

Numerical Experiment to Test Effectiveness of Lomb-Scargle Periodogram with Noise

"N" Sample Points			Cosine Signal + Noise					Noise
			Noise = Normal(mean=0, sd=value)					
			0.00	0.10	0.20	0.50	1.00	N(0,1)
48	PeakSPD	Min	23.5	22.5	20.3	10.5	1.5	0.7
		Max	23.5	23.3	22.8	20.4	17.7	11.4
	p value	Min	3.3E-9	3.9E-9	6.4E-9	7.3E-8	1.1E-6	0.0006
		Max	3.3E-9	8.6E-9	8.2E-8	1.4E-3	1.000	1.000
	Period [hours]	Min	48	48	45.7	38.4	5.1	5.0
		Max	48	48	50.5	53.3	56.5	960.0

"N" Sample Points			Cosine Signal + Noise					Noise
			Noise = Normal(mean=0, sd=value)					
			0.00	0.10	0.20	0.50	1.00	N(0,1)
24	PeakSPD	Min	11.5	11.0	9.7	3.9	1.7	1.0
		Max	11.5	11.4	11.3	10.6	9.3	8.0
	p value	Min	0.0002	0.0002	0.0003	0.0006	0.002	0.008
		Max	0.0002	0.0003	0.0014	0.362	0.988	1.000
	Period [hours]	Min	48	45.7	43.6	19.6	5.0	5.0
		Max	48	48.0	50.5	53.3	960.0	960.0

"N" Sample Points			Cosine Signal + Noise					Noise
			Noise = Normal(mean=0, sd=value)					
			0.00	0.10	0.20	0.50	1.00	N(0,1)
12	PeakSPD	Min	5.5	5.2	4.5	1.9	1.5	1.4
		Max	5.5	5.5	5.5	5.3	5.4	6.4
	p value	Min	0.03	0.03	0.03	0.04	0.04	0.01
		Max	0.03	0.04	0.09	0.73	0.86	0.90
	Period [hours]	Min	48	45.7	40.0	5.0	5.0	5.0
		Max	48	50.5	53.3	60.0	960.0	960.0

Notes:

- Cosine Signal: $\cos(2*\pi*t/48)$; 0 Mean, Ranges from -1 to +1
- Noise Signal: Normal Distribution; Mean=0, Standard Deviation as specified
- PeakSPD = Maximum Lomb-Scargle Periodogram Spectral Power Density
- p value is the one associated with the PeakSPD
- The Expected Period in all cases containing the cosine "signal" above is 48 hours. The observed periods for the "noise" case are expected to be random.
- Cosine + Noise statistics based on 5000 expression profiles;
Noise statistics based on 5000 expression profiles (except for N=48 where the values are the "worst case" from 7 sets of 5000 profiles)