

Investigation of Dynamic Conditional Correlation and Causal Relationship between Price of Cryptocurrencies with Emphasis on the Role of Creation Mechanism and Consensus in Them

Mohammad Kazem Sadeghian*

Kazem Yavari**

Abbas Alavi Rad***

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Abstract

The entry of cryptocurrencies into the capital market and their increasing price has created a fundamental change in the international currency and monetary exchanges of the world. The present study uses data from 2015 to 2021 to investigate the relationship between causality and dynamic conditional correlation between the price variable of 9 cryptocurrencies with different creation mechanisms. The results of this study show that Bitcoin, Litecoin and Ethereum, which have a proof-of-work mechanism, have a dynamic conditional correlation relationship in the short and long run.

On the other hand, the dynamic conditional correlation coefficient of Ripple, Nano and Monero that have proof of stake mechanism and EOS, Tron and Stellar that have new consensus mechanisms were not significant in the short run but in the long run, their relationship is statistically significant. Also, there is a two-way causality relationship between the price of Bitcoin, Litecoin, Ethereum and Monero. But among the prices of Tron, Stellar, Nano and Ripple with a newer consensus mechanism than other cryptocurrencies, there is mainly a one-way causality relationship.

Keywords: Cryptocurrency; Bitcoin; Consensus; Dynamic Conditional Correlation; Granger Causality.

JEL Classification: C32, e49, e42, f50, C10.

* PhD Candidate in Economics, Abarkooh Branch, Islamic Azad University, Abarkooh, Iran.
Email: mksad2014@gmail.com

** Professor of Economics, Faculty of Economics, Management and Accounting, Yazd University, Yazd, Iran
(Corresponding Author) Email: kyavari@yazd.ac.ir

*** Associate Professor, Department of Economics, Abarkooh Branch, Islamic Azad University, Abarkooh, Iran.
Email: alavi_rad@abarkouhiau.ac.ir



Bibliography

- Argha, Leila, Mowlaei, Mohammad, Khezri, Mohsen. "Investigating Impact of the Selected Domestic and Foreign Assets Returns on Stock Price Index Returns in Iran: An Approach from DCC-FIAPARCH Model" *Journal of Applied Economic Theories* 6 (4), (2019): 251-274. [In Persian]
- Aslanidis, Nektarios, Aurelio F. Bariviera & Oscar Mart'inez-Ibañez. "An analysis of cryptocurrencies conditional cross correlations." *Finance Research Letters* 31, (2019): 130-137.
- Bahramian, Mojtaba. "Ashnai ba Ramznegari Khamhaye Beyzavi" *Journal of Farhang va Andishe Riyazi*, 38 (64), (2019): 117-142. [In Persian]
- Bahri, Jamileh, Shayeghbroyeni, Hamidreza. "A Review of Consensus Algorithms in Blockchain", *Biannual Journal for Cyberspace Security and Information Exchange (Monadi AFTA)*, 8 (1), (2019): 31-42. [In Persian]
- Bhaskar, Nirupama Devi, & David LEE Kuo Chuen. Chapter 3: Bitcoin Mining Technology. *Handbook of Digital Currency Bitcoin, Innovation, Financial Instruments, and Big Data*, (2015).
- Bigoni Maria, Gabriele Camera, & Marco Casari. "Money is more than memory." *Journal of Monetary Economics* 110. (April 2020): 99-115. <https://doi.org/10.1016/j.jmoneco.2019.01.002>
- Chaudhari, Harshal & Martin Crane. "Cross-correlation dynamics and community structures of cryptocurrencies." *Journal of Computational Science* 44, (July 2020): 101130. <https://doi.org/10.1016/j.jocs.2020.101130>
- Corradi, Fiammetta & Philipp Höfner. "The disenchantment of Bitcoin: unveiling the myth of a digital currency." *International Review of Sociology*, 28:1. (Feb 2018): 193-207.
- Das, Debojyoti & Anupam Dutta. "Bitcoin's energy consumption: Is it the Achilles heel to miner's revenue?" *Economics Letters* 186, (January 2020): 108530. <https://doi.org/10.1016/j.econlet.2019.108530>
- Deflem, Mathieu. "The Sociology of Sociology of Money: Simmel and the Contemporary Battle of the Classics" *Journal of Classical Sociology* 3(1). (2003): 67-96. <https://doi.org/10.1177/1468795X03003001695>
- Dong, Qingxing & Orrin Cooper. "A peer-to-peer dynamic adaptive consensus reaching model for the group AHP decision making." *European Journal of Operational Research*, 250(2). (August 2016): 521-530. <https://doi.org/10.1016/j.ejor.2015.09.016>.
- Evans Charles W. "Bitcoin in Islamic Banking and Finance." *Journal of Islamic Banking and Finance June*, Vol. 3, No. 1, pp. 1-11, ISSN 2374-2666 (Print) (June 2015): 2374-2658.
- Eydi, Mahmoud, Hojbar Kiani, Kambiz, Rajaei, Yadolah, Rahimzadeh, Ashkan. "Barrasi Asarate Namotagharen Nerkh Arz Bar Tabe Taghazaye Pool Iran Ba Vojude Hazine Mazhabi Khanevar: Rooykarde NARDL" *Financial Economics* 14, 52, (2020): 27-54. [In Persian]

- Feld, Sebastian, Mirco Schönhofeld, & Martin Werner. "Analyzing the Deployment of Bitcoin's P2P Network under an AS-level Perspective." *Procedia Computer Science* 32. (December 2014): 1121-1126.
- Feng, Jingyu, Xinyu Zhao, Kexuan Chen, Feng Zhao, & Guanghua Zhang. "Towards random-honest miners' selection and multi-blocks creation: Proof-of-negotiation consensus mechanism in blockchain networks." *Future Generation Computer Systems* 105, (April 2020): 248-258. <https://doi.org/10.1016/j.future.2019.11.026>.
- Ferreira, Paulo, Ladislav Kristoufek & Eder Johnson de Area Leão Pereira. "DCCA and DMCA correlations of cryptocurrency markets." *Physica A: Statistical Mechanics and its Applications* 545, (May 2019): 123803. <https://doi.org/10.1016/j.physa.2019.123803>.
- Gilad, Yossi, Rotem Hemo, Silvio Micali, Georgios Vlachos & Nickolai Zeldovich. "Algorand: Scaling byzantine agreements for cryptocurrencies." *in: Proceedings of the 26th Symposium on Operating Systems Principles*, ACM, (2017): 51–68.
- Hassanzadeh, Ali, Mojtahed, Ahmad. "Mahiat va Karkarde Poul Asle Mehvari dar Jobrane kaheshe Arzeshe Poul Moghayeseye Eghtesadhaye Motaaraf va Eslami" *Journal of Tazehaye Eghtesad* 27, No. 125 (2013):57-67. [In Persian]
- Hayek, Friedrich. *Denationalisation of Money*: Institute of Economic Affairs, Hobart Paper Special, 1976.
- Kaboli Nooshabadi, Reza. "Bitcoin: Hamechiz az Hich." *Conference on Computational Algebra, Computational Theory of Numbers and Applications*1, (2014): 71-80. [In Persian]
- Kacprzyk, Janusz. & Mario Fedrizzi. "A 'soft' measure of consensus in the setting of partial (fuzzy) preferences." *European Journal of Operational Research* 34, (1988): 316–325. [https://doi.org/10.1016/0377-2217\(88\)90152-X](https://doi.org/10.1016/0377-2217(88)90152-X).
- Karimi, Mojtaba, Sarraf, Fatemeh, Imam Verdi, Ghodrattullah, Baghani, Ali. "Hambastegi Sharti Poyae Navasanate Gheymate Naft va Bazare Saham Keshvarhaye Hoze Khaliye Fars ba Takid bar Serayate Mali" *Financial Economics*13, 49, (2019):101-130. [In Persian]
- Killeen, Alyse. Chapter 24 the Confluence of Bitcoin and the Global Sharing Economy. (*Handbook of Digital Currency Bitcoin, Innovation, Financial Instruments, and Big Data*, 2015).
- Kristjanpoller, Werner & Elie Bouri. "Asymmetric multifractal cross-correlations between the main world currencies and the main cryptocurrencies." *Physica A* 523, (June 2019): 1057–1071. <https://doi.org/10.1016/j.physa.2019.04.115>.
- Kubát, Max. "Virtual Currency Bitcoin in the Scope of Money Definition and Store of Value." *Procedia Economics and Finance* 30, (2015): 409-416. [https://doi.org/10.1016/S2212-5671\(15\)01308-8](https://doi.org/10.1016/S2212-5671(15)01308-8).
- Lafourcade, Pascal, & MariusLombard-Platet. "About blockchain interoperability." *Information Processing Letters* 161, (September 2020): 105976. <https://doi.org/10.1016/j.ipl.2020.105976>.

- Liu, Yujia, Changyong Liang, Francisco Chiclana, & Jian Wu. "A trust induced recommendation mechanism for reaching consensus in group decision making." *Knowledge-Based Systems*, Volume 1191, (March 2017): 221-231. <https://doi.org/10.1016/j.knosys.2016.12.014>.
- Manavi, Seyed Alireza, Gholamreza Jafari, Shahin Rouhani & Marcel Ausloos. "Demythifying the belief in cryptocurrencies decentralized aspects. A study of cryptocurrencies time cross-correlations with common currencies, commodities and financial indices." *Physica A: Statistical Mechanics and its Applications* 556, (October 2020): 124759. <https://doi.org/10.1016/j.physa.2020.124759>.
- Mirza Khani, Reza, Saadi, Hoseinali. "Bitcoin and the Financial-Legal Nature of Digital Money" *Semi-annual Journal of Iran's Economic Essays* 15, No. 30, (2018):71-92. [In Persian]
- Mirzaee Ghazani, Majid & Reza Khosravi. "Multifractal detrended cross-correlation analysis on benchmark cryptocurrencies and crude oil prices." *Physica A* 560, (December 2020): 125172. <https://doi.org/10.1016/j.physa.2020.125172>.
- Mokni, Khaled & Ahdi Noomen Ajmi. "Cryptocurrencies vs. US dollar: Evidence from causality in quantiles analysis." *Economic Analysis and Policy* 69, (March 2021): 238-252. <https://doi.org/10.1016/j.eap.2020.12.011>.
- Nyman, Charlott. "The social nature of money: Meanings of Money in Swedish Families." *Women's Studies International Forum* 26, 1, (January–February 2003): 79-94. [https://doi.org/10.1016/S0277-5395\(02\)00357-6](https://doi.org/10.1016/S0277-5395(02)00357-6).
- Oliveira, Marcela T. de, Lucio H.A. Reis, Dianne S.V. Medeiros, Ricardo C. Carrano, Silvia D. Olabarriga, & Diogo M.F. Mattos, "Blockchain reputation-based consensus: A scalable and resilient mechanism for distributed mistrusting applications." *Computer Networks* 179, (June 2020): 107367. <http://dx.doi.org/10.1016/j.comnet.2020.107367>.
- Rahmani, Teymur. *Eghtesade Kalan*. Eighth edition, vol. 2, Tehran: Baradaran Publications, 2006.[In Persian]
- Rochon, Louis-Philippe, & Sergio Rossi. "Endogenous money: the evolutionary versus revolutionary views." *Rev. Keynes. Econ.* 1 (2). (2013): 210–229. <https://doi.org/10.4337/roke.2013.02.04>.
- Roudari, Soheil, Homayounifar, Masod, Salimifar, Mostafa. "Foreign Exchange rate Volatilities, Government Debt to the Banks and Current Government Spending: Wavelet Transform approach" *Journal of Monetary and financial Economics, New Period Finance* 27, no. 19, (2020): 1-27. [In Persian]
- Sezavar, Mohammad Reza, Khazaei, Alireza, Eslamian, Mojtaba. "Conditional Correlation between Foreign Exchange Markets, Gold, Housing, Stock and Oil in the Iranian Economy" *Quarterly Journal of Economic Strategy*, 8, 29, (2019):37-60. [In Persian]
- Shahbazi, Mohammad, Kazem Pourian, Saeed, Taghva, Mohammad Reza. "An applied investigation of Consensus Algorithms Used in Blockchain Networks" *Journal of Science and Technology Policy* 10, 3, (2020):35-54. [In Persian]
- Shi, Yongjing, Aviral Kumar Tiwari, Giray Gozgor & Zhou Lu. "Correlations among

cryptocurrencies: Evidence from multivariate factor stochastic volatility model.” *Research in International Business and Finance* 53, (October 2020): 101231. <https://doi.org/10.1016/j.ribaf.2020.101231>.

Simmel, Georg. *Georg Simmel. Sociological Theory*. 7th ed. New York: The McGraw-Hill Companies. 2008.

Soleymanipour, Mohammad Mehdi, Sultaninejad, Hamed, Pourmotahar, Mehdi. “Jurisprudential Study of Virtual Money” *Islamic Finance Research Bi-quarterly Journal* 6, no. 2, 12 (2017): 167-192. [In Persian]

Tavassoli, Mohammad Esmail. “Tahlile Mahiyate Poul” *Journal of Eghtesade eslami* 12, no. 48 (2012):107-130. [In Persian]

Thornton, Daniel L. Money in a Theory of Exchange. *Review. Federal Reserve Bank of St. Louis*. 2000.

Yasaghi, Reza, Staji, Ali. “Naghsh Peydayeshe Polhaye Digital va Majazi dar Kaheshe Vabastegi be Dolar Dar Iran” *Congress of Pioneers of Progress*10, (2016):2370-2377. [In Persian]

Yousefi, Ahmad Ali. “Mahiyate Poul va Rahbordhaye Feghhi va Eghtesadi An” *Institute of Islamic Culture and Thought*, 29 Economics 24, (1998):150-148. [In Persian]

Yu, Bin, Joseph Liu, Surya Nepal, Jiangshan Yu, & Paul Rimba. “Proof-of-QoS: QoS Based Blockchain Consensus Protocol.” *Computers & Security* 87, (November 2019): 101580.

Zahedi Vafa, Mohammad Hadi, Adel, Paighami. “Money and Time in Islamic Economics’ Distribution Theory” *Islamic Economics Studies Bi-quarterly Journal* 2, no. 1, 3, (2009): 5-37. [In Persian]

Zhang, Hengjie, Sihai Zhao, Gang Kou, Cong-Cong Li Yucheng Dong and Francisco Herrera. “An overview on feedback mechanisms with minimum adjustment or cost in consensus reaching in group decision making: Research paradigms and challenges.” *Information Fusion* 60, (August 2020): 65-79.

Zhang, Wei, Pengfei Wang, Xiao Li & Dehua Shen “The inefficiency of cryptocurrency and its cross- correlation with Dow Jones Industrial Average.” *Physica A: Statistical Mechanics and its-Applications* 510, (November 2018): 658-670.