

COINMETRICS

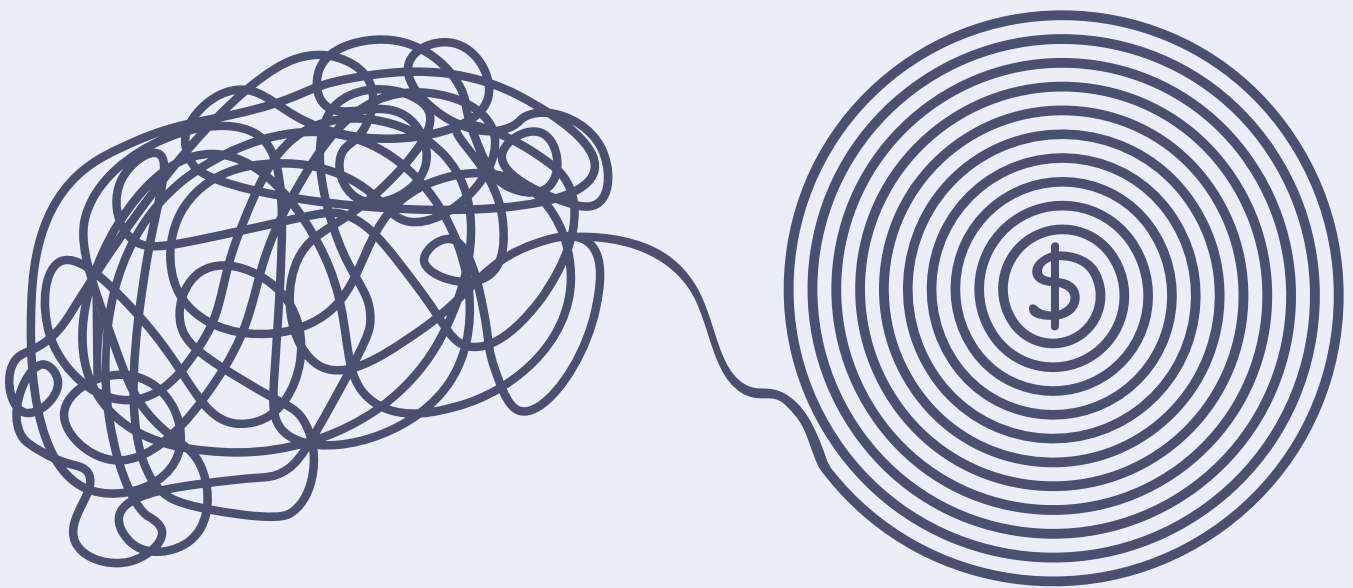
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# DECODING CRYPTO PRICING

INSIGHTS FOR INSTITUTIONAL INVESTORS

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By Kyle Waters, Matías Andrade, Uriel Morone, Kevin Lu  
and the Coin Metrics Team

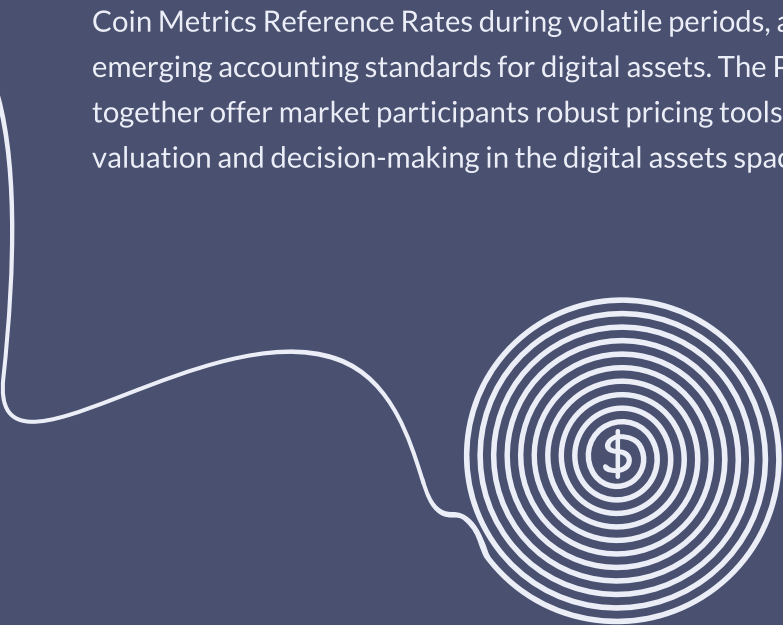




# SUMMARY

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As digital assets have gained popularity as an investment class, the need for reliable pricing methodologies has become increasingly important. Regulatory guidelines mandate that digital assets follow fair value accounting principles, requiring a valuation methodology that reflects the salability of assets on the specified measurement date. In response to these emerging regulatory guidelines, Coin Metrics has developed the Principal Market Price (PMP), a pricing methodology designed to provide reliable valuations that meet the FASB's guidelines for fair value accounting. The PMP offers market participants a robust pricing tool that facilitates informed decision-making and risk management, while meeting regulatory guidelines for accurate financial reporting. In addition to the PMP, Coin Metrics Reference Rates are designed to reflect an asset's average trading price across a variety of exchange markets, providing a valuable tool for market participants to gauge market trends and inform critical decision-making. This paper presents case studies to demonstrate the effectiveness of the PMP and Coin Metrics Reference Rates during volatile periods, as well as discussions on emerging accounting standards for digital assets. The PMP and Reference Rates together offer market participants robust pricing tools that facilitate effective valuation and decision-making in the digital assets space.



# WHICH PRICE IS RIGHT?

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A price is one of the most basic data points of any functioning, active market. Digital assets are traded around the clock, 24 hours a day, 7 days a week, and 365 days a year. These assets are well-known for their volatility, which can sometimes lead to material deviations among the prices observed for even a *single asset's* market prices. Consequently, a seemingly simple question such as: *What is the current price of bitcoin?*—can be unexpectedly challenging to answer.

Simultaneously, the emergence of digital assets as a new asset class has drawn the attention of various financial entities, such as institutional custodians, asset managers, trading funds, and corporations. As they move into the digital assets space, they expect high quality pricing data to mark assets to market, calculate net asset values (NAV), and conduct due diligence confidently. In addition, regulators have started to scrutinize the digital assets market and are imposing reporting requirements for digital asset holdings, as well as accounting frameworks that mandate precise and correct pricing data.

Coin Metrics has been studying, researching, and collecting data from digital asset exchanges for over four years. We now offer two different price benchmarks to clients: CM Reference Rates and CM Principal Market Price. In this report, we aim to compare and contrast these pricing methodologies, elucidate the underlying accounting rationale, and examine their historical performance through real-world case studies. The focus falls on the performance of Bitcoin (BTC) during high volatility events. The purpose of this report is not to recommend one method over the other, but rather to offer guidelines and insights into the two prices for participants in the digital assets sphere.

## Many to One: How to Find a Single Price?

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Coin Metrics collects data from over 40 different crypto exchanges today. These venues can range greatly in their popularity, reliability, and transparency. Under perfect market conditions, large deviations in price from exchange to exchange for the same asset should be rare. This is because arbitrageurs have an incentive to capitalize on price discrepancies by buying quantity on one exchange and selling it for a higher price on the other. Nevertheless, issues can and do arise, including but not limited to flash crashes, trader error, unstable infrastructure, and more. For this reason, it is important to understand that Coin Metrics calculates both its reference rates and principal market

price from a whitelisted set of constituent markets that meet the high standards required by our [Market Selection Framework](#). Selected markets satisfy conditions across technology, compliance, business model, data availability, and market data quality.

We will begin by discussing the methodology behind our benchmark reference rates. Coin Metrics [first released reference rates](#) in 2019, beginning with an hourly rate and later adding a real-time reference rate offering. From a high level, the reference rate is broadly calculated as a median price across the whitelisted set of markets. We take *all* spot trades from each constituent market in each time window and find a single price by weighting those trades by time and volume. Like all Coin Metrics product offerings, we rigorously developed the reference rate methodology from the ground-up, backtesting multiple frameworks under periods of high volatility and market distress. The result is a robust, manipulation-resistant, transparent, and independent price sourced from our many market data feeds. The reference rate was designed using best practices for financial benchmarks, including the International Organization of Securities Commissions' (IOSCO) Principles for Financial Benchmarks.

The principal market price (PMP), in contrast, is built on the simple guidelines of only looking at the principal or primary market by volume at the time of observation. An asset's *primary market* is the market with the greatest volume or level of activity. The principal market price was developed for the primary purpose of meeting accounting rules set out by the Financial Accounting Standards Board, or FASB. A more detailed discussion of the accounting standards and how the PMP fits into this are below.

To summarize thus far, the table below presents a comparison of the Reference Rate and Principal Market Price methodologies.

	Principal Market Price	Reference Rate
Calculated From	One Exchange	Many Exchanges
Selection Criteria	Greatest Volume	Median Price
Optimizes For	Simplicity	Stability
Whitelisted Exchange Set	Yes	Yes
Uses Only Realized Trades	Yes	Yes
Governance Oversight	Yes	Yes
Manipulation Resistant	Yes	Yes
Common Use Cases	Financial Accounting	Historical Analysis, Derivatives Settlement, Striking NAV

# Navigating the Accounting Landscape For Digital Assets

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To fit the purpose of use across financial accounting, Coin Metrics has developed the Principal Market Price (PMP), a pricing methodology that is specifically designed to represent the fair value of digital assets.

## Crypto Assets and Financial Accounting

Under U.S. Generally Accepted Accounting Principles (GAAP), digital assets are presently classified as intangibles, which places them on the balance sheet at their book value (i.e., cost basis), subject to periodic impairment tests, where auditors and financial advisors are required to examine the assets' fair-value and compare it to the book-value recorded for their acquisition.

Companies with digital assets categorized as intangibles are thus subject to corrections in their digital assets' value in their balance sheet (and accompanying impairment cost in their income statement) when the fair value goes *below* their purchase cost basis. Conversely, if the fair value exceeds the recorded book value, companies holding digital assets are not permitted to adjust their balance sheet values or recognize corresponding gains in their income statements. This treatment is important because it has significant practical implications for publicly-traded U.S. companies who hold crypto assets on their balance sheets, such as Tesla Motors (TSLA).

Fair-value is defined as the price that would be received to sell an asset or paid to transfer a liability in an orderly transaction between market participants at the measurement date. Crucially, if an active market exists for the specific asset being valued, then the fair-value will be calculated based on the market prices at the date of evaluation using the principal market methodology. ASC 820 establishes a framework for determining fair value. The fair value is thus determined based on the quoted price. The fair-value methodology is supposed to represent the valuation on the *effective* valuation date, and the price should reflect the salability of the assets only on the specified measurement date.

Guidance regarding the definition of an active market is especially important when there exists more than one active market for a given asset. In this case, the principal market methodology is used to select a market to price the asset in question. Coin Metrics' Market Selection Framework plays a critical role in this regard by identifying high-quality constituent exchanges that are accessible by a large majority of institutional investors. The principal market must be accessible to ensure accurate fair value estimation, making exchange selection a critical aspect of Coin Metrics' pricing methodology, particularly for the PMP.

The Coin Metrics Principal Market Price consolidates the exchanges that are available and selects the most active market based on the most volume traded within a period. It is essential to note that the PMP is updated on a rolling 1-hour window, which is essential because digital asset exchanges can, at times, discontinue trading due to planned or unplanned maintenance, which can lead to gaps in pricing data. The PMP methodology makes it easy to identify the source of the price at any given moment, which makes it especially convenient to verify for accounting and auditing purposes. Companies or auditors may therefore rely on this data without having to collate all the data from all available and relevant markets. This offers an advantage, since CM receives data directly from exchanges and calculates the Principal Market Price continuously.

## New FASB Ruling on Digital Assets

On February 1, 2023, the FASB convened to vote on a draft decision for a new accounting standard for digital assets, open to commentaries for 75 days. One of the most important changes to the accounting standards ruling digital assets is that they would no longer be subject to impairment tests, but would instead be directly valued as assets at their fair value, with periodic updates registering directly in the balance sheet and income statement. This is an important change, since by previous standards digital assets were treated as intangible assets. Digital assets accounted as intangible assets were subject to downward revisions in their valuation, which discourage companies from accumulating digital assets in their balance sheet.

Under the new provisions laid out by the FASB, companies will report *both* increases and decreases in their balance sheet in accordance with the fair value of the digital assets they own. Furthermore, any differences in fair values would be reflected in both the balance sheet and the income statement, even in the absence of liquidation of these assets.

On one hand, this will allow companies to report *earnings* arising from the valuation of assets held by the company on a period basis. However, they are also expected to report losses in their income statement if the value of their digital asset holdings decreases over the reporting period. This new approach to accounting for digital assets will provide more timely reporting of earnings and losses for companies, and will enhance their transparency and accountability.

# Analysis of Digital Asset Pricing Methods

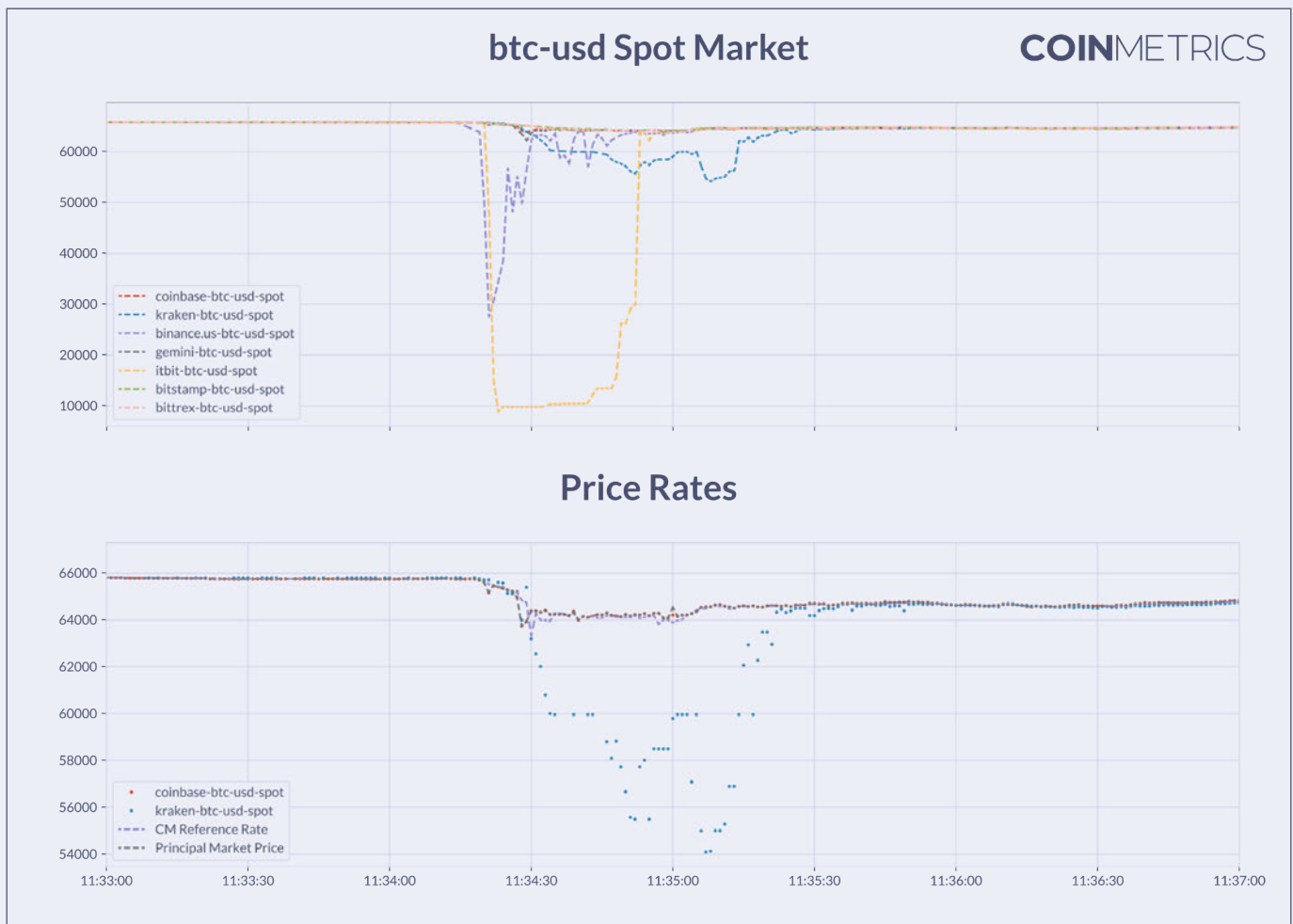
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In this section, we offer several case studies to demonstrate the performance of both the Principal Market Price and Reference Rate during specific periods of high price volatility. These examples are illustrative of the complex and volatile exchange environment as well as the differences between the PMP and Reference Rate methodologies used to represent price activity. These case studies are intended to provide practical insights into the potential impacts of market conditions on digital asset pricing. By examining these examples, we can see how to inform participants in the digital assets market about the importance of using robust pricing methodologies.

## Market Crashes

There is a phrase that is often repeated in trading circles that goes “stairs on the way up, elevator on the way down.” This is an accurate, if stylized, account of the fact that volatility during bullish periods is generally much lower than during bearish markets. There are many reasons for this, including the prevalence of speculative activity that uses leverage and is subject to margin calls that lead to liquidation selling of positions once prices cross a margin threshold. This leads to forced selling, which prompts market makers to withdraw their liquidity from the market and lead to violent and volatile price action.

In one instance seen below—on October 21, 2021—we observed significant price dislocations, with bitcoin prices deviating by \$30,000 for Gemini and over \$50,000 for ItBit for around two minutes, with Kraken taking the longest to recover. This is likely due to order book exhaustion following significant selling, leading to highly volatile price action. It is interesting to note that *both* the CM Reference Rate and the Principal Market Price methodology both remained relatively unaffected by this temporary dislocation, although each varied slightly from each other as seen in the second chart below.

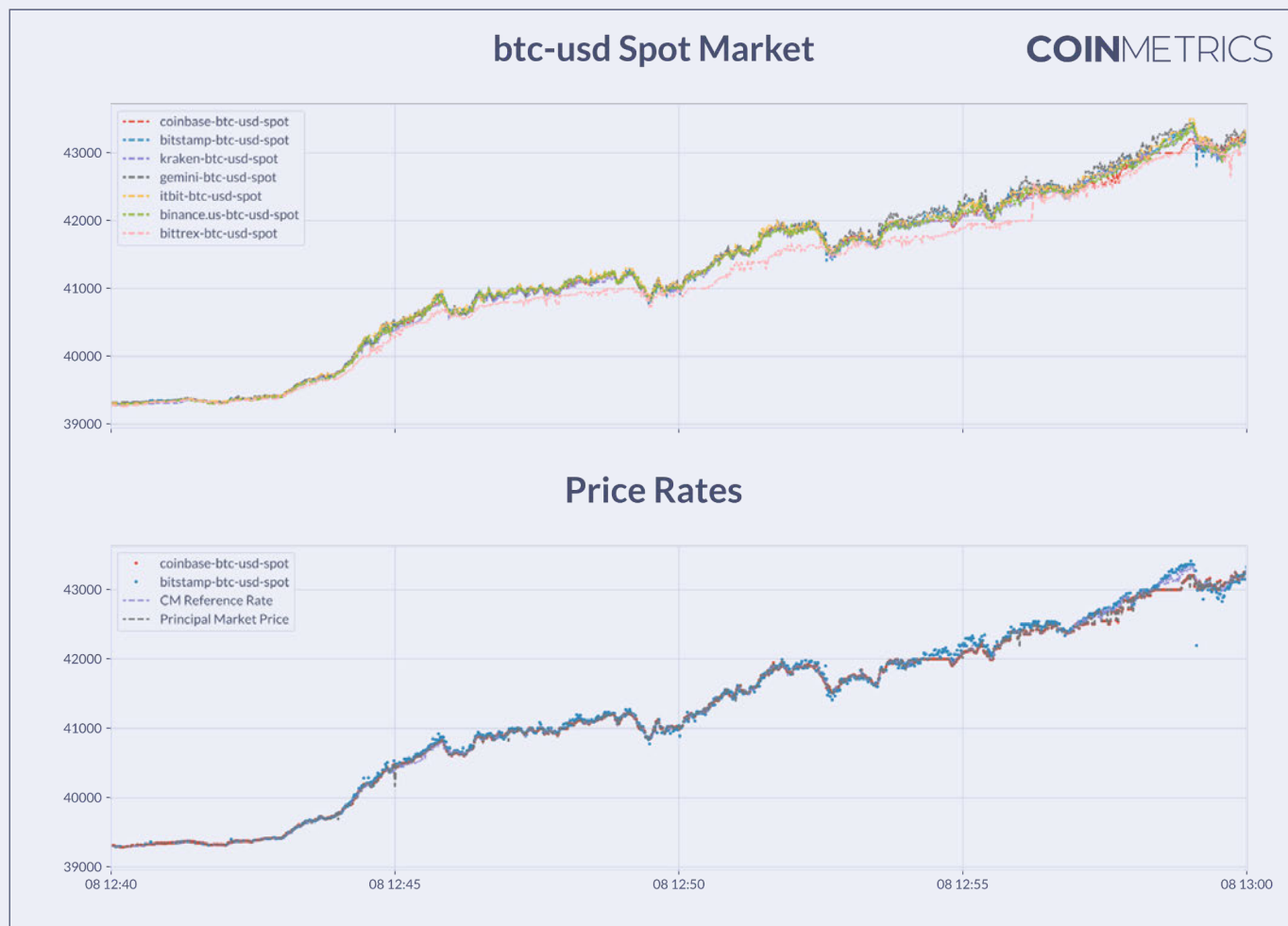




## Market Rallies

Previously, we discussed the fact that market crashes are often more volatile than bullish price action, even when rising prices follow news which should encourage both speculators and market makers to buy quickly and avoid selling respectively. This should strain the liquidity of the market, producing dislocations that are directly observable if not as significant as those observed during market crashes.

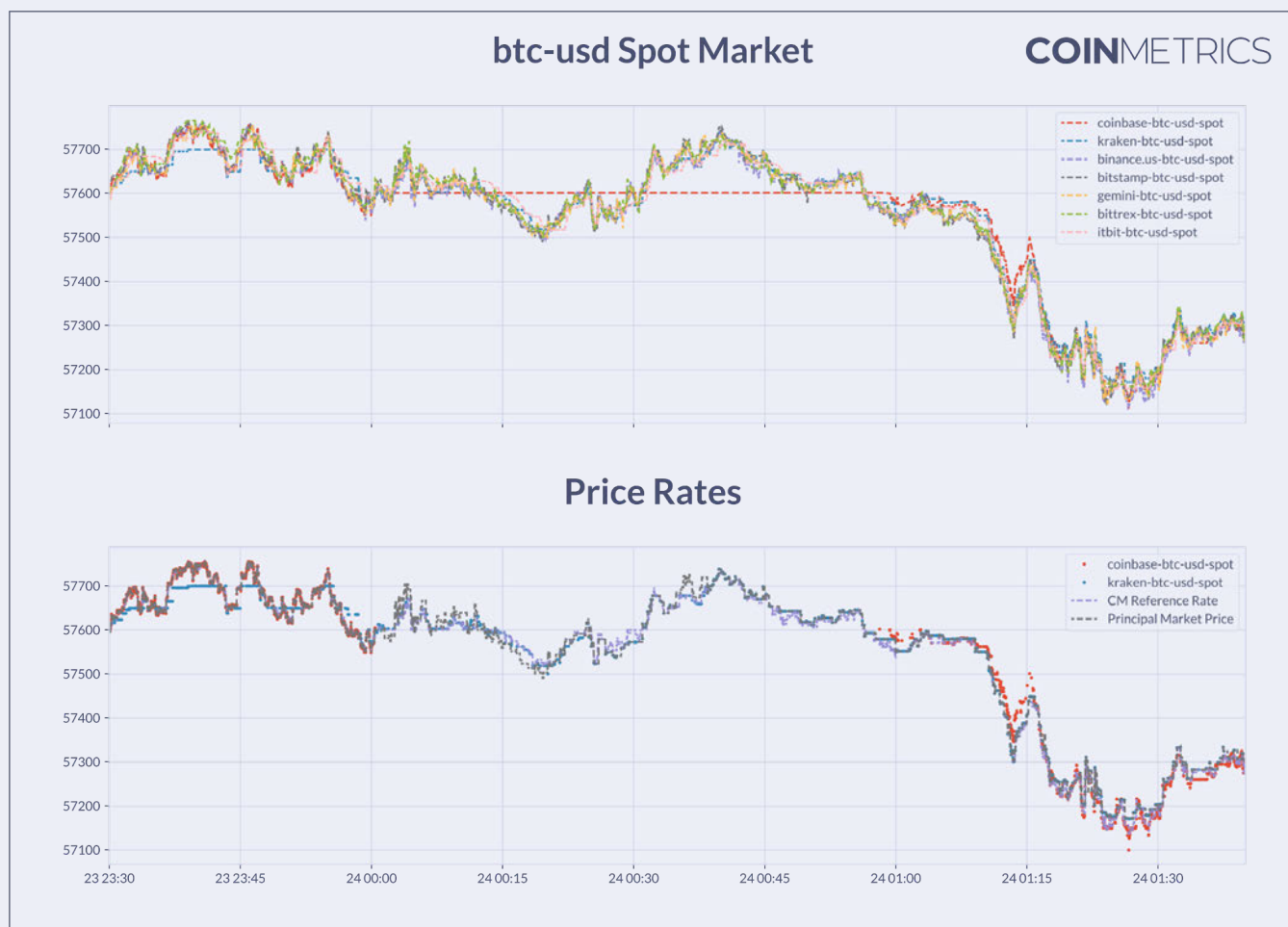
In the instance below, we take a look at BTC in the moments after Tesla announced that they would accept cryptocurrencies for payment in exchange for their electric vehicles. This news was judged to be highly significant by market participants, and it prompted a significant market rally on February 8, 2021. As we can see below, although price dislocations between exchanges are in the order of hundreds or a thousand USD (with Bitrex prices visibly lagging behind other exchanges) both the Coin Metrics Reference Rate and the Principal Market Price track the central tendency of all exchanges in spite of their differing methodologies.



## Exchange Offline

Another facet worth exploring is a temporary shutdown of a leading exchange due to technical issues or maintenance, which can lead to difficulties in arbitrage and can stymie traders that rely on particular infrastructure for their strategies. This can, in theory, lead to significant intra-exchange volatility and price discrepancies.

On November 23, 2021, near a peak in BTC prices during the bull-run, Coinbase, one of the leading US exchanges by trade volume, experienced connectivity issues that led to a halt in trading activity for around ninety minutes. Coin Metrics' Reference Rate was unaffected by this incident, despite the fact that Coinbase's BTC-USD market represents the largest constituent market by volume. Moreover, thanks to the exchange selection mechanism that underlies the Principal Market Price methodology, the PMP was also able to continue tracking the price during this period even as both Kraken and Coinbase experienced issues nearly at the same time.



# CONCLUSION

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Digital assets markets are emerging markets and there are many unique challenges to pricing digital assets. To date, crypto markets have been very global and fragmented with many venues to buy and sell digital assets with varying degrees of jurisdictional oversight. The exchange ecosystem has also changed dramatically over the years, as evidenced by Binance's fast rise and the dramatic fall of FTX in November 2022.

For these reasons, it is increasingly important to have manipulation resistant, thoroughly researched pricing methodologies. As we have explained in this report, the Coin Metrics Reference Rate and Principal Market Price have different strengths and use-cases, but both effectively aggregate trade data from various exchanges to source prices that are more consistent and less volatile than directly sourcing these prices from any single exchange. Temporary issues arising in exchanges, as well as price dislocations resulting from forced selling or significant news events, can introduce ambiguity that may not be so obviously resolved. The availability of reliable pricing tools, particularly the PMP, ensures that clients can be confident that the prices they use for their accounting requirements are both accurate and consistent with the methodological guidelines set forth by the FASB. Overall, the PMP offers a valuable tool for market participants to effectively manage and value their digital asset holdings, while also meeting regulatory requirements.

# AUTHORS

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