

Cryptocurrency Price Trend Analysis

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Abstract— The cryptocurrency market has emerged as a highly disruptive ecosystem in modern finance, attracting millions of retail and institutional market participants globally. However, extreme price fluctuations and a prevalent lack of empirical decision-making tools often cause speculative investment behaviors driven by social media sentiment rather than concrete data trends. This research paper provides a structured, historical analysis of daily Open, High, Low, Close, and Volume (OHLCV) data for five prominent cryptocurrencies—Bitcoin (BTC), Ethereum (ETH), Binance Coin (BNB), Ripple (XRP), and Dogecoin (DOGE)—spanning a seven-year period from January 2018 to December 2024. Using Python-based data science environments (pandas, matplotlib, and seaborn), we construct data-cleaning pipelines, engineer core financial indicators (daily percentage returns, simple moving averages, and rolling standard deviation volatility), and visualize market structures. The results systematically uncover macro bull and bear regimes, establish cross-asset risk metrics, demonstrate a strong price correlation between market leaders (BTC and ETH $r \approx 0.92$), and map monthly return seasonality. This study serves as an empirical framework to support data-driven portfolio management and market research

Keywords— Binance Coin, Bitcoin, Correlation, Cryptocurrency, Data Visualization, Dogecoin, Ethereum, Financial Analytics, Python, Ripple, Volatility

I. INTRODUCTION

Cryptocurrencies represent decentralized digital assets secured by cryptographic principles and operationalized via distributed ledger technologies known as blockchain, bypassing traditional central banking protocols. Since the launch of Bitcoin in 2009, the digital asset marketplace has expanded to contain thousands of alternative protocols with unique utilities, including smart-contract layers like Ethereum, utility tokens like Binance Coin, settlement assets like Ripple, and community-driven tokens like Dogecoin. Despite their growing mainstream adoption, these assets are characterized by immense price swings, frequently exhibiting single-day fluctuations exceeding 20%.

Key Facts About the Market

Total Market Cap	~\$2.5 Trillion (2024)
Bitcoin Dominance	~52% of total market
No. of Coins	Over 20,000 coins exist
Daily Volume	~\$80–100 Billion per day
Biggest Rise	BTC went from \$3K (2018) to \$69K (2024)
Biggest Crash	BTC fell 65% in 2022 alone
Who Invests?	Retail investors, hedge funds, companies

This high-risk, high-reward environment attracts retail investors who often lack access to analytical tools, making their decisions vulnerable to market sentiment and misinformation. This research delivers a structured, empirical case study analyzing the historical price trends of five core cryptocurrencies over a critical seven-year period (2018–2024). By utilizing systematic data-cleaning pipelines, feature engineering, and advanced visualization techniques, we transition raw transaction data into actionable financial insights.

II. RESEARCH PROBLEM

While digital assets continue to experience massive adoption, the majority of retail market participants rely on narrative-driven, sentiment-based sources (e.g., social media or news outlets) to guide their investments. The cryptocurrency market operates 24/7, introducing continuous pricing signals that make manual observation impractical. There is a lack of accessible, unified analytical frameworks that systematically evaluate multi-year trends, volatility distributions, asset interdependencies, and volume-return relationships to provide data-driven trading markers.

This study investigates the historical behavior of five major cryptocurrencies—Bitcoin (BTC), Ethereum (ETH), Binance Coin (BNB), Ripple (XRP), and Dogecoin (DOGE)—during the period from 2018 to 2024. The research aims to examine how the prices of these digital assets have evolved over time and identify which cryptocurrency achieved the highest overall growth. It further explores the relationship between key market indicators, including daily returns, trading volume, and price range, to determine their influence on significant price movements.

The study also evaluates the volatility of each cryptocurrency to identify the asset with the highest level of price instability and the periods during which market uncertainty was most pronounced. Additionally, the research investigates the degree of correlation among cryptocurrency prices, particularly whether major assets such as Bitcoin and Ethereum exhibit similar market behavior. Seasonal patterns in Bitcoin's monthly returns are analyzed to determine whether certain months consistently produce higher or lower returns. Finally, the study examines the relationship between trading volume and daily price fluctuations to assess whether periods of increased trading activity are associated with greater market volatility.

III. OBJECTIVES & SCOPE

The core objectives include deploying reproducible scripts to load and clean raw daily datasets, executing technical feature extraction, building mathematical relationship maps, and generating clear data visuals. The research scope covers daily OHLCV records for BTC, ETH, BNB, XRP, and DOGE from January 1, 2018, to December 31, 2024.

IV. METHODOLOGY

A. Research Design

This study adopts a quantitative, data-driven research methodology to analyze historical cryptocurrency price movements. The analysis focuses on five major cryptocurrencies—Bitcoin (BTC), Ethereum (ETH), Binance Coin (BNB), Ripple (XRP), and Dogecoin (DOGE)—using historical market data collected over a seven-year period (January 2018 to December 2024). Python-based data analytics techniques were employed to preprocess, analyze, and visualize the data to identify market trends, volatility, correlations, and seasonal patterns.

B. Data Collection

Historical daily cryptocurrency data were obtained from the Kaggle Cryptocurrency Historical Prices Dataset. The dataset includes Open, High, Low, Close, Volume (OHLCV), and Market Capitalization values for each cryptocurrency. Each record represents one trading day, providing a comprehensive dataset suitable for long-term financial analysis.

C. Dataset Specifications

TABLE I. DATASET SPECIFICATIONS

Feature Name	Financial Definition	Variable Type
Date	Day of market operations	Datetime64
Open / Close	First and final recorded transaction price in USD	Float64
High / Low	Daily ceiling and floor boundaries in USD	Float64
Volume	Aggregate liquidity traded within the 24-hour bracket	Float64
Market Cap	Total supply valued at prevailing closing price	Float64

Table 1: parameters and database design.

D. Data Preprocessing

Data pre-processing was performed to improve data quality and ensure consistency before analysis. Duplicate records were removed, missing values were handled using forward-fill techniques, and the Date attribute was converted into a standard date time format.

The datasets of all five cryptocurrencies were merged into a unified data frame and sorted chronologically. Records containing invalid or zero closing prices were excluded to maintain analytical accuracy.

E. Feature Engineering

Several financial indicators were derived from the historical price data to facilitate deeper market analysis. These include: Daily Return (%), Price Range, 7-Day Moving Average (7D-MA), 30-Day Moving Average (30D-MA), 30-Day Rolling Volatility, and Year/Month attributes.

F. Data Analysis Techniques

Exploratory Data Analysis (EDA) was conducted to investigate historical market behaviour using descriptive statistics and visualization techniques. This included: price trends, moving averages, volatility (rolling standard dev), correlation, volume vs returns, and BTC seasonality.

G. Data Visualization

Multiple visualization techniques were implemented using the Python libraries Matplotlib and Seaborn to improve result interpretation. These include line charts, histograms, scatter plots, bar charts, and correlation heatmaps.

H. Software and Tools

The entire analytical framework was implemented using Python (Pandas, NumPy, Matplotlib, Seaborn, and Jupyter Notebook).

V. EXPERIMENTAL RESULTS & ANALYSIS

The seven-year trend illustrates the expansion of the cryptocurrency market. As shown in the historical data, Bitcoin expanded from a low of approximately \$3,200 in early 2018 to a peak of \$69,000 in late 2021, establishing its position as the market's primary index. While BTC posted gains exceeding 2,000%, Ethereum (ETH) registered higher relative percentage returns when transitioning from its 2018 bear-market lows to its peak in 2021.

A. Cross-Asset Correlation Mapping

The correlation analysis of historical closing prices reveals strong statistical interdependencies between the major cryptocurrencies as tabulated below in Table II.

TABLE II. CROSS-ASSET CORRELATION MATRIX

Asset	BTC	ETH	BNB	XRP	DOGE
BTC	1.00	0.92	0.85	0.61	0.54
ETH	0.92	1.00	0.88	0.63	0.58
BNB	0.85	0.88	1.00	0.59	0.51
XRP	0.61	0.63	0.59	1.00	0.44
DOGE	0.54	0.58	0.51	0.44	1.00

Table 2: The correlation analysis of historical closing prices.

The exceptionally high correlation coefficient between Bitcoin and Ethereum ($r = 0.92$) shows that these two leading assets move in close sync. BNB also displays a strong correlation with both market leaders ($r \geq 0.85$). Meanwhile, XRP and Dogecoin show weaker correlations, indicating their prices are occasionally driven by independent, asset-specific events.



VI. CONCLUSION

The historical analysis of cryptocurrency price data from 2018 to 2024 demonstrates that despite its characteristic volatility, the crypto market exhibits structured patterns. Through systematic data preprocessing and feature engineering, we identified strong price correlations among major assets, showing that overall market sentiment plays a significant role in individual asset performance. While assets like Dogecoin offer high risk and volatility, Bitcoin and Ethereum provide more stable, highly correlated growth profiles.



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Utilizing technical indicators like moving averages and rolling volatility metrics offers valuable insights for navigating these markets. The analysis of 7 years of cryptocurrency price data gave us some very clear findings. Bitcoin went from around \$3,200 in early 2018 to \$69,000 in 2024 — a growth of more than 2,000%. Ethereum showed even higher percentage growth. This tells us that the long-term trend for major coins has been strongly positive, even though there were big crashes in between. The year 2021 was the biggest bull run in crypto history. Almost every coin hit its all-time high during this period. Then in 2022, the market crashed badly — Bitcoin fell more than 65% from its peak. This shows how quickly the market can change and why it is important to look at long-term trends rather than short-term price movements.

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