Synthetic BTC derivatives

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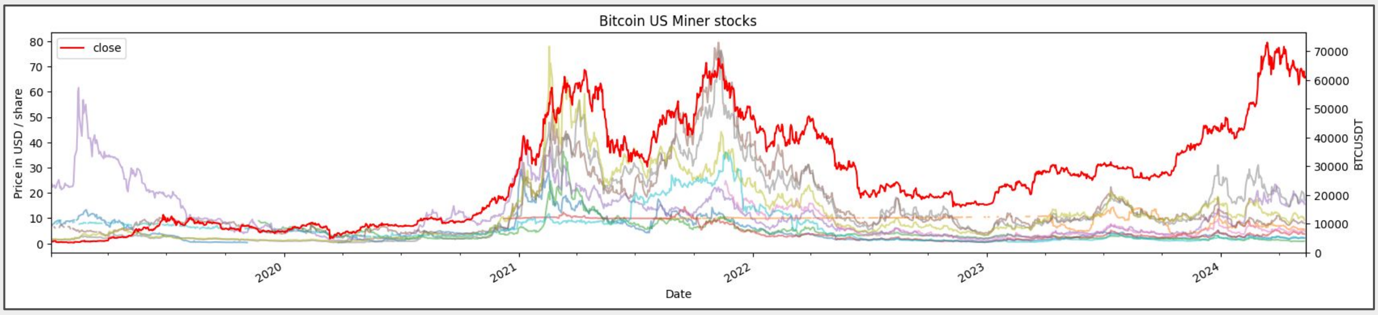
Using US publicly traded companies engaged in BTC mining to create a portfolio calibrated to mimic BTC returns. We propose creating derivatives on top of this portfolio.

Opportunity: In March 2024, SEC rejected CBOE to start offering options trading on recently approved Bitcoin ETF. We believe that offering options on a basket of stocks closely tight to the BTC price can be used as a way to trade options on spot BTC.

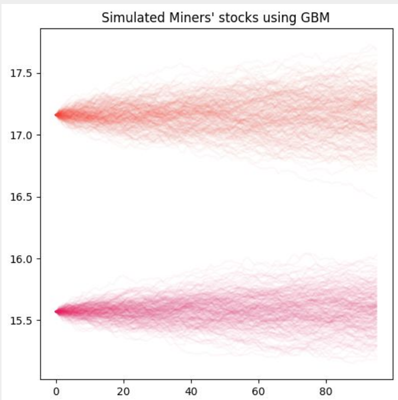
Basket: Portfolio that mimics the returns of BTC is calibrated using previous 21 trading days. Portfolio consists of 10 publicly traded US companies which business is tight to bitcoin mining. The list of the companies is: MARA, CLSK, RIOT, CIFR, HUT, IREN, WULF, BTDR, CAN, BTBT.

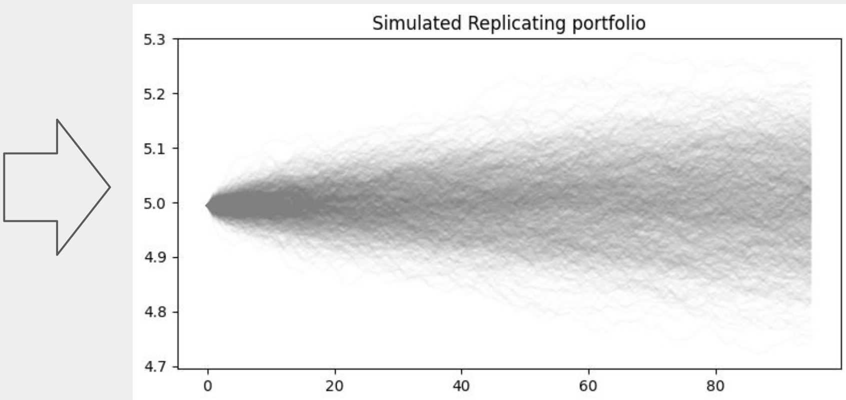


Replication: We replicated daily BTC returns by a linear combination of stock returns listed above. We minimized MAPE loss to mimic future BTC returns. This way we obtained weights that was used to create a replicating portfolio.

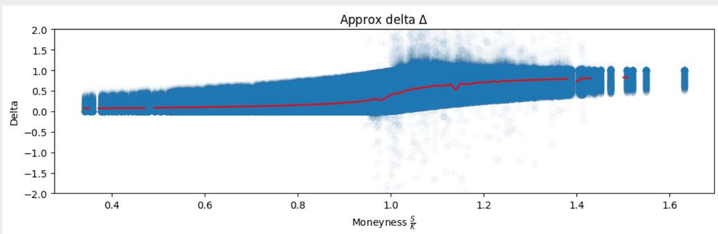
Option pricing: Generate multiple paths for underlying stocks using Monte Carlo with Cholesky decomposition of the correlation matrix of stock returns. This way GBM paths will be correlated. Then, combine these paths into a portfolio using weights calculated through replication problem. Having obtained that, discount cashflows of the derivatives to obtain the price. Psi Ψ denotes correction for the replication error which was realized at maturity.

$$\text{Synthetic ATM BTC Call payoff} = \max\left(\sum_{i=1}^{N}(S_{iT} - S_{i0})w_i, 0\right) \cdot \Psi = \max(S_{\text{portfolio},T} - S_{\text{portfolio},0}) \cdot \Psi$$





Greeks: Delta of the asset follows the pattern, having the value of 0.5 ATM and being 1 as moneyness increases. We changed initial asset prices by multiplying by a random vector sampled from uniform (0.8, 1.2) and calculated corresponding changes in underlying price of the portfolio and corresponding change in premium



Potential risks:

1. Lack of diversification by geography and company types, which may exposes investments by geopolitical threats or US regulatory changes
2. Limits of calibration methods. Decoupling of BTC price and replicating portfolio closer to maturity.
3. Relatively low trading volume for the securities in the replicating portfolio