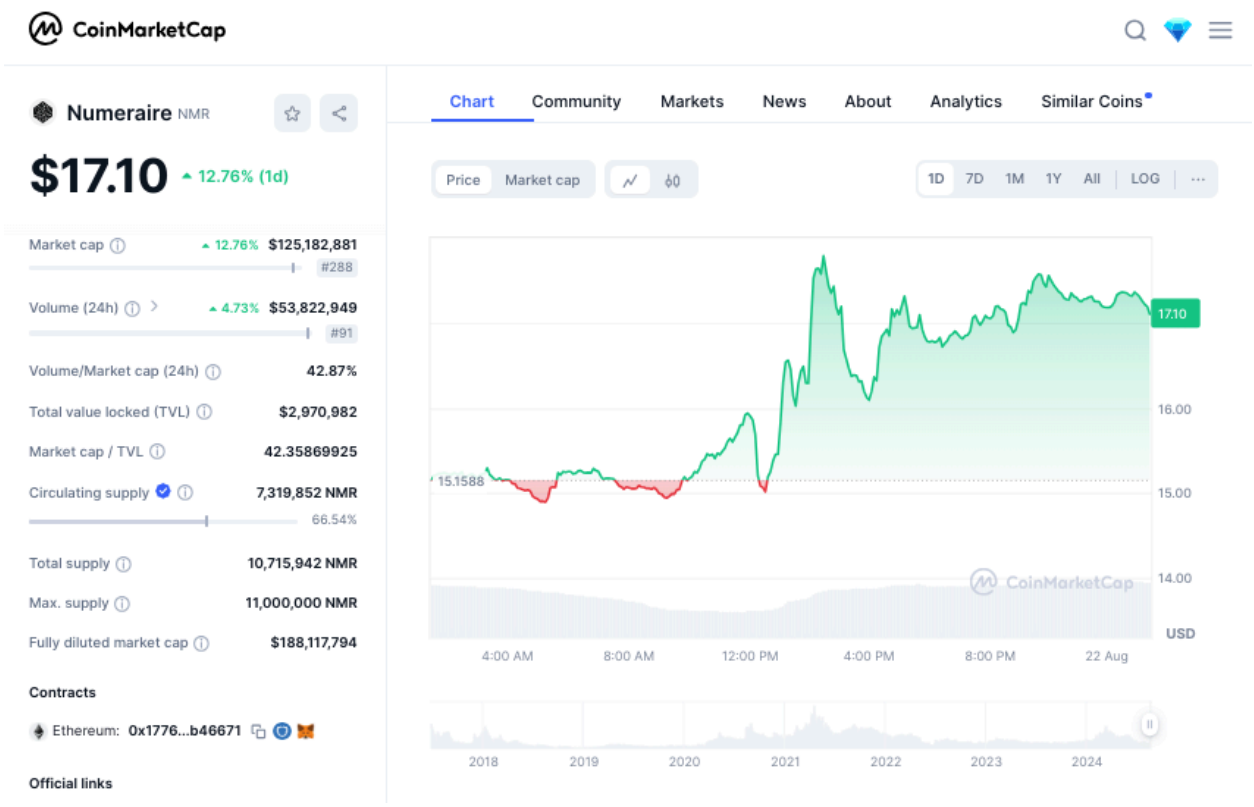
WHAT MOVES THE CRYPTO MARKETS?

Introducing the Crypto Price Variance Model (CPVM)



CYRIL MAWUTOR AGBENYENU (**@polymawutor**)
Mawutor Utility Company, August 2024.

Abstract

This study introduces the Crypto Price Variance Model (CPVM), a novel approach to understanding and predicting cryptocurrency price movements. Building upon the foundation of the Fama-French model, the CPVM incorporates three key factors: Price Momentum, Fear & Greed Index, and Interest Rates. These factors were identified through a comprehensive correlation analysis of various economic indicators against crypto price variance. The model aims to provide a more tailored and relevant framework for analyzing cryptocurrency markets, addressing the unique characteristics and dynamics of this emerging asset class. While the CPVM offers valuable insights into the drivers of crypto price variance, it also acknowledges the limitations inherent in applying traditional financial models to the rapidly evolving and often unpredictable crypto landscape. This research contributes to the growing body of knowledge on cryptocurrency valuation and risk assessment, offering both practitioners and researchers a new tool for understanding this complex market.

Table of Contents

Abstract **2**
Table of Contents 3
Introduction **4**
Background **5**
Fundamentals 6
Macroeconomics 7
Data Collection & Preparation **11**
Factor Models **12**
Initial Findings 12
Factors Deep Dive 15
Explaining Macroeconomic Factor Effects 18
Factor Selection Using Correlation Matrix 22
Model Development 24
Conclusion **26**
Reference(s) **28**
Appendix **28**

Introduction

The cryptocurrency landscape is a diverse and dynamic space, populated by a wide range of participants—from venture capitalists and Bitcoin maximalists to founders, traders, and memecoin enthusiasts. Each of these players holds a different thesis on what drives the movement of cryptocurrency prices. On platforms like “Crypto Twitter,” it often appears that crypto prices follow specific narratives, typically championed by influential figures. For example, Bitcoin has been framed as "digital gold," while Ethereum gained traction as "programmable money." The emergence of Solana was driven by the narrative of speed and scalability, and similar stories have shaped the rise of other cryptocurrencies.

Over time, well-established cryptocurrencies have shown a tendency to increase in price, forming the basis of theories like Zu Shu’s “Supercycle” and more recently, Michael Saylor’s aggressive Bitcoin accumulation strategy. Despite the varying perspectives, these theories converge on a single truth: certain factors are responsible for the price movements of cryptocurrencies. Understanding what drives these price changes is the focus of this analysis.

Rather than fixating on short-term price fluctuations, which can be erratic due to crypto assets' inherent volatility, this paper will take a broader view. We will explore the historical context of cryptocurrencies—why they were created, the problems they were designed to solve, and how the ecosystem has evolved in ways that even Satoshi Nakamoto might not have anticipated.

Using a rigorous analytical approach, we will select a set of factors that are observed to influence asset prices, grounded in the basic economic principles of supply and demand. We aim to develop models that assess how these factors affect different groups of cryptocurrencies. Ultimately, our goal is to create a resource-rich document that participants in the crypto ecosystem can use as a foundation for sound investment decisions or for educational purposes.

The following sections will provide the background of this research, explaining how the chosen factors were influenced. We will then gather relevant data reflecting these factors and construct models to understand the extent to which each factor influences various cryptocurrencies.

Background

To understand what drives cryptocurrency prices, it's essential to first grasp the nature of this asset class and the specific problems that Bitcoin, the first cryptocurrency, was created to address. The roots of cryptocurrency can be traced back to the cypherpunk movement, a group of libertarian-minded individuals who believed that governments—controlled by a select group of elites—should not have absolute authority over monetary policy. These early visionaries argued that the world needed a hard digital currency, free from the control of nation-states, which have historically implemented policies leading to significant devaluation of fiat money over time.

The pursuit of a decentralized currency that could retain its value led to the creation of Bitcoin by the pseudonymous Satoshi Nakamoto. Bitcoin was built on the foundational research of notable figures like Adam Back and Hal Finney, who contributed to the development of the cryptographic technologies that made Bitcoin possible.

In addition to creating a decentralized and deflationary currency, Bitcoin also addressed a major issue inherent in fiat currency systems: transparency. With fiat currencies, market participants often operate in the dark, as governments can manipulate monetary policy without full transparency. The true circulating supply of fiat money is difficult to ascertain, which creates uncertainty. Bitcoin, however, solved this problem by introducing an open ledger—known as the blockchain—where all transactions are publicly recorded and easily verifiable but extremely difficult to alter, thanks to advances in cryptographic technology.

Therefore, the primary adversary of cryptocurrency is not fiat money itself, but rather the ruling class and institutions that oppose the transparency and decentralization that crypto represents.

Given the high level of transparency inherent in crypto assets, researchers should, in theory, be able to predict price movements with greater accuracy compared to synthetic assets like stocks and options, or even traditional non-synthetic assets like gold and silver. In other words, over a sufficient time horizon, it should be possible to predict cryptocurrency price variance with a higher degree of accuracy than any other asset class, by analyzing macroeconomic trends, and fundamental factors, and employing robust statistical techniques.

Fundamentals

To ensure that Bitcoin fulfilled its promise of value retention, it was designed to adhere strictly to the universal laws of supply and demand. Bitcoin's architecture incorporates a fixed total supply, which is gradually introduced into circulation through a process known as mining. Additionally, Bitcoin's circulating supply is programmed to halve approximately every four years, an event known as the "halving." This mechanism inherently increases the scarcity of new Bitcoin, placing additional pressure on miners to invest in more advanced equipment to maintain their previous levels of block rewards.

This design aligns with the game theory principle of "skin in the game," where participants must demonstrate a significant commitment to keep the system functioning as intended. In contrast to traditional fiat-based systems, where policymakers are often insulated from the consequences of their decisions, Bitcoin's model ensures that its economic dynamics directly impact those involved in maintaining the network.

From this, we can identify the most critical fundamental factors that influence a financial asset's behavior:

1. **Total Supply**: This refers to the maximum amount of the asset that will ever be in circulation. Is the supply capped or unlimited? A fixed supply generally creates scarcity, which can drive value over time.
2. **Circulating Supply**: This is the amount of the asset currently available to market participants. The circulating supply determines how much of the asset is accessible for trading, affecting its liquidity and market dynamics.

3. **Inflation Rate**: This represents the rate at which new units of the asset are introduced into circulation annually. For Bitcoin, this rate decreases over time due to the halving events, which is a crucial factor in its value retention.

These core factors are fundamental in assessing an asset's soundness. Historically, researchers have been able to predict price movements by analyzing how these factors interact.

In this analysis, we will deliberately exclude factors such as liquidity and inherent value. Liquidity is not universal; it varies widely between markets, introducing noise that could skew our analysis. The concept of value is also highly subjective, differing based on the location, interests, and risk appetite of various market participants. Consequently, it is challenging to make objective claims based on inherent value alone.

By focusing on the more quantifiable and universally applicable factors—total supply, circulating supply, and inflation rate—we can develop a more robust understanding of the fundamental drivers of cryptocurrency prices.

Macroeconomics

The amount of energy a human being can expend in their lifetime is finite. To maximize efficiency, we often turn to nature to supplement our energy in various ways. While the energy available from natural resources can be managed to last for generations, it is ultimately limited. Scholars refer to the study of this phenomenon—the scarcity of human resources—as economics, and when examined on a larger scale, it is known as macroeconomics.

It is well-established that every asset class in the world is subject to macroeconomic factors. The notion that cryptocurrency, by design, is immune to macroeconomic influences is a misconception. In reality, cryptocurrencies are not isolated from the broader economic environment. For instance, when individuals have little to no disposable income and are struggling to meet basic needs, it is unreasonable to expect them to invest in crypto assets. Even when people have fiat currency, its purchasing power can be eroded by inflation, reducing the amount of cryptocurrency they can afford to buy. Additionally, existential

threats such as natural disasters and wars can significantly impact the decisions of cryptocurrency market participants.

Given the global nature of cryptocurrency, it is essential to consider key macroeconomic factors in our analysis:

1. **Global Inflation Rates**: This refers to the rate of change in consumer prices. Lower inflation rates correspond to higher purchasing power, allowing individuals to buy more with the same amount of money, and vice versa.
2. **Global Interest Rates**: These represent the average cost of borrowing worldwide. Lower interest rates reduce the cost of borrowing, potentially increasing investment in assets, including cryptocurrencies.
3. **Global GDP Growth Rate**: This measures the rate at which the global economy is expanding. A growing global economy can increase the availability of disposable income, which may lead to higher investment in crypto assets.

These factors are considered on a global scale because cryptocurrency is a global asset class, accessible to anyone with an internet connection. Geographic restrictions do not typically apply, as they can easily be circumvented using basic tools like VPNs. Moreover, unpredictable global events can profoundly impact these macroeconomic factors and thus will be given due consideration in our analysis.

By understanding and incorporating these global macroeconomic factors, we can gain a clearer picture of how they influence cryptocurrency markets and inform our broader analysis of price movements within this unique asset class.

Statistics

Like any other financial market, the crypto secondary markets generate a wealth of historical data resulting from market participation. This data provides valuable insights into the importance that participants place on certain coins and the overall level of market activity. Unlike fundamental data, which is based on the intrinsic characteristics of assets, market data of this nature is derived from statistical techniques and methods.

There are various types of statistically generated market data, but we will focus on the most critical ones:

1. **Volume**: This refers to the total amount of an asset that is being traded among participants. Volume is a key indicator of market activity and reflects how much traders are willing to risk based on their convictions.
2. **Momentum**: Momentum measures the tendency of an asset's price to continue moving in a particular direction. Sustained volume in a specific direction can be an indicator of momentum, suggesting that market sentiment is strong enough to maintain the price trend.
3. **Volatility**: Volatility represents the degree of price fluctuation over some time. High volatility indicates significant price swings, suggesting that there is a strong tug-of-war between buyers and sellers. Conversely, low volatility implies that prices are stable and tend to hover around a certain mid-point.
4. **Crypto Fear & Greed Index**: This index measures the overall sentiment within the crypto markets. It is based on several data points, including volatility, market volume, social media sentiment, Bitcoin dominance, and Google search trends. The index helps gauge whether the market is driven by fear or greed, which can significantly influence price movements.

The goal is to identify a set of statistics-based factors that capture relevant market indicators while minimizing noise. Volume is an effective measure of market participants' commitment to their positions, and when coupled with momentum, it can signal strong price trends. Volatility, on the other hand, provides insight into the level of uncertainty or disagreement in the market. High volatility suggests that prices are subject to significant fluctuations, while low volatility indicates stability.

By analyzing these statistically generated data points, we can gain a deeper understanding of market dynamics and how they influence the price movements of various cryptocurrencies. This approach allows us to build more accurate models that reflect the real-world behavior of market participants.

Categories

Having defined 10 factors spanning fundamentals, macroeconomics, and statistical measures, the next step is to determine the type and number of crypto assets we will analyze. Given the vast and ever-growing number of cryptocurrencies—infinite, as anyone can create a new asset—we must carefully and rigorously select the assets for our study to ensure the highest quality and integrity of our findings.

To achieve this, we will categorize crypto assets based on their market capitalization. Market capitalization (market cap) is the total financial value of an asset, typically expressed in fiat currency, in this case, the U.S. dollar (USD). Using data from CoinMarketCap, we will limit our analysis to crypto assets with a market cap greater than USD 100 million. As of August 24 at 10:00 UTC, this criterion yields **357** crypto assets.

Among these, we identified **17 stablecoins**—crypto assets pegged directly to the value of the USD. Since stablecoins are designed to maintain a constant value and do not exhibit the price variability we are interested in, we will exclude them from our analysis. This leaves us with **340 crypto assets**, which will serve as the foundation for our study.

We will further categorize these crypto assets into three distinct groups: blue-chip, mid-cap, and small-cap assets. These categories are defined as follows for our research:

1. **Blue-Chip**: Crypto assets with a market cap of USD 10 billion or more.
2. **Mid-Cap**: Crypto assets with a market cap between USD 1 billion and USD 10 billion.
3. **Small-Cap**: Crypto assets with a market cap between USD 100 million and USD 1 billion.

Categorizing crypto assets is essential for several reasons:

1. **Differentiation of Established Assets**: It is crucial to distinguish well-established assets (blue-chip) from emerging ones (small-cap) to give more weight to the price movements of the former, which are typically more stable and reliable.
2. **Capturing Market Diversity**: While small-cap assets may introduce some noise and present less reliable data, they are vital for capturing the full spectrum of the crypto market. Including a diverse range of assets allows us to understand the broader market dynamics.

3. **Ensuring a Robust Sample Size**: Although blue-chip assets dominate the crypto secondary markets, focusing exclusively on them would limit the scope of our analysis. By including mid-cap and small-cap assets, we ensure a larger and more representative sample, enabling us to make generalizations that adhere to widely accepted research standards.

This approach will allow us to conduct a comprehensive analysis of the crypto market, taking into account assets of varying market capitalizations to better understand how different factors influence their price movements.

Data Collection & Preparation

Data Sources

After identifying 340 crypto assets for our analysis, the next step is to gather the essential data required for our factor analysis. We will source price data from CoinMarketCap due to its comprehensive and aggregated price feeds. The data collection will span five years, from 2020 to 2024, with a quarterly frequency. This timeframe aligns with our strategy to filter out short-term market noise and focus on capturing long-term price trends.

The table below outlines the data sources for the various factors we will incorporate into this research:

Factor	**Data Source**
Total Supply	CoinMarketCap
Circulating Supply	CoinMarketCap
Token Inflation Rate	CoinMarketCap
Global Inflation Rate	World Bank
Global Interest Rates	EOCD
Global GDP Growth Rate	EOCD
Trade Volume	CoinMarketCap

Momentum	Computed
Volatility	Computed
Crypto Fear & Greed Index	BitDegree

Data Collection, Cleaning & Structuring

For our analysis, we began by downloading bulk datasets in CSV format for each of the 340 identified crypto assets. These datasets included OHLCV data (Open, High, Low, Close, Volume) along with market capitalization and timestamp information. Additionally, we gathered macroeconomic data from the World Bank and sentiment data, specifically the Fear & Greed Index, from the BitDegree website.

To ensure the data was properly aligned for our analysis, we employed various cleaning and structuring methods, though not in a strictly defined sequence. First, we extracted quarterly values from Q1 2020 to Q2 2024 to match our focus on long-term price trends. For assets lacking historical data, we replaced missing values with zeros to prevent any disruptions during script processing. Finally, we created separate CSV files for each factor, facilitating easy identification and computation during the analysis.

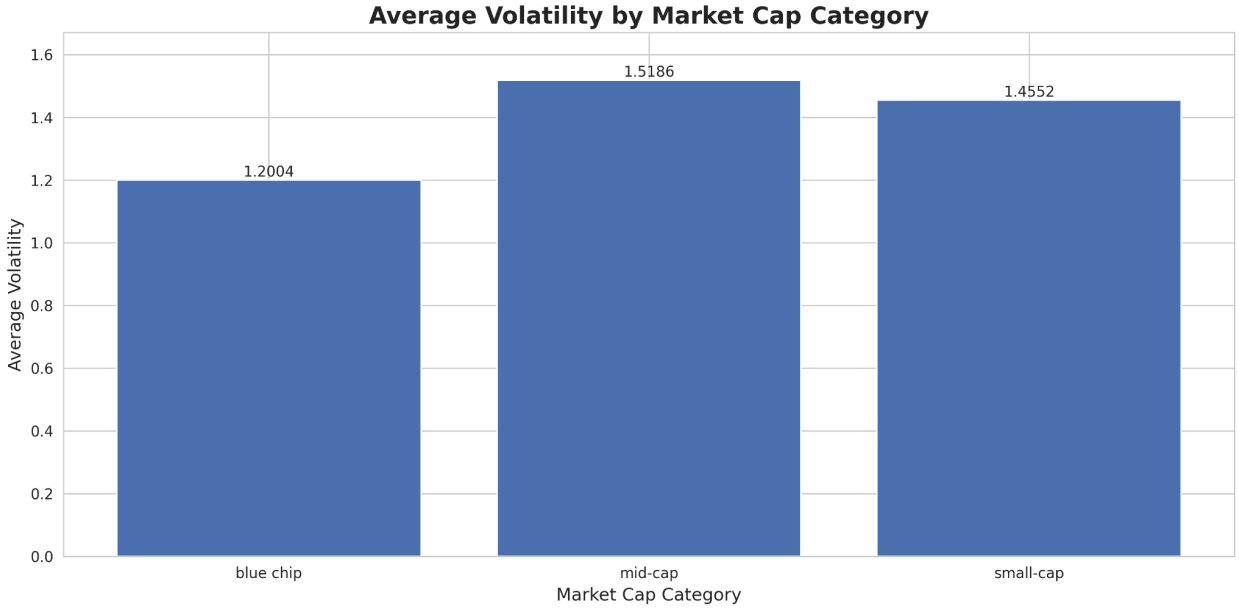
Factor Models

Initial Findings

At the end of Q2 2024, the combined market capitalization of the 340 selected crypto assets was 2.075 trillion USD, representing approximately 90% of the overall cryptocurrency market cap. This significant proportion confirms that our sample size is indeed reflective of the broader crypto market in terms of capital distribution.

We analyzed 333 of the assets for overall average volatility, calculated using standard deviation, which resulted in a figure of 1.458817. This translates to a volatility rate of 145.88%. Such high volatility underscores that cryptocurrencies are a highly unstable asset class compared to traditional stores of value, like gold and other precious metals. Among

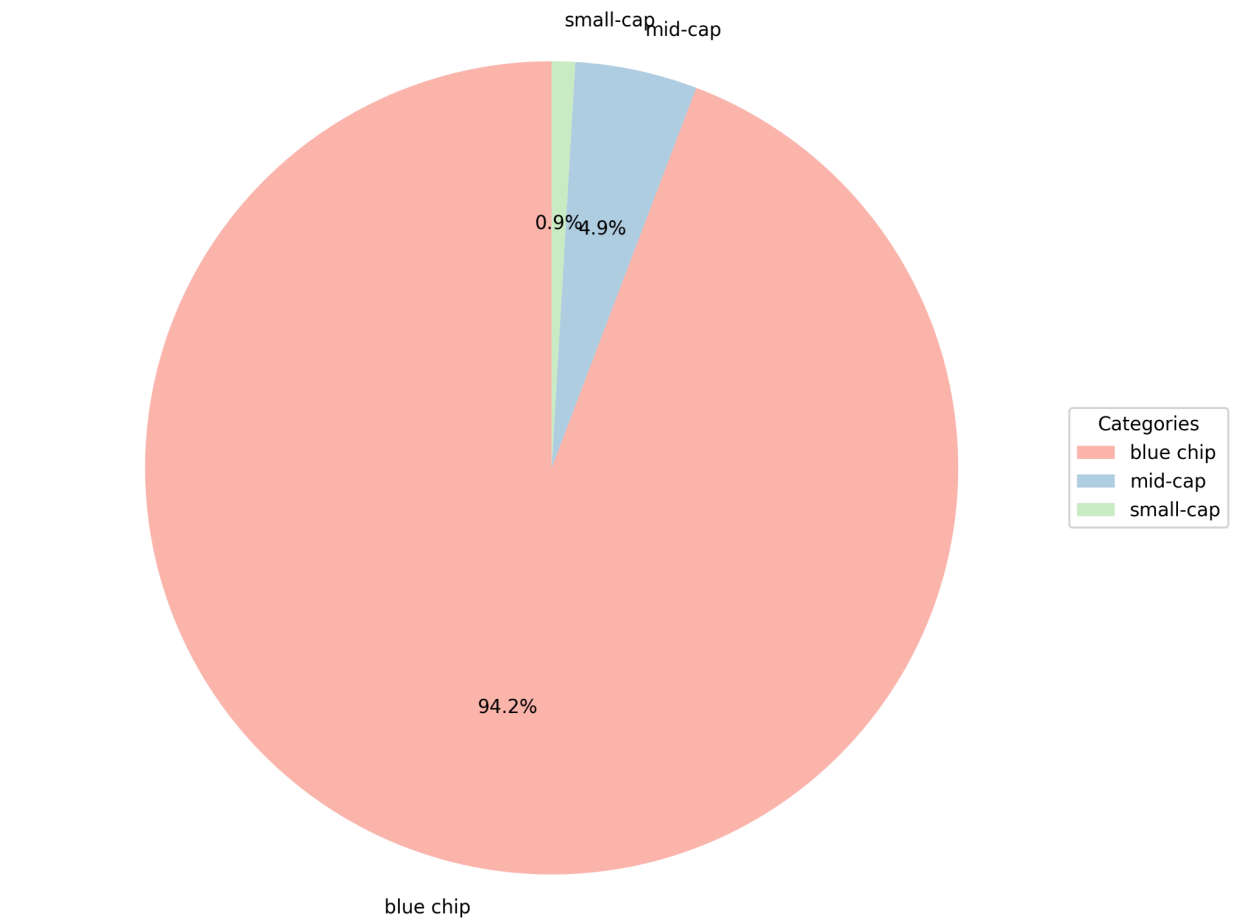
the analyzed assets, **BONK** emerged as the most volatile, with an astonishing historical volatility of 1440.59%.



Volatility measured as standard deviation of quarterly returns (Q1 2020 - Q2 2024)

When grouping the average volatility by market cap categories, we observed the following results: Blue Chip assets exhibited an average volatility of 120%, Mid-Cap assets showed 151%, and Small-Cap assets had an average volatility of 145.5%. These findings indicate that Mid-Cap crypto assets are the most volatile, followed closely by Small-Caps, while Blue Chips are the least volatile among the categories.

When analyzing the average quarterly trading volumes across different market cap categories, we found that Blue Chips dominate, accounting for 92.4% of the total quarterly volume. Mid-cap assets contribute 4.9%, while small-cap assets represent just 0.9% of the total volume.



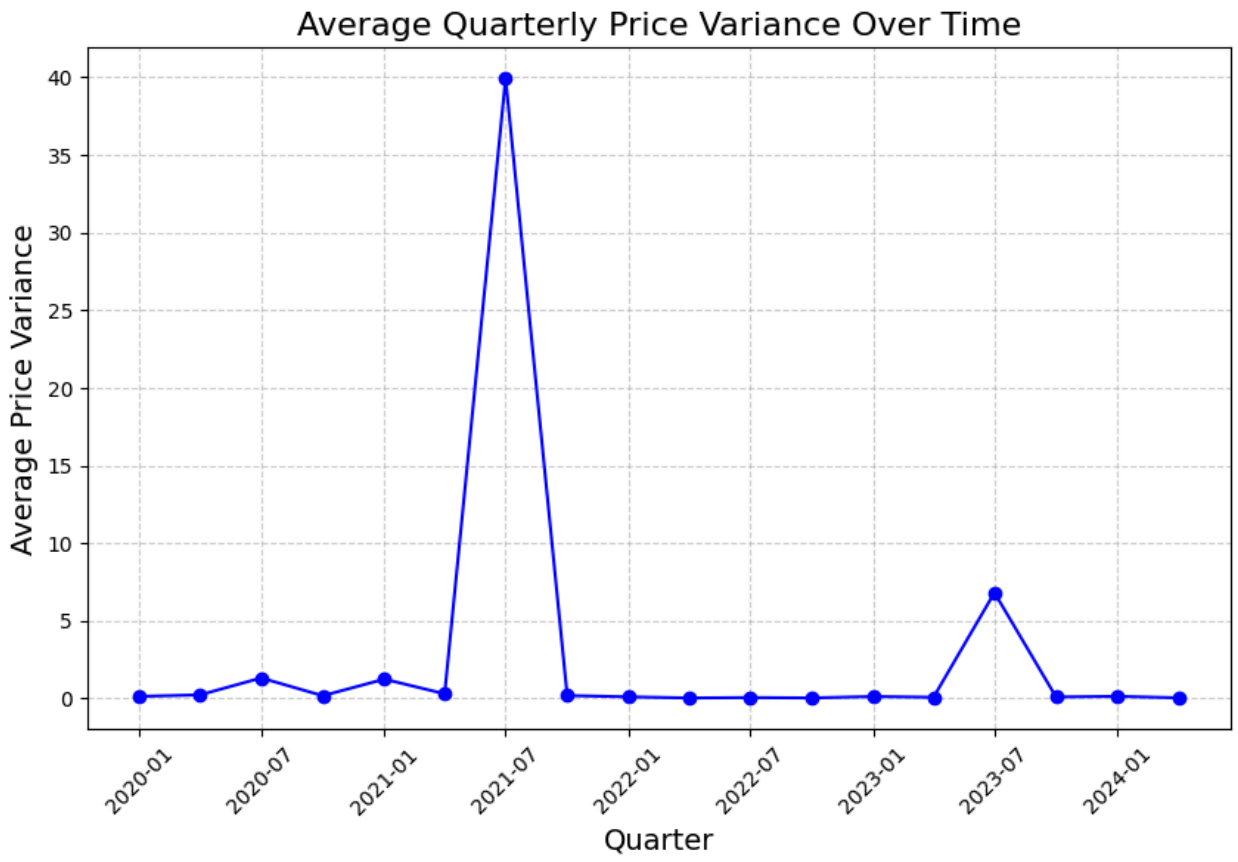
Average quarterly volume calculated from available data in price files

- **Blue Chip:** 71.8 billion USD
- **Mid-Cap:** 3.7 billion USD
- **Small-Cap:** 705 million USD

These figures highlight that Blue Chip crypto assets are responsible for the vast majority—over 90%—of the market's trading volume.

Factors Deep Dive

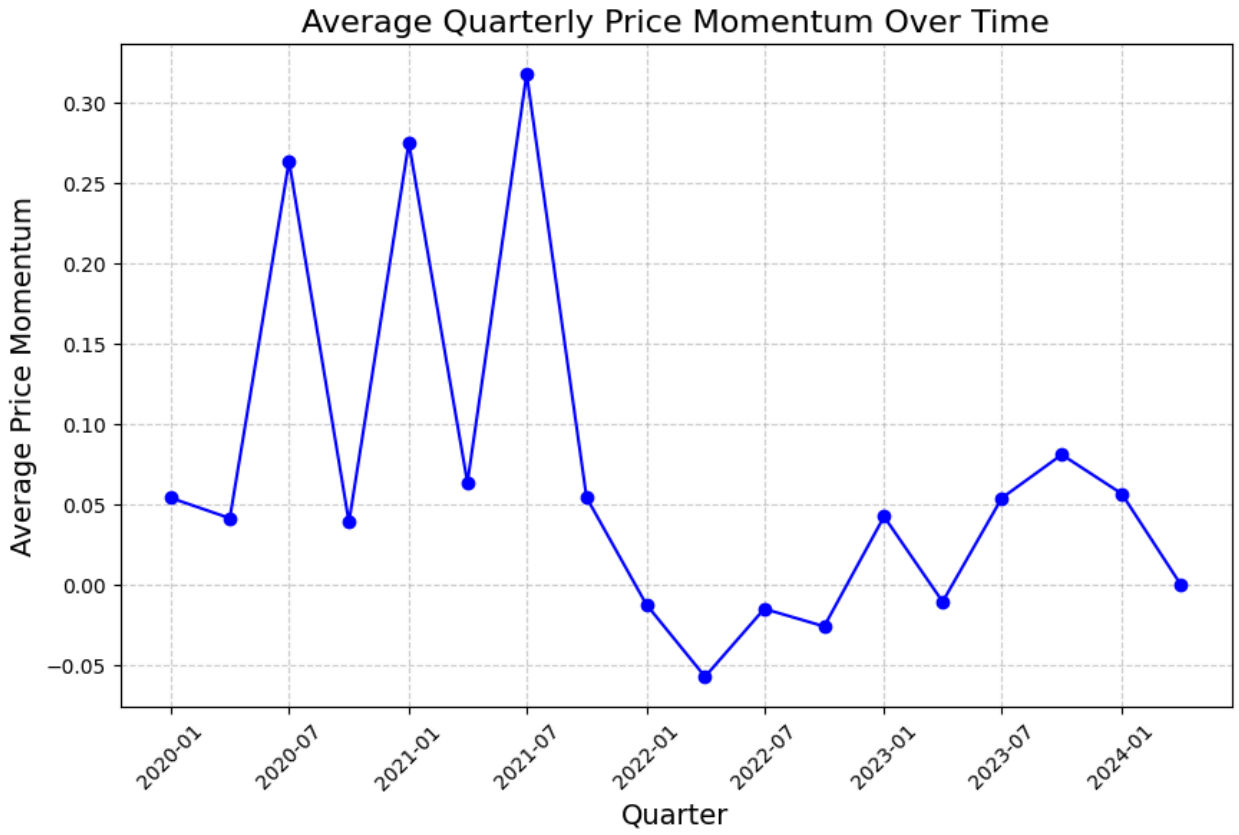
The average quarterly price variance of the top 340 crypto assets by market cap shows significant fluctuations over the years, reflecting the volatile nature of the cryptocurrency market. For example, in the third quarter of 2021, the return skyrocketed to nearly 40, indicating a massive surge in the value of these assets, likely driven by strong market momentum and increased investor interest. This contrasts sharply with the more modest returns seen in other quarters, such as the second quarter of 2022, where the return was just 0.025, showing how quickly the market can cool down after periods of rapid growth.



These ups and downs are similar to the way certain stocks or commodities might experience booms and busts but on a more extreme scale. Imagine if a popular tech stock suddenly became the talk of Wall Street, causing its price to jump dramatically, only to see it level off or even dip as excitement waned or broader economic factors came into play.

The cryptocurrency market behaves similarly, but with even more pronounced peaks and valleys, reflecting the unique risks and opportunities in this emerging asset class.

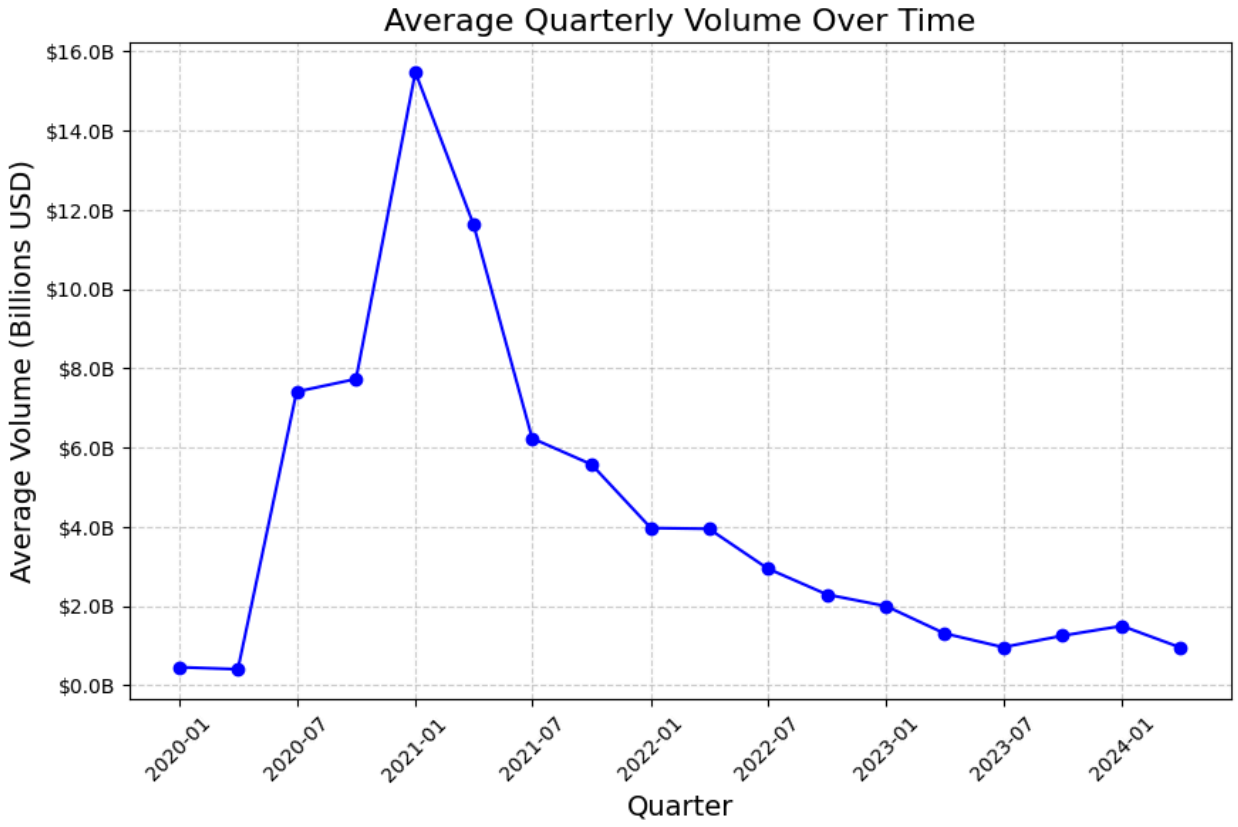
Momentum measures how much the price continues to move in the same direction as it did in previous quarters. For instance, in the third quarter of 2021, the momentum was quite strong at 0.318, indicating that the prices of these crypto assets were steadily rising, likely fueled by growing optimism and sustained buying activity. This is similar to a snowball effect, where once a trend starts, it can gain speed and keep rolling in the same direction.



However, there were also periods when the momentum turned negative, such as in the first quarter of 2022, when the momentum dipped to -0.012. This suggests that the market was losing steam, with prices starting to decline after a period of growth.

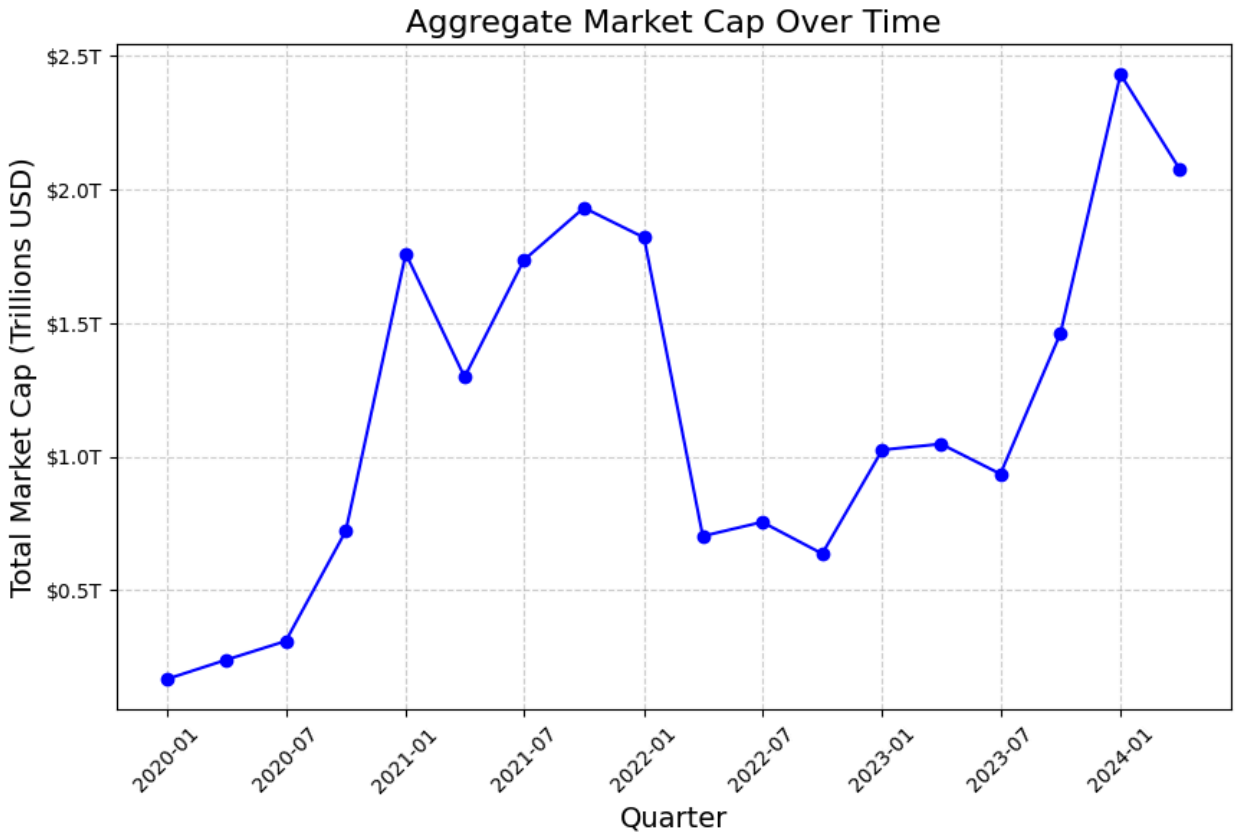
The average quarterly volume reflects how much trading activity is happening in the market. This volume indicates the total amount of these assets being bought and sold over a quarter. For example, in the third quarter of 2020, the volume soared to over USD 7.4

billion, showing a high level of trading interest and activity, similar to a bustling market where a lot of buying and selling is taking place. This peak in volume often correlates with heightened market excitement or significant news that draws more traders in.



On the other hand, by the first quarter of 2023, the volume had dropped significantly to around USD 1.9 billion. This decrease suggests that trading activity had slowed down, much like a quiet store with fewer customers. Lower volumes can indicate a reduction in market interest or uncertainty, leading to less frequent trading.

The aggregate quarterly market cap measures the total value of all these assets combined at the end of each quarter. For instance, in October 2020, the market cap surged to about USD 722 billion, reflecting a period of substantial growth and investor enthusiasm, similar to a booming real estate market where property values are rapidly increasing. This significant rise indicates a heightened interest and investment in cryptocurrencies during that time.



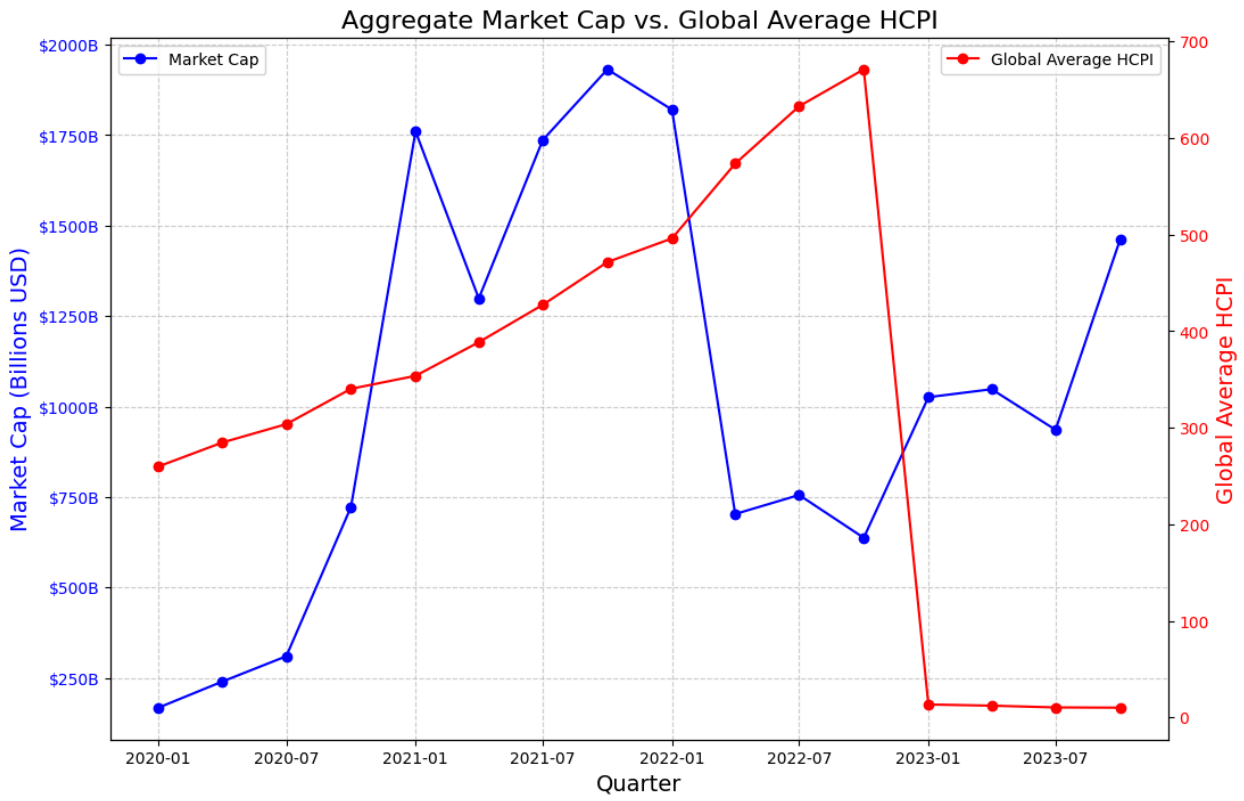
Conversely, in the first quarter of 2024, the market cap reached approximately USD 2.43 trillion, demonstrating a continued expansion in the value of these assets. This is like a growing city where more businesses and residents contribute to the overall economic value. The increase in market cap over time shows that the cryptocurrency market has seen significant growth, although it can also fluctuate based on market conditions and investor sentiment. This broad measure helps investors understand the overall scale and health of the cryptocurrency market.

Explaining Macroeconomic Factor Effects

Global Average HCPI (Harmonized Consumer Price Index)

The HCPI measures inflation by tracking the price change of a basket of goods and services over time. A rising HCPI typically indicates higher inflation rates. Rising HCPI reflects

increasing inflation, which erodes the purchasing power of fiat currencies. This often drives investors toward assets perceived as hedges against inflation, including cryptocurrencies.

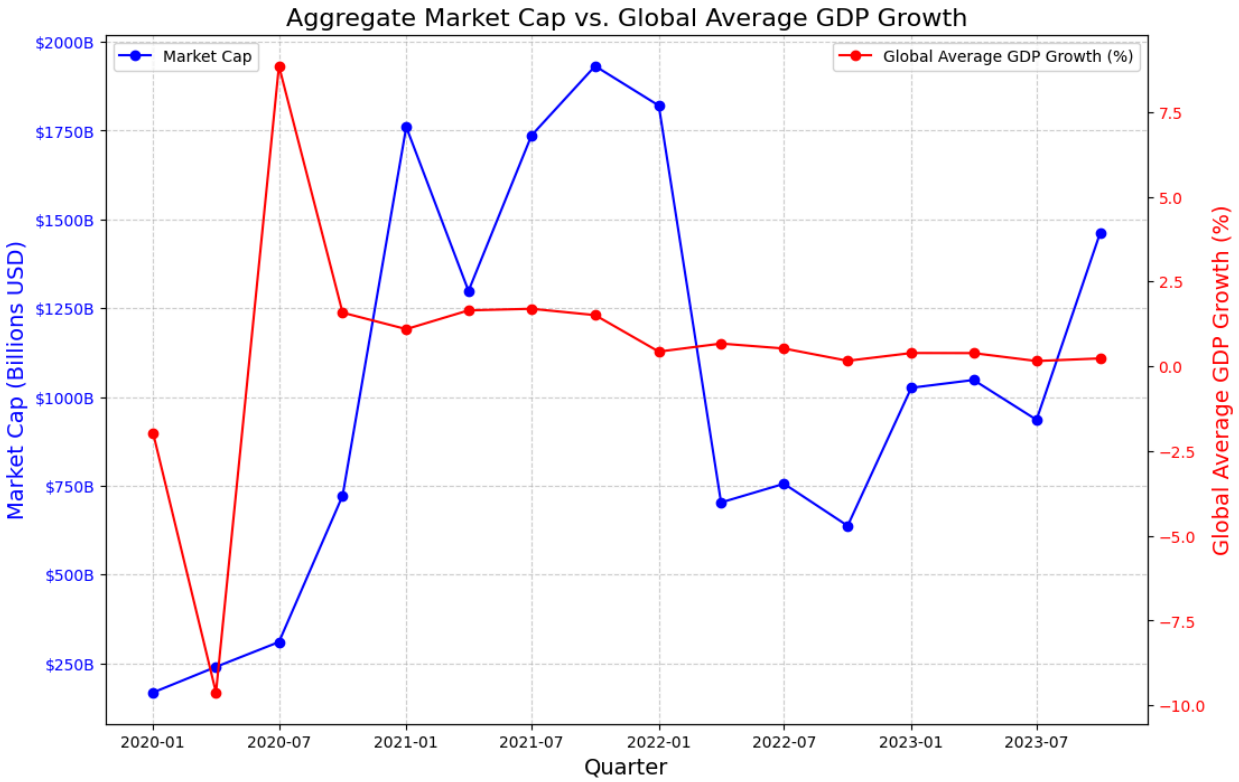


The significant increase in HCPI observed in 2022 could correlate with heightened market cap volatility in cryptocurrencies. Investors might have turned to cryptocurrencies as a store of value, leading to fluctuations in market capitalization as they reacted to inflationary pressures.

Global Average GDP Growth

GDP growth represents the overall increase in the economic output of a country or region. It is a critical indicator of economic health and investor confidence. Positive GDP growth typically signals robust economic conditions, which can lead to increased investment in various assets, including cryptocurrencies. Investors may feel more confident in allocating funds to riskier assets when the economy is strong. Conversely, negative GDP growth can

dampen market sentiment and reduce investment in riskier assets as investors become more cautious.

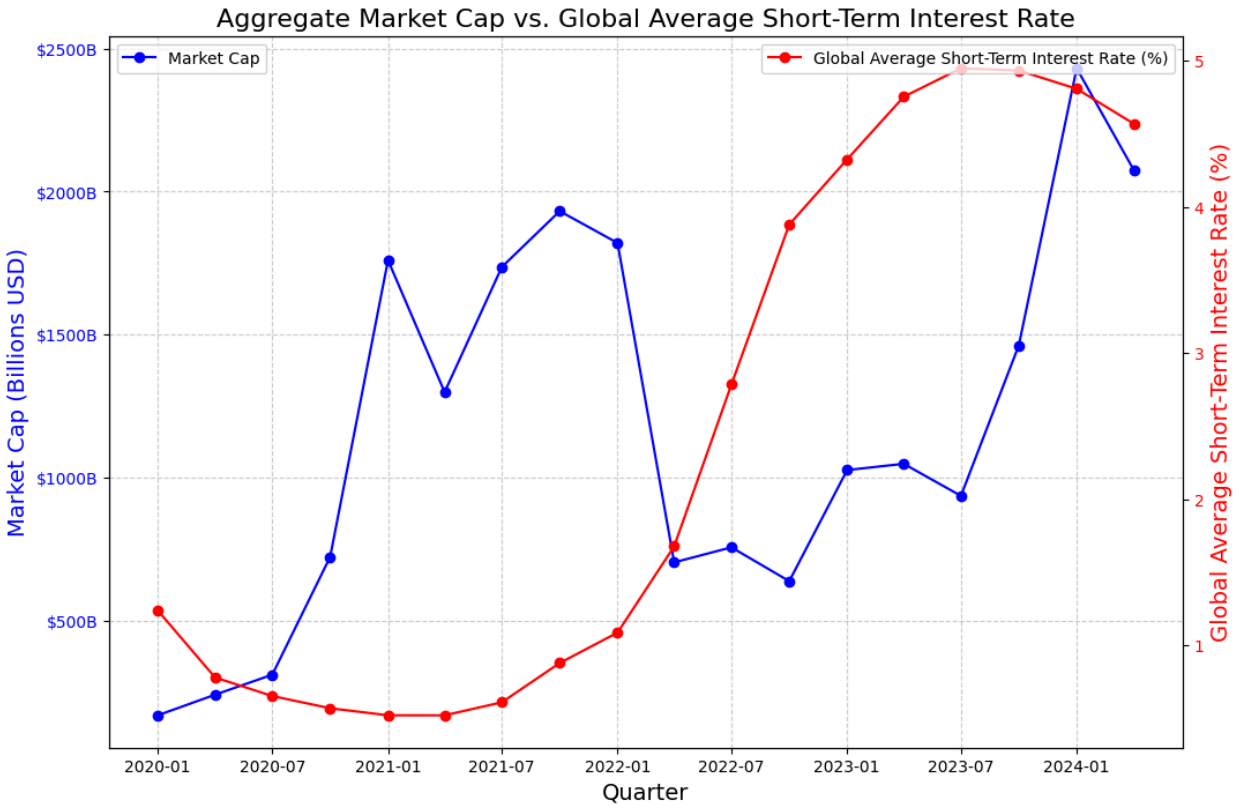


Fluctuations in GDP growth rates can influence the level of investment in cryptocurrencies. Periods of strong economic growth might correlate with higher market cap values for cryptocurrencies as investment flows increase. Conversely, during economic downturns, reduced investment might lead to lower market caps.

Global Average Short-Term Interest Rates

Short-term interest rates are set by central banks and influence the returns on savings and short-term investments. Lower rates generally reduce the returns on traditional savings accounts and bonds. Lower interest rates decrease the returns on traditional savings and bonds, making alternative investments like cryptocurrencies more attractive. This can drive up cryptocurrency investments and market capitalization. Conversely, higher short-term

interest rates make traditional investment vehicles more appealing, which might reduce the attractiveness of cryptocurrencies.

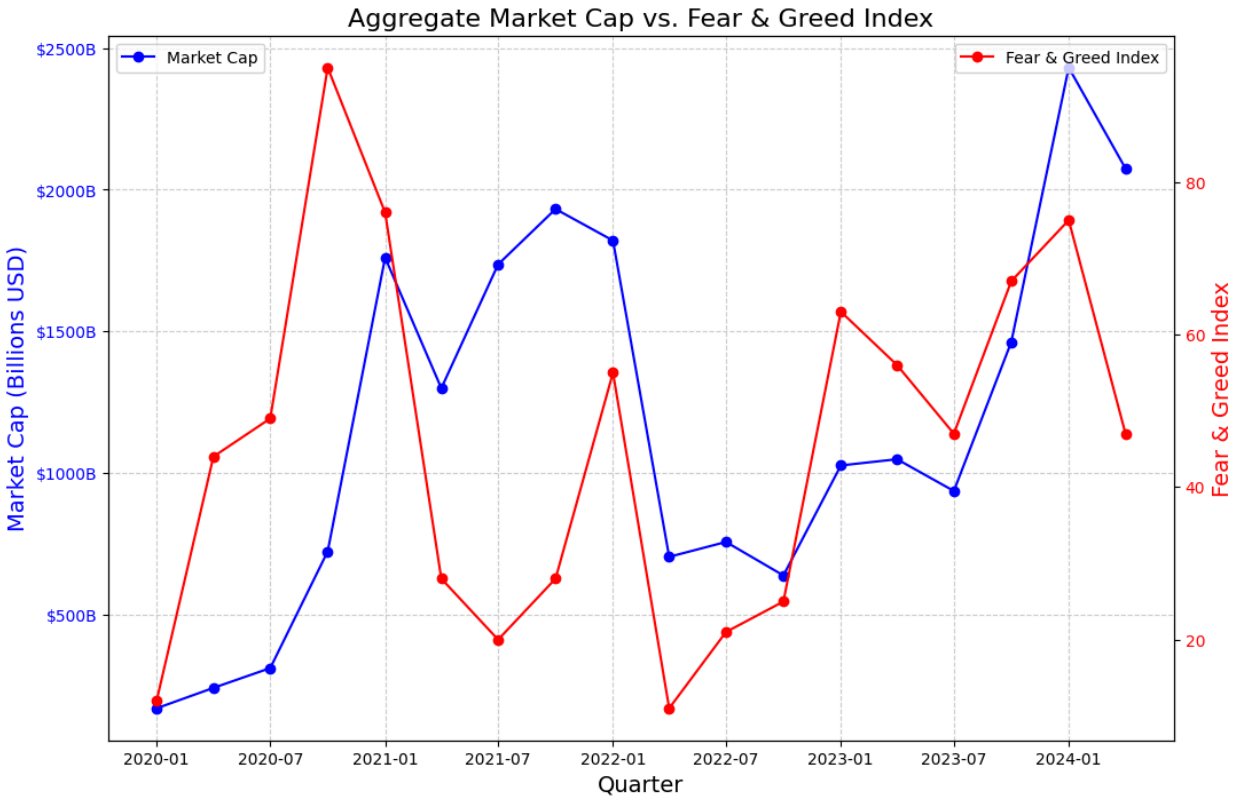


When short-term interest rates are low, there is often an increase in cryptocurrency investments as investors seek higher returns. Higher interest rates may coincide with a decrease in market cap as investors shift their focus to more stable, interest-bearing investments. But from the chart, we can see that that has not been the case since 2022.

Fear & Greed Index

The Fear & Greed Index measures market sentiment by gauging the level of fear or greed among investors. High values indicate a greedy, risk-taking sentiment, while low values signal fear and risk aversion. High levels of greed can lead to increased investments in cryptocurrencies as investors become more willing to take on risk. This could drive up

market cap values. On the other hand, high levels of fear may result in reduced investments and lower market cap as investors retreat to safer assets.

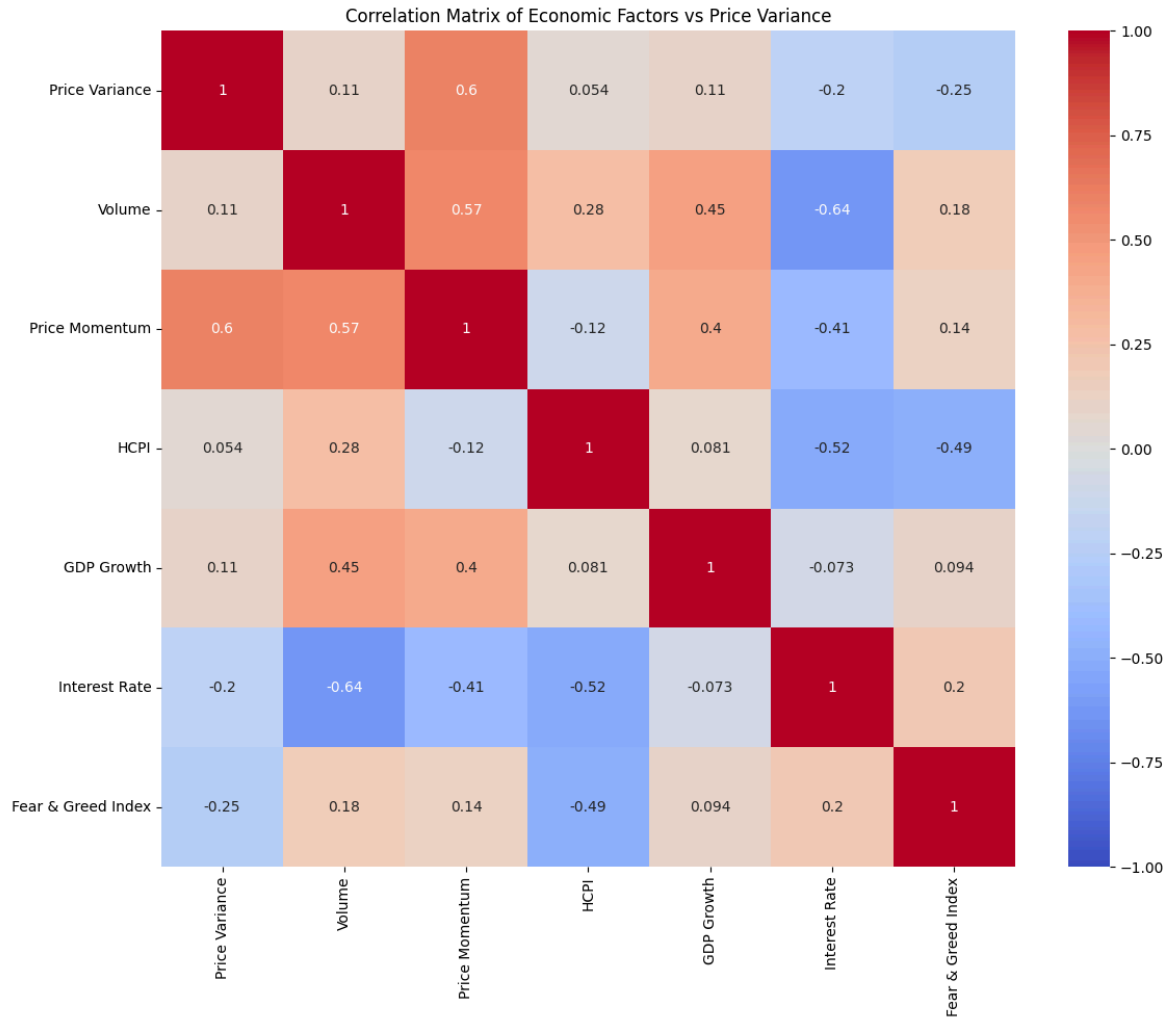


The Fear & Greed Index can provide insight into market sentiment and its potential impact on cryptocurrency investments. Periods of high greed might correspond with rising market cap values, as investors are more willing to invest in riskier assets like cryptocurrencies.

Factor Selection Using Correlation Matrix

To build a model around the most relevant factors influencing average quarterly price variance, we aim to identify the top three factors most highly correlated with price variance from a pool of seven potential factors. We constructed a correlation matrix to assess the relationships between six factors and the average quarterly price variance.

Below are the results from the correlation matrix:



Top 3 Highly Correlated Factors with Price Variance:

1. **Price Momentum**: 0.6049
2. **Fear & Greed Index**: 0.2508
3. **Interest Rate**: 0.2011

These factors exhibit the strongest correlations with average quarterly price variance, indicating their potential importance in our model.

Model Development

Based on the correlation matrix results, we can develop a modification of the Fama-French model tailored for cryptocurrency price variance using the top 3 most correlated factors. Let's call this model the "**Crypto Price Variance Model**" (CPVM).

The Crypto Price Variance Model (CPVM):

The model can be expressed as:

$E(R) = Rf + \beta1(PM - Rf) + \beta2(FGI) + \beta3(IR)$

Where: E(R) = Expected return of the cryptocurrency Rf = Risk-free rate PM = Price Momentum factor FGI = Fear & Greed Index factor IR = Interest Rate factor β1, β2, β3 = Factor coefficients (sensitivities)

Detailed Explanation

1. Risk-free rate (Rf): This represents the return an investor can expect from a risk-free investment. In the crypto context, this could be the yield from stablecoin lending or a traditional short-term government bond rate.
2. Price Momentum factor (PM - Rf): This factor captures the tendency of crypto assets that have performed well in the recent past to continue performing well. It's calculated as the difference between the returns of high-momentum and low-momentum cryptocurrencies.
3. Fear & Greed Index factor (FGI): This factor represents market sentiment. It captures the psychological aspects of the crypto market, which can significantly influence price movements.
4. Interest Rate Factor (IR): This factor accounts for the impact of broader economic interest rates on crypto prices. It could be based on global average short-term interest rates or a specific benchmark rate.

Strengths of the CPVM

1. Tailored for cryptocurrencies: Unlike traditional asset pricing models, this model incorporates factors specific to the crypto market.
2. Incorporates market sentiment: The inclusion of the Fear & Greed Index acknowledges the significant role that market psychology plays in crypto price movements.
3. Captures momentum: The price momentum factor aligns with the observed trend-following behavior in crypto markets.
4. Considers macroeconomic factors: The interest rate factor links crypto performance to broader economic conditions.
5. Data-driven: The model is based on empirical correlations, making it potentially more relevant than theoretical models not tested on crypto data.

Limitations of the CPVM

1. Simplification: Like all models, this is a simplification of complex market dynamics and may not capture all relevant factors.
2. Unstable correlations: Cryptocurrency markets are relatively new and volatile. The relationships between these factors and price variance may not be stable over time.
3. Limited historical data: Compared to traditional financial markets, there's less historical data for cryptocurrencies, which may affect the model's long-term reliability.
4. Omitted variables: Other important factors (e.g., regulatory changes, and technological advancements) are not explicitly included in the model.
5. Assumes linearity: The model assumes linear relationships between the factors and expected returns, which may not always hold in practice.
6. Market inefficiencies: Crypto markets may be less efficient than traditional markets, potentially limiting the applicability of factor-based models.
7. Lack of consensus on risk-free rate: There's no clear consensus on what constitutes a risk-free rate in the crypto context.

Implementation and Use

1. Calculate the factors (PM, FGI, IR) for the crypto market or specific cryptocurrencies.
2. Determine the risk-free rate for the crypto context.
3. Estimate the factor coefficients (β1, β2, β3) using historical data and regression analysis.
4. Apply the model to estimate expected returns or analyze the sensitivity of crypto assets to these factors.

This model could be useful for crypto portfolio management, risk assessment, and understanding the drivers of cryptocurrency returns. However, it should be used in conjunction with other analysis tools and with an understanding of its limitations. Regular re-evaluation of the model's parameters and performance would be crucial given the dynamic nature of cryptocurrency markets.

Conclusion

The development and analysis of the Crypto Price Variance Model (CPVM) represent a significant step forward in our understanding of cryptocurrency price dynamics. By adapting traditional financial models to the unique characteristics of the crypto market, we have created a framework that offers valuable insights into the factors driving price variance in this emerging asset class.

The CPVM's focus on Price Momentum, Fear & Greed Index, and Interest Rates as key factors aligns well with the observed behavior of cryptocurrency markets. The strong correlation of Price Momentum with price variance underscores the importance of trend-following behaviors in crypto trading. The inclusion of the Fear & Greed Index captures the significant role of market sentiment and investor psychology, which are particularly pronounced in the crypto space. The Interest Rate factor provides a link to broader macroeconomic conditions, acknowledging that cryptocurrencies do not exist in isolation from traditional financial markets.

However, it is crucial to recognize the limitations of the CPVM. The cryptocurrency market's relative youth, high volatility, and rapid evolution present challenges to any modeling attempt. The relationships identified in this study may not remain stable over time, and the model may not capture all relevant factors influencing crypto prices. Furthermore, the application of linear models to a market often characterized by non-linear behaviors may limit the model's predictive power in certain scenarios.

Despite these limitations, the CPVM provides a valuable framework for analyzing cryptocurrency price movements. It offers a data-driven approach to understanding market dynamics, which can inform investment strategies, risk management practices, and further research in the field. The model's flexibility allows for future refinements and adaptations as our understanding of cryptocurrency markets deepens and as new data becomes available.

Looking ahead, further research could focus on:

1. Testing the model's performance across different market conditions and time horizons.
2. Exploring additional factors that may enhance the model's explanatory power.
3. Investigating non-linear relationships between factors and price variance.
4. Adapting the model to account for the unique characteristics of different cryptocurrency categories (e.g., blue-chip vs. small-cap).

In conclusion, while the Crypto Price Variance Model should not be viewed as a definitive solution to predicting cryptocurrency prices, it represents a significant contribution to the field. It provides a structured approach to analyzing crypto price movements, grounded in both traditional financial theory and the unique characteristics of the cryptocurrency market. As the crypto space continues to evolve, models like the CPVM will play a crucial role in enhancing our understanding of this complex and dynamic market.

Reference(s)

Ha, Jongrim, M. Ayhan Kose, and Franziska Ohnsorge (2023). "One-Stop Source: A Global Database of Inflation." Journal of International Money and Finance 137 (October): 102896.

EOCD - https://data-explorer.oecd.org/

CoinMarketCap - https://coinmarketcap.com/

BitDegree - https://www.bitdegree.org/cryptocurrency-prices/fear-and-greed-index

Appendix

CPVM Repo (Datasets, Code Samples, and Charts) - https://github.com/polymawutor/cpvm