

Subject

Pricing European options on the Bitcoin market

Supervisors, contact, place of research

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Scientific discipline

Technical Computer Science and Telecommunications

Project Description

Bitcoin (BTC) is one of the best-known cryptocurrencies. It was created in 2009 by a person or group of persons known under the pseudonym Satoshi Nakamoto. The BTC transactions do not require an intermediary. The system of BTC transactions is based on fixed rules, a peer-to-peer network, and cryptography (see [1]). As mentioned in [1] and references therein, Bitcoin behaves as a high volatility stock and the high volatility of its price may depend on market attention for this cryptocurrency.

European options on BTC have been recently traded on appropriate websites. In [1], the BTC price and dynamics of the attention index are modelled by continuous stochastic processes, described by a system of stochastic differential equations. Moreover, the attention index affects the BTC price at time t up to a certain time preceding t . The authors proved that, under appropriate assumptions, the model is free of arbitrage, derived pricing formulas for European style derivatives on BTC, applying methods of financial mathematics, and estimated the model parameters, using the volume of transactions as well as the number of Google searches on the term “bitcoin” as proxies for the attention index.

In the traditional Black–Scholes (BS) model, the underlying asset price is described by a geometric Brownian motion. However, besides the advantages of the BS approach, which are an analytical option pricing expression and the completeness of the BS financial market model, it has drawbacks (see [2]). Therefore, some alternatives for the BS model have been proposed, including approaches using Levy processes with jumps to model underlying assets (see, e.g. [3–6]).

The proposed research work, using advanced mathematical and computer science methods, concerns introducing jump parts to the model considered in [1], derivation of the valuation expressions for European options on BTC, as well as proposition of an estimation method for the generalized model. The process of fitting this model to market data will require application of various computational techniques. Additionally, it would be interesting to take into consideration features associated with the BTC technology, other than market attention for BTC.

Bibliography

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Date: May 31, 2021