

Chapter 7

Investigating the Relationship Between Twitter Sentiment and Bitcoin Price Movements

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ABSTRACT

Bitcoin, launched in 2009 as the pioneer cryptocurrency, has caught the eye of investors worldwide due to its nature and remarkable growth. Recent studies indicate that elements, like announcements, news sentiments, government regulations, and overall market sentiments significantly influence the trajectory of bitcoin price. This work presents a comprehensive analysis to provide deeper insights into the relationship between user sentiments expressed as tweets and bitcoin prices (daily price changes). As a significant contribution, the authors propose multiple approaches to performing the non-trivial task of integrating tweet sentiment with bitcoin price data. The chapter also presents the incorporation of inherent lag in the expression of sentiments and their impact on price change by demonstrating lagged sentiment analysis. The work employs state-of-the-art machine learning and deep learning models for analyzing the data both as classification and regression tasks to uncover hidden patterns.

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INTRODUCTION

Due to their decentralized nature and ability to replace traditional fiat currencies, cryptocurrencies—such as the groundbreaking Bitcoin—have entirely changed the global financial landscape. Introduced in 2009 by the enigmatic Satoshi Nakamoto, Bitcoin revolutionized digital finance by introducing blockchain technology and spurring the development of other rival cryptocurrencies. Due to its fixed amount, decentralized structure, and cryptographic security, Bitcoin has become a disruptive force in finance, upending conventional ideas about money and investing.

The cryptocurrency market is infamous for its extreme volatility, with values subject to swings based on various factors, including regulation changes, technological advancements, macroeconomic patterns, and investor sentiment. Particularly concerning Bitcoin, there have been significant price fluctuations ranging from sharp increases to sharp decreases, offering investors both a profitable opportunity and a dangerous risk. Because of the market's inherent volatility, there is intense interest in comprehending the fundamental reasons behind price fluctuations and creating prediction models to assist investors in managing its complexity.

The attempt to anticipate bitcoin values has sparked a flurry of research, with experts investigating various approaches and data sources to get insights into market dynamics. This research journey begins with essential publications such as those by Lamon et al., (2017), who pioneered the development of prediction models based on news and social media sentiment. Their findings proved the possibility of using supervised learning algorithms for text-based sentiment classification, setting the framework for future research. With social media becoming ubiquitous in the last decade, this research has paved the way for a multitude of studies presenting approaches to integrate public sentiments with traditional analysis methods for a comprehensive understanding of the bitcoin market.

By examining the price movement prediction of more cryptocurrencies, such as Bitcoin, Ethereum, Ripple, and Litecoin, Valencia et al., (2019) broadened the scope. Their study demonstrated the potential of sentiment analysis and machine learning in predicting market trends, with neural networks emerging as a viable technique for predictive modeling.

Building on this foundation, Raju and Tarif (2020) looked into the use of machine learning algorithms and sentiment analysis of social media data to predict the price of Bitcoin in real time. Their findings emphasized the need to incorporate sentiment research into predictive models, particularly given Bitcoin's high volatility and the rapid transmission of information via social media platforms. Research like that of Kurniasari and Setyanto (2020), who examined sentiment analysis utilizing deep learning and neural networks, has allowed the investigation of sentiment analysis approaches to continue to advance. Their study, which concentrated on the Indone-

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