

BITCOIN AND SOLAR ACTIVITY (2011-2024)

V.A. Belkin

Abstract.

Comparison of the ordinal numbers of the years of the average solar cycle and the annual change in the price of bitcoin for the period 2011-2024 revealed a strong direct relationship between them with a correlation coefficient of 0.71 for the 1-5th years of the average solar cycle and a moderate inverse relationship with a correlation coefficient of -0.48 for 5-11 years of the average solar cycle.

Keywords:

solar cycle, Wolf numbers, bitcoin, economic cycle

Great scientists Frederick William Herschel, William Stanley Jevons and Alexander Leonidovich Chizhevsky developed a methodological approach to studying the connections between solar and economic activity in their works.

For example, in his article “Solar-Commercial Cycles” W. S. Jevons placed graphs of solar activity cycles (Wolf number cycles) and corn price cycles in Delhi for the period 1760-1810 one under the other [1, P.227]. That is, he **compared** solar and economic activity.

A. L. Chizhevsky in his monograph “The Cosmic Pulse of Life: Earth in the Embrace of the Sun” in Chapter 4 “The Sun and Epidemics” in Fig. 33 constructed a diagram that shows the **average** solar activity (SA) cycle (Wolf number cycle) over a hundred years and the average number of cholera cases in Russia for the period 1823-1923 [2, P. 11].

In another monograph, “The Earth’s Echo of Solar Storms,” he placed graphs of grain yields in Russia and solar activity (SA) one under the other, which show a close direct connection between them [3, P. 106]. These graphs cover a long period of time.

In this study, a single diagram compares the years of the mean solar cycle in order depending on the value of the mean annual Wolf numbers and the value of the annual changes in the price of Bitcoin.

The annual mean Wolf numbers, the main indicator of SA, were taken from the well-known astrophysical website for the determination, conservation and distribution of the international sunspot number [4]. They are presented in column 2 of Table 1.

The ordinal numbers of years in column 3 of Table 1 are determined in accordance with the numbering of years accepted in solar astrophysics. Namely, the first year in the SA cycle is considered to be the first year of its growth, i.e. the growth of the Wolf number. Then the years are numbered in order, and the last year in the cycle is considered to be the year of the minimum of the Wolf number. The years of the minimum of SA in Table 1 are highlighted in blue, and the years of the maximum in red.

The CryptoRank website [5] provides data on the annual percentage change in the price of Bitcoin. These are presented in column 4 of Table 1.

Table 1. Years, average annual Wolf numbers, ordinal numbers of years in the SA cycles, and annual percentage changes in the price of Bitcoin, 2011 - 2024.

The years	Wolf numbers	The serial number of the year in the cycle of SA	Annual change in bitcoin price, %
1	2	3	4
2011	80.8	3	1,435
2012	84.5	4	183.5
2013	94	5	5435
2014	113.3	6	-57.6
2015	69.8	7	34.4
2016	39.8	8	123.8
2017	21.7	9	1,369
2018	7	10	-73.3
2019	3.6	11	90.9
2020	8.8	1	304.1
2021	29.6	2	59.6
2022	83, 2	3	-64.3
2023	125.5	4	155.4
2024	154.6	5	121.1
2025		6	

Then the statistical data of Table 1 were grouped by the serial numbers of years in the SA cycles. The results of grouping the data of Table 1 are presented in Table 2. The year of the maximum of the average solar activity cycle for the period 2011-2024 is highlighted in red in this table. It turned out to be year number 5. The year of the minimum of SA is highlighted in blue. It turned out to be year number 11.

Table 2. Grouping of data from Table 1 by ordinal numbers of years in SA cycles

The serial number of the year in the cycle of SA	Number of years with this number for the period 2011 - 2024	Average arithmetic mean:	
		wolf numbers	annual change in bitcoin price, %
1	2	3	4
1	1	8.7	304.1
2	2	27.25	59.6
3	2	82	685.35
4	2	105	169.45
5	2	124.3	2,778.05
6	1	113.3	-57.6
7	1	69.8	34.4
8	1	39.8	123.8
9	1	21.7	1369
10	1	7	-73.3
11	1	3.6	90.9
Total:	14		
		Correlation coefficient:	
Rows 1-5, columns 3-4:	Average direct connection	0.648654965	
Rows 5-11, columns 3-4:	Moderate direct connection	0.449272706	
Rows 1-11, columns 3-4:	Moderate direct connection	0.38870767	
Rows 1-5, columns 1-4:	Strong direct connection	0.707012865	
Rows 5-11, columns 1-4:	Moderate feedback	-0.481828603	

Based on the data in columns 1, 3 and 4 of Table 2, a diagram was constructed (see Fig. 1). It shows a strong direct relationship between the ordinal numbers of the years of the SA cycle and the change in the price of Bitcoin for years 1-5 of the solar cycle (the correlation coefficient is 0.707012865) and a moderate inverse relationship for years 5-11 of the SA cycle (the correlation coefficient is -0.481828603).

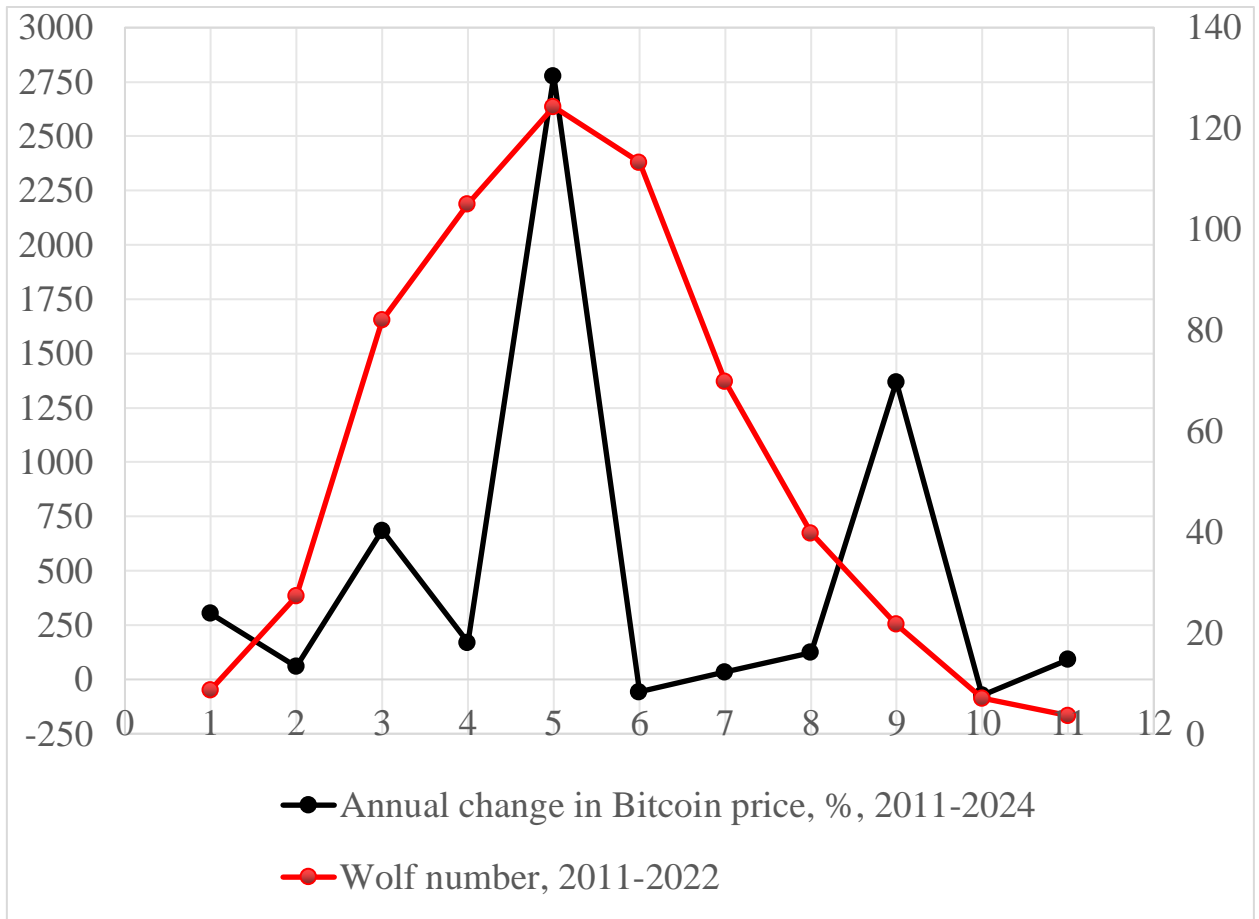


Fig. 1. Ordinal numbers of years of the average solar cycle and annual changes in the price of bitcoin (left scale), 2011 - 2024.

The SA factors that operate during a year with a particular number include magnetic storms, magnetic calms, atmospheric pressure, capillary blood flow velocity, coherence (consistency) in the work of various parts of the brain and, as a result, moods of optimism or pessimism.

The year 2025 will be the 6th year of the current 25th SA cycle. In the diagram in Fig. 1, we see that there is a downward trend in the annual change in the price of Bitcoin the year after the year of its growth. Therefore, it seems most likely that the annual change in the price of Bitcoin will decrease in 2025.

In addition, it should be noted that 2024 is highly likely to be the year of the maximum of the current 25th SA cycle. After years of SA maximums, as a rule, there is a significant decline in global economic activity.

It should be especially noted that the number of years of observations (14) is still insufficient to speak about the stable nature of the identified relationships.

This work does not constitute investment advice.

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