DSSV 2023 Data Science, Statistics & Visualisation
EC 2023 European Conference on Data Analysis

Practicable portfolio optimization for portfolios that contain nonfungible tokens

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Nonfungible tokens (NFT) are a novel asset class in the financial markets that has recently garnered major attention in the media and the scientific literature. With a total market capitalization exceeding ten billion USD, it should not come as a surprise that a diverse set of financial services are spawning up, such as NFT hedge funds or lending protocols with NFTs as a collateral, to name a few. The profitability of such services depends on the financial decisions they take, which on their turn often depend on the quality of data and analytics built thereupon.

NFTs are by definition nonfungible, which makes it challenging to estimate financial metrics using methods applied to traditional assets and determine properties such as asset valuation, volatility and risk. Several challenges that NFT transaction data pose have been outlined in [1].

Most NFTs are traded on a blockchain as *collections*, which are sometimes considered to be a homogeneous financial asset. However, tokens within collections have unique traits, which often leads to very significant price differentiation. Figure 1 illustrates this for *Cryptopunks*. It also shows that sundry outliers are present in the price history unrelated to the token trait. These effects make moving averages highly unstable at the collection level.

Here, we introduce a practicable portfolio optimization strategy that allows to trade slices of NFT collections for which liquidity can reasonably be assumed. Moreover, the effect of outliers can be mitigated by applying cellwise robust portfolio optimization based on hierarchical risk parity [2], which is shown to outperform conventional approaches.

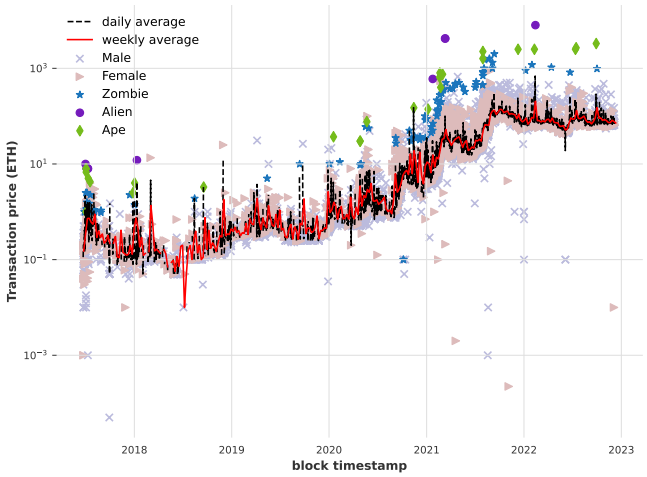

Figure 1: Cryptopunks price history grouped by Cryptopunk *body type*: Alien, Ape, Female, Male and Zombie

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[1] J. Cho, S. Serneels, and D. Matteson, "Non-fungible token transactions: data and challenges," *Data Science in Science*, vol. 2, p. 2151950, 2023.
[2] E. Menvouta, S. Serneels, and T. Verdonck, "Portfolio optimization using cellwise robust association measures and clustering methods," *The Journal of Finance and Data Science*, vol. submitted for publication, 202x.