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Topological Analysis of the Transfer Entropy Network of Cryptocurrencies During the Uptrend and Downtrend Periods.

Cryptocurrency is a decentralized payment tool that generally does not require any government backing or intermediary. Currently, there are a large number of low-fee exchanges for buying and selling cryptocurrencies with less restrictions. However, the pricing behavior of this highly-dynamic type of market and driving factors for changes of market prices remain unclear. The cryptocurrency market has various nonlinear and overlapping linear drivers, in which the conventional Granger causality analysis was shown to be inefficient. Therefore, the Granger causality analysis was replaced by the Transfer entropy calculations between all pairs of cryptocurrencies. Calculations were performed on two datasets consisting of time series of 40 cryptocurrency prices: (1) the 'upward trend'dataset with a monotonic increase of the Bitcoin price and (2) the 'downward trend'dataset with a monotonic decrease of the Bitcoin price. Then, information flow networks were created from transfer entropy between each pair of cryptocurrencies. Lastly, we analyzed topological parameters to observe the behavior during the upward and downward trends of the market. The results showed that the 'In Degree'and 'Out Degree'values for the transfer entropy network from the 'downward trend'dataset were twice those from the 'upward trend'dataset, indicating the higher level of data transmission during the 'downward trend'period. Similarly, the Transitivity value from the 'downward trend'was almost twice that from the 'upward trend', indicating that changes in cryptocurrency prices in the 'downward trend'were more likely to occur in the same direction.

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