
CRYPTO-DERIVATIVES

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Does the crypto environment exhibit the same level of sophistication and leverage in the derivatives industry as traditional finance? This Article explores this question by providing the first qualitative and empirical analysis of the uncharted crypto-derivatives landscape within the crypto economy and its interaction with traditional finance. The conclusion drawn is that, at their current stage of development, crypto-derivatives do not represent a significant leap forward in terms of sophistication. Instead, they tend to replicate the most basic existing structures. Furthermore, although they have the potential to be a transformative force in the crypto economy and contribute to the emergence of a new financial network, they are not yet widely spread in the market.

Derivatives and leverage have significantly influenced the development of modern financial capitalism, contributing to the emergence of new networks, particularly the shadow banking system, with unprecedented levels of financial innovation. Starting from this foundation, this Article delves into the analysis of new financial derivatives in the crypto economy. It provides a qualitative and quantitative assessment of these structures, including the first dataset of existing crypto-derivatives available in the market, referring to 100+ crypto-exchanges. This Article also considers the size of the liquid staking market and liquid staking derivatives (“LSDs”), taking into account the major fifty competitors globally. It then contextualizes crypto-derivatives in the entire crypto economy, questioning whether they contributed to the emergence of a new network identified as crypto shadow banking, mimicking the shadow banking system and, more generally, traditional finance. In doing so, this Article highlights the role of crypto-derivatives in the development of similar problems affecting the financial system, particularly liquidity risks and technology-related risks. It also identifies some regulatory measures to mitigate and, in some cases, anticipate these imminent problems.

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I. INTRODUCTION

Is the crypto environment equally leveraged and characterized by a high level of sophistication in the derivatives industry as traditional finance? This Article explores this question by providing the first qualitative and empirical analysis of the crypto-derivatives landscape in the crypto economy and its relationship with traditional finance.

Derivatives played a fundamental role in finance, displaying a direct impact on the society and our lives. According to the most recent data from the Bank for International Settlements (“BIS”) the total notional amounts outstanding for contracts in the derivatives market was an estimated \$600 trillion.¹ The great increase in the value of derivatives—and financial leverage²—was often considered one the causes leading to the great financial crisis of 2008.³ Derivatives and the financial innovations from the late 1990s to the 2008 financial crisis represent one of the most notable examples of disruptive innovation in finance in modern times,⁴ and have posed a challenge to regulators who struggled to identify effective regulatory tools to manage the financial and economic risks associated with these practices. The challenges experienced by regulators in the context of financial innovation highlight the importance of understanding the role of technological innovation and developing adequate regulatory strategies in contemporary times.

The crypto economy proved to be difficult for market actors, regulators and investors. New developments in the crypto economy still extremely relevant for traditional finance include the recent approval of Bitcoin Exchange-Traded Funds (“ETFs”) by the Securities and Exchange Commission (“SEC”) in January

1. BANK FOR INT’L SETTLEMENTS, OTC DERIVATIVES STATISTICS AT END-JUNE 2022 1 (2022), https://www.bis.org/publ/otc_hy2211.pdf [<https://perma.cc/J84J-DYZX>].

2. Leverage refers to the possibility of making an investment recurring to “a small upfront monetary commitment using borrowed funds.” See ALAN N. RECHTSCHAFFEN, CAPITAL MARKETS, DERIVATIVES, AND THE LAW: POSITIVITY AND PREPARATION 163 (2019).

3. See FIN. CRISIS INQUIRY COMM’N, THE FINANCIAL CRISIS INQUIRY REPORT: FINAL REPORT OF THE NATIONAL COMMISSION ON THE CAUSES OF THE FINANCIAL AND ECONOMIC CRISIS IN THE UNITED STATES xix–xx (2011).

4. See generally Nathan Cortez, *Regulating Disruptive Innovation*, 29 BERKELEY TECH. L.J. 175 (2014).

2024.⁵ This radical novelty could bring significant changes in the market, increasing the importance of tokenization of real assets, and creating more opportunities for new financial instruments, including the creation of new complex crypto-derivatives.

Before that, the Crypto-Winter of 2022 was an extremely difficult time for the crypto economy and Decentralized Finance (“DeFi”). Several major market crashes and scandals took place, leading to a decline in the overall market capitalization of cryptocurrencies⁶ and losses exceeding \$2 trillion.⁷ Investors also faced an unprecedented number of hacks⁸ and regulatory uncertainties related to the bankruptcy proceedings applied to the crypto economy. In May 2022, the stablecoin Terra USD (“UST”) suffered a major collapse, resulting in billions of dollars in losses,⁹ triggering the market crash of two prominent crypto-lending and broker-dealer platforms, Celsius and Voyager, which both filed for Chapter 11 bankruptcy in June 2022.¹⁰ Celsius and Voyager operated as lending and broker-dealer platforms, although they were not regulated as credit institutions.¹¹ In October 2022, the FTX scandal wiped out \$183 billion in value in the crypto-market,¹² and had a significant impact on the cryptocurrency price.¹³ The FTX scandal exposed the weaknesses of a non-regulated system, where market platforms engage in various activities, including high-risk proprietary trading.¹⁴ FTX’s affiliated company, Alameda Research, engaged in risky and highly

5. Gary Gensler, *Statement on the Approval of Spot Bitcoin Exchange-Traded Products*, SEC (Jan. 10, 2024), <https://www.sec.gov/news/statement/gensler-statement-spot-bitcoin-011023> [<https://perma.cc/4YG8-EM3P>].

6. Cheyenne De Von, *Bitcoin Lost Over 60% of Its Value in 2022—Here’s How Much 6 Other Popular Cryptocurrencies Lost*, CNBC (Dec. 23, 2022, 9:30 AM), <https://www.cnbc.com/2022/12/23/bitcoin-lost-over-60-percent-of-its-value-in-2022.html> [<https://perma.cc/7LGM-VQJQ>].

7. Ari Levy & MacKenzie Sigalos, *Crypto Peaked a Year Ago—Investors Have Lost More than \$2 Trillion Since*, CNBC, <https://www.cnbc.com/2022/11/11/crypto-peaked-in-nov-2021-investors-lost-more-than-2-trillion-since.html> (Nov. 14, 2022, 3:07 AM) [<https://perma.cc/XR8S-U5EK>].

8. Josh Smith, *Crypto Hacks Stole Record \$3.8 Billion in 2022, Led by North Korea Groups—Report*, REUTERS (Feb. 6, 2023, 5:09 PM), <https://www.reuters.com/technology/crypto-hacks-stole-record-38-billion-2022-led-by-north-korea-groups-report-2023-02-01/> [<https://perma.cc/8BW3-WQXD>].

9. As Chainalysis explains, “The collapse of TerraUSD (UST) had three stages. First, two traders broke UST’s peg; next, Terraform Labs and three supporters repaired it by purchasing \$2B UST; finally, the continued sell-off drained those funds, hyperinflated UST’s sister token LUNA, and crashed the price of both LUNA and UST.” *The Trades That Triggered TerraUSD’s Collapse*, CHAINALYSIS (June 9, 2022), <https://blog.chainalysis.com/reports/how-terrausd-collapsed/> [<https://perma.cc/9VVE-TXMK>].

10. Ryan Deffenbaugh, *Crypto Bankruptcy Plunges the Industry into Uncharted Territory*, PROTOCOL (July 15, 2022), <https://web.archive.org/web/20230922113521/https://www.protocol.com/fintech/crypto-bankruptcy-voyager-celsius> [<https://perma.cc/HX42-L2ND>].

11. *Id.*

12. Lyllah Ledesma, *FTX Collapse Leaves Total Crypto Market Cap Under \$800B, Close to 2022 Low*, COINDESK (Nov. 17, 2022, 4:05 PM), <https://www.coindesk.com/markets/2022/11/17/ftx-collapse-leaves-total-crypto-market-cap-under-800b-close-to-2022-low/> [<https://perma.cc/Y5JR-VV3E>].

13. *See id.*

14. *SEC Charges Samuel Bankman-Fried with Defrauding Investors in Crypto Asset Trading Platform FTX*, SEC (Dec. 13, 2022), <https://www.sec.gov/newsroom/press-releases/2022-219> [<https://perma.cc/YS63-TDFT>].

leveraged investments (margin trading), which generated significant losses as early as May 2022, before the crash of UST.¹⁵

Many observers have drawn parallels between the recent events in the crypto economy and DeFi and the financial crisis of 2008.¹⁶ During the financial crisis, financial conglomerates created Too-Big-To-Fail (“TBTF”) problems, and were channels for financial interconnectedness, systematically related to highly leveraged investments and proprietary trading activities facilitated by the widespread use of financial derivatives.¹⁷

At present, a crucial question is whether the developing ecosystems of the crypto economy and DeFi are establishing fundamentally new frameworks or simply replicating—“cloning,” as suggested by the International Organization of Securities Commissions¹⁸ (“IOSCO”)—existing trends and structures of traditional finance. This Article aims to answer this question by examining the derivative market industry in the crypto economy, and analyzing its implications. In traditional finance, derivatives brought important changes and contributed to the emergence of the shadow banking, a network of financial institutions and financial instruments providing the same functions to the financial system as banks, but without being regulated as such.

The process of financial transformations leading to the establishment of new financial institutions beyond traditional credit institutions started in the 1970s and has not stopped since.¹⁹ The trend of banking disintermediation, or market-based credit intermediation, and the emergence of the shadow banking system reduced the centrality of traditional banks in the economy and introduced new risks.²⁰ Banking disintermediation occurs when corporations obtain funding from sources other than banks, whether provided by non-bank lenders or alternative techniques, such as issuing bonds.²¹ Financial and economic crises, as well as increased regulatory pressure (such as the Basel Accords, strengthening

15. Jeff Kauffman & Emily Mason, *How Did Sam Bankman-Fried’s Alameda Research Lose So Much Money?*, FORBES, <https://www.forbes.com/sites/jeffkauffman/2022/11/19/how-did-sam-bankman-frieds-alameda-research-lose-so-much-money/> (Nov. 21, 2022, 10:51 AM) [<https://perma.cc/Y2YN-F6XJ>].

16. See, e.g., David Z. Morris, *Satoshi Wept: How Crypto Replayed the 2008 Financial Crisis*, COINDESK, <https://www.coindesk.com/layer2/2022/07/12/satoshi-wept-how-crypto-replayed-the-2008-financial-crisis> (May 11, 2023, 12:02 PM) [<https://perma.cc/AW38-3XNP>].

17. See FIN. CRISIS INQUIRY COMM’N, *supra* note 3, at xix.

18. Media Release, Int’l Org. of Sec. Comm’n, IOSCO Explains How Decentralised Finance Is Cloning Financial Markets 1 (Mar. 24, 2022), <https://www.iosco.org/news/pdf/IOSCONEWS637.pdf> [<https://perma.cc/S7KM-GP7V>].

19. See generally Charles K. Whitehead, *The Evolution of Debt: Covenants, the Credit Market, and Corporate Governance*, 34 J. CORP. L. 641 (2009).

20. See Steven L. Schwarcz, *Regulating Shadow Banking*, 31 REV. BANKING & FIN. L. 619, 624–25 (2012).

21. For an analysis of the transformations at the level of market structures and banking disintermediation, see *id.*; see also Whitehead, *supra* note 19, at 673; KERN ALEXANDER, *PRINCIPLES OF BANKING REGULATION* 26–27 (2019).

the capital ratios for banks), have significantly contributed to the rise of banking disintermediation.²²

The emergence of the shadow banking system led to increased financial complexity and interconnection, promoting riskier investments within the financial system.²³ At the same time, it increased the level of legal uncertainty in financial regulation and contributed to regulatory “capture” due to this increased complexity.²⁴ This was a reflection of the financial industry’s growing ability to create unregulated structures and financial instruments, which ultimately culminated in the financial crisis of 2008.²⁵

These transformations were the result of two layers. The first is financial engineering, with a wave of complex derivatives and structured products that began to penetrate the market, and the second is technology, which has facilitated the evolution of the financial industry.²⁶

From this perspective, this Article explores the similarities between the crypto economy, DeFi, and traditional finance. It assesses the existing crypto-derivatives providing a qualitative and empirical analysis. Furthermore, it proposes the label “Crypto Shadow Banking,” and identifies how the emerging financial instruments, techniques and practices in the crypto economy correspond to those in traditional finance and replicate the same functions and model of business. Those crypto-platforms acting as lenders and broker-dealers are not fully regulated, and provide a wide range of services, such as trading, custody, deposits, and loan issuance. The recent market crashes have shown a high level of engagement in risky proprietary trading activities, which the post-2008 crisis regulatory regime tried to limit.²⁷ In doing so regulators opted for separating financial institutions, especially credit institutions, from the private fund industry, namely hedge-funds and private equity funds. These platforms are also involved in the development of stablecoins and the creation of new financial instruments, including crypto-derivatives. The process of tokenizing real-assets, also supported by the Web3 developments, is becoming a key driver in the crypto economy and could reach \$16 trillion by 2030.²⁸

At a more mature stage of its development, it is interesting to note how the crypto economy and DeFi resemble the pre-existing traditional financial system.

22. For an overview of the pre-crisis financial architecture and a historical approach, see generally Rolf H. Weber & Douglas W. Amer, *Toward a New Design for International Financial Regulation*, 29 U. PA. J. INT’L L. 391 (2007).

23. See Schwarcz, *supra* note 20, at 628–29, 632.

24. See, e.g., Daniel C. Hardy, *Regulatory Capture in Banking 5* (Int’l Monetary Fund, Working Paper No. 06/34, 2006); see also Giovanni Dell’Ariccia & Robert Marquez, *Competition Among Regulators and Credit Market Integration*, in LIQUIDITY AND CRISES 320, 321 (Franklin Allen, Elena Carletti, Jan Pieter Krahnén & Marcel Tyrell eds., 2011).

25. See Cortez, *supra* note 4, at 185–86.

26. See *id.*

27. See, e.g., *SEC Charges Samuel Bankman-Fried with Defrauding Investors in Crypto Asset Trading Platform FTX*, *supra* note 14.

28. Sumit Kumar, Rajaram Suresh, Darius Liu, Bernhard Kronfellner & Aaditya Kaul, RELEVANCE OF ON-CHAIN ASSET TOKENIZATION IN ‘CRYPTO WINTER’ 6 (2022), <https://web-assets.bcg.com/1e/a2/5b5f2b7e42dfad2cb3113a291222/on-chain-asset-tokenization.pdf> [<https://perma.cc/RNB4-764Z>].

Similar functions and business models could potentially lead to similar risks, as well as new ones arising from technology.

This Article is structured as follows. Part II lays the groundwork for the analysis, focusing on the traditional financial system. It explores the landscape of traditional derivatives, their evolution, and the significance of shadow banking. Part III conducts an in-depth analysis of crypto-derivatives, examining the key features of the most significant instruments emerging in the market. It also provides a quantitative analysis of all crypto-derivatives traded in the market. Part IV contextualizes the impact of crypto-derivatives concerning the emergence of a new financial network: Crypto Shadow Banking. It scrutinizes the similarities between the two networks, comparing key financial instruments and entities in traditional shadow banking, such as money market funds (“MMFs”), private funds, prime brokers, and securitizations, with their counterparts in Crypto Shadow Banking. Part IV also evaluates the associated risks arising from Crypto Shadow Banking in the financial sector. This includes excessive leverage, liquidity risks, a lack of financial metrics to assess and rate the emerging crypto economy, its entities, and instruments. It further considers the risk of new financial conglomerates emerging, potentially fueled by technological advancements and related scale economies. Part V proposes specific regulatory measures at the levels of market infrastructures, crypto-financial products, crypto-financial conglomerates, and ratings. These measures could be implemented by regulators to mitigate systemic risks and enhance investor protection.

II. WHAT ARE DERIVATIVES

This Part provides a background analysis of what derivative contracts are, considering the most important ones, notably futures, options, swaps, and forwards, and how these derivatives evolved. This information is fundamental to understanding the new financial instruments emerging in the crypto economy, the emergence of a new financial network, Crypto Shadow Banking, and finally, the risks, as explored in Parts III, IV, and V.

A. *Traditional Derivatives*

1. *General Characteristics*

Derivatives are contracts in which two parties agree to execute specific actions conditional on the price movement of an underlying asset or the occurrence of a future event.²⁹ Each type of derivative serves distinct functions.³⁰ For instance, counterparties may agree to exchange a specified amount of the underlying asset at a predetermined price on a future date (as in forwards or futures), or they may acquire the right, but not the obligation, to do so (as in options). Alternatively, derivatives may involve periodic payments linked to the performance

29. See RECHTSCHAFFEN, *supra* note 2, at 158.

30. *Id.* at 165–75.

of the underlying asset, as is common in swap contracts.³¹ Generally, derivatives can be used for hedging or speculative purposes.³²

Depending on their transaction venue, derivatives can be either exchange-traded (standardized)³³ or OTC (over the counter, privately negotiated).³⁴ Exchange-traded derivatives are designed to “virtually eliminate counterparty risk.”³⁵ Instruments such as futures are quoted and traded exclusively on exchanges or other organized platforms, where their contractual terms are defined and standardized. Traditionally, traders negotiated these derivatives through verbal calls and hand signals in a system known as open outcry.³⁶ Electronic trading, however, has replaced this system virtually everywhere,³⁷ starting an evolution toward algorithmic, high-frequency, and increasingly decentralized trading methodologies.

OTC derivatives allow counterparties to agree on specific clauses tailored to their specific needs, though this flexibility comes with increased liquidity and counterparty risks.³⁸ OTC derivatives, such as forwards and swaps, are negotiated bilaterally (or multilaterally) off-exchange, which grants parties flexibility to customize contractual terms.³⁹ This, however, also results in a less transparent market, a factor that contributed to the 2008 financial crisis.⁴⁰ In response, OTC derivatives have undergone extensive regulatory reforms in various jurisdictions, with a focus on greater standardization, transparency, and trading safeguards.⁴¹

31. *Id.* at 172.

32. *See generally* Lynn A. Stout, *Risk, Speculation, and OTC Derivatives: An Inaugural Essay for Convivium*, ACCT. ECON. & L., Jan. 2011, at Article 2.

33. *Derivatives*, U.S. DEP’T TREASURY, <https://web.archive.org/web/20210318234744/https://www.treasury.gov/resource-center/faqs/Markets/Pages/derivatives.aspx> (Dec. 5, 2010, 9:37 AM) [<https://perma.cc/4F4L-DLV4>].

34. *See* RECHTSCHAFFEN, *supra* note 2, at 161.

35. *Id.* at 162.

36. *See generally* Yiuman Tse & Tatyana V. Zabolina, *Transaction Costs and Market Quality: Open Outcry Versus Electronic Trading*, 21 J. FUTURES MKTS. 713 (2001).

37. For example, the London Metal Exchange (LME) still employs an open outcry system. *See The Ring*, LONDON METAL EXCH., <https://www.lme.com/Trading/Trading-venues/The-Ring> (last visited July 26, 2025) [<https://perma.cc/JN3P-RN6R>]. The Chicago Board Options Exchange (CBOE) is also renowned for maintaining options ‘pits’ dedicated to open outcry trading. *See* Katherine Doherty, *Cboe Keeps Old Model Alive Opening New Trading Floor*, BLOOMBERG (June 7, 2022, 1:34 PM), <https://www.bloomberg.com/news/articles/2022-06-06/cboe-keeps-old-school-pit-alive-with-new-chicago-trading-floor> [<https://perma.cc/5S4L-UFRU>].

38. RECHTSCHAFFEN, *supra* note 2, at 162.

39. *Id.* at 161–62.

40. *See* Michael J. Casey, *Without Stronger Transparency, More Financial Crises Loom*, CPJ, <https://cpj.org/2014/02/attacks-on-the-press-transparency-finance/> (last visited July 26, 2025) [<https://perma.cc/UGG6-SXAH>].

41. These are listed among the regulatory objectives listed in the G20 Leaders’ Statement delivered at the Pittsburgh Summit of 2009. Org. for Econ. Coop. & Dev., *Leaders’ Statement: The Pittsburgh Summit 7 (2009)*, <https://web.archive.org/web/20240224093032/https://www.oecd.org/g20/summits/pittsburgh/G20-Pittsburgh-Leaders-Declaration.pdf> [<https://perma.cc/98T3-XTX3>]. Some of the most relevant efforts towards the Pittsburgh objectives in relation to OTC derivatives are represented by the US Dodd-Frank Act, the European Market Infrastructure Regulation (EMIR) and the UK Financial Services and Markets Act 2000 (Over the Counter Derivatives, Central Counterparties and Trade Repositories) Regulations 2013.

Derivatives trading is conducted through brokerage firms or financial institutions that provide investors access to exchanges for a fee.⁴² Derivatives are essentially traded “on margin,” meaning that traders commit to a fraction of the total cost of the trade relative to the actual exposure of the position.⁴³ This commitment requires depositing successive tranches of funds into a margin account held by the broker, which serves as collateral to mitigate counterparty credit risk. The tranche is deposited when entering into a derivative contract (the initial margin) and is determined by the broker as a percentage of the total cost of the position (the initial margin requirement).

At set intervals, the margin account is adjusted through a “mark-to-market” adjustment, reflecting the investor’s profits and losses.⁴⁴ To prevent the account from becoming negative, a maintenance margin level is also established.⁴⁵ If the margin balance falls below this maintenance level, the investor receives a margin call to restore the margin account to the initial margin level, requiring additional funds known as variation margin.⁴⁶ If the variation margin is not provided within a specified period, the broker will close out the position and liquidate it to cover incurred losses.⁴⁷ Should the proceeds from liquidation be insufficient, the broker may, as outlined in the agreement, have the right to liquidate other positions within the same account, a process referred to as cross-product margining.⁴⁸ Additionally, the required margin amount may be aligned with the simulated risk of the entire portfolio, a practice known as portfolio margining.⁴⁹

Depending on the type of derivative contract,⁵⁰ margin may be exchanged directly between the counterparties or, more commonly, through a central clearing counterparty (“CCP”) entrusted with clearing and settling transactions. CCPs act as substitute counterparties for transactions submitted by their members, relying on novation or other legal mechanisms (*e.g.*, an open offer) to become the sole principal to both sides of a trade, thereby absorbing the associated credit

42. See Dmytro Matsypura & Laurent L. Pauwels, *Does Portfolio Margining Make Borrowing More Attractive?*, 43 INT’L REV. FIN. ANALYSIS 128, 128 (2016).

43. *Id.*

44. *What Is Mark to Market (MTM)?*, M.STOCK, <https://www.mstock.com/articles/mark-to-market> (last visited July 26, 2025) [<https://perma.cc/T7TS-A9AL>].

45. See Matsypura & Pauwels, *supra* note 42, at 128.

46. *Id.*; see also James Chen, *Variation Margin: Definition, Calculation, Examples*, INVESTOPEDIA, <https://www.investopedia.com/terms/v/variationmargin.asp> (Aug. 16, 2024) [<https://perma.cc/9AJY-2AAL>].

47. See Chen, *supra* note 46.

48. See SHYAM VENKAT & STEPHEN BAIRD, LIQUIDITY RISK MANAGEMENT: A PRACTITIONER’S PERSPECTIVE 95–96 (2016).

49. Customer Margin Rules Relating to Security Futures, Exchange Act Release No. 46,292, 78 S.E.C. Docket 384 (July 31, 2002), <https://www.sec.gov/rules/2002/08/customer-margin-rules-relating-security-futures> [<https://perma.cc/7U8V-92XK>]. See also Matsypura & Pauwels, *supra* note 42, at 133. For futures contracts, minimum margin levels are usually calculated using the Standard Portfolio Analysis of Risk (“SPAN”). See CFTC & SEC, A JOINT REPORT OF THE SEC AND THE CFTC ON HARMONIZATION OF REGULATION 38 (2009), <https://www.sec.gov/news/press/2009/cftcjointreport101609.pdf> [<https://perma.cc/4LUT-2YDE>].

50. Some classes of OTC derivatives are not subject to central clearing obligation. For example, in the EU, ESMA regularly updates a “Public Register for the Clearing Obligation.” See generally ESMA, PUBLIC REGISTER FOR THE CLEARING OBLIGATION (2024), https://www.esma.europa.eu/sites/default/files/library/public_register_for_the_clearing_obligation_under_emir.pdf [<https://perma.cc/86K9-3XXH>].

risk.⁵¹ CCPs become “the buyer to every seller and seller to every buyer.”⁵² Firms affiliated with a CCP become its members and deposit margin directly with the CCP, which also retains a contribution toward a default fund.⁵³ This fund is available to mutualize substantial losses resulting from member defaults.⁵⁴

Margin requirements play a pivotal role in mitigating credit risk and maintaining stability in derivatives markets. At the same time, they reflect the nature of derivatives as “embedded” leverage instruments, often serving as the sole capital threshold needed to control fluctuations in the price of the underlying asset.⁵⁵ While this dual may seem contradictory, it encapsulates embodies the delicate balance inherent in derivatives across financial markets.

2. *Most Relevant Contracts*

After highlighting the general characteristics associated with derivatives, this Section briefly highlights the key features of the most important derivative contracts.

a. Futures

The primary purpose of derivatives is to transfer the risk of financial loss due to price fluctuations in the underlying asset, a practice known as *hedging*.⁵⁶ Futures contracts facilitate hedging by allowing traders to lock in prices for buying or selling a specific quantity of the underlying asset at a set future date.⁵⁷ A trader anticipating a price increase in an asset might *buy* a futures contract linked to that asset, effectively taking a *long* position in the futures. This entails agreeing to purchase a specified quantity of the underlying asset at a predetermined future date from a counterparty who is *selling*, or taking a *short* position, in that same futures contract. The transaction price is determined based on the futures’ *bid* (purchase) and *ask* (sale) quotes published by the exchange, which reflect the best available prices at which buyers and sellers are willing to transact at that moment.

On the execution date, the underlying asset is delivered to the buyer, resulting in a profit or loss determined by the difference between the agreed-upon price

51. *Id.* at 5.

52. Robert T. Cox & Robert S. Steigerwald, *A CCP is a CCP is a CCP* 1 (Fed. Rsv. Bank of Chi., Working Paper, 2017), https://fraser.stlouisfed.org/files/docs/historical/frbchi/policydiscussion/frbchi_policy_2017-01.pdf [<https://perma.cc/32RC-KU2P>]. See also, *ex multis*, COMMITTEE ON PAYMENT AND SETTLEMENT SYSTEMS, A GLOSSARY OF TERMS USED IN PAYMENTS AND SETTLEMENT SYSTEMS 12–13, 33 (Mar. 2003), https://www.bis.org/cpmi/glossary_030301.pdf [<https://perma.cc/7GCA-UQ4S>].

53. Guillaume Vuilleme, *The Value of Central Clearing* 13, (HEC Paris Rsch., Working Paper No. FIN-2018-1307, 2019), <http://dx.doi.org/10.2139/ssrn.3247551> [<https://perma.cc/ZL3L-L26G>].

54. Dominic Cucic, *Central Clearing and Loss Allocation Rules*, 59 J. FIN. MKTS. 1, 2 (2022).

55. See Andrea Frazzini & Lasse Heje Pedersen, *Embedded Leverage*, 12 REV. ASSET PRICING STUDIES 1, 1 (2022).

56. See Sergey Chernenko & Michael Faulkender, *The Two Sides of Derivatives Usage: Hedging and Speculating with Interest Rate Swaps*, 46 J. FIN. & QUANTITATIVE ANALYSIS 1727, 1728 (2011).

57. John Buchovecky, *The Future of Leverage Contract Trading Under the Futures Trading Act of 1986*, 37 AM. U. L. REV. 157, 171–73 (1987).

and the latest settlement price of the futures contract.⁵⁸ For instance, this structure helps airlines mitigate their exposure to rising fuel costs by securing a fixed purchase price for fuel. It also assists precious metal investors, who may commit to delivering precious metals to protect against potential future declines in their market price.⁵⁹

Futures and underlying spot prices differ throughout the life of the derivative, despite being influenced by the same economic factors (known as *correlation*).⁶⁰ This discrepancy arises from various factors, including the cost of carry and general market sentiment. As a futures contract approaches maturity, however, the price difference narrows and may become negligible (referred to as *convergence*) due to arbitrage.⁶¹ If the futures price is higher (or lower) than that of the underlying asset, traders can profit by going short (or long) on the futures while simultaneously buying (or selling) the underlying asset and completing (or receiving) delivery.⁶² Arbitrageurs help to make the relationship between futures and underlying prices predictable, allowing hedgers to transfer unwanted risk.

The majority of futures contracts, like derivatives in general, do not culminate in the physical delivery of assets.⁶³ Instead, positions are often closed before execution by entering into offsetting trades; more commonly, they are settled in cash.⁶⁴ In a cash settlement, the parties exchange a single sum of money representing the net value of their positions.⁶⁵ Cash settlement in futures occurs daily within the margin account,⁶⁶ supporting not only hedging but also the speculative use of these contracts, allowing investors to capitalize on price differentials without the intention of exchanging the actual underlying asset.

b. Options

An option contract gives the holder the right, but not the obligation, to either sell (*put*) or purchase (*call*) the underlying asset by a certain expiration date for a set strike price.⁶⁷ Therefore, an investor expecting an upward price movement in the underlying asset will buy (go long) a call option or sell (go short) a put option. Conversely, an investor who expects the asset's price to decline will purchase a put option and sell a call option.⁶⁸

58. Adam Hayes, *Futures Contract Definition: Types, Mechanics, and Uses in Trading*, INVESTOPEDIA, <https://www.investopedia.com/terms/f/futurescontract.asp> (Feb. 9, 2024) [https://perma.cc/VBM8-NG97].

59. See generally JOHN C. HULL, *OPTIONS, FUTURES, AND OTHER DERIVATIVES* 764 (2022).

60. Adam Hayes, *Contango Meaning, Why it Happens, and Backwardation*, INVESTOPEDIA, <https://www.investopedia.com/terms/c/contango.asp> (Sept. 3, 2024) [https://perma.cc/7VXX-6NNR].

61. HULL, *supra* note 59, at 113.

62. *Id.* at 48–50.

63. Robert C. Lower, *The Regulation of Commodity Options*, 1978 DUKE L.J. 1095, 1106 (1978).

64. James Chen, *Close Position: Definition, How It Works in Trading and Example*, INVESTOPEDIA, <https://www.investopedia.com/terms/c/closeposition.asp> (Aug. 27, 2024) [https://perma.cc/NN3Z-PV69].

65. James Chen, *Cash Settlement: Definition, Benefits, and Examples*, INVESTOPEDIA, <https://www.investopedia.com/terms/c/cashsettlement.asp> (Feb. 20, 2024) [https://perma.cc/RNS3-ZHUD].

66. See *Margining Process*, EUREX, <https://www.eurex.com/ec-en/services/margining/margining-process> (last visited July 26, 2025) [https://perma.cc/A653-J24X].

67. See HULL, *supra* note 59, at 205.

68. See *id.* at 206.

To obtain an option right, investors pay a premium to the option seller (*writer*).⁶⁹ Although the premium represents a larger upfront cost compared to futures or other instruments, the potential loss is capped at the premium as long as the option remains unexercised.⁷⁰ If exercising the option would result in a loss exceeding the premium paid, the contract is considered *out-of-the-money*.⁷¹ Conversely, if the option is *in-the-money*, the holder is entitled to receive an amount equivalent to the profit they would have made from the purchase or sale of the underlying asset.⁷² Given that premiums are generally lower than the cost of outright purchasing the underlying asset or even entering into futures (though this may depend on the type of option),⁷³ options typically offer cheaper (embedded) leverage.

In addition to the type of underlying asset and venue of trading, options may also differ according to their exercise rights. The most common types of contracts are *European*, *American*, and *Asian* (or *Bermudan*).⁷⁴ A European option can be exercised only upon contract expiration;⁷⁵ an American option can be exercised at any time before the expiration date, while Asian options can be exercised only on some predefined dates.⁷⁶

c. Swaps

Both forwards and swaps derive from options: a forward can be seen as a combination of a call and a put, while swaps can be structured as a series of forwards requiring payments on different dates.⁷⁷ The purpose of swap contracts is to exchange cash flows or liabilities generated from different sources. There are several different types of swaps. The interest rate swap (“IRS”) is the most common contract and the most actively traded OTC derivative globally.⁷⁸ In a

69. See *id.* at 207.

70. Marshall Hargrave, *Options Contract: What It Is, How It Works, Types of Contracts*, INVESTOPEDIA, <https://www.investopedia.com/terms/o/optionscontract.asp> (June 17, 2024) [https://perma.cc/G74N-3GTG].

71. See HULL, *supra* note 59, at 212.

72. See Robert Geske, Avanidhar Subrahmanyam & Yi Zhou, *Capital Structure Effects on the Prices of Equity Call Options*, 121 J. FIN. ECON. 231, 232 (2016).

73. As an example of actual margins required by brokers, see, e.g., *Options Margin Overview*, INTERACTIVE BROKERS, <https://www.interactivebrokers.com/en/trading/margin-options.php> (last visited July 26, 2025) [https://perma.cc/9Y4K-37AR].

74. Adam Hayes, *Bermuda Option: What They Are, Examples, Pros and Cons*, INVESTOPEDIA, <https://www.investopedia.com/terms/b/bermuda.asp> (Apr. 21, 2022) [https://perma.cc/8WPD-CN8R].

75. Considering a long European call, its value can never be worth less than $S_0 - Ke^{-rT}$ and can never be worth more than $Ke^{-rT} - S_0$. S_0 is the underlying's current price (e.g., a stock), K is the strike price of option discounted at r , being the continuously compounded risk-free interest rate for an investment maturing in time T . The option payoff is displayed as the positive part of the value at exercise, thus $payoff = \max(S_T - K, 0)$. S_T is the price of the underlying at exercise. See HULL, *supra* note 59, at 205, 252–53.

76. *American vs European vs Bermudan Options*, CORP. FIN. INST., <https://corporatefinanceinstitute.com/resources/derivatives/american-vs-european-vs-bermudan-options/> (last visited July 26, 2025) [https://perma.cc/E379-WSM7].

77. JAE K. SHIM & MICHAEL CONSTAS, ENCYCLOPEDIA OF INTERNATIONAL FINANCE AND BANKING 103 (2001).

78. In the first half of 2023, the notional amount of outstanding OTC derivatives was above \$573 trillion, almost \$466 trillion of which coming from IRSs. *Global OTC Derivatives Market*, BANK INT'L SETTLEMENTS,

vanilla IRS, one counterparty agrees to make payments at a predetermined fixed rate to another counterparty, which, in turn, agrees to pay interest at a floating rate.⁷⁹ While the fixed leg does not change for the duration of the contract, the floating rate is linked to a benchmark rate—traditionally London Inter-Bank Offered Rate (“LIBOR”), now replaced by overnight reference rates—and adjusts accordingly.⁸⁰ Typically, neither party pays the resulting obligations directly; instead, positions are netted against one another, so that the party owing the greater amount on any given day pays the other the difference between the two amounts.

As with other derivatives, IRSs can be used for either hedging or speculation.⁸¹ Hedging is appropriate when the underlying involves an actual transaction.⁸² For instance, assume Party A receives a loan from Bank B with a floating interest rate. If the benchmark rate rises, Party A may seek a fixed interest rate by entering into an IRS with Bank C, the swaps dealer. In this arrangement, Party A continues to pay floating interest to Bank B while receiving a fixed amount, minus a fee, from Bank C, and making fixed interest payments to Bank C.

Both hedging and speculation can also take the form of arbitrage. In fact, swaps and derivatives, in general, can be used to leverage discrepancies in prices, rates, or interests across different markets.⁸³ Without delving into a detailed example, it can be stated that two counterparties, each lacking access to the other’s market conditions regarding rates, can simply take out loans in their respective markets and subsequently exchange cash flows through an IRS. If the agreement involves swapping principal and interest payments made in different currencies, it is referred to as a cross-currency IRS (or “XCS”).⁸⁴ Since each counterparty is required to pay the interest rate appropriate to their currency under the transaction, both interest and currency rates must be computed to determine the actual payoffs.

d. Forwards

A forward is a contractual agreement between two parties to trade an asset on a future date at a predetermined delivery price, irrespective of the spot price of the underlying asset when the forward contract expires.⁸⁵ Profit or loss for investors depends on how the spot price compares to the delivery price. If the spot price is higher than the delivery price, the buyer of the forward purchases the underlying asset below the market price, thus making a profit.⁸⁶ Conversely, the forward seller makes a profit only if, upon expiration of the contract, the spot

https://data.bis.org/topics/OTC_DER/tables-and-dashboards/BIS,DER_D5_1,1.0?time_period=2023-S1 (last visited July 26, 2025) [<https://perma.cc/MYD3-ZDD2>].

79. ALASTAIR HUDSON, *THE LAW OF FINANCIAL DERIVATIVES* 157 (2017).

80. HULL, *supra* note 59, at 173–74.

81. Chernenko & Faulkender, *supra* note 56, at 1729.

82. *Id.*

83. *Id.* at 1728.

84. SHIM & CONSTAS, *supra* note 77, at 56.

85. *Id.* at 130.

86. *Id.* at 62.

price is lower than the delivery price.⁸⁷ The forward buyer is said to assume a *long* position, while the seller assumes a *short* position.

The economics of forwards is the same as that of futures. The key differences are that forwards are customizable contracts traded off-exchange between counterparties, while futures are standardized and traded exclusively on-exchange.⁸⁸ Moreover, unlike futures, forwards are settled only on the delivery date and are not marked to market. This significantly increases exposure to counterparty risk.⁸⁹

Large financial institutions typically use foreign exchange (“FX”) forwards, whereby counterparties agree to buy a certain amount of one currency by selling a certain amount of another on a specific future date.⁹⁰ This effectively allows them to lock in an exchange rate between the two currencies, mitigating exposure to currency fluctuations.⁹¹

B. *How Did Derivatives Evolve*

Derivatives have been used for millennia. Early forms of forwards and options, dating back to Mesopotamian, Greek, and Roman cultures, were primarily used to protect the value of harvests.⁹² Between the sixteenth and eighteenth centuries, commodity derivatives were traded as security contracts on European exchanges such as those in Antwerp, Amsterdam, and London.⁹³ But it was not until the mid-nineteenth century that daily settlements in U.S. “time contracts” (akin to forwards)—in contrast with the European practice of monthly settlements—spurred secondary markets and gave rise to a class of purely speculative investors uninterested in the delivery of the underlying asset.⁹⁴ Speculation attracted abuses and manipulation, highlighting the need for a system of rules. In 1863, the Chicago Board of Trade (“CBT”), initially a meeting place for commercial matters, adopted the first self-regulations for on-exchange forward trading.⁹⁵ Shortly afterward, it began transitioning forwards into standardized futures with margin requirements and formal contract settlements.⁹⁶

87. *Id.* at 63–64.

88. *Id.* at 141.

89. PATRICE PONCET & ROLAND PORTAIT, CAPITAL MARKET FINANCE: AN INTRODUCTION TO PRIMITIVE ASSETS, DERIVATIVES, PORTFOLIO MANAGEMENT AND RISK 314–15 (2022).

90. *Id.* at 338.

91. *Id.*

92. See generally EDWARD J. SWAN, BUILDING THE GLOBAL MARKET: A 4000 YEAR HISTORY OF DERIVATIVES (2000).

93. Geoffrey Poitras, *From Antwerp to Chicago: The History of Exchange Traded Derivative Security Contracts*, 1 REVUE D’HISTOIRE DES SCIENCES HUMAINES 11, 23–24 (2009).

94. *Id.* at 36.

95. *Id.* at 37.

96. Joseph Santos, *A History of Futures Trading in the United States*, ECON. HIST. ASS’N (Mar. 16, 2008), <https://eh.net/encyclopedia/a-history-of-futures-trading-in-the-united-states/> [<https://perma.cc/ZML3-G72K>]; see also Jerry W. Markham, *Federal Regulation of Margin in the Commodity Futures Industry—History and Theory*, 64 TEMPLE L. REV. 59, 66–67 (1991).

On the other hand, early attempts to regulate option trading (then called “privileges”) were unsuccessful.⁹⁷ The establishment of clearinghouses was also not an early success. Initially used only to reduce transaction costs,⁹⁸ clearinghouses offering counterparty substitution were funded by only a few smaller U.S. exchanges, drawing inspiration from entities like the Caisse de Liquidation des Affaires en Marchandises in Le Havre and the London Produce Clearing House (“LPCH”), established in 1888.⁹⁹ The CBT established its clearinghouse, the Board of Trade Clearing Corporation (“BOTCC”), only in 1925.¹⁰⁰

Widespread public opposition to futures and options trading—viewed as a form of gambling and a means of exploiting farmers—combined with a collapse in grain prices, led to the enactment of the Grain Futures Act of 1922.¹⁰¹ This marked the first federal effort to regulate derivatives, requiring exchanges to prevent price manipulation and imposing a substantial tax on option trading.¹⁰² In 1936, the Act was expanded and renamed the Commodity Exchange Act (“CEA”).¹⁰³ Notably, it criminalized market manipulation, imposed limits on the size of speculators’ positions to favor small investors, and banned options linked to selected “domestic” commodities.¹⁰⁴ This long-sought ban, which was fully lifted with the Futures Trading Act of 1982, ultimately favored both OTC and offshore trading,¹⁰⁵ facilitating strategies such as “naked” options and, eventually, “leverage contracts.”

In a “naked” (or “uncovered”) option, the seller lacks any offsetting or risk-reducing position, such as a hedging option or the underlying asset itself.¹⁰⁶ As a result, if the option is exercised, the seller must purchase the underlying asset and sell it under the contract terms.¹⁰⁷ This strategy was popularized by firms such as Goldstein-Samuels, which mass-marketed options on commodities excluded from the 1936 ban, such as silver and coffee.¹⁰⁸ “Leverage contracts,” on the other hand, were essentially commodity futures traded off-exchange, with leverage contract merchants collecting margin and handling trade settlements.¹⁰⁹

97. Lower, *supra* note 63, at 1099.

98. Randall S. Kroszner, *Can the Financial Markets Privately Regulate Risk?*, 31 J. MONEY, CREDIT & BANKING 596, 601 (1999).

99. *Id.* at 602; see PETER NORMAN, *THE RISK CONTROLLERS: CENTRAL COUNTERPARTY CLEARING IN GLOBALISED FINANCIAL MARKETS* 79–94 (2011).

100. See Vuilleme, *supra* note 53; Kroszner, *supra* note 98, at 602; see also NORMAN, *supra* note 99, at 200–03.

101. Lower, *supra* note 63, at 1100.

102. For an overview of the institutional misunderstandings surrounding the imposition of this tax, see John H. Stassen, *The Commodity Exchange Act in Perspective—A Short and Not-So-Reverent History of Futures Trading Legislation in the United States*, 39 WASH. & LEE L. REV. 825, 836–37 (1982).

103. *Id.* at 838.

104. Commodity Exchange Act of 1936, §§ 3–4; see RECHTSCHAFFEN, *supra* note 2, at 321.

105. Poitras, *supra* note 93, at 42.

106. *Id.* at 32.

107. *Id.* at 28.

108. See Joseph C. Long, *Commodity Options—Revisited*, 25 DRAKE L. REV. 75, 82–85 (1975).

109. Buchovecky, *supra* note 57, at 160–62; see also M. Van Smith, *The Commodity Futures Trading Commission and the Return of the Bucketeteers: A Lesson in Regulatory Failure*, 57 N.D. L. REV. 7, 33–34 (1981).

Following decades of instability and gradual recovery, commodity futures trading experienced a global surge, outpacing several physical asset markets by the early 1970s.¹¹⁰ This “financialization” of commodity trade¹¹¹ evolved alongside destabilizing world events, including the collapse of the Bretton Woods system, the 1973 oil crisis, and multiple General Agreement on Tariffs and Trade (“GATT”) negotiation rounds between 1963 and 1979.¹¹² These factors significantly reshaped the global economic landscape, leading to the rise of the modern forex market, increased interest rate volatility, and heightened demand for hedging instruments, which spurred financial market innovation and prompted responses from public regulators.¹¹³

The U.S. government, anticipating potential risks in non-centrally regulated futures markets, amended the CEA in 1968 to cover unregulated commodities and established the Commodity Futures Trading Commission (“CFTC”) in 1974.¹¹⁴ The CFTC was granted exclusive jurisdiction over futures trading in all commodities and became the sole agency authorized to license brokers and exchanges.¹¹⁵ In Europe, rather than adopting a unified approach, regulatory models diverged between two main systems: the UK, which relied on self-regulation and an informal control framework managed by the Bank of England; and France, which favored centralized regulation through the Commission de Marchés à Terme (“COMT”), similar to the CFTC model.¹¹⁶ The English model was considered leaner and more efficient, providing a competitive advantage in a rapidly growing market that was expanding beyond commodity futures to include currency, interest rate, and credit derivatives.¹¹⁷

In terms of derivative products, the 1970s saw the introduction of the first foreign exchange (“forex”) futures and swaps, typically linked to non-USD currencies; U.S. Treasury futures, requiring either the purchase or sale of U.S. Treasury bills or bonds; and “Ginnie Mae” futures.¹¹⁸ Importantly, the latter involved

110. 3 RICHARD N. COOPER & ROBERT Z. LAWRENCE, THE 1972–1975 COMMODITY BOOM, in BROOKINGS PAPERS ON ECONOMIC ACTIVITY 671, 702–03 (1975). For more granular data spanning from the late 1960’s to the early 1980’s, see Yves Simon, BOURSES DE COMMERCE ET MARCHÉS À TERME DE MARCHANDISES 25 (1986).

111. See Marco Bertilorenzi, *Futures of Europe: The City of London’s Commodity Exchanges, the European Economic Community, and the Global Regulation of Futures Trading (1960s–1980s)*, 24 ENTER. & SOC’Y 731, 732 (2023); see also Kyle J. Putnam, *Financialization of Commodity Markets*, in H. KENT BAKER, GREG FILBECK & JEFFREY H. HARRIS, COMMODITIES: MARKETS, PERFORMANCE, AND STRATEGIES 502 (H. Kent Baker et al. eds., 2018).

112. *Ex multis*, see generally David Hammes & Douglas Wills, *Black Gold: The End of Bretton Woods and the Oil-Price Shocks of the 1970s*, 9 INDEP. REV. 501 (2005); Lucia Coppolaro, *In Search of Power: The European Commission in the Kennedy Round Negotiations (1963–1967)*, 23 CONTEMP. EUR. HIST. 23 (2014); see also Barry Eichengreen, GLOBAL IMBALANCES AND THE LESSONS OF BRETTON WOODS 1–34 (2006).

113. See Darrell Duffie & Rohit Rahi, *Financial Market Innovation and Security Design: An Introduction*, 65 J. ECON. THEORY 1, 5 (1995), reporting data retrieved from John O. Matthews, STRUGGLE AND SURVIVAL ON WALL STREET: THE ECONOMICS OF COMPETITION AMONG SECURITIES FIRMS (1994).

114. See Markham, *supra* note 96, at 79.

115. *CFTC History in the 1970s*, CFTC, https://www.cftc.gov/About/HistoryoftheCFTC/history_1970s.html (last visited July 26, 2025) [<https://perma.cc/LGW3-H56M>].

116. Bertilorenzi, *supra* note 111, at 745–46.

117. *Id.* at 746–747.

118. See Duffie & Rahi, *supra* note 113.

futures on certificates issued and guaranteed by the U.S. Government National Mortgage Association (“GNMA” or “Ginnie Mae”).¹¹⁹ Each certificate represented a mortgage-backed security, effectively a share in an underlying pool of mortgages. Ginnie Mae futures, therefore, enabled the transfer of interest rate risk.¹²⁰ To similarly hedge against interest rate volatility, interest rate futures began trading on the CBT as early as 1975.¹²¹

Furthermore, the Chicago Board Options Exchange (“CBOE”), established in 1973, became the first registered options exchange, introducing standardized option contracts alongside the existing OTC market.¹²² This was facilitated by the breakthrough Black-Scholes valuation model,¹²³ which significantly improved the efficiency and affordability of option pricing. The model’s impact helped foster an active and liquid market for exchange-traded options. Additionally, it laid the groundwork for a range of “exotic” instruments with embedded options that entered the market in the 1980s, including caps, floors, collars, collateralized mortgage obligations (“CMOs”), and swaptions, among others.¹²⁴

In the early 1980s, securities index futures and options saw significant development,¹²⁵ along with the widespread adoption of currency swaps following the landmark IBM–World Bank deal in 1981.¹²⁶ As the market for currency swaps gained momentum, banks began arranging interest rate swaps, enabling counterparties to exchange a floating-rate asset for a fixed-rate asset.¹²⁷

The rapid innovation and increasing complexity of derivatives, particularly in OTC contracts, led to the enactment of the Futures Trading Act in the U.S. in 1982.¹²⁸ In addition to renewing the CFTC’s regulatory mandate and legalizing all commodity options, the Act codified the Shad-Johnson Jurisdictional Accord.¹²⁹ This 1981 agreement between the CFTC and the SEC established the

119. Sam Scott Miller, *Regulation of Trading in Ginnie Maes*, 21 DUQ. L. REV. 39, 39–40 (1982).

120. *Id.* at 41, 48.

121. DEUTSCHE BUNDESBANK, DEUTSCHE BUNDESBANK MONTHLY REPORT 33 (Jan. 2003), <https://www.bundesbank.de/resource/blob/706310/53b118fe45b51abd4acee38d44b6cc05/mL/2003-01-interest-rate-data.pdf> [<https://perma.cc/9ZKU-5ASE>].

122. Eleuterio Vallelado González, *Options Evolution: The Introduction of Organized Markets in the USA*, 7 ANALES DE ESTUDIOS ECONÓMICOS Y EMPRESARIALES 97, 102–104 (1992) (Spain); *see also Cboe’s Beginnings in the Words of Our Founding President*, CBOE (Apr. 23, 2023), <https://www.cboe.com/insights/posts/cboes-beginnings-in-the-words-of-our-founding-president/> [<https://perma.cc/KM6D-PYDJ>].

123. Fischer Black & Myron Scholes, *The Pricing of Options and Corporate Liabilities*, 81 J. POL. ECON. 637, 640–45 (1973).

124. Darrell Duffie, *Black, Merton and Scholes—Their Central Contributions to Economics*, 100 SCANDINAVIAN J. ECON. 411, 418–419 (1998); *see also* Duffie & Rahi, *supra* note 113, at 6.

125. Duffie, *supra* note 124; William J. Brodsky, *The Globalization of Stock Index Futures: A Summary of the Market and Regulatory Developments in Stock Index Futures and the Regulatory Hurdles Which Exist for Foreign Stock Index Futures in the United States*, 15 NW. J. INT’L L. & BUS. 248, 249–50 (1994).

126. *See* Russell J. Funk & Daniel Hirschman, *Derivatives and Deregulation: Financial Innovation and the Demise of Glass–Steagall*, 59 ADMIN. SCI. Q. 669, 669–70 (2014).

127. *Id.* at 683.

128. *Id.* at 689.

129. *CFTC History in the 1970s*, *supra* note 115.

jurisdictional boundaries between the two agencies.¹³⁰ Under this compromise, the CFTC was granted exclusive authority over futures and options on broad-based securities indices (e.g., the S&P 500), most foreign currencies, and certain municipal securities.¹³¹ But it was not until the Commodity Futures Modernization Act of 2000 that Congress explicitly declared OTC derivatives would not be regulated as either futures or securities, leading to substantial deregulation of financial derivatives.¹³² This deregulation arguably allowed banks to engage freely in credit default swaps (“CDS”), collateralized mortgage obligations (“CMOs”), and other opaque products, which ultimately played a significant role in the 2008 financial crisis.¹³³

In the aftermath of the 2008 financial crisis, derivatives regulation underwent substantial changes at both the U.S. and EU levels.¹³⁴ Key provisions were introduced to enhance transparency, mitigate systemic risk, and promote market integrity.¹³⁵ In the U.S., the Dodd-Frank Wall Street Reform and Consumer Protection Act, enacted in 2010, mandated central clearing for standardized derivatives, introduced reporting requirements, and established new rules for swap dealers and participants.¹³⁶ In the EU, the European Market Infrastructure Regulation (“EMIR”) was implemented to address similar objectives, with a particular emphasis on the role of clearing counterparties (“CCPs”),¹³⁷ risk mitigation techniques for non-cleared derivatives,¹³⁸ and trade repositories.¹³⁹

III. UNDERSTANDING CRYPTO-DERIVATIVES

In a rather unstable and volatile market surrounding the first developments in the crypto economy, traders suffered the significant decline in Bitcoin since late 2017, as they are limited by the thin liquidity of the Bitcoin market and controlled by Bitcoin “whales” implementing buy-and-hold strategies.¹⁴⁰ In this context, speculation was a main reason for traders to push for the implementation of derivatives, thus increasing levels of exchanges.¹⁴¹ Leverage offers great

130. Lene Powell, *Derivatives Industry Honors Memory of Legal Luminary Philip McBride Johnson*, JIM HAMILTON’S WORLD SEC. REGUL. (Aug. 19, 2021), <https://jimhamiltonblog.blogspot.com/2021/08/derivatives-industry-honors-memory-of.html> [https://perma.cc/SG46-687N].

131. *Id.*

132. Lynn A. Stout, *Derivatives and the Legal Origin of the 2008 Credit Crisis*, 1 HARV. BUS. L. REV. 1, 22 (2011).

133. *See id.* at 6.

134. *Id.* at 31–33.

135. *See id.*

136. *Id.* at 31–35.

137. Council Regulation 648/2012, tit. III, 2012 O.J. (L 201) 25–30.

138. Council Regulation 648/2012, tit. II, 2012 O.J. (L 201) 17–25.

139. Council Regulation 648/2012, tit. VI, 2012 O.J. (L 201) 17–50–52.

140. Olga Kharif, *Bitcoin Speculators Gain Upper Hand as Derivative Trading Surges*, BLOOMBERG (Oct. 22, 2019, 8:00 PM), <https://www.bloomberg.com/news/articles/2019-10-22/bitcoin-speculators-gain-upper-hand-as-derivative-trading-surges> [https://perma.cc/32ZB-H44G].

141. Steven Zheng, *Bakkt’s Monthly Bitcoin Futures Hit All-Time-High of \$15M*, BLOCK, <https://www.theblockcrypto.com/linked/46523/bakkt-monthly-bitcoin-futures-hit-all-time-high-of-15m> (Nov. 11, 2019, 11:02 AM) [https://perma.cc/W98U-CD5G].

speculative opportunities and, not surprisingly, its use is growing in the crypto economy, relying on DeFi.

Speculative trends characterized the emergence of the crypto economy, since the first wave of ICOs and cryptocurrencies, that contributed to make this market extremely volatile. After the speculative frenzy of ICOs and cryptocurrencies starting in 2017, a bear market, generally referred to as “Crypto-Winter” emerged in the crypto economy.¹⁴² During the Crypto-Winter of 2018–2019, the majority of cryptocurrencies experienced a significant depreciation, and the general activities connected to ICOs slowed down significantly.¹⁴³ Different causes led to this market situation, in particular the number of frauds coupled with the increasing regulatory pressure. One of the consequences triggered by Crypto-Winter has been the sophistication of speculation in the crypto economy.¹⁴⁴ From this perspective, while leverage and more complex products may be a sign of increased maturity in the financial system, this may also be a sign of the speculative trait of investments in this ecosystem. Leverage and more sophisticated products may be an attempt to maintain high levels of returns, which the sole investment in cryptocurrency cannot achieve anymore. Consistent with the trends in traditional finance, these increased levels of sophistication and the use of leverage in the crypto economy may exacerbate specific risks, such as liquidity and counterparty risks, thereby impacting overall levels of systemic risk.

Market infrastructures, in particular crypto-exchanges, played an important role in favoring an increase in the leverage in the crypto economy and DeFi.¹⁴⁵ In this process, a non-harmonized international regulation is an important factor, which favors the emergence of the new and potentially dangerous, especially in view of an expanding sector.¹⁴⁶ While crypto-exchanges are to some extent more regulated in the U.S. and Europe as a consequence of the enforcement activities of securities agencies and regulators, Asian exchanges benefit from a different treatment, and for this reason they were incisively defined as the “biggest casino ever.”¹⁴⁷ In Asia, lighter regulations have favored direct access to both retail and institutional investors to exchanges, and to the multiple possibilities to leveraging their positions, up to 100 times.¹⁴⁸

Multiple techniques and financial instruments led to increased financial leverage in the crypto economy. New derivative contracts, short selling,¹⁴⁹ and

142. Max Yakubowski, *What's Next for the Industry as 'Crypto Winter' Thaws?*, COINTELEGRAPH (Oct. 5, 2019), <https://cointelegraph.com/news/whats-next-for-the-industry-as-crypto-winter-thaws> [https://perma.cc/6LXC-7UYB].

143. *Id.*

144. *Id.*

145. *See* Kharif, *supra* note 140.

146. *See id.*

147. *See id.*

148. GALEN MOORE, CRYPTO DERIVATIVES: WHAT TO EXPECT IN A FAST CHANGING MARKET 6 (Oct. 2019).

149. For an overview on short selling applied to cryptocurrencies, see Oliver Smith, *How to Short Sell Bitcoin, and Why More People Aren't*, FORBES, <https://www.forbes.com/sites/oliversmith/2018/07/12/how-to-short-sell-cryptocurrencies-and-why-more-people-arent/#5c9ee2b14e63> (July 13, 2018, 9:14 AM) [https://perma.cc/9WCD-8RGW].

margin trading are all tools for leveraging financial investments and their use is increasing within the crypto economy, thus enhancing their sophistication. These techniques and the way they developed in the crypto economy will be analyzed in the following Sections.

A. *Crypto-Derivatives*

Crypto-derivatives started as instruments tied to the value of bitcoin (“BTC”).¹⁵⁰ The first ever BTC derivative was arguably a futures launched around November 2011 on a platform called ICBIT, when BTC hardly traded above \$4.¹⁵¹ The contract provided exposure to the USD/BTC rate and settled in bitcoins.¹⁵² This structure appealed particularly to early traders in the cryptocurrency space who aimed to accumulate and invest in bitcoins. It was also convenient for platforms as they could operate without relying on fiat currency.¹⁵³ Eventually, derivative products that were margined and settled in cryptocurrency started being labelled as ‘inverse,’ emphasizing a departure from markets where cryptocurrencies were treated akin to fiat-settled commodities.¹⁵⁴ This context would lead the first BTC derivative to be marketed today as an inverse futures contract.

1. *Crypto-Derivatives Key Characteristics*

a. Linear vs. Inverse Contracts

All kinds of crypto-derivative contracts can be either ‘linear’ or ‘inverse,’ depending on their payoff structure. In the context of BTC, derivatives are paid conditional to the price of BTC expressed against a chosen currency, often USD or Tether (“USDt”).¹⁵⁵ Yet, owing to inefficiencies in the crypto market,¹⁵⁶

150. *Crypto Derivatives—A Comprehensive Guide*, ION MARKETS (Feb. 21, 2025), <https://iongroup.com/blog/markets/crypto-derivatives-a-comprehensive-guide/> [https://perma.cc/64H4-JH7B].

151. *ICBIT Derivatives Market (USD/BTC Futures Trading)—LIVE*, BITCOINTALK (Nov. 3, 2011, 9:01 PM), <https://bitcointalk.org/index.php?topic=50817.0> [https://perma.cc/FW88-JV55]. For BTC historical data, see *Bitcoin*, INVESTING.COM, <https://www.investing.com/crypto/bitcoin/historical-data> (last visited July 26, 2025) [https://perma.cc/GKA7-EHPB].

152. *Bitcoin Derivatives Market and Exchange*, ICBIT, <https://web.archive.org/web/20130430052630/http://icbit.se/> (last visited July 26, 2025) [https://perma.cc/YE5L-3CC3].

153. See, e.g., Carol Alexander, Ding Chen & Arben Imeraj, *Crypto Quanto and Inverse Options*, 33 MATHEMATICAL FIN. 1005, 1014 (2023).

154. See, e.g., *id.* at 1007.

155. See, e.g., *id.* at 1009.

156. In the case of BTC, supply and demand dynamics and levels of liquidity have been recognized among the main factors leading to variations in Bitcoin prices. See Ao Shu, Feiyang Cheng, Jianlei Han, Zini Liang & Zheyao Pan, *Arbitrage Across Different Bitcoin Exchange Venues: Perspectives from Investor Base and Market Related Events*, 63 ACCT. & FIN. 5183, 5187 (2023); Alexander Brauneis, Roland Mestel, Ryan Riordan & Erik Theissen, *Bitcoin Unchained: Determinants of Cryptocurrency Exchange Liquidity*, 69 J. EMPIRICAL FIN. 106, 107 (2022). On Bitcoin price formation, see generally Walid M.A. Ahmed, *Robust Drivers of Bitcoin Price Movements: An Extreme Bounds Analysis*, 62 N. AM. J. ECONS. & FIN. 1 (2022); Cho-Hoi Hui, Chi-Fai Lo, Po-Hon Chau & Andrew Wong, *Does Bitcoin Behave as a Currency?: A Standard Monetary Model Approach*, 70 INT’L REV. FIN. ANALYSIS 1 (2020).

cryptocurrency quotes can differ significantly across spot exchanges. As a result, derivatives rely on a composite price index, commonly calculated as the weighted average of BTC prices from various constituent sources.¹⁵⁷ The final settlement price is then derived from the calculated index value over a specific timeframe, ranging between 10 to 30 minutes prior to settlement.¹⁵⁸ Linear contracts present a direct relationship with the movement of the index and when it is denominated in USD, they settle in USD and necessitate USD margining.¹⁵⁹ Conversely, in an index referencing USD/BTC prices, denomination is in BTC and any linear derivative would be margined and settled in BTC.¹⁶⁰ A derivative's payoff can be quoted in either currency of the index pair, however, transitioning from a linear ($y=mx$) to a non-linear or convex ($y=1/x$) relationship and vice versa. For instance, a futures based on BTC/USD prices can exhibit a linear pay-off in terms of USD or a non-linear payoff in terms of BTC, expressed as $1/(\text{USD}/\text{BTC})$. If we consider a long futures with a notional of USD 35,000, contract size of USD 1 and a closing price of \$37,000, the profit in USD would be:

$$\text{Notional} * (P_{\text{close}}/P_{\text{open}} - 1)$$

$$35,000 * (37,000/35,000 - 1) = 2,000 \text{ USD}$$

The same profit expressed in BTC would be:

$$\text{Notional} * (1/P_{\text{open}} - 1/P_{\text{close}})$$

$$35,000 * (1/35,000 - 1/37,000) = 0.054054 \text{ BTC} = 1891.89 \text{ USD}$$

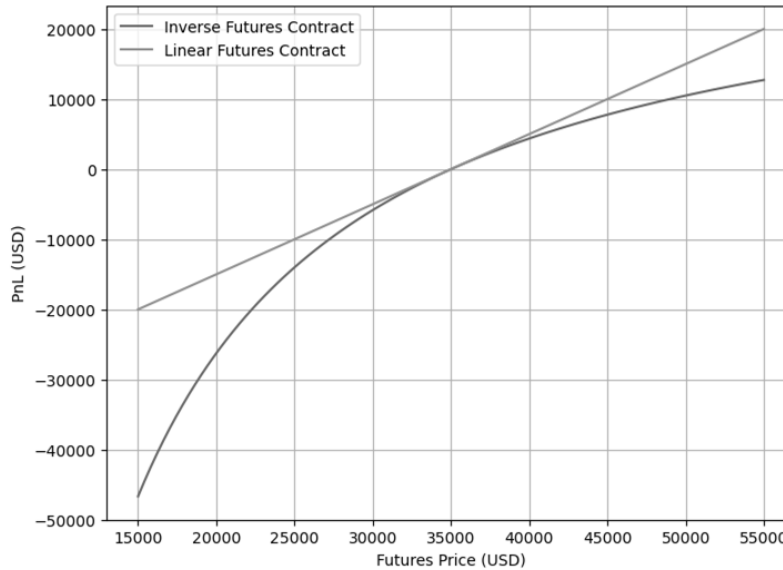
157. See, e.g., Brauneis, Mestel, Riordan & Theissen, *supra* note 156, at 117. Calculations may vary across exchanges, especially between regulated (e.g., CME) and unregulated (e.g., BitMEX) ones. CME tracks the BTC/USD rate via a BRR, BitMEX refers to BTC price, which if expressed in USD, corresponds to the BTC/USD rate, yet may slightly differ due to offer and demand on platforms.

158. BitMEX for instance takes a 30-minute TWAP ("Time Weighted Average Price") of its Bitcoin index. See *How to Arbitrage with Crypto Futures and Spot*, BITMEX (Mar. 15, 2024), <https://blog.bitmex.com/arbitrage-in-crypto/> [https://perma.cc/PLX3-MNDH].

159. See, e.g., Alexander et al., *supra* note 153, at 1007.

160. See, e.g., *id.* at 1014.

FIG. 1. PAYOFF COMPARISON: INVERSE VS. LINEAR BTC/USD FUTURES



As shown in Figure 1, the hyperbolic nature of non-linear payoffs leads BTC-denominated traders to have a different perspective on profit and loss (PnL) compared to USD-denominated traders, represented by lower earnings in bull markets and greater losses in bearish conditions. Importantly, derivatives margined and settled in the same cryptocurrency—whether linear or inverse—present an additional layer of risk, as a sudden drop in the price of the cryptocurrency may trigger liquidation more quickly. From the same example above, let us consider a 5% maintenance margin of the notional value, namely 1,750 USD in the case of the linear contract. If the value of BTC were to drop by 50%, the value of the position would be 17,500 USD and above the margin limit. In case of an inverse futures, however, the value of the derivative would drop by 1 BTC, hence way below the 0.05 BTC margin value and thus triggering liquidation of the position. But different margining methods do have a varying impact on potential liquidation.

b. Margin and Leverage

Crypto-derivatives are usually highly leveraged contracts (often maxing at 125x) and margin amounts are necessary to open and maintain derivatives positions.¹⁶¹ Initial margin (“IM”) and maintenance margin (“MM”) refer respectively to the minimum amount required to enter a position and the minimum percentage of the value of that position traders are required to hold to prevent

161. See, e.g., *Leverage and Margin of Perpetual Futures Contracts*, LBANK, <https://support.lbank.site/hc/en-gb/articles/900001655503-Leverage-and-Margin-of-Perpetual-Futures-Contracts> (last visited July 26, 2025) [<https://perma.cc/2ZKQ-YTTM>].

automated liquidation.¹⁶² IM requirements may be calculated slightly differently between exchanges, but it is always an inverse function of leverage and a direct function of the position size.¹⁶³ On the other hand, MM is proportional to the position size but is calculated regardless of the level of leverage a trader selects.¹⁶⁴ Nevertheless, platforms typically provide risk limits, namely IM, MM and maximum levels of leverage per different types of contract and position size.¹⁶⁵

Exchanges generally offer two methods of margining: “isolated” and “cross.” In isolated margining, liability is limited to the initial margin posted. If the value of the position falls below that level, the position is liquidated automatically with no margin call.¹⁶⁶ But margin can be added and removed at will, or leverage can be adjusted. Any margin deficiency or liquidation for a single position will not affect other positions in the portfolio. This might be suitable for a speculative and highly leveraged position that a trader would like to monitor closely and have a higher degree of control over.¹⁶⁷ On the other hand, in “cross” (or “spread”) margining, margin is shared between all open positions with the same settlement cryptocurrency.¹⁶⁸ When needed, a position will draw more margin from the total account balance of the corresponding cryptocurrency to avoid liquidation.¹⁶⁹ Some platforms may also offer portfolio margin, which considers the overall portfolio risk and adjusts margin requirements accordingly.¹⁷⁰ As a result, a well-diversified portfolio, which is likely to exhibit lower risk, will generally require less overall margin compared to calculating margin for each individual position separately.

For instance, let us consider a trader with a position worth 1 BTC at a price of 35,000 USD. The trader posts 0.04 BTC worth of initial margin, and further 0.06 BTC as maintenance margin. Leverage is therefore 25x. Liquidation price is then set at 0.94 BTC. If the price falls to 0.94 BTC (*i.e.*, 32,900 USD) the

162. See Matsypura & Pauwels, *supra* note 42, at 128.

163. See *Initial Margin (USDT Contract)*, BYBIT (Mar. 2, 2025, 2:05 PM), https://www.bybit.com/en/help-center/article/Initial-Margin-USDT-ContractUSDT_Perpetual_Contract [<https://perma.cc/7SXS-YWPQ>]; *Leverage and Margin in Coin-Margined Futures Contracts*, BINANCE (June 11, 2020, 2:38 AM), <https://www.binance.com/en/support/faq/leverage-and-margin-in-coin-margined-futures-contracts-be2c7d9d95b04a7e8044ed02dd7dfe5c> [<https://perma.cc/8LKT-4P3X>].

164. See *Maintenance Margin (Inverse Contract)*, BYBIT (Aug. 23, 2024, 3:21 AM), <https://www.bybit.com/en/help-center/article/Maintenance-Margin-Inverse-Contract> [<https://perma.cc/QH4A-SSHE>]; *What's Margin in Futures? How Does it Work?*, POLONIEX, <https://support.poloniex.com/hc/en-us/articles/6670524566423-What-s-margin-in-Futures-How-does-it-work> (last visited July 26, 2025) [<https://perma.cc/6SX5-WE33>]; *Leverage & Margin*, BINANCE FUTURES, <https://www.binance.com/en/futures/trading-rules/quarterly/leverage-margin> (last visited July 26, 2025) [<https://perma.cc/TS7C-J6TD>].

165. See *Risk Limits*, BITMEX, <https://www.bitmex.com/app/riskLimits> (last visited July 26, 2025) [<https://perma.cc/HFZ3-W2ZZ>]; *Risk Limit (USDC Perpetual & Futures)*, BYBIT (Aug. 1, 2024), <https://www.bybit.com/en/help-center/article/Risk-Limit-USDC-Contract> [<https://perma.cc/VE7J-RNUA>].

166. See, *e.g.*, Cox & Steigerwald, *supra* note 52, at 8.

167. See, *e.g.*, *Isolated and Cross Margin*, BITMEX, <https://www.bitmex.com/app/isolatedMargin> (last visited July 26, 2025) [<https://perma.cc/S4KP-NR4U>].

168. As seen in cross-product margining for traditional derivatives. See Brodsky, *supra* note 125, at 273.

169. *Isolated and Cross Margin*, *supra* note 167.

170. *Leverage and Margin in Coin-Margined Futures Contracts*, *supra* note 163.

system liquidates the position and the trader only loses the initial margin. If the trader had used cross margin, they would have had a larger unrealized loss of 0.06 BTC but would have kept the position from being liquidated.

c. Derivatives CEXs vs. DEXs

Crypto-derivatives trade both on centralized (“CEXs”) and decentralized exchanges (“DEXs”).¹⁷¹ When trading on DEXs, crypto-derivatives fall under an additional category, known as decentralized or DeFi derivatives. Derivatives DEXs are predominantly order-book exchanges, where the market price of a contract is determined by the last matched buy and sell orders.¹⁷² Automated market-maker (“AMM”) based DEXs, such as Hegic and Lyra, though considerably less common, offer a higher degree of decentralization thanks to smart-contract price discovery protocols along with a fully automated marketplace.¹⁷³

2. *Most Relevant Crypto-Derivatives*

a. Perpetual Swaps

In the wake of ICBIT’s success—the platform was reportedly facilitating more than \$15 million worth of BTC futures in 2014¹⁷⁴—other “exchanges” such as Romania-based MPEX and 1Broker started offering BTC-settled futures, options and contracts for difference. But the true industry breakthrough was represented by BitMEX’s introduction of the BTC ‘perpetual swap.’

Perpetual swaps, also known as ‘perpetual futures’ or simply ‘perpetuals,’ are inspired by traditional futures contracts but differ in that they omit an expiry date.¹⁷⁵ A perpetual’s position can therefore be held indefinitely until the trader decides to close it or faces liquidation. In the absence of an expiry date, correlation and convergence between spot and futures prices become uncertain, posing challenges for traders aiming to transfer unwanted risk.¹⁷⁶ In order to tether the perpetual’s price to the underlying reference index, a funding mechanism is employed. The parties to a perpetual, one long and one short, exchange funding payments typically every eight hours.¹⁷⁷ When the perpetual trades at a premium relative to index, traders who are long will make payments to traders who are

171. See, e.g., Alexander et al., *supra* note 153, at 1006.

172. See, e.g., *Why Are Order Books Important in (DEXs)?*, NADCAB LABS (June 3, 2025), <https://www.nad-cab.com/blog/order-books-in-dex> [<https://perma.cc/M88L-SSYP>].

173. Hegic facilitates crypto options trading on Ethereum. See *Trade One-Click Option Strategies*, HEGIC, <https://www.hegic.co/app#/arbitrum/trade/new> (last visited July 26, 2025) [<https://perma.cc/99NP-XCPR>]. Lyra also offers the possibility to trade perpetuals. See Ali Baloch, *Lyra Finance: The Leading Onchain Options Protocol*, SYNTHETIX (Sept. 18, 2023), <https://blog.synthetix.io/lyra-finance-the-leading-onchain-options-protocol/> [<https://perma.cc/7Q7A-D8WP>].

174. Jon Matonis, *Inching Towards Bitcoin Derivatives*, COINDESK, <https://www.coindesk.com/markets/2014/05/27/inching-towards-bitcoin-derivatives/> (Mar. 6, 2023, 9:22 AM) [<https://perma.cc/E8PR-698P>].

175. See Alexander et al., *supra* note 153, at 1007.

176. See *id.*

177. See Adam Hayes, *Perpetual Futures: What They Are and How They Work*, INVESTOPEDIA (Aug. 20, 2024), <https://www.investopedia.com/what-are-perpetual-futures-7494870> [<https://perma.cc/45MS-X7LE>].

short. This way, more traders are incentivized to sell or go short, thus driving down the price of the derivative. Conversely, when the perpetual trades at a discount compared to the index, shorts will pay longs driving up the price of the perpetual.¹⁷⁸ Calculations may slightly vary among exchanges, but each funding payment is determined by multiplying the mark value of the position by the funding rate. The latter, in turn, is the sum of an interest component (a proxy for the cost of holding a position in the perpetual) and a premium or discount component.¹⁷⁹

In addition to standard futures, perpetuals operate in a manner closely aligned with currency swaps, differing primarily in the initial exchange of notional and, again, the absence of an expiry date. Their mechanics share even more similarities with “rolling spot” forex contracts (“RSFs”). RSFs are essentially currency-based contracts for difference (“CfDs”). These derivatives provide holders with direct exposure to the price movements of an underlying currency pair.¹⁸⁰ When a trader buys or goes long (sells or shorts) an RSF, they profit from a rise (drop) in the price of the underlying. The variation between the RSF closing and opening rates is exchanged between long and short positions at intervals with no pre-defined maturity.¹⁸¹ Both CfDs and RSFs are considered high-risk instruments,¹⁸² leading to their prohibition for U.S. citizens and their acceptance through robust regulations in jurisdictions such as the EU and the UK.¹⁸³

Perpetual swaps present the same advantages as RSFs, including low margin requirements (*i.e.*, cheap leverage) and no need to roll over trades; in fact, they are by far the most traded crypto-derivatives. At the same time, these advantages can be seen as criticalities determining high risk and, at scale, a potential element of instability, worsened in case of inverse payoff.

b. Crypto Options and Quantos

Options are a relatively recent category of derivatives in the crypto space. They can be seen as a sign of sophistication of the crypto-derivatives market as they represent a step-up from mono-dimensional futures and perpetuals, which

178. Every exchange has a different calculation methods and funding intervals. *See id.*

179. *See, e.g., Perpetual Contracts Guide*, BITMEX, <https://www.bitmex.com/app/perpetualContractsGuide#Premium—Discount—Component> (last visited July 26, 2025) [<https://perma.cc/6BBJ-RZB2>].

180. *See, e.g., FOREX.COM, KEY INFORMATION DOCUMENT—ROLLING SPOT FOREX 1 (2024)*, <https://www.filesandimages.com/brand/forex/en-uk/pdf/kids/forex-uk-rolling-spot-forex-kid.pdf> [<https://perma.cc/6P3G-4YXF>].

181. *Id.*

182. *See Contract for Difference (CFD), Rolling Spot Forex e Opzioni Binarie: Tra Rischio e Scommessa!*, CONSOB (It.), <https://www.consob.it/web/investor-education/opzioni-binarie> (last visited July 26, 2025) [<https://perma.cc/V85H-FE6K>].

183. *See Richard Berry, Why You Can't Trade CFDs in America Plus Three Better Alternatives*, GOOD MONEY GUIDE (Jan. 29, 2025), <https://goodmoneyguide.com/usa/can-you-trade-cfds-in-america/> [<https://perma.cc/NU2Y-QD3Y>]; *ESMA Adopts Final Product Intervention Measures on CFDs and Binary Options*, ESMA (Jan. 6, 2018), <https://www.esma.europa.eu/press-news/esma-news/esma-adopts-final-product-intervention-measures-cfds-and-binary-options> [<https://perma.cc/9VPL-5WBF>]; *FCA Highlights Continuing Concerns About Problem Firms in the CFD Sector*, FCA (Dec. 1, 2022) <https://www.fca.org.uk/news/press-releases/fca-highlights-continuing-concerns-about-problem-firms-cfd-sector> [<https://perma.cc/FHP3-E4SL>].

only track the price (or exchange rate) of cryptocurrencies.¹⁸⁴ Options somehow add a layer of complexity, in that their efficient use is contingent on a thorough understanding of so-called ‘Greeks’—delta, gamma, theta and rho, that affect the price of an option contract.¹⁸⁵ Additionally, options allow traders not only to hedge against and profit from the price of cryptocurrencies, but also other factors such as volatility.

Most crypto options, whether direct or inverse, are of the ‘European’ type, meaning they can only be exercised at expiration.¹⁸⁶ Like other crypto-derivatives, they are typically priced based on a price index built from multiple price sources. But challenges arise depending on the legal qualification of the underlying asset and, consequently, the correct pricing model to employ.¹⁸⁷ In instances where the underlying is categorized as a currency pair, the option can be priced according to an FX pricing model, such as Garman-Kohlhagen or Dupire.¹⁸⁸ But since these models involve a risk-free rate, there is no direct equivalent in crypto finance.¹⁸⁹ Furthermore, when the underlying is classified as a security or commodity, standard pricing models such as Black-Scholes are the predominant choice.¹⁹⁰ This leads to numerous applicable models that may cause additional complexity within the crypto option market. Pricing rigor could be assured by a consensus-based taxonomy of crypto assets. Regardless of the pricing model, the payoff of both direct crypto options (*i.e.*, fiat- or stablecoin-margined and settled) and inverse options (*i.e.*, margined and settled in the underlying cryptocurrency) is calculated as traditional options.¹⁹¹

An important example of option contract that found its way into crypto finance is quantity-adjusted options, or “quanto.” A quanto is a type of traditional derivative in which the underlying is denominated in one currency, but the instrument itself is settled in another currency at some fixed rate.¹⁹² They include a predetermined conversion rate that eliminates currency risk upon settlement.

In the crypto space, quanto direct options are similar to traditional quantos, but quanto inverse options are a completely new type of exotic contract.¹⁹³ A direct quanto option payoff is calculated as $\max X(ST-K,0)$, where X represents

184. See, e.g., Alexander et al., *supra* note 153, at 1006–07.

185. See HULL, *supra* note 59, at 395–428; see also *Understanding Options Greeks in Crypto Trading*, BINANCE (Dec. 14, 2023), <https://www.binance.com/en/blog/futures/understanding-options-greeks-in-crypto-trading-91001745549966134> [<https://perma.cc/7JXF-U952>].

186. See, e.g., Alexander et al., *supra* note 153, at 1007; see also Black & Scholes, *supra* note 123, at 637.

187. To the best of the author’s knowledge, the issue was first formalized in Alexander et al., *supra* note 153.

188. See UWE WYSTUP, *FX OPTIONS AND STRUCTURED PRODUCTS* 5–6, 46–47 (2017).

189. See *id.* at 149.

190. For example, BTC options are priced as security-based options using a stochastic volatility with a correlated jump (SVCJ) model. See Ai Jun Hou, Weining Wang, Cathy Y.H. Chen & Wolfgang Karl Härdle, *Pricing Cryptocurrency Options*, 18 J. FIN. ECONOMETRICS 250, 262–69 (2020); see also Jovanka Lili Matic, Natalie Packham & Wolfgang Karl Härdle, *Hedging Cryptocurrency Options*, 26 REV. DERIVATIVES RSCH. 91, 92–93 (2023).

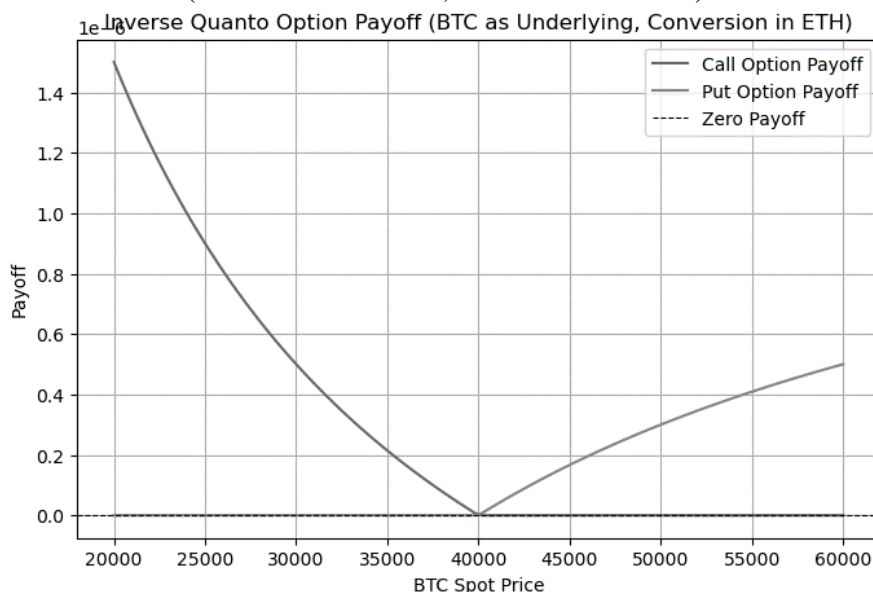
191. See Alexander et al., *supra* note 153, at 1008.

192. See Javed Hussain, Nattie Packham & Wolfgang Karl Härdle, *Hedging Cryptocurrency Options*, RESULTS APPLIED MATHEMATICS, April 26, 2023, at 1.

193. See Alexander et al., *supra* note 153, at 1008.

the predetermined exchange rate.¹⁹⁴ Both ST and K are denominated in fiat, but the payoff is converted into cryptocurrency through X .¹⁹⁵ An inverse quanto payoff, instead, mimics payoffs of inverse options, but it is denominated in a different currency.¹⁹⁶ As an illustrative example, let us consider a BTC inverse quanto option, including both put and call options, where the strike price (“ K ”) is set at 40,000, the BTC index price fluctuates within the range of USD 20,000 to 60,000, and (“ X ”) denotes the conversion factor to ETH, fixed at 0.06.

FIGURE 2 INVERSE QUANTO OPTION PAYOFF
(BTC AS UNDERLYING, CONVERSION IN ETH)



Option trading for retail investors typically occurs through decentralized “vaults” (“DOVs”).¹⁹⁷ DOVs are automated market-maker (“AMM”), namely smart contracts, in which users deposit their cryptocurrencies. They act as investment funds selecting the most appropriate strategies and executing trades. On top of potential option gains, users receive a share, proportionate to their deposits, of the premia collected from selling options.¹⁹⁸

194. *Id.* at 1016.

195. *Id.*

196. *Id.* at 1018.

197. QCP Capital, *An Explanation of DeFi Options Vaults (DOVs)*, MEDIUM (Dec. 12, 2021), <https://qpcapital.medium.com/an-explanation-of-defi-options-vaults-dovs-22d7f0d0c09f> [https://perma.cc/KSA8-P5RZ].

198. Omkar Godbole, *Crypto Options Traders Adopt New Strategies to Profit From DeFi-Led Volatility Gyration*, COINDESK, <https://www.coindesk.com/markets/2022/04/19/crypto-options-traders-adopt-new-strategies-to-profit-from-defi-volatility-gyration/> (May 11, 2023, 4:45 PM) [https://perma.cc/U7FJ-UH3D]; see also QCP Capital, *supra* note 197.

c. Staking and Liquidity Staking

In the context of proof-of-stake (“PoS”) consensus mechanisms, such as the ones implemented by Ethereum and Solana, validators are selected via a PoS algorithm that randomly picks nodes from those who lock up the blockchain’s native coin as a deposit (‘staking’) in the network. This has led to the emergence of at least a secondary market for trading representations of staked coins, commonly known as liquid staking derivatives (“LSDs”).¹⁹⁹

PoS stands out as an energy-efficient alternative to PoW, as it relies on token holdings rather than computational power.²⁰⁰ PoS-based protocols randomly select block proposers, known as ‘validators,’ based on their staked capital—the more blockchain’s native tokens a node ‘locks’ (or ‘stakes,’ or ‘bonds’) in the network, the greater the probability of being selected and rewarded.²⁰¹ Blocks produced through PoS algorithms are subsequently validated one by one, which provides immediate and provable (rather than probabilistic) finality of transactions.²⁰²

PoS protocols typically mandate minimum staking amounts, such as Ethereum where at least 32 ethers are necessary to activate validators software,²⁰³ or Fantom, in which a validator node may run only upon posting 500,000 fantoms (“FTM”) worth of collateral,²⁰⁴ or Binance Smart Chain requiring no less than 10,000 Binance Coins (“BNB”).²⁰⁵ To reach these volumes, stakers tend to pool so as to avoid excessive technical and financial commitments. Alternatively, other PoS models create mechanisms to use staking as a form of token and reward sharing. For example, Solana’s delegated proof-of-work (“DPoS”) allows ‘delegator’ nodes to stake their tokens (“SOL”) by assigning any amount to one or more candidate validators, thus increasing their consensus weight and potential rewards.²⁰⁶ Similarly, Tezos relies on stakers having the opportunity to either participate in the validation process or delegate this authority to other nodes through liquid proof-of-stake (“LPoS”).²⁰⁷ Additionally,

199. See QCP Capital, *supra* note 197.

200. *Liquid Proof-of-Stake*, OPEN TEZOS, <https://opentezos.com/tezos-basics/liquid-proof-of-stake/> (last visited July 26, 2025) [<https://perma.cc/HR9B-8DPB>].

201. Felix Irresberger, Kose John, Peter Mueller & Fahad Saleh, *The Public Blockchain Ecosystem: An Empirical Analysis 1* (Sept. 30, 2023) (unpublished article) (on file with NYU Stern School of Business), <http://dx.doi.org/10.2139/ssrn.3592849> [<https://perma.cc/5DMK-KYA9>].

202. Alistair Stewart & Eleftherios Kokoris-Kogia, *GRANDPA: A Byzantine Finality Gadget*, CORNELL UNIV. (June 30, 2020), <https://doi.org/10.48550/arXiv.2007.01560> [<https://perma.cc/BPV3-CPS7>].

203. As of January 2024, 32 ETH roughly correspond to USD 71,000. See *How to Stake Your Eth: Earn Rewards While Securing Ethereum*, ETHEREUM.ORG, <https://ethereum.org/en/staking/#what-is-staking> (last visited July 26, 2025) [<https://perma.cc/NL36-BY3Q>].

204. As of January 2024, 50,000 roughly correspond to USD 200,000. *Stake FTM. Earn Rewards.*, FANTOM FOUND., <https://fantom.foundation/ftm-staking/> (last visited July 26, 2025) [<https://perma.cc/YKL3-U4T4>].

205. As of January 2024, 10,000 BNB roughly correspond to over \$2 million USD.

206. See *Delegated Proof of Stake Explained*, BINANCE ACAD., <https://academy.binance.com/en/articles/delegated-proof-of-stake-explained> (Apr. 20, 2023) [<https://perma.cc/MJ9A-CVZ7>]; see also *Staking and Inflation FAQ*, SOLANA, <https://solana.com/staking#overview/what-is-staking> (last visited July 26, 2025) [<https://perma.cc/R3LB-TBS2>].

207. See *Liquid Proof-of-Stake*, *supra* note 200.

Polkadot operates on a nominated proof-of-stake (“NPoS”) system, where validators are selected daily from a list of candidates submitted by ‘nominator’ nodes. Both nominators and chosen validators engage in staking Polkadot’s native token (“DOT”),²⁰⁸ the first for increasing their influence, the latter as a collateral against behaviors that may diverge from the protocol’s rules and be punished with loss of staked capital (‘slashing’).²⁰⁹

In addition to staking amounts, minimum bonding periods may also be implemented, arising from either formal requirements (as seen in pre-merge Ethereum),²¹⁰ technical consequences of the protocol, such as in Polygon,²¹¹ or withdrawal queues.

Both amount and period criteria pose significant barriers to enter the staking business, along with potential concentration of wealth. While pool staking or staking-as-a-service²¹² may represent viable solutions, locked up tokens remain nevertheless fully illiquid until they are accessible again. This has led to the emergence of a market for trading representations of LSDs.

Liquid staking (“LS”) enables the extraction of utility from bounded tokens in addition to staking rewards.²¹³ This is achieved by staking tokens in protocols that return representations, in token form, of the staked tokens, known as liquid staking tokens (“LSTs”) or more generally as liquid staking derivatives (“LSDs”).²¹⁴ Users can then earn (potential) staking rewards while concurrently using LSTs to benefit from yields across on-chain products.²¹⁵ A common strategy involves posting LSTs as collateral for borrowing tokens, which are in turn liquid staked, creating a cyclical process known as leverage staking.²¹⁶

208. *Introduction to Staking*, POLKADOT WIKI, <https://wiki.polkadot.network/docs/learn-staking> (Dec. 18, 2024) [<https://perma.cc/WH3Q-N5FM>]; see also Alfonso Cevallos, *Overview of NPoS*, RSCH. WEB3 FOUND., <https://research.web3.foundation/Polkadot/protocols/NPoS/Overview> (last visited July 26, 2025) [<https://perma.cc/YZ4P-GPHQ>].

209. See generally PAPER ON STAKING SERVICES ON PROOF-OF-STAKE PROTOCOLS, CRYPTO VALLEY 2 (2023), https://d1c2gz5q23tkk0.cloudfront.net/assets/uploads/3686271/asset/CVA_Paper_on_Staking_Services_on_Proof-of-Stake_Protocols_11_December_2023_-f.pdf?1702386013 [<https://perma.cc/L95L-L8YB>].

210. See CleanApp, *Bond, Ethereum Bond*, MEDIUM (May 5, 2024), <https://support.kraken.com/hc/en-us/articles/overview-of-eth-restaking-on-kraken> [<https://perma.cc/5JQU-4ZWC>]; see also Kyrian Alex, *Ethereum’s Shapella Upgrade: What It Means for ETH Holders*, MEDIUM (Apr. 10, 2023), <https://medium.com/coinmonks/ethereums-shapella-upgrade-what-it-means-for-eth-holders-d271b63ea53f> [<https://perma.cc/FS6G-EWST>].

211. It normally takes up to 3–4 days to unstake Polygon’s native tokens (MATIC), as the network’s operations are organized in time slots known as “checkpoints,” each of which lasts around three hours. See Deepanshu Rathor, *What Is the Unbonding Period?*, POLYGON SUPPORT, <https://support.polygon.technology/support/solutions/articles/82000887501-what-is-the-unbonding-period-> (Mar. 11, 2024) [<https://perma.cc/GW8N-NKFY>].

212. See *Staking as a Service*, ETHEREUM, <https://ethereum.org/en/staking/saas/> (last visited July 26, 2025) [<https://perma.cc/22EB-E3XN>].

213. See *What Is Liquid Staking?*, LIQUID COLLECTIVE (Nov. 14, 2022), <https://liquidcollective.io/liquid-staking/> [<https://perma.cc/4NL4-TKJY>].

214. See *id.*

215. *Id.*

216. Lido Finance is currently the leading LS protocol, creating a powerful LSD ecosystem in conjunction with DeFi lending protocol Aave. See XIHAN XIONG, ZHIPENG WANG, XI CHEN, WILLIAM KNOTTENBELT & MICHAEL HUTH, *LEVERAGE STAKING WITH LIQUID STAKING DERIVATIVES (LSDS): OPPORTUNITIES AND RISKS* 7 (2023).

LS protocols operate either in the form of smart contracts (*e.g.*, Lido Finance and Rocket Pool) or as separate applications (*e.g.*, Stride and pStake). Upon deposit from the users, the protocol acts as a DPoS delegator and forwards the tokens to one or more validators.²¹⁷ The delegated stake is then collected into a staking pool.²¹⁸ Concurrently, the protocol mints an ERC-20 LST which is typically acquired as a swap by the stakeholder's wallet²¹⁹ and represents a claim against the delegated stake.²²⁰

LSDs are generally divided between rebasable and exchange-rate based. The value of rebasable LSDs is kept at a 1:1 ratio with that of the underlying token.²²¹ For instance, when staking 1 ETH on Lido Finance, users receive 1 stETH LST. Likewise, they can redeem ETH by burning an equal ratio of stETH. The rebasing nature of stETH also determines the holder's balance (*i.e.*, in terms of quantity of LSTs) to change daily, altering the stETH holder's share with respect to the total amount of ETH controlled by the protocol. Rebasing, however, is not supported by various decentralized applications ("Dapps"), thus requiring stETH to be wrapped into wstETH tokens representing the holder's share of the total protocol supply of stETH.²²² wstETH balance does not rebase, it is the wstETH's price denominated in stETH (*i.e.*, the exchange rate) that changes to account for rewards and fees at the protocol level.

B. *Developments in the Market*

1. *An Example of Existing Opportunities*

At the moment there are different options for investors interested in crypto-derivatives: exchange-traded products, custom derivatives OTC, futures and forwards, perpetual swaps.²²³ The Chicago Mercantile Exchange ("CME") proposed a form of regulated bitcoin futures last year.²²⁴ CME's Bitcoin futures contract is a USD cash-settled contract based on the CME CF Bitcoin Reference Rate ("BRR"), which serves as a once-a-day reference rate of the U.S. dollar price of bitcoin.²²⁵ The BRR aggregates the trade flow of major bitcoin spot exchanges during a one-hour calculation window into the U.S. dollar price of one

217. *Id.* at 4.

218. *Id.* at 5.

219. *See Staking ETH in Coinbase Wallet*, COINBASE, <https://help.coinbase.com/en/wallet/dapps-and-defi/eth-staking> (last visited July 26, 2025) [<https://perma.cc/W3DZ-SLEP>].

220. Apostolos Tzinas & Dionysis Zindros, *The Principal-Agent Problem in Liquid Staking 4* (May 18, 2023), <https://eprint.iacr.org/2023/605.pdf> [<https://perma.cc/R6RR-NX4V>].

221. Treehouse, *An Introduction to Liquid Staking and Its Strategies*, MEDIUM (Mar. 14, 2023), <https://medium.com/cryptostars/an-introduction-to-liquid-staking-and-its-strategies-cef7fa5c16e> [<https://perma.cc/A5XT-SE6M>].

222. *Lido Tokens Integration Guide*, LIDO DOCS, <https://docs.lido.fi/guides/lido-tokens-integration-guide/> (last visited July 26, 2025) [<https://perma.cc/F357-M29K>].

223. MOORE, *supra* note 148, at 6–7.

224. *See What Are Bitcoin Futures?*, CME GRP., <https://www.cmegroup.com/education/courses/introduction-to-bitcoin/what-are-bitcoin-futures.html> (last visited July 26, 2025) [<https://perma.cc/8W7U-27QL>].

225. MOORE, *supra* note 148, at 7.

bitcoin as of 4 p.m. Greenwich Mean Time (“GMT”).²²⁶ A single BTC contract has a value of five times the value of the BRR Index and is quoted in U.S. dollars per one bitcoin.²²⁷ The tick increments are quoted in multiples of \$5 per bitcoin, meaning a one-tick move of the BTC future is equal to \$25.²²⁸ More recently, the CME Group completed its offer of derivatives with an option on its future contracts.²²⁹

The Asian Bitmex and Binance exchanges offer futures contracts for both Bitcoin and smaller coins that can be leveraged more than 100 times and often perpetually.²³⁰ Bitmex created and now offers a new product, the perpetual swap. Different from futures, such perpetual swaps do not have a closing date. They settle to an index periodically (on Bitmex settlement occurs every eight hours) in cash, letting traders maintain their positions without rolling them over.²³¹

Exchange-Traded Notes (“ETN”) have existed in Europe since 2015. Although they may not be characterized as “derivatives” they still serve the same economic function of providing exposure to bitcoin and other crypto-assets via more regulated markets.²³² In Sweden, the bitcoin ETN is consistently traded with all other listed instruments on the Nasdaq exchange. Investing in these instruments requires a bank account, perhaps one with an advisor or online broker. XTB Provider AB hedges all sales of the bitcoin ETN by buying an equivalent value in the bitcoin market.²³³

In the U.S., for ten years, Exchange Traded Products (“ETPs”) were never granted an approval by the SEC, because of concerns relating to market manipulation.²³⁴ This was the case of the Winklewoss’ Gemini ETF application, as well as other cases such as VanEck, Bitwise, and United States Bitcoin and Treasury Investment.²³⁵ In the Winklewoss’ rejection, the SEC highlighted the lack of a proper mechanism of price discovery underlying the Bitcoin market and the Gemini Exchange.²³⁶ As mentioned above, the situation has changed, with the

226. *What are Bitcoin Futures?*, *supra* note 224.

227. *Id.*

228. *Id.*

229. Kharif, *supra* note 140.

230. *See id.*

231. MOORE, *supra* note 148, at 6. For an overview of the “perpetual” contractual scheme, see *Perpetual Contracts Guide*, *supra* note 179.

232. MOORE, *supra* note 148, at 7.

233. Yessi Bello Perez, *Sweden’s Nasdaq Exchange Approves Bitcoin-based ETN*, COINDESK, <https://www.coindesk.com/markets/2015/04/29/swedens-nasdaq-exchange-approves-bitcoin-based-etn> (Sept. 11, 2021, 6:39 AM) [<https://perma.cc/E7TQ-64ZK>].

234. Suzanne McGee & Hannah Lang, *The Decade-Long Journey to a US Spot Bitcoin ETF*, REUTERS (Jan. 10, 2024, 4:31 PM), <https://www.reuters.com/technology/decade-long-journey-us-spot-bitcoin-etf-2024-01-10/> [<https://perma.cc/WH4J-RGQP>].

235. Benzinga, *Bitcoin ETF Proposals: The SEC’s Long History Of Rejections*, BUS. INSIDER (Mar. 30, 2021, 6:21 PM), <https://markets.businessinsider.com/news/etf/bitcoin-etf-proposals-the-sec-s-long-history-of-rejections-1030261105> [<https://perma.cc/2W4K-H5YZ>].

236. *See generally* SEC, Release No. 34-83723, SELF-REGULATORY ORGANIZATIONS; BATS BZX EXCHANGE, INC.; ORDER SETTING ASIDE ACTION BY DELEGATED AUTHORITY AND DISAPPROVING A PROPOSED RULE CHANGE, AS MODIFIED BY AMENDMENTS NO. 1 AND 2, TO LIST AND TRADE SHARES OF THE WINKLEVOSS BITCOIN TRUST (Jul. 26. 2018), <https://www.sec.gov/rules/other/2018/34-83723.pdf> [<https://perma.cc/3MGQ-CB8S>].

SEC approving a series of proposed rule changes, allowing for the listing and trading of bitcoin-based products on national securities exchanges on January 10, 2024, with transformative consequences for the crypto economy.²³⁷

Currently, the market for Bitcoin options is very active, despite data suggesting these instruments are less widespread in the market than perpetuals. Cantor Futures Exchange, LP (“Cantor Exchange”) launched a Bitcoin Binary option on December 1, 2017, a cash-settled instrument with the structure of a swap.²³⁸ The platform ‘Nader’ offers bitcoin binary options to retail investors.²³⁹ OKEx is a new Bitcoin/USD option trading that was launched on January 9, 2020.²⁴⁰ Furthermore, the cryptoexchange FTX launched new bitcoin options, generating a volume of \$15 million in the first 24 hours.²⁴¹ Furthermore, Goldman Sachs recently traded a bitcoin-linked nondeliverable option with a crypto merchant bank, Galaxy Digital.²⁴²

OTC trading is extremely relevant for crypto markets activity, and involves different market participants. Hedge funds, smaller asset managers, and family offices are buyers, while miners are the main sellers, with the involvement of regulated broker-dealers and crypto exchange OTC desks.²⁴³ Binance, Coinbase, and Circle all have their own OTC desks.²⁴⁴ The vast majority of transactions involve actors in Asia and North America.²⁴⁵ The fact that a giant in asset management like Fidelity entered the market of storing and trading crypto sourced

237. Omnibus Approval Order, Securities Exchange Act Release No. 34-99306 (Jan. 10, 2024), <https://www.sec.gov/files/rules/sro/nysearca/2024/34-99306.pdf> [<https://perma.cc/AN7P-A469>]; see also Gensler, *supra* note 5.

238. See *Cantor Futures Exchange Bitcoin Swap Contract*, CANTOR FUTURES EXCH. 1, 17 (Dec. 1, 2017), <https://www.cftc.gov/sites/default/files/filings/ptc/17/12/ptc120117cantordcm001.pdf> [<https://perma.cc/6AT2-FEQX>].

239. *Bitcoin Contract Specifications*, NADEX, <https://web.archive.org/web/20190214172320/https://www.nadex.com/markets/cryptocurrency/bitcoin-contract-specifications> (last visited July 26, 2025) [<https://perma.cc/W88P-BBY3>].

240. *BTCUSD Options Now Available*, OKEX (Jan. 9, 2020, 6:00 AM), https://okexsupport.zendesk.com/hc/en-us/articles/360038631171?utm_source=twitter.com&utm_medium=social&utm_campaign=okexoptions-the-much-awaited-btc-usd-o [<https://perma.cc/NKV3-WHXG>].

241. Sam Bankman-Fried (@SBF_FTX), TWITTER (Jan. 13, 2020, 1:02 PM), https://twitter.com/SBF_Alameda/status/1216797698113724416?utm_source=InstitutionalCrypto&utm_medium=Email&utm_campaign=2020-01-14clid= [<https://perma.cc/ABX2-VWL9>].

242. Hugh Son, *Goldman Sachs, Galaxy Digital Announce Milestone Over-The-Counter Crypto Trade*, CNBC, <https://www.cnbc.com/2022/03/21/bitcoin-options-goldman-sachs-announces-otc-crypto-trade-with-galaxy-digital.html> (Mar. 21, 2022, 12:22 PM) [<https://perma.cc/FF9Y-J58J>].

243. Romal Almazo, *The OTC Crypto Market: At a Glance*, FINEXTRA (Feb. 6, 2019), <https://www.finextra.com/blogposting/16628/otc-crypto-market--at-a-glance> [<https://perma.cc/A6KV-J35U>].

244. See, e.g., Connor Dempsey, *How Does Crypto OTC Actually Work?*, MEDIUM (Mar. 25, 2019), <https://medium.com/circle-research/how-does-crypto-otc-actually-work-e2215c4bb13> [<https://perma.cc/W2Z9-7E2E>].

245. Damian Chmiel, *Bitcoin ETFs and US Elections Drove Institutional Crypto OTC Trading to \$39 Billion Daily*, FIN. MAGNATES (Feb. 26, 2025, 10:48 AM), <https://www.financemagnates.com/cryptocurrency/bitcoin-etfs-and-us-elections-drove-institutional-crypto-otc-trading-to-39-billion-daily/> [<https://perma.cc/ZCZA-A6LJ>].

from OTC markets for institutional investors²⁴⁶ is a signal that more and more actors will eventually be involved in this market.

Institutional investors opting to enter the market of crypto-derivatives currently have two options. First, the TeraExchange, LLC (“TeraExchange”) operating since 2014 provides support for institutional investors who want to be exposed to the Bitcoin market offering a derivative contract falling under the supervision of the CFTC.²⁴⁷ And second, the LedgerX offers Bitcoin options: with the Long-Term Equity Anticipation Security, investors can have a right to buy or sell bitcoins at the strike price before an expiration date (one year or more).²⁴⁸ More recently, an internal member of LedgerX alleged bad practices and financial mismanagement in a letter to the CFTC.²⁴⁹ CME entered the space of options of bitcoin futures, to respond to the growing interest of clients with hedging or trading purposes.²⁵⁰ CME designed this option of bitcoin futures consistently with the structure of bitcoin futures: the contract unit consists of one CME’s bitcoin futures contract, representing five bitcoin, and is quoted in U.S. dollars per one bitcoin, and a tick size of \$25 or \$5 in case of reduced tick size.²⁵¹ While not exclusively addressed to institutional investors, CME’s reputation will likely attract the interest of institutional investors, too.

2. *Collateralized Debt Instruments in the Crypto Economy*

CDOs and similar financial instruments played an important role in spreading the financial risk and increasing opacity among investors during the last financial crisis of 2008,²⁵² because Commercial banks as well as hedge funds and investment banks took large positions in CDOs.²⁵³ CDOs are a specific type of asset-backed security, where a portfolio of bonds, loans and other assets backs the securities’ value.²⁵⁴

246. See Ana Alexandre, *Fidelity Investments Fully Rolls Out Crypto Custody Service, Exec Says*, COINTELEGRAPH (Oct. 19, 2019), <https://cointelegraph.com/news/fidelity-investments-fully-rolls-out-crypto-custody-service-exec-says> [https://perma.cc/BA7P-37GG].

247. See Stan Higgins, *CFTC Grants Full Registration to Bitcoin Swaps Trading Platform*, COINDESK, <https://www.coindesk.com/business/2016/05/26/cftc-grants-full-registration-to-bitcoin-swaps-trading-platform> (May 9, 2023, 3:03 AM) [https://perma.cc/CSX6-VYEK].

248. See Nikhilesh De, *LedgerX Board Member Says Company in Disarray After Founders’ Ouster*, COINDESK, <https://www.coindesk.com/markets/2020/01/10/ledgerx-board-member-says-company-in-disarray-after-founders-ouster> (Sept. 13, 2021, 7:07 AM) [https://perma.cc/RF8B-7H96]; see also Giovanni Patti, *The Regulation of Financial Product Innovation Typified by Bitcoin-Based Derivative Contracts*, 38 REV. BANKING & FIN. L. 765, 783–84 (2019).

249. See De, *supra* note 248.

250. Daniel Palmer, *CME Says It Will Launch Bitcoin Options in January*, COINDESK, <https://www.coindesk.com/markets/2019/11/12/cme-says-it-will-launch-bitcoin-options-in-january> (Sept. 13, 2021, 6:41 AM) [https://perma.cc/B4DG-WFAX].

251. *Options on Bitcoin Futures*, CME GROUP, <https://www.cmegroup.com/cme-group-futures-exchange/options-bitcoin-futures.html> (last visited July 26, 2025) [https://perma.cc/K9QT-Z8KH].

252. See generally David Zaring, *Litigating the Financial Crisis*, 100 VA. L. REV. 1405 (2014).

253. See STEPHEN J. CHOI & ADAM C. PRITCHARD, *SECURITIES REGULATION* 158 (Robert C. Clark et al. eds., 4th ed. 2015).

254. *Id.*

What if CDOs start spreading in the crypto economy? In 2021, Opium Finance introduced CDO products for Compound Finance's automated lending markets.²⁵⁵ Up until now, the vast majority of security tokens allowed the representation of a single-asset. The transition towards a multi-asset representation will create new possibilities in the form of collateralized debt positions ("CDPs").²⁵⁶ A security token CDP should characterize as a debt token, the value of which is collateralized by an underlying pool of digital securities.²⁵⁷ Consistent with CDOs, the liquidity, the value and the risk are also important in this context. The quality of the underlying assets is of extreme relevance in order to maintain high-levels of liquidity, value and low risk. The opacity of existing digital assets may be a relevant source of risk that could be amplified with potential crypto-CDPs. An example comes from Opium Finance, which has introduced collateralized debt obligation ("CDO") products for Compound Finance's automated lending markets.

3. *Future Developments: On-Chain Derivatives*

Further developments may come into play with the implementation of "on-chain" derivatives and with the application of smart contracts and DLT to derivatives. It is uncertain, however, whether these technologies will penetrate this market and to what extent.²⁵⁸ A potential scenario would be that fully on-chain derivatives increase the opportunities for derivatives, facilitating the broad use of tokenized assets as underlying and collateral and increasing the ease of execution. After analyzing the legal framework of smart contracts,²⁵⁹ the International Swap Dealer Association ("ISDA") was heavily invested in exploring potential opportunities for concretely building smart derivatives contracts²⁶⁰, and defined four key principles for the development of smart contracts derivatives.²⁶¹

255. As reported by Coindesk,

Investors can put up the Compound debt token cDai—and soon Uniswap LP tokens—to diversify exposure to DeFi lending markets. Opium's product pays out structured returns to both a senior and junior risk tranche in exchange. The former tranche offers a 7% fixed return on dai (a collateral-backed stablecoin) at maturity, while the latter pool offers a variable rate paid out after filling up the senior tranche's return.

William Foxley, *Collateralized Debt Obligations Make Their Way Into DeFi Lending*, COINDESK, <https://www.coindesk.com/tech/2021/01/25/collateralized-debt-obligations-make-their-way-into-defi-lending/> (Sept. 24, 2021, 6:00 AM) [<https://perma.cc/RAF7-JA4B>].

256. See Jesus Rodriguez, *Collateralized Debt Positions for Security Tokens*, HACKERNOON (Feb. 25, 2019), <https://hackernoon.com/collateralized-debt-positions-for-security-tokens-28b7ec8f5522> [<https://perma.cc/CR4K-S5W6>].

257. *Id.*

258. INT'L SWAPS & DERIVATIVES ASS'N, LEGAL GUIDELINES FOR SMART DERIVATIVE CONTRACTS: INTRODUCTION 4 (2018), <https://www.isda.org/a/MhgME/Legal-Guidelines-for-Smart-Derivatives-Contracts-Introduction.pdf> [<https://perma.cc/QN7P-RRM9>].

259. INT'L SWAPS & DERIVATIVES ASS'N & LINKLATERS LLP, SMART CONTRACTS AND DISTRIBUTED LEDGER—A LEGAL PERSPECTIVE 4–8 (2017), www.isda.org/a/6EKDE/smart-contractsand-distributed-ledger-a-legal-perspective.pdf [<https://perma.cc/8KAN-5NMY>].

260. See generally INT'L SWAPS & DERIVATIVES ASS'N & KING & WOOD MALLESONS, SMART DERIVATIVES CONTRACTS: FROM CONCEPT TO CONSTRUCTION (2018), <https://www.isda.org/a/cHvEE/Smart-Derivatives-Contracts-From-Concept-to-Construction-Oct-2018.pdf> [<https://perma.cc/4HX4-T2AB>].

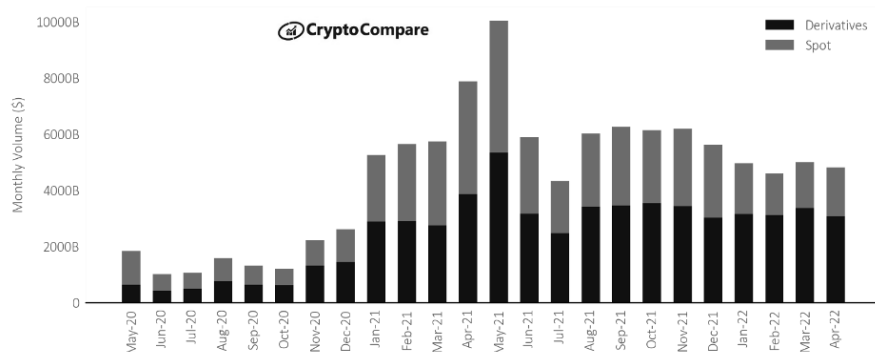
261. INT'L SWAPS & DERIVATIVES ASS'N, *supra* note 258, at 10–12.

C. Data

1. The Overall Crypto-Derivatives Market

Looking at the market trends in crypto-derivatives, there has been a substantial increase in the volume traded in a day, comparing the volumes of 2020, with those of 2022 and 2023.²⁶² Furthermore, there has been a clear market dominance in comparison to spot market. Coingekko and CCData confirmed the trend of market dominance by crypto-derivatives with peaks in March (\$2.95 trillion) and November (\$2.58 trillion).²⁶³

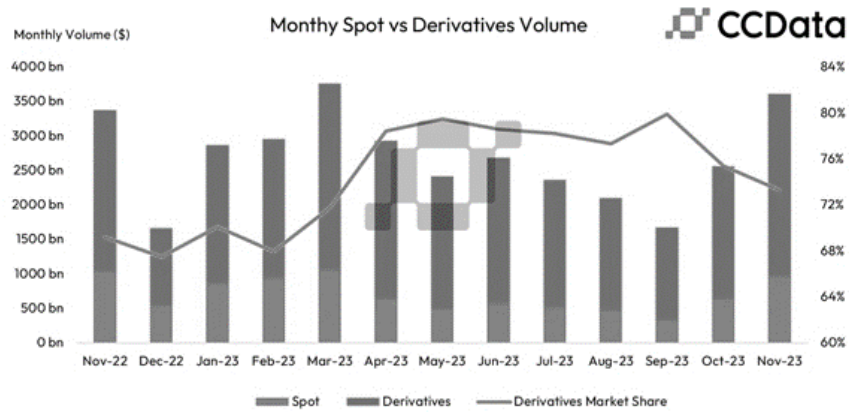
FIGURE 3. MONTHLY SPOT VS DERIVATIVES VOLUME MAR. 20–APR. 22²⁶⁴



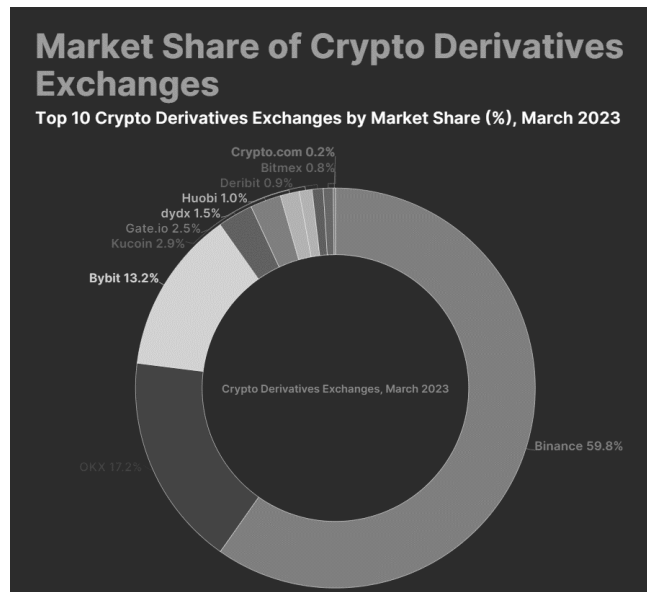
262. See Marco Dell’Erba, *Crypto-Trading Platforms as Exchanges*, MICH. ST. L. REV. 1, 62 (2024).

263. Shaun Paul Lee, *Crypto Derivatives Market Size 2023*, COINGECKO, <https://www.coingecko.com/research/publications/crypto-derivatives-market> (May 30, 2023) [<https://perma.cc/U9KZ-6VVG>].

264. *Exploring the Evolution of the Crypto Derivatives Market and Institutional Adoption*, CFC ST. MORITZ, <https://cfc-stmoritz.com/industry-insights/exploring-the-evolution-of-the-crypto-derivatives-market-and-institutional-adoption> (last visited July 26, 2025) [<https://perma.cc/57SD-LJ4U>].

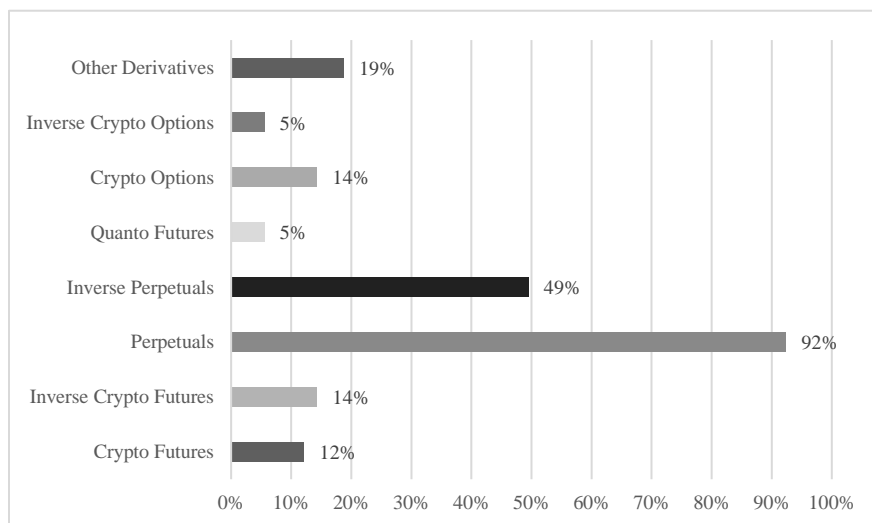
FIGURE 4. MONTHLY SPOT VS DERIVATIVES VOLUME NOV. 22–NOV. 23²⁶⁵

Interestingly, looking at the market share of crypto-exchanges, Binance is the most dominant (with a market share of almost 60%), followed by OKX (17.2%) and Bybit (13.2%). The other crypto-exchanges have a marginal role.²⁶⁶ This is consistent with the general trends in the crypto economy, and fintech more generally.²⁶⁷

FIGURE 5. MARKET SHARE OF CRYPTO-DERIVATIVES EXCHANGE²⁶⁸265. *Id.*266. *See Lee, supra* note 263.267. *See generally* Dell'Erba, *supra* note 262.268. *See generally* COINGECKO, 2023 Q1 CRYPTO INDUSTRY REPORT (2023), <https://assets.coingecko.com/reports/2023/CoinGecko-2023-Q1-Report.pdf> [<https://perma.cc/H4BB-WBHM>].

2. *Crypto-Derivatives by Product*

FIGURE 6. DISTRIBUTION OF DIFFERENT TYPES OF CRYPTO-DERIVATIVE CONTRACTS ACROSS NINETY-ONE ACTIVE PLATFORMS



This Section is based on a hand-coded dataset that takes into account more than 100 crypto exchanges operating worldwide, which are included in Annex A at this end of this Article. The Figure above illustrates the distribution of crypto-derivative contracts among ninety-one currently active crypto-derivative exchanges. Direct perpetuals (*i.e.*, margined and settled in fiat or stablecoins) are by far the most popular contracts, as they are offered by 92% of the platforms analyzed.²⁶⁹ This popularity can be attributed to their high and continuous leverage, comparatively low margin requirements, and the absence of the need to roll over trades. Inverse perpetuals (*i.e.*, margined and settled in the underlying cryptocurrency) are the second most commonly offered crypto-derivatives, available on 49% of the platforms.²⁷⁰ It is important to note that the ratio between direct and inverse perpetual contracts (currently above 53%) may vary depending on the global monetary outlook.²⁷¹ In times of high interest rates, traders may be more inclined to use cryptocurrencies rather than cash for margining crypto-derivatives.

Crypto options, both direct and inverse, are offered by 19% of exchanges.²⁷² While they are a relative novelty among crypto-derivative contracts, being inherently more complex instruments compared to futures contracts, they may struggle to attain the popularity of perpetuals.

269. *See id.*

270. *See id.*

271. *See id.*

272. *See supra* Figure 6.

19% of exchanges offer other types of derivatives, such as contracts for difference (“CFDs”) or customized options.²⁷³ But the most traded derivatives in this category are leveraged tokens. Each leveraged token tracks the value of a basket of perpetual contracts, maintaining a constant leveraged exposure usually between 1% and 4%.²⁷⁴ As passive instruments, they do not pose the risk of liquidation nor require investors to post any margin.²⁷⁵

Quanto futures are the least offered products at 5%.²⁷⁶ This can, again, be attributed to their inherent complexity, a characteristic shared with ‘traditional’ quantos.²⁷⁷ This scarcity in availability may be influenced by the intricate nature of quanto instruments, which involve currency risk management and complex valuation mechanisms.²⁷⁸ Furthermore, the limited demand for these futures could also stem from the specialized knowledge and expertise required for trading and managing such derivatives, deterring exchanges from widespread adoption.²⁷⁹ Additionally, market participants may exhibit a preference for more straightforward and widely understood instruments, contributing to the relatively lower popularity of quanto futures in comparison to other derivative products.

3. *Liquid-Staking*

At the time of writing, the liquid staking market boasts a total value locked (“TVL”) of \$31.273 billion, of which nearly \$21 billion is locked on the Lido platform.²⁸⁰ The next closest competitors are Rocket Pool and Binance, with TVLs of \$2.762 billion and \$1.749 billion, respectively.²⁸¹ All other providers have TVLs below \$700 million. Consistent with other trends in the crypto economy, in particular market infrastructures (namely crypto-exchanges)²⁸² the market for liquid staking shows the same levels of concentration.

273. See *supra* Figure 6.

274. See *supra* Figure 6.

275. See *Leverage and Margin in Coin-Margined Futures Contracts*, *supra* note 163; *Bybit Leveraged Tokens*, BYBIT, <https://www.bybit.com/en/trade/spot/act/lt-landing-page> (last visited July 26, 2025) [<https://perma.cc/9U59-EDC3>].

276. See *supra* Figure 6.

277. See generally Javed Hussain, *Pricing of Quanto Power Options and Related Exotic Options*, 18 RESULTS APPLIED MATHEMATICS, Apr. 26, 2023.

278. See *id.* at 2.

279. See *id.* at 1.

280. *Liquid Staking TVL Rankings*, DEFILLAMA, <https://defillama.com/protocols/Liquid%20Staking> (last visited July 26, 2025) [<https://perma.cc/VQ52-CALF>].

281. See *id.*

282. See Dell’Erba, *supra* note 262, at 15.

FIGURE 7. DEVIATION OF TOTAL VALUE LOCKED (TVL) FROM \$1 BILLION FOR LARGEST LIQUID STAKING PLATFORMS

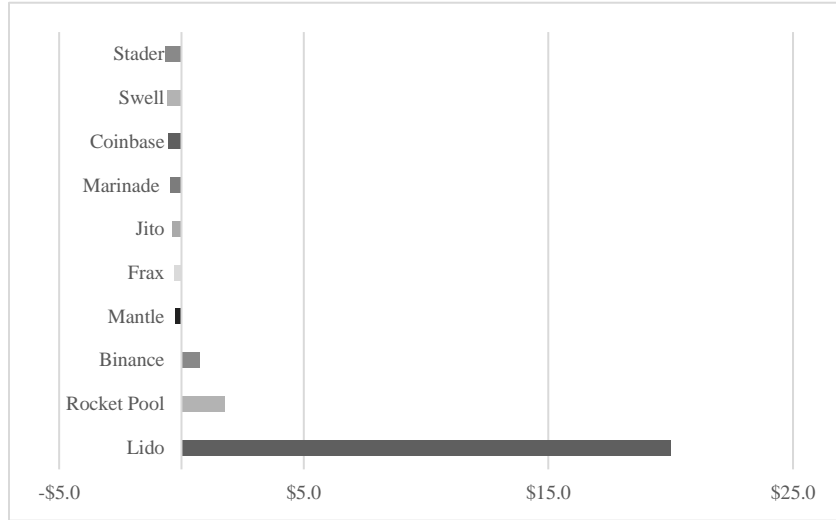
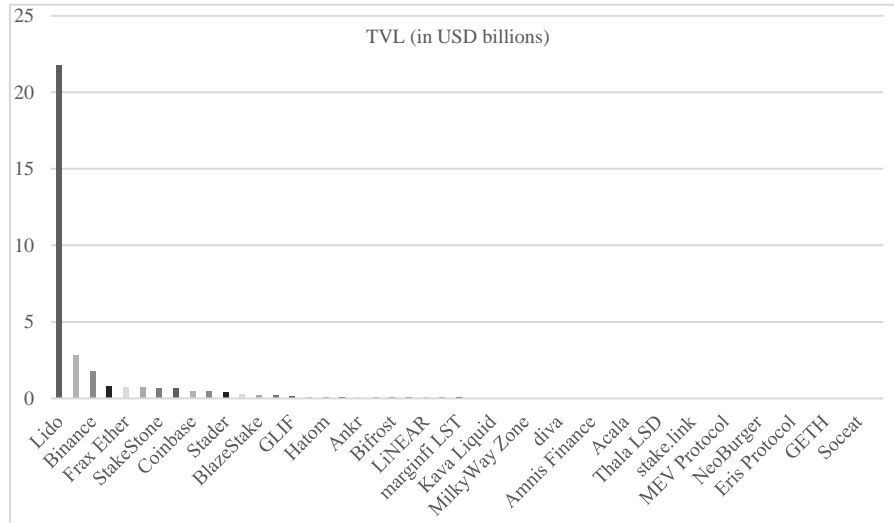


FIGURE 8. TOTAL VALUE LOCKED (TVL) FOR FIFTY LARGEST LIQUID STAKING PLATFORMS



IV. THE FUNDAMENTAL IMPLICATIONS OF CRYPTO-DERIVATIVES

A. *Understanding Data*

Are crypto-derivatives sophisticated instruments? Data suggest that the emerging crypto-derivative market is not sophisticated. The expectation that exotic and sophisticated structures would emerge as a consequence of an increased technological environment connected to the blockchain is rather a problem of perception, which data does not confirm. The most developed and traded derivatives are perpetuals, a structure which de-facto replicates the key features of the rolling-spot forex segment. The digital asset derivative market structure, however, is expected to evolve as institutional users demand more exposure to digital assets and more complex product offerings.²⁸³ The digital asset derivative product suite will mirror traditional financial instruments to start, facilitated by smart contracts that increase efficiency, reliability, and auditability. Similar to the rise of the digital asset perpetuals, an increase in options activity may take place as established players stand up options infrastructure in the centralized market and as viable decentralized protocols are built on faster chains or scaling solutions that reduce costs, increase speed, and reduce collateralization requirements.²⁸⁴

The levels of concentration in terms of market shares of the most established crypto-exchanges confirm the trends emerging in the entire crypto economy, where giants play a dominant role. A significant portion of today's activity in digital asset-based derivatives is concentrated on specific centralized exchanges, and it is foreseeable that this concentration of liquidity will endure in the coming years as these exchanges demonstrate their ability to comply with regulatory and operational infrastructure standards essential for institutional investors.²⁸⁵ Liquidity distribution, however, might become more scattered across exchanges due to factors such as product availability (*e.g.*, products restricted to specific protocols supported by particular platforms) and fee compression as markets mature and experience reduced volatility.²⁸⁶ Regulatory measures will likely result in segmented areas, with some adhering to local requirements (*e.g.*, permissioned protocols), while others operate in unregulated or lightly regulated larger liquidity pools within the DeFi space. In the longer term, there might be a shift away from centralized exchanges towards DeFi. The advancement of scaling solutions, aiming to reduce transaction costs and enhance transaction execution speed, is expected to stimulate further expansion in this domain.²⁸⁷

Looking at the overall leverage in the crypto economy, the analysis also suggests that at the current stage crypto-derivatives are not equally spread in the market as in the case of traditional finance, although consistent growth has taking

283. *Id.* at 62–63.

284. *See id.* at 53.

285. *See id.* at 45.

286. *See* Saule T. Omarova, *New Tech v. New Deal: Fintech as a Systemic Phenomenon*, 36 YALE J. ON REG. 735, 787 (2019).

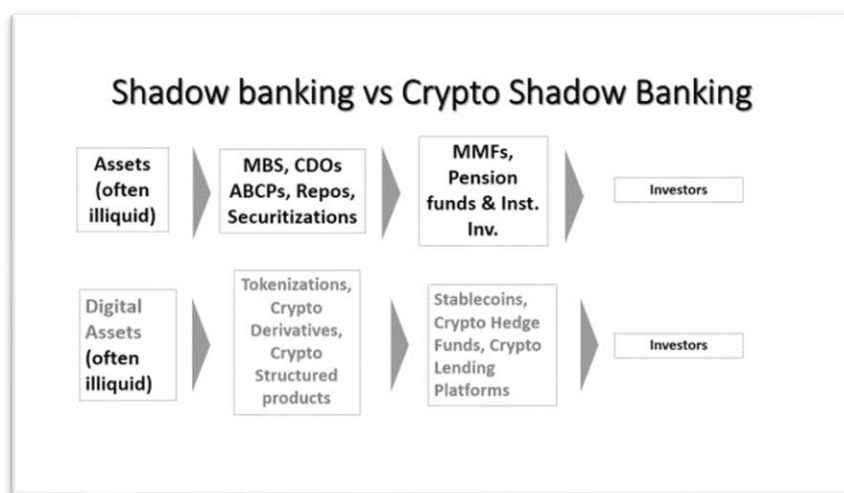
287. *See id.* at 760.

place in the last three years.²⁸⁸ While there are numerous digital asset tokens in circulation, current derivatives focus on only a portion of this population, highlighting potential for expansion and innovation. Therefore, new derivative products will likely emerge, encompassing more customizable options that align with the growth and specific requirements of the digital asset market.

B. Crypto-Derivatives and Their Role in the Development of Crypto Shadow Banking

Crypto-derivatives are connected to a series of activities emerging in the crypto-space, all related to an emerging new network, Crypto Shadow Banking.

FIGURE 9 SHADOW BANKING VS. CRYPTO SHADOW BANKING



The shadow banking system is a “network of financial instruments and institutions” and serves to connect “commercial and consumer borrowers indirectly to investors in capital markets.”²⁸⁹ Similarly, the Crypto Shadow Banking system is a network of financial instruments and institutions for the crypto-space. Furthermore, looking at the functions of Crypto Shadow Banking in comparison with traditional shadow banking, it may also be the case that the function of indirectly connecting borrowers to investors in capital markets for the purpose of providing credit and liquidity transformation could more systematically emerge in this context. This is certainly one of the traits characterizing Crypto Shadow Banking, especially when considering the new activities related to crypto-lending, as well as the possibility of developing specific types of derivatives and structured products. But the current early stage of development suggests that

288. *See id.* at 781.

289. Erik F. Gerding, *The Shadow Banking System and Its Legal Origins*, at 3 (Jan. 24, 2012) (on file with author).

Crypto Shadow Banking is also a network for gaining access to highly speculative financial instruments populating the crypto economy.

1. *Crypto-Lending or DeFi Lending*

Crypto-lending or DeFi Lending and the activities of lending and borrowing in virtual currencies emerged as new trends in the market, and are the ones more clearly related to the shadow banking activity.²⁹⁰ DeFi lending experienced a significant growth in particular since 2020, also because of a more systematic utilization of stablecoins,²⁹¹ and more generally this connects to the opportunity offered by DeFi for crypto-asset holders “to earn interest by depositing crypto and/or borrowing more crypto by posting collateral.”²⁹²

In the crypto lending market, there are four categories of users: crypto-lenders, cash-lenders, crypto borrowers, and cash borrowers, plus the lending platforms acting as intermediaries.²⁹³ Looking at crypto-borrowers, they can be either individuals or any kind of firm, such as OTC desks, interested in trading as well as making markets in the context of crypto-assets.²⁹⁴

The key actors in crypto-lending are DeFi lending platforms, and the scheme implemented by DeFi lending platforms is straightforward: lending platforms receive crypto-assets as deposits and lend them to borrowers, under the condition that they might certain collateral criteria.²⁹⁵ Consistent with the vast majority of intermediaries currently active in the crypto economy, both centralized and decentralized lending platforms exist in the current framework, and they differ in many respects. The core business of centralized platforms concentrates on specific clients, offering custodial services to those who need to exchange crypto-assets for cash or vice versa.²⁹⁶ In addition to firms focusing on this business (such as Genesis Capital), other key actors in the space include OTC desks, exchanges and other kinds of platforms, interested in maximizing the management of their positions in crypto assets, or offer the possibility of margin trading or margin lending (that will be further considered in the following Sections).²⁹⁷ Decentralized platforms exclusively focus on crypto-assets; smart contracts manage the loan origination as well as the interest payments, and do not offer custodial services.²⁹⁸

DeFi crypto-lending platforms work in a specific manner, and rely on deposits, borrowing and collateral. Users have the opportunity to gain interests from their deposits in crypto assets that would be part of a “liquidity pool”

290. See JOSE ABAD ET AL., INT’L MONETARY FUND, GLOBAL FINANCIAL STABILITY REPORT: SHOCKWAVES FROM THE WAR IN UKRAINE TEST THE FINANCIAL SYSTEM’S RESILIENCE 75 (2022).

291. *Id.*

292. *Id.*

293. NOELLE ACHESON & GALEN MOORE, COINDESK, CRYPTO LENDING 101 4–6 (2020).

294. *Id.* at 5.

295. ABAD ET AL., *supra* note 290, at 75.

296. ACHESON & MOORE, *supra* note 293, at 6–7.

297. *Id.*

298. *Id.* at 7.

corresponding to the specific type of crypto assets.²⁹⁹ After the deposit, the depositors obtain a certificate of deposits in the form of a “platform-specific utility token,” and its value is equal to the underlying asset deposited but bears interest.³⁰⁰ A depositor would be in the position to withdraw the deposit at any time.³⁰¹ Furthermore, the depositor is also in the position to borrow a crypto-asset from a liquidity pool, by using the deposited asset as collateral, and the lending interest rate would vary on the basis of “the level of utilization for the borrowing asset.”³⁰² Collateralization, and often over-collateralization, are required by lending platforms.³⁰³ Borrowers can opt for repaying their debt at any time, although they have to fulfil their collateral requirements.³⁰⁴

2. Money Market Funds (“MMFs”) and Stablecoins

MMFs are mutual funds, and they act as “intermediaries between shareholders who desire liquid investments and borrowers who seek term funding.”³⁰⁵ Typically, money market funds invest in highly liquid cash or cash-equivalent securities, with a short-term maturity of less than thirteen months and the possibility to redeem their shares at any time, at a stable value.³⁰⁶ They provide credit to businesses, financial institutions and governments significantly invested in short-term funding markets.³⁰⁷ In the context of the shadow banking system, money market liability has a role in financing long-term financial assets.³⁰⁸

Stablecoins work in a manner that can be compared to money market funds in the ecosystem of cryptocurrencies,³⁰⁹ since, like MMFs, they guarantee nominal fixed returns. For this reason, the IMF considers one possible approach to regulation: extend the regulation for MMFs, especially in terms of sufficient liquidity and capital.³¹⁰ They may be a new form of money, notably investment-money (“i-money”).³¹¹

Stablecoins may not just work as MMFs, but they may also serve to foster the derivatives industry in the crypto economy.³¹² Up until now, the vast majority of derivatives used bitcoin as an underlying asset and, therefore, the procedures

299. See ABAD ET AL., *supra* note 290, at 75.

300. *Id.*

301. *Id.*

302. *Id.*

303. *Id.*

304. *Id.* at 76.

305. SEC. AND EXCH. COMM’N, PRESIDENT’S WORKING GROUP REPORT ON MONEY MARKET FUND REFORM 2 (2010), <https://www.sec.gov/rules/other/2010/ic-29497.pdf> [<https://perma.cc/U63N-B3CF>] (emphasis added).

306. Troy Segal, *Money Market Funds: What They Are, How They Work, Pros and Cons*, INVESTOPEDIA, <https://www.investopedia.com/terms/m/money-marketfund.asp> (Oct. 4, 2024) [<https://perma.cc/YG37-KKXY>].

307. *Id.*

308. Morgan Ricks, *Shadow Banking and Financial Regulation 1* (Columbia L. and Econ., Working Paper No. 370., 12010), <https://ssrn.com/abstract=1571290> [<https://perma.cc/PNB6-5ZHU>].

309. See *id.* at 10.

310. See TOBIAS ADRIAN & TOMMASO MANCINI-GRIFFOLI, INT’L MONETARY FUND, *THE RISE OF DIGITAL MONEY* 6–10 (2019).

311. *Id.* at 5.

312. See Dell’Erba, *supra* note 262, at 56.

necessary to define the reference price are rather opaque.³¹³ The supposed stability of stablecoins might favor their use as a reference in the context of derivatives given the need for stability.

3. *Private Funds, Prime Brokers and Custodians*

Among the very first entities investing and financing the crypto economy, private funds played a major role in the development of the crypto economy. Private funds engaged in two types of investments, a direct investment in cryptocurrencies and investments in start-ups engaged with activities related to cryptocurrencies.³¹⁴ Just as in traditional finance, institutional investors in the crypto economy need specific services including liquidity, reliable platforms providing advanced trading interface, sophisticated data analytics, high speed order execution, and a wide range of quantitative solutions, all provided for low rates and trading fees.³¹⁵ Prime brokers, custodians and depositories are important service providers for private funds in traditional finance, especially in the context of private funds.

Looking specifically at the prime broker industry, it began in the 1980s, with the purpose to provide comprehensive investment services to financial institutions.³¹⁶ Goldman Sachs, Morgan Stanley, and UBS are the market leaders, in particular linking hedge funds to their counterparties, as well as providing complementary services, such as securities lending in exchange for collateral.³¹⁷ Many new ventures emerged in the business of prime brokerage in the crypto economy. Troy Trade provides an all-in-one service for traditional investors, which includes margin and OTC, quant strategies and dynamic-data tools.³¹⁸ Altonomy, created in 2018 and acquired by the cryptoexchange Blockchain.com in 2021, focused on specific services, in particular OTC derivatives, Liquidity Management, and Institutional Cloud Mining via AltMiner, a cloud-based mining product for institutions and accredited investors to ‘rent’ digital asset miners.³¹⁹ In addition to newcomers, established investment banks may be in a position to enter this market and exploit their expertise in this new economic venue. Although this has not yet occurred, it may be a further development in the near future. Wall Street institutions reacted to Fintech by trying to absorb innovations in an attempt to avoid disruption. In an extremely lucrative business, like prime-

313. See MOORE, *supra* note 148, at 3.

314. ADRIAN & MANCINI-GRIFFOLI, *supra* note 310, at 5.

315. See Kai Sedgwick, *How Prime Brokerage Will Affect Crypto Markets*, BITCOIN.COM NEWS (Sept. 14, 2019, 10:45 AM), <https://news.bitcoin.com/how-prime-brokerage-will-affect-crypto-markets/> [<https://perma.cc/6GLQ-V8BB>].

316. Bertilorenzi, *supra* note 111, at 739–40.

317. *Prime Brokerage Services Are Coming to Crypto*, YAHOO FIN. (Sept. 16, 2019), <https://finance.yahoo.com/news/prime-brokerage-services-coming-crypto-134018657.html> [<https://perma.cc/SZ48-P4KW>].

318. Sedgwick, *supra* note 315.

319. ALTONOMY, <https://www.altonomy.com/#/> (last visited July 26, 2025) [<https://perma.cc/QR8G-HMUL>]; Danny Nelson, *Crypto Exchange Blockchain.com Acquires Altonomy's OTC Desk*, COINDESK, <https://www.coindesk.com/business/2022/03/21/crypto-exchange-blockchaincom-acquires-altonomys-otc-desk> (May 11, 2023, 11:08 AM) [<https://perma.cc/JLY7-EGFC>].

brokerage, there are significant incentives for these institutions to do the same again.

4. *Securitization and Tokenization*

Securitization is the process of issuing securities, creating a representation of real tradable assets.³²⁰ Securitization plays an important role in shadow banking, and although they proved a powerful financial tool, the financial crisis made clear the risks associated with this practice.³²¹ Home mortgages (including subprime loans), student loans, and credit card receivables are all common assets in a securitization transaction.³²² In a typical securitization, a financial institution (the originator) aggregates a pool of non-liquid assets and sells them to a special purpose vehicle (“SPV”).³²³ The SPV then sells interests in the stream of money from the pool and the interests may be structured as interests in the profits from the pool or as “asset-backed securities,” debt secured by the assets in the pool.³²⁴ The final stage consists of the SPV using the proceeds from the sale of interests in the pool, or ABS, to fund the initial purchase of the underlying pooled assets from the originator.³²⁵ As an economic function, securitizations make illiquid assets more liquid and tradable. Subprime mortgages are an example of illiquid assets, partitioned and spread to investors, without achieving a higher level of liquidity and attractiveness simply because they are partitioned among multiple investors.

The tokenization of assets is the process of issuing a blockchain token that is a digital representation of real tradable assets, with the same function of a security in a securitization.³²⁶ Although tokens have different functions (as the case of utility and payment tokens shows), ICOs and its multiple transformations, in particular STOs,³²⁷ illuminates the similarities between tokens and securities. Bitcoin and ICOs are both examples of assets synthetization with the digital representation or the tokenization of securities and assets, and DLT as infrastructural technology could potentially amplify the magnitude of the trading.³²⁸

The tokenization of assets provides greater liquidity in the context of private securities, or specific illiquid assets, such as fine art, and it strengthens their tradability in secondary markets. Furthermore, it is a faster and cheaper framework for transactions and it promises to be more transparent and inclusive, since

320. James Chen, *Securitization: Definition, Pros & Cons, Example*, INVESTOPEDIA, <https://www.investopedia.com/terms/s/securitization.asp> (June 14, 2024) [<https://perma.cc/NQ2A-TVTY>].

321. See FIN. CRISIS INQUIRY COMM’N, *supra* note 3, at 33.

322. See CHOI & PRITCHARD, *supra* note 253, at 156.

323. *Id.* at 156–57.

324. *Id.* at 157.

325. *Id.*

326. Patrick Laurent, Thibault Chollet, Michael Burke & Tobias Seers, *The Tokenization of Assets is Disrupting the Financial Industry. Are You Ready?*, DELOITTE (2018), <https://www.wyoleg.gov/InterimCommittee/2019/S3-20190506TokenizationArticle.pdf> [<https://perma.cc/G3QS-99NR>].

327. *Id.*

328. See Omarova, *supra* note 286, at 771–82.

it increases the opportunities to invest reduced amounts in assets generally precluded to a wide audience.³²⁹

At the moment there are no rules equating the mechanisms of securitizations and the one of tokenization and, therefore, there is a significant lack of clarity. A major regulatory advancement which could facilitate the tokenization of assets is the Token and Trustworthy Technology Service Providers Act adopted in Liechtenstein.³³⁰ The broad definition of token (referred to as a Token Container Model)³³¹ includes “a piece of information on a TT System which: 1. can represent claims or rights of memberships against a person, rights to property or other absolute or relative rights; and 2. is assigned to one or more TT identifiers.”³³² A major advantage is the possibility to use the token as a container in the sense that it has “the ability to hold rights of all kinds [and] can be loaded with a right that represents a real asset such as real estate, stocks, bonds, gold, access rights, money . . . [as well as being] empty, as in the case of digital code.”³³³ In this way, this approach offers the opportunity to clearly separate (i) the right and the asset from (ii) the token which is running on the blockchain, therefore differentiating law and technology.³³⁴

Switzerland is at the forefront of private projects in the area of tokenization.³³⁵ Three major initiatives for the tokenization of “digital assets” have taken place, under the impulse of SEBA,³³⁶ Sygnum’s Digital Asset Trading Facility,³³⁷ and Six Digital Exchange (in partnership with SBI).³³⁸

C. *The Risks Connected to Crypto-Derivatives*

Understanding potential developments of crypto-derivatives and looking at their growth as well as at a potential new network, Crypto Shadow Banking, also facilitates the identification of potential problems and regulatory solutions.

329. *Id.*

330. Liechtenstein Legal Gazette, Law of 03 October 2019 on Tokens and TT Service Providers, art. 2, let. c [hereinafter Token and Trustworthy Technology Service Providers Act].

331. Philipp Sandner, *Liechtenstein Blockchain Act: How Can Nearly Any Right and Therefore Any Asset Be Tokenized Based On the Token Container Model?*, MEDIUM (Oct. 7, 2019), <https://philippsandner.medium.com/liechtenstein-blockchain-act-how-can-nearly-any-right-and-therefore-any-asset-be-tokenized-based-389fc9f039b1> [https://perma.cc/6QQX-2QV6].

332. Token and Trustworthy Technology Service Providers Act, *supra* note 330.

333. Sandner, *supra* note 331.

334. *Id.*

335. Christian Gundiuc, *Swiss Digital Bank Tackles Asset Tokenization for Fully Compliant Institutions*, SECURITIES (July 16, 2020), <https://www.securities.io/swiss-digital-bank-tackles-asset-tokenization-for-fully-compliant-institutions/> [https://perma.cc/U4HL-8EGY].

336. *Id.*

337. *Sygnum’s Digital Asset Trading Facility (OTF) Gets Regulatory Clearance From FINMA*, SYGNUM (Sept. 1, 2020), <https://www.sygnum.com/news/sygnums-digital-asset-trading-facility-otf-gets-regulatory-clearance-from-finma/> [https://perma.cc/2ZXU-ELG9].

338. *SIX and SBI Digital Asset Holdings Announce Plans for Singapore-Based Joint Exchange Venture*, SDX (Dec. 8, 2020), <https://www.sdx.com/news/six-and-sbi-digital-asset-holdings-announce-plans-for-singapore-based-joint-exchange-venture/> [https://perma.cc/PAH4-U954].

1. *Excessive Leverage and Opacity*

The FTX crash in November 2022 demonstrated the risks for the crypto economy, emerging from leverage.³³⁹ FTX implemented aggressive margin trading strategies through its affiliate Alameda Research, generating uncontrolled levels of illiquidity.³⁴⁰ As mentioned for financial derivatives, specific financial products existed for the last two or three years. At the same time, traditional speculative actions such as short selling and margin trading are commonly executed. A massive use of leverage, however, is a novelty which emerged in the last few months.³⁴¹ While all the practices based on debt are by definition mechanisms aimed at exploiting a certain degree of leverage in financial markets, the new crypto-derivatives such as the perpetual swaps are the main cause of an increased leverage in the crypto economy.

After the 2008 financial crisis, regulators implemented a new framework to regulate derivatives, including OTC derivatives.³⁴² In key jurisdictions, regulation of clearing houses was a key pillar in increasing transparency and reducing systemic risk. This was achieved by strengthening risk management practices, monitoring transactions, and implementing netting by novation.³⁴³ For clearing houses to operate efficiently, the quality of collateral for derivatives must correspond to the level of liquidity. The more liquid the collateral is, the higher its quality.³⁴⁴ For example, cash, short term monetary instruments, and government bonds issued by reputable governments are all highly liquid.

In the context of the crypto economy, the problem for crypto-derivatives is the lack of regulation in the majority of systems, at the financial product and market infrastructure levels.³⁴⁵ Currently, the market for crypto-derivatives offers very limited fully regulated possibilities. One such possibility is the CME futures that was authorized by the Commodities Futures Trading Commission (“CFTC”).³⁴⁶ Other jurisdictions do not provide any restrictions nor allow any category of individual investors, without distinguishing between sophisticated and unsophisticated investors, the possibility to invest in perpetual swaps and have access to leveraged instruments up to 100 times the exposure (“100X”).³⁴⁷ This is possible due to a lack of harmonized regulation, which results in a lack

339. See COINGECKO, *supra* note 268, at 4.

340. Paige Tortorelli & Kate Rooney, *Sam Bankman-Fried’s Alameda Quietly Used FTX Customer Funds For Trading, Say Sources*, CNBC, <https://www.cnbc.com/2022/11/13/sam-bankman-frieds-alameda-quietly-used-ftx-customer-funds-without-raising-alarm-bells-say-sources.html> (Mar. 28, 2024, 4:22 PM) [<https://perma.cc/H7Z6-CCWE>].

341. *Id.*

342. Marco Dell’Erba & Giovanni Patti, *The Monte dei Paschi di Siena Affaire. Distressed Banks and The European Regulation on Short Selling*, 12 CAP. MARK. L.J. 510, 512 (2017).

343. See EURO. SEC. & MKTS. AUTH., FUNCTIONAL DEFINITION OF A CENTRAL COUNTERPARTY CLEARING HOUSE (CCP), https://www.esma.europa.eu/sites/default/files/EACH2_0.pdf [<https://perma.cc/MQ38-3377>].

344. See generally Yesha Yadav, *The Problematic Case of Clearinghouses in Complex Markets*, 101 GEO. L.J. 387 (2013); see also Jeremy C. Kress, *Credit Default Swaps, Clearinghouses, and Systemic Risk: Why Centralized Counterparties Must Have Access to Central Bank Liquidity*, 48 HARV. J. ON LEGIS. 49, 56–57 (2011).

345. MOORE, *supra* note 148, at 9.

346. *Id.* at 7.

347. *Id.* at 6.

of uniform rules for market infrastructures, especially for exchanges, which are free to offer any instrument they choose. Furthermore, the level of involvement of other market infrastructures, such as clearing houses, is highly uncertain. In the U.S., there are a few clearing houses operating in cryptocurrencies: Mint Exchange, Digital Asset Exchange,³⁴⁸ and Apex Crypto, owned by SEC-registered and FINRA member Apex Clearing.³⁴⁹ At this stage, it is challenging to predict what kind of market practices exist in this new market, and what might occur in the near future.

While cryptocurrencies and blockchain were often associated with transparency, the reality may be different and the technological advancements at the moment may be a step back and not a step forward, with respect to a higher level of compliance associated with transparency. An example of this complete opacity is the way exchanges in charge of offering derivatives on cryptocurrencies do not disclose the methodologies for fixing the target price.

2. *Liquidity Risks*

Liquidity is a fundamental attribute in a financial ecosystem. The recent collapse of Celsius, Voyager, and FTX demonstrated the problems related to liquidity risk.³⁵⁰ Celsius and Voyager suffered the exposure to the stablecoin UST affecting the liquidity of their loans, and FTX was exposed to the consequences of margin trading on very illiquid investments.

There are many potential sources of liquidity risk in the crypto economy. First, the quality of tokenized assets is a major issue. In a context where speculative trends dominate the scene, issuers (“tokenizers” one could say) may be tempted to tokenize any asset, even the most illiquid with the consequence that the market presence of illiquid assets would be likely to grow.³⁵¹ This practice could be much riskier than the one of a traditional securitization. The tokenization of assets may be cheaper than a traditional securitization because it would drastically cut the number of entities and service providers involved. A negative downside would be the presence of less gatekeepers in the process, thus increasing the risk of toxic assets entering the market. Furthermore, potential negative consequences of a tokenization in lieu of securitization to originate ABSs and CDOs may be even worse than the negative consequences experienced at the level of ICOs.³⁵² Different from the first wave of ICOs, the origination of structured crypto-products may be much more systemic, exactly as in the case of subprime mortgages in the financial crisis of 2008.

348. David Kariuki, *Another Cryptocurrency Clearinghouse Has Launched*, CRYPTOMORROW (Nov. 15, 2018), <https://www.cryptomorrow.com/2018/11/15/another-cryptocurrency-clearinghouse-has-launched/> [<https://perma.cc/39FK-DBUV>].

349. See Marie Huillet, *SEC-Registered Clearing House Brings Crypto Trading to 5 Million Clients*, COINTELEGRAPH (June 28, 2019), <https://cointelegraph.com/news/sec-registered-clearing-house-brings-crypto-trading-to-5-million-clients> [<https://perma.cc/73N5-PFA3>].

350. Dell’Erba, *supra* note 262, at 13–14.

351. See Ahmed, *supra* note 156, at 2.

352. PONCET & PORTAIT, *supra* note 89, at 1307.

Toxic assets are extremely problematic also in situations where they may be used as collateral, because of their inherent illiquidity.³⁵³ This is extremely important in two different contexts, crypto-derivatives as well as stablecoins. Collateral for derivatives is very important, and assumes the form of an “initial margin,” the one that has to be posted at the beginning, and the “variation margin,” the collateral that has to be posted on a daily basis, depending on the variations in the value of derivatives.³⁵⁴ This collateral has to be very liquid to reduce associated liquidity and counterparty risks and the role of clearing houses and their rules are extremely important to pursue this objective.³⁵⁵ There may be the risk that non-regulated market infrastructures accept highly illiquid collateral, contributing to increasing in systemic risk.

The FSB highlighted the liquidity risk in relation to the high concentration, that can be observable in the context of lending platforms and their liquidity providers.³⁵⁶ In the context of lending platforms, if demand for borrowing a crypto asset increases, the utilization rate (measuring how much of the liquidity for a particular crypto asset has been loaned out on each DeFi platform) for its liquidity pool increases accordingly.³⁵⁷ In a scenario where the utilization rate is particularly high, there could be problems related to redemptions, in a situation where multiple depositors would withdraw their assets at the same time. Because on average half of the deposits are provided by less than ten accounts, an idiosyncratic withdrawal of funds by any of those large depositors could significantly affect the platform’s liquidity.

3. *Technology-Related Risks*

Security of the networks—along with the reliability of smart-contracts and more generally DLT technology—are additional problems afflicting the technological space. This is particularly relevant for market infrastructures, such as crypto-exchanges, as well as clearing houses and financial institutions operating in the space, such as lending platforms.³⁵⁸ Generally speaking, any organization is exposed to the risks of bugs in the system or, for example, the mistakes of smart-contracts, which are in charge of managing funds and investment contracts and may generate mistakes they are virtually unable to correct. A further common problem is the one of cybersecurity and the inherent exposure to the attack of a hacker. In 2021, cyberattacks grew dramatically and generally involved compromised wallet key, fallacies in computer code, and scams directly perpetrated by developers.³⁵⁹

353. On the role of toxic assets in the financial crisis of 2008, see William Poole, *Causes and Consequences of the Financial Crisis of 2007-2009*, 33 HARV. J.L. & PUB. POL’Y 421, 431 (2010).

354. Cox & Steigerwald, *supra* note 52, at 8.

355. *See id.*

356. *See* JOSE ABAD ET AL., *supra* note 290, at 78.

357. *See id.*

358. *See id.* at 19–20, 82.

359. *See id.* at 79.

Cyberattacks generate significant losses, and could lead to the collapse of entire platforms.³⁶⁰ Beyond the loss generated by the theft, cyberattacks affect the reputation of platforms, which often suffer significant withdrawals by depositors who are concerned about their potential inability to redeem their deposits.³⁶¹ In light of this, cyberattacks would become especially relevant when the point of fragility is a financial conglomerate managing relevant amounts. In such a scenario, technological risks may become an especially strong cause of systemic risk, when compared to the traditional systems, due to the sector's total reliance on technology.

In April 2019, the trading platform Bitmex, which specializes in trading leveraged products in Bitcoin, experienced a problem with its derivative contracts.³⁶² A technical mistake led to automatic deleveraging, as a consequence of the increase in the price of Bitcoin, causing significant losses for investors.³⁶³ Similar problems have been seen in traditional finance, too. The 1987 Wall Street Crash, and later flash crashes, such as the one in May 2010, highlight the fragility of the financial system when it is coupled with technology.³⁶⁴ To mitigate these risks, the SEC introduced the so-called “circuit breakers,” as a way to break market volatility and limit shocks.³⁶⁵ In comparison with traditional finance, which is definitely more regulated, it would be much harder in the context of the non-regulated crypto economy to design similarly effective mechanisms.

Specific governance mechanisms may significantly affect the way new financial institutions work and the risks (even the financial ones) to which they are exposed.³⁶⁶ An example comes from on-chain lending with fully decentralized platforms, based on Proof of Stake (“PoS”) blockchain. A recent study has shown that in systems allowing on-chain lending, the security of the consensus is in danger even if all the agents are rational and do not want to purportedly boycott the consensus protocol.³⁶⁷ Therefore, the lack of governance mechanisms that are able to react to such conditions may prevent the emergence of trust in such lending platforms.

360. *Id.*

361. *Id.*

362. William Suberg, *BitMEX to Compensate Users Affected by Unforeseen Auto-Deleveraging After Bitcoin Bullrun*, COINTELEGRAPH (Apr. 4, 2019), <https://cointelegraph.com/news/bitmex-to-compensate-users-affected-by-unforeseen-auto-deleveraging-after-bitcoin-bullrun> [<https://perma.cc/2PPE-W4SZ>].

363. *Id.*

364. See FIN. CRISIS INQUIRY COMM'N, *supra* note 3, at xvii, 44.

365. *Investor Bulletin: Measures to Address Market Volatility*, SEC (July 1, 2012), <https://web.archive.org/web/20221213071526/https://www.sec.gov/oiea/investor-alerts-bulletins/investor-alerts-circuitbreakersbulletin> [<https://perma.cc/NVD7-STT2>]. On the role of circuit breakers in capital markets, see also Dell'Erba & Patti, *supra* note 342, at 516–17.

366. See, e.g., Tarun Chitra, *Competitive Equilibria Between Staking and On-Chain Lending*, ARXIV (Feb. 5, 2020), at 1, <https://arxiv.org/pdf/2001.00919> [<https://perma.cc/ZSK6-CXRR>].

367. See *id.* at 17.

V. REGULATORY MEASURES TO BUILD A STABLE CRYPTO-ECOSYSTEM

Regulators should address certain concerns with adequate ex-ante measures, reconsider past experiences, and reassess their ex-post reactions as a starting point from which to re-adapt existing strategies to this nascent paradigm.

A. Market Infrastructures

The regulation of market infrastructures remains an unsolved, key pillar. The levels of opacity surrounding market infrastructures in the crypto economy are worse when compared to the ones in traditional financial markets. In traditional financial markets, exchanges such as the New York Stock Exchange (“NYSE”), the London Stock Exchange (“LSE”), the Swiss Stock Exchange (“SIX”), the Chicago Mercantile Exchange (“CME”), are reputed and established institutions.³⁶⁸ They are also self-regulatory organizations whose market practices are a successful example of “private” self-regulation.³⁶⁹ In the post-crisis reforms, regulators intervened at the level of clearing houses, to increase the levels of transparency in the post-trading phases, thereby reducing systemic risk.³⁷⁰

In the context of the crypto economy, the situation is more complex because a lack of regulation and transparency affects both the trading and post-trading phases.³⁷¹ Opacity in market infrastructures displays its negative consequences at the derivatives contracts level, the main source of leverage in the crypto economy. While the CME offers a regulated framework for investing in crypto-derivatives, key exchanges remain rather opaque. The uncertainty surrounding the regulation of exchanges remains the main source for such uncertainty. The example of BitMex and its aggressive innovative strategies in creating and offering new products and a leverage up to 100X makes clear the potential behind these risks. In these circumstances, it would be important to consider the possibility of establishing healthy market discipline, with some form of public intervention, which is necessary to address regulatory arbitrage and favor the establishment of reputed institutions.

American, European, and Swiss regulators are trying to bring more certainty in this context. In Switzerland, the recent Federal Act on the Adaptation of Federal Law to Developments in Distributed Ledger Technology (“DLT Law”) attempts to solve some of the issues related to new market infrastructures.³⁷² Under the DLT Law, DLT trading systems are subject to most of the requirements provided for traditional trading facilities.³⁷³ According to Article

368. See González, *supra* note 122, at 99; Yadav, *supra* note 344, at 389.

369. See Yadav, *supra* note 344, at 409 n.94.

370. See González, *supra* note 122, at 104, 107.

371. See MOORE, *supra* note 148, at 3.

372. Jean-Claude Spillmann & Cecilia Peregrina, *Swiss DLT Law: New Regulations Bring New Opportunities*, PwC, <https://www.pwc.ch/en/insights/regulation/swiss-dlt-new-regulations.html> (last visited July 26, 2025) [<https://perma.cc/64E7-6XHA>].

373. *Id.*

73a of the FMIA, a DLT trading facility is a facility for multilateral trading of DLT securities, which aims to simultaneously exchange offers between multiple participants and conclude contracts implementing non-discretionary rules.³⁷⁴ In Europe, the recently approved Market in Crypto-Assets Regulation (“MiCA”) brought further clarity, especially in terms of conflicts of interest mitigation, but it is still far from being enforced.³⁷⁵

In the U.S., the proposed Digital Commodity Exchange Act (“DCEA”) intended to create a “single, opt-in national regulatory framework for digital commodity trading platforms” that will be regulated by the U.S. Commodity Futures Trading Commission (“CFTC”).³⁷⁶ Under the DCEA, “digital commodity” means any form of fungible intangible personal property that can be exclusively possessed and transferred person to person without necessary reliance on an intermediary, and which does not represent a financial interest in a company, partnership, or investment vehicle.³⁷⁷

B. *Crypto-Financial Products*

Offering a more regulated framework is fundamental to controlling unintended risks and establishing sustainable market practices that support the development of the crypto economy. Achievement of this objective would require an increased ability to attract investors that are not exclusively interested in speculative maneuvers, since they may need to recur to derivatives and leverage for hedging purposes. This is especially important in situations of extreme volatility, as well as in times of stable undervaluation of the crypto-assets. In the instance of extreme volatility, speculative movements in crypto-derivatives amplify risks because of high financial leverage. And, in the instance of speculative investors, cryptocurrencies cannot, *per se*, sustain massive investments in crypto-derivatives, which boosts the speculative investor’s high return.

Currently, regulation appears to be highly fragmented, which poses a significant challenge in the context of crypto-derivatives due to their global scope. The absence of standardized market practices in this area—for example, regarding derivatives pricing—further complicates the regulatory landscape. Adopting convergent regulatory approaches and encouraging the development of appropriate market practices is essential for achieving stability and consistency in this evolving market.

374. DLT trading facilities shall meet at least one of the following requirements: “(i) admission of legal entities other than supervised financial institutions or private clients as participants; (ii) provision of central custody of DLT securities based on uniform rules and procedures; or (iii) provision of clearing and settlement for transactions in DLT securities based on uniform rules and procedures.” See Silvan Thoma, *Switzerland Strengthens Fintech and Blockchain Sector*, PwC (Sept. 15, 2020), <https://www.pwc.ch/en/insights/fs/amending-act-DLT-blockchain.html> [<https://perma.cc/6NZC-EMYD>] (emphasis added).

375. See Dell’Erba, *supra* note 262, at 12.

376. MARCO DELL’ERBA, *TECHNOLOGY IN FINANCIAL MARKETS: COMPLEX CHANGE AND DISRUPTION* 148–49 (2024).

377. *Id.* at 149.

C. Financial Conglomerates

Another potential issue is the one of financial conglomerates. The problem of “too-big-to-fail” (“TBTF”) and entities that are “too interconnected” have emerged in the history of capitalism, and most of them are strictly related to the shadow banking networks.³⁷⁸ TBTF entities typically encompass credit institutions that have adopted “universal” banking in both the U.S. and the EU by providing a broad range of services.³⁷⁹ They also maintain ties with investment funds as well as significant interests in their proprietary trading activities. But the vast majority of TBTF entities encompasses broker dealers, insurance companies, government sponsored enterprises and hedge funds.³⁸⁰ Credit and financial institutions were often interconnected, and in the aftermath of the financial crisis of 2008, measures like the Volcker Rule intended to break this interconnection and halt any conflicts of interest among banks that invest in investment funds’ proprietary trading.³⁸¹ As vastly analyzed by academic and policy works, derivatives contributed to foster high levels of interconnectedness.

Although the concept of decentralization is often associated with DLT, specific trends prove that concentration affects the crypto economy at various levels.³⁸² For example, mining pools are geographically concentrated and they are themselves intermediaries.³⁸³ So far, the crypto economy has favored the establishment of new intermediaries and market infrastructures. Crypto-derivatives mimic this concentration, at least looking at market infrastructures offering them. And on par with this trend, even Crypto Shadow Banking may lead to the faster creation of new financial conglomerates when compared to traditional finance. Tech-giants became dominant in a very short time: Google and Facebook were created in 1998 and in 2004, respectively.³⁸⁴ Foundational technologies like the Internet, in the past, and DLT, nowadays, contribute to the accelerated key changes in the capitalistic framework.

New financial conglomerates may be created in different ways, involving first movers and/or tech-giants. In the case of first movers investing in a broad range of activities in the context of the crypto economy, who may enjoy the benefits of developing relevant activities on a global scale. These activities might include managing a global stablecoin, running a systemically important trading

378. See, e.g., Yesha Yadav, *Too-Big-to-Fail Shareholders*, 103 MINN. L. REV. 587, 650, 654 (2018).

379. *Id.* at 604.

380. See NOURIEL ROUBINI & STEPHEN MIHM, *CRISIS ECONOMICS: A CRASH COURSE IN THE FUTURE OF FINANCE* 223–30 (2010).

381. See Charles K. Whitehead, *The Volcker Rule and Evolving Financial Markets*, 1 HARV. BUS. L. REV. 39, 68 (2011).

382. See, e.g., DELL’ERBA, *supra* note 376, at 81, 108.

383. This is a theory in a work in progress by Angela Walch, *Intermediaries Who Must Not Be Named? A Legal & Policy Research Agenda for Crypto Miners*. For a video presentation on the theory, see Simons Institute, *Blockchain Intermediation*, YOUTUBE (Nov. 21, 2019), <https://www.youtube.com/watch?v=jywZcWoinVU> [<https://perma.cc/863G-XUEG>].

384. *Behind the Screens: The Origins of the Giants Google, YouTube, Facebook, Instagram, and X*, AMPLITUDO (June 21, 2024), <https://amplitudo.me/blog/behind-the-screens-the-origins-of-the-giants-google-youtube-facebook-instagram-and-x> [<https://perma.cc/YR2N-A7DN>].

platform, and being engaged in leveraged activities and the offer of leveraged products as crypto-derivatives, which will likely become systemically relevant. This situation would require an ex-ante consideration and measures designed to prevent well known problems, leading regulators to adopt a “Volcker Rule” style. This kind of regulatory intervention is part of what is commonly referred to as “structural regulation,” consisting of measures for which the rationale is to preserve financial stability (especially in the banking sector) by limiting the range of activities that a credit institution can carry out.³⁸⁵

Another possibility is that tech-giants may enter the financial and banking industry, become systemically important financial institutions, and exploit loopholes because of the power of their existing networks. This requires a closer look at their corporate governance, a closer monitoring of the different types of financial operations and their implementation, coupled with an extension of specific banking regulations, such as capital requirements and liquidity measures, especially when engaged with leveraged products as crypto-derivatives.

D. Facing Technological Risks

When approaching network security and cybersecurity, regulators have to take into account the emerging relevance of TechRisk, a new form of risk related to the great digitization of the financial economy.³⁸⁶ Regulators should approach TechRisk implications at different levels, from a corporate-governance perspective and the broader angle of financial risks, and financial stability, especially when such risk is associated with SIFIs.³⁸⁷ The European Digital Operational Resiliency Act goes in the direction of strengthening the resilience of regulated financial institutions against cybersecurity risks.

To enhance the reliability of the technology and encourage its resilient development, another possibility would be to design new stress tests in order to create strategies that efficiently react to mistakes generated in the context of unstoppable smart contracts, which might be especially problematic when dealing with crypto-derivatives, or attacks of a great relevance targeting systemic institutions. Stress tests are a common practice when assessing the resilience of credit institutions and measuring their resistance to financial shocks.³⁸⁸ Although different in nature, technological risks are also highly unpredictable. The novelty of specific technologies, such as DLT and clouding, makes outcomes unpredictable.

In the context of crypto-derivatives and Crypto Shadow Banking more generally, there is no basis for concretely elaborating specific stress tests capable of assessing potential situations of emergency. In such a scenario, regulators should attempt to have a clearer picture of the characteristics and the volume of specific

385. See JOHN ARMOUR ET AL., PRINCIPLES OF FINANCIAL REGULATION 505–07 (2016).

386. See Ross P. Buckley, Douglas W. Amer, Dirk A. Zetsche & Eriks Selga, *The Dark Side of Digital Financial Transformation: The New Risks of FinTech and the Rise of TechRisk* (Univ. of Hong Kong, L. Working Paper Series, Paper No. 2019-009, 2019), <https://ssrn.com/abstract=3478640> [<https://perma.cc/ZM8N-Y3BN>].

387. *Id.* § III.A.

388. See Cox & Steigerwald, *supra* note 52, at 15.

activities and to try to interact even more intensively with the industry. To achieve stronger regulations, however, policy makers must first understand the interaction among specific actors, in particular trading platforms, crypto-lending platforms, and OTC desks. All of these institutions remain outside the radars of regulators, making it harder to understand the way the technological and financial practices are actually developing. These steps are fundamental to the identification of potential strategies in order to mitigate systemically risky future events and attempt to design a new sort of stress test. The role of regulators in this field is essential because the private sector likely lacks adequate incentives.

VI. CONCLUSION

This Article has explored the crypto-derivatives market, providing a qualitative and quantitative analysis of this emerging segment. The current developments suggest that the crypto-derivative market is not more sophisticated than traditional finance, and the most well-known and widely used structures are perpetuals, which do not exhibit any degree of sophistication. Simultaneously, potential developments in the market could lead to significant changes, bringing with them well-known risks that regulators are positioned to mitigate and anticipate. Crypto-derivatives could act as a catalyst for the development of a new network—Crypto Shadow Banking—that would mimic existing structures and risks in traditional finance. Despite being overall less leveraged than traditional finance in absolute terms, the crypto economy is an environment where leverage and its connected risks have the potential to develop in the coming years, requiring regulators to take actions to at least monitor those trends.

CoinCatch	Centralized	https://www.coincatch.com/en	No	No	Yes - multiple coins - USDT margin and settlement	No	Yes	No	No	No	isolated; cross
ComFgg	Centralized	https://www.comfgg.fiat/	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	N/A
Coinfx	Centralized	https://www.coinfx.com/en/	No	No	Yes- multiple coins: USDT, USDC margin and settlement	Yes- BTC, ETH	No	No	No	No	isolated; cross
CoinFLX	Centralized	shut down	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
CoinTiger	Centralized	https://www.cointiger.com/en-us/#/index	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins - underlying coin margin & settlement	No	No	No	No	isolated; cross
CoinTR Pro	Centralized	https://www.cointr.pro/en-us	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated (here "fixed"); cross
CoinW	Centralized	https://www.coinw.com/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross (https://coinw.zenode.com/hi/en-us/articles/36004037953-Perpetual-Contract-FAQ); smart cross margin for all futures
Crypto.com	Centralized	https://crypto.com/exchange	Yes - BTC, ETH - USD (fiat) settlement. List of stablecoins and tokens that can be used for margin	Yes - BTC, ETH - USD (fiat) settlement. List of stablecoins and tokens that can be used for margin	Yes - multiple coins - USD (fiat) settlement. List of stablecoins and tokens that can be used for margin	Yes - multiple coins - USD (fiat) settlement. List of stablecoins and tokens that can be used for margin	No	No	No	No	smart cross margin for all futures
C-Trade	Centralized	site inaccessible	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Despoin	Centralized	https://www.despoin.com/	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	isolated; cross
Delta Exchange	Centralized	https://www.delta.exchange/	No	No	Yes - multiple coins - margin and settlement	Yes - BTC, ETH	No	Yes - BTC, ETH - USDT margin and settlement	No	No	isolated; cross; portfolio
Demex	Decentralized	https://dem.exchange/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
Deri Protocol	Decentralized	https://deri.io/#/index	No	No	Yes - BTC, ETH - Multiple stablecoins and tokens that can be used for margin. USD settlement	Yes, as ETH derivatives can be collateralized using ETH. This is not true for BTC derivatives. USD settlement.	No	Yes - BTC, ETH - Multiple stablecoins and tokens that can be used for margin. USD settlement	Yes, as ETH derivatives can be collateralized using ETH. This is not true for BTC derivatives. USD settlement.	- Everlasting options (i.e. perpetual options) (see https://docs.deriproto.io/library/academy/everlasting-options-introducing-overlasting-options) - power perpetuals	Isolated; cross
Deribit	Centralized	https://www.deribit.com/	No	Yes - BTC, ETH	Yes - multiple coins - USDC margin and settlement	Yes - multiple coins	No	No	Yes - BTC, ETH, SOL	1) Deribit BTC volatility index (DVOI) listed, linear future	isolated (here "standard"); cross (here "portfolio")
DigiFinex	Centralized	https://www.digifinex.com/en-us/?t=1693495840	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	isolated; cross
Dopex	Decentralized	https://www.dopex.io/	No	No	No	No	No	Yes- multiple coins- margin and settlement in underlying crypto (calls) or stablecoin (puts)	Yes- multiple coins- can be inverse, depending on the contract	No	cross
Drift Protocol	Decentralized	https://www.drift.trade/	No	No	Yes - multiple coins - USDC settlement. List of stablecoins and tokens that can be used for margin	Yes - multiple coins - USDC settlement. List of stablecoins and tokens that can be used for margin	No	No	No	No	isolated; cross (USDC and SOL)
DueDEX	Centralized	website shut down	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
dYdX	Decentralized	https://dydx.exchange/	No	No	Yes - multiple coins - USDC margin and settlement	No	No	No	No	No	isolated; cross; portfolio
Fairdesk	Centralized	https://www.fairdesk.com/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
FamEX	Centralized	https://www.famex.com/en-US	No	No	Yes - multiple coins - USDT and USDC margin and settlement	No	No	Yes - multiple coins - USDT margin and premium	No	No	isolated; cross
Flipster	Centralized	https://flipster.xyz/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross

Mango Markets	Decentralized	https://mango.markets/	No	No	Yes - multiple coins - Margin in various stablecoins of cryptocurrencies - All deposited assets are considered collateral. Settlement in USDC.	Yes - multiple coins - Margin in various stablecoins of cryptocurrencies - All deposited assets are considered collateral. Settlement in USDC.	No	No	No	No	cross-margin/multi-collateral
MCDEX (Arbitrum) exchange	Decentralized	see MUX	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MCS exchange	Centralized	exchange closed	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
MEXC	Centralized	https://www.mexc.com/futures	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	isolated; cross
Mufex	Decentralized	https://www.mufex.finance	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
MUX protocol (then MCDEX)	Decentralized	https://mux.network/	No	No	Yes - multiple coins - margin: a list of stablecoins and cryptocurrencies - Settlement in the underlying	Yes - multiple coins - margin: a list of stablecoins and cryptocurrencies - Settlement in the underlying	No	No	No	N/A	N/A
OKX	Centralized	https://www.okx.com/	Yes - multiple coins - USDT, USDC margin and settlement	Yes - multiple coins	Yes - multiple coins - USDT, USDC margin and settlement	Yes - multiple coins	No	Yes - BTC, ETH - margin and settlement in the underlying coins. USDT in Pro Mode	Yes	No	Isolated; cross (single and multi-currency); portfolio
Opnx	Centralized	https://opnx.com	No	No	Yes - multiple coins - Multiple stablecoins and tokens than can be used for margin. Settlement is paid out in oUSD (platform's stablecoin pegged to USD)	Yes - multiple coins - Multiple stablecoins and tokens than can be used for margin. Settlement is paid out in oUSD (platform's stablecoin pegged to USD)	Yes	No	No	1) Repos; 2) Technically, Opnx perpetuals are "quants"	universal (similar to cross); portfolio (similar to isolated)
OrangeX	Centralized	https://www.orangex.com/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
Levana	Centralized	https://www.levana.finance/	No	No	Yes - multiple coins - USD and USDC margin and settlement	No	No	No	No	No	N/A
Paradex	Decentralized	https://www.paradex.trade/	No	No	Yes - multiple coins - USDC margin and settlement. USD quote.	No	No	No	No	No	cross
Perpetual Protocol	Decentralized	https://perp.com/	No	No	Yes - multiple coins - USDC margin and settlement. Other currencies can be deposited as collateral, they are weighted and converted into USDC.	No	No	No	No	No	Isolated; cross
Phemex	Centralized	https://phemex.com/	No	No	Yes - multiple coins - USDT, USD margin and settlement	Yes - BTC, ETH	No	No	No	No	Isolated; cross
Pionex	Centralized	https://www.pionex.com/en/	No	No	Yes - multiple coins - USDT margin and settlement	No	Yes - Quanto perpetual	No	No	Leveraged tokens	isolated; cross
Poloniex	Centralized	https://poloniex.com/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
Powertrade	Centralized	https://powertrade/	N/A	N/A	Yes - BTC, ETH - Multiple stablecoins and tokens than can be used for margin. USD denominated	Yes - BTC, ETH - Multiple stablecoins and tokens than can be used for margin. USD denominated	No	No	Yes - BTC, ETH	No	Portfolio margin using SPAN (Standard Portfolio Analysis of Risk)
Prime XBT	Centralized	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Quickswap	Decentralized	https://perps.quickswap.exchange	No	No	Yes - multiple coins - USD value or USDC margin and settlement.	Yes - However, it depends on accepted collateral and selected settlement currency.	No	No	No	No	N/A

RabbitX	Decentralized	https://rabbits.io/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	cross
Stormgain	Centralized/ Decentralized	https://stormgain.com/	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins (BTC and DOGE mks) -- - quotes	No	Yes - BTC, ETH - USDT margin and settlement	No	Tokenized commodities (Gold and Silver)	cross
SynFutures	Decentralized	https://www.synfutures.com/	No	No	Yes - Multiple stablecoins and tokens than can be used for margin. Settlement in sUSD (platform's stablecoin)	Yes - multiple coins - Multiple stablecoins and tokens than can be used for margin. Settlement is paid out in the same currency used for margin.	No	No	No	NFT-based perpetual futures (Leverage 3x, SAMM)	shared margin
Tapbit	Centralized	https://www.tapbit.com/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	Forex contracts for difference (CFD) settled in USDT https://tapbitex.zendesk.com/hc/en-us/articles/9280026363289-Forex-Guide	isolated; cross
Toobit	Centralized	https://www.toobit.com/en-US/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated; cross
Valr	Centralized	https://www.valr.com/	No	No	Yes - BTC, ZAR, USD - USDT or ZAR margin and settlement (depending on the pair's quote currency)	Yes - depending on the currency (e.g. BTC/ZAR, if collateralized in ZAR is an inverse perpetual)	No	No	No	No	isolated; cross
Weex	Centralized	https://www.weex.com/	No	No	Yes - multiple coins - USDT margin and settlement	Yes - BTC, ETH	No	No	No	No	isolated; cross
WhiteBIT	Centralized	https://whitebit.com/futures	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	cross
WOOF Pro	Decentralized	https://dex.woo.org/en/trade/ETH_PERP	No	No	Yes- multiple coins - USDC margin and settlement.	N/A	No	No	No	No	N/A
WOO X	Centralized	https://x.woo.org/	No	No	Yes - multiple coins - USDT settlement. List of stablecoins and tokens than can be used for margin	N/A	No	No	No	No	N/A
XT.COM	Centralized	https://www.xt.com/en/	Yes - BTC, ETH - USDT margin and settlement	Yes - multiple coins	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	isolated; cross
ZB	Centralized	https://www.zb.com/en/	No	No	Yes - multiple coins - USDT margin and settlement	No	No	No	No	No	isolated
ZBG Futures	site down	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zoomex	Centralized/ Decentralized	https://www.zoomex.com/en/	No	No	Yes - multiple coins - USDT margin and settlement	Yes - multiple coins	No	No	No	No	isolated; cross

TABLE 2: LIQUID STAKING

	Name	TVL (USD)
1	Lido	\$21.76b
2	Rocket Pool	\$2.86b
3	Binance	\$1.816b
4	Mantle	\$778.35m
5	Frax Ether	\$731.7m
6	Jito	\$720.3m
7	StakeStone	\$667.98m
8	Marinade	\$648.25m
9	Coinbase	\$467.82m
10	Swell	\$448.12m
11	Stader	\$385.29m
12	Benqi Staked Avax	\$262.03m
13	BlazeStake	\$249.53m
14	StakeWise	\$236.52m
15	GLIF	\$137.14m
16	Stride	\$88.71m
17	Hatom	\$83.21m
18	Folks Finance	\$74.94m
19	Ankr	\$71.58m
20	Liquid Collective	\$70.61m
21	Bifrost	\$70.48m
22	JPool	\$66.15m
23	LiNEAR	\$61.85m
24	Meta Pool	\$56.09m
25	marginfi LST	\$54.04m
26	Tonstakers	\$49.06m
27	Kava Liquid	\$43.82m
28	Synclub	\$43.08m
29	MilkyWay Zone	\$42.95m
30	STFIL	\$42.1m
31	diva	\$40.83m
32	TruFin Protocol	\$40.2m
33	Amnis Finance	\$38.04m
34	Algem	\$36.47m
35	Acala	\$34.17m
36	Hydro Protocol	\$34.04m
37	Thala LSD	\$33.03m
38	NodeDAO	\$31.63m
39	stake.link	\$30m
40	Acala LCDOT	\$23.22m
41	MEV Protocol	\$22.63m
42	StackingDAO	\$22.33m
43	NeoBurger	\$20.16m

44	KLAYstation	\$19.2m
45	Eris Protocol	\$18.48m
46	Volo	\$16.9m
47	GETH	\$15.63m
48	Aftermath	\$15.39m
49	Soceat	\$15.29m
50	Bemo	\$15.72m

