From Melodies to Markets: Leveraging LSTM for Music-Driven Predictions in NFT Trading Dynamics

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ABSTRACT

This study investigates the correlation between the audio features of top-charting music and Non-Fungible Tokens (NFT) market dynamics, presenting a novel perspective within the realm of behavioral finance. Drawing on the regulatory focus theory and existing research on music's affective influence, the authors argue that popular music, as a reflection of society's collective regulatory focus, can significantly impact trading behaviours in NFTs, an asset class known for its susceptibility to emotional drivers and speculative activity. By employing a Long Short-Term Memory (LSTM) machine learning model and permutation importance technique, the analysis demonstrates that specific musical attributes—such as danceability, loudness, and mode—exhibit predictive power over daily NFT trading volumes. The study not only provides evidence of music's capacity to signal shifts in trading behaviors, offering innovative insights into the drivers of digital asset markets, but introduces a new interdisciplinary approach focusing on the collective regulatory focus reflected in the music.

INTRODUCTION

Since late 2017, Non-Fungible Tokens (NFTs) have emerged as a significant innovation within the blockchain ecosystem. Despite their explosive market growth, the pricing and trading dynamics of NFTs remain elusive and complex. Unlike fungible tokens such as Bitcoin and Ether, which have a uniform value and can be subdivided or merged, NFTs are inherently unique and non-

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interchangeable. Each NFT represents a distinct asset or entity, with its value tied to its specific attributes. This non-fungibility means that NFTs cannot be divided into smaller units or combined without losing their inherent value.

NFTs are powered by blockchain technology, which serves as the foundational infrastructure enabling their uniqueness and verifiable ownership. Each NFT is created through a smart contract that encodes the asset's metadata, ownership record, and transfer history on a decentralized ledger(Guan et al., 2023; Lee et al., 2023). This immutable record ensures authenticity, traceability, and security, allowing buyers and sellers to transact without centralized intermediaries. The blockchain's consensus mechanism guarantees that once ownership is recorded, it cannot be altered retroactively, creating trust in digital provenance. In this way, blockchain underpins both the technological and economic logic of NFTs—transforming digital files into verifiable assets that can be traded, collected, and monetized across decentralized marketplaces.

Such heterogeneous features make it extremely difficult to put any quantitative parameters on NFTs' pricing. It is generally believed that NFT markets are driven more by public opinion, expectations, the perception of buyers, and the goodwill of creators (Qian et al., 2022). To name a few, Wang et al. (2022) documented that NFT market exhibits speculative bubbles, which are highly correlated with market hype and with more general cryptocurrency market uncertainty. Park et al. (2023) find that the NFT market is also heavily influenced by a small group of dominant players, known as "whales," who drive price movements. Das et al. (2022) investigated how the entities external to the blockchain are able to interfere with NFT markets, leading to serious consequences, and quantified the malicious trading behaviors carried out by users under the cloak of anonymity.

A range of studies therefore have resorted to investor sentiment, a concept well-studied in behavioral finance, to understand the NFT market dynamics. For instance, Horky et al. (2023) used a dataset of over 5 million English-language tweets on NFTs to calculate a daily sentiment index and linked it to NFT sales and trading volume. They reported findings that reveal Twitter's significance as a primary source of information for a broad audience. Baklanova et al. (2023) constructed a sentiment index, termed the NFT hype index, by analyzing written content posted by 62 high-profile individuals and opinion leaders on the social media platform Twitter. They found that the NFT hype index exhibited a higher degree of predictive accuracy compared to the well-known sentiment indices.

In this study, we offer a novel perspective for understanding investor sentiment and market dynamics, by looking into the potential link between the popular songs that people listen to and NFT daily volumes. Music, as a form of art consumption, has long been recognized for its ability to capture and convey the emotions and sentiments of a society. The lyrics of popular songs, in particular, often reflect the prevailing moods, concerns, and aspirations of the public. Some studies looked into how music sentiment could impact stock market performance. Edmans et al. (2022) utilized the listening data from Spotify to build a measure of sentiment that measures the positivity of songs that individuals choose to listen to. Harsley et al. (2016) analyzed the music sentiment for polarity and mood and found statistically significant correlations between lyrical sentiment polarity and DJIA closing values.

Our study will be the first to connect music features and NFT market dynamics. This study leverages advanced deep learning methods, specifically Long Short-Term Memory (LSTM) networks, to examine the potential link between popular music sentiment and NFT market dynamics. Music sentiment, captured through features like danceability, loudness, and key, reflects societal emotions and cultural trends, offering a unique data source to predict NFT trading volumes. LSTM models, renowned for their capability to learn long-term dependencies in sequential data, provide an ideal tool for analyzing time-series patterns in NFT trading. By integrating music features with