

Integrating Financial Engineering and FinTech in the Design and Evaluation of Crypto Asset Instruments – A Case Study of the Binance Platform

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المخلص

تهدف هذه الدراسة إلى تحليل مستوى التكامل بين الهندسة المالية والتكنولوجيا المالية (FinTech) في تصميم وتقييم أدوات الأصول المشفرة، من خلال دراسة حالة منصة Binance اعتمدت الدراسة على المنهج الوصفي التحليلي، باستخدام تحليل بيانات سوقية مستخرجة من منصة Binance خلال الفترة 2023–2025، كعينة تمثيلية لحركة الأصول المشفرة، كما تم استخدام أدوات تحليل فني وسلوكي لتقييم الأداء المالي والمخاطر، توصلت الدراسة إلى أن التكامل بين التكنولوجيا المالية والهندسة المالية يمثل شرطاً أساسياً لتحسين كفاءة الأدوات المالية الرقمية وتوسيع نطاق استخدامها، خصوصاً في ظل تنامي حجم الأصول المشفرة.

الكلمات المفتاحية:

الهندسة المالية، التكنولوجيا المالية، الأصول المشفرة، منصة بينانس.

Abstract:

The research examines how financial engineering interacts with FinTech for cryptocurrency instrument design and assessment through Binance platform analysis. The research employs a descriptive-analytical method by analyzing Binance market data from 2023 through 2025 to represent cryptocurrency asset market behavior. Financial performance along with associated risks were evaluated through technical and behavioral analysis tools. The research demonstrates that combining FinTech with financial engineering is crucial to enhance digital financial instrument efficiency and broaden their adoption as cryptocurrency assets expand.

Keywords: Financial Engineering, Financial Technology, Cryptocurrency Assets, Binance Platform.

JEL Classification Codes : G11; G23; C58; O33.

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1. INTRODUCTION

The financial technology sector has introduced a new innovative tool which aims to enhance financial literacy while reaching out to unbanked populations and adapting to digital financial sector changes. The new financial engineering tool takes the form of crypto-asset products which merge human and artificial intelligence components in their design. These instruments serve as major wealth-generating assets and function as direct investment drivers between domestic and international markets without requiring third-party intermediaries. The advanced nature of these instruments has attracted substantial academic interest which demands mathematical-statistical forecasting combined with sophisticated algorithmic programming for their proper analysis.

The new financial reality requires fundamental theoretical and practical structure which researchers need to develop together with financial system stakeholders. Such collaboration between researchers and financial system stakeholders helps identify and regulate these tools while developing standardized frameworks which minimize their associated risks. The design and evaluation of financial derivatives based on crypto-assets requires special attention. The trading environment of digital platforms including Binance requires deep understanding of technological and financial innovation connections to address their intertwined challenges and opportunities.

Serious questions about this unavoidable change demand active participation from people since globalization has intensified these effects. The global financial system now functions as an integrated whole which makes it susceptible to changes in geopolitical and geo-economic and geo-financial domains as well as technological companies which distribute their products through single-click international operations.

Through these various transformations in the financial system, this study seeks to address the following issue:

What are the dimensions of the relationship between financial engineering and fintech in the innovation and valuation of crypto-asset instruments? (With a case study of the Binance platform).

Study Hypothesis

This research argues that the interaction between financial engineering and fintech enables the creation of new structures by applying mathematical theories and statistical models. This approach aims to evaluate the performance and pricing of crypto-assets in digital and virtual financial markets, expand their trading, take advantage of available opportunities, and manage associated risks.

Study Significance

The importance of this study lies in the novelty of its subject and its multidisciplinary approach, combining fintech and financial engineering. Its practical

relevance is reinforced by the analysis of one of the largest global crypto-asset trading platforms, which deepens understanding of the realities and challenges facing digital markets. The study also helps bridge a research gap in the literature on the integration of financial engineering with fintech outputs in the digital environment.

Study Objectives

- To review and analyze the theoretical frameworks of both fintech and financial engineering in the context of developing new and innovative financial instruments.
- To highlight the distinctive characteristics of digital crypto-assets and their related financial derivatives.
- To explore the strengths and weaknesses of the integration between fintech and financial engineering within digital market environments.
- To present findings and recommendations that enhance the understanding of crypto-asset instruments.

Study Methodology

This study uses a descriptive-analytical approach to examine concepts related to crypto-assets, with particular focus on digital derivatives. It also adopts a case study methodology by applying the analysis to the Binance platform as a practical model for evaluating the relationship between financial technology and financial engineering in the design and trading of crypto-asset instruments.

Data were collected from publicly available statistical sources provided by crypto-asset platforms that offer this information free of charge, along with live trading data accessible on the Binance platform. This approach aims to provide a comprehensive understanding of the technical and functional aspects of the digital financial instruments used on the platform.

2. Overview of Digital Transformation in the Financial Sector:

Modern financial systems require technological advancements to enhance their competitive edge and sustainability because of rapid technological and business transformations. Digital breakthroughs now serve as a foundation for modernizing financial systems and improving operational efficiency. The financial sector has transformed into a prime location for innovation where new solutions bridge supply-demand gaps to fulfill expanding customer requirements. The Fourth Industrial Revolution technologies including artificial intelligence and cloud computing together with financial process automation enable these advancements.

The financial management systems along with banking administration have gained from precise data quality and reduced error impact as well as enhanced customer satisfaction. Financial engineering plays a fundamental role in this transformation by developing systems that let financial technology tackle existing system limitations. The system enables comprehensive factor integration which helps restructure financial

models while cutting expenses and maximizing time efficiency to combat worldwide financial crisis effects.

2.1 The Future of Financial Services: Between Fintech and Financial Engineering

The continuous and cyclical nature of the financial and investment environment requires ongoing adaptation through the development of innovative tools and products. These innovations aim to reduce escalating, compounding costs and mitigate risks caused by imbalances in financial markets, thereby maximizing returns (Rashwan & Rahma, 2018). Such returns are pursued by investor-shareholders who allocate financial surpluses to cover deficits resulting from rising demand for financing by members struggling to meet budget shortfalls and sustain their activities within and beyond the financial market (Qandoz, 2021).

However, the current situation does not meet these needs or adapt effectively to the accelerating dynamics, which have created a form of creative disruption. This disruption has led to reliance on financial engineering outputs to bridge the gap between supply and demand for existing products. This is done by processing and integrating generated data into raw databases and applying advanced mathematical and statistical methods to develop financial products that restore balance and return markets to normal, stable conditions.

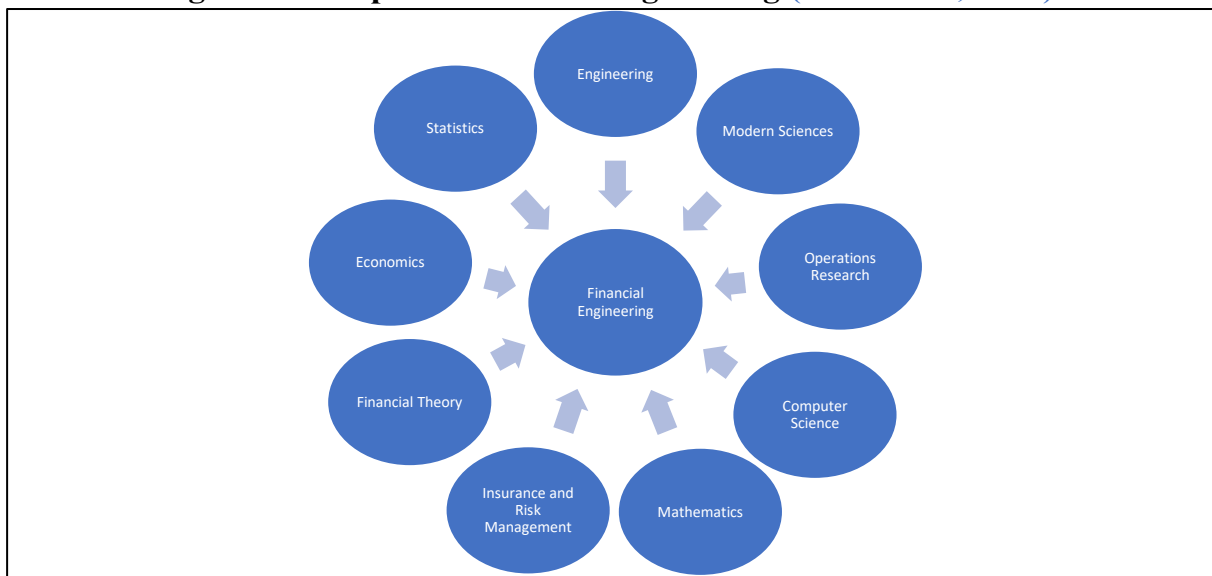
Furthermore, the search for alternatives, driven by the outcomes of the Fourth Industrial Revolution—which has accelerated the integration of technology into the financial system and the application of key financial engineering principles (see Figure 1)—has led to new practices. These practices aim to meet current needs by promoting financial inclusion on one hand and harnessing the skills of the algorithm generation on the other. Among the factors accelerating this transformation are:

The integration of algorithms delivered a complete transformation to the financial system by disturbing conventional monetary frameworks. The transformation depended on financial engineering as the fundamental driver to develop novel financial products and services which financial system participants had never encountered before. The substantial financial transaction data volumes allowed new possibilities to emerge.

The current situation shows that the market demand is growing quickly, but there isn't enough supply to meet it. This is because customers want modern products, but the financial markets are going through big changes. To meet customer demand and make a good profit, the market needs a product delivery system that works well, is completely open, and is easy to use.

People use data in ways that don't make sense, which leads to security problems and problems with following the rules. This has made data misuse a major privacy issue. At the crossroads of financial technology and financial engineering, new conceptual frameworks must be embraced to enhance comprehension of these matters and establish legal structures for secure technology utilization.

Figure 01: Scope of Financial Engineering (Babarinde, 2020):



The fast-paced advancements in nanotechnology and the efforts to integrate the financial system have made it clear how financial technology and financial engineering can work together to make smart solutions. Companies that make financial technology use advanced quantitative models and tools to help people make the best financial decisions about managing their personal risk and optimizing their investment portfolios. The use of new technologies in the integration of all parts of the financial system allows financial engineering to create more uses and make operations run more smoothly.

The changing financial landscape increases system effectiveness and adaptability toward digital demands by establishing a framework that leads to new innovative financial service designs.

Financial technology and financial engineering function as connected disciplines which maintain separate areas of specialization and academic investigation. The fields utilize their distinct depths and methodologies to address intricate situations while controlling potential risks through their unique strategic approaches. The two fields exhibit both matching characteristics and unique differences as well as multiple shared elements which include the following:

2.1.1 Similarities between Financial Technology and Financial Engineering:

- Financial institutions share the goal to regularly modify and reorganize their financial offerings for better modern standards and cost-efficient access to consumers and contemporary financial systems.
- Both organizations utilize artificial intelligence and big data analytics along with blockchain technology to build modern financial solutions.
- Both organizations work on developing new financial products and services which respond to the changing requirements of present-day market participants.

2.1.2 Differences Between Fintech and Financial Engineering

Area of Focus:

- Fintech companies make digital financial products and services, and making them easy to use is a top priority.
- Financial engineering uses math and quantitative models to look at financial systems and find ways to make them work better.

Methodology:

- Fintech's "customer-first" approach lets them improve and simplify financial services through their work.
- Financial engineering uses a systematic scientific approach to look at markets and predict risks.

Tools Utilized:

- Fintech uses technology like AI and blockchain to come up with new ways to solve problems.
- Financial engineering uses math models, algorithms, and computer simulations to look at and improve financial systems.

Practical Objectives:

- Fintech aims to increase the flexibility, speed, and ease of financial services.
- Financial engineering seeks to control risks, enhance returns, and improve market efficiency.

2.2 The Context Behind the Expansion of the Financial Environment

The integration of financial engineering and fintech has led to the emergence of multidisciplinary fields, adding new dimensions to the domain. As a result, applying this integration in crypto-asset financial markets has created opportunities for developers and innovators to take advantage of the prevailing openness. This allows for adapting the current systems that govern structured products, risk management, reinsurance companies, financing mechanisms, market operations, banks, auditing firms, investment entities, consulting firms, and others (Babarinde, 2020). The goal is to transform these products through algorithms into digitally and virtually tradable assets that generate added value and tap into alternative opportunities presented by this new reality.

Among the key factors that have driven these transformations are the following (Masoudi & Ayach, 2021):

- The failure of the Bretton Woods system and the collapse of the fixed exchange rate regime, followed by the transition to a flexible exchange rate system dictated by market supply and demand forces and the associated risks.
- The increase in return rates to 15%, applied to equity or profit margins on private assets.
- Competition for financial market shares amid technological advancements and the emergence of the third generation of the internet ("Web 3.0").

- Variations in tax systems across countries, coupled with rising transaction costs.
- Instability in interest rates, escalating inflation rates, and increased risk levels.
- The growing impact of scientific research on financial theory.
- The fragility within global securities markets, which has prompted investors to turn to financial derivatives as alternatives for protecting their financial assets.

3. Crypto Assets as a Tool for Restructuring Crypto Financial Markets:

The modernization of financial markets and assets (see Table 01), in line with the digitization demands of the digital economy, has been driven by major advancements in telecommunications infrastructure and rapid progress in computing hardware and software. These developments have introduced new dimensions to traditional financial structures, allowing financial market products to evolve from localized offerings into borderless, transcontinental markets. These markets adapt to diverse conditions and provide comprehensive services by leveraging accumulated data analysis to produce products that generate added value.

Table 01: Evolution of Financial Assets (Block & Duane Block, 2025)

Before the 1980s	From 1980 to 2010	After 2010
Paper Certificates: -Certificates were issued, transferred, and settled manually through paper certificates, which resulted in significant operational discrepancies and delays in settlement and record-keeping using the T+5 system. -The absence of centralized clearing led to errors in settlement processes and delays in the movement of funds. Decentralized and manual work methodologies.	Elimination of the Physical Nature: - Electronic ledger systems have been established to convert financial securities into book-entry form, centralized within clearinghouses to reduce many of the operational risks that existed in the era of paper documents. - However, this transition has led to the emergence of new intermediaries and extended settlement cycles, even though these cycles have become faster—reaching the T+2 level. - Geographical barriers and the limitations of operational capabilities have restricted the flow of financial liquidity, and transparency has remained confined to specific institutions. Centralized systems with reliance on intermediaries.	Clearing: -It offers a shared system for real-time data recording and asset transfer in a programmable manner, which reduces settlement risks and improves intermediary chains. -Through enhanced auditability and greater control over ownership, crypto assets address coordination shortcomings, as well as the delays and monopolies characteristic of previous generations of financial systems. -This transformation enables the execution of multi-asset operations supported by a financial infrastructure that is more configurable and easier to access. Decentralized and user-centric systems.

The acceleration of the transformation process has been largely driven by the use of tokenization—the application of a dedicated programmable ledger to create an asset, whether financial or non-financial, in the form of a tradable algorithm. Once created, such an asset becomes immutable and can be issued and held for trading on these ledgers, which function as platforms for the exchange of data and value (Block & Duane Block, 2025).

The focus is on redefining a new reality that enables the trading and management of crypto-assets by leveraging the interoperability and trustless nature of these technologies, which are characterized by the following features (Lavayssière, 2025):

- The integration of each tangible asset with its corresponding crypto-asset representation, enabling both to be traded within their respective environments.
- The distinctiveness of each crypto-asset and the specific environment in which its trading occurs.
- The preservation of legal rights, including identity verification, authorized wallets for safeguarding such assets, and digitally secured ownership.

3.1 Financial Derivatives in the Crypto-Asset Market

The majority of crypto financial derivatives trading happens within centralized exchanges that use traditional centralized limit order books for recording orders. The trading of crypto assets features special attributes which provide users with greater accessibility and operational flexibility. The market operates continuously with 24/7/365 availability alongside an independent decentralized pricing system that functions without traditional banking institution involvement.

The control over distributing savings across different trading platforms rests entirely with individual participants. Through personal control of liquidity distribution people can implement their strategies independently of standard rules which traditional financial systems typically apply.

Blockchain technology brought decentralized exchange trading which provides an alternative market structure while diminishing the need for centralized financial institutions.

The market relies on centralized platforms because these systems oversee fundamental trading functions including clearing and settlement services. The distributed systems enabled by decentralized technology operate differently from centralized platforms which maintain control over fundamental functions.

The market has introduced new financial instruments through these developments which include perpetual futures contracts that investors use because of their flexible nature and liquidity benefits.

The legal framework for crypto derivative trading operates with insufficient regulations at present. Therefore, numerous traders have shifted their operations toward offshore trading platforms (Kunke & Brian Rudick, 2023).

This section examines a selection of widely utilized crypto derivatives which operate in the digital asset market (LLP & Ernst, 2024) including:

- Crypto Options
- Crypto Futures
- Perpetual Swaps

The instruments represent either traditional derivatives that underwent complex cryptographic algorithm modification or new financial products designed for modern digital platforms. The new financial products include UpDown options alongside non-deliverable Bitcoin futures that track hash price values and staking yield swaps.

3.1.1 Crypto Options:

Traditional options share similar features with crypto options but the main difference is digital assets serve as their underlying instruments (e.g. cryptocurrencies and crypto indexes). Contracts settle through asset delivery or cash settlement depending on their chosen method.

The crypto options market connects with Black-Scholes pricing model because it measures contract values through implied volatility analysis.

3.1.2 Black–Scholes Model (Hayes, 2025):

$$C = SN(d_1) - K_e^{-rt}N(d_2)$$

Where:

$$d_1 = \frac{\ln \frac{S}{K} + \left(r + \frac{\sigma_v^2}{2}\right)t}{\sigma_s \sqrt{t}}$$

And:

$$d_2 = d_1 - \sigma_s \sqrt{t}$$

- C: Call option price
- S: Price of the underlying crypto asset
- K: Strike price
- r: Risk-free interest rate
- T: Time remaining until expiration
- N: Cumulative distribution function of the standard normal distribution

3.1.3 Crypto Futures:

Participants in financial derivatives obtain the ability to create agreements that purchase or sell crypto-assets at specified prices across defined future settlement periods. The settlement process can take place through cash payment or actual delivery of the underlying asset. These contracts represent essential instruments for assessing market views regarding spot prices because numerous crypto-assets possess highly liquid futures markets.

3.1.4 Perpetual Swaps:

Also known as “perpetual futures,” this derivative contract is an agreement between a buyer and a seller for a crypto-asset with no fixed expiration date. Traders can speculate on the price movements of the underlying crypto-asset. A key feature of this contract is the absence of an expiry date, allowing it to be held indefinitely without renewal.

In addition to these re-tokenized products, new innovative financial instruments have been developed and approved for trading on exchange platforms, including:

3.1.5 UpDown Option:

This option, launched by the American exchange Crypto.com Derivatives North America and authorized by the Commodity Futures Trading Commission (CFTC), is a pre-configured, exclusive option set within specific price ranges—“target prices” and “closing prices.” It allows for automatic opening and closing to maintain expected profit margins and prevent pre-programmed potential losses. This mechanism supports trading that responds to desired crypto-asset price movements and aligns with the intended strategy by allowing early trade closure during periods of price volatility and market fluctuations (Shi, Donald Cheng, Yang Yang, & Seha Islam, 2024).

3.1.6 Bitcoin Hashrate-Based Non-Deliverable Futures Contract (Luxor, 2025):

This financial derivative, developed by Luxor through a complex algorithm, represents the predicted profit associated with the movement of one petahash per second (PH/s) of Bitcoin's hashprice over a one-day period.

This metric estimates the potential returns a miner can earn over a given period of mining activity. The hash rate pricing is typically quoted in terms of a specific cryptocurrency or digital asset, though it is most commonly expressed in U.S. dollars or its equivalent in Bitcoin.

3.1.7 Staking Yield Swap (Falconx, 2022):

Financial engineers at FalconX platform created this new financial derivative. The main function of this derivative enables users to trade set staking yield amounts for variable payments linked to Proof-of-Stake (PoS) crypto asset returns. The integrated blockchain wallets hold these secured rates which are managed by an unchangeable algorithm that network participants can access. This structure enables the development of custom trading strategies for investment and hedging which allows financial innovators and engineers to build market-leading financial products.

3.2 Classification of Crypto Assets:

The establishment of a strict academic framework for crypto asset conceptualization requires more than basic generalizations which regulatory bodies and financial system designers and economic agents and consumers commonly use.

A solid conceptual framework allows better communication between crypto asset experts and financial algorithm specialists as well as their stakeholders. The system enables financial digitization and technological integration to develop better approaches which lead to improved financial inclusion for underserved populations.

Knowledge of how these assets' components connect enables essential development for modernization and critical analysis and innovation and specialized discourse expansion. A solid foundation enables researchers to develop frameworks which can incorporate future advancements and updates while supporting sustainability initiatives.

This classification is based on key characteristics: transferability, fungibility, the

type of distributed ledger technology (DLT) used, and the asset's legal status as a recognized currency or not (Goldman & Kumar, 2021).

Table 03: Crypto Assets (Parma Bains, Arif Ismail, Fabiana Melo, & Nobuya, 2022)

Central Bank Digital Currencies (CBDC)	Stablecoins	Unbacked Crypto Assets	Utility Tokens	Security Tokens	NFTs
-Issued centrally by a state or central bank -Designed to maintain price stability -The stabilization mechanism usually involves a sovereign currency	- Designed to maintain value stability - The stabilization mechanism may involve backing or guarantees through: • Commodity • Sovereign currency • Multiple currencies -Unbacked crypto assets Algorithms	-Generally decentralized -Designed for use as a medium of exchange -Limited rights for token holders -No single reference source for rights claims -Transferable	-Issued centrally -Grant rights to a product or service -Accepted within specific ecosystems -Transferable -Can be used as a medium of exchange	-Issued centrally -Defined under securities laws in each jurisdiction -Subject to regulatory frameworks	- Usually issued centrally -Provide ownership of a specific product -Collectible and non-fungible

4. Case Study:

4.1 The Current State of Trading on Cryptocurrency Platforms

Cryptocurrency is a unique social phenomenon that has experienced unprecedented growth in a much shorter timeframe than other financial and economic sectors. These assets are defined by dual ownership structures: they may be affiliated with financial institutions operating under regulatory frameworks established by national authorities, or they may be privately held by individuals.

Some of the most prominent companies and their global locations include:

- United States: Kraken, Gemini, Crypto.com, and Fidelity.
- South Korea: Bithumb and Upbit.
- Japan: Coincheck, Bitflyer, and Bitbank.
- Europe: Bitvavo, Bitpanda, and Revolut.

Among privately owned platforms, Binance stands out as a leading example, owned by Chinese engineer and investor Changpeng Zhao.

Estimates suggest that these platforms collectively hold cryptocurrency assets valued at approximately 1.2 trillion U.S. dollars, with their websites attracting around 438 million users as of November 2024 (Shahid, 2025).

In terms of trading preference, ten platforms have emerged as leaders, according to a report by a specialized data analysis team affiliated with Forbes Advisor (Shahid, 2025). The report evaluated platform performance based on twenty indicators, including trading fees, supported currencies, security measures, educational tools, and customer support. The findings are summarized in the following table:

Cryptocurrency Exchange	Rating	Trading Fees	Number of Supported Currencies
Kraken	5	Fees for trades under \$10,000 within 30 days are as follows: Maker Fee: 0.25% Taker Fee: 0.40%	400
Uphold	4.1	Fixed fees based on the asset (0.2% for most stablecoins; 1.4%–1.6% for Bitcoin and Ethereum).	250
Crypto.com	4.6	Maker Fee: 0.25%, Taker Fee: 0.50% (for trades up to \$10,000 within 30 days).	400
GEMINI	3.7	Maker Fee: 0.20%, Taker Fee: 0.40% (for trades under \$10,000 within 30 days).	70
Coinbase	3.9	Maker Fee: 0.40%, Taker Fee: 0.60% (for trades up to \$10,000 within 30 days).	290
Binance	3.8	Maker Fee: 0.10%, Taker Fee: 0.10% (for regular users within a 30-day period).	160
Interactive Brokers	3.5	Commissions range between 0.12% and 0.18%, depending on trading volume.	11
Bitstamp	3.3	Maker Fee: 0.30%, Taker Fee: 0.40% (for trades under \$10,000 within 30 days).	100
BitFlyer	3.2	Fees can be as low as 0.10% for trades under \$50,000 within 30 days.	9
EToro	2.8	1% fee plus the bid-ask spread.	100

According to market share by trading volume for April 2025 (Lee, 2025), Binance led with 38% of the total market and a spot trading volume of \$482.6 billion. This represents a significant decline from April 2024, when its volume was approximately \$694.05 billion — a drop of 43.81%.

Gate.io held a market share of 8.96% with a spot trading volume of \$113.73 billion, up from \$99.10 billion in April 2024.

Bitget, MEXC, and OKX held market shares of 7.25%, 7.09%, and 7.05%, respectively, with spot trading volumes of \$92.01 billion, \$90.07 billion, and \$89.46 billion — totaling \$271.54 billion combined.

Following them were Coinbase, Bybit, Upbit, and Crypto.com with similar market shares of 6.93%, 6.74%, 6.38%, and 6.16%, and spot trading volumes of \$88.04 billion, \$85.51 billion, \$80.96 billion, and \$78.23 billion, respectively. Their combined volume amounted to \$332.74 billion.

Lastly, HTX was the weakest performer in April, with a 5.43% market share and a spot trading volume of \$68.94 billion.

2025 Centralized Exchanges Spot Trading Volume								
Exchange	24-Oct	24-Nov	24-Dec	25-Jan	25-Feb	25-Mar	25-Apr	Mean %
Binance	39.9	39.1	34.73	35.76	37.22	40.66	38.01	37.91
Gate.io	5.2	6.45	6.81	6.46	6.84	6.87	8.96	6.8
Bitget	4.24	3.66	6.44	4.64	4.98	6.25	7.25	5.35
MEXC	4.51	4.66	6.09	5.15	6.78	7.05	7.09	5.9
OKX	5.65	6.71	6.18	6.04	6.2	6.8	7.05	6.38
Coinbase	5.73	6.91	6.54	6.96	7.08	7.01	6.93	6.74
Bybit	11.63	8.54	8.92	10.44	10.25	5.85	6.74	8.91
Upbit	4.47	9.26	9.8	8.38	5.77	5.9	6.38	7.14
Crypto.com	14.06	11.42	11.18	12.19	10.72	7.19	6.16	10.42
HTX	4.61	3.31	3.29	3.96	4.14	6.42	5.43	4.45
Total Trading Volume (in Trillions of USD):	1,1	2,5	2,9	2,2	1,7	1,4	1,3	

4.2 Binance Platform:

4.2.1 Introduction to the Binance Trading Platform:

Binance is a cryptocurrency trading platform established in 2017 by Chinese software engineer and investor Changpeng Zhao ([Peters, 2023](#)). It serves over 235 million users in more than 180 countries, supporting 350 digital currencies.

- The platform offers its products according to a strategy aimed at meeting all user demands through ([Binance, 2025](#)):
 - Spot trading, virtual trading, futures contracts, and options trading.
 - Peer-to-peer trading service (Binance P2P).
 - Lending services with interest (Binance Earn).
 - Investment services in cryptocurrency assets and digital currencies.
 - Trading services for non-fungible tokens (Binance NFT).

4.2.2 Analysis of Binance Platform Data:

This section analyzes the market's performance by examining key indicators used in the technical and chart analysis of daily price movements for the BNB/USDT currency pair. BNB is the official token of the Binance platform, while USDT is a stablecoin pegged to the US dollar at a fixed rate of 1 USDT = 1 USD. The analysis covers the period from January 1, 2023, to July 1, 2025.

Price data, including buy and sell orders for these assets, were obtained from the official site ([Coingecko, 2025](#)) and subjected to technical analysis as follows:

4.3 Technical and Chart Analysis:

4.3.1 Descriptive and Statistical Analysis:

Descriptive Analysis: Binance Data

Prices		BNB Bids		BNB Asks	
		Price	Quantity	Price	Quantity
Count	2.561000e+03	5000.000000	5000.000000	5000.000000	5000.000000
Mean	5.382109e+05	643.807584	3.735251	700.964054	6.109439
Std	2.090627e+07	16.575228	38.134591	17.546126	70.776202
Min	2.000000e-08	614.480000	0.008000	672.210000	0.007000
25%	9.310000e-04	629.667500	0.033000	685.677500	0.028000
50%	1.462000e-01	644.085000	0.094000	699.995000	0.094000
75%	2.456000e+00	658.002500	0.341000	715.932500	0.397000
Max	1.042508e+09	672.200000	1500.507000	732.870000	3318.218000

4.3.2 Analysis of Table Results

A. Raw Prices of Cryptocurrency Assets:

- Number of assets: 2,560 cryptocurrencies.
- Mean value: 5.382109×10^5 , which is exceptionally high, indicating the presence of outliers.
- Standard deviation (std): also very large, reflecting significant volatility within the data.

From these results, we infer that both the mean and standard deviation are heavily influenced by the wide variance in cryptocurrency prices, which range from extremely low values (2.000000×10^{-8}), representing illiquid assets, to extraordinarily high values (1.042508×10^9), indicative of assets with speculative prices driven by high demand and scarcity.

B. Buy Orders for BNB:

- Mean buy order price: 643.807584
- Standard deviation: 16.5, indicating some volatility in buy orders, though relatively minor and thus within acceptable bounds.

These findings suggest that demand for cryptocurrency assets among investors exhibits a generally stable pattern, with some fluctuations attributable to decisions made by major shareholders.

C. Sell Orders for BNB:

- Mean sell price: 700.964054. Compared with the average buy price, this increase reflects a desirable profit margin and active willingness among traders to liquidate their assets.
- Standard deviation: 17.546126, representing the variability inherent in the selling process, which supports notable profit margins and contributes to market dynamism.

4.4 Technical Analysis (Indicators):

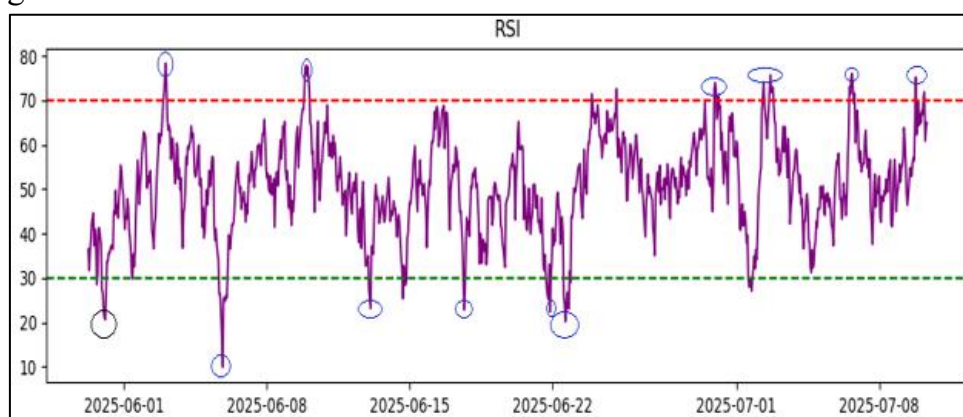
4.4.1 Relative Strength Index (RSI):

The RSI is an indicator measuring the magnitude of recent price changes to

evaluate overbought or oversold conditions in cryptocurrency prices over a specified time frame. It tracks the asset prices within the trading platform and provides signals that reflect investor and trader tendencies towards buying or selling, based on three key thresholds:

- $RSI < 30$: Indicates a sharp decline in asset prices. Any reversal at this stage signals strong market control by traders, suggesting an oversold condition.
- $30 < RSI < 70$: Denotes price fluctuations within a moderate range, where buy and sell decisions remain discretionary.
- $RSI > 70$: Reflects a significant price increase, with reversal signals indicating sellers' dominance and a market that is overbought.

The accompanying figure illustrates price movements over a six-week trading period of BNB—the native cryptocurrency of the Binance platform—measured according to the RSI indicator.



4.4.2 Moving Averages:

Moving averages represent a metric used to calculate the average asset prices over a specified time period. This approach aims to mitigate the impact of random fluctuations that may induce volatility in the overall price trend.

The calculation is performed using the following formula:

$$SMA_n = \frac{P_1 + P_2 + \dots + P_n}{n}$$

Where:

- SMA_n : represents the simple moving average over the specified period n .
- P_n : denotes the price of the cryptocurrency asset.
- n : is the sample size (number of periods).

To analyze the relationship between the closing price curve over a specific period and the calculated moving average curves, it is essential to observe the crossover points and their positions relative to the primary price curve of the assets. This observation enables informed decision-making regarding the status of owned assets, by considering the following:

- When the closing price curve crosses the moving average curve in an upward

direction, it indicates that prices are moving strongly above the general trend of asset prices.

- Conversely, when the curves intersect downward, it suggests that prices are moving below the general price trend.

The accompanying figure depicts three coordinated curves following consistent trajectories: the daily closing price of BNB, the SMA20 (simple moving average over 20 days), and the SMA50 (simple moving average over 50 days). The studied period covers a segment of six weeks of trading activity.

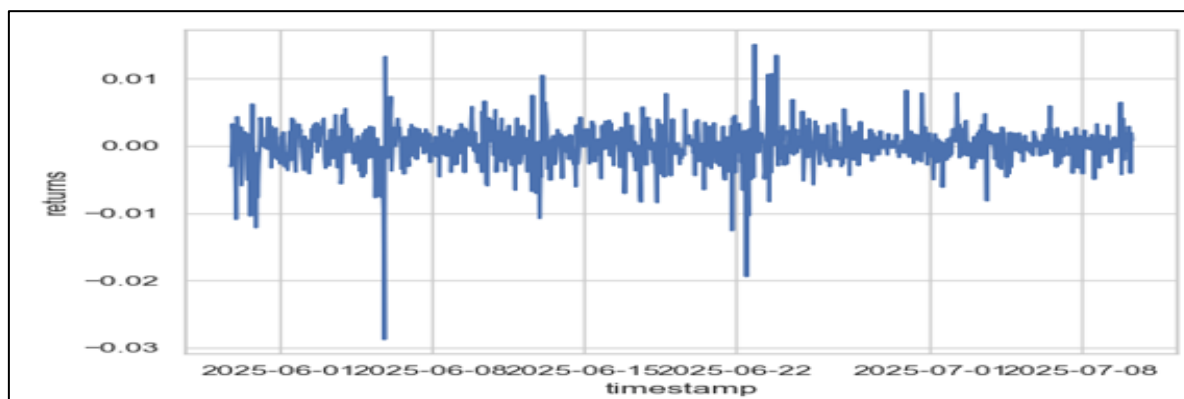
4.4.3 Analysis of BNB Price Movements from June 1 to July 8, 2025, as shown in the attached figure:

- Phase One: (June 1 to June 10) A gradual decline in prices reflects a back-and-forth dynamic of buying and selling, alongside growing concerns of a major drop, reaching around 630 units. This is followed by an upward reversal, supported by positive data encouraging renewed investment, peaking near 670 units. Despite this movement, traders remain affected by strong selling pressure, limiting full recovery.
- Phase Two: (June 10 to June 22) The period is marked by significant sideways price movement, ending in a sharp decline triggered by sudden, unfavorable external factors, bringing the price down to around 607 units. A crossover occurs as the SMA20 drops below the SMA50, signaling a steep decline consistent with the broader bearish trend.
- Phase Three: (Late June to July 8) Positive momentum returns as the market shows signs of recovery through ascending peaks and troughs. This reflects a strong upward trend, suggesting that investors are trading confidently and without significant pressure.



4.4.4 Behavioral Analysis of the Market

- Phase One: Analysis of Instantaneous Returns



The instantaneous returns curve demonstrates the series of price changes between hourly closing prices and their preceding closing points. The statistical base for quantitative studies in financial data relies on this indicator. The percentage difference between current price and preceding price represents the hourly return which directly shows price direction movement in real-time.

The returns demonstrated volatility around zero during the analyzed period which means the market lacked any persistent trend although short-term price waves occurred. The return series showed noticeable spikes in specific time frames particularly during mid-June when positive returns rose above 1% per hour while negative returns reached nearly -3%.

These changes in price and market sentiment seem to be caused by unexpected events and more activity from big investors. Analysts can find possible market turning points and confirm technical price breakouts by looking at extreme return peaks. The return fluctuations in early July saw a big drop, which means that the momentum is slowing down, which is something that usually happens during consolidation phases or when there are no market catalysts.

– Phase Two: Volatility Analysis



The standard deviation of returns across time segments serves as the quantitative measure to track market price variability. The volatility analysis applied a 20-hour timeframe to calculate hourly volatility that produces both quick and statistically precise results.

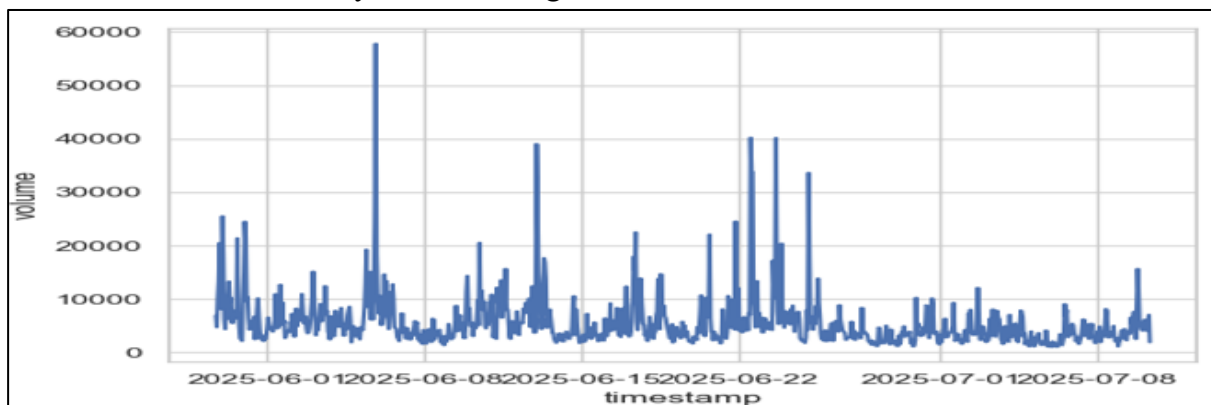
A volatility chart shows distinct market instability phases that recorded the highest reading above 0.008 during June's middle period while maintaining uncertainty at higher

levels. An hourly return standard deviation of 0.8% at the value of 0.008 during brief time periods remains an uncommonly high measure for cryptocurrency markets.

Volatility peaks in risk assessments create environments where the market becomes more likely to experience sudden price reversals along with sharp slippages. The data confirms that high volatility periods overlap with large return increases thus establishing the link between intense price movements and heightened risk parameters.

The market witnessed less volatility between late June and early July when its metric decreased to 0.001. The market environment proved suitable for both range trading and long-term investment approaches because the likelihood of sudden price shocks was extremely low.

– Phase Three: Analysis of Trading Volume Behavior



The essential behavioral metrics of trading volume serve technical analysis as a tool to evaluate price movement strength and validate market trends. The BNB/USDT hourly volume curve presented high volatility during June with numerous peaks that crossed 60,000 units per hour in the first half.

The volume peaks line up perfectly with the return and volatility peaks, which show that institutional or speculative market activity is on the rise. By making analytical connections, price changes happened through market transactions, which made the trends that were seen during those time periods more reliable.

The volume showed a steady decrease that kept it low from late June to early July. The drop in market activity could mean that liquidity is temporarily leaving the market or that the market is in an uncertain state. During these market phases, price pressure usually builds in one direction before breaking out, which causes big price changes.

– Summary of the Integrated Analysis:

The examination of returns volatility in conjunction with volume over time elucidates a comprehensive model that accounts for market behavior during the study period.

The market first showed strong return disturbances, and then volatility spikes appeared as trading activity increased, showing that the market was active and risk levels were high.

As the observation period came to an end, all three indicators showed consistent drops. This showed that the market was moving toward structural equilibrium with less market momentum.

The close link between returns volatility and volume is a reliable way to figure out how strong a signal is. When traders are in these situations, they should use RSI or MACD indicators along with other measures to improve their entry timing instead of just relying on one indicator.

5. CONCLUSION:

The investigation examined financial technology along with financial engineering techniques for digital virtual financial markets through the analysis of performance and pricing of crypto-assets while employing their trading features in risk management strategies. The study presents its conclusions through the following findings:

Study Findings:

- The investigation reveals inadequate alignment between financial technology and financial engineering principles, resulting in incomplete instrument development in crypto-assets, where technical components overshadow financial evaluation and risk assessment methodologies.
- Binance operates with sophisticated technologies including artificial intelligence and blockchain but certain derivatives lack consistent dependence on traditional mathematical valuation methods used for financial derivatives.
- Available data shows futures and digital options have substantial price fluctuations that create major obstacles for valuation systems and risk management tools.
- Digital markets including Binance operate without established regulatory standards which produces poor data quality and reduces transparency thus weakening financial protection systems.
- The growing dependence on technology for investor market access has made financial structures more complicated while demonstrating the need for adaptable financial engineering approaches.

Based on these findings, the study proposes several recommendations, including:

Study Recommendations:

- Financial engineering models need to be developed specifically for cryptocurrency assets because they need to handle the high volatility and be integrated into digital trading platform technical systems.
- Financial products require precise and transparent design which can only be achieved through strengthened collaboration between financial technology specialists and financial engineers.
- Digital assets require appropriate regulatory and supervisory frameworks to minimize both operational and informational risks that must be established.

- The establishment of standardized performance indicators for digital derivatives should be promoted since they enhance risk assessment methods as well as portfolio management strategies
- The digital trading environment requires special attention to financial and technical literacy development because it enables individual investors to grasp digital derivative operations while recognizing potential benefits and dangers.

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7. Appendices



