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FRAUD ON THE CRYPTO MARKET

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ABSTRACT

Crypto asset trading markets are booming. Traders in the United States presently can buy and sell hundreds of crypto assets on dozens of crypto exchanges, and this trading is expected to further intensify in the coming years. While investors now increasingly turn to crypto asset trading for portfolio appreciation and diversification, the popularization of secondary crypto asset trading risks significant investor harm through increased incidents of fraud. False or misleading statements by crypto asset sponsors or third parties have the prospect of financially impairing traders in crypto asset trading markets, including everyday traders who are ill-equipped to sustain significant investment losses.

As traders seek judicial redress for their fraud-related injuries, courts will be asked to make doctrinal determinations that will be pivotal to injured traders' ability to recover. A primary issue that courts will need to confront is whether crypto asset traders can avail themselves of fraud on the market in connection with fraud claims asserted under SEC Rule 10b-5 or CFTC Rule 180.1. This Article addresses that question and has as its intended audience not just academics, but also courts, practitioners, and market participants.

The Article shows that as a doctrinal matter fraud on the market is available in securities or commodities fraud cases involving crypto assets that trade on crypto exchanges, especially in light of *Halliburton II*, in which the Supreme Court resolved that fraud on the market is predicated on just a generalized notion of market efficiency, rather than a strict financial economic notion of efficiency. Drawing on how courts apply the doctrine to fraud cases involving stock transactions, the Article articulates a framework for how fraud on the market should be applied to the crypto asset context and explores methodological issues relevant to the framework's application in a given crypto asset case.

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I. INTRODUCTION

In a little more than a decade, an entirely new asset class has emerged and become a fixture in the global investment landscape. The trading of crypto assets on secondary markets is now ubiquitous. As of this Article's writing, the market capitalization of bitcoin alone is nearly a third of a trillion dollars, with billions of dollars of bitcoin

trades occurring the past twenty-four hours.[1] New crypto assets emerge almost daily[2] and quickly become the object of intense trading activity by institutional[3] and retail investors alike.[4] Traders are now able to buy and sell hundreds of crypto assets on dozens of crypto exchanges.[5]

Though investors may welcome crypto asset trading as a perceived means of portfolio appreciation and diversification, significant investor protection concerns loom. As a reference point, between 2017 and 2019, thousands of crypto assets were initially offered to the public and others through initial coin offerings ("ICOs").[6] Many of those offerings were legitimate, and the offered crypto assets continue to support applications and actively trade on crypto exchanges. But many other crypto asset initial offerings were riddled with fraud, with crypto asset sponsors and others misrepresenting to investors key aspects of the offering.[7]

Now, as crypto asset investing has evolved to encompass the wide-scale secondary trading of crypto assets on crypto exchanges, the focal point of fraud has concomitantly evolved to also encompass fraud occurring in connection with secondary crypto asset transactions. False or misleading statements by crypto asset promoters or third parties risk the imposition of significant injury on the millions of investors who are or will be engaged in the secondary trading of crypto assets, including many retail investors who are ill-equipped to weather the financial losses that accompany fraud.[8] Such unchecked fraud not only risks

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1. *See Bitcoin*, COINMARKETCAP, https://coinmarketcap.com/currencies/bitcoin [https://perma.cc/5CZ7-ETUK]. Because of the high volatility of crypto asset prices, *see infra* note 48 and associated text, these numbers may markedly differ from current amounts even in the short term.

2. *See In Full – The Complete ICO Calendar*, COINMARKETCAP, https://coinmarketcap.com/ico-calendar [https://perma.cc/KKQ3-8BS9].

3. *See 71% of Institutional Investors Plan to Buy or Invest in Digital Assets in the Future, According to New Research from Fidelity Digital Assets*, FID. DIGIT. ASSETS (2021), https://www.fidelitydigitalassets.com/bin-public/060_www_fidelity_com/documents/FDAS/digital-asset-survey-2021.pdf [https://perma.cc/XFT4-FEGF].

4. *See* Carmen Reinicke, *1 in 10 People Currently Invest in Cryptocurrencies, Many for Ease of Trading, CNBC Survey Finds*, CNBC (Aug. 24, 2021, 1:00 PM), https://www.cnbc.com/2021/08/24/1-in-10-people-invest-in-cryptocurrencies-many-for-ease-of-trading.html [https://perma.cc/FV6W-J48X].

5. *See infra* Section II.B. A major crypto exchange, FTX, very recently collapsed, *see infra* note 52, causing traders with holdings on the exchange to likely sustain substantial investment loss. While there have been allegations of serious, even criminal, misconduct, as of this Article's writing the definitive causes of the collapse have not yet been resolved.

6. *See, e.g.*, MATHIAS FROMBERGER & LARS HAFFKE, ICO MARKET REPORT 2018/2019 — PERFORMANCE ANALYSIS OF 2018'S INITIAL COIN OFFERINGS 9 (2019), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3512125 [https://perma.cc/XYL5-NZP8] (showing that over two thousand ICOs were conducted in 2018 alone).

7. *See infra* Section III.A.

8. While reported statistics vary, according to one recent study, more than one-third of crypto asset traders have an annual household income below $60,000, 55% lack a college degree, and approximately 45% are persons of color. *See More than One in Ten Americans Surveyed Invest in Cryptocurrencies*, NORC (July 22, 2021), https://www.norc.org/News

injury to investors who trade the affected crypto assets but also risks damaging the reputation of legitimate crypto assets whose trading markets can be tainted by the prospect of fraud.

Crypto asset fraud has not gone unnoticed by regulators. Both the Securities and Exchange Commission ("SEC") and the Commodity Futures Trading Commission ("CFTC") actively exercise their civil enforcement powers to deter and redress fraud occurring in the context of crypto asset transactions.[9] The Department of Justice also has been active in this space and has brought criminal proceedings against defendants accused of crypto fraud.[10] And, as most relevant to this Article, defrauded investors themselves have brought private suits, including class actions, to recover their fraud-based losses.[11]

As these crypto asset fraud cases work themselves through the judiciary, courts will be increasingly asked to resolve important open doctrinal questions in securities and commodities law that those cases implicate. Courts have already started addressing some of these core doctrinal questions, such as the extent to which a crypto asset is a security or a commodity, as those terms are defined under securities and commodities law.[12] But many fundamental doctrinal questions remain entirely unanswered.

This Article focuses on one such open doctrinal issue: the applicability and operation of fraud on the market to securities and commodities fraud claims where the at-issue transactions involve an exchange-

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EventsPublications/PressReleases/Pages/more-than-one-in-ten-americans-surveyed-invest-in-cryptocurrencies.aspx [https://perma.cc/KX3C-EKRM]; *see also* Kristin Johnson, Commissioner, Commodity Futures Trading Comm'n, Opening Remarks for the CFTC and OMWI Roundtable on Digital Assets and Financial Inclusion (Aug. 19, 2022), https://www.cftc.gov/PressRoom/SpeechesTestimony/opajohnson1 [https://perma.cc/45VK-R2YN] ("Among those in the increasingly diverse crypto-investing community, we find a significant population of historically underserved racial and ethnic minorities, senior citizens, active-duty military, and veterans.").

9. *See, e.g.*, Litigation Release No. 25157, SEC, SEC Charges Issuer for Conducting Fraudulent and Unregistered Digital Asset Security Offering (Aug. 4, 2021), https://www.sec.gov/litigation/litreleases/2021/lr25157.htm [https://perma.cc/PCP5-P827]; *see infra* note 122 (examples of CFTC enforcement actions). In addition to policing fraud, the SEC actively brings enforcement actions challenging the unregistered offering of crypto assets. *See*, *e.g.*, Press Release 2020-338, SEC, SEC Charges Ripple and Two Executives with Conducting $1.3 Billion Unregistered Securities Offering (Dec. 22, 2020), https://www.sec.gov/news/press-release/2020-338 [https://perma.cc/D3JY-WZNV]. State securities regulators have also directed enforcement resources to addressing fraud in the crypto markets. *See Operation Cryptosweep*, NASAA, https://www.nasaa.org/policy/enforcement/operation-cryptosweep [https://perma.cc/T4Y7-ZSZT].

10. *See, e.g.*, Indictment at 4–5, United States v. Matthew Brent Goettsche, No. 19-877, 2019 WL 11660533 (D.N.J. Dec. 5, 2019).

11. *See, e.g.*, Stan Higgins, *Customers Sue Alleged Crypto Ponzi Scheme GAW Miners*, COINDESK (Sept. 11, 2021, 8:19 AM), https://www.coindesk.com/markets/2016/06/16/customers-sue-alleged-crypto-ponzi-scheme-gaw-miners [https://perma.cc/E7AK-8W5E].

12. *See infra* Section III.B.

traded crypto asset.[13] Fraud on the market is a mainstay of federal securities law and is essential to investors in securities class actions brought under SEC Rule 10b-5 that involve secondary stock transactions. If plaintiffs in those actions satisfy the elements of the doctrine, they are entitled to a rebuttable presumption that they relied on the false or misleading statement. In the doctrine's absence, plaintiffs in stock-based Rule 10b-5 class actions could not litigate their claims as a class because individual issues of reliance would dominate common issues, thereby defeating Federal Rule of Civil Procedure 23(b)(3)'s predominance requirement.

A similar fate awaits crypto asset investors who sustained fraud-related losses through their secondary crypto asset transactions and seek relief under Rule 10b-5, but are unable to rely on fraud on the market. Without the doctrine, injured crypto asset traders could not litigate a Rule 10b-5 claim as a class because of the predominance requirement. Similarly, while injured crypto asset traders may be able to assert claims under CFTC Rule 180.1, their inability to rely on fraud on the market likewise would doom their ability to proceed as a class for purposes of their 180.1 claim. Because no single crypto asset investor may find it in their financial interest to litigate their claim individually, injured traders would be unable to recover their fraud-related losses.

As the Article's doctrinal analysis shows, fraud on the market is available, as a general matter, to defrauded crypto asset traders in Rule 10b-5 and Rule 180.1 cases involving secondary transactions of a crypto asset occurring on a crypto exchange. But whether traders will be able to establish the doctrine's elements necessary to certify their class will depend on the specific circumstances of the crypto asset at issue and the market or markets in which it trades.

Before undertaking the necessary doctrinal analysis, the Article first addresses some necessary precursors. In Part II, to frame the analysis that follows, the Article provides a very high-level overview of the secondary trading of crypto assets on crypto exchanges. Part III then discusses the prospect of fraud occurring in connection with those secondary transactions and injured traders' ability to seek redress under the securities and commodities laws.

Parts IV and V provide the Article's substantive analysis. Those two Parts evaluate the applicability and operation of fraud on the market in Rule 10b-5 or Rule 180.1 cases where the transactions at issue are crypto assets that were purchased or sold on a crypto exchange. As discussed there, while fraud on the market originated in and has had its contours shaped by Rule 10b-5 cases involving the secondary trading of stock, nothing doctrinally limits it to stock transactions.

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13. While there are different variants of fraud, the Article focuses on statement-based fraud in the form of false or misleading statements. *See infra* Part III.

Rather, fraud on the market is predicated on how the at-issue asset transacts — in particular, whether it trades in a market with an informationally valuable price, in the sense that the price generally reflects material, public information. As discussed in Part IV, that standard is met as a general matter with respect to crypto assets that trade on a crypto exchange, and it is also reasonable to assume that secondary crypto asset traders rely on the integrity of crypto asset prices in the doctrinally relevant sense. It therefore follows that the doctrine is available to traders in Rule 10b-5 or Rule 180.1 cases who seek redress for fraud occurring in connection with exchange-traded crypto asset transactions. However, traders in a given Rule 10b-5 or Rule 180.1 case will be able to avail themselves of fraud on the market only if they can establish the doctrine's elements with respect to the crypto asset at issue, including establishing that the crypto asset trades in a generally efficient market. Part V of the Article articulates a framework for how fraud on the market should be applied in the crypto asset context and discusses methodological issues relevant to the framework's application in a given crypto asset case.

The Article's intended audience includes not only academic readers but also judges, lawyers, and market participants who may be aided by the Article's analysis, especially given the current dearth of work evaluating fraud on the market in the context of crypto asset fraud claims.[14]

II. THE SECONDARY TRADING OF CRYPTO ASSETS ON CRYPTO EXCHANGES

Once a niche activity, the buying and selling of crypto assets[15] on crypto exchanges has rapidly moved into the mainstream. By one

14. While much has been written on aspects of fraud on the market, discussion of the doctrine in the context of crypto asset-based claims of fraud appears to be limited to Gregory Day, John T. Holden & Brian M. Mills, *Fraud on Any Market*, 97 IND. L.J. 659, 704–05 (2022) (explaining that application of fraud on the market to crypto asset fraud claims would promote investor wellbeing) and Reno Varghese, *The Possible Regulatory Gap in Future ICO Class Action Litigation*, COLUM. BUS. L. REV. (Nov. 18, 2020), https://journals.library.columbia.edu/index.php/CBLR/announcement/view/365 [https://perma.cc/DCJ7-NMP6] (evaluating the applicability of fraud on the market to fraud claims arising from crypto asset initial offerings).

15. The Article uses the term "crypto asset" broadly to refer to any digital asset that relies on a distributed ledger. This definition corresponds to the CFTC and SEC's use of the term "digital asset." *See, e.g.*, *Framework for "Investment Contract" Analysis of Digital Assets*, SEC (Apr. 3, 2019), https://www.sec.gov/corpfin/framework-investment-contract-analysis-digital-assets [https://perma.cc/Y2YF-GKU4] ("The term 'digital asset' . . . refers to an asset that is issued and transferred using distributed ledger or blockchain technology."); Amendments to Form FP to Amend Reporting Requirements for All Filers and Large Hedge Fund Advisers, 87 Fed. Reg. 53832 (proposed Sept. 1, 2022) (citation omitted) ("[W]e propose to define the term 'digital asset' as an asset that is issued and/or transferred using distributed

estimate, the largest crypto exchanges had more than $14 trillion in trading volume in 2021, representing a nearly 700% increase in trading volume compared to the year before.[16] The significant rise in secondary trading of crypto assets is not being driven by a narrow stratum of the population. According to a recent survey, nearly one in six U.S. adults has personally invested in, traded, or otherwise used a crypto asset.[17]

A. Crypto Exchanges and Their Salient Features

The core features of a crypto exchange are like those of a secondary equity market.[18] As in a stock exchange, a crypto exchange facilitates the mutually beneficial trade of a previously issued asset among multiple buyers and sellers by matching submitted buy and sell offers.[19] As in a stock exchange, whenever a trade occurs on a crypto exchange, the exchange reports the price at which the transaction occurred.[20] Those prices are also reported on price tracking websites[21] and discussed in

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ledger or blockchain technology . . . . These types of assets also are commonly referred to as 'crypto assets.'").

A distributed ledger is a database that is held and maintained by participants in a network, rather than a centralized source. For a non-technical exposition of distributed ledger in a legal publication, see Dirk A. Zetzsche, Ross P. Buckley & Douglas W. Arner, *The Distributed Liability of Distributed Ledgers: Legal Risks of Blockchain*, 2018 U. ILL. L. REV. 1361, 1370–74. Blockchain is a specific type of distributed ledger. *See* DYLAN YAGA, PETER MELL, NIK ROBY & KAREN SCARFONE, U.S. DEP'T OF COM., NISTIR 8202: BLOCKCHAIN TECHNOLOGY OVERVIEW 1 (2018) (defining blockchain). For a clear and accessible discussion of bitcoin and its blockchain, see Matt Levine, *The Crypto Story*, BLOOMBERG (Oct. 25, 2022, 5:00 AM), https://www.bloomberg.com/features/2022-the-crypto-story [https://perma.cc/BWW3-5LS8].

16. *See* Yogita Khatri, *Centralized Crypto Exchanges Saw over $14 Trillion in Trading Volume This Year*, THE BLOCK (Dec. 24, 2021), https://www.theblockcrypto.com/linked/128526/centralized-crypto-exchanges-14-trillion-trading-volume-2021 [https://perma.cc/7QK7-2NKM] (citing data that the largest centralized crypto exchanges had $14 trillion in trading volume in 2021, representing a nearly 690% increase in trading volume from the year before, and that the largest decentralized crypto exchanges had more than $1 trillion in trading volume in 2021, representing a nearly 860% increase in trading volume relative to 2020).

17. *See* Andrew Perrin, *16% of Americans Say They Have Ever Invested in, Traded or Used Cryptocurrency*, PEW RSCH. CTR. (Nov. 11, 2021), https://www.pewresearch.org/fact-tank/2021/11/11/16-of-americans-say-they-have-ever-invested-in-traded-or-used-cryptocurrency [https://perma.cc/4GJA-YQ66].

18. The discussion in this Section and others within this Part of the Article is heavily streamlined. For a more complete discussion of crypto exchanges, see, for example, Kristin N. Johnson, *Decentralized Finance: Regulating Cryptocurrency Exchanges*, 62 WM. & MARY L. REV. 1911, 1951–59 (2021).

19. As discussed below, in addition to these secondary transactions, some crypto asset initial offerings are also conducted on crypto exchanges. *See infra* note 77.

20. *See, e.g.*, *Solana (SOL)*, COINBASE, https://www.coinbase.com/price/solana [https://perma.cc/4P6U-QGL3] (price of SOL on the crypto exchange Coinbase).

21. *See, e.g.*, COINMARKETCAP, https://coinmarketcap.com [https://perma.cc/Q2LM-GUVP].

news stories, Twitter and other social media, and on discussion sites like Reddit, among other places.[22]

Crypto exchanges include both spot and derivative markets.[23] U.S. residents presently can only trade limited crypto asset derivatives, such as bitcoin futures,[24] though that may change.[25] The Article focuses on crypto asset spot markets, though the substantive analysis carries over to crypto asset derivative markets.

Many crypto exchanges are centralized, in the sense that they involve an intermediary to facilitate transactions, but others are decentralized, in that they do not.[26] Decentralized crypto exchanges were developed after centralized crypto exchanges and are increasing in popularity among traders.[27] Regardless of type, crypto exchanges do not close and allow trading 24 hours a day, 365 days of the year.[28]

Centralized crypto exchanges use a limit order book to match buyers and sellers.[29] Prices in these exchanges therefore are directly set by the orders that traders submit to the exchange. In contrast, a

22. *See, e.g.*, @CoinDesk, TWITTER (Nov. 9, 2022, 5:57 PM), https://twitter.com/CoinDesk/status/1590478797341540352 [https://perma.cc/W6K7-Q2JP].

23. A spot market is a market in which assets are traded for immediate delivery. In contrast, a derivative market is a market involving the trading of financial contracts between multiple parties whose value is based on an underlying asset or a set of assets.

24. *See, e.g.*, *Bitcoin Futures — Specs*, CME GRP., https://www.cmegroup.com/markets/cryptocurrencies/bitcoin/bitcoin.contractSpecs.html [https://perma.cc/6D5L-QMJL] (bitcoin future contracts available for trade).

25. *See* Elizabeth Howcroft, Tom Wilson & Medha Singh, *Coinbase Buys Crypto Futures Exchanges, Plans to Sell Derivatives in U.S.*, REUTERS (Jan. 13, 2022, 2:48 PM), https://www.reuters.com/technology/coinbase-buys-crypto-futures-exchanges-plans-sell-derivatives-us-2022-01-13 [https://perma.cc/3MPX-YJHY]; Philip Stafford, *Crypto Industry Makes Push into Regulated Derivates Markets*, FIN. TIMES (Feb. 22, 2022), https://www.ft.com/content/364dee59-fb51-400b-acd2-808d4ec41ab3 [https://perma.cc/STR4-KASQ].

26. Coinbase is an example of a centralized crypto exchange. *See What Is Coinbase?*, COINBASE, https://help.coinbase.com/en/coinbase/getting-started/getting-started-with-coinbase/what-is-coinbase [https://perma.cc/HV4J-JTJQ]. Uniswap is an example of a decentralized crypto exchange. *See Frequently Asked Questions*, UNISWAP LABS, https://uniswap.org/faq [https://perma.cc/VZ87-YR4B].

27. *See* Benedict George, *What Is a DEX? How Decentralized Crypto Exchanges Work*, COINDESK (Feb. 11, 2022, 11:01 AM), https://www.coindesk.com/learn/what-is-a-dex-how-decentralized-crypto-exchanges-work [https://perma.cc/F2MK-SDZW].

28. *See, e.g.*, Eva Szalay, *Crypto Trading Puts Pressure on Bourses to Open All Hours*, FIN. TIMES (Nov. 14, 2021), https://www.ft.com/content/7b7ff0cb-b695-485d-b6be-ef0c8c0edde0 [https://perma.cc/AD79-VCKP].

29. *See, e.g.*, *Coinbase Markets Trading Rules*, COINBASE, https://www.coinbase.com/legal/trading_rules [https://perma.cc/T8Q8-CR48] ("Coinbase operates a central limit order book trading platform."). A limit order book is a database of limit orders to buy (i.e., bids) and sell (i.e., asks) a tradeable asset, such that buy orders are arranged from highest to lowest price and sell orders are arranged from lowest to highest price. *See, e.g.*, *BTC-USD*, COINBASE, https://pro.coinbase.com/trade/BTC-USD [https://perma.cc/T7V7-TR72] (crypto exchange's order book for bitcoin (in U.S. dollars)). An exchange's matching engine will fill an incoming market order, i.e., an order to immediately buy or sell at prevailing prices, by drawing — pursuant to specified priority rules — from the opposing orders that sit at the top of the order book. *See, e.g.*, *Coinbase Markets Trading Rules*, *supra*, § 1.7 ("Coinbase Markets matches Taker Orders with Open Maker Orders on each Order Book based on Price-Time Priority.").

decentralized crypto exchange ordinarily will use an automated market maker to facilitate transactions, rather than an order book system.[30] Prices in such an exchange are set by a pricing algorithm established by the crypto exchange.[31]

The largest crypto exchanges have robust trading volume, while the smallest ones do not.[32] Any given crypto exchange will make available for trading a subset of the universe of crypto assets trading in the secondary market. Many crypto assets are cross-listed and trade on multiple crypto exchanges. Because crypto asset arbitrage is costly, a crypto asset's price will vary to some extent across the various exchanges on which it trades.[33] While there can be considerable crypto asset price differences across any two given crypto exchanges, price differences between crypto exchanges that can each be accessed by residents of the same country are much more modest.[34]

As an example of some of these aspects of crypto exchanges, consider Coinbase, one of the largest centralized crypto exchanges available to U.S. residents. As of this Article's writing, over 200 crypto assets are available to trade on Coinbase.[35] Solana ("SOL") is one of the many crypto assets that currently trade on Coinbase[36] and simultaneously trades on other crypto exchanges accessible to U.S. residents, such as Binance.US.[37] The trading volume of assets on Coinbase is high. In the first six months of 2022, for instance, over half a trillion dollars in crypto transactions occurred on the exchange.[38]

Not all secondary crypto asset trading takes place on crypto exchanges. First, some crypto assets that trade on crypto exchanges can also be purchased and sold outside of crypto exchanges, such as in over-

30. In an automated market maker-based crypto exchange, traders buy and sell crypto assets from a liquidity pool that is supported and incentivized by the crypto exchange. *See What Is an Automated Market Maker (AMM)?*, BINANCE ACAD. (Sept. 1, 2022), https://academy.binance.com/en/articles/what-is-an-automated-market-maker-amm [https://perma.cc/JZF5-UG6V].

31. *See, e.g.*, *How Uniswap Works*, UNISWAP LABS, https://docs.uniswap.org/protocol/V2/concepts/protocol-overview/how-uniswap-works [https://perma.cc/XJL8-WK78] (generally describing Uniswap's pricing algorithm).

32. *See Top Cryptocurrency Spot Exchanges*, COINMARKETCAP, https://coinmarketcap.com/rankings/exchanges [https://perma.cc/PJ8A-XXXZ].

33. *See* Igor Makarov & Antoinette Schoar, *Trading and Arbitrage in Cryptocurrency Markets,* 135 J. FIN. ECON. 293, 293 (2020) (evaluating and documenting price differences across a set of crypto exchanges).

34. *See id.* at 294 (documenting a more than 15% and approximately 10% and 3% daily average price ratio between the United States and Korea, the United States and Japan, and the United States and Europe, respectively, but finding that the average price ratio for exchanges within the same country generally are less than 1%).

35. *See Explore the Cryptoeconomy*, COINBASE, https://help.coinbase.com/en/coinbase/supported-crypto [https://perma.cc/E5CW-RVL2].

36. *See id.*

37. *See USD Markets*, BINANCE, https://www.binance.us/en/markets [https://perma.cc/A7T8-BCRF].

38. *See* Coinbase Global, Inc., Quarterly Report (Form 10-Q) 48 (Aug. 9, 2022).

the-counter ("OTC") markets.[39] Second, some secondary crypto asset trading occurs in auction-like environments.[40] Finally, some crypto assets may not trade at all because they have not been listed on any exchange, market, or other trading venue.

B. Exchange-Traded Crypto Assets

As of this Article's writing, U.S. investors can buy and sell hundreds of crypto assets[41] on dozens of crypto exchanges.[42] Nearly forty traded crypto assets presently have a market capitalization greater than $1 billion; and approximately ten of those have a market capitalization greater than $10 billion.[43]

These tradeable crypto assets offer their holders a diverse range of potential benefits. A universal benefit is potential financial gain caused by appreciation in the crypto asset's price. Consider, for example, SOL, the crypto asset associated with the Solana blockchain.[44] SOL trades on a number of crypto exchanges.[45] On July 1, 2022, SOL traded at $32.80, according to CoinMarketCap's calculated average price.[46] One

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39. *See, e.g.*, *Kraken OTC Desk: Large Trades with Private and Personalized Services*, KRAKEN, https://www.kraken.com/en-us/features/otc-exchange [https://perma.cc/7MBM-YBML] (example of an OTC desk).

40. For instance, the secondary trading of nonfungible tokens ("NFTs") occurs largely in NFT marketplaces, which operate auction markets in which sellers post NFTs for sale and potential buyers are either able to bid on the asset or purchase it at the seller's set price. *See, e.g.*, *OpenSea*, https://opensea.io [https://perma.cc/6YA4-K3WM] (a popular NFT marketplace).

41. *See All Cryptocurrencies*, COINMARKETCAP, https://coinmarketcap.com/all/views/all [https://perma.cc/T83V-VZPZ] (listing crypto assets trading on selected exchanges); *Listings Criteria*, COINMARKETCAP (Sept. 12, 2022), https://support.coinmarketcap.com/hc/en-us/articles/360043659351-Listings-Criteria [https://perma.cc/5WYM-3SB2] (describing the process for determining which crypto assets to include on its crypto asset listing).

42. *See Top Cryptocurrency Spot Exchanges*, *supra* note 32 (listing crypto exchanges). Not all crypto exchanges are available to U.S. residents. *See, e.g.*, Colin Harper, *Binance Ramps Up Crackdown on US Users, Giving Them 14 Days to Withdraw Funds*, COINDESK (Sept. 14, 2021, 6:34 AM), https://www.coindesk.com/markets/2020/11/24/binance-ramps-up-crackdown-on-us-users-giving-them-14-days-to-withdraw-funds [https://perma.cc/4763-JAV7]. And some crypto exchanges are only available to the residents of some states. *See, e.g.*, *List of Unsupported States*, BINANCE, https://support.binance.us/hc/en-us/articles/360046786914-List-of-Unsupported-States [https://perma.cc/3F8M-PR6S].

43. *See Today's Cryptocurrency Prices by Market Cap*, COINMARKETCAP, https://coinmarketcap.com [https://perma.cc/WGU9-5JJP].

44. *See Introduction*, SOLANA DOCUMENTATION, https://docs.solana.com/introduction#what-are-sols [https://perma.cc/HW2G-B7N6].

45. *See Solana: Markets*, COINMARKETCAP, https://coinmarketcap.com/currencies/solana/markets [https://perma.cc/W9AJ-2BCJ] (listing crypto exchanges on which SOL trades).

46. *See Solana: Historical Data*, COINMARKETCAP, https://coinmarketcap.com/currencies/solana/historical-data [https://perma.cc/RWQ5-MDE5]. For a given crypto asset, CoinMarketCap's price is the average price across a set of crypto exchanges, weighted by trading volume. *See Price (Market Pair, Cryptoasset)*, COINMARKETCAP, https://support.coinmarketcap.com/hc/en-us/articles/360043395752-Price-Market-Pair-Cryptoasset [https://perma.cc/3L3X-CVCR]. CoinMarketCap reports historical prices at the "open" and "close" of each trading day. Because crypto exchanges do not close, CoinMarketCap defines the market open

month later, on August 1, 2022, SOL traded at $41.79, according to CoinMarketCap's metric.[47] An investor who purchased SOL on July 1, 2022 therefore would have seen the market value of their SOL holdings appreciate by more than 25% in a month.

Of course, crypto asset investment gains will be accompanied by losses. While crypto asset prices ebb and flow like other asset prices, they also often experience significant volatility causing investors to sustain notable market-incurred losses.[48] Continuing with SOL as an example, on September 1, 2022, SOL traded at $31.59, according to CoinMarketCap's calculated average price.[49] So, the market value of a portfolio of $10,000 of SOL purchased on August 1, 2022 would have shrunk in four weeks to about $7,560. This portfolio would have dropped even further had it been held for subsequent months.[50]

Crypto assets have also experienced significant single-day price deterioration[51] and dominant market participants have collapsed almost overnight.[52] In addition to asset-specific price changes, crypto assets as a class have experienced episodic periods of significant price decline and subsequent price stagnation, which also have had deleterious effects on the value of crypto asset investors' portfolios.[53]

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as 12:00 AM UTC and the market close as 11:59 PM UTC for purposes of price reporting. *See Market Open and Close Times*, COINMARKETCAP, https://support.coinmarketcap.com/hc/en-us/articles/360016193231-Market-Open-and-Close-Times [https://perma.cc/FC72-2R34]. The CoinMarketCap prices provided in the text are market close prices.

47. *See Solana: Historical Data*, *supra* note 46.

48. *See, e.g.*, Carol R. Goforth, *Using Cybersecurity Failures to Critique the SEC's Approach to Crypto Regulation*, 65 S.D. L. REV. 433, 438–40 (2020) (discussing crypto asset price volatility). Stablecoins are a class of crypto assets that seek to avoid such price fluctuation by pegging their value to another asset. *See, e.g.*, Dan Ashmore, *An Introduction to Stablecoins*, FORBES ADVISOR (Aug. 17, 2022, 10:29 AM) https://www.forbes.com/advisor/investing/cryptocurrency/stablecoins [https://perma.cc/8YJL-99NP]. Stablecoins have not always functioned as intended, with the most notable example occurring in May 2022 when the stablecoin UST lost its peg to the U.S. dollar. This caused the prices of UST and its associated crypto asset Terra to plummet, resulting in UST and Terra holders suffering significant financial loss. *See* Daniel Van Boom, *Luna Crypto Crash: How UST Broke and What's Next for Terra*, CNET (May 25, 2022, 5:00 AM) https://www.cnet.com/personal-finance/crypto/luna-crypto-crash-how-ust-broke-and-whats-next-for-terra [https://perma.cc/6C3G-UZAR].

49. *See Solana: Historical Data*, *supra* note 46.

50. The price of SOL dropped more than 40% in a 24-hour period in November 2022. *See* Taylor Locke, *How Will the Binance-FTX Drama Affect Solana? Here's What We Know So Far*, FORTUNE (Nov. 9, 2022, 1:09 PM), https://fortune.com/crypto/2022/11/09/how-will-the-binance-ftx-drama-affect-solana-heres-what-we-know-so-far [https://perma.cc/HJC4-NNBA]. That rapid and significant price drop has been attributed to the collapse of the crypto exchange FTX. *See id.*; *infra* note 52.

51. *See, e.g.*, discussion *supra* note 48 (on UST and Terra); *supra* note 50 (on SOL).

52. For instance, in November 2022, the dominant crypto exchange, FTX, unraveled in a matter of days. *See* Julian Mark, *Why the FTX Collapse Has Plunged the Crypto World into Upheaval*, WASH. POST (Nov. 11, 2022, 10:10 AM), https://www.washingtonpost.com/business/2022/11/10/ftx-faq-crypto-turmoil [https://perma.cc/JM4A-TEAA].

53. The most recent such fall and subsequent stagnation of crypto asset prices, popularly referred to as a crypto winter, began in Q3 2021 and continues up to this Article's writing. *See, e.g.*, Farran Powell, *Crypto Winter Is Here: What You Need To Know*, FORBES ADVISOR

Beyond potential investment gain (or loss), a given exchange-traded crypto asset may generate additional benefits for the asset's holders. For instance, a crypto asset may be accepted as a form of payment for traditional goods and services[54] or for other crypto assets,[55] or may serve as the method of payment for transactions conducted on an associated distributed ledger.[56]

A crypto asset may also be associated with one or more applications,[57] such that the asset enables its holders to engage in activities on the associated application[58] or engage in such activities at a discounted price.[59] Consider, for example, the Golem network, which is a decentralized marketplace for computing power,[60] and the associated crypto asset GLM. A user who wants to access computing power on the Golem network must do so using GLM.[61] In addition to this use value, GLM trades on crypto exchanges and so can be purchased and sold for investment purposes.[62]

A crypto asset also may give its holders decision-making rights concerning an associated application.[63] As an example, consider the crypto exchange Uniswap and the associated crypto asset UNI. Holders of UNI have governance rights over the protocol on which Uniswap is

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(Sept. 2, 2022, 11:18 AM), https://www.forbes.com/advisor/investing/cryptocurrency/what-is-crypto-winter [https://perma.cc/3KVS-Q7BP].

54. While some companies have accepted bitcoin as a form of payment for some time, *see, e.g.*, *Microsoft to Accept Payments Made in Bitcoins*, BBC (Dec. 11, 2014), https://www.bbc.com/news/technology-30377654 [https://perma.cc/74P8-LU97] (noting that Microsoft accepts bitcoin for certain services), the set of crypto assets that are accepted as a method of payment has grown. *See, e.g.*, Erin Finegold, *Mavs To Accept Dogecoin Cryptocurrency for Tickets and Merch*, MAVS (Mar. 4, 2021), https://www.mavs.com/dogecoin [https://perma.cc/EWF7-7WY6] (announcing that the Dallas Mavericks would accept Dogecoin for tickets and online merchandise). These crypto assets are sometimes referred to as payment tokens. *See, e.g.*, Andrew Verstein, *Crypto Assets and Insider Trading Law's Domain*, 105 IOWA L. REV. 1, 10 (2019).

55. *See, e.g.*, *What's WETH? How Do I Get It?*, OPENSEA, https://support.opensea.io/hc/en-us/articles/360063498293-What-s-WETH-How-do-I-get-it [https://perma.cc/2CVV-ALVB] (wrapped ether ("WETH") used to make NFT purchases on the OpenSea marketplace).

56. *See, e.g.*, *Gas and Fees*, ETHEREUM (Sept. 12, 2022), https://ethereum.org/en/developers/docs/gas [https://perma.cc/DCR8-RYKM] (describing how ether ("ETH") is used to pay for transaction fees on the Ethereum blockchain).

57. This Article uses the term "application" broadly to refer to any product or service that is directly facilitated by the crypto asset.

58. These crypto assets are sometimes referred to as utility tokens. *See, e.g.*, Verstein, *supra* note 54, at 10.

59. *See, e.g.*, *Binance to Extend the 25% Trading Fee Discount When Using BNB*, BINANCE (June 30, 2022, 8:08 AM), https://www.binance.com/en/support/announcement/844f0bae047d4be4903303cb743734e1 [https://perma.cc/L43X-ABJR].

60. *See* GOLEM, https://www.golem.network [https://perma.cc/89CB-7APP].

61. *See What is GLM?*, GOLEM, https://www.golem.network/glm [https://perma.cc/L233-D4XT].

62. *See, e.g.*, *Explore the Cryptoeconomy*, *supra* note 35.

63. These crypto assets are sometimes referred to as governance tokens. *See* Yuliya Guseva, *A Conceptual Framework for Digital-Asset Securities: Tokens and Coins as Debt and Equity*, 80 MD. L. REV. 166, 177 (2020).

based, including the ability to submit proposals to modify the protocol underlying Uniswap[64] and to vote on submitted proposals.[65] Some crypto assets also give their holders an interest in another asset.[66] For instance, INX Ltd. seeks to develop a regulated crypto asset trading platform.[67] The crypto asset INX entitles its holders to a pro rata distribution of 40% of INX Ltd.'s adjusted net cash flow from operating activities.[68]

On the other hand, some exchange-traded crypto assets may not provide the asset's holders with any tangible benefit other than potential investment gain, though the crypto asset's holders may obtain inherent utility from simply owning the asset.[69] Crypto assets sometimes are labeled by their functional attributes, such as payment tokens, utility tokens, and security tokens.[70] Other times, crypto assets are labeled with respect to their relation to the associated distributed ledger, in which case they may be categorized as either native tokens or non-native tokens.[71] Because the Article's substantive analysis concerning fraud on the market does not turn on these labels, it avoids their use and instead uses the collective term crypto asset.[72]

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64. *Process*, UNISWAP LABS, https://docs.uniswap.org/protocol/concepts/governance/process [https://perma.cc/2DD9-DQXF]; *Uniswap Governance*, UNISWAP LABS, https://gov.uniswap.org [https://perma.cc/79G8-AERL].

65. *Process*, UNISWAP LABS, *supra* note 64.

66. These crypto assets are sometimes referred to as security tokens. *See, e.g.*, Verstein, *supra* note 54, at 10.

67. *See* INX Ltd., Annual Report (Form 20-F) 34–37 (May 2, 2022), https://www.sec.gov/Archives/edgar/data/1725882/000121390022023077/f20f2021_inxlimited.htm [https://perma.cc/36H8-W87C].

68. INX Ltd., Report of Foreign Private Issuer (Form 6-K) F-9 (May 16, 2022), https://www.sec.gov/Archives/edgar/data/1725882/000121390022027375/ea160089-6k_inxlimited.htm [https://perma.cc/6RE4-5WTE].

69. For instance, many meme coins, which are exchange-traded crypto assets based on a meme or Internet joke, offer holders no tangible benefit, other than potential price appreciation and utility gain from the act of possession. *See, e.g.*, Megan DeMatteo, *The Psychology of Meme Coins, From Actual Investors*, COINDESK (Dec. 30, 2021, 5:50 AM), https://www.coindesk.com/markets/2021/12/30/the-psychology-of-meme-coins-from-actual-investors [https://perma.cc/TH48-TN7M].

70. *See* Verstein, *supra* note 54, at 10; Guseva, *supra* note 63.

71. *See, e.g.*, WORLD BANK GRP., DISTRIBUTED LEDGER TECHNOLOGY & SECURED TRANSACTIONS: LEGAL, REGULATORY AND TECHNOLOGICAL PERSPECTIVES — GUIDANCE NOTES SERIES, NOTE 3: DISTRIBUTED LEDGER TECHNOLOGY AND SECURED TRANSACTIONS FRAMEWORKS: A PRIMER 20 (May 2020), https://openknowledge.worldbank.org/bitstream/handle/10986/34009/Distributed-Ledger-Technology-and-Secured-Transactions-Framework.pdf?sequence=4&isAllowed=y [https://perma.cc/J65J-D6MX]. For further discussion of the various taxonomies of crypto assets, see Guseva, *supra* note 63, at 175–79.

72. The Article's use of the collective term "crypto asset" should not be construed as a suggestion that the particularities of a crypto asset have no bearing on the incidence of cognizable secondary trading fraud. Consider, for instance, the issue of operational decentralization discussed in the next Section. *See infra* Section II.C. If a crypto asset becomes sufficiently decentralized during its lifecycle such that its developers cede development, operation, management, and promotion of the crypto asset and its associated applications to others, then a false statement about the crypto asset by its developers occurring after such decentralization presumably is less likely to be deemed material by investors, and thus generate investor losses,

C. Initial Offerings and Operational Decentralization

Before a crypto asset begins trading in the secondary markets, it ordinarily will have been the subject of an initial offering, through which the asset's sponsors[73] offered the crypto asset, or rights to the future delivery of the crypto asset,[74] for sale to the public or a designated group of investors. Sponsors may allocate some of the crypto assets to themselves during an initial offering,[75] and a crypto asset may start trading on one or more crypto exchanges during its initial offering period.[76]

A crypto asset's sponsors can conduct an initial offering in various ways. When crypto assets first emerged, their initial offerings ordinarily were conducted through ICOs, but the available ways to conduct an initial offering has grown and continues to evolve.[77] Sponsors also may make crypto assets available through means other than an initial offering.[78]

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relative to a circumstance in which the developers remain critical to development and operation of the crypto asset, all else equal.

73. The Article uses the term "sponsor" to describe the class of persons or entities that develops, promotes, or sells the crypto asset.

74. Rather than the contemporaneous sale of a crypto asset, some crypto asset initial offerings have instead involved the sale of a Simple Agreement for Future Tokens, or SAFT, which entitles the purchaser to the right to the future delivery of the crypto asset. *See, e.g.*, THE CARDOZO BLOCKCHAIN PROJECT, NOT SO FAST—RISKS RELATED TO THE USE OF A "SAFT" FOR TOKEN SALES 3 (2017), https://larc.cardozo.yu.edu/cgi/viewcontent.cgi?article=1000&context=blockchain-project-reports [https://perma.cc/3XNL-QNC5] (providing an overview of the SAFT approach).

75. *See* Luke Conway, *What Is Binance Coin? Is It a Good Investment?*, THESTREET (Oct. 27, 2021, 1:42 PM), https://www.thestreet.com/crypto/defi/what-is-binance-coin-is-it-a-good-investment [https://perma.cc/SCX8-KWGM] (describing how 40% of crypto assets sold in the ICO were reserved for the crypto assets' founders).

76. *See* BlockOne, Securities Act Release No. 10714, 2019 WL 4793292 (Sept. 30, 2019) (crypto asset's initial offering period spanned June 26, 2017, to June 1, 2018; crypto asset began trading on crypto exchanges as early as July 1, 2017).

77. *See, e.g.*, Olga Kharif, *Crypto Coin Sales Stage Revival After Bursting of ICO Bubble*, BLOOMBERG (Apr. 10, 2019, 8:30 PM), https://www.bloomberg.com/news/articles/2019-04-10/crypto-coin-sales-stage-revival-after-bursting-of-ico-bubble#xj4y7vzkg [https://perma.cc/G6ZY-KNX3]. For a summary of the ICO process and detailed summary statistics of more than 1,500 ICOs, see Sabrina T. Howell, Marina Niessner & David Yermack, *Initial Coin Offerings: Financing Growth with Cryptocurrency Token Sales*, 33 REV. FIN. STUD. 3925, 3930–45 (2020) (describing the ICO market and providing detailed summary statistics of a sample of more than 1,500 ICOs). Some more recent offering methods include Initial Exchange Offerings ("IEOs") and Initial DEX Offerings ("IDOs"), both of which are initial offerings conducted on crypto exchanges. *See, e.g.*, *Initial Exchange Offerings (IEOs) — Investor Alert*, SEC (Jan. 14, 2020), https://www.sec.gov/oiea/investor-alerts-and-bulletins/ia_initialexchangeofferings [https://perma.cc/TJ6W-2YW2] (discussing IEOs); *What Is an IDO (Initial DEX Offering)?*, BINANCE ACAD. (Feb. 14, 2022), https://academy.binance.com/en/articles/what-is-an-ido-initial-dex-offering [https://perma.cc/C2J6-TVTT] (discussing IDOs).

78. For instance, sponsors may distribute crypto assets for free to certain holders for one or more purposes, such as to encourage engagement with a project or service associated with the crypto asset. This is ordinarily referred to as an airdrop. *See* Andrey Sergeenkov, *What Is a Crypto Airdrop?*, COINDESK (Jan. 18, 2022, 10:31 AM), https://www.coindesk.com/learn/

In relation to a crypto asset's development or initial offering, the asset's sponsors may prepare and publish one or more white papers describing the crypto asset and any applications associated with it.[79] In addition to a white paper, the sponsors may provide potential investors with additional information about the crypto asset in connection with its initial offering.[80]

Following its introduction to the market through an initial offering or other means, a crypto asset and its associated applications, if any, may undergo operational decentralization, in the sense that development, operation, management, and promotion of the crypto asset and its associated applications cease to be vested in a centralized group, such as the crypto asset's developers. At that time, those tasks are distributed to a wide group of stakeholders, such as the crypto asset's holders, developers of the crypto asset and its associated application, a centralized body involved in governance and promotion, and perhaps also the crypto asset's developers, who may continue to maintain some involvement in those tasks.

As an example, consider the crypto asset FIL and its associated application, Filecoin.[81] FIL and Filecoin were developed by Protocol Labs,[82] which conducted FIL's initial offering in 2017.[83] However, neither Filecoin nor FIL presently is managed by a centralized body, such as a board of directors or management team, as would be the case with a corporate entity. Instead, any individual can participate in Filecoin's

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what-is-a-crypto-airdrop [https://perma.cc/SG5J-VFF8]. Also, some crypto assets become available through a token migration or token swap, through which an existing crypto asset is transferred from one blockchain to another. *See, e.g.*, *Golem Token Migration*, GOLEM (Sept. 9, 2021, 9:05 AM), https://glm.golem.network [https://perma.cc/R229-TMP7] (describing the migration from GNT to GLM).

79. *See, e.g.*, *Tether: Fiat Currencies on the Bitcoin Blockchain*, GITHUB, https://github.com/Cryptorating/whitepapers/blob/master/Tether/TetherWhitePaper.pdf [https://perma.cc/EJ4W-4CFM]; *see also Cryptorating / whitepapers*, GITHUB, https://github.com/Cryptorating/whitepapers [https://perma.cc/7E2G-ZPHQ] (repository of white papers).

80. *See* Moran Ofir & Ido Sadeh, *ICO vs. IPO: Empirical Findings, Information Asymmetry, and the Appropriate Regulatory Framework*, 53 VAND. J. TRANSNAT'L L. 525, 562–66 (2020).

81. Filecoin is an innovative decentralized data storage network that allows users to access computing storage provided by others. *See* FILECOIN, https://filecoin.io [https://perma.cc/X5M6-L397]. A user who wants to store or retrieve data on Filecoin's network must use FIL. *See Store Data*, FILECOIN, https://docs.filecoin.io/get-started/store-and-retrieve/store-data [https://perma.cc/3655-RHKV]; *Retrieve Data*, FILECOIN, https://docs.filecoin.io/get-started/store-and-retrieve/retrieve-data [https://perma.cc/B9HW-SRY4].

82. *See* PROTOCOL LABS, https://protocol.ai/about [https://perma.cc/U4UR-2MDL]; PROTOCOL LABS, FILECOIN: A DECENTRALIZED STORAGE NETWORK 1 (2017), https://filecoin.io/filecoin.pdf [https://perma.cc/T56V-PCU7].

83. *See Filecoin Sale Completed*, PROTOCOL LABS (Sept. 13, 2017), https://protocol.ai/blog/filecoin-sale-completed [https://perma.cc/FS8W-HLHB].

governance by submitting a Filecoin Improvement Proposal.[84] Filecoin's many stakeholders, including FIL holders and Filecoin developers, then determine whether the proposal should be adopted.[85] At the same time, Protocol Labs maintains some involvement in Filecoin's development.[86] Additionally, as is the case with other crypto assets and their applications, a centralized body remains involved in aspects of Filecoin's development, management, and promotion.[87]

III. CRYPTO ASSET FRAUD AND INVESTOR REDRESS UNDER THE SECURITIES AND COMMODITIES LAWS

No matter a crypto asset's specific features, traders engaged in its secondary trading expose themselves to potential investment loss. Some losses will be market-generated, owing to the ordinary ups and downs of crypto asset prices, which at times can be extremely volatile. Traders who transact on crypto exchanges presumably anticipate and assume this inherent market risk, similar to how equity traders anticipate and assume the risk of fluctuating stock prices. But in addition to these market-generated losses, crypto asset traders risk significant investment losses through fraud in the form of false or misleading statements by the asset's sponsors or third parties.[88]

A. Fraud in Connection with Secondary Market Crypto Asset Trading

To take a simple motivating example, suppose the sponsors of an exchange-traded crypto asset falsely represent that an associated application will undergo a feature improvement. Suppose further that the misrepresentation causes the crypto asset's price to rise, because the

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84. *See Governance*, FILECOIN FOUND., https://fil.org/governance [https://perma.cc/JR9V-ECX7]; *Filecoin Improvement Protocol*, GITHUB, https://github.com/filecoin-project/FIPs/blob/master/README.md [https://perma.cc/M2Y7-G3E5].

85. *See Governance*, FILECOIN FOUND., *supra* note 84.

86. *See Sr. Software Engineer, Filecoin Virtual Machine (FVM)*, PROTOCOL LABS, https://boards.greenhouse.io/protocollabs/jobs/4621742004 [https://perma.cc/Q2RM-42SK] (job opening at Protocol Labs for a Filecoin software engineer).

87. *See About us*, PROTOCOL LABS, https://fil.org/about [https://perma.cc/ZF3L-TA9X] ("The Filecoin Foundation (FF) is an independent organization that facilitates governance of the Filecoin network, funds critical development projects, supports the growth of the Filecoin ecosystem, and advocates for Filecoin and the decentralized web.").

88. While this Article focuses on statement-based fraud, investors in secondary crypto asset markets also risk losses from sponsor or third-party fraudulent conduct, such as market manipulation and other deceptive schemes, *see, e.g.*, Complaint at 2–3, SEC v. Barksdale, No. 1:22-cv-1933 (S.D.N.Y. 2022) (SEC complaint against crypto asset sponsors alleging fraudulent manipulation and fraudulent misrepresentation), and theft in the form of hacking, *see, e.g.*, MacKenzie Sigalos, *Iranian Immigrant Lost $53,000 in Crypto Hack, Says He Faces Ruin if BitMart Doesn't Pay Him Back*, CNBC (Jan. 7, 2022, 6:16 PM), https://www.cnbc.com/2022/01/07/cryptocurrency-theft-bitmart-still-owes-victims-of-200-million-hack.html [https://perma.cc/KBA9-FM29].

misrepresentation is deemed credible by traders and causes them to update their valuation of the crypto asset. Traders who purchased the crypto asset at the elevated price will incur trading losses once the truth is revealed that the associated application will not undergo a feature improvement, causing the crypto asset's price to drop. The fraudulent statement need not have been made by the crypto asset's sponsors — false or misleading statements by third parties can also be the source of significant investor harm.[89] Whether the false or misleading statements were made by a third party or those affiliated with the subject crypto asset, intentionality is not a precondition to investor harm, and less culpable conduct is equally injurious to the crypto asset's traders.

Features of the crypto asset ecosystem make it a ripe arena for secondary market fraud. First, crypto asset traders often lack information that can be helpful in identifying false or misleading statements about the asset or an associated application. In contrast to the public offering of other assets such as stock, crypto asset offerings are almost never registered under federal securities law.[90] Crypto asset traders thus lack the benefit of the detailed disclosures required by the Securities Act with which they could better evaluate the accuracy of representations made about the crypto asset or an associated network.[91] Furthermore, when crypto asset sponsors do voluntarily disclose some information relevant to traders' investment decisions, that information is thin and

89. For instance, in September 2021, a third party issued a press release falsely attributed to Walmart, misrepresenting that Walmart would start accepting the crypto asset Litecoin. *See* Tanaya Macheel, *Walmart Says Crypto Payments Announcement Is Fake. Litecoin Tumbles After Spike*, CNBC (Sept. 14, 2021, 7:03 AM), https://www.cnbc.com/2021/09/13/walmart-to-accept-payments-with-cryptocurrencies-using-litecoin.html [https://perma.cc/28UA-E3KK]; *Walmart Statement in Response to Fake Litecoin Press Release*, WALMART (Sept. 13, 2021), https://corporate.walmart.com/newsroom/2021/09/13/walmart-statement-in-response-to-fake-litecoin-press-release# [https://perma.cc/NT44-JWVY]. In the immediate period after the misrepresentation, Litecoin's price increased by approximately 30%, Matthew Goldstein, Ephrat Livni & Michael Corkery, *Phony Walmart News Release Signals a Crypto Pump-and-Dump Scheme*, N.Y. TIMES (Sept. 27, 2021), https://www.nytimes.com/2021/09/13/business/litecoin-walmart-crypto-hoax.html [https://perma.cc/LS2W-ZZBN], though an event study is necessary to determine how much of that price increase can be attributed to the false statement as opposed to other factors, *see infra* Section V.A.

90. The Securities Act mandates registration of a non-exempt offering of securities, *see* 15 U.S.C. § 77e, a process that obligates the issuer to disclose detailed information about itself and the offering. *See, e.g.*, SEC, FORM S-1: REGISTRATION STATEMENT UNDER THE SECURITIES ACT OF 1933. Sponsors do not register non-exempt crypto asset offerings because they usually consider the offered assets to be outside of the definitional perimeter of a "security" and therefore not subject to the Securities Act registration requirement. *See, e.g.*, SEC v. Kik Interactive Inc., 492 F. Supp. 3d 169, 177–82 (S.D.N.Y. 2020) (evaluating crypto asset sponsor's argument that the crypto assets it offered without registration were not securities); *see also infra* Section III.B. There are limited examples of registered offerings of crypto assets. For instance, INX Ltd. conducted a registered offering of its INX crypto asset. *See* INX Ltd., Registration Statement (Form F-1) (Aug. 19, 2019).

91. Furthermore, issuers of publicly tradeable stock furnish the market with periodic disclosures relevant to investors' trading decisions because of the periodic reporting requirements imposed on them by the Securities Exchange Act. *See* 15 U.S.C. § 78m (2018). Crypto asset issuers and sponsors do not provide those periodic disclosures or any that are analogous.

likely not understandable to the average investor. White papers usually are highly technical documents and do not contain the type of information called for by a registration statement.[92] As Brummer, Kiviat, and Massari have observed, white papers "fall well short of providing the full array of disclosures most investors would need in order to make sound investment decisions."[93]

Additional aspects of the crypto asset ecosystem facilitate crypto asset trading fraud. Because of the operational decentralization discussed in the previous Part,[94] the management and operation of a traded crypto asset may be distributed to an expansive group of stakeholders. In this case, if third parties make misrepresentations or misleading statements about a crypto asset, there may not be a centralized body that is able, or incentivized, to quickly or effectively correct the false or misleading statement.[95] Relatedly, a crypto asset's stakeholders may not include a group analogous to an investor relations department found in issuers of publicly traded stock that aid issuers in providing the market with investment-relevant information.

Crypto asset investors also routinely turn to sources of information such as discussion sites like Reddit, messaging and chat apps like Discord and Telegram, and social media sites like Facebook and Twitter for information about listed and to-be-issued crypto assets.[96] These sources are important propagators of information generally, whether

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92. *See, e.g.*, FILECOIN: A DECENTRALIZED STORAGE NETWORK, PROTOCOL LABS (2017), https://filecoin.io/filecoin.pdf [https://perma.cc/CD2C-BW6Y].

93. Chris Brummer, Trevor I. Kiviat & Jai Massari, *What Should Be Disclosed in an Initial Coin Offering?*, *in* CRYPTOASSETS: LEGAL, REGULATORY, AND MONETARY PERSPECTIVES 157, 169 (Chris Brummer ed., 2019); *see also* Shaanan Cohney, David Hoffman, Jeremy Sklaroff & David Wishnick, *Coin-Operated Capitalism*, 119 COLUM. L. REV. 591, 597–98 (2019) (analyzing the fifty top-grossing ICOs of 2017 and concluding that the content of the ICOs' disclosures often did not align with the ICOs' software code); Dirk A. Zetzsche, Ross P. Buckley, Douglas W. Arner & Linus Föhr, *The ICO Gold Rush: It's a Scam, It's a Bubble, It's a Super Challenge for Regulators*, 60 HARV. INT'L L.J. 267, 267 (2019) (reviewing over 1,000 ICO white papers and concluding that most included inadequate disclosures).

94. *See supra* Section II.C.

95. The presence of a centralized body does not ensure that false or misleading statements about a crypto asset will be effectively corrected. For example, in the Walmart-Litecoin example discussed above, *see supra* note 89, the Litecoin Foundation, an organization that promotes the crypto asset, itself shared the false announcement via Twitter. *See* LTC Foundation (@LTCFoundation), TWITTER (Sept. 13, 2021, 2:34 PM), https://twitter.com/LTCFoundation/status/1437484869664137221 [https://perma.cc/WP2Z-NQ7Y]. That social media post further amplified investor losses as some investors had seemingly purchased Litecoin on the basis of it. *See* Cem Öntaş (@CosmicRelax), TWITTER (Sept. 13, 2021, 8:15 PM), https://twitter.com/CosmicRelax/status/1437570550356799491 [https://perma.cc/8FGS-CYBA]. Major news outlets also were fooled into disseminating the false information. *See* Clint Rainey, *How Did a Fake Walmart Press Release About Litecoin Get on GlobeNewswire?*, FAST CO. (Sept. 13, 2021), https://www.fastcompany.com/90675708/how-did-a-fake-walmart-press-release-about-litecoin-get-on-globenewswire [https://perma.cc/R7SV-XFBP].

96. For instance, the single subreddit "Cryptocurrency" currently has over five million subscribers and just by itself generates thousands of Reddit comments daily. *See* R/CRYPTOCURRENCY, https://www.reddit.com/r/CryptoCurrency [https://perma.cc/44YR-FNUZ].

that information be accurate, false, or misleading.[97] Some crypto asset traders also may lack significant prior trading experience, which may impede those traders' ability to readily identify false or misleading information.

Indeed, fraud has been a part of the crypto ecosystem from the very beginning. Starting in the second half of 2017 and continuing through 2019, crypto asset initial offerings exploded.[98] In 2018 alone, sponsors raised more than $14 billion through ICOs.[99] Investors' readiness to invest in crypto asset initial offerings incentivized unscrupulous sponsors to conduct fraudulent offerings that resulted in investors sustaining significant economic losses.[100] One recent study, for example, estimated that as many as 40% of ICOs on the five leading ICO listing websites occurring between August 2018 and August 2019 were scams.[101]

In those fraudulent offerings, crypto asset sponsors misrepresented or misled investors about investment-relevant features of the crypto asset or the offering, such as how the raised funds would be used,[102] the extent of the development of the associated network or application,[103] or the financial gain that crypto asset investors could expect.[104] In response, the SEC began directing and continues to direct significant enforcement resources targeting fraudulent crypto asset initial offerings.[105] That enforcement priority is supported by academic work

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97. *See, e.g.*, Complaint at 9, SEC v. AriseBank, No. 3:18-cv-186-M, 2018 WL 10419828 (N.D. Tex. Mar. 9, 2018) (alleging misrepresentations relating to the initial offering of a crypto asset made on sponsor's Facebook page); *see also* Caitlin Reilly, *Gensler: SEC's Social Media Focus Is on Fraud, Not Collusion*, ROLL CALL (May 6, 2021, 4:59 PM), https://rollcall.com/2021/05/06/gensler-secs-social-media-focus-is-on-fraud-not-collusion [https://perma.cc/VMG8-9WNF].

98. *See, e.g.*, Cristiano Bellavitis, Christian Fisch & Johan Wiklund, *A Comprehensive Review of the Global Development of Initial Coin Offerings (ICOs) and Their Regulation*, 15 J. BUS. VENTURING INSIGHTS (2021), 3 fig.1 (depicting the number of ICOs occurring between Q3 2015 and Q2 2020).

99. *See* FROMBERGER & HAFFKE, *supra* note 6, at 3.

100. For discussion of some of the most well-known instances of fraud occurring in connection with initial crypto asset offerings, see Thomas Conlon & Richard J. McGee, *ICO Fraud and Regulation*, *in* UNDERSTANDING CRYPTOCURRENCY FRAUD: THE CHALLENGES AND HEADWINDS TO REGULATE DIGITAL CURRENCIES 43, 44–48 (Shaen Corbet ed., 2022).

101. *See* Kenny Phua, Bo Sang, Chishen Wei & Gloria Yang Yu, *Trust, but Verify: The Economics of Scams in Initial Coin Offerings*, ASIAN BUREAU FIN. & ECON. RSCH., May 2022, at 1, 5, https://www.abfer.org/component/edocman/?task=document.viewdoc&id=722&Itemid= [https://perma.cc/N64L-WVFS].

102. *See, e.g.*, Press Release 2021-22, *SEC Charges Three Individuals in Digital Asset Frauds* (Feb. 1, 2021), https://www.sec.gov/news/press-release/2021-22 [https://perma.cc/TJ6Z-T59D].

103. *See, e.g.*, Press Release 2020-12, *SEC Charges Convicted Criminal Who Conducted Fraudulent ICO Using a Fake Identity* (Jan. 17, 2020), https://www.sec.gov/news/press-release/2020-12 [https://perma.cc/QD5K-MERR].

104. *See, e.g.*, Press Release 2017-219, *SEC Emergency Action Halts ICO Scam* (Dec. 4, 2017), https://www.sec.gov/news/press-release/2017-219 [https://perma.cc/4HEN-NZCG].

105. *See, e.g.*, *supra* notes 102–04; *cf.* SIMONA MOLA, CORNERSTONE RSCH., SEC CRYPTOCURRENCY ENFORCEMENT: Q3 2013–Q4 2020 3 (2021), https://www.cornerstone.com/

showing that sponsors routinely disregarded promises they made regarding initial crypto asset offerings.[106]

Now that the scope of crypto asset transactions has expanded to encompass the secondary trading of crypto assets on crypto exchanges, the locus of fraud has concomitantly expanded as well. In addition to fraud connected to the initial offering of crypto assets, crypto asset traders are now also at risk of sponsor or third-party fraud in the context of secondary crypto asset transactions.

B. Trader Redress Under the Securities and Commodities Laws

Defrauded crypto asset traders may seek collective redress through a Rule 23(b)(3) class action, asserting claims under the securities or commodities laws, among others.[107] SEC Rule 10b-5 provides a potential mechanism for traders' recovery through its prohibition in subpart (b) against the making of materially false or misleading statements in connection with the purchase or sale of a security.[108] Voluminous case law and significant academic commentary have developed around Rule 10b-5, in large part because of the high volume of Rule 10b-5 class actions involving allegedly false or misleading statements made in connection with secondary stock transactions.

Defrauded crypto asset traders may also seek relief through CFTC Rule 180.1,[109] the commodities law analog to Rule 10b-5. The CFTC enacted Rule 180.1 in 2011 pursuant to Section 6(c)(1) of the Commodity Exchange Act ("CEA").[110] The CFTC expressly patterned Rule

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wp-content/uploads/2021/12/SEC-Cryptocurrency-Enforcement-Q3-2013-Q4-2020.pdf [https://perma.cc/Q9TM-ZT99] (SEC brought seventy-five enforcement actions involving crypto assets and of those seventy-five, thirty-nine contained an allegation of fraud). The SEC also dedicates significant enforcement resources to challenging unregistered crypto asset offerings. *See id.*

106. *See, e.g.*, Cohney et al., *supra* note 93, at 639 (comparing the content of white papers and other materials disclosed in connection with fifty initial crypto asset offerings with the software code for applications associated with those crypto assets, and finding that in many instances the code did not comport with what was disclosed).

107. Traders can litigate their claims individually, but in almost all cases the expected cost of litigation will significantly exceed its expected value.

108. *See* 17 C.F.R. § 240.10b-5 (2017). While subsection (b) is limited to the making of false or misleading statements, *see* Janus Capital Grp., Inc. v. First Derivative Traders, 564 U.S. 135, 142 (2011) (noting "the maker of a statement is the person or entity with ultimate authority over the statement" for purposes of subsection (b) of Rule 10b-5), deceptive conduct is addressed by subsections (a) and (c) of Rule 10b-5. Those two provisions, the scheme liability provisions, respectively prohibit "any device, scheme, or artifice to defraud" and "any act, practice, or course of business which operates or would operate as a fraud or deceit" in connection with the purchase or sale of a security. *See* 17 C.F.R. § 240.10b-5(a), (c). The SEC promulgated Rule 10b-5 pursuant to Section 10(b) of the Securities Exchange Act, 15 U.S.C. § 78j(b).

109. *See* 17 C.F.R. § 180.1 (2014).

110. *See* Prohibition on the Employment, or Attempted Employment, of Manipulative and Deceptive Devices and Prohibition on Price Manipulation, 76 Fed. Reg. 41398, 41399 (July 14, 2011). Congress added Section 6(c)(1) of the Commodity Exchange Act through the

180.1 after Rule 10b-5.[111] Like Rule 10b-5, Rule 180.1 prohibits, in part, the making of materially false or misleading statements[112] but only concerns certain transactions involving a commodity, such as contracts for the sale of a commodity.[113] Because of the newness of Rule 180.1, there is little case authority construing it, and little scholarly analysis of the rule relative to Rule 10b-5; however, as discussed below, courts routinely rely on Rule 10b-5 jurisprudence when evaluating issues pertinent to Rule 180.1.[114]

The particular features of the at-issue crypto asset will dictate whether defrauded traders can viably assert claims under Rule 10b-5 or Rule 180.1. The securities and commodities laws only reach transactions in securities or commodities, respectively, as those terms are statutorily defined. Accordingly, defrauded crypto asset traders will be able to bring a Rule 10b-5 claim only if the traded crypto asset falls within the definitional scope of a security and a Rule 180.1 claim only if the asset falls within the definitional scope of a commodity.

To determine whether the at-issue crypto asset is a security for Rule 10b-5 purposes, the relevant question is whether it constitutes an investment contract under *SEC v. W.J. Howey Co.*[115] Determinations in litigated matters, which to date are limited and have involved crypto assets at the initial offering stage, have largely concluded that the at-

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Dodd-Frank Act and modeled it on Section 10(b) of the Securities Exchange Act. *See* COMMODITY FUTURES TRADING COMM'N OFF. OF PUB. AFFS., PROPOSED RULE REGARDING PROHIBITION OF MARKET MANIPULATION 1 (Jan. 2011), https://www.cftc.gov/sites/default/files/idc/groups/public/@newsroom/documents/file/antimanipulation_factsheet.pdf [https://perma.cc/KA88-RXFG] ("[Section 6(c)(1)] is patterned after section 10b of the Securities Exchange Act of 1934."). Like Section 10(b) of the Securities Exchange Act, *see supra* note 108, Section 6(c)(1) of the CEA prohibits any "manipulative or deceptive device or contrivance." *See* 7 U.S.C. § 9(1).

111. *See* COMMODITY FUTURES TRADING COMM'N OFF. OF PUB. AFFS., ANTI-MANIPULATION AND ANTI-FRAUD FINAL RULES 1 (July 2011), https://www.cftc.gov/sites/default/files/idc/groups/public/@newsroom/documents/file/amaf_factsheet_final.pdf [https://perma.cc/X8WN-7GFJ] ("Rule 180.1 . . . is modeled on Securities and Exchange Commission Rule 10b-5 . . . .").

112. *See* 17 C.F.R. § 180.1(a)(2) (2014). Rule 180.1 also addresses statement-based fraud through a prohibition on the delivery of false or misleading reports. *See id.* § 180.1(a)(4). Additionally, like Rule 10b-5, Rule 180.1 also prohibits deceptive conduct. *See id.* § 180.1(a)(1), (3).

113. *See id.* § 180.1(a) (prohibiting conduct occurring "in connection with any swap, or contract of sale of any commodity in interstate commerce, or contract for future delivery on or subject to the rules of any registered entity").

114. *See infra* Section IV.E.

115. 328 U.S. 293 (1946). "Investment contract" is one of the enumerated categories in the Securities Exchange Act's definition of the term security, 15 U.S.C. § 78c(a)(10) (definition of "security"). Under *Howey*, a transaction is an investment contract if the following factors are met: (1) there was an investment of money; (2) in a common enterprise; (3) with the expectation of profit; (4) to be derived from the efforts of others. *See Howey*, 328 U.S. at 298–99. The Securities Exchange Act expressly excludes currencies from the definition of a security. *See* 15 U.S.C. § 78c(a)(10) ("The term 'security' . . . shall not include currency . . . .").

issue crypto asset was an investment contract, but not uniformly so.[116] The SEC has brought dozens of enforcement proceedings based on the SEC's understanding that the offered crypto asset was an investment contract and therefore a security.[117]

For purposes of Rule 180.1, the pertinent definitional issue is whether the crypto asset falls within the Commodity Exchange Act's definition of a commodity.[118] The CFTC has taken the position for some years that "virtual currencies," which the CFTC defines broadly as "digital representation[s] of value that function[] as a medium of exchange, a unit of account, or a store of value,"[119] are commodities.[120] The CFTC has brought a series of enforcement proceedings based on

116. *Compare* SEC v. LBRY, Inc., No. 21-cv-260-PB, 2022 WL 16744741, at *7–8 (D.N.H. Nov. 7, 2022) (determining on a motion for summary judgment that the at-issue crypto asset was an investment contract), *and* SEC v. Kik Interactive Inc., 492 F. Supp. 3d 169, 177–78 (S.D.N.Y. 2020) (same), *and* SEC v. Telegram Grp. Inc., 448 F. Supp. 3d 352, 381 (S.D.N.Y. Mar. 24, 2020) (finding on a motion for preliminary injunction that the SEC had shown a substantial likelihood of success in proving that the crypto asset at issue was an investment contract), *with* Amy Jane Longo, Mark Cianci & Helin Azizoglu, *Federal Court Orders New Trial to Consider Whether Cryptocurrency Constitutes a "Security,"* ROPES & GRAY (July 7, 2022), https://www.ropesgray.com/en/newsroom/alerts/2022/July/Federal-Court-Orders-New-Trial-to-Consider-Whether-Cryptocurrency-Constitutes-a-Security#:~:text=the%20first%20time.-,Federal%20Court%20Orders [https://perma.cc/42L9-FN65] (discussing *Audet v. Frazer*, in which the jury concluded that the four crypto assets at issue were not investment contracts and the court's subsequent ruling that granted a new trial to reconsider that definitional determination as to one of the four crypto assets); *see also* SEC v. NAC Found., LLC, 512 F. Supp. 3d 988, 997 (N.D. Cal. Jan. 8, 2021) (rejecting on a 12(b)(6) motion to dismiss defendants' argument that the crypto asset at issue was not an investment contract); Balestra v. ATBCOIN LLC, 380 F. Supp. 3d 340, 357 (S.D.N.Y. Mar. 31, 2019) (similar); United States v. Zaslavskiy, No. 17-cr-647, 2018 WL 4346339, at *9 (E.D.N.Y. Sept. 11, 2018) (rejecting defendant's argument — on a motion to dismiss an indictment — that the crypto asset at issue was not an investment contract, and also rejecting defendant's argument that the at-issue crypto asset was a currency and therefore not within the statutory definition of a security).

117. *See, e.g.*, SIMONA MOLA, SEC CRYPTOCURRENCY ENFORCEMENT: 2021 UPDATE 10 (2021), https://www.cornerstone.com/wp-content/uploads/2022/01/SEC-Cryptocurrency-Enforcement-2021-Update.pdf [https://perma.cc/Z5ZP-T549] (finding that from 2013 to 2021, SEC brought seventy-one crypto asset enforcement actions alleging an unregistered securities offering); James J. Park & Howard H. Park, *Regulation by Selective Enforcement: The SEC and Initial Coin Offerings*, 61 WASH. U. J.L. & POL'Y 99, 110–22 (2020) (discussing key SEC enforcement actions alleging an unregistered securities offering). The SEC also has issued guidance on how it analyzes whether a crypto asset meets the definitional requirement of a security. *See Framework for "Investment Contract" Analysis of Digital Assets*, *supra* note 15; Report of Investigation Pursuant to Section 21(a) of the Securities Exchange Act of 1934: The DAO, Exchange Act Release No. 81207 (July 25, 2017), https://www.sec.gov/litigation/investreport/34-81207.pdf [https://perma.cc/9C4T-6XSH].

118. 7 U.S.C. § 1a(9). The CEA's broad definition of a commodity encompasses a diverse set of agricultural products and, as relevant to crypto assets, "all other goods and articles . . . and all services, rights, and interests . . . in which contracts for future delivery are presently or in the future dealt in." *Id.*

119. *See Customer Advisory: Understanding the Risks of Virtual Currency Trading*, CFTC, https://www.cftc.gov/LearnAndProtect/AdvisoriesAndArticles/understand_risks_of_virtual_currency.html [https://perma.cc/ES3Z-36XS].

120. *See, e.g.*, *An Introduction to Virtual Currency*, CFTC, https://www.cftc.gov/sites/default/files/2019-12/oceo_aivc0218.pdf [https://perma.cc/DDB6-5KSY].

that understanding.[121] Additionally, in the two decisions that to date have addressed the issue, the courts concluded that at-issue crypto assets were commodities for purposes of Rule 180.1.[122]

Analysis of the circumstances under which a crypto asset is or is not a security or commodity is outside the scope of this Article. Interested readers instead can turn to the literature, which contains extensive analysis of the salient issues.[123] There is also the prospect of future

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121. *See, e.g.*, *In re* Coinflip, Inc., CFTC No. 15-29, 2015 WL 5535736, at 2 (Sept. 17, 2015) (consent order) ("Bitcoin and other virtual currencies are encompassed in the definition and properly defined as commodities"); *In re* BFXNA Inc., CFTC No. 16-19, 2016 WL 3137612, at 5–6 (June 2, 2016) (consent order) ("[V]irtual currencies are encompassed in the [Act's] definition and properly defined as commodities"); *In re* Kim, CFTC No. 19-02, 2018 WL 5993718, at 3 (Oct. 29, 2018) (consent order) ("Virtual currencies such as Bitcoin and Litecoin are encompassed in the definition of 'commodity'").

122. *See* CFTC v. My Big Coin Pay, Inc., 334 F. Supp. 3d 492, 498–500 (D. Mass. Sept. 26, 2018); CFTC v. McDonnell, 287 F. Supp. 3d 213, 217 (E.D.N.Y. Mar. 6, 2018). In *CFTC v. My Big Coin Pay*, the CFTC asserted a Rule 180.1 claim against the sponsors of the crypto asset My Big Coin ("MBC"), alleging that the sponsors had committed fraud in their solicitation of purchasers of the crypto asset. *My Big Coin Pay, Inc.*, 334 F. Supp. 3d at 492. On a motion to dismiss, the sponsors argued that MBC was not within the scope of the CEA's definition of commodity because no futures contracts on MBC were available. *Id.* at 496. The court rejected the sponsors' argument and concluded that a crypto asset is a commodity if that crypto asset is presently the subject of futures trading or, if not, is sufficiently similar to another crypto asset that is presently the subject of futures trading. *Id.* at 497–98. The court determined that because MBC was alleged to be sufficiently similar to bitcoin and because bitcoin futures were presently available, MBC was a commodity, despite the fact that there was no futures trading of MBC. *Id.* at 498. Under this reasoning, a crypto asset not presently the subject of futures trading could nonetheless fall within the definitional scope of a commodity. The relevant consideration would be whether the at-issue crypto asset is sufficiently similar to bitcoin (or any other crypto asset that at the time is the subject of futures trading).

In the second case, *CFTC v. McDonnell*, the CFTC brought suit challenging a deceptive scheme in which defendants represented that they would provide customers advice about trading crypto assets, including bitcoin and Litecoin, and would undertake crypto asset purchases and trading on behalf of those customers. *See McDonnell*, 287 F. Supp. 3d at 216–18; McDonnell Complaint ¶ 1, CFTC v. McDonnell, 287 F. Supp. 3d 213 (E.D.N.Y. Mar. 6, 2018) (No. 1:18-cv-361). In granting the CFTC's motion for preliminary injunction, the *McDonnell* court ruled that the crypto assets at issue were commodities under the CEA. *McDonnell*, 287 F. Supp. 3d at 224. While the court based its ruling on the CEA's definition of a commodity, the decision makes no mention whether the crypto assets at issue were the subject of futures trading, *see id.* at 228, and instead just concludes that the crypto assets fell "well-within . . . the CEA's definition of 'commodities' as 'all other goods and articles . . . in which contracts for future delivery are presently or in the future dealt in.'" *Id.* The court also grounded its determination that the crypto assets at issue were commodities in the ordinary meaning of the term commodity. *Id.* According to the *McDonnell* court, "[c]ommodities are generally defined as 'goods sold in the market with a quality and value uniform throughout the world.'" *Id.* at 224 (quoting Mitchell Prentis, Note, *Digital Metal: Regulating Bitcoin as a Commodity*, 66 CASE W. RSRV. L. REV. 609, 626 (2015)). This articulation also admits within the definition of a commodity a broad range of crypto assets, including crypto assets that are not presently the subject of futures trading.

123. For a sample of the literature addressing the securities law definitional question, see, for example, James J. Park, *When Are Tokens Securities? Some Questions from the Perplexed*, LOWELL MILKEN INST. POL. REP. (Dec. 2018), https://lowellmilkeninstitute.law.ucla.edu/wp-content/uploads/2019/06/When-are-Tokens-Securities.pdf [https://perma.cc/Z8XF-324J]; Jonathan Rohr & Aaron Wright, *Blockchain-Based Token Sales, Initial Coin Offerings, and the Democratization of Public Capital Markets*, 70 HASTINGS L.J. 463, 488–502 (2019);

legislation modifying the definitional scope of the securities and commodities laws as they relate to crypto assets.[124] The remainder of the Article assumes that the at-issue crypto asset is within the definitional perimeter of a security or commodity, as those terms are now or subsequently may be defined.

IV. FRAUD ON THE MARKET AND ITS APPLICABILITY TO CRYPTO ASSET FRAUD CLAIMS

Despite sustaining financial injury from sponsor or third-party fraud, doctrinal obstacles may prevent defrauded crypto asset traders from recovering their fraud-related losses. Reliance is a leading doctrinal impediment.[125] Because reliance is an element of both a private

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M. Todd Henderson & Max Raskin, *A Regulatory Classification of Digital Assets: Toward an Operational* Howey *Test for Cryptocurrencies, ICOs, and Other Digital Assets*, 2019 COLUM. BUS. L. REV. 443, 455; J.S. Nelson, *Cryptocommunity Currencies*, 105 CORNELL L. REV. 909, 939–53 (2020); Petal Walker, *The Legend of the "Secumodity": Can the Same Coin Be a Security or Commodity at Different Points in Its Evolution?*, J.L. INV. & RISK MGMT. PRODS.: 39 FUTURES & DERIVATIVES L. REP., 2019, at 1, 1; CAROL R. GOFORTH & YULIYA GUSEVA, REGULATION OF CRYPTOASSETS 263–327 (2d ed. 2022).

To a much lesser degree, there also have been scholarly inquiries into the circumstances under which a crypto asset will satisfy the Commodity Exchange Act's definition of a commodity. For a sample of that analysis, see, for example, James Michael Blakemore, *New Things Under the Sun: How the CFTC is Using Virtual Currencies to Expand its Jurisdiction*, 73 ARK. L. REV. 205, 224 (2020); Prentis, *supra* note 122, at 621–23; Walker, *supra*; GOFORTH & GUSEVA, *supra*, at 484–528.

One important definitional issue is whether the operational decentralization (discussed in Section II.C) can cause a crypto asset that is an investment contract to no longer be an investment contract and therefore fall outside the definitional scope of a security. That proposition is ordinarily attributed to a 2018 speech by Bill Hinman, former director of the SEC's Division of Corporation Finance, *see* William Hinman, Dir., SEC Div. of Corp. Fin., Digital Asset Transactions: When *Howey* Met *Gary (Plastic)* (June 14, 2018), https://www.sec.gov/news/speech/speech-hinman-061418 [https://perma.cc/SNX7-XWEY], and has been the subject of academic inquiry. *See, e.g.*, Park & Park, *supra* note 117; Henderson & Raskin, *supra*; Nelson, *supra*. A related, though distinct, definitional question is whether a crypto asset can be a security during the early stages of its lifecycle and then a commodity at later stages. For some discussion of this issue, see, for example, Walker, *supra*.

124. *See, e.g.*, Joseph A. Castelluccio et al., *The Lummis-Gillibrand Responsible Financial Innovation Act: What to Know*, MAYER BROWN (June 21, 2022), https://www.mayerbrown.com/en/perspectives-events/publications/2022/06/the-lummisgillibrand-responsible-financial-innovation-act-what-to-know [https://perma.cc/5AQ7-2BR5] (discussing S. 4356, the Responsible Financial Innovation Act); Chu Chen, *Digital Commodities Consumer Protection Act of 2022: A Controversial Effort Caught in the Crossfire of the FTX Collapse*, JOLT DIGEST (Dec. 12, 2022), https://jolt.law.harvard.edu/digest/digital-commodities-consumer-protection-act-of-2022-a-controversial-effort-caught-in-the-crossfire-of-the-ftx-collapse-1# [https://perma.cc/T3K6-XAQP] (discussing S. 4760, the Digital Commodities Consumer Protection Act of 2022).

125. Other doctrinal considerations may also prevent defrauded crypto asset investors from recovering. One important issue relates to the extraterritorial reach of the federal securities laws. Under *Morrison*, the federal securities laws apply only to "transactions in securities listed on domestic exchanges" and "domestic transactions in other securities." Morrison v. Nat'l Austl. Bank, 561 U.S. 247, 267 (2010). Whether the crypto asset transactions that form the basis of traders' Rule 10b-5 claim satisfies *Morrison*'s rule of extraterritoriality will

Rule 10b-5[126] and a private Rule 180.1[127] claim, defrauded crypto asset traders must demonstrate they were aware of and traded in response to the sponsors' or third party's materially false or misleading statement.[128] In a class action, this would necessitate an individualized inquiry into the nature of each trader's reliance, with an assessment of trader-specific issues such as how, when, and whether each trader heard the false or misleading statement; how each responded to it, if at all; and whether the trader's reliance was justified.[129] Because of this individualized reliance inquiry, individual issues will predominate common ones, thus precluding satisfaction of Federal Rule of Civil

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depend on the nature of the crypto asset transactions and the crypto exchange or exchanges on which those transactions occurred. *Compare In re* Tezos Sec. Litig., No. 17-cv-06779, 2018 WL 4293341, at *8 (N.D. Cal. Aug. 7, 2018) (at-issue crypto asset transactions satisfied *Morrison*), *with* Anderson v. Binance, No. 1:20-cv-2803, 2022 WL 976824, at *4 (S.D.N.Y. Mar. 31, 2022) (at-issue crypto asset transactions failed to satisfy *Morrison*); Barron v. Helbiz Inc., No. 20-CV-4703, 2021 WL 229609, at *5 (S.D.N.Y. Jan. 22, 2021), *vacated and remanded*, No. 21-278, 2021, WL 4519887 (2d Cir. Oct. 4, 2021) (same); *see also* Williams v. Block One, No. 20-cv-2809, Docket No. 146, at *7–8 (S.D.N.Y. Aug. 15, 2022) (mem.) (denying settlement of a crypto asset securities class action based on extraterritoriality considerations).

Some scholars have argued for a further narrowing of the extraterritorial reach of Rule 10b-5 in the stock context. *See* Merritt B. Fox, *Securities Class Actions Against Foreign Issuers,* 64 STAN. L. REV. 1173, 1182–85 (2012) (arguing that class action Rule 10b-5 liability based on fraud on the market should not be imposed on any genuinely foreign issuer). Analysis of whether the extraterritorial reach of private Rule 10b-5 claims should be broadened or narrowed in the crypto asset context awaits future work.

126. *See* Basic Inc. v. Levinson, 485 U.S. 224, 243 (1988). Some courts have concluded that the reliance requirement is weakened in a Rule 10b-5 private claim for injunctive relief, rather than damages. *See, e.g.*, Britt v. Cyril Bath Co., 417 F.2d 433, 436 (6th Cir. 1969). For a history of the reliance requirement in Rule 10b-5 cases, see Jill E. Fisch, *The Trouble with* Basic*: Price Distortion After* Halliburton, 90 WASH. U. L. REV. 895, 900–15 (2013).

127. *See, e.g.*, Ploss v. Kraft Foods Grp., Inc., 197 F. Supp. 3d 1037, 1068 (N.D. Ill. June 27, 2016) ("In addition to a material misrepresentation or omission, a fraud claim also requires reliance, causation, and loss."); Jing v. Sun, No. CV 21-2350, 2022 WL 1505950, at *16 (E.D.N.Y. Jan. 4, 2022) ("[P]rivate plaintiffs . . . must show not only false statements, but also reliance on such statements."). Reliance is not an element of a Rule 10b-5 claim brought by the SEC, *see* Lorenzo v. SEC, 139 S. Ct. 1094, 1104 (2019), or an element of a Rule 180.1 claim asserted by the CFTC, *see* CFTC v. Mintco LLC, No. 15-cv-61960, 2016 WL 3944101, at *7 (S.D. Fla. May 16, 2016).

128. *See* Erica P. John Fund, Inc. v. Halliburton Co., 563 U.S. 804, 810 (2011) ("The traditional (and most direct) way a plaintiff can demonstrate reliance is by showing that [they were] aware of a company's statement and engaged in a relevant transaction — *e.g.*, purchasing common stock — based on that specific misrepresentation. In that situation, the plaintiff plainly would have relied on the company's deceptive conduct."). As with claims based on the making of deceptive statements, reliance is also an element of private fraud claims based on deceptive conduct asserted under Section 10(b) of the Exchange Act or Section 6(c)(1) of the CEA. *See, e.g.*, Stoneridge Inv. Partners, LLC v. Sci.-Atlanta, Inc., 552 U.S. 148, 159 (2008) ("Reliance by the plaintiff upon the defendant's deceptive acts is an essential element of the § 10(b) private cause of action."); *cf. Ploss*, 197 F. Supp. 3d at 1059 n.11 (determining that plaintiffs had adequately alleged reliance with respect to their Section 6(c)(1) claim based on deceptive conduct).

129. *See, e.g.*, Wright v. Nat'l Warranty Co., L.P., 953 F.2d 256, 261–62 (6th Cir. 1992) (reliance must be justifiable).

Procedure 23(b)(3)'s predominance requirement.[130] Equity traders in Rule 10b-5 class actions face the same doctrinal obstacle, and courts have acknowledged for decades that because an inquiry into plaintiffs' reliance would cause individual issues to predominate common ones, Rule 10b-5's reliance requirement serves to prevent certification of a Rule 23(b)(3) class action.[131]

Fraud on the market opens a path to class certification. If plaintiffs establish the doctrine's elements, they are entitled to a rebuttable presumption that they each relied on the false or misleading statement at issue.[132] Once unburdened from the need to establish reliance, plaintiffs can certify their class where individual issues of reliance would otherwise dominate common issues. Fraud on the market is essential to the private enforcement of Rule 10b-5.[133]

While fraud on the market finds its genesis in statement-based Rule 10b-5 class actions involving the secondary trading of stock,[134] and while the vast majority of fraud on the market cases are stock-based class actions,[135] the particular type of asset at issue itself is irrelevant to the doctrine's analytical underpinnings, as discussed below. Instead, fraud on the market rests on the manner in which the affected transactions occurred and the informational content of prices.[136] The doctrine

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130. *See* FED. R. CIV. P. 23(b)(3) (requiring, inter alia, that common questions of law or fact predominate individual issues).

131. *See* Fisch, *supra* note 126, at 900 ("From the earliest cases addressing the implied private right of action under section 10(b) of the Securities Exchange Act and SEC Rule 10b-5, the lower courts recognized that it was impractical to impose a reliance requirement in federal securities fraud litigation.").

132. Fraud on the market is not limited to class actions and also is available to any individual Rule 10b-5 plaintiff. *See* Amgen Inc. v. Conn. Ret. Plans & Tr. Funds, 568 U.S. 455, 462 (2013). Further, while fraud on the market is ordinarily used in Rule 10b-5 claims predicated on statement-based fraud, in certain circumstances the doctrine also may apply in scheme-based claims brought under Rule 10b-5(a) or (c). *See infra* note 174.

133. *See Amgen*, 568 U.S. at 467 ("[W]ithout the fraud-on-the-market theory, the element of reliance cannot be proved on a classwide basis through evidence common to the class."). Some scholars have argued or suggested that the reliance requirement should be read out of Rule 10b-5, which would obviate the need for fraud on the market to be a facilitator of Rule 10b-5 class actions. *See, e.g.*, Daniel R. Fischel, *Use of Modern Finance Theory in Securities Fraud Cases Involving Actively Traded Securities*, 38 BUS. LAW. 1, 11 (1982); Fisch, *supra* note 126, at 913–14; *see also* Charles R. Korsmo, *Market Efficiency and Fraud on the Market: The Danger of* Halliburton, 18 LEWIS & CLARK L. REV. 827, 868–70 (2014) (providing numerical examples supporting the proposition that while reliance serves a valuable doctrinal role in face-to-face fraud cases, it is unnecessary in fraud cases involving market-traded securities). Yet other scholars have argued instead that private Rule 10b-5 plaintiffs seeking damages should be required to directly show reliance. *See, e.g.*, Joseph A. Grundfest, *Damages and Reliance Under Section 10(b) of the Exchange Act*, 69 BUS. LAW. 307, 307 (2014).

134. *See* Basic Inc. v. Levinson, 485 U.S. 224, 245 (1988).

135. More precisely, the doctrine developed through statement-based fraud cases involving secondary transactions of common stock occurring on an exchange. As discussed below, the doctrine has also been applied in Rule 10b-5 cases involving securities other than stock and in cases involving stock trading on venues other than an exchange. *See infra* notes 210–12 and accompanying text.

136. *See infra* Section IV.C.

is based on the supposition that the transactions at issue occurred in a market with an informationally valuable price, in that the asset's price sufficiently reflects material, public information, as well as the supposition that traders rely on the integrity of market prices.[137]

The Supreme Court first acknowledged fraud on the market in *Basic v. Levinson*,[138] but it did not clearly specify the nature of price responsiveness that motivates the doctrine. As discussed below, the Court ameliorated that uncertainty in *Halliburton II*, when it explained that fraud on the market is grounded in only a generalized notion of price efficiency.[139]

The discussion below dedicates some attention to *Basic* and *Halliburton II* because many courts, including courts after *Halliburton II*, as well as many litigants and their experts, continue to articulate fraud on the market as being based on semi-strong efficient markets. That notion of efficiency is drawn from the financial economics literature and is more exacting than the generalized notion of efficiency expressed by the Court in *Halliburton II*. An elucidation of the proper foundation of fraud on the market is necessary because there are statistical studies indicating that, at least currently, crypto asset prices as a general matter are not semi-strong efficient,[140] just as there are empirical studies yielding findings inconsistent with the semi-strong efficiency of stock prices.[141] Thus, if courts were to assess the viability of fraud on the market for crypto asset transactions by interrogating whether crypto asset prices are semi-strong efficient, they most likely would conclude, incorrectly, that the doctrine is unavailable to that asset class.

As discussed below, the prices of exchange-traded crypto assets, like stock prices, are generally efficient in the manner doctrinally required. It is also reasonable to assume that crypto asset traders rely on the integrity of crypto asset prices in the doctrinally relevant manner. As such, fraud on the market is available to traders of exchange-traded crypto assets in connection with Rule 10b-5 claims and, by implication, to Rule 180.1 claims. The doctrine is available to traders regardless of whether the materially false or misleading statements were made by the crypto asset's sponsors or third parties.[142]

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137. *See id.*

138. *Basic*, 485 U.S. at 241.

139. Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258, 271 (2014).

140. *See, e.g.*, David Vidal-Tomás & Ana Ibañez, *Semi-Strong Efficiency of Bitcoin*, 27 FIN. RSCH. LETTERS 259, 260 (2018); Ho-Jun Kang, Sang-Gun Lee & Soo-Yong Park, *Information Efficiency in the Cryptocurrency Market: The Efficient-Market Hypothesis*, 62 J. COMPUT. INFO. SYS. 622 (2021).

141. *See infra* note 159.

142. A line of authority in stock-based Rule 10b-5 cases holds that fraud on the market is not limited to false or misleading statements by the issuer but also such statements made by third parties. *See* 1 JOSEPH M. MCLAUGHLIN, MCLAUGHLIN ON CLASS ACTIONS: LAW AND PRACTICE § 5:26 (18th ed. 2021) (collecting stock-based Rule 10b-5 cases holding that fraud on the market is not limited to misrepresentations by issuers).

It is important to note, though, and as discussed in the next Part of the Article, that while the doctrine is available to those trading exchange-traded crypto assets, crypto asset traders in a given case can benefit from the doctrine only if they are able to establish its elements, including whether the price of the specific crypto asset at issue is efficient in the relevant sense, i.e., it generally reflects public, material information. Despite the general efficiency of crypto asset prices as a class, any particular crypto asset's price may or may not be generally efficient.[143]

A. The Doctrine's Analytical Underpinnings

By the time the Supreme Court acknowledged fraud on the market in *Basic*, many lower courts had already adopted mechanisms that permitted plaintiffs in Rule 10b-5 cases to avoid having to establish reliance.[144] The analytical underpinning of fraud on the market couples the efficiency, or informational content, of market prices with investors' presumed reliance on the integrity of those prices. The *Basic* Court explained so much in the key part of its opinion summarizing the doctrine:

> An investor who buys or sells stock at the price set by the market does so in reliance on the integrity of that price. Because most publicly available information is reflected in market price, an investor's reliance on any public material misrepresentations, therefore, may be presumed for purposes of a Rule 10b-5 action.[145]

In this way, *Basic* articulated a theory of indirect reliance: To the extent a given security's price sufficiently reflects material public

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143. The use of the singular "price," which suggests that a crypto asset trades on a single crypto exchange, is for expositional convenience. As discussed, a given crypto asset ordinarily will trade on multiple crypto exchanges and its price will differ on those crypto exchanges. *See supra* Section II.A. This Article assumes for simplicity that a crypto asset trades on a single crypto exchange and discusses the implications of a crypto asset trading on multiple crypto exchanges at a later point. *See infra* Section V.B.2.b.

144. *See* Fisch, *supra* note 126, at 903; *see also* Barbara Black, *Fraud on the Market: A Criticism of Dispensing with Reliance Requirements in Certain Open Market Transactions*, 62 N.C. L. REV. 435, 447–57 (1984) (summarizing pre-*Basic* lower court rules concerning reliance in Rule 10b-5 cases). Also, several years before *Basic*, the Supreme Court held in *Affiliated Ute* that if the 10b-5 claim primarily involves material omissions and the defendant owes the plaintiff a duty to disclose, then the plaintiff does not need to prove reliance. *See* Affiliated Ute Citizens of Utah v. United States, 406 U.S. 128, 153 (1972); *see also* Fisch, *supra* note 126, at 904–07 (discussing lower courts' interpretation of *Affiliated Ute* and tracing the doctrinal history of *Affiliated Ute* to fraud on the market). There is also an extensive academic literature concerning *Affiliated Ute*. For a comprehensive discussion of the case, see Donald C. Langevoort, Basic *at Twenty: Rethinking Fraud on the Market*, 2009 WISC. L. REV. 151, 151.

145. Basic Inc. v. Levinson, 485 U.S. 224, 247 (1988).

information, then even a trader who did not directly rely on a false or misleading statement indirectly relied on the statement, in the sense that the trader is presumed to have relied on the integrity of the market price, which in turn incorporated the false or misleading statement.[146] Through adoption of fraud on the market, the *Basic* Court reoriented Rule 10b-5's reliance analysis so that it is directed at the informational content of the at-issue security's price rather than traders' subjective reliance on the false or misleading statements that underlie their fraud claim.[147]

The Court cited empirical studies to support the predicate proposition that stock prices are sufficiently responsive to public information.[148] In addition to that empirical evidence, the *Basic* Court based its decision to acknowledge fraud on the market on the pragmatic considerations discussed below.[149] The Court also delineated how defendants can rebut fraud on the market's presumption of reliance in a given Rule 10b-5 case.[150]

Aspects of *Basic* are opaque. Notably, the Court was unclear about the nature of efficiency that underpins fraud on the market and that is necessary for the doctrine to apply in a given Rule 10b-5 case. In some parts of the opinion, the Court suggested a stringent test that requires a security's price to reflect "all publicly available information."[151] In other parts, the Court suggested that the relevant test is a more forgiving

146. As an example of security prices incorporating false or misleading statements, suppose a company's stock is trading at $100 per share and the company publicly reports false financials that inflate the company's revenues beyond the company's actual revenues and beyond what investors expected. Suppose that some traders learn of the falsely reported revenues and begin purchasing the company's stock because they believe, based on the false information, that the company's shares are undervalued because they do not yet represent the company's higher (falsely reported) revenues. Because of the increased buying activity, the price of the company's stock will go up, for example, to $110 per share. Suppose a subsequent investor buys the company's stock at $110 per share but was unaware of the falsely reported financials. In that case, while the subsequent trader did not directly rely on the false financials, the $110 price at which she transacted was based in part on the false financials.

147. *Basic* did not fully expunge subjective reliance from Rule 10b-5 jurisprudence. The *Basic* Court also based its holding on the supposition that traders rely on the integrity of market prices when transacting. *See infra* Section IV.C. Additionally, the grounds on which the reliance presumption may be rebutted include considerations that probe traders' transaction motivations. *See infra* note 150; *see also infra* note 270 and accompanying text.

148. *See Basic*, 485 U.S. at 246 ("[R]ecent empirical studies have tended to confirm Congress' premise that the market price of shares traded on well-developed markets reflects all publicly available information, and, hence, any material misrepresentations.").

149. *See infra* Section IV.D.

150. *See Basic*, 485 U.S. at 248–49; *see also* Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258, 269 (2014) ("'[A]ny showing that severs the link between the alleged misrepresentation and either the price received (or paid) by the plaintiff, or his decision to trade at a fair market price, will be sufficient to rebut the presumption of reliance.' So for example, if a defendant could show that the alleged misrepresentation did not, for whatever reason, actually affect the market price, or that a plaintiff would have bought or sold the stock even had he been aware that the stock's price was tainted by fraud, then the presumption of reliance would not apply." (quoting *Basic*, 485 U.S. at 248–49)).

151. *See supra* note 148.

one that is met when the security's price reflects "most publicly available information."[152] Ultimately, the *Basic* Court disclaimed any position on the nature of efficiency a plaintiff needs to establish in order to obtain the benefit of fraud on the market.[153] Additionally, as discussed below, the *Basic* Court left uncertain the nature and basis of the doctrine's second analytical underpinning — the supposition that traders rely on the integrity of market prices when transacting.[154]

B. The Market Efficiency Requirement

After *Basic*, many lower courts deduced that fraud on the market found its analytical roots in the Efficient Capital Markets Hypothesis, which concerns the extent to which asset prices reflect material information.[155] Many courts described, either explicitly or implicitly, fraud on the market as an application of the semi-strong version of the Efficient Capital Markets Hypothesis.[156] The implication of that proposition, if taken literally, is that a court should certify a Rule 10b-5 class only if the at-issue security's price fully and rapidly incorporates all material public information.[157] A chief theoretical difficulty is that

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152. *See Basic*, 485 U.S. at 247; *see also id.* at 246 n.24 ("For purposes of accepting the presumption of reliance in this case, we need only believe that market professionals generally consider most publicly announced material statements about companies, thereby affecting stock market prices.").

153. *See id.* at 248 n.28 ("[B]y accepting this rebuttable presumption, we do not intend conclusively to adopt any particular theory of how quickly and completely publicly available information is reflected in market price.").

154. *See infra* Section IV.C.

155. The Efficient Capital Markets Hypothesis has three variants: weak form, semi-strong form, and strong form. Weak form efficiency means that an asset's price fully incorporates all past public information; semi-strong-form efficiency means that an asset's price fully incorporates all public information; and strong-form efficiency means that an asset's price fully incorporates all public and private information. *See* Eugene F. Fama, *Efficient Capital Markets: A Review of Theory and Empirical Work*, 25 J. FIN. 383, 388 (1970). In this context, an asset's price is said to "fully reflect" a specific set of information, e.g., all public information, if traders cannot use that information to earn above-average risk-adjusted returns. *See* FRANK K. REILLY, KEITH C. BROWN & SANFORD J. LEEDS, INVESTMENT ANALYSIS AND PORTFOLIO MANAGEMENT 127–28 (11th ed. 2019).

156. *See, e.g.*, *In re* PolyMedica Corp. Sec. Litig., 432 F.3d 1, 19 (1st Cir. 2005) ("For purposes of establishing the fraud-on-the-market presumption of reliance, we adopt the prevailing definition of market efficiency, which provides that an efficient market is one in which the market price of the stock fully reflects all publicly available information. By 'fully reflect,' we mean that [the] market price responds so quickly to new information that ordinary investors cannot make trading profits on the basis of such information."); No. 84 Emp.-Teamster Joint Council Pension Tr. Fund v. Am. W. Holding Corp., 320 F.3d 920, 947 (9th Cir. 2003) ("The premise of [fraud on the market] is that in a modern and efficient securities market, the market price of a stock incorporates all available public information."); *In re* Res. Am. Sec. Litig., 202 F.R.D. 177, 189 (E.D. Pa. Aug. 6, 2001) ("The *Basic* court adopted the semi-strong form of market efficiency as a prerequisite for a fraud on the market presumption.").

157. Because the semi-strong version of the Efficient Capital Markets Hypothesis requires that an asset's price incorporate all public material information, it further demands that new publicly released material information be rapidly incorporated into the asset's price. *See*

actual markets cannot be truly efficient in that sense, in part because it is costly for traders to undertake the information gathering necessary for market prices to incorporate material public information.[158] There also is a vigorous scholarly disagreement whether, as an empirical matter, stock prices are semi-strong efficient.[159] Other courts rejected the notion that fraud on the market requires semi-strong efficiency and instead understood the doctrine to require less.[160]

In *Halliburton II*, the Supreme Court resolved the uncertainty in *Basic* concerning the nature of market efficiency that underpins fraud on the market. The *Halliburton II* Court made clear that fraud on the market is not predicated on the semi-strong version of the Efficient Capital Markets Hypothesis and is instead grounded on only a generalized notion of market efficiency.

A primary issue presented in *Halliburton II* was whether the Court should overrule *Basic*, an invitation the Court rejected, thereby firmly cementing the doctrine in Rule 10b-5 jurisprudence.[161] A leading argument advanced by the petitioner, Halliburton, in support of its argument

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Jonathan R. Macey & Geoffrey P. Miller, *Good Finance, Bad Economics: An Analysis of the Fraud-on-the-Market Theory*, 42 STAN. L. REV. 1059, 1060 (1990).

158. *See* Eugene F. Fama, *Efficient Capital Markets: II*, 46 J. FIN. 1575, 1575 (1991) ("I take the market efficiency hypothesis to be the simple statement that security prices fully reflect all available information . . . . Since there are surely positive information and trading costs, the extreme version of the market efficiency hypothesis is surely false."); Lucian A. Bebchuk & Allen Ferrell, *Rethinking* Basic, 69 BUS. LAW. 671, 682 (2014) ("It is worth noting that even among supporters of the efficient market hypothesis, it is uncontested that markets cannot be perfectly efficient."). There are many other reasons why markets, including a highly liquid market for the secondary trading of a stock, may not be semi-strong efficient. For instance, behavioral economists point to trader irrationality as a reason why markets may not satisfy the dictates of the Efficient Capital Markets Hypothesis. *See, e.g.*, ANDREI SHLEIFER, INEFFICIENT MARKETS: AN INTRODUCTION TO BEHAVIORAL FINANCE 10–12 (2000).

159. *See, e.g.*, Brief of Financial Economists as Amici Curiae in Support of Respondents at 6–8, Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258 (2014) (No. 13-317) (summarizing academic debate about the semi-strong efficiency of stock prices and citing empirical findings that are inconsistent with the semi-strong efficiency of stock prices, as well as summarizing reasons posited in the academic literature why those empirical findings in fact may not be incongruent with semi-strong efficiency).

160. *In re* PolyMedica Corp. Sec. Litig., 224 F.R.D. 27, 41 (D. Mass. Sept. 7, 2004) ("[A]n 'efficient' market in the context of the 'fraud on the market' theory is *not* one in which a stock price rapidly reflects all publicly available material information. Rather, the 'efficient' market required for 'fraud on the market' presumption of reliance is simply one in which 'market professionals generally consider most publicly announced material statements about companies, thereby affecting stock market prices.'" (citing Basic Inc. v. Levinson, 485 U.S. 224, 246 n.24 (1988))).

161. *See Halliburton II*, 573 U.S. at 269. A second question presented in *Halliburton II* was whether a Rule 10b-5 defendant should be able to rebut the presumption of reliance at class certification by showing a lack of price impact, i.e., that the allegedly false or misleading statement affected the market price. The Court answered that question in the affirmative. *See id.* at 279. Subsequently, in *Goldman Sachs*, the Court held that defendants bear the burden of persuasion of proving a lack of price impact by a preponderance of the evidence at class certification. *See* Goldman Sachs Grp., Inc. v. Ark. Tchr. Ret. Sys., 141 S. Ct. 1951, 1963 (2021).

that the Court should overrule *Basic* is that, in *Basic*, the Court grounded fraud on the market in the Efficient Capital Markets Hypothesis. That was no longer sure ground, Halliburton argued, because considerable economic evidence had amassed in the intervening years demonstrating that stock prices do not follow the dictates of that theory of financial economics.[162]

The Court rejected Halliburton's argument. As the Court explained, efficiency for fraud on the market purposes is different than financial economists' notion of efficiency and requires less price responsiveness.[163] Before *Halliburton II*, various scholars had explained that the underlying logic of fraud on the market only requires a weak notion of efficiency,[164] and in *Halliburton II*, the Court agreed. While the semi-strong version of the Efficient Capital Markets Hypothesis demands that all public information be fully reflected in a security's price, efficiency for fraud on the market purposes, the *Halliburton II* Court explained, merely rests on the "modest premise" that "public

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162. *Halliburton II*, 573 U.S. at 270 ("*Basic* stated that 'the market price of shares traded on well-developed markets reflects all publicly available information, and, hence, any material misrepresentations.' From that statement, Halliburton concludes that the *Basic* Court espoused 'a robust view of market efficiency' that is no longer tenable, for 'overwhelming empirical evidence' now 'suggests that capital markets are not fundamentally efficient.' To support this contention, Halliburton cites studies purporting to show that 'public information is often not incorporated immediately (much less rationally) into market prices.'" (first quoting *Basic*, 485 U.S. at 246; then citing Brief for Petitioners at 14–16 & 17, *Halliburton II*, 573 U.S. 258)).

163. *See Halliburton II*, 573 U.S. at 271–72 ("Halliburton's criticisms fail to take *Basic* on its own terms. Halliburton focuses on the debate among economists about the degree to which the market price of a company's stock reflects public information about the company — and thus the degree to which an investor can earn an abnormal, above-market return by trading on such information. *See* Brief for Financial Economists as *Amici Curiae* 4–10 (describing the debate). That debate is not new. Indeed, the *Basic* Court acknowledged it and declined to enter the fray . . . ."). The cited amicus brief was authored by fourteen financial economists who made the associated point clearly. *See* Brief of Financial Economists, *supra* note 159, at 3 ("There is widespread debate about market efficiency among economists . . . . But economists do *not* generally disagree about whether market prices respond to new material information. In particular, there is little doubt that the stock price will increase reasonably promptly after favorable news about a company is released and decline after unfavorable news."); *id.* at 12 ("The economic proposition that prices move reasonably promptly in a predictable direction in response to favorable or unfavorable public information does not require that markets be anywhere near perfectly efficient."). As the *Halliburton II* Court succinctly explained, "[e]ven the foremost critics of the efficient capital markets hypothesis acknowledge that public information generally affects stock prices." *Halliburton II*, 573 U.S. at 272.

164. *See, e.g.*, Fisch, *supra* note 126, at 913 ("The connection that the *Basic* decision identified between fraud and stock price depends only on the weakest conception of market efficiency — the premise that information affects securities prices."); James D. Cox, *Understanding Causation in Private Securities Lawsuits: Building on* Amgen, 66 VAND. L. REV. 1719, 1724 (2013) ("While lower court decisions subsequent to *Basic* consistently condition its application on a finding that the market in question is an 'efficient' one, *Basic* referred more generally to 'developed,' 'well-developed,' or 'modern' markets. It did not invoke the 'efficient market' moniker used by economists to describe the hypothesized performance of capital markets.").

information *generally affects* stock prices."[165] The Court described this latter concept as "general efficiency."[166]

Others have commented on the significance of the *Halliburton II* Court's more generalized articulation of market efficiency that justifies fraud on the market.[167] Through that relaxed efficiency standard, the *Halliburton II* Court weakened substantially Rule 10b-5's reliance requirement in relation to an efficiency standard that demands that security prices be semi-strong efficient.

Notwithstanding *Halliburton II*'s clear statement that fraud on the market relies on just a generalized notion of market efficiency, some courts continue to recite that fraud on the market is rooted in the Efficient Capital Markets Hypothesis.[168] While these courts may simultaneously include language acknowledging *Halliburton II*'s loosened notion of efficiency[169] and also require plaintiffs to just establish that prices satisfy a more expansive notion of efficiency than the financial economic notion,[170] these opinions would be more analytically in line

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165. *See Halliburton II*, 573 U.S. at 272 (emphasis added); *see also id.* at 279 (explaining that fraud on the market requires plaintiff to show "that the stock traded in a generally efficient market").

166. *See, e.g.*, *Halliburton II*, 573 U.S. at 277 ("It should not be enough, Halliburton contends, for plaintiffs to demonstrate the general efficiency of the market in which the stock traded."). The Court previewed its notion of general efficiency, and its implication for fraud on the market, the previous year in *Amgen*. *See* Amgen Inc. v. Conn. Ret. Plan & Tr. Fund, 568 U.S. 455, 462 (2013) ("If a market is generally efficient in incorporating publicly available information into a security's market price, it is reasonable to presume that a particular public, material misrepresentation will be reflected in the security's price.").

167. *See* Donald C. Langevoort, Halliburton II *and Market Efficiency*, THE CLS BLUE SKY BLOG (July 10, 2014), https://clsbluesky.law.columbia.edu/2014/07/10/halliburton-ii-and-market-efficiency [https://perma.cc/9NYB-PP2G] ("[T]he most helpful conceptual contribution made by *Halliburton II* is on market efficiency. . . . [The opinion] stress[es] that the efficiency question is not meant to be particularly rigorous — 'generalized' efficiency is sufficient, not some idealized vision of hyper-efficiency. On this*, Halliburton II* is clearly right."); Ann M. Lipton, Halliburton II, *An Unexpected Gift to Plaintiffs*, BUS. L. PROF BLOG (June 28, 2014), https://lawprofessors.typepad.com/business_law/2014/06/halliburton-ii-an-unexpected-gift-to-plaintiffs.html [https://perma.cc/D898-NR3M] ("[T]he Supreme Court's language in *Halliburton II* opens a path to a looser definition of efficiency that more closely comports with the relevant *legal* question, i.e., whether the market has characteristics that make it reasonable to assume that false statements affect stock prices in some way."); Geoffrey Miller, *The Problem of Reliance in Securities Fraud Class Actions*, 57 ARIZ. L. REV. 61, 65 (2015) ("*Halliburton II* makes class certification easier in the range of cases where doubts could be raised about the efficiency of the market from the perspective of corporate finance.").

168. *See* Waggoner v. Barclays PLC, 875 F.3d 79, 107 n.27 (2d Cir. 2017) ("[Fraud on the market] relies on the 'efficient market hypothesis, which postulates that an efficient market incorporates fraudulent statements into a price viewed by investors as based on available accurate information.'" (quoting Pa. Pub. Sch. Emps.' Ret. Sys. v. Morgan Stanley & Co., 772 F.3d 111, 121 n.3 (2d Cir. 2014))); *see also In re* Teva Sec. Litig., No. 3:17-cv-558, 2021 WL 872156, at *7 n.15 (D. Conn. Mar. 9, 2021) ("When I refer to 'market efficiency' in this ruling, unless I say otherwise I refer to 'semi-strong-form market efficiency.'").

169. *See Waggoner*, 875 F.3d at 97 ("[T]he Supreme Court has suggested that the burden required to establish market efficiency 'is not an onerous one.'" (quoting *In re* Petrobras Sec., 862 F.3d 250, 278 (2d Cir. 2017))).

170. *See infra* note 242 and accompanying text.

with Supreme Court jurisprudence if they dispensed with references to the financial economic description of market efficiency.

Similarly, parties and their experts in post-*Halliburton II* cases sometimes continue to invoke semi-strong efficiency in litigation, despite the relevant legal standard for price efficiency being the generalized notion articulated in *Halliburton II*.[171] Courts have admonished parties and their experts for misapprehending the underpinnings of fraud on the market in light of *Halliburton II*.[172]

Finally, while fraud on the market doctrinally matured with respect to claims based on the making of false or misleading statements asserted under subsection (b) of Rule 10b-5,[173] courts also recognize the availability of the doctrine for claims asserted under the remainder of Rule 10b-5, i.e., scheme liability claims asserted under subsections (a) and (c) of Rule 10b-5.[174] The analysis above applies equally to fraud on the market as it relates to scheme liability claims, because market efficiency is also an element of fraud on the market in that context.[175]

C. Traders' Reliance on the Integrity of Market Prices

Basic's grounding of fraud on the market in price efficiency intuitively links the informational content of prices to trader harm. If the at-

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171. *See, e.g.*, *In re Teva*, 2021 WL 872156, at *24 ("According to the Defendants, the proper way to test for 'market efficiency' is to 'assume[] that the market is semi-strong-form efficient (*the null hypothesis*) and test[] whether sufficient evidence is available to reject the null hypothesis and, thereby, conclude that the market is *not* semi-strong-form efficient (*the alternative hypothesis*).' . . . In the Defendants' view, 'the proportion of statistically significant news days should be 100%.'" (quoting Defendants' expert report)).

172. *See, e.g.*, Carpenters Pension Tr. Fund of St. Louis v. Barclays PLC, 310 F.R.D. 69, 84 n.98 (S.D.N.Y. Aug. 20, 2015) ("[D]efendants wrongly contend that the semi-strong form of market efficiency is required under *Basic*. . . . Defendants further argue that the semi-strong form is what matters because the experts in this case have analyzed efficiency under the presumption that the standard is the semi-strong form. However, an expert's misconceptions about what the law requires does not bind this Court."); *In re* Petrobras Sec. Litig., 312 F.R.D. 354, 370–71 (S.D.N.Y. Feb. 1, 2016), *aff'd in part*, Waggoner v. Barclays PLC, 875 F.3d 79 (2d Cir. 2017) (citation omitted) ("[Defendant's expert] objected to the sufficiency of [Plaintiff's expert's] results on the grounds that 'in an efficient market, the price of a security should always move in response to the release of new value-relevant information that is materially different from expectations.' . . . The Supreme Court has rejected [Defendant's expert's] absolutist view of market efficiency by making clear that 'market efficiency is a matter of degree' and that '*Basic*'s presumption of reliance . . . does not rest on a binary view of market efficiency.'" (quoting *Halliburton II*, 573 U.S. at 272)).

173. *Basic*, for instance, involved a claim of statement-based fraud. *See* Levinson v. Basic, Inc., No. C79-1220, 1984 WL 1152, at *2 (N.D. Ohio Aug. 3, 1984).

174. *See* ALAN R. BROMBERG & LEWIS D. LOWENFELS, BROMBERG & LOWENFELS ON SECURITIES FRAUD § 7:469 (2d ed. 2003) ("[I]t now seems settled that [fraud on the market] applies to all three clauses of Rule 10b-5."); *see also* Stoneridge Inv. Partners, LLC v. Sci.-Atlanta, Inc., 552 U.S. 148, 159 (2008) (concluding in a deceptive conduct Rule 10b-5 case that fraud on the market was not available to plaintiffs because defendants' deceptive acts were not publicly communicated).

175. *See, e.g.*, *In re* Merrill Lynch Auction Rate Sec. Litig., 704 F. Supp. 2d 378, 393–95 (S.D.N.Y. Mar. 31, 2010).

issue asset's price is sufficiently responsive to new information, then a materially false or misleading statement will be expected to distort the price at which traders transact. If a false or misleading statement causes the asset's price to rise, then traders who purchased the asset after the fraudulent statement, but before the arrival of a disclosure to the market that fully corrects the statement, will have purchased the asset at a distorted price higher than if there had been no fraud.

Fraud on the market, however, seeks to provide a theory of trader reliance, not damages, at least in the first instance. An analytically sound way to tether market efficiency to trader reliance would be to invoke the further proposition that traders rely on an asset's market price when transacting. Such an assumption is sensible. In one way or another, every trading decision is dictated, at least in part, by market prices. Even an irrational investor who transacts without immediate regard for an asset's price will have their trading activity influenced by that price, in that the price will serve to bound the amount of the asset the trader can purchase. When coupled with price efficiency, traders' reliance on market prices generates a workable theory of indirect reliance. Traders can be understood to have indirectly relied on a false or misleading statement because they directly relied on the market price when transacting, and that price, in turn, incorporated the false or misleading statement, assuming sufficient price responsiveness.

The *Basic* Court, though, did not rest its reasoning on traders' reliance on market prices per se. Rather, the Court grounded fraud on the market on the supposition that when traders transact in a well-developed market, they do so in reliance on the "integrity" of market prices.[176] While sometimes articulated as a second analytical underpinning of fraud on the market,[177] the *Basic* Court did not explain with meaningful clarity what it meant by the "integrity" of market prices or the nature of traders' assumed reliance on the integrity of those prices. Also, in contrast to its market efficiency analysis, the *Basic* Court did not provide any empirical support for its supposition that investors rely on the integrity of market prices.

One interpretation is that through its discussion of traders' assumed reliance on the integrity of market prices, the *Basic* Court was

176. *See* Basic Inc. v. Levinson, 485 U.S. 224, 247 (1988) ("An investor who buys or sells stock at the price set by the market does so in reliance on the integrity of that price."); *see also id.* at 255 (White, J., concurring in part and dissenting in part) ("For in adopting a 'presumption of reliance,' the Court *also* assumes that buyers and sellers rely — not just on the market price — but on the '*integrity*' of that price. It is this aspect of the fraud-on-the-market hypothesis which most mystifies me.").

177. *See Halliburton II*, 573 U.S. at 273 ("Halliburton also contests a second premise underlying the *Basic* presumption: the notion that investors 'invest in reliance on the integrity of [the market] price.'" (quoting Brief for Petitioner at 14, *Halliburton II*, 573 U.S. 258 (No. 13-317))). Some scholars have been critical of the *Basic* Court's reliance on an assumption of trader behavior to support its fraud on the market analysis. *See, e.g.*, James D. Cox, *Fraud on the Market After* Amgen, 9 DUKE J. CONST. L. & PUB. POL'Y 1, 12 (2013).

observing that it is reasonable to assume that traders in secondary equity markets transact on the belief that a stock's price reflects its value. There is language in *Basic* suggestive of this interpretation,[178] though the Court is not clear whether it means that, when transacting, traders believe that stock prices reflect their fundamental value in the form of discounted cash flows,[179] that current stock prices are good estimates of future stock prices, or something else altogether. In any event, as has been noted in the literature for some time, a chief difficulty with assuming that traders transact on the belief that stock prices reflect stock value is that many traders do not act in accordance with that supposition, and instead buy and sell stock precisely because they believe otherwise, i.e., that stocks are under or overvalued.[180]

Halliburton II afforded the Court a means to clarify the nature of *Basic*'s supposition that secondary stock traders transact in reliance on the integrity of the market price, but the Court did not fully seize that opportunity. Compared to its explication of the market efficiency requirement discussed above, the *Halliburton II* Court left considerably

178. *See Basic*, 485 U.S. at 244–45 ("In an open and developed market, the dissemination of material misrepresentations or withholding of material information typically affects the price of the stock, and purchasers generally rely on the price of the stock as a reflection of its value." (quoting Peil v. Speiser, 806 F.2d 1154, 1161 (3d Cir. 1986))). In his dissent in *Basic*, Justice White indeed characterized the *Basic* majority as assuming that stock traders believe that a stock's price reflects its value. *See id.* at 255 (White, J., concurring in part and dissenting in part) ("To define the term 'integrity of the market price,' the majority quotes approvingly from cases which suggest that investors are entitled to 'rely on the price of a stock as a reflection of its value.' But the meaning of this phrase eludes me, for it implicitly suggests that stocks have some 'true value' that is measurable by a standard other than their market price." (quoting *Peil*, 806 F.2d at 1161)). Some post-*Basic* lower court decisions similarly interpreted the nature of the assumed reliance. *See, e.g.*, Freeman v. Laventhol & Horwath, 915 F.2d 193, 197 (6th Cir. 1990) ("Investors rely on the price of the security as an accurate reflection of its worth.").

179. *See infra* note 206 and accompanying text.

180. *See* Jonathan R. Macey, *The Fraud on the Market Theory: Some Preliminary Issues*, 74 CORNELL L. REV. 923, 925–26 (1989) ("Investors who buy securities employ one of two strategies. One is to create a diversified portfolio of investments in order to eliminate firm-specific risk. The other is to attempt to locate undervalued stocks in an effort to 'beat the market.' In the latter category of cases investors are in essence betting that the market for the securities they are buying is in fact inefficient. It is not immediately obvious that such purchasers are relying on the efficiency of the market when they purchase stock."); *see also* Charles W. Murdock, Halliburton*,* Basic*, and Fraud on the Market: The Need for a New Paradigm*, 60 VILL. L. REV. 203, 212 (2015) ("[I]nvestors do not believe that the stock price is 'true': investors buying stock believe that the price is too low, whereas investors selling stock believe that the price is too high."). That many traders appear to not act in accordance with the supposition that traders believe that stock prices reflect stock value formed a primary basis for Justice White's dissent in *Basic*, *see Basic*, 485 U.S. at 256 (White, J., concurring in part and dissenting in part), as well as that part of Justice Thomas' opinion concurring in the judgment in *Halliburton II* in which he argued that *Basic* should be overruled. *See Halliburton II*, 573 U.S. at 291–94 (Thomas, J., concurring in the judgment).

more uncertain the assumed nature of stock traders' reliance on market price integrity.[181]

In *Halliburton II*, in addition to challenging the premise that secondary equity markets are sufficiently efficient to sustain fraud on the market, Halliburton challenged the *Basic* Court's supposition that traders in those markets invest in reliance on the integrity of the market price. Halliburton forged its argument by first pointing to certain classes of traders "for whom 'price integrity' is supposedly 'marginal or irrelevant,'"[182] including the "primary example [of a] value investor, who believes that certain stocks are undervalued or overvalued and attempts to 'beat the market' by buying the undervalued stocks and selling the overvalued ones."[183] According to Halliburton, the Court explained, "[i]f many investors 'are indifferent to prices,' . . . then courts should not presume that investors rely on the integrity of those prices and any misrepresentations incorporated into them."[184]

The Court was not convinced that the presence of value traders mandates jettisoning fraud on the market, observing that "*Basic* concluded only that 'it is reasonable to presume that *most* investors . . . will rely on the security's market price as an unbiased assessment of the security's value in light of all public information.'"[185] That analysis leaves open the question of what it means for investors to rely on a security's market price as an unbiased assessment of its value or, as initially characterized in *Basic*, to assume that investors rely on the integrity of market prices.

Then, in the third and final paragraph of that part of its opinion relevant to the issue of market price integrity, the *Halliburton II* Court provided its explanation of the nature of traders' assumed reliance:

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181. *See* Langevoort, *supra* note 167, at 51 (noting that *Halliburton II* did not "articulate exactly what the uninformed investor is reasonably relying upon" and that the opinion's "most helpful conceptual contribution is with regard to market efficiency").

182. *Halliburton II*, 573 U.S. at 273 (citing Reply Brief of Petitioner at 14, *Halliburton II*, 573 U.S. 258 (No. 13-317)).

183. *Id.*

184. *Id.* (citing Reply Brief of Petitioner at 14, *Halliburton II*, 573 U.S. 258 (No. 13-317)). At least based on the cited part of its briefing, Halliburton argued something different than the Court's characterization of its argument — namely, Halliburton argued that because traders differ with respect to whether they believe prices reflect value, the commonality of traders' reliance implied by *Basic* is erroneous. *See* Reply Brief of Petitioner at 14, *Halliburton II*, 573 U.S. 258 (No. 13-317) (citation omitted) ("[M]arket realities now show that investors do not simply invest 'in reliance on the integrity of [the market] price,' making the presumption of common reliance wholly fictional . . . . [P]rice integrity (much less information conveyed by price) often is marginal or irrelevant to investors' trading decisions; indeed, some investors are indifferent to prices or their fluctuations because their investment strategies do not depend on those features. . . . Logically, investors with such substantially varying motivations cannot be *presumed* to have *common reliance* guiding their every transaction." (quoting *Basic*, 485 U.S. at 247)).

185. *Halliburton II*, 573 U.S. at 273 (quoting Amgen Inc. v. Conn. Ret. Plans & Tr. Funds, 568 U.S. 455, 462 (2013)).

> In any event, there is no reason to suppose that even [a value investor] is as indifferent to the integrity of market prices as Halliburton suggests. . . . To be sure, the value investor 'does not believe that the market price accurately reflects public information at the time he transacts.' But to indirectly rely on a misstatement in the sense relevant for the *Basic* presumption, he *need only trade stock based on the belief that the market price will incorporate public information within a reasonable period*. The value investor also presumably tries to estimate how undervalued or overvalued a particular stock is, and such estimates can be skewed by a market price tainted by fraud.[186]

According to this reasoning, then, investors can be said to rely on the integrity of market prices if they transact on the belief that market prices incorporate public information within a reasonable period.[187] That interpretation of what it means for traders to rely on the integrity of market prices is consistent with *Basic*'s understanding of a market price as an information transmission mechanism.[188] The supposition that investors transact on the belief that prices embody material information is analytically appealing also because it is the subjective counterpart to fraud on the market's objective requirement of informationally valuable prices.

At the same time, there are other reasonable interpretations of the *Basic* and *Halliburton II* Courts' understanding of investors' assumed reliance on the integrity of market prices. One well-known interpretation by Donald Langevoort is that through the part of its opinion concerning market price integrity, the *Basic* Court created an entitlement for investors to rely on security prices undistorted by fraud.[189]

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186. *Id.* at 273–74 (emphasis added and omitted) (citation omitted).

187. *See also In re* DVI, Inc. Sec. Litig., 639 F.3d 623, 641 (3d Cir. 2011) ("Reliance on the 'integrity of the market price,' means only that an investor relies on the fact that the price reflects publicly available information as the market digests it, and nothing more." (quoting *Basic*, 485 U.S. at 247)).

188. *See Basic*, 485 U.S. at 244 ("In face-to-face transactions, the inquiry into an investor's reliance upon information is into the subjective pricing of that information by that investor. With the presence of a market, the market is interposed between seller and buyer and, ideally, transmits information to the investor in the processed form of a market price." (quoting *In re* LTV Sec. Litig., 88 F.R.D. 134, 143 (N.D. Tex. 1980))); *see also* Cox, *supra* note 177, at 29 ("What appears most consistent with the reasoning in both *Basic* and *Amgen* is evidence supporting the investor's dependence on the integrity by which the pricing of shares occurs in the market. Certainly the classic investor places faith in the information relied on to trade and presumably this extends to faith that share prices reflect publicly available information. The indexer and style investor also place faith in the market's pricing mechanism.").

189. *See* Langevoort, *supra* note 144, at 160–61; Langevoort, *supra* note 167, at 49–51. A slightly different interpretation is that through its analysis of traders' reliance on the integrity of market prices, the Court meant that traders affirmatively rely on markets being free from

D. The Doctrine's Availability in Fraud Cases Involving Secondary Crypto Asset Transactions Occurring on Crypto Exchanges

Both *Basic* and *Halliburton II*, like the vast majority of fraud on the market cases, involved secondary stock transactions occurring on an exchange. As shown above, a critical predicate of the doctrine as applied to such transactions is that they occur in markets with informationally valuable prices, in the sense that stock prices generally reflect material, public information. As *Halliburton II* made clear, the doctrine is not based on stock prices being efficient in the financial economic sense of semi-strong efficiency.

Crypto asset transactions occurring on a crypto exchange equally satisfy that critical predicate. Like secondary stock transactions, those crypto asset transactions occur in markets in which a market price intermediates transactions.[190] And those prices, as discussed below, are generally efficient, just as stock prices are generally efficient. Additionally, as also discussed below, it is reasonable to assume that secondary crypto asset traders transact on the belief that crypto asset prices incorporate public information within a reasonable period. For these reasons, as it is available to traders in connection with Rule 10b-5 claims involving secondary stock transactions, fraud on the market is equally available to traders where the at-issue transactions are secondary crypto asset transactions occurring on a crypto exchange.

Empirical studies show that exchange-traded crypto asset prices are generally responsive to material, public information. A 2020 study, for example, evaluated how the market prices of bitcoin, ether, and Ripple responded to a set of positive and negative news events.[191] To conduct their analysis, the authors applied event study methodology, which is discussed in the next Part.[192] The researchers' empirical findings show that the prices of the studied crypto assets responded to public, material information in a directionally appropriate way in that the

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fraud. *See, e.g.*, Korsmo, *supra* note 133, at 860 ("The [fraud on the market] presumption does assume that market prices reflect and transmit information, including fraudulent information. It also assumes that traders rely on the integrity of market prices — not necessarily on the market prices being *correct* — but simply that they have not been fraudulently distorted."). There is language in *Basic* supporting that interpretation. *See Basic*, 485 U.S. at 246–47 ("It has been noted that 'it is hard to imagine that there ever is a buyer or seller who does not rely on market integrity. Who would knowingly roll the dice in a crooked crap game?'" (quoting Schlanger v. Four-Phase Sys. Inc., 555 F. Supp. 535, 538 (S.D.N.Y. 1982))). *But see* Langevoort, *supra* note 144, at 160 (arguing that because of the prevalence of fraud and manipulation, it would be unreasonable for stock traders to assume that markets are free from fraud).

190. *See supra* Section II.A.

191. Mohammad Hashemi Joo, Yuka Nishikawa & Krishnan Dandapani, *Announcement Effects in the Cryptocurrency Market*, 52 APPLIED ECON. 4794 (2020). For each crypto asset, the authors examine market reactions to ten major positive news announcements and ten negative news announcements. *See id.* at 4794.

192. *See infra* Section V.A.

prices increased in response to positive news announcements and decreased in response to negative news announcements.[193] Other studies show or suggest that the prices of crypto assets trading on crypto exchanges are generally efficient.[194] Statistical studies of specific crypto assets likewise show that their prices generally respond to material, public information.[195] While crypto asset prices may not move in response to all material, public information, or may not instantly move in response to material, public information,[196] that heightened concept of efficiency is not a requirement for fraud on the market.[197]

While no study has evaluated the general efficiency of the prices of the universe of crypto assets trading on crypto exchanges, that does not preclude application of the doctrine to those transactions. Rather, in a given case, the efficiency properties of the crypto asset at issue will be determined in connection with that case, such as at class certification.[198] And while stock prices may be more efficient than crypto asset

193. In an event study, price responsiveness is determined through calculation of abnormal returns. *See infra* Section V.A. Joo et al. provide average cumulative abnormal returns for each of the three crypto assets, separated by positive news events and negative news events, in Table 4. *See* Joo et al., *supra* note 191, at 4803–04 tbl.4. Panel B shows those average cumulative abnormal returns for seven event windows, all starting with the day of the announcement and ending zero to six days after the announcement. *Id.* For each crypto asset and each event window, the average cumulative abnormal return is positive for positive news events and negative for negative news events. *Id.* Based on the provided t-statistics, the average cumulative abnormal returns are statistically significant at the 5% level for event windows generally spanning three days or more. *Id.*

194. *See, e.g.*, Jiahang Zhang & Chi Zhang, *Do Cryptocurrency Markets React to Issuer Sentiments? Evidence from Twitter*, 61 RSCH. INT'L BUS. & FIN. 1, 1 (2022) (conducting event study on forty-seven crypto assets to determine price responsiveness to posts on Twitter and finding directionally appropriate twelve-hour abnormal returns and twenty-four-hour cumulative returns that are statistically significant at the 5% level); Jeroen Koenraadt & Edith Leung, *Investor Reactions to Crypto Token Regulation*, 2022 EUR. ACCT. REV. 1, 1 (conducting event study on 1,886 crypto assets to determine price responsiveness to news about crypto asset regulation and finding negative average cumulative abnormal returns that are statistically significant at the 1% level).

195. For instance, David Vidal-Tomás and Ana Ibañez evaluated the responsiveness of bitcoin's price, on two crypto exchanges, in response to fifty bitcoin-related news events. Vidal-Tomás & Ibañez, *supra* note 140, at 260. The authors found directionally appropriate price responses on both exchanges. Though the authors do not provide standard errors or p-values, they find that three of those four price responses were significant at the 1% level, while the fourth was not significant at the 10% level. *Id.* at 261–63; *see also* Expert Report of Albert Metz at 5, SEC v. Ripple Labs, Inc., No. 20 Civ. 10832, (S.D.N.Y. Mar. 11, 2022) (event studies showing XRP's price responsiveness); *cf.* Wei Yue, Sijia Zhang & Qiang Zhang, *Asymmetric News Effects on Cryptocurrency Liquidity: An Event Study Perspective*, 41 FIN. RSCH. LETTERS 1, 6 (2021) (evaluating average returns for 100 crypto assets during and after five positive news events and five negative news events; finding positive average returns at the 1% level of significance on the announcement date of positive news events and each of the five days after the announcement and negative average returns at the 1% level of significance on the announcement date of negative news events and each of the five days after the announcement).

196. *See supra* note 140 (empirical studies yielding findings inconsistent with the semi-strong efficiency of crypto asset prices).

197. *See supra* Part IV.

198. *See infra* Section V.A.

prices in that stock prices more completely or more rapidly incorporate new public information, that doctrinally does not preclude application of fraud on the market to crypto asset transactions.[199]

With respect to the second analytical underpinning of fraud on the market, it is reasonable to assume that crypto asset traders rely on the integrity of crypto asset prices in the doctrinally relevant sense,[200] because it is reasonable to assume that traders expect prices of crypto exchange-traded crypto assets to incorporate public information within a reasonable period. Crypto asset exchanges, like stock exchanges, facilitate transactions between buyers and sellers through an intermediating price.[201] News and other material information about tradeable crypto assets is the source of extensive discussion on sites like Reddit, messaging and chat apps, and social media sites like Facebook and Twitter.[202] If new information material to a crypto asset becomes publicly available, crypto asset traders who become aware of the new information will seek to profit from it through additional crypto exchange transactions, which will result in an eventual adjustment in the crypto asset's price. These price adjustments are especially to be expected given that large, sophisticated institutional investors now are engaged in secondary crypto asset transactions.[203]

Although some crypto asset traders may undertake trading activity for reasons other than financial gain, or may engage in financially irrational trades, the mere presence of those traders does not preclude adoption of the doctrine, for the same reason that the mere presence of value traders does not preclude adoption of the doctrine.[204] Nonetheless, in a given case, the trading behavior of the at-issue crypto asset's traders may be probative of whether the asset is sufficiently price responsive for applicability of fraud on the market.[205]

In the case of an income-generating asset like a stock or bond, financial economics theorizes that under certain assumptions, the asset's price will correspond to the net present value of the asset's expected income stream, ordinarily referred to as the asset's fundamental value.[206] The same cannot be said for crypto asset prices. Because crypto assets, at least currently, are not designed to generate cash flow,[207] a crypto asset's price will not correspond to the net present

199. *See Halliburton II*, 573 U.S. at 272 ("Debates about the precise *degree* to which stock prices accurately reflect public information are thus largely beside the point.").

200. *See supra* Section IV.C.

201. *See supra* Section II.A.

202. *See id.*

203. *See* Reinicke, *supra* note 4.

204. *See supra* Section IV.C.

205. *See infra* Section V.B.1.

206. *See, e.g.*, JOHN Y. CAMPBELL, ANDREW W. LO & A. CRAIG MACKINLAY, THE ECONOMETRICS OF FINANCIAL MARKETS 253–58 (1997).

207. There are exceptions. *See, e.g.*, *supra* note 68 and accompanying text (providing example of a crypto asset entitling holders to potential cash flow).

value of its expected income stream, which will be zero. In other words, a crypto asset will usually not have any fundamental value in the expected cash flow sense. That observation does not negate the availability of fraud on the market to crypto asset fraud cases. As *Halliburton II* made clear, the notion of price in the fraud on the market context — that is, as an embodiment of material, public information generally — is different from financial economic notions, including fundamental efficiency.[208]

The application of fraud on the market to Rule 10b-5 claims involving crypto asset transactions occurring on a crypto exchange is harmonious with the doctrine's development. Courts have long appreciated that fraud on the market is not limited to Rule 10b-5 claims involving secondary stock transactions occurring on an exchange[209] and therefore have applied the doctrine to claims reaching various other security types and trading venues. For example, a number of courts have allowed plaintiffs the opportunity to establish the doctrine's elements in Rule 10b-5 cases involving the secondary trading of bonds — which, like stocks and crypto assets, also trade in secondary markets intermediated by an informationally valuable price — and most of the courts in those bond cases concluded that the doctrine's elements were met and therefore certified plaintiffs' class.[210] Courts have also applied

208. *See* Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258, 272 (2014) ("'That the . . . price [of a stock] may be inaccurate does not detract from the fact that false statements affect it, and cause loss,' which is 'all that *Basic* requires.'" (quoting Schleicher v. Wendt, 618 F.3d 679, 685 (7th Cir. 2010))); *see also supra* Section IV.B.

209. *See, e.g.*, Harman v. Lyphomed, Inc., 122 F.R.D. 522, 525 (N.D. Ill. 1988) ("[N]othing in the theory limits its application to stocks which trade on a particular exchange.").

210. *See, e.g.*, *In re* Teva Sec. Litig., No. 3:17-cv-558, 2021 WL 872156, at *4 (D. Conn. Mar. 9, 2021); Bennett v. Sprint Nextel Corp., 298 F.R.D. 498, 498 (D. Kan. 2014); *In re* Dynex Cap., Inc. Sec. Litig., No. 05 Civ. 1897, 2011 WL 781215, at *4 (S.D.N.Y. Mar. 7, 2011); *In re* HealthSouth Corp. Sec. Litig., 261 F.R.D. 616, 621 (N.D. Ala. 2009); *In re* Enron Corp. Sec. Derivative & "ERISA" Litig., 529 F. Supp. 2d 644, 676 (S.D. Tex. 2006); *In re* DVI Inc. Sec. Litig., 249 F.R.D. 196, 216 (E.D. Pa. 2008). *But see In re* Am. Int'l Grp., Inc. Sec. Litig., 265 F.R.D. 157, 188 (S.D.N.Y. 2010) (finding plaintiffs had failed to establish the elements of fraud on the market with respect to the bonds at issue). For discussion of aspects of fraud on the market as it relates to bonds, see generally James J. Park, *Bondholders and Securities Class Actions*, 99 MINN. L. REV. 585 (2014), and Michael Hartzmark, Cindy A. Schipani & H. Nejat Seyhun, *Fraud on the Market: Analysis of the Efficiency of the Corporate Bond Market*, 2011 COLUM. BUS. L. REV. 654.

the doctrine to other security types[211] and to secondary stock transactions occurring in venues other than an exchange.[212]

The other considerations articulated by the *Basic* Court as relevant to its decision to acknowledge fraud on the market also support application of the doctrine to secondary crypto asset transactions occurring on a crypto exchange.[213] In addition to relying on the presence of a trading market and the nature of market pricing mechanisms, the *Basic* Court also grounded its decision on two pragmatic considerations. One consideration was the value of presumptions in facilitating judicial decision-making in circumstances in which resolution through direct proof is difficult.[214] An additional consideration was to lighten the evidentiary burden of Rule 10b-5 plaintiffs who traded on impersonal markets, because requiring those plaintiffs to prove reliance would impose on them an unrealistic evidentiary burden.[215] Those two considerations are equally applicable to the crypto asset context.[216]

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211. *See In re* Petrobras Sec. Litig., 862 F.3d 250, 256 (2d Cir. 2017) (American Depository Receipts). Also, at least one court has applied the doctrine in connection with a Rule 10b-5 case involving secondary transactions of preferred stock but found that the elements of the doctrine were not met. *See In re* Fed. Home Loan Mortg. Corp. (Freddie Mac) Sec. Litig., 281 F.R.D. 174, 182 (S.D.N.Y. 2012). For discussion of fraud on the market as it applies to preferred stock, see Michael L. Hartzmark & H. Nejat Seyhun, *Understanding the Efficiency of the Market for Preferred Stock*, 8 VA. L. & BUS. REV. 149, 164 (2014).

212. *See Harman*, 122 F.R.D. at 522 (stock trading in OTC market). *But see* Epstein v. Am. Rsrv. Corp., 1988 WL 40500, at *5 (N.D. Ill. Apr. 21, 1988) ("Although the issue was not briefed, we believe that the over-the-counter market is incapable of meeting the [*Basic*] test.").

213. In addition to the doctrinal considerations discussed in this paragraph, there is generous academic literature evaluating whether the stock-based securities class actions facilitated by fraud on the market are effective means of compensating defrauded investors or effective deterrence mechanisms. For a summary of the leading arguments, ordinarily framed around two critiques known as the circularity critique and the diversification critique, as well as a rejoinder to those arguments, see James Cameron Spindler, *We Have a Consensus on Fraud on the Market — And It's Wrong*, 7 HARV. BUS. L. REV. 67, 77–91 (2017), and Merritt B. Fox, *Demystifying Causation in Fraud-on-the-Market Actions*, 60 BUS. L. 507, 529–30 (2005) (arguing that the deterrence effects of stock-based security class actions enhance social welfare by improving share price accuracy). An open area of inquiry is the extent to which the critiques concerning compensation and deterrence in the stock-based securities class action context are applicable to the crypto asset context. Because of this Article's doctrinal focus, it brackets off these public policy considerations, which I instead seek to analyze in separate work.

214. *See* Basic Inc. v. Levinson, 485 U.S. 224, 245 (1988).

215. *See id.* The Court also observed that fraud on the market is consistent with and effectuates legislative intent. *See id.* at 245–46.

216. Additionally, some of the arguments made by the two dissenting Justices in *Basic* arguing against adoption of fraud on the market are less applicable to crypto asset cases than stock-based cases. For example, Justice White's dissent in *Basic* argued that the doctrine frustrates the securities laws' disclosure regime because it mitigates parties' incentives to become familiarized with companies' public disclosures. *See id.* at 258–59 (White, J., concurring in part and dissenting in part). That consideration is largely irrelevant to the crypto asset context as crypto asset sponsors do not furnish investors with disclosures like the ones required of public companies.

E. Fraud on the Market and Rule 180.1

The discussion in the previous Part focused on Rule 10b-5, but the analysis is equally applicable to Rule 180.1. No court has yet ruled on the availability of fraud on the market in connection with claims asserted under Rule 180.1.[217] During rulemaking in 2011 associated with Rule 180.1, the CFTC was asked through comment to reject the availability of fraud on the market in Rule 180.1 cases.[218] The CFTC declined that invitation[219] and left determination of the elements of a private Rule 180.1 claim to the courts.[220]

Because the CFTC expressly patterned Rule 180.1 on Rule 10b-5 and because Congress modeled Section 6(c)(1) of the Commodity Exchange Act on Section 10(b) of the Securities Exchange Act,[221] courts draw heavily on existing Section 10(b) and Rule 10b-5 jurisprudence when interpreting CEA Section 6(c)(1) and Rule 180.1.[222] For instance, courts have:

(1) imported reliance and loss causation into a private Rule 180.1 claim because they are elements of a private Rule 10b-5 claim,[223]

(2) relied on Section 10(b) and Rule 10b-5 authority to interpret the phrase "in connection with" as it is used in CEA Section 6(c)(1) and Rule 180.1,[224] and

(3) assessed whether CEA Section 6(c)(1) and Rule 180.1 only reach fraudulent conduct by relying on Section 10(b) and

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217. The closest a court seems to have come is in *Ploss v. Kraft Foods Group, Inc.*, 197 F. Supp. 3d 1037 (N.D. Ill. 2016). In that case, traders brought a class action asserting, among other things, a Rule 180.1 claim related to an alleged wash trading scheme based on express misrepresentations. *Id.* at 1068–69. On a motion to dismiss, the court dismissed that Rule 180.1 claim, in part because plaintiffs had failed to adequately allege reliance. *Id.* at 1069. In discussing reliance, the court observed that the traders had waived fraud on the market and, even if not, their allegations insufficiently pled the elements of the doctrine because the traders had not pled facts showing an efficient market. *See id.* at 1069 n.15.

218. *See* Prohibition on the Employment, or Attempted Employment, of Manipulative and Deceptive Devices and Prohibition on Price Manipulation, 76 Fed. Reg. 41398, 41402 (July 14, 2011).

219. *Id.* at 41403 ("The Commission declines to adopt comments recommending outright rejection of the potential application of the 'fraud-on-the-market' theory under final Rule 180.1.").

220. *Id.* ("[W]e decline to opine on the required elements of a private right of action under CEA section 6(c)(1) and final Rule 180.1 as it is beyond the purview of this rulemaking.").

221. *See supra* notes 110–11.

222. Similarly, the CFTC noted during rulemaking that it would be guided by "the substantial body of judicial precedent" when applying Rule 180.1. *See* Prohibition on the Employment, or Attempted Employment, of Manipulative and Deceptive Devices and Prohibition on Price Manipulation, 76 Fed. Reg. 41398, 41399 (July 14, 2011).

223. *See, e.g.*, Ploss v. Kraft Foods Grp., Inc., 197 F. Supp. 3d 1037, 1068 (N.D. Ill. 2016).

224. *See* CFTC v. Hunter Wise Commodities, LLC, 21 F. Supp. 3d 1317, 1346–48 (S.D. Fla. 2014).

> Rule 10b-5 authority that evaluated the same question for 10(b) and 10b-5 purposes.[225]

In keeping with their practice of importing Section 10(b) and Rule 10b-5 jurisprudence into CEA Section 6(c)(1) and Rule 180.1, once courts are presented with the issue, they can be expected to import fraud on the market into Rule 180.1 to the same extent it applies in the Rule 10b-5 context, i.e., when the commodity at issue trades in a market with a generally efficient price, such as crypto exchange-traded crypto assets. That doctrinal evolution is sensible. Courts' acknowledgment of the doctrine in the Rule 180.1 context is supported by the same analytical logic and the same pragmatic considerations that drove the Court in *Basic* to acknowledge fraud on the market for purposes of Rule 10b-5.

V. THE APPLICATION OF FRAUD ON THE MARKET IN CRYPTO ASSET FRAUD CASES

The availability of fraud on the market in connection with Rule 10b-5 and Rule 180.1 claims that involve crypto exchange-traded transactions does not necessarily mean that traders will be able to avail themselves of the doctrine in a specific case. Instead, to do so, traders must satisfy the doctrine's elements, including the requirement that the at-issue crypto asset trades in a generally efficient market.[226]

In the context of stock-based fraud claims, courts have developed a framework for assessing market efficiency for fraud on the market purposes. This Part of the Article evaluates whether that framework is suitable for the judicial assessment of market efficiency in the context of crypto asset transactions occurring on a crypto exchange. The Article concludes that it is, as a general matter, but with some modifications necessary to accommodate the key differences between secondary stock transactions and secondary crypto asset transactions. The Article then turns to and ends with a discussion of some methodological considerations relevant to the use of event studies to directly establish market efficiency in crypto asset-based fraud class actions.

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225. *See* CFTC v. Kraft Foods Grp., Inc., 153 F. Supp. 3d 996, 1008–10 (N.D. Ill. 2015); *see also In re* Tether & Bitfinex Crypto Asset Litig., 576 F. Supp. 3d 55, 111–12, 118–20 (S.D.N.Y. Sept. 28, 2021) (relying on Section 10(b) and Rule 10b-5 cases to determine the meaning of the term "manipulative device" as used in Rule 180.1(a)(1)).

226. In addition to efficiency, the other elements of fraud on the market are: (1) the alleged false or misleading statements were publicly known, (2) those statements were material, and (3) the relevant trades occurred between when the statements were made and when the truth was revealed. *See* Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258, 268 (2014).

A. Market Efficiency in Connection with Secondary Stock Transactions

Market efficiency lies at the core of fraud on the market and in any given case will be the doctrine's most contested element. That element requires evaluating whether the asset's price generally incorporates material, public information.[227] Market efficiency is not a binary question and securities may impound material public information in different degrees.[228]

When assessing market efficiency for purposes of fraud on the market in stock-based cases, courts conduct a holistic analysis guided by a set of factors acknowledged by courts as germane to the market efficiency question, which are collectively referred to as the *Cammer* factors.[229] The factor courts consider most important calls for direct evidence on market efficiency in the form of empirical facts showing a cause-and-effect relationship between the arrival of new, material public information and the stock's price.[230] Courts refer to the other *Cammer* factors as indirect indicia of market efficiency,[231] and they consider evidence of those indicia as indirectly establishing market efficiency.[232]

To provide direct evidence of market efficiency, a party ordinarily will rely on an event study, which is a widely used statistical tool capable of assessing whether, and the extent to which, an asset's price responds to publicly disclosed, material information.[233] Academics

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227. *See supra* Section IV.B.

228. *See* Langevoort, *supra* note 144, at 167.

229. The naming is attributed to the case in which the factors were first enunciated and used. Cammer v. Bloom, 711 F. Supp. 1264, 1276 (D.N.J. 1989).

230. *See, e.g.*, Teamsters Loc. 445 Freight Div. Pension Fund v. Bombardier Inc., 546 F.3d 196, 207 (2d Cir. 2008).

231. The other *Cammer* factors are (1) the average weekly trading volume of the stock, (2) the number of securities analysts following and reporting on the stock, (3) the extent to which market makers traded in the stock, and (4) the issuer's eligibility to file an SEC registration Form S-3. *See, e.g.*, Waggoner v. Barclays PLC, 875 F.3d 79, 94 (2d Cir. 2017). Courts sometimes supplement the analysis with other factors that they similarly describe as indirect indicia of market efficiency. One set of these additional factors, the *Krogman* factors, consist of (1) the company's market capitalization, (2) the stock's bid-ask spread, and (3) the percentage of stock not held by insiders. *See id.* at 94–95 (citing Krogman v. Sterritt, 202 F.R.D. 467, 474 (N.D. Tex. 2001)).

232. *See, e.g.*, *In re* Teva Sec. Litig., No. 3:17-cv-558, 2021 WL 872156, at *8 (D. Conn. Mar. 9, 2021) ("[T]he existence of a 'significant number' of analysts covering a company's securities implies that analysts scrutinized information regarding the company to, eventually, 'make buy/sell recommendations to client investors.' In that way, 'the market price of the stock would be bid up or down to reflect the financial information' released to the market." (quoting Cammer v. Bloom, 711 F. Supp. 1264, 1286 (D.N.J. 1989))).

233. *See, e.g.*, Halliburton Co. v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258, 280 (2014). There is an extensive academic literature on event studies. For a lucid primer on event study methodology in a law review, which includes discussion of the key methodological limitations on the use of event studies in fraud litigation, some of which are discussed below, see Jill E. Fisch, Jonah B. Gelbach & Jonathan Klick, *The Logic and Limits of Event Studies in Securities Fraud Litigation*, 96 TEX. L. REV. 553 (2018). There are technical details

developed the event study methodology for research purposes, and it continues to be used extensively in that way, but the methodology has also become the primary way that parties litigating fraud on the market seek, through their experts, to directly establish or refute market efficiency.[234]

An event study is based on one or more unpredicted events that are a priori assumed to affect the price of the asset.[235] The primary object of inquiry for a given event is the asset's abnormal (or residual) returns.[236] Because of the way in which they are constructed, an asset's abnormal returns are intended to capture how the price of the asset responded to the event at issue. Specifically, an asset's abnormal returns are defined as the difference between the asset's actual or realized returns and the returns that would have been expected in the absence of the event, which are usually referred to as the asset's normal returns.[237] Once calculated, the researcher will subject the asset's abnormal returns to statistical analysis.[238]

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of event studies that this Article sidesteps as they are not relevant to its analysis. For well-regarded resources accessibly discussing some of those technical details, see, for example, A. Craig MacKinlay, *Event Studies in Economics and Finance*, 35 J. ECON. LIT. 13 (1997), and CAMPBELL ET AL., *supra* note 206, at 149–80.

234. Parties in securities or commodities fraud cases also use event studies for other purposes, such as to establish and calculate damages. *See, e.g.*, Plymouth Cnty. Ret. Sys. v. Patterson Cos., Inc., No. 18-871, 2020 WL 5757695, at *14 (D. Minn. Sept. 28, 2020) (explaining that an event study provides the standard measurement of damages in Section 10(b) securities case); Ploss v. Kraft Foods Grp., Inc., 431 F.Supp.3d 1003, 1017 (N.D. Ill. 2020) (explaining that plaintiffs, in a Rule 180.1 class action, relied on their expert's event study for their damages calculations); *see also* Jill E. Fisch & Jonah B. Gelbach, *Power and Statistical Significance in Securities Fraud Litigation*, 11 HARV. BUS. L. REV. 55, 56 (2021) (describing the various other ways that event studies are used in securities fraud cases).

235. For instance, if a crypto asset's sponsors publicly announced that an associated application will undergo a feature improvement, then, so long as the market did not fully anticipate the announcement, it could serve as a valid event, because that announcement is expected to generate an increase in the price of the crypto asset. *See, e.g.*, Liam J. Kelly, *Thorchain's RUNE Token Rallies Double Digits Amid Wave of New Features*, DECRYPT (Mar. 11, 2022), https://decrypt.co/94849/thorchain-rune-token-rallies-new-features [https://perma.cc/PBD4-Y9Z3] (describing price increase in RUNE in response to improvements in Thorchain, an associated application).

236. Abnormal returns are calculated over a span of time known as the event window, which, assuming daily returns, *see infra* note 237, consists of the day of the event and, depending on the research design, possibly also a set number of days before and after the event. *See, e.g.*, MacKinlay, *supra* note 233, at 19–20. In the discussion that follows, the Article assumes daily returns and that the researcher or expert sets the event window so that it consists only of the day of the event, not any additional days before or after the event. In this case, for any event, the event study yields a single abnormal return, i.e., the one occurring on the event day.

237. *See, e.g.*, MacKinlay, *supra* note 233, at 15. Event studies conducted in the context of fraud on the market ordinarily use daily returns, though an event study can be conducted using any time frequency that the data allow, such as hourly returns. *See, e.g.*, Ben R. Marshall, Nick Nguyen & Nuttawat Visaltanachoti, *A Note on Intraday Event Studies*, 28 EUR. ACCT. REV. 605 (2019).

238. *See infra* Section V.B.2.a.

For some academic inquiries, the question an event study seeks to address is whether the market in which the asset traded was semi-strong efficient.[239] If the market is efficient in that sense, then the asset's price would have quickly and fully responded to each of the unpredicted events under inquiry.[240] In this case, the events' price effects would be fully and rapidly reflected in the associated abnormal returns. But, as discussed, the relevant inquiry for fraud on the market is instead whether the asset's price is generally efficient, in that the price generally responds to new, material public information.[241] The manner in which event studies are used in stock cases for fraud on the market purposes exemplifies courts' application of this more generous notion of efficiency. Courts find direct evidence of market efficiency even if a relatively small percentage of the unanticipated events under investigation are associated with statistically significant abnormal returns.[242]

As noted above, courts have extended fraud on the market to securities other than stock, such as bonds.[243] In those other contexts, courts assess market efficiency using the same general framework as they use in the stock context, i.e., relying on direct evidence of market efficiency, ordinarily assessed through the parties' event studies, and

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239. *See, e.g.*, Vidal-Tomás & Ibañez, *supra* note 140, at 260. Scholars have developed other tests capable of assessing whether a market is semi-strong efficient beyond an event study. *See* REILLY ET AL., *supra* note 155, 131–36 (describing market efficiency tests based on identification of predictable returns).

240. *See* REILLY ET AL., *supra* note 155, at 136 ("[T]he intent of event studies is to examine abnormal rates of return surrounding significant economic information. Those who advocate [that markets are semi-strong efficient] would expect returns to adjust quickly to announcements of new information such that investors cannot experience positive abnormal rates of return by acting after the announcement.").

241. *See infra* Section V.B.

242. Consider, for instance, the class certification decision in *In re Petrobras*. *See In re* Petrobras Sec. Litig., 312 F.R.D. 354 (S.D.N.Y. 2016). To streamline the discussion, consider just one of the three securities at issue — the defendant's common American Depository Receipts ("ADRs"). At class certification, Plaintiffs introduced both direct evidence of market efficiency and evidence probative of the indirect indicia of market efficiency. To directly establish market efficiency, Plaintiffs' expert identified three groups of events around which to conduct event studies to assess the at-issue security's market efficiency. Those three groups of events were six days on which the defendant made Form 6-K filings in which the defendant publicly revealed allegations of widescale corruption by its employees ("corruption-related 6-K dates"); 23 days on which the defendant released its earnings ("earnings dates"); and 503 days on which the defendant made Form 6-K filings ("6-K dates"). *See* Corrected Report on Market Efficiency ¶¶ 106–09, 122, 126, 129, *In re Petrobras*, 312 F.R.D. 354 (No. 14-cv-9662). The event studies conducted by Plaintiffs' expert found abnormal returns that were statistically significant at the 5% level for three out of the six (i.e., 50%) corruption-related 6-K dates; eight of the twenty-three (i.e., 34.78%) earnings dates; and 39 of the 503 (i.e., 7.75%) 6-K dates. *See id.* ¶¶ 148, 151, 157. Overall, therefore, the event studies found abnormal returns that were statistically significant at the 5% level for 50 of the 532 (i.e., 9.40%) identified event dates. Even though over 90% of the event dates did not experience abnormal returns that were statistically different from zero at the 5% level, the court nonetheless concluded that the plaintiffs had furnished direct evidence of market efficiency. *See In re Petrobras*, 312 F.R.D. at 367.

243. *See supra* Section IV.D.

indirect indicia of market efficiency.[244] As in the stock context, in those other contexts, courts acknowledge that direct evidence of market efficiency is the most important factor in the inquiry.[245]

B. Crypto Assets and Market Efficiency

The application of fraud on the market to Rule 10b-5 or Rule 180.1 claims involving exchange-traded crypto asset transactions requires a framework for assessing market efficiency. This Part of the Article first outlines the contours of such a framework and then turns to some methodological considerations.[246]

1. Direct Evidence and Indirect Indicia

An inquiry into the market efficiency of a given crypto asset should start, in the first instance, with direct evidence of the general responsiveness of the crypto asset's price in the form of an event study.[247] Courts have significant familiarity with event study methodology because of their extensive use in stock-based securities class actions; there is an expansive academic literature concerning the methodology; and it is known to be a statistically meaningful way to identify whether an asset's price incorporates material, public information. Because of the inconsistent language used in the cases,[248] it is helpful to reiterate that to directly show market efficiency, the event study does not need to demonstrate semi-strong efficiency but only that the crypto asset's price generally responds to material, public information.[249] Additionally, while there are well-known methodological issues with event studies as they are used to assess market efficiency in stock-based Rule 10b-

244. *See, e.g.*, *In re* HealthSouth Corp. Sec. Litig., 261 F.R.D. 616, 632–38 (N.D. Ala. 2009).

245. *See id.* at 635.

246. The analysis below is framed in terms of assessing market efficiency in fraud claims involving a crypto exchange-traded crypto asset, but much of the analysis applies equally to market efficiency assessments in stock-based fraud claims.

247. This statement takes as given the set of statistical tools that can readily assess price responsiveness. To the extent additional tools are subsequently developed that better assess general price responsiveness than an event study, those other empirical tools should be used to directly establish market efficiency. Some scholars have argued that alternate methodologies should substitute for or complement event study methodology in securities class actions. *See* Frank Partnoy, *Market Prices vs. Fundamental Value: The Case for Using Discounted Cash Flow Analysis in Securities Class Actions*, 77 BUS. LAW. 1059, 1059 (2022) (proposing that discounted cash flow analysis be used as a substitute for, or complement to, event studies in securities class actions in order to shift from the analysis of market prices to the analysis of fundamental value).

248. *See supra* notes 168–69, 171–72.

249. *See supra* Section IV.B. Of course, if the event study or other statistical analysis were to show that prices were semi-strong efficient, then that would satisfy the more relaxed standard of general efficiency.

5 class actions, some of which are discussed below,[250] the appropriate response to these issues is for courts to be aware of them, and the parties to be required to address them, rather than outright rejection of the event study methodology.[251]

One of the strengths of an event study is that it allows for decomposition of an observed price change in response to an event into the part attributed to the event and the part attributed to market-level or other factors. Alternate mechanisms for directly determining whether a crypto asset's price is responsive to the arrival of material public information may lack this feature and thus generate erroneous conclusions. As a simplistic, yet illustrative, example, suppose that instead of an event study, a crypto asset's price responsiveness were assessed simply by evaluating whether price changes accompanied the arrival of material public information. In this case, observing a price response after the arrival of material public information could not support, without more, a sufficiently confident determination that the crypto asset's price responded to the information, as the price change could have been caused by contemporaneously occurring market-level changes that also affected the crypto asset's price.[252]

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250. *See, e.g.*, *infra* Section V.B.2.a.; Fisch et al., *supra* note 233, at 589–620; Alon Brav & J.B. Heaton, *Event Studies in Securities Litigation: Low Power, Confounding Effects, and Bias*, 93 WASH U. L. REV. 583 (2015).

251. For instance, confounding is a known issue with event study methodology. Specifically, a price-determinative event may occur contemporaneously with the event that serves as the basis of the study and may not be controlled for in the estimate of the asset's expected returns. *See, e.g.*, Brav & Heaton, *supra* note 250, at 605–08 (discussing confounding). The result is that the calculated abnormal returns attributed to the event will be biased in that they will also include returns generated by the confounding event. To take a concrete example, consider an event study based on an announcement by a crypto asset's sponsors of an improvement to an associated application. *See supra* note 235. But suppose on that same day, sponsors of another crypto asset associated with a competing application also announce an improvement to the competing application. In that case, the event study may show no price effect, i.e., no abnormal returns — not because the crypto asset's price did not move in response to the new material information about the improvement in the associated application, but instead because that price increase was offset by the price-lowering effect of the announcement of the improvement to the competing application.

The possibility of confounding does not mean that event studies should be rejected; rather, courts should be aware of the issue and require parties to address confounding if it is a relevant consideration. *See, e.g.*, Fisch et al., *supra* note 233, at 613 (discussing confounding and the use of intraday returns as a potential means of addressing the issue); *see also* Fisch, *supra* note 126, at 921 (discussing confounding and other methodological issues, and concluding that the identified methodological issues "do not mean that event studies are unreliable or should not be used, but merely that their results should be viewed with caution").

252. This is essentially the sort of analysis that the district court rejected on remand from the First Circuit's decision in the pre-*Halliburton II* case, *In re PolyMedica Corp. Securities Litigation*, 432 F.3d 1 (1st Cir. 2005). *In re* PolyMedica Corp. Sec. Litig., 453 F. Supp. 2d 260, 278–79 (D. Mass 2006). To establish market efficiency, Plaintiffs' expert identified five days during which material news about the defendant company was disclosed publicly. *See id.* at 269. Plaintiffs' expert concluded that the company's stock price was efficient largely on the ground that the stock price moved on those five news days. *See id.* That analysis, the court held, did not establish market efficiency because it did not control for other factors that could have affected the stock price on those five news days. *See id.* at 270 ("These proffers barely

When assessing a crypto asset's price efficiency using an event study, the relevant inquiry should be whether the crypto asset's price moved in a directionally appropriate way in response to those events, not merely whether the price changed, up or down.[253] So, for instance, if an event is a priori expected to increase the crypto asset's price, then the event study should be formulated so that it statistically assesses whether the asset's price increased in response to the event, not just whether the asset's price responded in some fashion. Without mandating directionality, courts would sanction a finding of market efficiency even if the asset's price fell in response to positive news and increased in response to negative news, which is contrary to how prices would respond if they were appropriately responsive to new, material information.

To take an example, consider an event study-based test to assess market efficiency that has been used in recent securities class actions, which experts, litigants, and courts sometimes refer to as the FDT test.[254] To conduct that test, the expert first separates the class period into two subsamples: one subsample comprised of all of the days in the class period in which new material, public information arrived to the

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identify (let alone control for) any of the myriad variables other than news that might explain the movements in [the company's] stock."). While the court's analysis is correct as a general matter, the expert likely could have established price responsiveness after controlling for market and other changes because the data showed that the stock price changed dramatically on the identified five news days, thus likely excluding the possibility that those dramatic changes were purely attributed to market or other factors. *See id.* at 269 (identifying price changes in the range of 17.65% and 49.54% in absolute value). That said, because the First Circuit had directed the lower court to assess market efficiency using the semi-strong standard, *see supra* note 156, price movement alone would not have been enough to satisfy that exacting standard of efficiency because, for instance, semi-strong efficiency requires a complete and rapid price response. *See supra* notes 155, 157.

253. Others have made this point. *See, e.g.*, Fisch et al., *supra* note 233, at 590 ("In event studies used in securities fraud litigation, by contrast, price must move in a specific direction to support the plaintiff's case. For example, an unexpected corrective disclosure should cause the stock price to fall."). The point that an event study should evaluate whether the asset's price moves in a directionally appropriate way is not merely theoretical and instead has practical importance. In *Petrobras*, the Second Circuit affirmed in part the district court's grant of class certification even though the district court placed only limited weight on evidence of directionality. *See In re* Petrobras Sec. Litig., 312 F.R.D. 354, 370 (S.D.N.Y. 2016). ("The Court . . . places only limited weight on the evidence of the directionality . . . . [E]vidence of directionality or the degree of fit between expected and observed moves in a market need not be substantial to allow a finding of market efficiency."). Other courts have similarly credited event studies that were conducted without regard for directionality. *See In re* Teva Sec. Litig., No. 3:17-cv-558, 2021 WL 872156, at *28–29 (D. Conn. Mar. 9, 2021); Petrie v. Elec. Game Card, Inc., 308 F.R.D. 336, 354–55 (C.D. Cal. 2015); Första AP-Fonden v. St. Jude Med., Inc., 312 F.R.D. 511, 521 n.5 (D. Minn. 2015). Instead, for the reasons discussed in the text above, courts should insist that event studies be conducted in a manner that assesses directionally appropriate price responses.

254. *See In re Teva*, 2021 WL 872156, at *22. That naming is in reference to the authors of the article from which the test is drawn. *See* Paul A. Ferrillo, Frederick C. Dunbar & David Tabak, *The "Less Than" Efficient Capital Markets Hypothesis: Requiring More Proof from Plaintiffs in Fraud-on-the-Market Cases*, 78 ST. JOHN'S L. REV. 81, 119–22 (2004).

market, i.e., event days, and a second subsample comprised of all other days, i.e., non-event days. The expert then will conduct an event study to determine the proportion of days in each subsample that experienced abnormal returns that were statistically significant, ordinarily at the 5% level.[255] If the proportion of days with statistically significant abnormal returns in the event days subsample is greater than the proportion of days with statistically significant abnormal returns in the non-event days subsample, and the difference is statistically significant at the chosen level of significance, the expert will take that finding as evidence of market efficiency.[256] The proffered reasoning is that the findings demonstrate price responsiveness because they show that the asset's price moved more on event days than non-event days, in a proportional sense.[257] Courts have found market efficiency based on such findings.[258]

One of the chief methodological issues with this test concerns the lack of directionality. To see this, suppose that the class period is comprised of 500 days. Suppose the expert determines that new, material information arrived to the market on 100 of those 500 days (event days), but not on the remaining 400 days (non-event days). To eliminate the possibility of confounding,[259] suppose that on each of the event days, only a single piece of new, material information arrived to the market. Suppose further that the expert conducts an event study and finds that all 100 of the event days experienced abnormal returns that were statistically significant at the 5% level, and that none of the 400 non-event days experienced any abnormal returns. An expert conducting the FDT test would take these findings as evidence of market efficiency, as the proportion of event days that experienced abnormal returns was greater than the proportion of non-event days that experienced abnormal returns and the difference would have been statistically significant at the 5% level.

Now suppose that each of the 100 event days was a day in which positive, material news arrived to the market, in the sense that a priori the news would be expected to increase the asset's price, but the calculated abnormal returns for each of those 100 event days turn out negative. In this case, the conclusion of market efficiency based on the FDT test would be erroneous. If the asset's price were responsive to material

255. For discussion of significance levels, see *infra* Section V.B.2.a.

256. *See, e.g.*, *In re Petrobras*, 312 F.R.D. at 367–68. The expert may instead implement the test as it was initially articulated and statistically test whether the proportion of days with statistically significant abnormal returns in the event days subsample differs from the proportion of days with statistically significant abnormal returns in the non-event days subsample. *See* Ferrillo et al., *supra* note 254, at 120–22.

257. *See, e.g.*, *In re Petrobras*, 312 F.R.D. at 367–68.

258. *See, e.g.*, *id.* at 371.

259. *See supra* note 251.

information, then abnormal returns on the event days would be expected to be positive, not negative.

Furthermore, the putative class in a securities class action alleging a materially false or misleading statement ordinarily is comprised of those investors who purchased the asset after the statement but before a corrective disclosure.[260] If an asset's price perversely moved in a directionally inappropriate manner, in the sense that its price falls upon the arrival of good news and rises upon the arrival of bad news, then a material misrepresentation that is a priori expected to increase the asset's price would generate no injury to those putative class members. Because the misrepresentation would have caused the asset's price to drop, those investors would have paid *less* for the asset, not more, than they would have in the absence of the fraudulent statement.

An additional doctrinal question is whether the market efficiency determination in a crypto asset-based fraud claim should be limited to direct evidence of market efficiency or also incorporate indirect indicia of market efficiency. That is a relevant consideration generally but also because some economists and scholars have argued that, in the stock context, courts should minimize reliance on the indirect indicia when assessing market efficiency.[261]

The primary objection to courts' reliance on the indirect indicia in stock-based fraud on the market cases is that those indicia poorly correlate with market efficiency.[262] The strength of that objection depends on the nature of efficiency being contemplated. To the extent the objection is that the indicia do not effectively predict whether the market is semi-strong efficient, then the objection is supported by empirical evidence[263] and the financial economic literature more generally.[264] However, the relevant efficiency question, at least after *Halliburton II*, is whether the indirect indicia correlate with the more generalized

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260. *See* Complaint ¶ 21, *In re Petrobras*, 312 F.R.D. 354 (No. 14-cv-9662).

261. *See, e.g.*, Brief of Financial Economists and Legal Scholars as Amici Curiae in Support of Petitioners at 6–10, Barclays PLC v. Waggoner, 138 S. Ct. 1702 (2018) (mem.) (No. 17-1209) (arguing that courts should not find market efficiency in stock-based cases based solely on the indirect indicia).

262. *See, e.g.*, Brav & Heaton, *supra* note 250. Another argument why the indirect indicia in stock-based cases poorly predict market efficiency is that they correlate with one another and so any given indicium may not add independent explanatory power. *See* J. B. Heaton, *Kill* Cammer*: Securities Litigation Without Junk Science*, 11 WM. & MARY BUS. L. REV. 417, 420 (2020) (observing that some indirect *Cammer* factors — number of covering analysts, number of market makers, and ability to file SEC Form S-3 — correlate with the *Krogman* factor of market capitalization).

263. *See* Brief of Financial Economists and Legal Scholars as Amici Curiae in Support of Petitioners at 9 n.10, *Waggoner*, 138 S. Ct. 1702 (No. 17-1209) (citing empirical studies).

264. *See, e.g.*, Allen Ferrell & Andrew Roper, *Price Impact, Materiality, and* Halliburton II, 93 WASH. U. L. REV. 553, 558 n.18 (2015) ("The finance literature does not support viewing the first four *Cammer* factors [*see supra* Section V.A] as formulated and applied as constituting a reliable test for establishing semi-strong form market efficiency as they are commonly invoked prior to class certification.").

notion of efficiency that underlies the doctrine, rather than semi-strong efficiency.[265] In that latter regard, while the empirical findings are more mixed,[266] it remains the case that the indirect indicia may not properly correlate with general price responsiveness, at least in certain instances. For example, while small companies may not satisfy many of the indirect indicia, the price of their stock nonetheless may still be generally responsive to material, public information.[267]

This discussion illuminates the key requirement that indirect indicia of market efficiency in the crypto asset context must satisfy: sufficient correlation with crypto asset price responsiveness. Before recognizing an indicium as a means of indirectly showing market efficiency in the crypto asset context, a court should be reasonably confident that the indicium correlates with crypto asset price responsiveness. Even in the absence of formal quantitative analysis bearing on that question, a court may still permit a crypto asset plaintiff to use a particular indicium of market efficiency, so long as other evidence sufficiently connects the indicium to crypto asset price responsiveness.

To take an example, at least some crypto asset traders are seemingly motivated by non-financial considerations when engaging in crypto asset transactions, including crypto asset transactions that occur on crypto exchanges.[268] If many traders of the at-issue crypto asset trade the crypto asset for reasons unrelated to financial considerations, then it may be that the crypto asset's price is insufficiently responsive to material, public information.[269] Those non-financially motivated traders may not modify their trading behavior in response to new material information or may modify their trading behavior in a manner that offsets the price effects of those other traders who do base their trades on financial considerations.

This raises the possibility that one potential indicium of crypto asset price responsiveness is the extent to which the traders of the at-issue crypto asset are not motivated by financial considerations or fail to

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265. *See supra* Section IV.B.

266. *See, e.g.*, O. Miguel Villanueva & Steven Feinstein, *Stock Price Reactivity to Earnings Announcements: The Role of the* Cammer/Krogman *Factors*, 57 REV. QUANT. FIN. & ACCT. 203, 205 (2021) (finding that certain of the indirect indicia correlate positively with the associated stocks having a greater price response to earnings announcements).

267. *See, e.g.*, Cox, *supra* note 177, at 24–25 (making this point and citing empirical studies). Also, to the extent the indirect indicia in stock-based cases do not properly correlate with general price responsiveness, the appropriate response is not to preclude plaintiffs from relying on indirect indicia to establish general price responsiveness but instead to reformulate the indicia so that they better align with general price responsiveness.

268. *See, e.g.*, Dirk G. Baur & Thomas Dimpfl, *Asymmetric Volatility in Cryptocurrencies*, 173 ECON. LETTERS 148, 148 (2018) (concluding that fear of missing out motivates some crypto asset traders' trading behavior).

269. In the stock context, scholars have made the similar observation that the presence of meme investors (i.e., retail investors who have initiated recent stock rallies through social media) may undermine a stock's price responsiveness. *See* Sue S. Guan, *Meme Investors and Retail Risk*, 63 B. C. L. REV. 2051, 2054, 2079 (2022).

modify their trading behavior in response to material, public information. Before a court were to acknowledge that indicium, it should be reasonably confident that it correlates with crypto asset price responsiveness. In addition to any available quantitative studies, an additional means of establishing that necessary correlation could be through the testimony of an expert who is adequately knowledgeable about secondary crypto asset trading. That expert may be able to credibly opine on whether crypto asset traders are sufficiently motivated by non-financial considerations such that it is sensible in a given case to inquire whether traders' non-financial considerations sufficiently attenuate the crypto asset's price responsiveness. Further, if just some of the crypto asset's traders trade without regard to the crypto asset's price, but the crypto asset's price remains sufficiently price responsive because of the price-sensitive trading of other crypto asset traders, the defendant may be able to rebut the presumption of reliance as to those former traders. [270]

A final question pertinent to the structure of the framework courts should use to assess market efficiency in a given crypto asset Rule 10b-5 or Rule 180.1 case is whether traders should be required to produce direct evidence on market efficiency or instead be able to rely solely on indirect indicia to make that showing.[271] There is nothing in the Supreme Court's fraud on the market jurisprudence that obligates plaintiffs to produce direct evidence on market efficiency. The relevant question is whether the traders in a given case establish that the crypto asset at issue trades in a generally efficient market. So long as the indirect indicia adopted by courts are sufficiently probative of generalized efficiency, plaintiffs need not be required to produce direct evidence; courts should instead conduct a holistic analysis of market efficiency based on the totality of the evidence before them.[272] But while they should not be obligated to do so, traders in crypto asset cases are expected to significantly rely on event studies because they offer a methodologically sound way to directly assess price responsiveness and because of their centrality in current fraud on the market cases.

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270. *See supra* note 150; *see also* GAMCO Invs., Inc. v. Vivendi, S.A., 927 F. Supp. 2d 88, 102–04 (S.D.N.Y. 2013) (presumption of reliance rebutted because plaintiffs were found to have not relied on the market price when making their trading decisions).

271. That issue is a subject of an incipient disagreement among the Courts of Appeal in stock-based Rule 10b-5 fraud claims, with the Second Circuit holding that plaintiffs need not always produce direct evidence of market efficiency, *see* Waggoner v. Barclays PLC, 875 F.3d 79, 97 (2d Cir. 2017), but other circuits suggesting otherwise, *see In re* Xcelera.com Sec. Litig., 430 F.3d 503, 512 (1st Cir. 2005) ("In the absence of such a [cause-and-effect] relationship, there is little assurance that information is being absorbed into the market and reflected in its price.").

272. This reasoning equally applies to the stock-based context and thus supports the Second Circuit's decision in *Waggoner* holding that plaintiffs need not produce direct evidence of market efficiency. *See Waggoner*, 875 F.3d at 97; *supra* note 271.

2. Event Studies and Methodological Considerations

The expected use of event studies in crypto asset-based fraud cases will implicate a set of important methodological considerations. Many of these methodological considerations are applicable to the stock-based context and so have been the subject of previous inquiry. The Article in this Section focuses on the issue of low power and then briefly touches on additional methodological considerations.

a. Low Power, Including Because of Crypto Asset Price Volatility

In a set of important papers, scholars highlighted a key limitation on the predictions that can be drawn from event studies as they are presently used in fraud actions.[273] While the issue, known as low power, applies even beyond event studies,[274] in the event study context it concerns the potential inability of the study to identify a statistically significant price response even when the underlying asset's price is truly price responsive. This Section of the Article highlights that issue and its relevance to the crypto asset context.

A key difference between event studies used in academic work and those used in stock-based fraud cases is that stock-based event studies in academic work usually use data from multiple firms.[275] In such studies, the researcher will estimate the abnormal returns for a large number of firms' stock and then subject that large group of abnormal returns to statistical analysis.[276] In contrast, event studies in stock-based fraud cases use data from a single firm — the issuer of the stock involved in the litigation.

Single-firm event studies present several issues, including low power.[277] To see the nature and implication of low power in the context of an event study, suppose that a researcher is contemplating conducting an event study to determine whether a company's stock responded to the public disclosure of some material information in a directionally appropriate way.[278] The researcher will want the statistical test to

273. Brav & Heaton, *supra* note 250; Fisch et al., *supra* note 233; Fisch & Gelbach, *supra* note 234.

274. Specifically, the issue arises in relation to statistical analysis in the form of hypothesis testing. *See infra* note 278.

275. *See* Brav & Heaton, *supra* note 250, at 586.

276. *See, e.g.*, Menesh S. Patel, *Does Insider Trading Law Change Behavior? An Empirical Analysis*, 53 U.C. DAVIS L. REV. 447, 479 (2019) (conducting an event study on a sample of firms that were subject to an acquisition).

277. Single-firm event studies raise additional methodological issues beyond low power. *See* Brav & Heaton, *supra* note 250.

278. The researcher's statistical analysis in this Section, as is the case in fraud claims, is in the form of a hypothesis test, where the researcher identifies a hypothesis to statistically evaluate, referred to as the null hypothesis, against an alternative hypothesis. The statistical analysis permits the researcher to reject the null hypothesis or not reject the null hypothesis. The

satisfy certain properties. First, the researcher, all else equal, will want to minimize the probability of a false positive — that is, incorrectly concluding that there was a directionally appropriate price response when there actually was none.[279] By setting a significance level for the test, such as 1%, 5%, or 10%, the researcher implicitly sets her tolerance for false positives.[280]

But in addition, again all else equal, the researcher will want to maximize the probability of a true positive — that is, rejecting the hypothesis that there was no directionally appropriate price response when there actually was a directionally appropriate price response.[281] The probability of a true positive is the power of the researcher's statistical test.[282] Stated slightly more informally, in the context of an event study, power is the likelihood that the researcher correctly concludes from the data that there was a directionally appropriate price response when in fact there was one.

While a researcher wants a low probability of a false positive and a high probability of a true positive, i.e., high power, she cannot have both because there is a known tradeoff between the two.[283] Moreover, plaintiffs and defendants see things differently, both as to themselves

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null hypothesis for purposes of assessing market efficiency is that the price of the asset did not respond in the directionally appropriate way to the associated event. So, for instance, if the analyzed event is the one discussed above in which a crypto asset's sponsors publicly announced that an associated application will undergo a feature improvement, then the null hypothesis is that the crypto asset price stayed the same or fell in response to the announcement.

279. A false positive is known as a Type I error.

280. In particular, by setting a significance level of α, the researcher sets the probability of a false positive, i.e., a Type I error, equal to α. So, for instance, setting a 10% level of significance instead of 5% simply means that the researcher is somewhat more willing to tolerate false positives — i.e., she is comfortable that 10% of the time she may erroneously conclude there was a directionally appropriate price response when there actually was not a directionally appropriate price response, rather than being wrong in that regard 5% of the time.

281. This is ordinarily framed in terms of the researcher wanting to minimize the probability of a Type II error, which is defined as the researcher failing to reject the null hypothesis (i.e., the hypothesis that there was no directionally appropriate price response) when the null is false. This articulation and the one in the text lead to the same substantive conclusions because the probability of a Type II error is one minus the probability of a true positive. For an intuitive graphical exposition of Type II errors, see Edward G. Fox, Merritt B. Fox & Ronald J. Gilson, *Economic Crisis and the Integration of Law and Finance: The Impact of Volatility Spikes*, 116 COLUM. L. REV. 325, 353–54 (2016).

282. An event study's power cannot be determined in the abstract and instead requires information on the variability of the asset's returns and the designated level of statistical significance. Furthermore, an event study's power is a function of the true abnormal return, which is hypothesized in advance of calculating the power and can be set at any value. *See* Fisch & Gelbach, *supra* note 234, at 78 n.89 (providing the formula for power). For examples of power calculations, see Brav & Heaton, *supra* note 250, at 599–600 (discussing single-firm event studies with power equal to 42.8% and 21.7%, for two specifications of the true abnormal returns). Brav and Heaton have proposed that parties be required to conduct and report the results of power analysis for any event study. *See* Brav & Heaton, *supra* note 250, at 612–13.

283. This is ordinarily framed as a tradeoff between the probability of Type I errors and Type II errors. *See, e.g.*, Fox et al., *supra* note 281, at 369–70 (discussing the tradeoff between the probability of Type I and Type II errors in the context of event studies in fraud cases).

and as to the researcher. With respect to an event study undertaken to assess price responsiveness of an at-issue asset, defendants prefer a low probability of false positives and desire low power, while plaintiffs prefer a high probability of false positives and want high power, assuming such litigants care solely about case outcomes.

Courts ordinarily focus on a 5% significance level and sometimes may insist that an abnormal return be statistically significant at the 5% level before crediting it.[284] This is tantamount to the court setting the probability of a false positive equal to 5%, a low value that benefits defendants in those cases. Others have explored the important public policy issues implicated by that decision rule.[285] Discussion of those policy considerations, as well as the various critiques that have been lodged against strong statistical cutoff rules,[286] are beyond the scope of this Article, which assumes that courts maintain their usual focus on a 5% level of statistical significance when assessing event study findings.

Plaintiffs in stock-based fraud cases are further disadvantaged because the event study will only involve the stock of a single firm and, as noted, single-firm event studies are known to potentially have low power.[287] This same issue carries over to the crypto asset context. An event study conducted in a fraud or commodities class action involving

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284. *See, e.g.*, *In re* Intuitive Surgical Sec. Litig., No. 5:13-cv-01920-EJD, 2016 WL 7425926, at *13 (N.D. Cal. Dec. 22, 2016) (rejecting plaintiffs' argument that their expert's event study showed that a lower than expected earnings announcement generated abnormal returns to the at-issue stock because the estimate was not significant at the 5% level but was significant at the 10% level); *In re* Moody's Corp. Sec. Litig., 274 F.R.D. 480, 494 n.11 (S.D.N.Y. 2011) (plaintiffs' expert's event study, which showed abnormal returns associated with a negative news story at the 10% level of statistical significance, not credited because it was not significant at the 5% level).

285. *See, e.g.*, Jonah B. Gelbach, *Estimation Evidence*, 168 U. PA. L. REV. 549, 552 (2020) (explaining that courts' adherence to a 5% level of significance does not align with the preponderance of evidence standard and proposing that courts adopt Bayesian hypothesis testing rather than conventional hypothesis testing); Fisch & Gelbach, *supra* note 234, at 101 (explaining that the choice of significance level is a policy choice and calling on the SEC to identify the optimal significance level); *see also* Merritt B. Fox, Halliburton II*: It All Depends on What Defendants Need To Show To Establish No Impact on Price*, 70 BUS. LAW. 437, 459–62 (2015) (identifying possible reasons why courts have insisted on a 5% level of significance when considering fraud on the market).

286. For instance, as the American Statistical Association has noted, "[p]ractices that reduce data analysis or scientific inference to mechanical 'bright-line' rules (such as '$p<0.05$' [i.e., 5% significance]) for justifying scientific claims or conclusions can lead to erroneous beliefs and poor decision making. A conclusion does not immediately become 'true' on one side of the divide and 'false' on the other." Ronald L. Wasserstein & Nicole A. Lazar, *The ASA Statement on* p-*Values: Context, Process, and Purpose*, 70 AM. STATISTICIAN 129, 131 (2016). To take an example, suppose that a finding fails to be significant at the 5% level but is significant at the 5.1% level. Intuition suggests that the finding should not lose all informational value simply because its significance level tiptoes over the 5% level.

287. *See* Brav & Heaton, s*upra* note 250, at 586; Fisch et al., *supra* note 233, at 578; Fisch & Gelbach, *supra* note 234, at 58. The reason has to do with the volatility of abnormal returns, which will be relatively high if there is just one firm in the event study, compared to the case in which there are many. *See* Brav & Heaton, *supra* note 250, at 603–05.

a crypto exchange-traded crypto asset will involve just one asset, rather than multiple assets, and therefore likely will have low power.

But the prospect of low power is magnified when the asset at issue is an exchange-traded crypto asset, rather than stock, because crypto asset prices presently are much more volatile than stock prices and at times are very volatile.[288] An increase in the volatility decreases an event study's power.[289] Given the high volatility observed among crypto assets as a class,[290] an event study may not be able to readily identify — at the 5% level ordinarily used by courts — a statistically significant price response in a given case, even when the crypto asset at issue was price responsive.[291]

There are statistically sound modifications to the event study methodology that may enable better assessment of market efficiency in the

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288. For example, in a comprehensive study, Yukun Liu and Aleh Tsyvinski evaluate the statistical properties of over 1,700 crypto exchange-traded crypto assets between January 1, 2011 and December 31, 2018. *See* Yukun Liu & Aleh Tsyvinski, *Risks and Returns of Cryptocurrency*, 34 REV. FIN. STUDS. 2689, 2690 (2021). In addition to evaluating the statistical properties of certain individual crypto assets, the authors create an index of all the crypto assets in their sample. They find that the standard deviation of the return of the index is 5.46%, which is considerably higher than the volatility of stock returns. *See id.* at 2698 tbl.1 (calculating 5.46% standard deviation for returns of the constructed crypto asset index, compared to 0.95% standard deviation for stock returns over the sample period). However, it is important to note that the authors found that the standard deviation of the crypto asset index's returns decreased substantially over the sample period. *See id.* at 2719 ("We find that the standard deviation of coin market returns decreased significantly from the first half to the second half of the sample period. The figure in the Internet Appendix shows a significant decrease in the volatility of the coin market returns over time."). The referenced Internet Appendix plots the standard deviation of the crypto asset index's returns for each month over the January 1, 2011 to December 31, 2018 sample period. Yukun Liu & Aleh Tsyvinski, *Online Appendix of "Risks and Returns of Cryptocurrency,"* OXFORD ACAD. (Sept. 26, 2020), https://academic.oup.com/rfs/article/34/6/2689/5912024 [https://perma.cc/33KH-ZUD6]. In earlier periods, i.e., before 2015, the figure shows some months with very volatile returns, with the standard deviation approaching 10% in some months and even 15% in one month before 2015. *Id.* In the period after 2015, the figure shows significantly lower standard deviation than in the pre-2015 period, including no months with a standard deviation exceeding 10%. *Id.* It is possible that the downward trend in crypto asset volatility observed by Liu and Tsyvinski over the period from January 1, 2011 to December 31, 2018 has continued.

289. *See, e.g.*, Fisch & Gelbach, *supra* note 234, at 76–78.

290. *See* Liu & Tsyvinski, *supra* note 288. Shorter return frequencies can also facilitate an assessment of whether an asset's price moves in a directionally appropriate way in the sense discussed *supra* Section V.B.1. For example, suppose on a given day both good news and bad news concerning the asset arrive to the market. Because the two pieces of information are a priori expected to have divergent effects on the asset's price, it may not be possible to make a credible a priori determination whether the asset's price would be expected to rise or fall on that particular day (except in certain cases, such as if one of the pieces of news was significantly more important to traders than the other). This situation would serve to frustrate an assessment of whether the asset's price moved in a directionally appropriate way on the event day. However, an event study using a shorter return frequency would be able to assess directionality, as that would enable a separate assessment of the magnitude and direction of the price effects of each of the two pieces of news.

291. There is a distinct question about the effect that changing volatility has on event study methodology. For discussion of the key issues, see Fox et al., *supra* note 281, at 346, and Andrew C. Baker, *Single-Firm Event Studies, Securities Fraud, and Financial Crisis: Problems of Inference*, 68 STAN. L. REV. 1207, 1237–38 (2016).

face of volatile crypto asset prices. For instance, while event studies in fraud cases ordinarily use daily returns, it is methodologically sound for an event study to use different return frequencies, such as hourly returns, so long as the pricing data are available.[292] A crypto asset's price may be less volatile over shorter return frequencies,[293] in which case an event study based on shorter return frequencies may have higher power than a study based on daily returns. Shorter return frequencies have the additional benefit of potentially excluding confounding events from the event window.[294]

Regardless, the prospect of an event study being unable to readily detect true positives, especially in cases involving a crypto exchange-traded crypto asset, provides an additional justification for courts not requiring plaintiffs in fraud cases to produce direct evidence of market efficiency and also an additional justification for courts allowing such plaintiffs to rely on indirect indicia to establish price responsiveness.[295] Closely mirroring a suggestion by Fisch, Gelbach, and Klick, because an event study in a fraud case likely will have low power, regardless of asset type, one possible resolution may be for the court to admit the testimony of a qualified expert who could opine on the crypto asset's price responsiveness.[296]

Relatedly, because of the extent of fraud that occurred during crypto asset initial offerings,[297] traders who purchased those affected crypto assets in the secondary markets may seek classwide relief under Rule 10b-5 or Rule 180.1 on the theory that the initial offering fraud inflated the price of the crypto asset in the secondary market. While an event study is not suited to evaluating whether the crypto asset's price incorporates false or misleading statements made before the asset started trading on a crypto exchange, a qualified expert may be able to provide testimony valuable to the trier of fact about how materially false or misleading statements during the offering stage could have funneled into higher prices on the secondary markets, though any such testimony would have to satisfy the standards of Federal Rule of Evidence 702.

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292. *See supra* note 237.

293. *See* Liu & Tsyvinski, *supra* note 288, at 2698 tbl.1 (showing decreasing crypto asset return volatility as return frequency decreases from monthly to weekly to daily returns).

294. *See supra* note 250.

295. *See supra* Section V.B.1.

296. Fisch et al., *supra* note 233, at 619 ("[O]ne approach might be to allow financial-industry professionals to be qualified as experts for purposes of testifying that an alleged corrective disclosure could be expected to cause price impact, both for the class certification purposes on which we have focused and as to other merits questions. The logic of this idea is simple: when event study evidence fails to find a significant price impact, that evidence has limited probative value, so the value of general, nonstatistical expert opinions will be comparatively greater in such cases than in those cases is [sic] which event study evidence does find a significant price impact.").

297. *See supra* Section III.A.

Finally, as an intermediate position between overruling *Basic* and requiring semi-strong efficiency, some scholars argued with regard to *Halliburton II* that the Court should reject fraud on the market in favor of a doctrine that entitles plaintiffs to a rebuttable presumption of reliance only if they can establish price impact, i.e., show that the allegedly false or misleading statement affected the asset's market price.[298] While that proposal has doctrinal appeal, in part because a key implication of fraud on the market is that traders transacted at a price that was distorted by fraud,[299] the discussion above shows why that proposal could preclude class certification in many circumstances simply because of the nature of the statistical analysis. Because plaintiffs would be required to establish price impact using an event study that is expected to have low power, they may be unable to make the necessary showing, especially in light of courts' usual insistence on a 5% level of statistical significance.

b. Additional Methodological Considerations

The use of event studies in fraud class actions involving a crypto exchange-traded crypto asset would implicate other methodological considerations beyond low power. This Section of the Article briefly highlights two additional methodological issues.

First, as discussed earlier, unlike stock, crypto assets are often cross-listed on multiple crypto exchanges.[300] To the extent that a

298. *See* Brief of Law Professors as Amici Curiae in Support of Petitioners at 24–32, Halliburton v. Erica P. John Fund, Inc. (Halliburton II), 573 U.S. 258 (2014) (No. 13-317) (amicus brief by M. Todd Henderson and Adam C. Pritchard) (proposing that plaintiffs be able to obtain a presumption of reliance only if they can establish price impact); *see also* Adam C. Pritchard, Halliburton II*: A Loser's History*, 10 DUKE J. CONST. L. & PUB. POL'Y 27, 44–46 (2015) (discussing Henderson and Pritchard's price impact proposal and the Court's discussion of it during the oral argument in *Halliburton II*). In regards to *Halliburton II*, Lucian Bebchuk and Allen Ferrell proposed a similar doctrinal change but without taking a position on whether plaintiffs should be required to establish price impact or instead whether defendants should be required to establish lack of price impact. *See* Bebchuk & Ferrell, *supra* note 158, at 685–96; *see also* Jonathan R. Macey, Geoffrey P. Miller, Mark L. Mitchell & Jeffry M. Netter, *Lessons from Financial Economics: Materiality, Reliance, and Extending the Reach of* Basic v. Levinson, 77 VA. L. REV. 1017, 1021 (1991) ("The inquiry relevant to a presumption of reliance in a securities fraud case is not whether the market for a security is efficient, but whether the defendants' misstatements or omissions affected the price of that security."); Donald C. Langevoort, *Theories, Assumptions, and Securities Regulation: Market Efficiency Revisited*, 140 U. PA. L. REV. 851, 898–99 (1992) ("Why should we, however, limit the presumption to traders in efficient organized markets? . . . The only important question is whether the price was distorted.").

299. *See supra* Section IV.C.

300. *See supra* Section II.A. For instance, returning to the example of FIL discussed in Part II above, *see supra* Section II.C, that particular crypto asset presently trades on dozens of crypto exchanges, *see Filecoin*, COINMARKETCAP, https://coinmarketcap.com/currencies/filecoin/markets [https://perma.cc/YE25-EBLQ], though only some of those crypto exchanges are available to U.S. residents. *See id.* (listing both Binance (not available to U.S. residents) and Binance.US (available to U.S. residents)).

putative class is defined to encompass transactions of an at-issue crypto asset occurring on different crypto exchanges, the efficiency of each of those crypto exchanges must be separately assessed for fraud on the market purposes. If only some of the crypto exchanges in which members of the putative class transacted the at-issue crypto asset are generally efficient, then the fraud on the market presumption of reliance would not attach to transactions that occurred in the non-efficient markets.

Because the efficiency of each crypto exchange in which the proposed class transacted the at-issue crypto asset must be separately assessed, if plaintiffs rely on event studies to establish the efficiency of the relevant crypto exchanges, the associated statistical analysis must be conducted separately for each crypto exchange, rather than collectively for the set of relevant crypto exchanges.[301] There is some empirical evidence suggesting that different crypto exchanges may have different degrees of price responsiveness,[302] so plaintiffs may only be able to directly establish that some of the crypto exchanges in which the proposed class transacted were generally efficient.[303] Some empirical evidence also raises the possibility that crypto asset prices can become more price responsive over time.[304] If the direct evidence and indirect indicia show that the at-issue crypto asset traded on a generally efficient market for only a part of the class period, then the reliance presumption would only apply to transactions occurring during that segment of the class period.

The second methodological issue concerns the probabilistic distribution of abnormal returns. That issue, like low power, has been the subject of academic inquiry[305] but has not yet been incorporated into judicial determinations of market efficiency. Event study methodology and the associated hypothesis tests that researchers and experts use to statistically assess the findings of an event study assume that the at-issue asset's abnormal returns are distributed according to a normal

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301. So, for instance, it would be improper, for fraud on the market purposes, for an expert to develop an index of the crypto asset's prices based on its prices on the relevant crypto exchanges and then assess the collective efficiency of those markets by conducting event studies using the constructed price index.

302. *See* Vidal-Tomás & Ibañez, *supra* note 140, at 261 tbl.3 (reporting differing empirical findings from two separate event studies, one conducted on bitcoin transactions occurring on the Bitstamp crypto exchange and another conducted on bitcoin transactions occurring on the (now defunct) Mt. Gox crypto exchange).

303. This would not be determinative of the efficiency of any of the crypto exchanges because efficiency is assessed through evaluation of direct evidence and indirect indicia of market efficiency. *See supra* Section V.B.1.

304. *See* Vidal-Tomás & Ibañez, *supra* note 140, at 261 (concluding based on empirical findings that bitcoin became more price responsive to negative events over the sample period).

305. *See* Jonah B. Gelbach, Eric Helland & Jonathan Klick, *Valid Inference in Single-Firm, Single-Event Studies*, 15 AM. LAW & ECON. REV. 495, 533 (2013); Fisch et al., *supra* note 233, at 593–98.

distribution.[306] A failure of abnormal returns to be normally distributed in event studies used to assess market efficiency can generate incorrect statistical conclusions.[307]

There is evidence that abnormal stock returns are not normally distributed,[308] and there is no reason to assume that, in a given fraud case involving a crypto exchange-traded crypto asset, the at-issue crypto asset's abnormal returns will be normally distributed. To the extent the asset's abnormal returns are not sufficiently normally distributed, the expert should conduct additional statistical analysis that accommodates those non-normal returns. Scholars have proposed readily implementable solutions in the academic literature that can be used in that circumstance.[309]

VI. CONCLUSION

As secondary crypto asset trading fraud cases percolate through the judiciary, courts will be increasingly asked to decide whether fraud on the market is available to crypto asset traders in connection with SEC Rule 10b-5 or CFTC Rule 180.1 claims involving an exchange-traded crypto asset. The discussion above shows that because the predicates of fraud on the market are met with respect to crypto assets that trade on a crypto exchange, the doctrine is available to crypto asset traders in those circumstances. But in a given case, crypto asset traders will be able to avail themselves of fraud on the market only if they can establish the doctrine's elements, including market efficiency. The Article articulated the contours of the framework courts should use to assess market efficiency in the crypto asset context and identified methodological issues relevant to the framework's application in a given crypto asset case.

306. *See* Fisch et al., *supra* note 233, at 593.

307. For an intuitive discussion of the issue, see Fisch et al., *supra* note 233, at 593–94. For a more technical discussion, see Gelbach et al., *supra* note 305, at 509–14.

308. *See, e.g.*, Stephen J. Brown & Jerold B. Warner, *Using Daily Stock Returns: The Case of Event Studies*, 14 J. FIN. ECON. 3, 10 (1985); Gelbach et al., *supra* note 305, at 511, 534–37.

309. *See* Gelbach et al., *supra* note 305, at 593–99 (proposing and developing the SQ test). Despite the relative ease with which the SQ test can be implemented, as of this Article's writing, there appear to be no reported cases in which an expert is noted as having conducted that test.