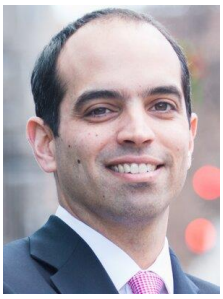
How Event Studies Can Be Applied To Crypto Markets

By **Nguyet Nguyen, Yingzhen Li and Sujay Davé** (May 17, 2023)

Nguyet Nguyen

Yingzhen Li



Sujay Davé

For decades, academic researchers have used the event study methodology to evaluate the reaction of asset prices to new information.[1] It is also a commonly accepted tool to establish or challenge loss causation in securities class actions and other financial disputes.[2]

While most frequently used to study publicly traded stocks, event studies have been applied to many other asset classes — including, more recently, to crypto markets by academic researchers.

Given the sharp increase in crypto-related U.S. Securities and Exchange Commission and Commodity Futures Trading Commission enforcement actions, and U.S. Department of Justice criminal prosecutions and civil litigation, the application of event studies to crypto-assets will likely become more common, particularly in cases involving allegations of market manipulation, fraud and insider trading.

For example, in April, the DOJ charged executives of Hydrogen Technology Corp. for manipulating the price of HYDRO, the company's ethereum-based cryptocurrency.[3] According to the indictment, the defendants designed a trading bot that executed "spoof orders" at obscure intervals to make it appear as though there was high demand for the token. In such a case, experts might consider using an event study to analyze the impact of alleged manipulative orders on prices and trading activity.

While the event study methodology can be applied to crypto-assets in litigation as it has been in academic research, the unique characteristics of crypto markets and individual crypto-assets are such that experts should carefully consider how to apply the methodology. In this article, we highlight five considerations that experts and counsel alike should be aware of when applying event studies to crypto markets.

Primer on Event Study Methodology

In a typical event study on a stock, the analysis starts with a model of the relationship between the returns of the stock and those of a market and/or industry index over some specified control period. This relationship is then used to estimate the expected return of the stock on a given day of interest. The expected return is an estimate of how the stock price is expected to behave on a given day in the absence of material company-specific news.

The event study analysis then tests the extent to which the actual return of the stock on a given day deviates from expectation, i.e., from the expected return. This test determines whether the differences between actual and expected returns — typically referred to as the residual or abnormal returns — are sufficiently large from a statistical standpoint that they are unlikely to be explained by random chance, i.e., whether they are statistically significant.

Under the event study framework, a statistically significant residual return is generally considered reasonably attributable to a specific disclosure of interest, assuming an absence of potentially confounding information.[4]

1. Market Efficiency

Event studies used for evaluating the impact of new information are typically conducted under some assumption of market efficiency.

There are different forms of market efficiency, but the one commonly assumed is called "semi-strong form" market efficiency, which assumes that prices reflect all public information.[5] This also means that prices react quickly to the public release of new information.

In the context of securities litigation, past court decisions and academic literature provide some guidance on how to assess market efficiency. For example, in litigation, market efficiency — or the lack thereof — is often considered in terms of the Cammer and Krogman factors.[6] These factors represent proxies for whether a stock trades in a market where information is well understood and quickly incorporated into prices.

In contrast, there is little legal precedent and relatively limited published academic literature on how to assess and establish market efficiency in crypto markets.

Academic researchers have found that crypto markets are generally less informationally efficient than the stock markets, though there is evidence that efficiency has increased over time.[7] Nevertheless, researchers have applied the event study methodology to evaluate the price reaction of certain digital tokens to major news events.[8]

2. Models of Expected Returns

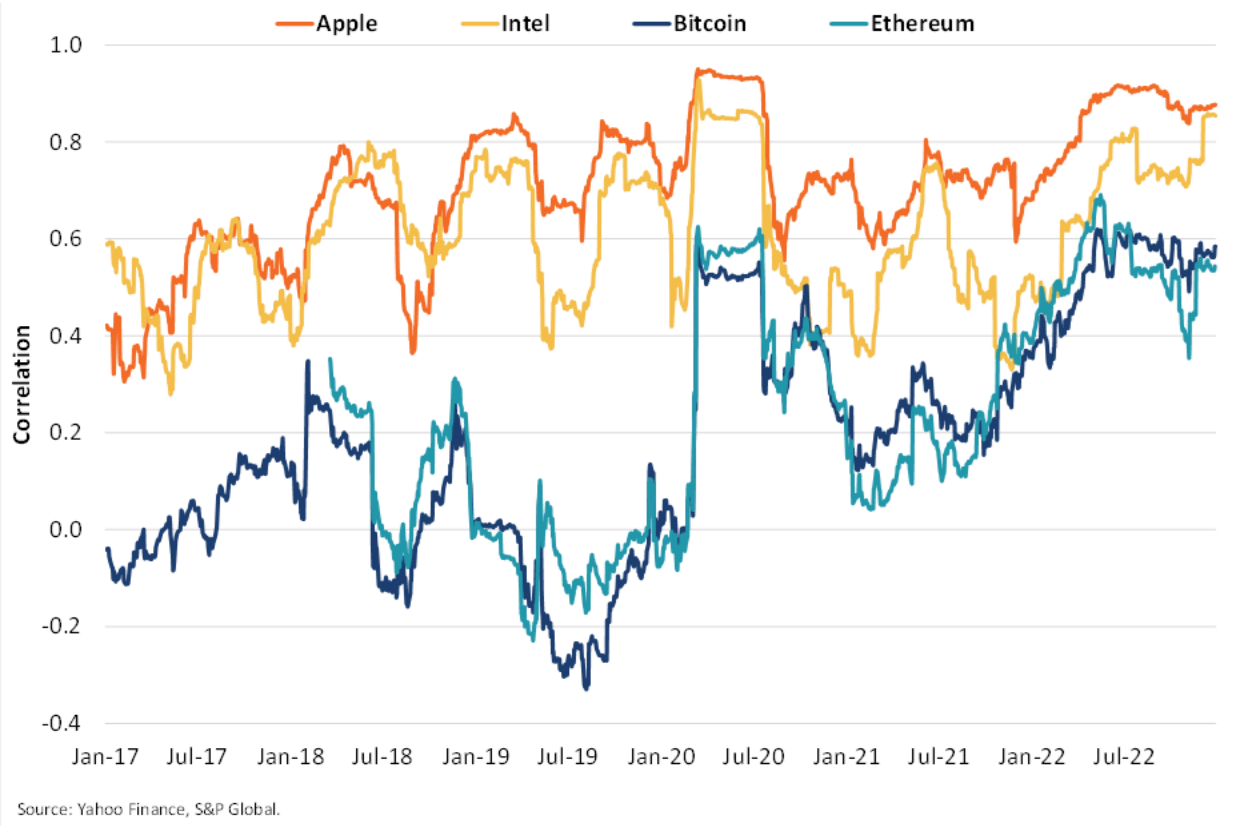
In event studies on publicly traded stocks, models of expected returns often capture the correlation between individual stocks and broad-based stock indices, such as the S&P 500 Index.[9]

Academic research has found that returns of crypto-assets have a limited correlation with the traditional equity-based indices, indicating that these indices may not serve as useful market benchmarks for an expected-return model for crypto-assets. This is illustrated in Figure 1 below, which plots the 90-day rolling correlation between the S&P 500 Total Return Index and four different instruments: Apple Inc., Intel Corp., bitcoin and ethereum.[10]

Figure 1 shows that the 90-day rolling correlation of Apple and Intel with the S&P 500 is consistently positive, while the 90-day rolling correlation of bitcoin and ethereum with the S&P 500 can be negative or positive.

A negative correlation means that when the S&P 500 increases, the prices of bitcoin and ethereum decrease. Further, the magnitude of the correlation for bitcoin and ethereum is often smaller than for Apple and Intel, even when it is positive, indicating a relatively weaker relationship.

Figure 1: 90-Day Rolling Correlation With S&P 500 Total Return: Crypto vs. Stocks



We recommend that experts take a thoughtful approach to identify and construct the appropriate factors for crypto expected-return models, taking into account the context of the case and the crypto-asset at hand.[11]

3. The First Disclosure

When using an event study to evaluate the impact of a disclosure about a stock, experts typically examine the price response to the first public disclosure of the information of interest. In a semi-strong form efficient market, any subsequent reiteration of the same information is not expected to affect stock prices.

Publicly traded companies are required to report certain information to the relevant regulatory authority — e.g., the SEC in the U.S. In addition, many public companies are followed by market analysts, who track and dissect company disclosures in detail. Regulatory requirements and the infrastructure that has long been set up for investors in the public stock markets mean that differentiating new news from old news and identifying the timing of disclosures — while a nontrivial task — can be done relatively systematically.

In contrast, it can be more challenging to identify when information is first disclosed in crypto markets: There are no formal regulatory channels through which information related to a crypto-asset needs to be disclosed. There is also no explicit regulatory guidance on what type of information must be disclosed, and by whom.

As a result, identifying the "first disclosure" can prove to be a more challenging task.

Experts might have to use data analytic tools to collect and compile information across chatrooms, blogs, social media and other crypto-specific news outlets — like CoinDesk, Decrypt or the Block — and conduct a content analysis to differentiate new news from old news.[12]

4. The Event Window

The "event window" is the period over which the price response to the disclosure at issue is analyzed. While it is generally accepted that, in an efficient market, stock prices respond quickly to new information, the interpretation of "quickly" can vary and depend on case specifics. Commonly used event windows in the context of public stocks include one to two days or, sometimes, shorter intraday intervals.

Consider an example where an expert uses daily returns to examine a one-day event window. The price impact of a disclosure that occurred during market hours on a given day is typically measured as the change in the closing stock price from the previous trading day to the closing price on the day of the disclosure.[13] The closing stock price refers to the last price a stock is traded at before or at the market close on a given day.

This means that, in a typical publicly traded U.S. stock, a one-day event window incorporates 6½ hours of trading, from 9:30 a.m. to 4 p.m.[14]

There is not a lot of precedent on how to define an appropriate event window in the context of crypto markets. Academic literature has investigated price reactions in the crypto markets over multiday windows,[15] taking into account the possibility that crypto prices may not react to information as quickly as what would be observed in public stock markets.

In addition, even defining what constitutes a trading day in a crypto market is less straightforward. Crypto markets trade 24 hours a day, seven days a week, and there is generally no predetermined market open or close. As a result, the start and end times to calculate daily returns are not delineated.

That means one calendar day in the U.S. stock market is typically 6½ hours of trading, compared to 24 hours in the crypto markets.

These factors may affect experts' interpretations of the speed at which information is reflected in crypto prices and should be considered with care.

5. Pricing Data Given Simultaneous Trading Across Exchanges

In public stock markets, most stocks are listed on only one exchange, such as the New York Stock Exchange or the Nasdaq. In contrast, crypto-assets can trade simultaneously on tens or even hundreds of exchanges. For a given crypto-asset, price differences can and do exist across exchanges.[16]

CoinMarketCap, CoinGecko and similar crypto market data websites provide a single volume-weighted price for many crypto-assets based on a custom basket of exchanges. The use of aggregated average prices offers convenience for experts and researchers, but it can obscure deviations in prices, spreads and volatilities across exchanges.

However, several data providers provide more granular trade-level price and volume data specific to an exchange. Experts may need to consider what pricing data is most appropriate for use and how to ascertain their reliability in their event studies.

Conclusion

The event study methodology — used for decades in traditional financial markets to analyze the price impact of news and events — can provide researchers and litigators with an "off the shelf" tool for analyzing price impact in crypto markets.

However, when performing a crypto event study, experts must thoughtfully consider the features of the crypto markets. This article highlights a few of the key considerations as examples, but it is not meant to be an exhaustive list. Experts should consider the facts and circumstances of a case and the characteristics of the asset at hand, such as time-varying volatility.

Nguyet Nguyen and Yingzhen Li are senior associates at The Brattle Group.

Sujay Dave is a principal at the firm and co-leader of its cryptocurrency and digital assets practice.

[1] John J. Binder, "The Event Study Methodology Since 1969," Review of Quantitative Finance and Accounting, Vol. 11, 1998, pp. 111-137 at p. 111.

[2] See, Frank Torchio, "Proper Event Study Analysis in Securities Litigation," The Journal of Corporation Law, Vol. 35, 2009, pp. 159-168, at p. 159 ("For over two decades, event studies have been prominently used as a valuation technique in various litigation matters including securities litigation.").

[3] United States of America v. Michael Kane, Shane Hampton, and George Wolvaardt, United States District Court Southern District of Florida, Case 1:23-cr-20172-KMW.

[4] Note that when a firm makes several disclosures at the same time, the event study analysis alone might not be sufficient in analyzing the impact of a specific disclosure. In this case, experts often apply further analysis in conjunction with an event study.

[5] Brealey, R. A., Myers, S. C., and Allen, F., Principles of Corporate Finance (New York: McGraw-Hill/Irwin, 2011), 10th edition, pp. 317, 318.

[6] These factors include trading volume, the number of market analysts following the company, the presence of market makers and arbitragers, S-3 eligibility, price response to news, market capitalization, bid-ask spread, and the size of public float.

[7] See, e.g, Andrew Urquhart, "The Inefficiency of Bitcoin," Economics Letters Vol. 148, 2016; Aurelio F. Bariviera, "The Inefficiency of Bitcoin Revisited: A Dynamic Approach," Economics Letters Vol. 161, 2017; Aviral Kumar Tiwari, R.K. Jana, Debojyoti Das, and David Roubaud, "Informational Efficiency of Bitcoin—An Extension," Economics Letters Vol. 163, 2018; and Ahmet Sensoy, "The Inefficiency of Bitcoin Revisited: A High-Frequency Analysis with Alternative Currencies," Finance Research Letters Vol. 28, 2019.

[8] See, e.g. Wenjun Feng, Yiming Wang, and Zhengjun Zhang, "Informed Trading in the Bitcoin Market," Finance Research Letters Vol. 26, 2018; and Dirk F. Gerritsen, Rick A.C. Lugtigheid, and Thomas Walther, "Can Bitcoin Investors Profit from Predictions by Crypto Experts?" Finance Research Letters, 2021; and Mohammad Hashemi Joo, Yuka Nishikawa, and Krishnan Dandapani, "Announcement effects in the cryptocurrency market," Applied Economics Vol. 52, No. 44, 2020.

[9] In some cases, an industry index may also be included in the model.

[10] A 90-day rolling correlation on Day t is calculated using returns over the previous 90 days.

[11] Researchers have documented that the returns of crypto-assets are correlated with other crypto-assets and factors specific to the crypto markets, such as user adoption and investor attention, which can be used in the expected-return models. Such factors typically require bespoke construction. See, e.g., Yukun Liu and Aleh Tsyvinski, "Risks and Returns of Cryptocurrency," The Review of Financial Studies Vol. 34, 2021, pp. 2689-2727; Albert S. Hu, Christine A. Parlour, and Uday Rajan, "Cryptocurrencies: Stylized Facts on a New Investible Instrument," Financial Management Vol. 48, 2019, pp. 1049-1068 at Abstract.

[12] Academic research has documented certain examples in which the republication of information still affected stock prices, albeit sometimes only temporarily—experts might also want to consider this and similar evidence when considering event study analysis for crypto-assets. See, for example, Hirshleifer, D., Lim, S., and Teoh, H. (2009). Driven to distraction: Extraneous events and underreaction to earnings news. The Journal of Finance, 64(5), 2289-2325.

[13] After taking into account any confounding information released during this time period.

[14] Note that there is also limited after-hour trading. Also in cases where the stock is not traded frequently, the last trading price might take place during the day (e.g., several hours before market close).

[15] For example, the Joo, Nishikawa, and Dandapan (2020) paper investigates price reactions from 3 days before to 6 days after an event. The Gerritsen, Lugtigheid, and Walther (2021) paper investigates price reactions from 4 days before to 4 days after an event. See also, Mark Schaub, "On the OCC Announcement Allowing US Banks to Use Stablecoins and the Immediate Impact on Cryptocurrency Valuations," The Economics and Finance Letters Vol. 8, 2021, Abstract ("… Bitcoin and Etherium increased over 20% in value within 5 days of the announcement…") and p. 156 ("Returns are reported beginning 10 days before the OCC announcement until 10 days after for a window of (-10, +10).").

[16] See, e.g., Igor Makarov and Antoinette Schoar, "Trading and Arbitrage in Cryptocurrency Markets," Journal of Financial Economics Vol. 135, 2020, pp. 293-319.