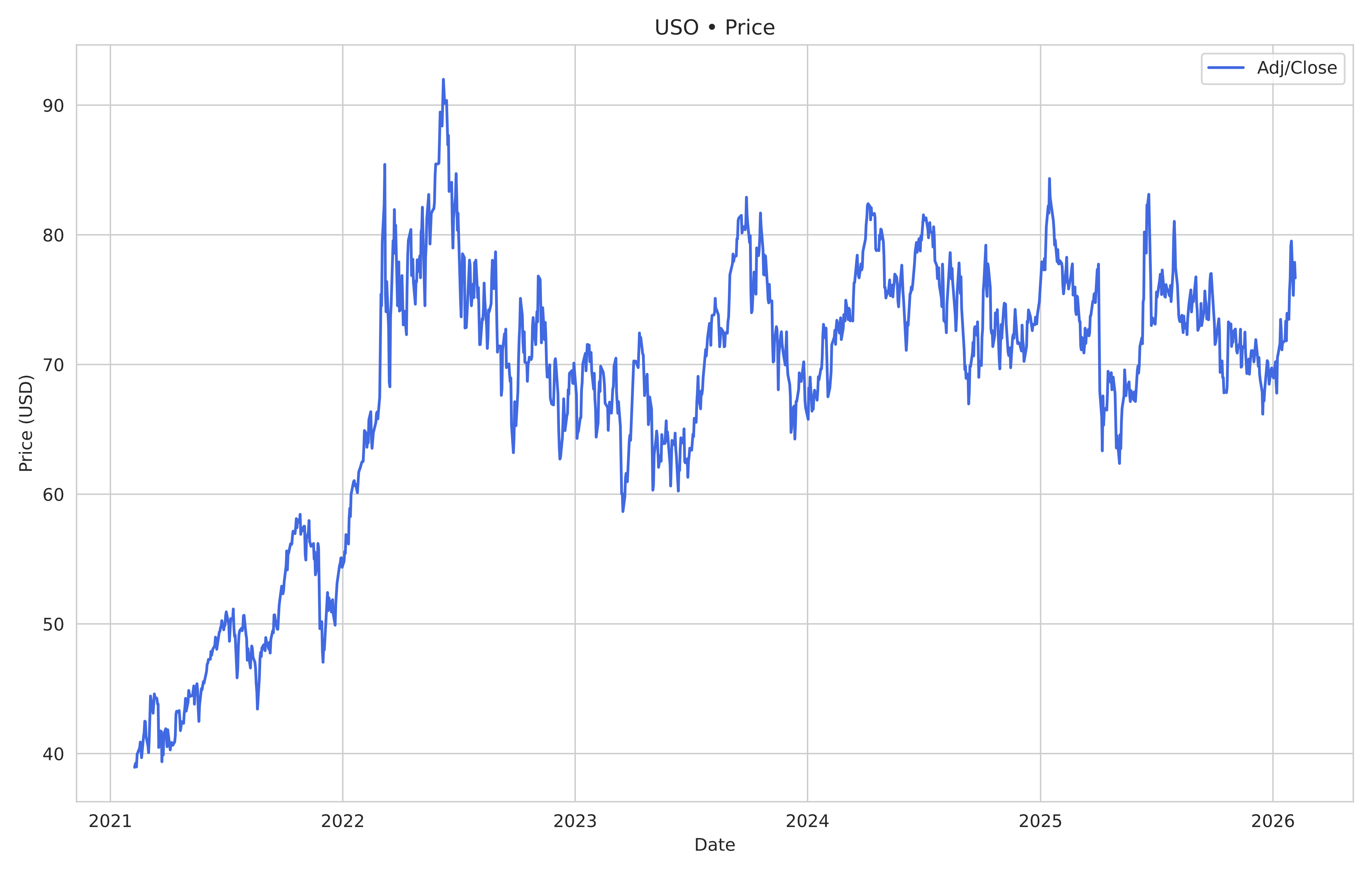

UNG • Lagged Prices
lag_1|UNG
lag_2|UNG
lag_3|UNG
Count
0
50
100
150
200
25
50
75
100
125
lag_1|UNG
lag_2|UNG
lag_3|UNG

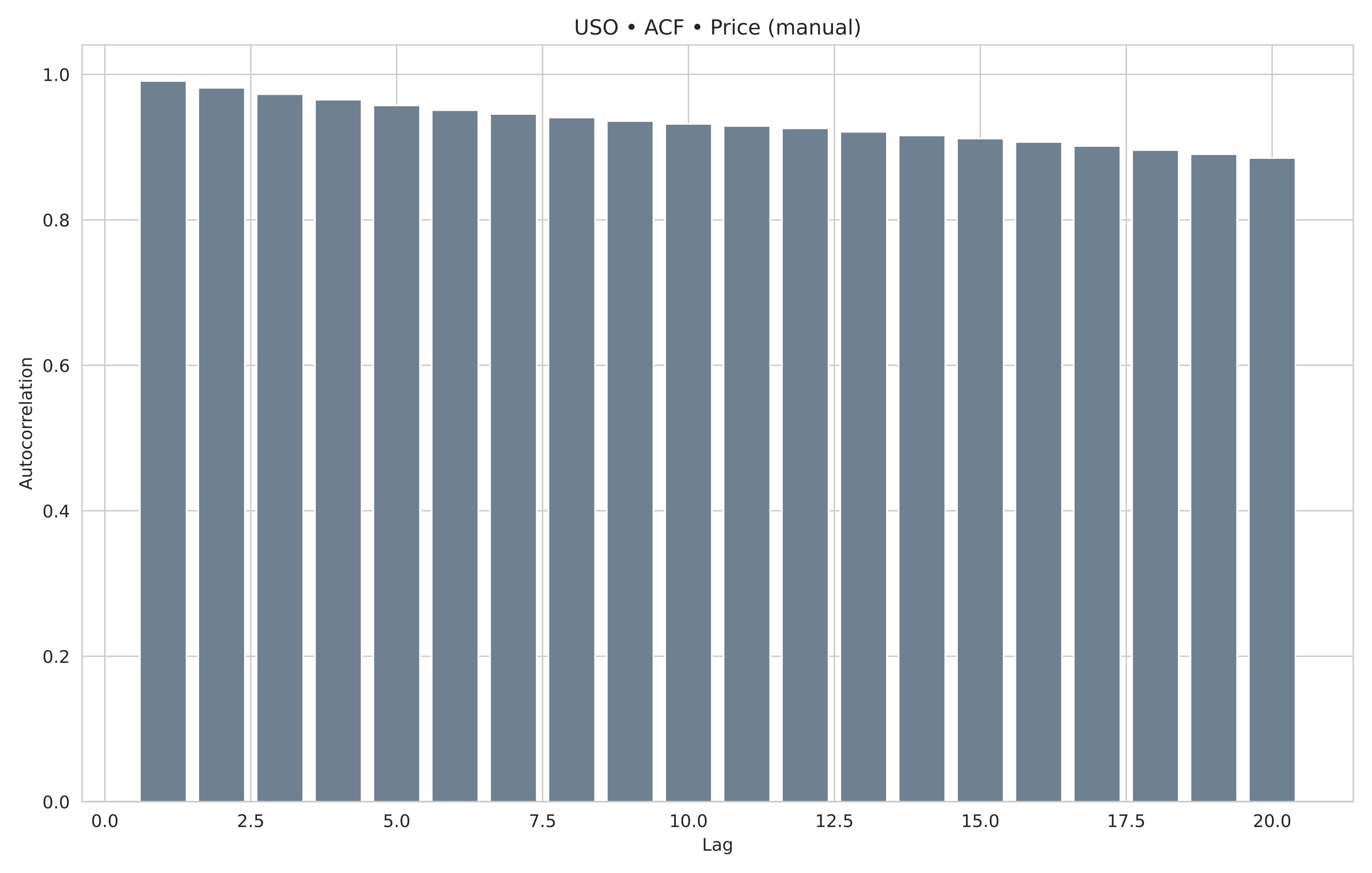
UNG • Correlation • Moving Averages

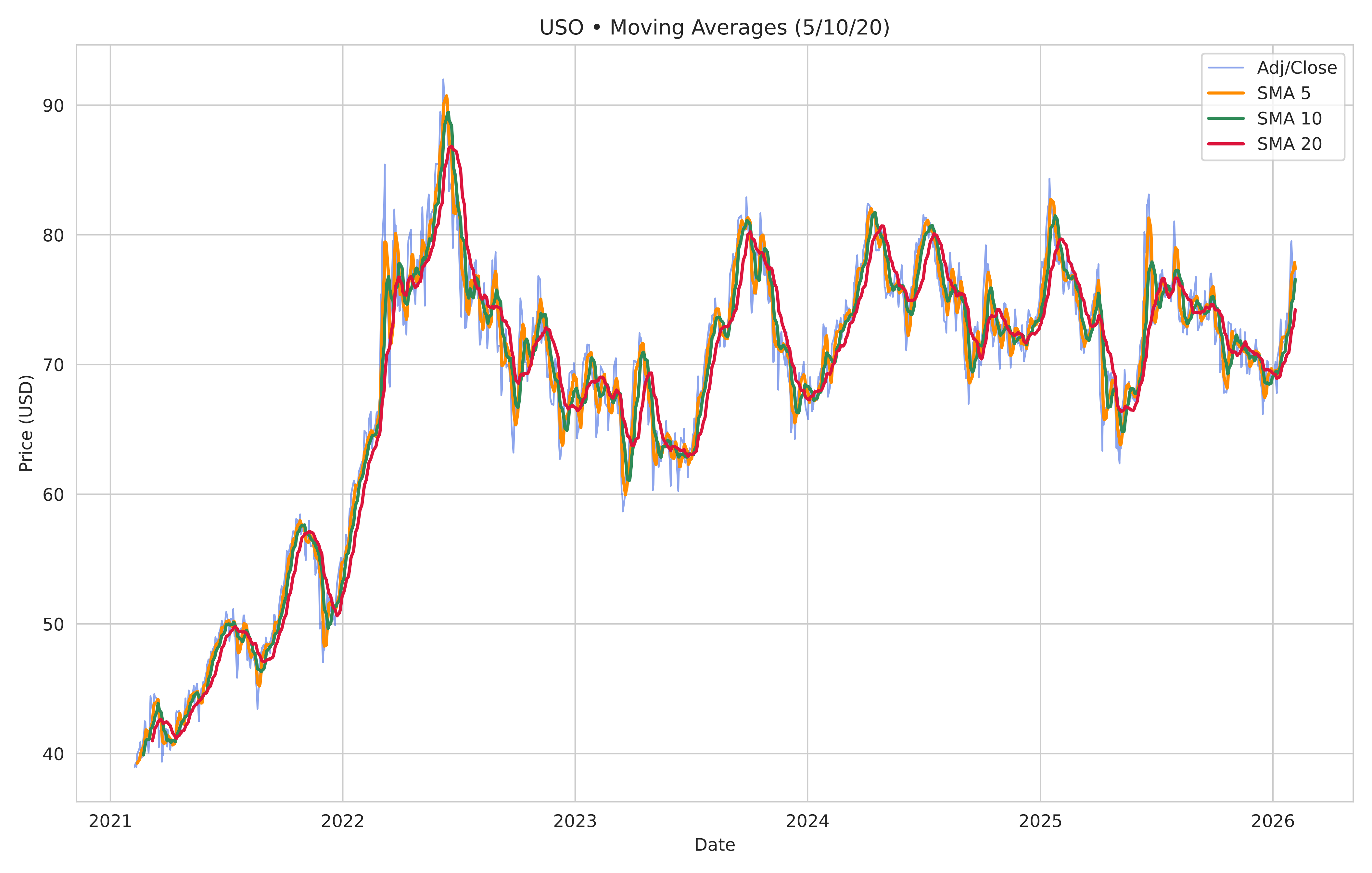


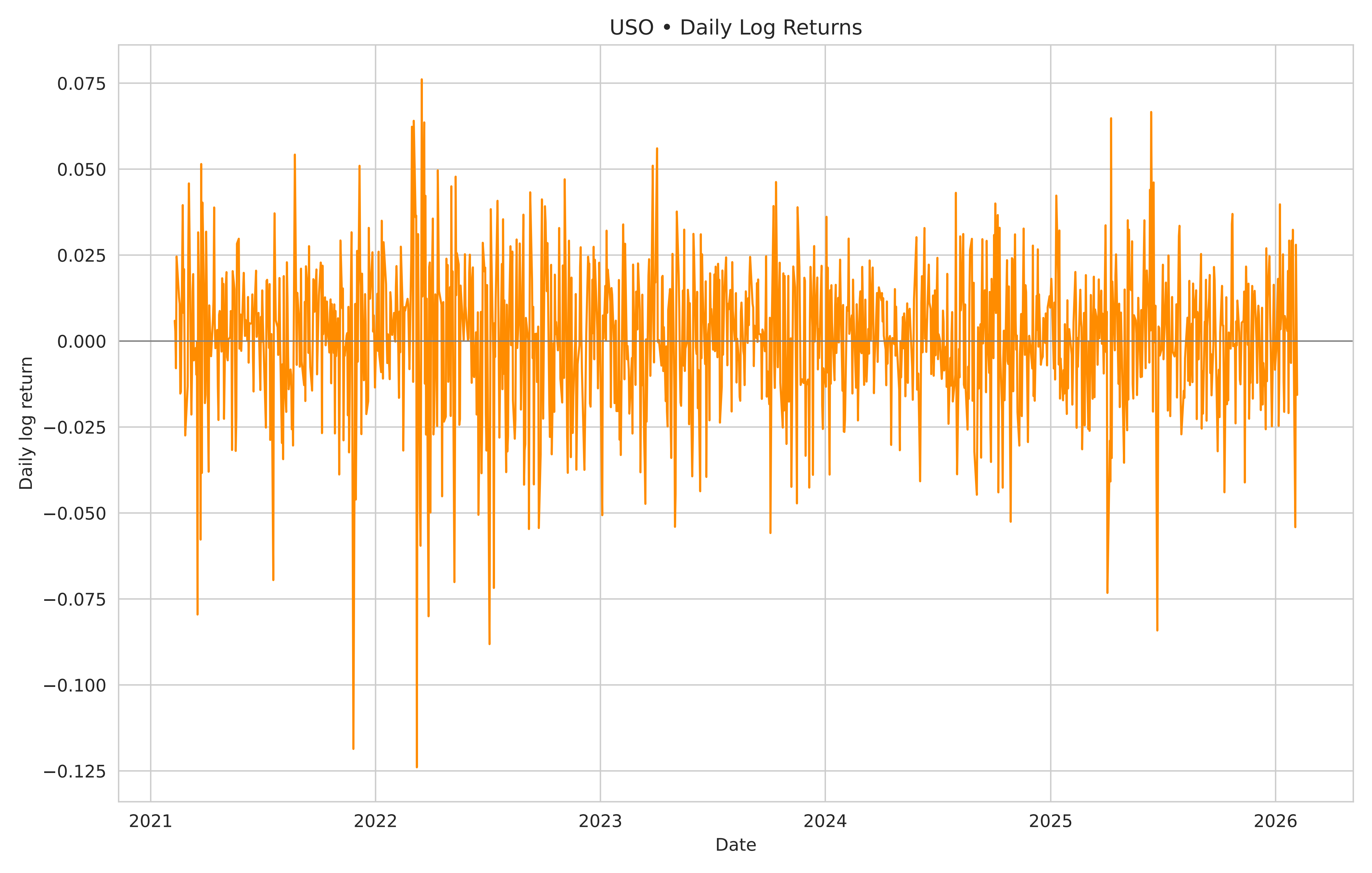


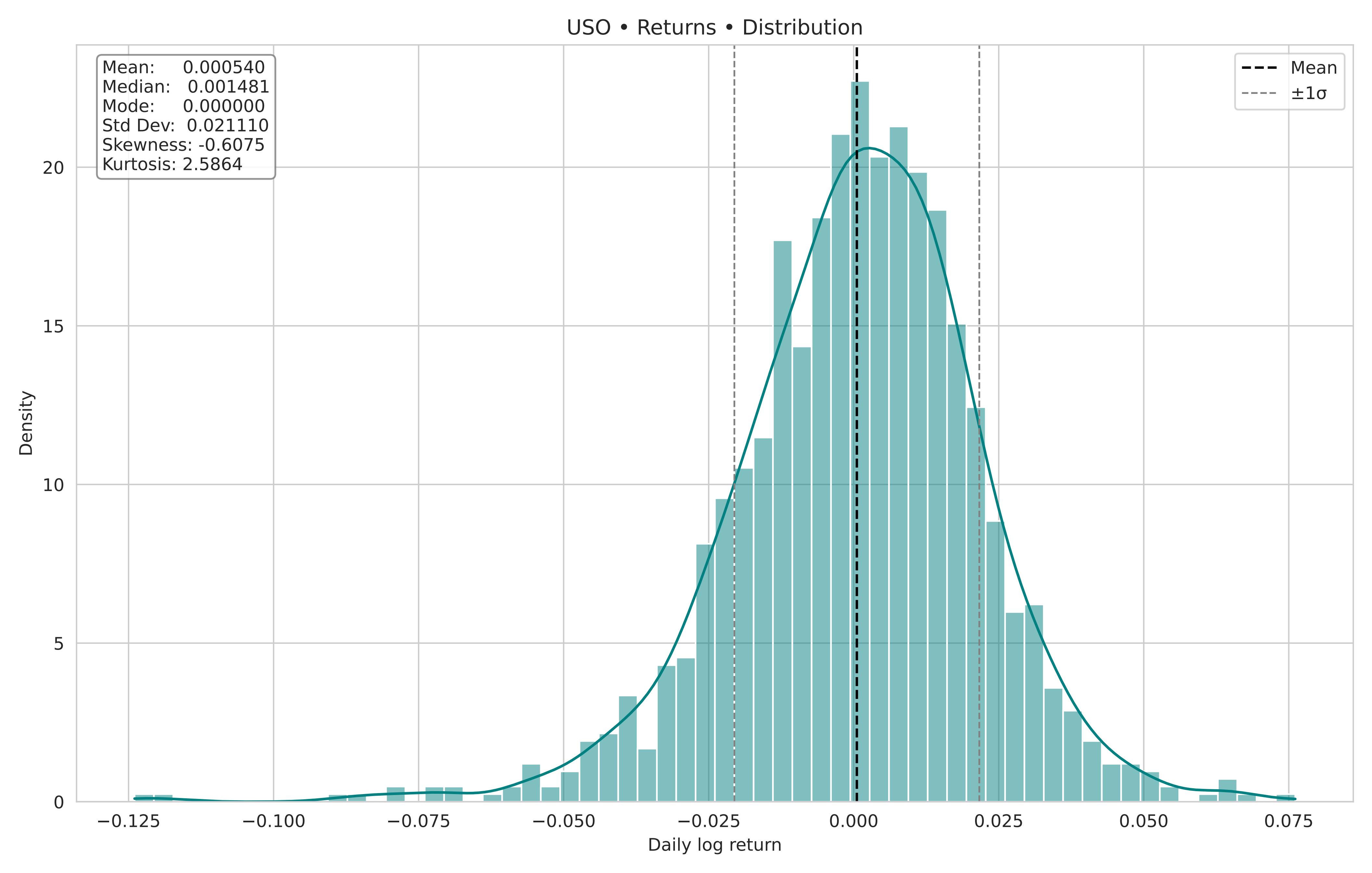
UNG • Correlation • Spreads + Lags
HL_spread|UNG
OC_spread|UNG
lag_1|UNG
lag_2|UNG
lag_3|UNG
1.00
0.06
0.83
0.83
0.83
0.06
1.00
0.02
0.01
0.01
0.83
0.02
1.00
1.00
0.99
0.83
0.01
1.00
1.00
1.00
0.83
0.01
0.99
1.00
1.00
HL_spread|UNG
OC_spread|UNG
lag_1|UNG
lag_2|UNG
lag_3|UNG
1.0
0.8
0.6
0.4
0.2


USO • Price
Adj/Close
90
80
70
60
50
40
Price (USD)
2021
2022
2023
2024
2025
2026
Date

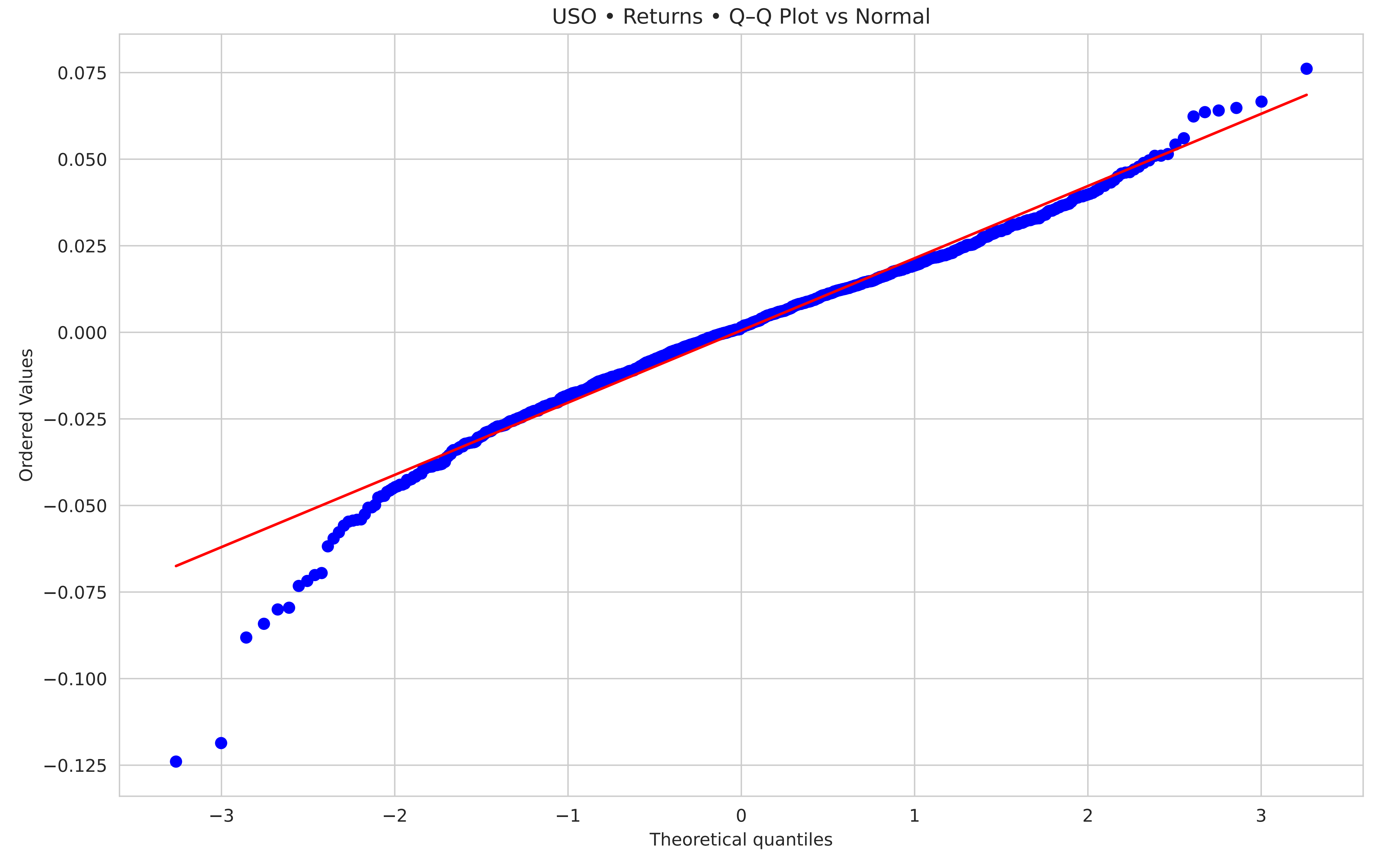

USO • ACF • Price (manual)
Autocorrelation
Lag
1.0
0.8
0.6
0.4
0.2
0.0
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


USO • Moving Averages (5/10/20)
Adj/Close
SMA 5
SMA 10
SMA 20
Price (USD)
Date
90
80
70
60
50
40
2021
2022
2023
2024
2025
2026

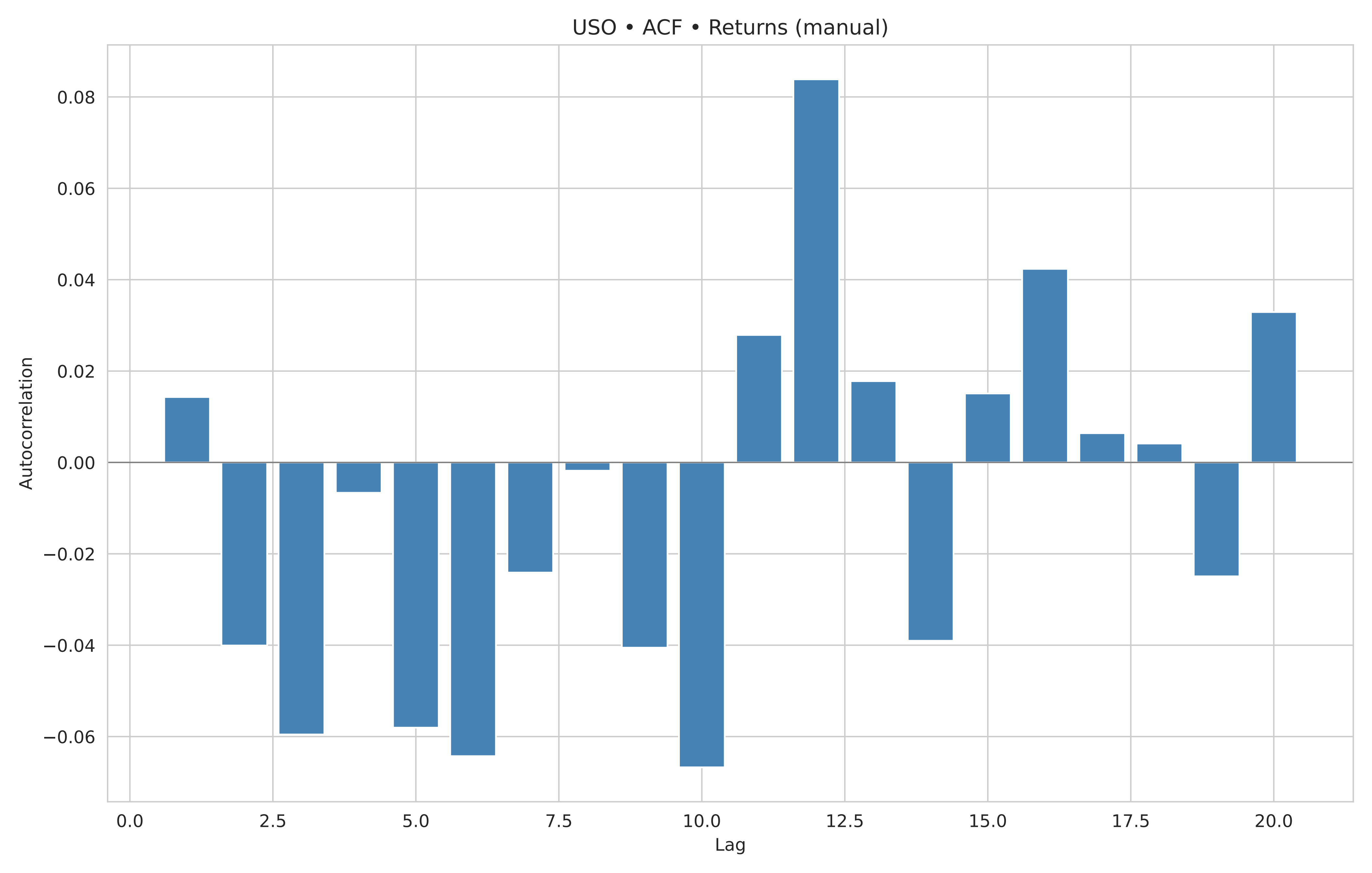

USO • Daily Log Returns
Daily log return
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
2021
2022
2023
2024
2025
2026
Date



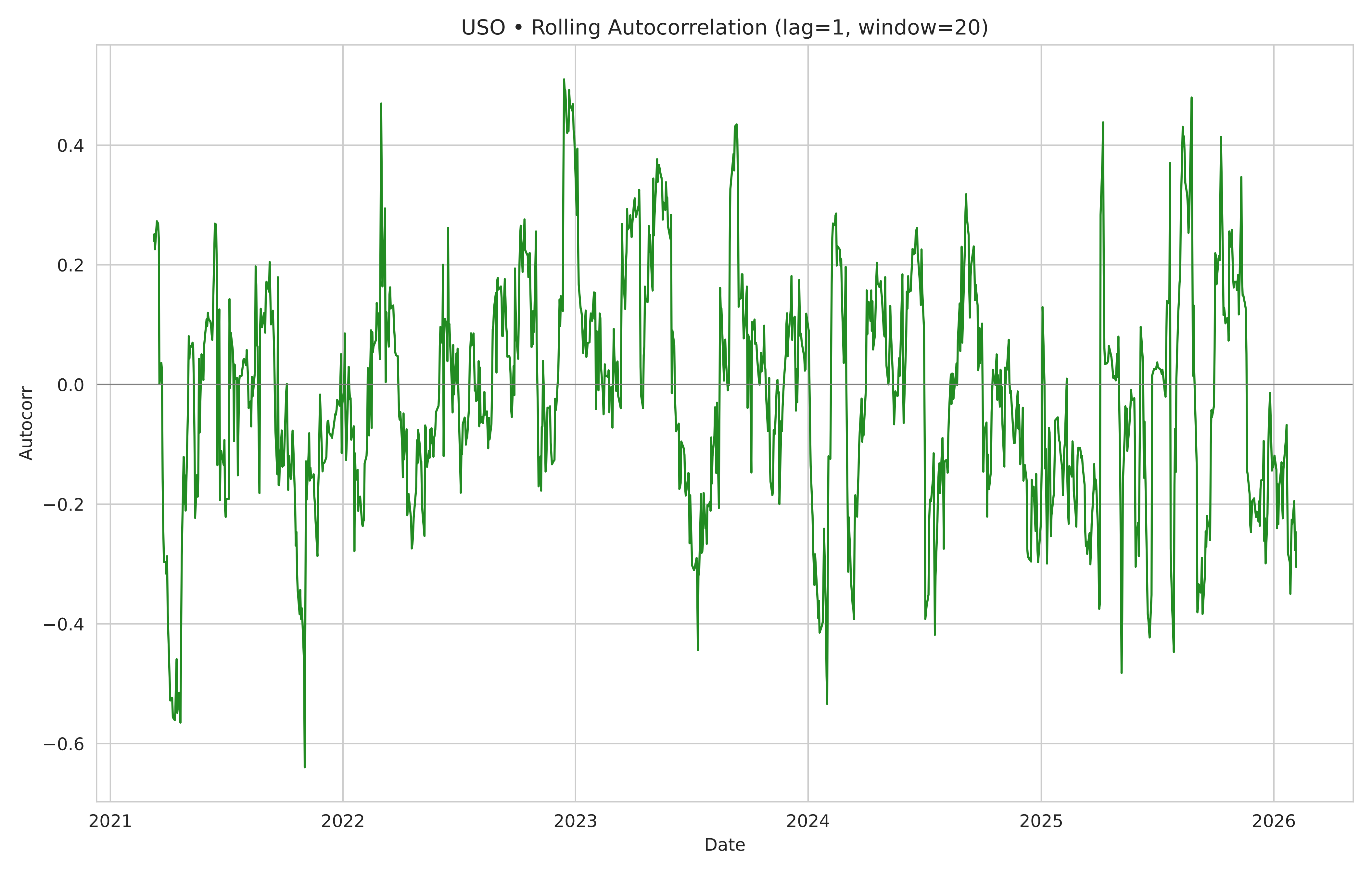
USO • Returns • Distribution
Mean: 0.000540
Median: 0.001481
Mode: 0.000000
Std Dev: 0.021110
Skewness: -0.6075
Kurtosis: 2.5864
Mean
±1σ
Density
Daily log return
0
5
10
15
20
−0.125
−0.100
−0.075
−0.050
−0.025
0.000
0.025
0.050
0.075

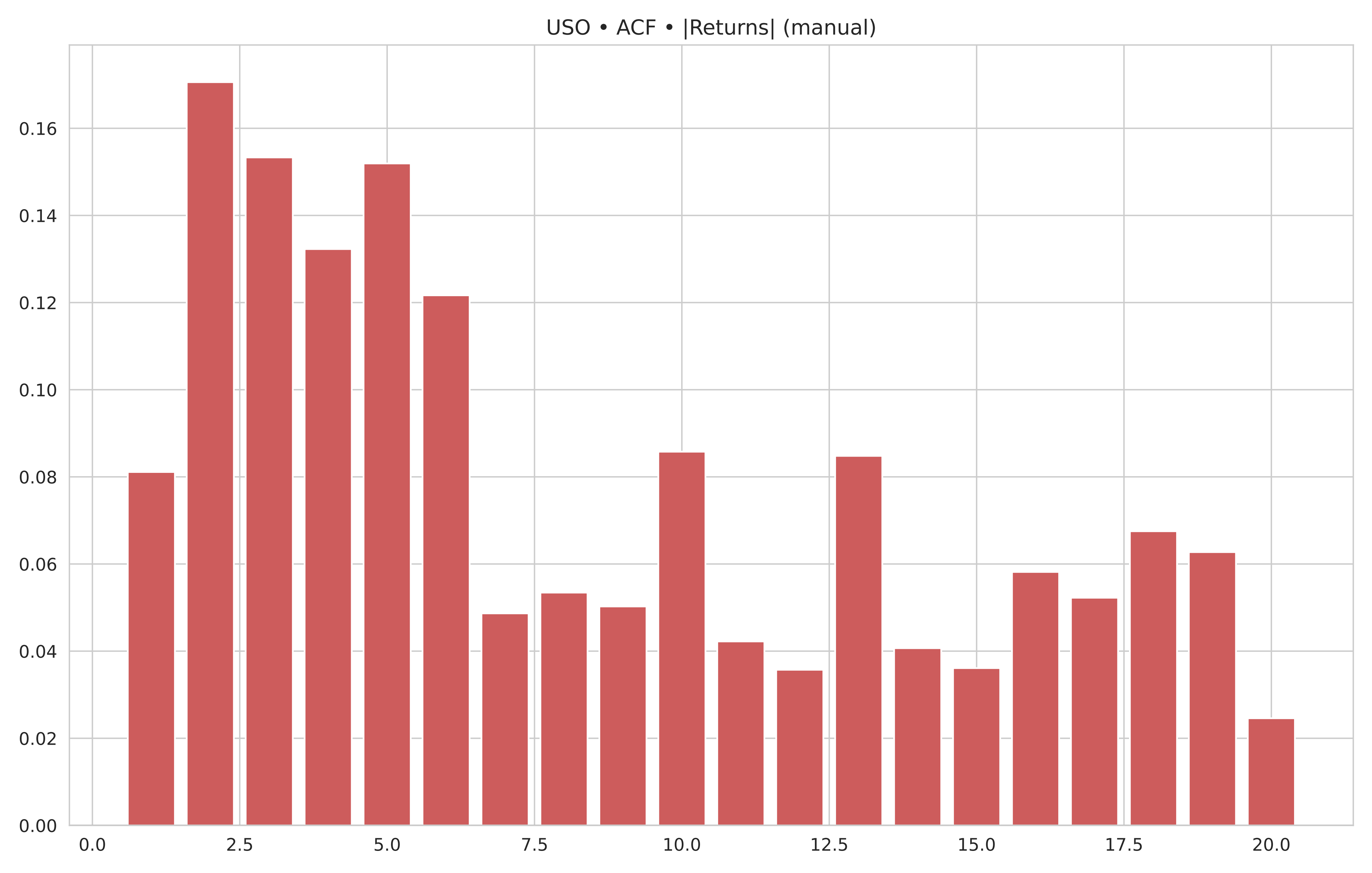


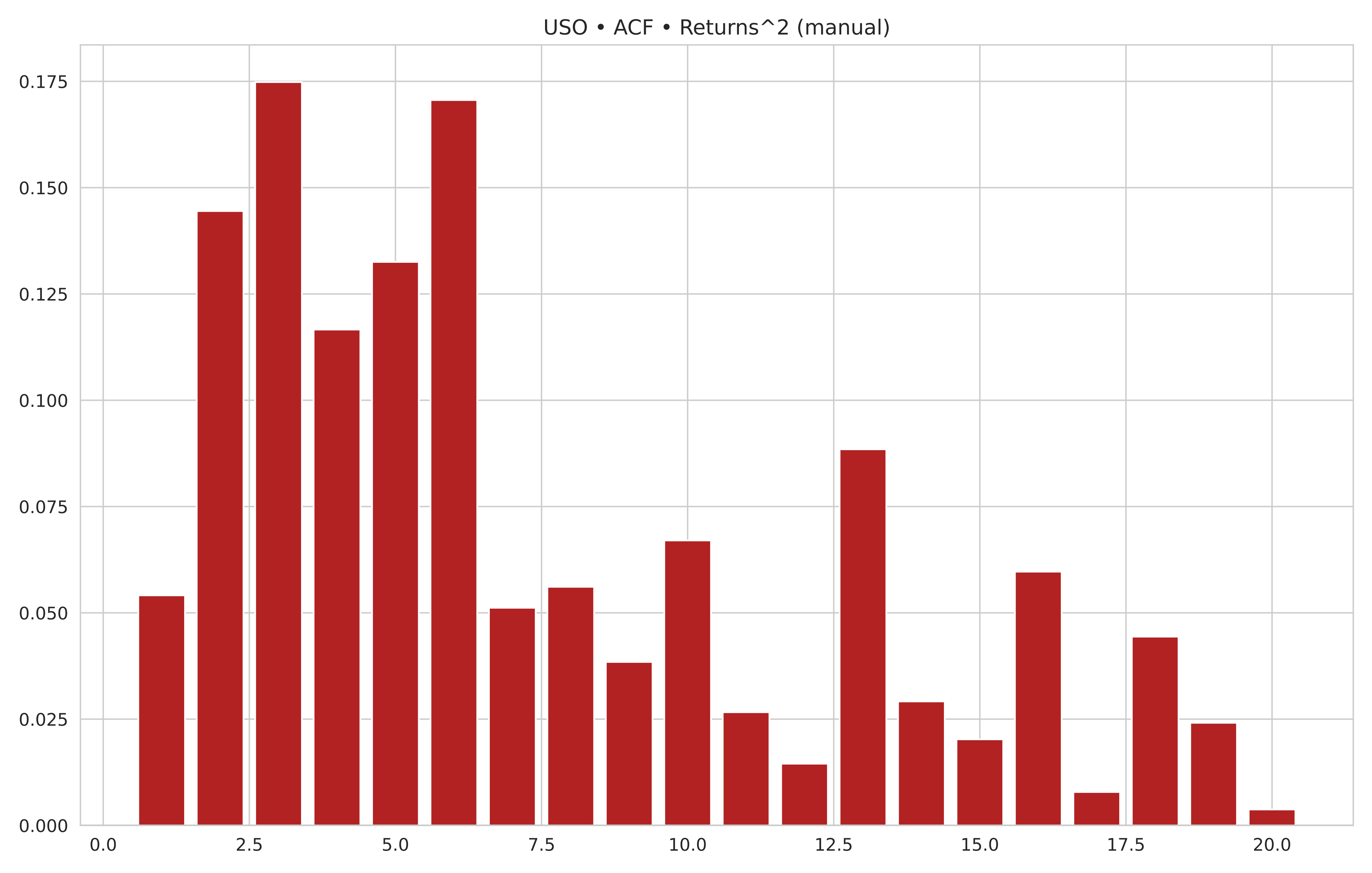
USO • Returns • Q–Q Plot vs Normal
Ordered Values
Theoretical quantiles
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
−3
−2
−1
0
1
2
3

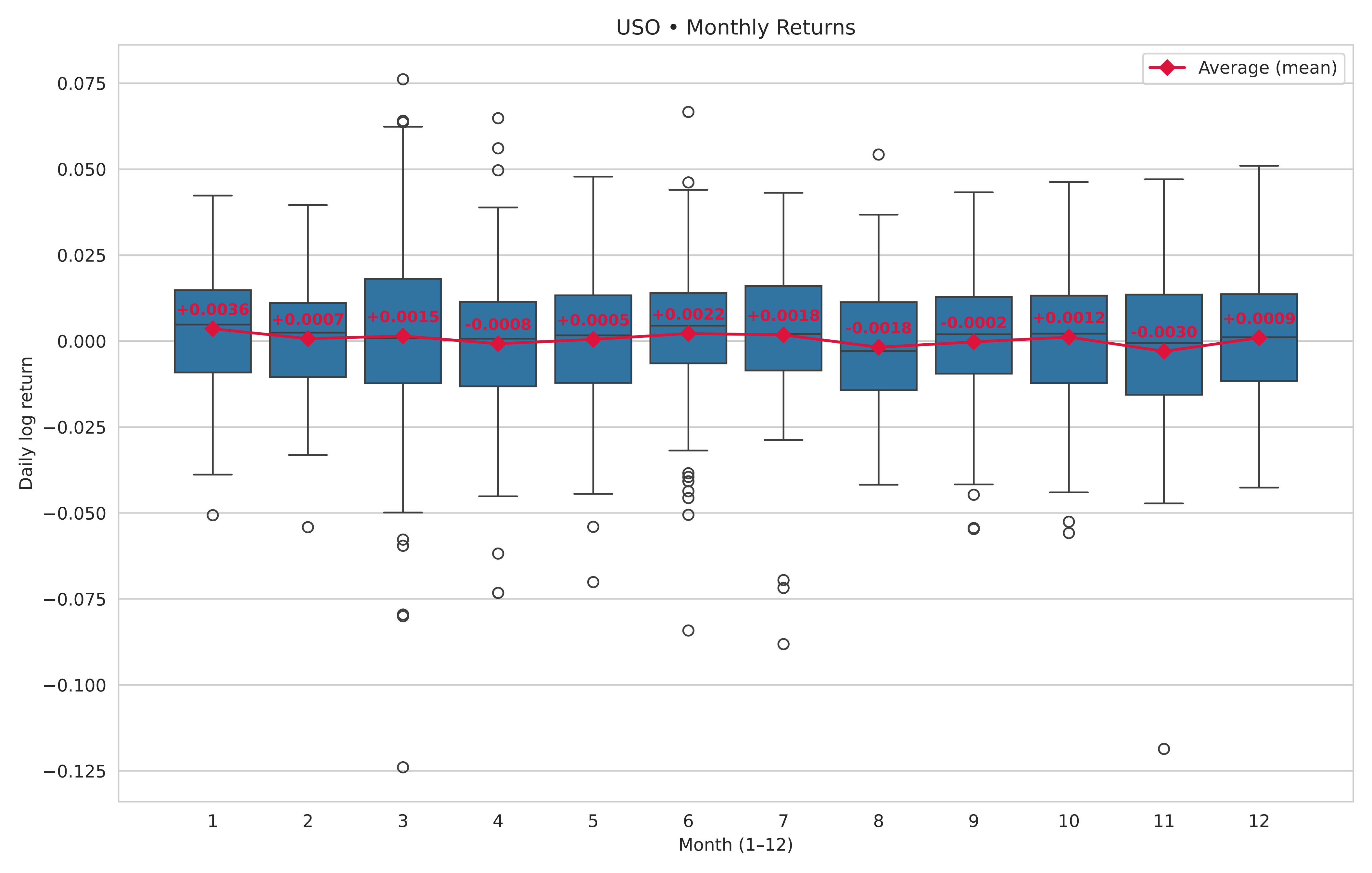


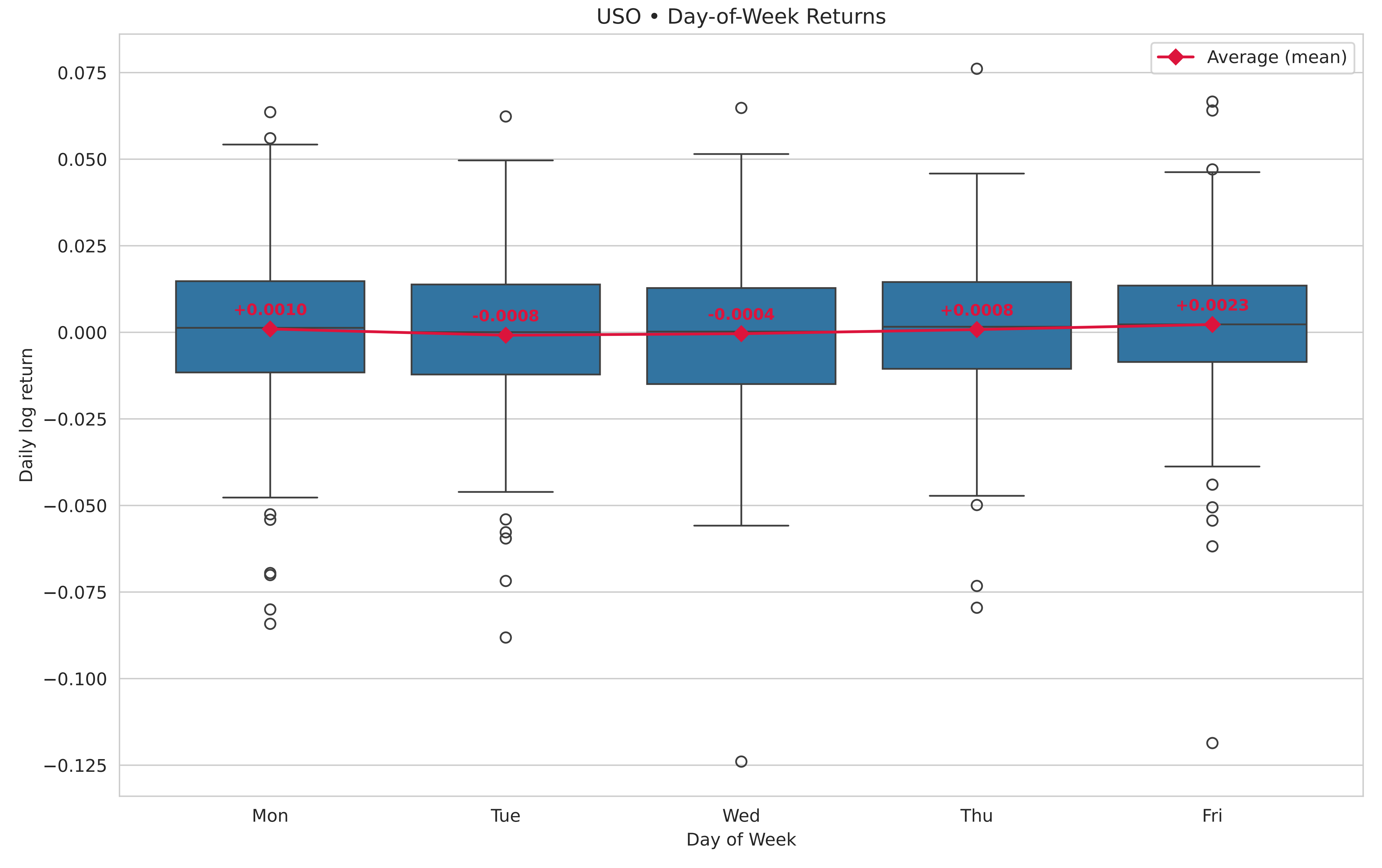
USO • ACF • Returns (manual)
Autocorrelation
0.08
0.06
0.04
0.02
0.00
−0.02
−0.04
−0.06
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0
Lag

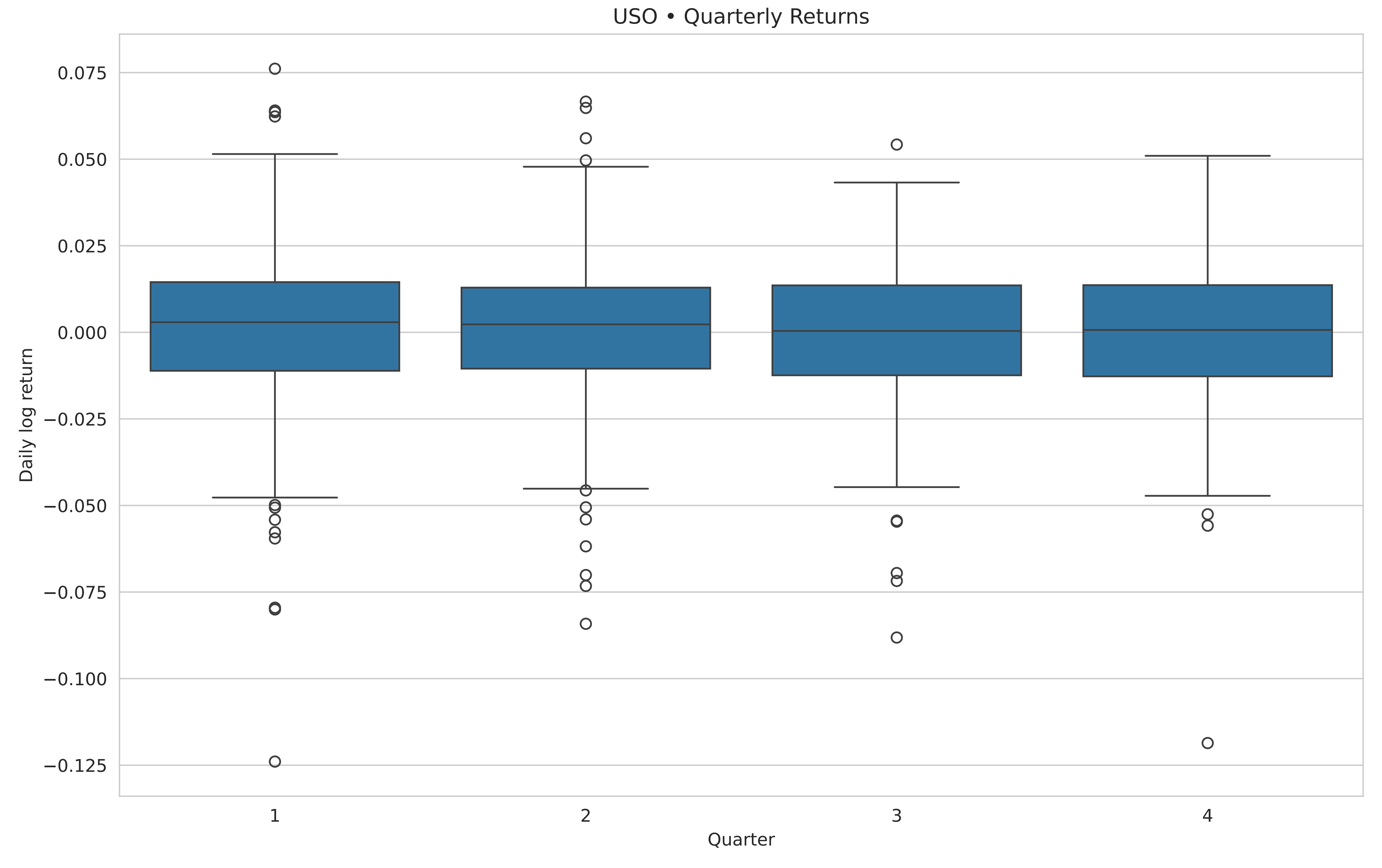

USO • Rolling Autocorrelation (lag=1, window=20)
Autocorr
Date
0.4
0.2
0.0
−0.2
−0.4
−0.6
2021
2022
2023
2024
2025
2026

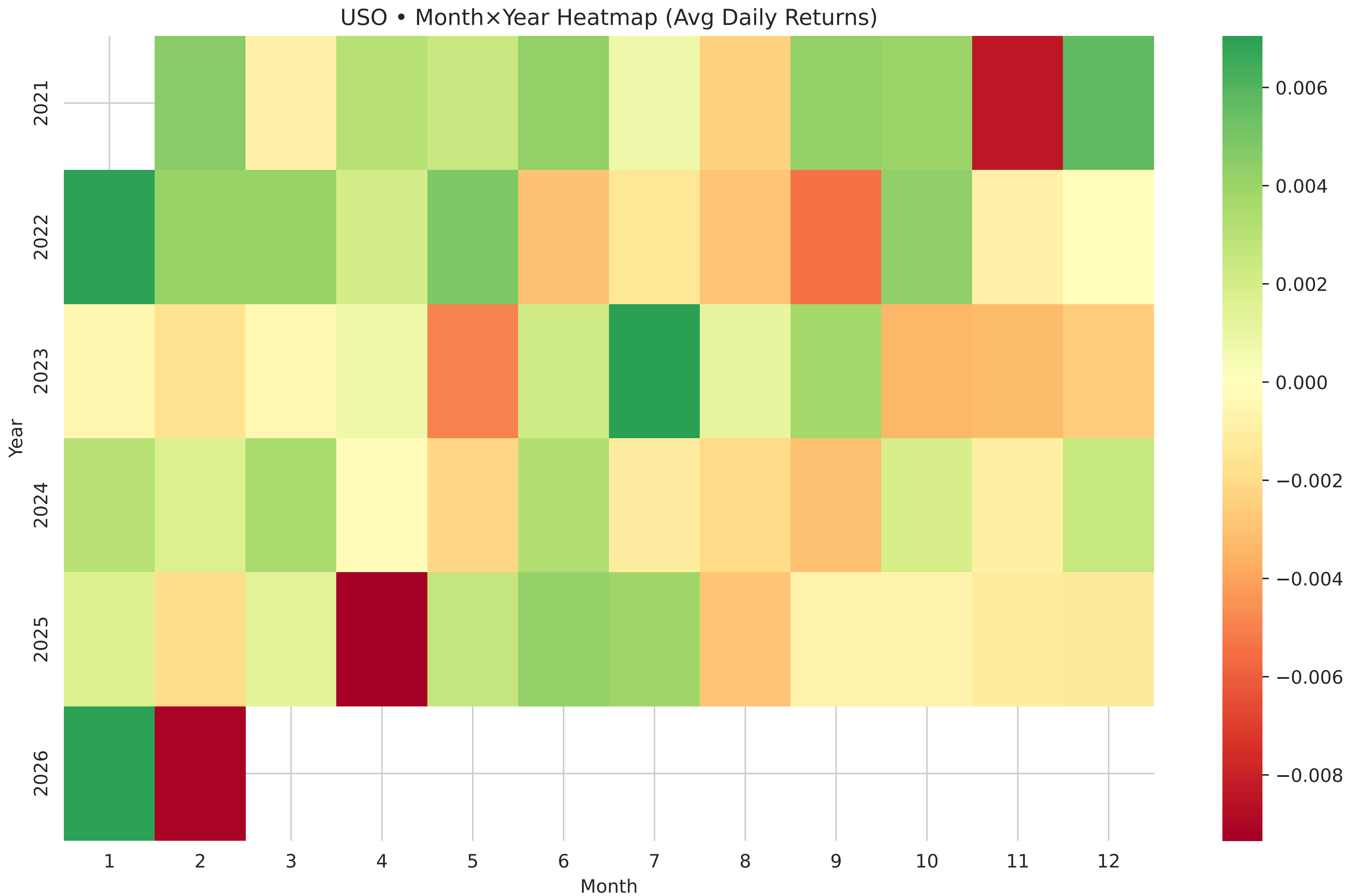

USO • ACF • |Returns| (manual)
0.00
0.02
0.04
0.06
0.08
0.10
0.12
0.14
0.16
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0

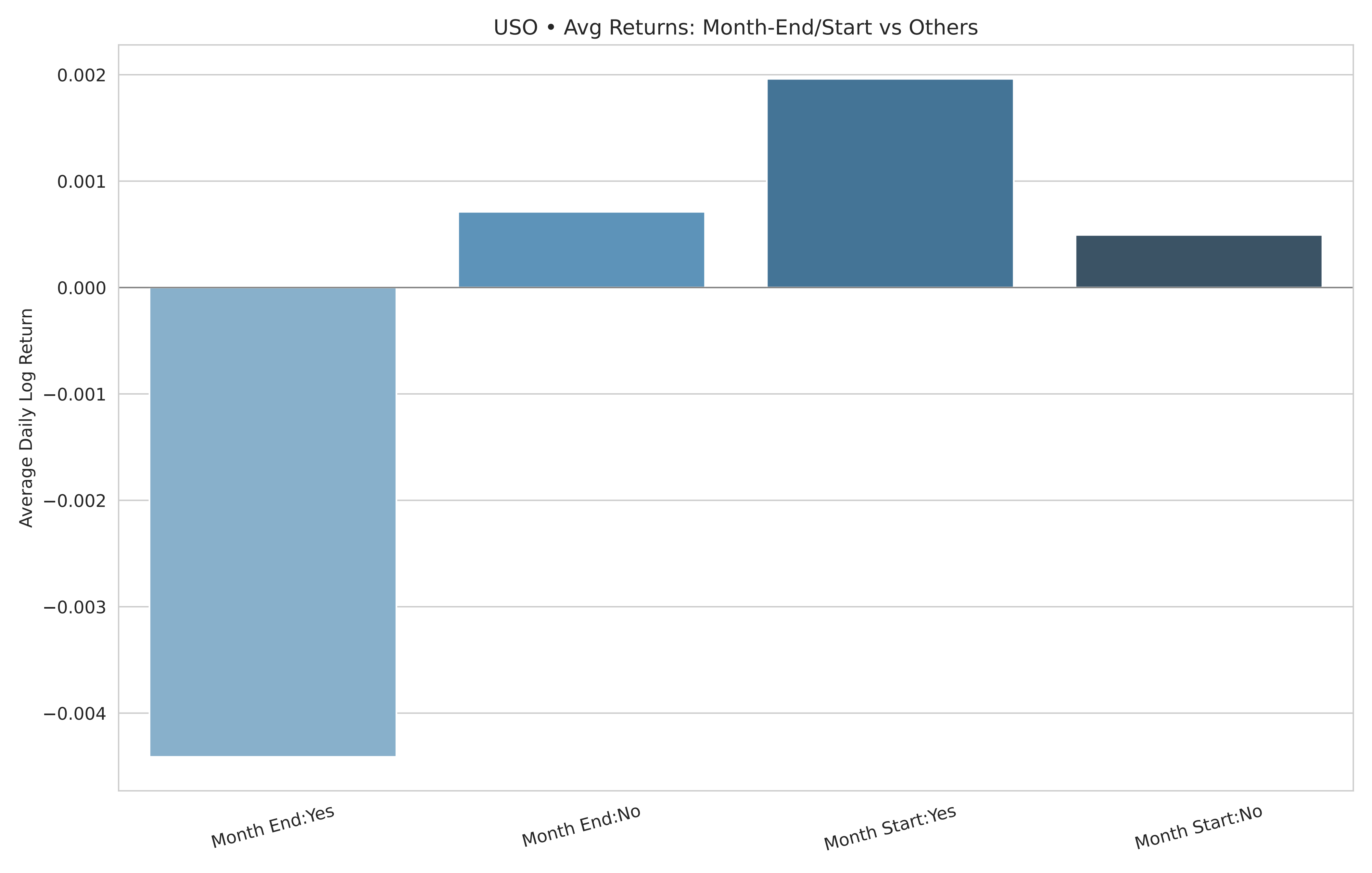

USO • ACF • Returns^2 (manual)
0.175
0.150
0.125
0.100
0.075
0.050
0.025
0.000
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
20.0


USO • Monthly Returns
Average (mean)
Daily log return
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
+0.0036
+0.0007
+0.0015
-0.0008
+0.0005
+0.0022
+0.0018
-0.0018
-0.0002
+0.0012
-0.0030
+0.0009
1
2
3
4
5
6
7
8
9
10
11
12
Month (1–12)

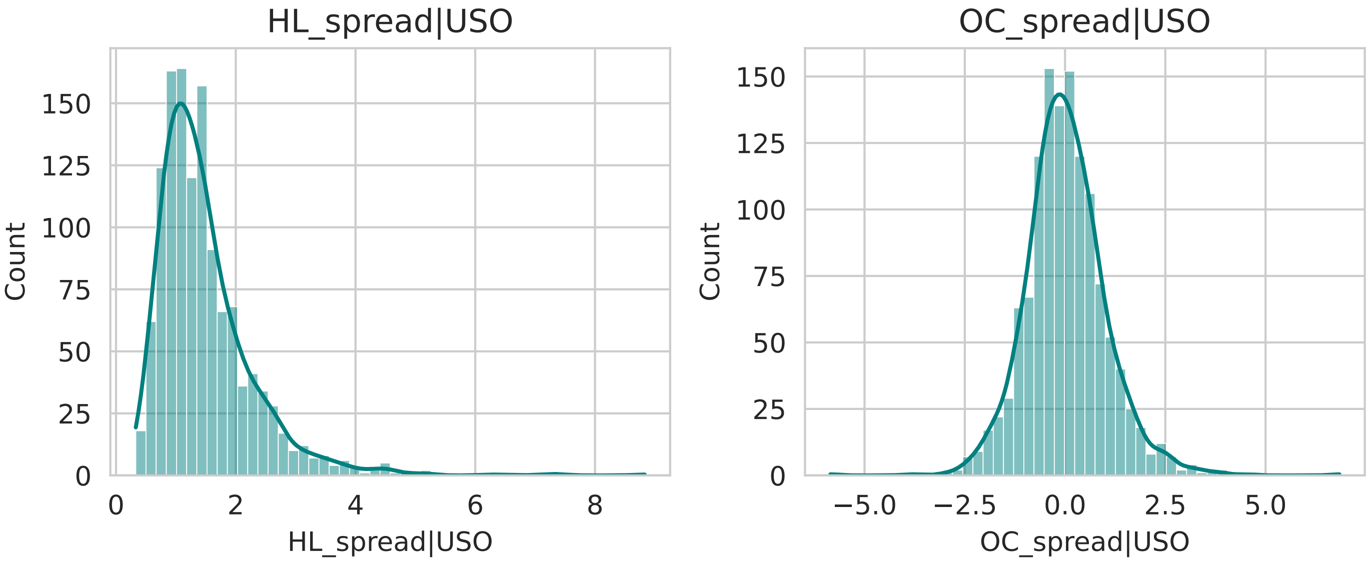

USO • Day-of-Week Returns
Average (mean)
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
Daily log return
+0.0010
-0.0008
-0.0004
+0.0008
+0.0023
Mon
Tue
Wed
Thu
Fri
Day of Week


USO • Quarterly Returns
Daily log return
0.075
0.050
0.025
0.000
−0.025
−0.050
−0.075
−0.100
−0.125
1
2
3
4
Quarter

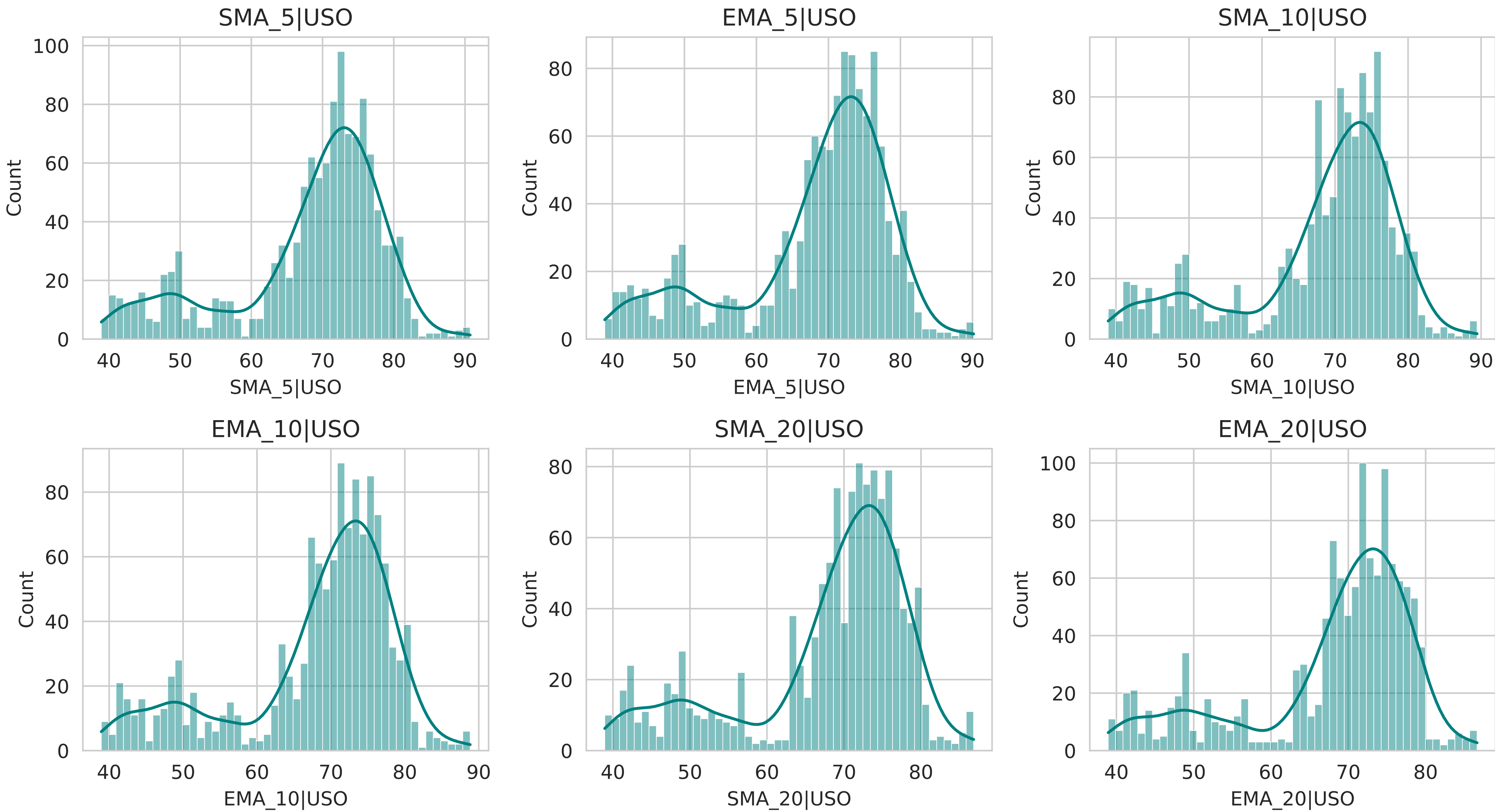

USO • Month×Year Heatmap (Avg Daily Returns)
Year
2021
2022
2023
2024
2025
2026
Month
1
2
3
4
5
6
7
8
9
10
11
12
0.006
0.004
0.002
0.000
−0.002
−0.004
−0.006
−0.008


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

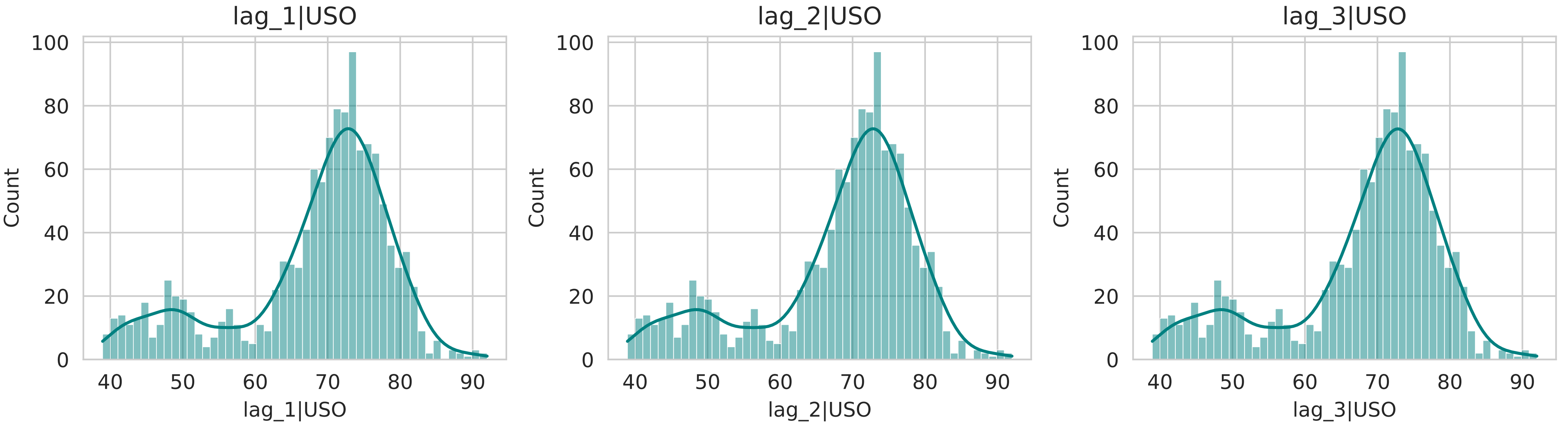
USO • Spreads


HL_spread|USO
OC_spread|USO
Count
Count
HL_spread|USO
OC_spread|USO
0
25
50
75
100
125
150
0
2
4
6
8
−5.0
−2.5
0.0
2.5
5.0

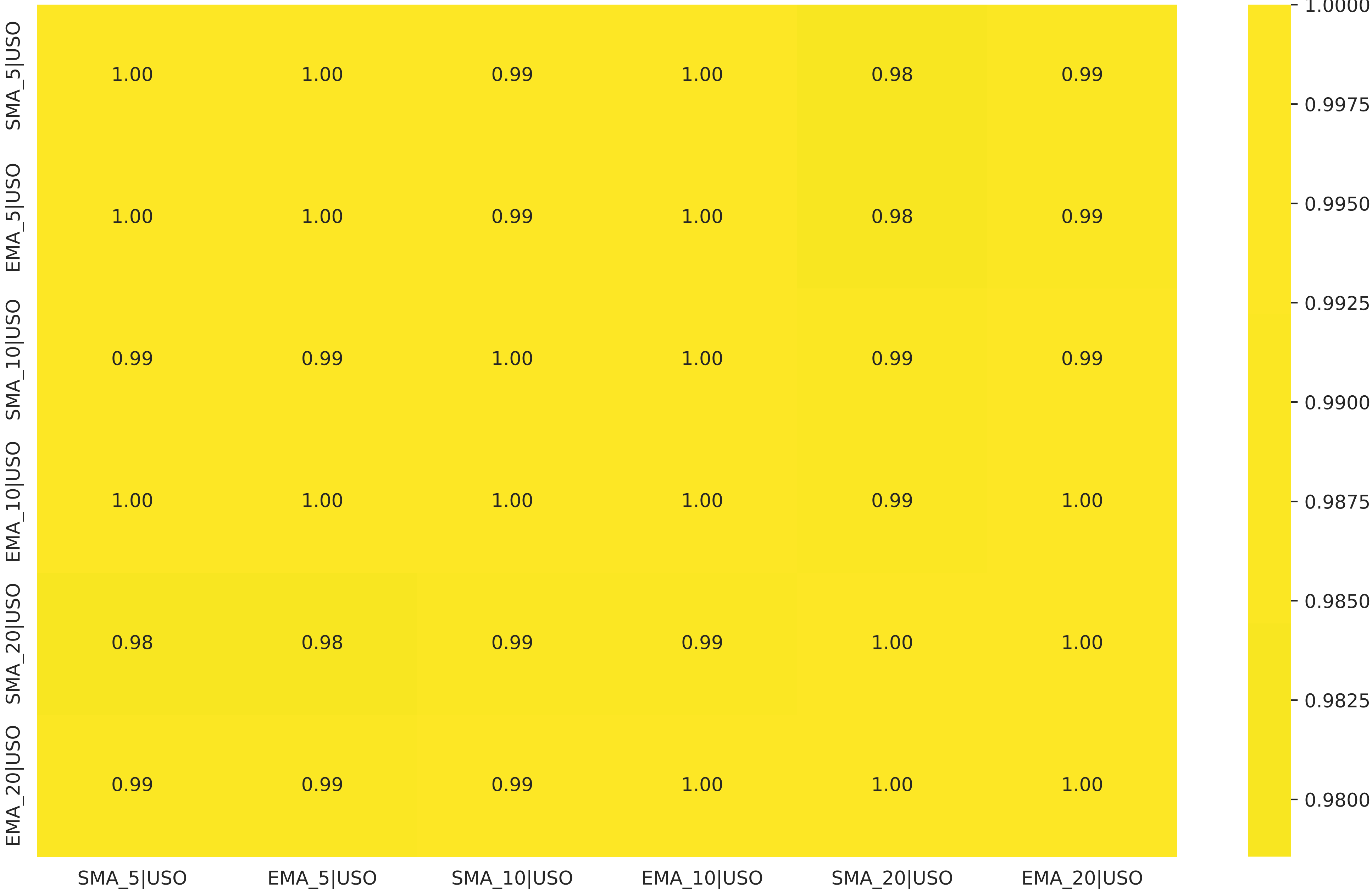
USO • Moving Averages / EMAs

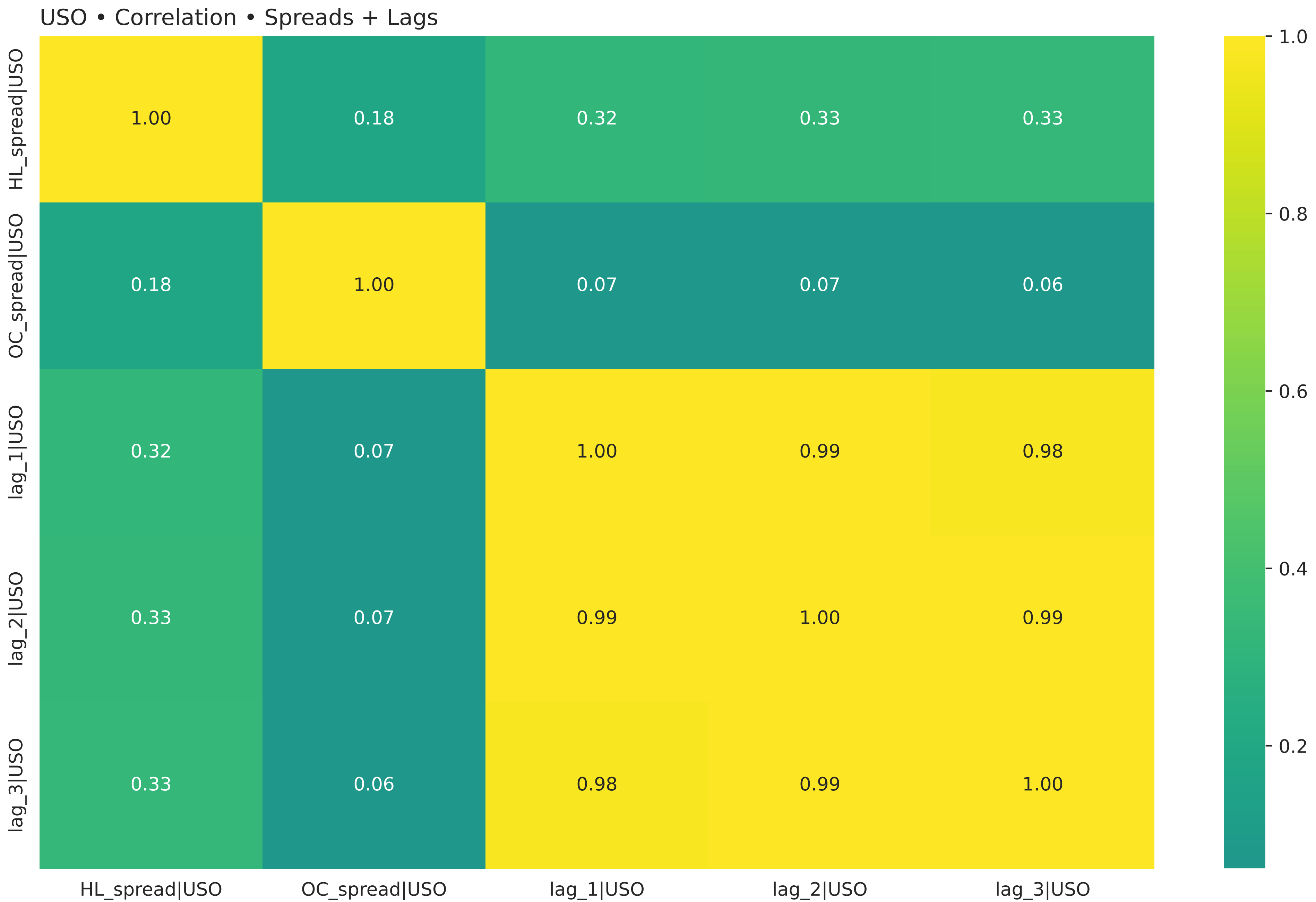


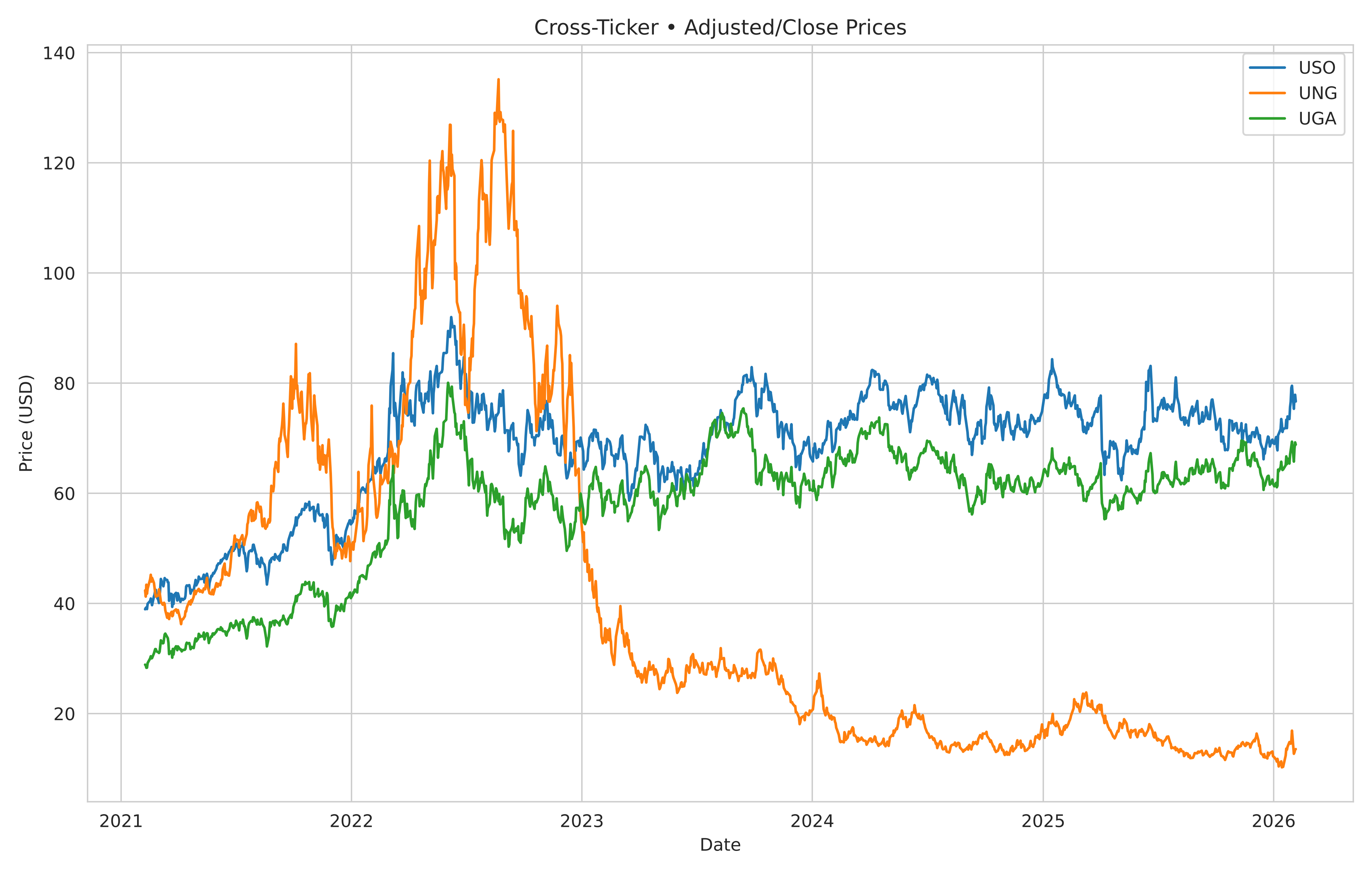
USO • Lagged Prices



USO • Correlation • Moving Averages




USO • Correlation • Spreads + Lags
HL_spread|USO
OC_spread|USO
lag_1|USO
lag_2|USO
lag_3|USO
1.00
0.18
0.32
0.33
0.33
0.18
1.00
0.07
0.07
0.06
0.32
0.07
1.00
0.99
0.98
0.33
0.07
0.99
1.00
0.99
0.33
0.06
0.98
0.99
1.00
1.0
0.8
0.6
0.4
0.2


Cross-Ticker • Adjusted/Close Prices
Price (USD)
Date
140
120
100
80
60
40
20
2021
2022
2023
2024
2025
2026
USO
UNG
UGA