

Cross Correlation Analysis

Series X: G1

Series Y: G3

Lag convention: positive lag means X_t is compared with Y_(t+lag).

Series summary:

series	n	mean	standard_deviation	minimum	q1	median	q3	maximum
G1	649	11.399076	2.745265	0.0	10.0	11.0	13.0	19.0
G3	649	11.906009	3.230656	0.0	10.0	12.0	14.0	19.0

Result summary:

	result_item	lag	r	p_value	interpretation
Lag 0 correlation		0	0.826387	1.617571e-163	Same-row / no lag correlation
Strongest absolute cross-correlation		0	0.826387	1.617571e-163	Same-row / no lag correlation

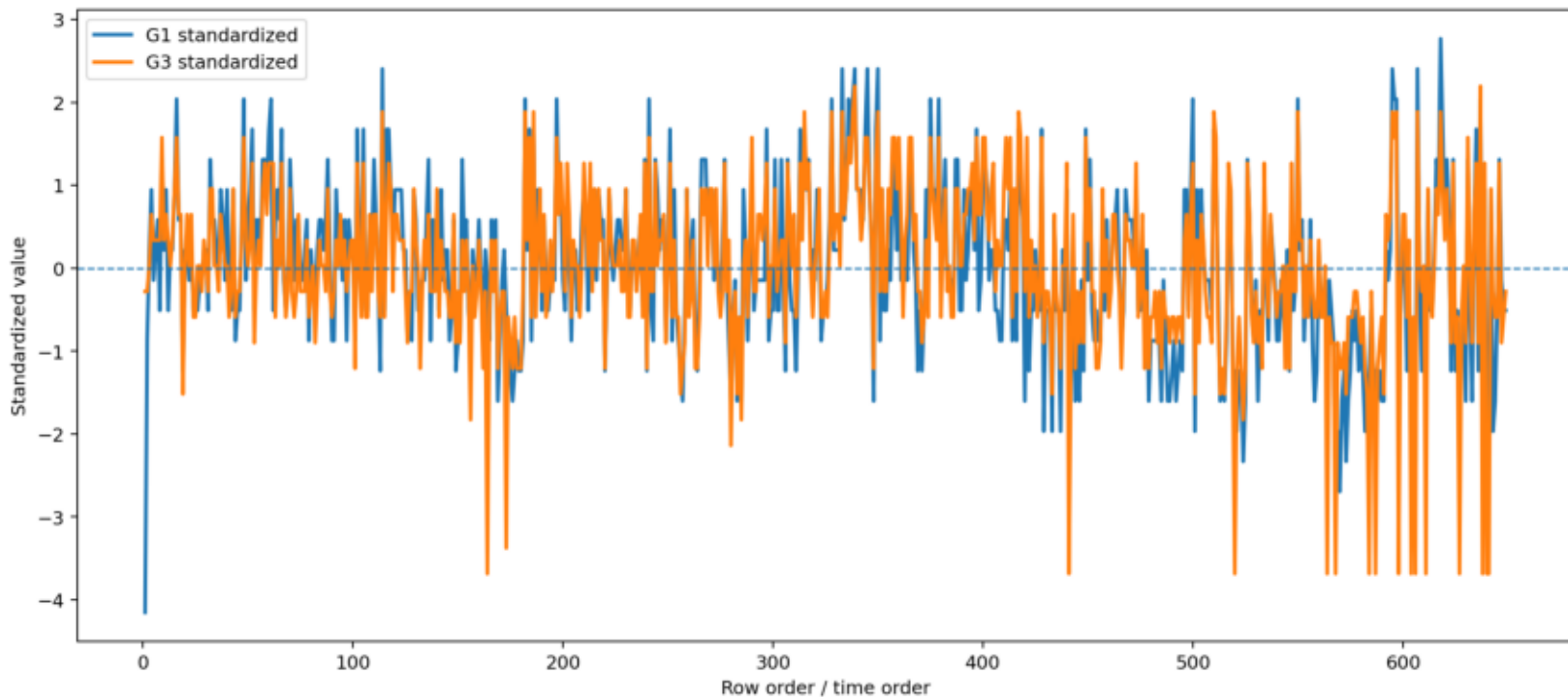
Top cross-correlation rows:

lag	pair	n	cross_correlation	r	t_statistic	p_value	two_tailed	ci95_lower	ci95_upper	approx_95_band	outside_approx_95_band	lag_direction	interpretation	absolute_correlation
0	649		0.826387		37.329167	1.617571e-163		0.800326	0.849331	0.076937	True	Same-row / no lag correlation		0.826387
-2	647		0.253746		6.662391	5.779680e-11		0.180190	0.324479	0.077056	True	G3 leads G1 by 2 row(s)		0.253746
2	647		0.228025		5.947814	4.455435e-09		0.153645	0.299835	0.077056	True	G1 leads G3 by 2 row(s)		0.228025
-3	646		0.211993		5.504899	5.338968e-08		0.137095	0.284481	0.077115	True	G3 leads G1 by 3 row(s)		0.211993
1	648		0.199643		5.178493	2.992007e-07		0.124538	0.272474	0.076996	True	G1 leads G3 by 1 row(s)		0.199643
-1	648		0.194014		5.026688	6.470112e-07		0.118769	0.267045	0.076996	True	G3 leads G1 by 1 row(s)		0.194014
-6	643		0.182561		4.701072	3.170104e-06		0.106748	0.256263	0.077295	True	G3 leads G1 by 6 row(s)		0.182561
-5	644		0.178943		4.608384	4.896689e-06		0.103109	0.252709	0.077235	True	G3 leads G1 by 5 row(s)		0.178943
-4	645		0.171598		4.416798	1.175208e-05		0.095666	0.245545	0.077175	True	G3 leads G1 by 4 row(s)		0.171598
11	638		0.153051		3.905819	1.039535e-04		0.076336	0.227965	0.077597	True	G1 leads G3 by 11 row(s)		0.153051

Strongest lag: 0; r = 0.8264; p = 1.618e-163

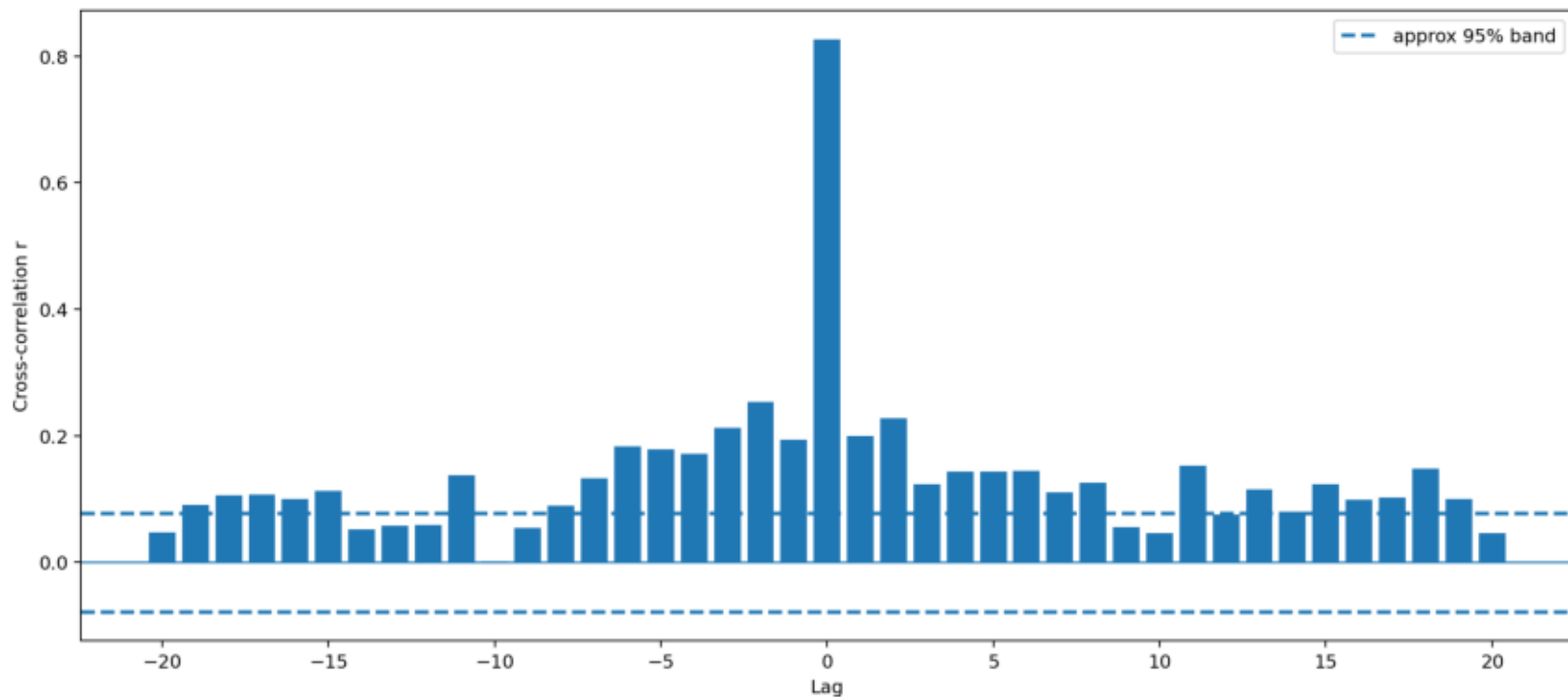
Cross Correlation: Ordered Series Profile

Standardizing both series makes timing pattern and co-movement easier to compare.



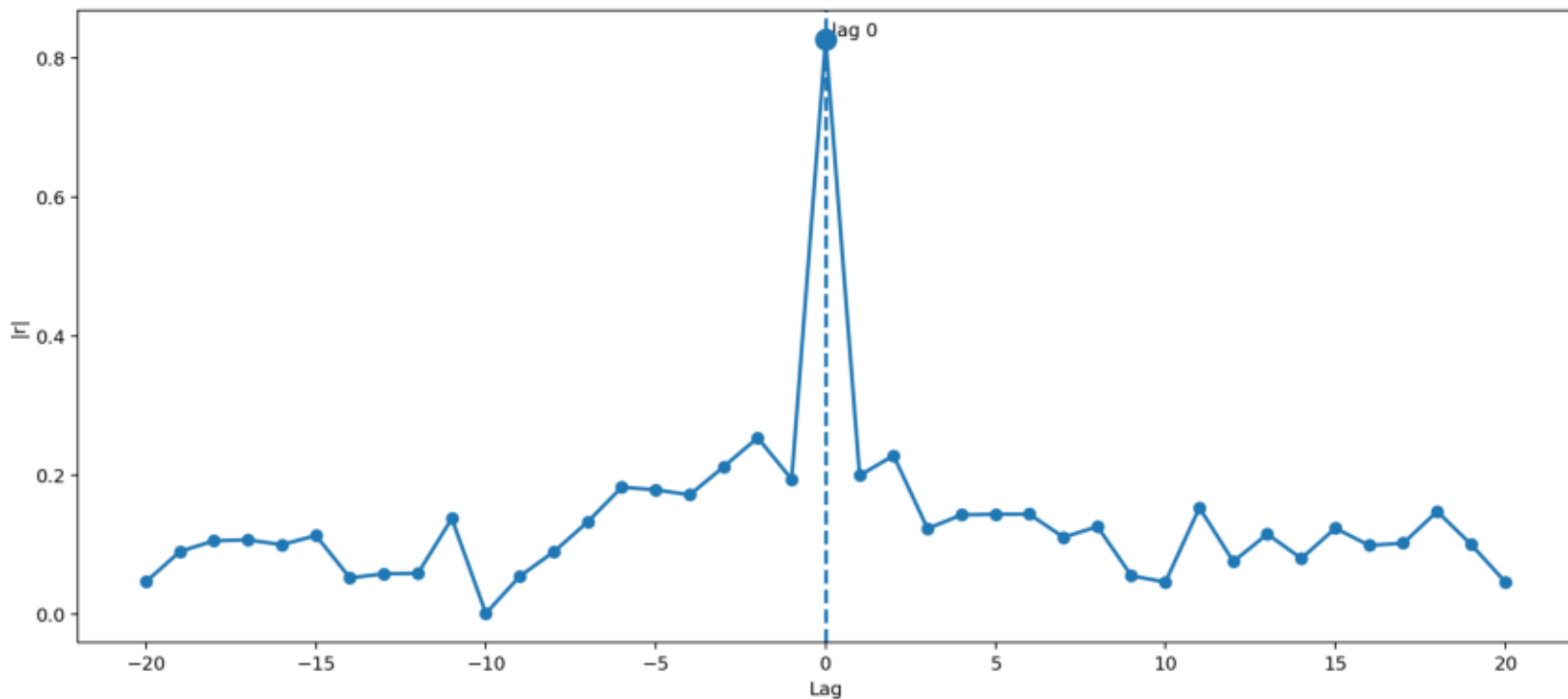
Cross Correlation Function

Positive lags mean G1 is compared with later G3 values.



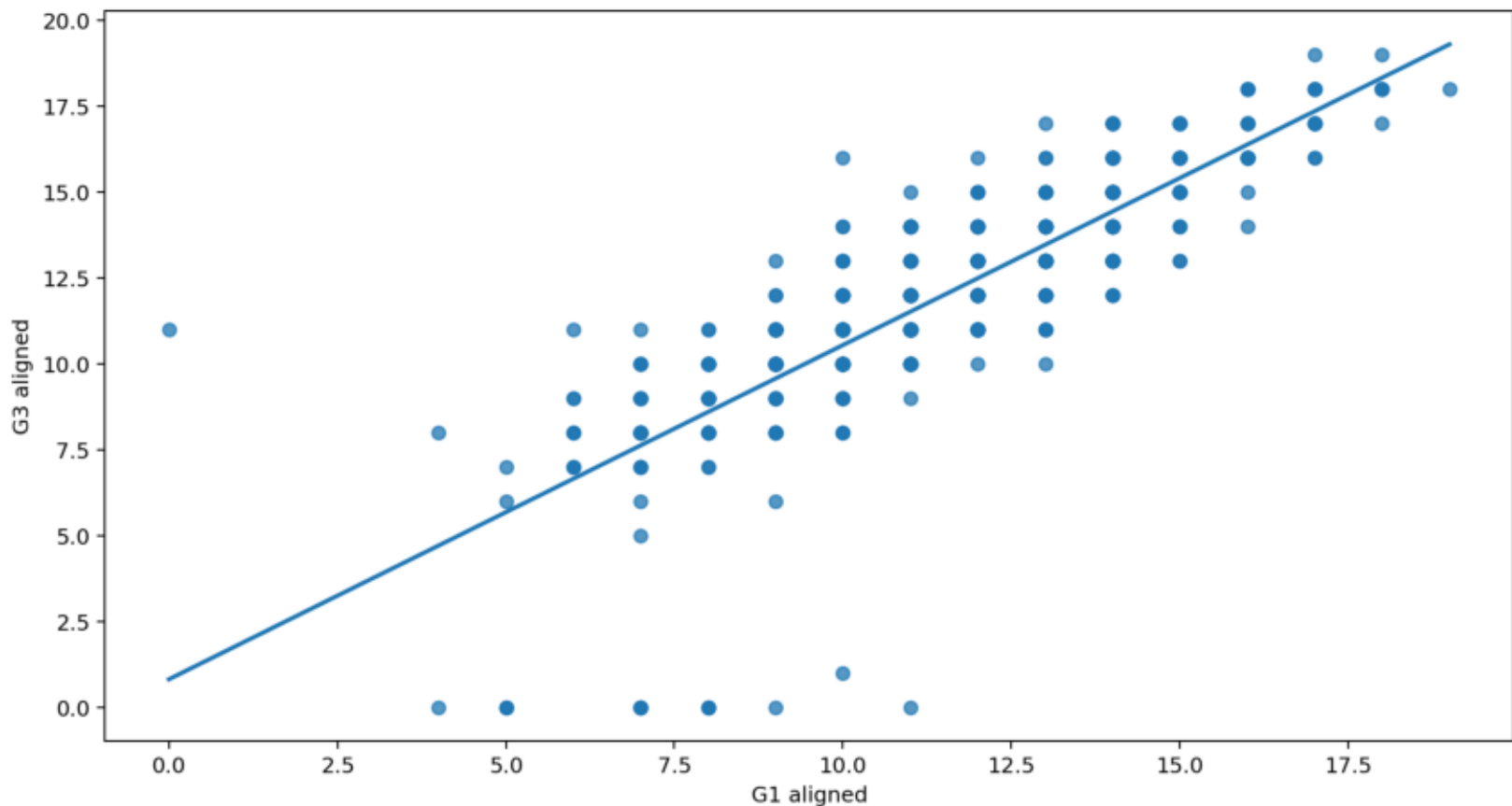
Cross Correlation: Lag Direction Strength

The largest absolute value identifies the most pronounced lagged association.



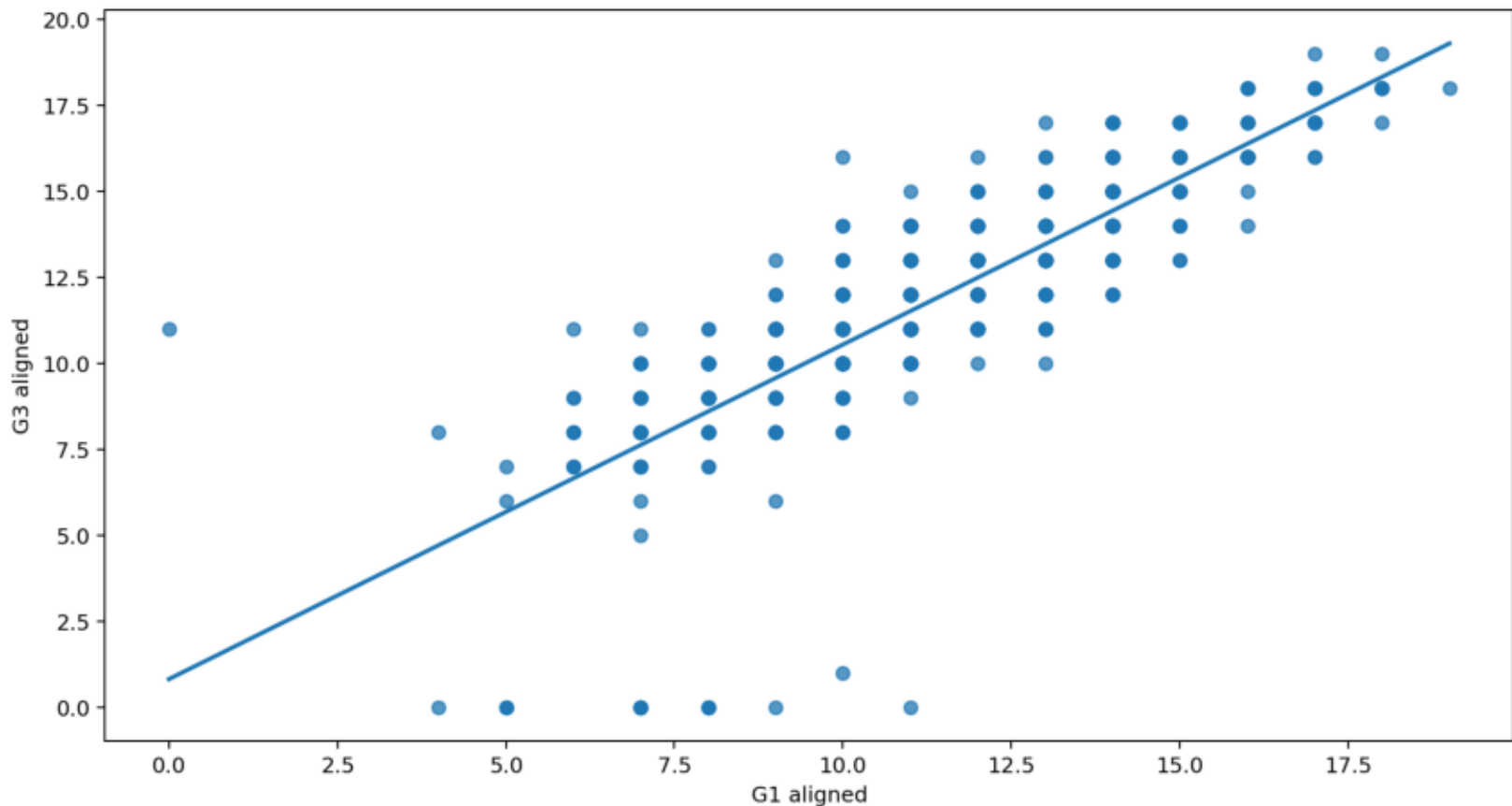
Cross Correlation: Same-Row Scatter

Lag = 0; aligned-pair Pearson $r = 0.8264$.



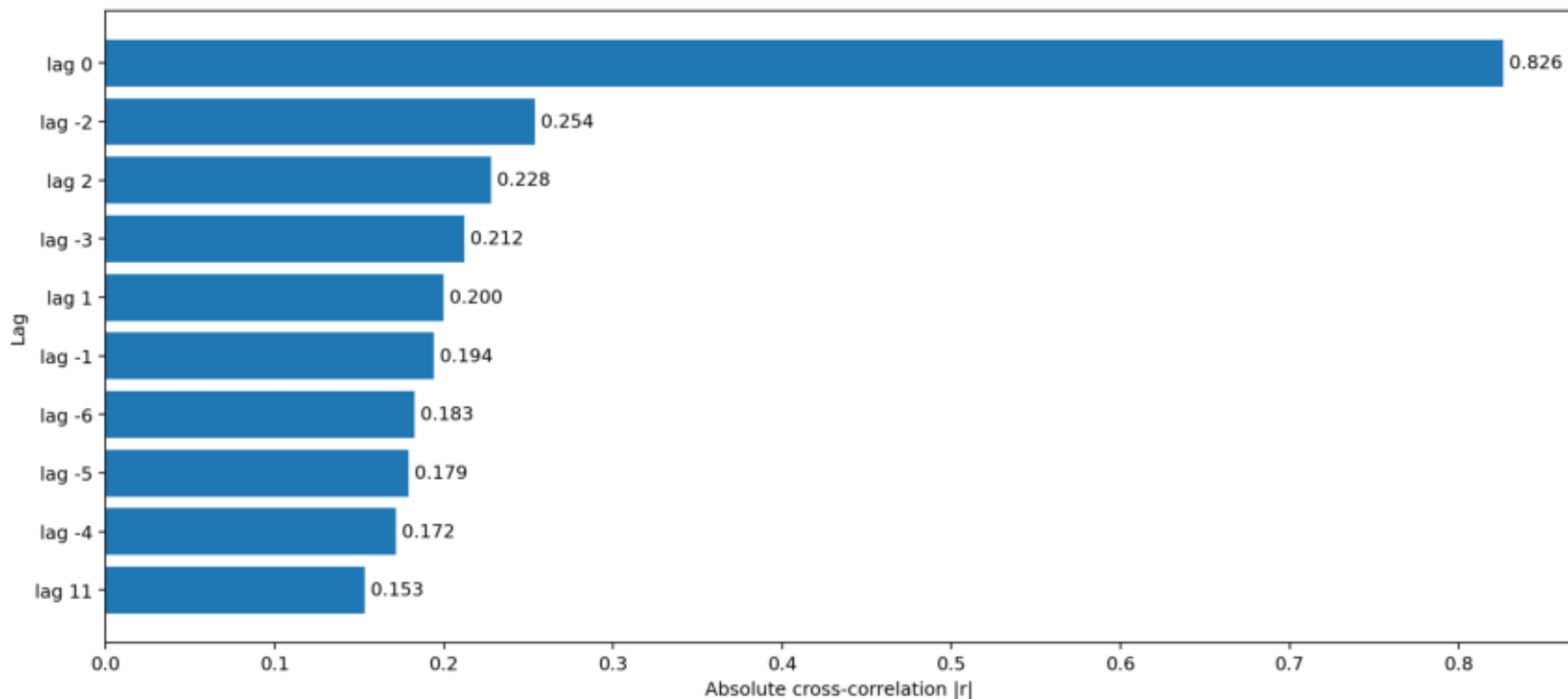
Cross Correlation: Strongest Lag Scatter

Lag = 0; aligned-pair Pearson $r = 0.8264$.



Cross Correlation: Top Lag Rankings

This chart ranks the largest lagged associations by absolute strength.



Lag 0 manual calculation rows

pair_index	G1_aligned	G3_aligned	x_deviation	y_deviation	cross_product	x_deviation_squared	y_deviation_squared
1	0.0	11.0	-11.399076	-0.906009	10.327668	129.938922	0.820853
2	9.0	11.0	-2.399076	-0.906009	2.173585	5.755563	0.820853
3	12.0	12.0	0.600924	0.093991	0.056481	0.361110	0.008834
4	14.0	14.0	2.600924	2.093991	5.446312	6.764808	4.384797
5	11.0	13.0	-0.399076	1.093991	-0.436585	0.159261	1.196816
6	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
7	13.0	13.0	1.600924	1.093991	1.751397	2.562959	1.196816
8	10.0	13.0	-1.399076	1.093991	-1.530576	1.957412	1.196816
9	15.0	17.0	3.600924	5.093991	18.343076	12.966657	25.948742
10	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
11	14.0	14.0	2.600924	2.093991	5.446312	6.764808	4.384797
12	10.0	13.0	-1.399076	1.093991	-1.530576	1.957412	1.196816
13	12.0	12.0	0.600924	0.093991	0.056481	0.361110	0.008834
14	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
15	14.0	15.0	2.600924	3.093991	8.047236	6.764808	9.572779
16	17.0	17.0	5.600924	5.093991	28.531058	31.370355	25.948742
17	13.0	14.0	1.600924	2.093991	3.352321	2.562959	4.384797
18	13.0	14.0	1.600924	2.093991	3.352321	2.562959	4.384797
19	8.0	7.0	-3.399076	-4.906009	16.675896	11.553714	24.068927
20	12.0	12.0	0.600924	0.093991	0.056481	0.361110	0.008834
21	12.0	14.0	0.600924	2.093991	1.258330	0.361110	4.384797
22	11.0	12.0	-0.399076	0.093991	-0.037509	0.159261	0.008834
23	12.0	14.0	0.600924	2.093991	1.258330	0.361110	4.384797
24	10.0	10.0	-1.399076	-1.906009	2.666651	1.957412	3.632871
25	10.0	10.0	-1.399076	-1.906009	2.666651	1.957412	3.632871

Strongest lag manual calculation rows

pair_index	G1_aligned	G3_aligned	x_deviation	y_deviation	cross_product	x_deviation_squared	y_deviation_squared
1	0.0	11.0	-11.399076	-0.906009	10.327668	129.938922	0.820853
2	9.0	11.0	-2.399076	-0.906009	2.173585	5.755563	0.820853
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4	14.0	14.0	2.600924	2.093991	5.446312	6.764808	4.384797
5	11.0	13.0	-0.399076	1.093991	-0.436585	0.159261	1.196816
6	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
7	13.0	13.0	1.600924	1.093991	1.751397	2.562959	1.196816
8	10.0	13.0	-1.399076	1.093991	-1.530576	1.957412	1.196816
9	15.0	17.0	3.600924	5.093991	18.343076	12.966657	25.948742
10	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
11	14.0	14.0	2.600924	2.093991	5.446312	6.764808	4.384797
12	10.0	13.0	-1.399076	1.093991	-1.530576	1.957412	1.196816
13	12.0	12.0	0.600924	0.093991	0.056481	0.361110	0.008834
14	12.0	13.0	0.600924	1.093991	0.657406	0.361110	1.196816
15	14.0	15.0	2.600924	3.093991	8.047236	6.764808	9.572779
16	17.0	17.0	5.600924	5.093991	28.531058	31.370355	25.948742
17	13.0	14.0	1.600924	2.093991	3.352321	2.562959	4.384797
18	13.0	14.0	1.600924	2.093991	3.352321	2.562959	4.384797
19	8.0	7.0	-3.399076	-4.906009	16.675896	11.553714	24.068927
20	12.0	12.0	0.600924	0.093991	0.056481	0.361110	0.008834
21	12.0	14.0	0.600924	2.093991	1.258330	0.361110	4.384797
22	11.0	12.0	-0.399076	0.093991	-0.037509	0.159261	0.008834
23	12.0	14.0	0.600924	2.093991	1.258330	0.361110	4.384797
24	10.0	10.0	-1.399076	-1.906009	2.666651	1.957412	3.632871
25	10.0	10.0	-1.399076	-1.906009	2.666651	1.957412	3.632871