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VIRTUAL ASSET MARKET AND SUPPLY-DEMAND MODEL

Abstract. Virtual assets are driving a new stage of technological progress and becoming an increasingly vital component of the digital economy, gaining popularity globally. The price of these assets reflects not only their intrinsic value but also market trust, usage, and investor expectations. In this sense, prices signal the strength, reliability and demand for these assets within the ecosystem. The general mechanisms of price formation are often explained by the classical common economic supply-demand model. This paper examines price formation mechanisms in virtual asset market using a standard supply-demand framework with differentiated supply elasticity structures. By modeling Bitcoin, Ethereum and fiat-backed stablecoin within a unified microeconomic system, the study demonstrated that volatility patterns are structurally determined by protocol-level supply design. A numerical simulation and elasticity analysis reveal that Bitcoin behaves as a demand-driven asset due to near-zero supply elasticity, Ethereum exhibits hybrid adjustment through partially elastic supply and stablecoins reverse the classical adjustment mechanism by fixing price and allowing quantity to absorb demand shocks. An empirical specification using log-linear regression models is proposed to estimate demand and supply elasticity.

The study shows that the applicability of the model varies significantly depending on the type of asset and that the virtual assets market requires hybrid theoretical frameworks. The analysis is inherently theoretical due to the difficulty in measuring supply and demand in the virtual assets market. This market lacks transparency and investor emotions significantly influence prices. While the findings may not offer practical results due to the virtual assets market's dynamic nature, the article provides valuable insights for economists, analysts, investors, and traders. It helps assess fair market value, potential risks and how changes in supply or demand could affect prices, offering strategic guidance for those involved in the crypto space.

The findings carry significant regulatory implications, suggesting that virtual asset supervision should be elasticity-centered rather than technology-centered. Policy recommendations include differentiated prudential treatment, reserve requirements for stablecoins and volatility-aware investor protection frameworks.

Keywords: *Virtual Asset, Supply and Demand Analysis, Supply Elasticity, Bitcoin, Etherium, Stablecoins.*

JEL Classification: G12; D41; C62.

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Introduction. Since ancient times, wealth has been concentrated in the hands of a small part of humanity - feudal lords, kings, rulers and their entourage. The emergence of financial institutions has improved the situation, but the principle of distribution has remained the same - the trace of wealth leads to the centers of power.

The transformation of modern financial systems accelerated significantly after the 2008 global financial crisis, which coincided with the emergence of Bitcoin and the first decentralized virtual asset systems (Hayes, 2017; Saengchote & Samphantharak, 2024). These systems introduced the idea of a digital, decentralized asset accessible to anyone who participates in the network, reducing reliance on traditional financial intermediaries (Urquhart, 2016; Gadzinski et al., 2024)). Before that, humanity had already experienced three great industrial revolutions. The first industrial revolution used water and steam to mechanize production, the second - created mass production through electricity. As a result of the third revolution, the process became automated with the help of electronic and information technologies. And the third revolution automated processes through electronics and information technologies (Mankiw, 2021; Samuelson & Nordau, 2010). Building on this foundation, a fourth industrial revolution is currently unfolding. It is characterized by the convergence of digital, physical, and biological systems, where multiple technologies interact and reshape traditional economic and financial structures (Ciaian et al., 2016; Schilling & Uhlig, 2019).

Explaining the mechanism of price formation is one of the fundamental tasks of economic theory. Classical microeconomics considers price as the result of the interaction between demand and supply (Mankiw, 2021; Samuelson & Nordhaus, 2010). However, the emergence of the crypto-asset market has introduced a new type of asset that does not fully fit the characteristics of a traditional commodities or financial instruments (Hayes, 2017; Urquhart, 2016).

A virtual asset is a global product. It knows no borders. Market turmoil fluctuations can be triggered by events occurring anywhere in the world, reflecting the high interconnectedness of digital financial systems (Ciaian et.al,. 2016; Lee et al., 2025). Virtual asset users typically trade on exchanges and store their assers in digital wallet. A wallet allows a user to send, receive, or store assets, while an exchange functions as an online marketplace for buyimg and selling virtual assets (Schilling & Uhlig, 2019). Today, there are about 2-3 thousand different virtual assets in the world. Despite increasing technological innovation and market competition, Bitcoin has remained the dominant asset since its inception, largely due to its widespread adoption and fixed supply structure (Urquhart, 2016; Fassas et al., 2020). Bitcoin's market capitalization represents the total value of all Bitcoins in circulation, while Ethereum ranks second and plays as key role as a smart contract platform, enabling a significant portion of decentralized finance (DeFi) and NFT ecosystems.

A stablecoin is a type of virtual asset designed to maintain a stable value, typically pegged to a fiat currency, such as US dollar or euro or a basket of assets (Ji et al., 2024; Bagh et al., 2025). Unlike highly volatile assets such as Bitcoin or Ethereum, stablecoins aim to reduce price fluctuations, making them more suitable for everyday transactions, remittances, and as a store of value within crypto ecosystems (Fernández et al., 2024). They have also become a central focus of financial in major economies worldwide. The first widely recognized stablecoin, Tether (USDT), was launched in 2014 and was designed to be pegged to the US dollar in order to provide stability within volatile virtual asset markets (Saengchote & Samphantharak, 2024).

How the price of a virtual asset is formed and what the virtual asset rate means.

The virtual asset rate refers to the current market value of digital assets, which is determined through the interaction of demand and supply in trading markets (Mankiw, 2021; Samuelson & Nordhaus, 2010). It serves as a key indicator for investors and traders to assess the market conditions and make a decisions regarding buying or selling. The price of virtual assets is highly dynamic and can change multiple times within a single day due to various influencing factors, including news, events, regulatory developments and technical market signals (Urquhart, 2016; Hayes, 2017). This frequent fluctuation reflects the high volatility of the virtual asset market compared to traditional financial markets (Liu & Serletis, 2019). Overall, the price of a virtual asset functions as a central indicator of market sentiment, reflecting investor interest, market confidence, and shifts in demand for digital assets (Ciaian et al., 2016; Schilling & Uhlig, 2019)

The price of a virtual asset is a complex phenomenon that is influenced by a combination of internal and external factors, making it highly difficult to predict accurately (Hayes, 2017; Urquhart, 2016). Among internal factors, the most important is the interaction of demand and supply for a specific virtual asset, which forms the basis of price determination in economic theory (Mankiw, 2021; Samuelson & Nordhaus, 2010). In addition to supply and demand, several also affect price formation. Technical characteristics such as fast transaction speed, low fees, and high security can increase investor interest and contribute to perceived stability and value, Similarly, the strength and experience of the development team can enhance technological reliability and investment attractiveness. The underlying purpose and design of a virtual asset also plays an important role, particularly when it aims to solve specific economic or technological problems; Furthermore, news and related events, such as partnerships, technological updates, or regulatory announcements,

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can help to sudden and significant price fluctuations (Ciaian et al., 2016).

External factors are equally important in explaining price dynamics. The general macroeconomic environment, including inflation, interest rates, and unemployment levels can influence investor behavior and risk appetite. Global political and geopolitical developments, such as conflicts, sanctions, or instability, often increase demand for alternative assets as investors seek financial protection (Urquhart, 2016).

Technological innovation and regulation frameworks also play a critical role: while innovation increases interest in virtual asset, strict regulation can limit access and reduce market activity. Finally, media influence and public sentiment significantly affect price movements, as ews, rumors, and social media discussions shape perception and investor behavior (Schilling & Uhlig, 2019). Both internal and external factors are critically important in influencing the price of a virtual asset. However, the main factor that determines the price of a virtual asset is demand and supply.

Demand and Supply Equations are the fundamental tools of economics, forming the basic for determining market price and equilibrium in classical economic theory (Mankiw, 2021; Samuelson & Nordhaus, 2010). In principle, similar economic logic applies to the pricing of virtual assets as to conventional goods, where prizes are shaped by the interaction of supply and demand. However, in virtual asset market, prices adjustments occur at a significantly faster pace compared to traditional markets, reflecting higher sensitivity to information and market sentiment (Urquhart, 2016). It is generally impossible to predict the price of a virtual asset with 100% certainty, regardless of whether an experienced analyst does it or not. This uncertainty is primarily driven by the high volatility of the virtual asset market and the large number of interacting influencing factors, which make precise forecasting extremely challenging (Hayes, 2017; Schilling & Uhlig, 2019).

Although the general mechanism of price formation is often explained through the classical supply–demand framework, the structural and technological characteristics of virtual assets raise questions regarding the full applicability of traditional economic models (Ciaian et al., 2016). Understanding the supply–demand dynamics of virtual assets is essential for explaining price formation, market volatility, and investor behavior. Unlike conventional assets, the supply of many virtual assets is governed by algorithmic rules, consensus mechanisms, or protocol-level constraints, often resulting in fixed or predictable issuance schedules. On the demand side, factors such as utility, network effects, speculative expectations, regulatory developments, and macroeconomic conditions play a central role in shaping price dynamics (Cong et al., 2021). These unique characteristics suggest that virtual asset markets require an adapted analytical framework that integrates both economic fundamentals and technological design (Auer et al., 2025; Carbó & Gorjón, 2024).

This article examines the virtual asset market through the lens of a supply–demand model, highlighting how classical economic principles can be extended to account for decentralized issuance, tokenomics, and market sentiment. By analyzing the determinants of supply and demand and their interaction in virtual asset ecosystems, the study aims to provide a structured theoretical foundation for understanding price dynamics and market equilibrium in this emerging asset class. Such an approach contributes to both academic research and practical policy discussions surrounding the regulation, valuation, and sustainable development of virtual asset markets.

The object of the research is the virtual asset market and its economic functioning mechanisms. The subject of the research is the supply-demand model operating within the virtual asset market and the factors influencing price formation and market dynamics.

The task of the research is to analyze the relationship between supply and demand in the virtual asset market and to assess its impact on market performance and price volatility. In order to achieve the objective, the research addresses the following tasks: to examine the concept and characteristics of virtual assets and their markets; to analyze the role of supply and demand in price formation; to identify the key factors affecting market equilibrium and investor behavior; and to evaluate the economic and regulatory challenges associated with the development of the virtual asset ecosystem. The study shows that the applicability of the supply-demand model varies significantly depending on the type of asset (Bitcoin, Ethereum and stablecoins) and that the virtual assets market requires hybrid theoretical frameworks.

The study contributes to a better understanding of the economic nature of virtual assets and the mechanisms shaping market dynamics in the context of rapidly evolving digital finance.

ISSN 2524-2547 Соціальна економіка / Social Economics. 2026. Випуск/Issue 74

Literature Review. The growing academic interest in virtual asset markets has produced a diverse body of literature examining price formation, valuation, and market dynamics. While early studies often emphasized speculative behavior and market inefficiencies, more recent research increasingly frames virtual asset prices through economic fundamentals, particularly supply–demand interactions under protocol-defined constraints. This section reviews the literature along three main strands: (i) supply-side characteristics of virtual assets, (ii) demand-side determinants and behavioral factors, and (iii) equilibrium and dynamic modeling approaches.

(i). A defining feature of many virtual assets is the exogenous and algorithmic determination of supply. Unlike traditional financial assets or commodities, where supply may respond endogenously to price signals, the issuance of virtual assets such as Bitcoin follows predetermined protocol rules. Ciaian et al. (2016) and Hayes (2017) emphasize that this near-perfect supply inelasticity fundamentally alters price dynamics, shifting the burden of price adjustment almost entirely to the demand side. Schilling and Uhlig (2019) formalize this insight by modeling Bitcoin supply as fixed, demonstrating that stochastic demand alone can sustain positive prices and generate high volatility.

Subsequent studies refine the concept of supply by distinguishing between total supply and effective or liquid supply. Research on token behavior indicates that long-term hoarding decreases circulating supply, steepening the supply curve and magnifying price responses to demand shocks. Cong et al. (2021) further extend the analysis of supply-side mechanisms by examining decentralized mining structures and incentives, showing that although token issuance is algorithmically fixed, network participation and mining dynamics introduce endogenous elements into the effective supply and market equilibrium.

(ii). on the demand side, the literature identifies a wide range of factors driving virtual asset valuation. Empirical studies, suggest that demand can be decomposed into transactional and speculative components, with speculative motives often dominating during periods of high volatility and market stress (Urquhart, 2016; Hayes, 2017). This is consistent with evidence showing that trading volume, investor attention, and market sentiment significantly influence short-term price movements in virtual asset markets. This result is consistent with evidence that trading volume, investor attention, and market sentiment exert significant influence on short-term price movements.

More recent theoretical contributions emphasize the role of network effects and adoption dynamics. Cong et al. (2021) develop a framework in which demand arises endogenously from platform usage and user partivipation. In this setting the value of a token increases with network expansion, introducing nonlinear feedback effects into the demand formation and reinforcing price volatility

This article suggests that demand in virtual asset markets cannot be treated as exogenous or strictly price-dependent, Instead, it should be understand as a function of expectations, adoption dynamics and protocol-level utility. Behavioral finance perspectives in the literature support this view, highlighting that investor sentiment herding behavior and reaction to news can amplify demand fluctuations and contribute to deviations to fundamental value. (Schilling & Uhlig, 2019; Ciaian et al., 2015).

(iii): Building on these supply and demand characteristics, several studies propose equilibrium frameworks tailored to virtual asset markets. Schilling & Uhlig (2019) develop a general equilibrium model in which Bitcoin analyzed within a monetary framework alongside fiat currency. In their setting, agents optimize over consumption and asset holdings, and equilibrium prices emerge from the interaction between deterministic Bitcoin supply and stochastic demand. This framework highlights how predictable issuance schedules shape equilibrium price dynamics and can sustain speculative equilibria even in the absence of intrinsic cash flows.

The deterministic supply schedule of the virtual asset plays a key role in shaping the equilibrium price dynamics. Empirical equilibrium models typically estimate reduced-form supply–demand relationships using transaction volume, user adoption metrics, and macro-financial variables. Cong et al. develop a continuous-time dynamic optimization/asset-pricing model for platform tokens where demand arises endogenously from users' transaction needs and platform adoption – rather than from exogenous cash flows. In their framework token prices are determined in equilibrium through the interaction between users' optimal trading decisions and the evolution of the platform's user base, which in turn affects token valuation. The model incorporates predictable features of token supply and

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employs dynamic equilibrium methods to explain the valuation of virtual assets.

In a broader sense, equilibrium approaches in the literature emphasize that virtual asset pricing is determined jointly by supply constraints and demand-side optimization behavior. Ciaian et al. (2016) similarly show that market equilibrium in Bitcoin is driven primarily by demand shocks given the highly inelastic supply structure, while market clearing adjusts through price rather than quantity. These approaches suggest that traditional supply–demand equilibrium models can be extended to virtual asset markets, but must account for unique structural features such as deterministic issuance rules, decentralized validation mechanisms, and strong dependence on expectations and adoption dynamics (Hayes, 2017; Urquhart, 2016).

Although the international literature on virtual asset markets has expanded considerably, research conducted in Georgia remains relatively limited. Existing studies have mainly focused on the adoption of virtual assets, investor behavior, and regulatory developments. In contrast, relatively little attention has been devoted to examining virtual asset markets through the lens of demand and supply theory and its implications for equilibrium price formation. This indicates a gap in the Georgian literature and highlights the need for further research in this area.

Overall, the literature suggests that virtual asset markets represent a distinct economic environment in which classical supply–demand theory remains relevant but requires significant adaptation. Unlike traditional financial assets, virtual assets are characterized by predetermined or algorithmic supply mechanisms, demand driven largely by expectations and speculative behavior, and strong network externalities arising from user adoption. These features jointly influence price formation and market equilibrium, highlighting the need for integrated theoretical and empirical frameworks capable of capturing the unique dynamics of virtual asset markets. Building upon these insights, the present study applies the demand–supply framework to virtual asset markets in order to examine the determinants of equilibrium price formation and market behavior

Research Methodology. Demand and Supply Equations are the basic tools of economics – they determine market price and equilibrium.

Demand for a product or service is defined as the quantity of a product or service that consumers are willing to buy at various prices during a given period of time, other things being equal. Market demand is represented by a simple linear function such as $Q_d = a - bP$, where: Q_d – Quantity demanded, P – Price, a – Potential maximum demand, b – Price sensitivity of demand.

As price increases, demand decreases, reflecting the behavior of a rational consumer. This relationship between price and demand is called the law of demand. Similarly, supply refers to the quantity of a good or service that producers are willing to offer at different price levels over a given period of time, all other factors remaining constant. Q_s=c+dP is an equation of supply, where (d > 0) means that an increase in price increases supply.

The price at which demand and supply are equal (Q_s=Q_d)is the equilibrium price and calculated as follows $P = \frac{a-c}{b+d}$. At the equilibrium price, the quantity of a product that buyers are willing to buy and sellers are willing to sell is the equilibrium quantity. A market situation where demand exceeds supply and the price is below the equilibrium price is called a shortage, while a market situation where supply exceeds demand and the price is above the equilibrium price is called a surplus. In this framework, price acts as an information signal that coordinates the behavior of producers and consumers.

The study applies a standard linear supply-demand model to compare price formation mechanism across three virtual asset class: Bitcoin, Ethereum and Stablecoins. Demand is modeled as Q_d=a-bP. Supply structure differs across assets.

Bitcoin issuance is predetermined by protocol (block+halving) (Easley et al., 2019). Miners cannot instantly increase supply when price rises. So in short run: $Q_s = \bar{Q}$. That means supply is perfectly inelastic. Now equilibrium becomes: $a - bP = \bar{Q}$ and $P^* = \frac{a - \bar{Q}}{b}$. It means that if demand increases, than price jumps sharply and if demand falls, price collapses. That's why Bitcoin is highly volatile (Schilling & Uhlig, 2019).

Ethereum is different because issuance exists, staking locks supply, EIP-1559 burns fees. Supply is not fixed, which reacts somewhat to price and network usage. So, supply can be modeled normally Q_s=c+dP, but d is small (low elasticity), c shifts depending on burn rate and staking. Equilibrium $P^* = \frac{a - \bar{Q}}{b}$. Ethereum behaves like a commodity with partial elasticity. Compared to Bitcoin, price is still demand-sensitive, but supply adjustment dampens volatility slightly.

For fiat-backed stablecoins P=1. That means price is fixed by design. Supply adjusts instead. Equilibrium is Q_s=Q_d. If demand increases than Q_d=a-b·1, issuer mints more tokens. If demand decreases, tokens are redeemed and burned.

Based on above: Bitcoin is price adjusts, Ethereum – price mostly adjust and Stablecoin – quantity adjust. The point elasticity of demand $\varepsilon_d = \frac{\partial Q}{\partial P} \bullet \frac{P}{Q}$ since $\frac{\partial Q}{\partial P} = -b$, then $\varepsilon_d = -b \bullet \frac{P}{Q}$, supply elasticity $\varepsilon_s = \frac{\partial Q_s}{\partial P} \bullet \frac{P}{Q}$. For Interpretation: if supply is perfectly inelastic (fixed supply, like Bitcoin), then $\frac{\partial Q_s}{\partial P} = 0$, so ε_s=0. For stablecoins with fixed price, quantity adjusts with demand; elasticity in price terms is irrelevant – better to think in terms of quantity adjustment to demand shocks, not price changes.

To answer the main research question: to what extent and under what conditions do different types of crypto assets obey the classical supply-demand model, the author combines theoretical modeling with empirical analysis of market data**.** The study adopts a conceptual and illustrative approach, incorporating theoretical modeling, hypothetical numerical examples, and comparative analysis of different virtual assets.

The analysis covers the period from January 2018 to December 2024, enabling the examination of both short-term fluctuations and long-term trends in crypto-asset markets. The study relies on secondary data obtained from publicly available and reliable crypto-asset market databases, including:

1. Virtual asset price data (daily closing prices in USD).

2. Trading volume data as a proxy for market demand.

3. Circulating supply and total supply data as indicators of market supply.

The data are structured as a time-series dataset, allowing dynamic analysis of price behavior over time. The dependent variable is virtual asset price, while independent variables include demand indicators (trading volume, number of transactions) and supply indicators (circulating supply, newly issued coins). Data were collected through systematic extraction from online virtual asset platforms and statistical databases and were cleaned and standardized to ensure consistency across time periods and different virtual assets. Specifically, to collect the required data, the author relied on publicly available and reputable virtual assets market platforms and blockchain explorers:

For Bitcoin, price, supply, and transaction data were gathered from CoinMarketCap[1], Yahoo Finance[2], and Blockchain.com[3].

For Ethereum, price and supply data were collected from CoinMarketCap and Etherscan[4], along with transaction statistics from Ethereum block explorers.

For Stablecoins, supply and trading volume data were obtained from CoinMarketCap, CoinGecko[5], and official stablecoin platforms.

To estimate demand relationship, the following regression model applied: $Q_t=\alpha-\beta P_t+\gamma X_t+\varepsilon_t$, where Q_t represents quantity (proxied by trading volume), P_t denotes price and X_t includes control variables, ETF flows and transaction fees (e.g., gas fees). For Bitcoin, Supply is approximately fixed in the short run $\varepsilon_t \approx 0$. For Ethereum supply responsiveness was estimated through regression of changes in circulating supply on price movements. For Stablecoins, the analyses tested whether supply fully adjusts to demand shocks using ΔQ_t=$\theta(Q_d-Q_s)$. If $\theta=1$– Stablecoin $_x$hibits a strong peg mechanism with full quantity adjustment to demand changes (Pindyck & Rubinfeld, 2018).

This integrated approach provides a structured framework for assessing the theoretical applicability for assessing the applicability of classical supply-demand principles across different types of virtual assets. Despite the structured analytical framework, several limitations should be acknowledged:

Non-market-clearing mechanism: Stablecoin prices do not equilibrate through standard market-clearing mechanisms. Instead, issuers adjust supply to maintain a peg. As a result, classical price–quantity equilibrium models may not fully apply. Institutional and regulatory constraints: Stablecoin issuance is subject to reserve management, compliance requirements, and regulatory oversight. These institutional factors introduce discretionary frictions that are not purely market-driven;

Ambiguous interpretation of demand signals: Increases in stablecoin demand may reflect heterogeneous factors such as risk aversion, leverage accumulation, or growth in transactional usage. This limits the precision of inferences drawn from demand indicators alone.

In addition to the above, the study also took into account existing differences, listed in Table 1, of these three virtual assets in speculation, sensitivity to macroeconomic factors, institutional demand, and regulatory influence, listed in the Table 1.

Main Results. The behavior of virtual asset prices is shaped by both market mechanics and supply elasticity. Demand is influenced by economic, behavioral, and technological factors, including investment expectations, usability in payments and DeFi

1 CoinMarketCap. *Cryptocurrency market data*. URL: https://coinmarketcap.com (date of access: 28.02.2026).

2 Yahoo Finance. *Cryptocurrency historical data*. URL: https://finance.yahoo.com (date of access: 28.02.2026).

3 Blockchain.com. *Bitcoin blockchain data*. URL: https://www.blockchain.com (date of access: 28.02.2026).

4 Etherscan. *Ethereum blockchain explorer*. URL: https://etherscan.io (date of access: 28.02.2026).

5 CoinGecko. *Cryptocurrency market data*. URL: https://www.coingecko.com (date of access: 28.02.2026).

Table 1. Comparative Market and Institutional Sensitivities

Factor	Bitcoin	Ethereum	Stablecoin
Price speculation	High	High	No
Macroeconomic sensitivity	High	High	Low
Institutional demand	Strong	Growing	Financial Infrastructure
Regulatory influence	Important	Quit High	Very High

Source: Authors' analysis

Table 2. Comparative Economic Interpretation

Asset	Supply Elasticity	Price volatility	Adjustment Variable
Bitcoin	0	Very high	Price
Ethereum	Low	High	Mostly price
Stablecoin	Very high	Very low (if peg holds)	Quantity

Source: Authors' analysis

applications, macroeconomic conditions, regulatory signals, network effects, and sentiment or speculation driven by media and social networks.

Supply is often predetermined and algorithmic, with mechanisms such as fixed maximum supply (e.g., Bitcoin's 21 million coins), emission schedules (halving, staking rewards), token lockups and vesting, burn mechanisms, and liquidity concentration on exchanges. Prices are formed where quantity demanded equals quantity supplied, a process that occurs in real time, operates globally 24/7, and is highly volatile due to rapid information dissemination.

These findings highlight that supply design and market mechanisms are critical determinants of volatility, risk, and economic function across different types of virtual assets. Within this framework, the study identifies three distinct behaviors:

1. Bitcoin, with near-zero short-run supply elasticity, behaves as a demand-driven asset, causing prices to react sharply to changes in demand and amplifying volatility.

2. Ethereum exhibits hybrid behavior, where endogenous supply adjustments – such as issuance, staking, and burn mechanisms— help moderate price fluctuations.

3. Fiat-backed stablecoins invert the classical price-quantity relationship: their prices remain fixed, and quantities adjust to absorb demand shocks, effectively functioning like a monetary expansion process rather than a commodity pricing mechanism.

Bitcoin - Demand-Driven Asset: Bitcoin's supply is algorithmically fixed, with a terminal cap of 21 million coins, and periodic halvings introduce predictable supply shocks (Baur et al., 2018). Granular on-chain data enables precise estimation of circulating supply and investor behavior. Bitcoin demand is largely speculative or store-of-value oriented, sensitive to macro-financial variables such as inflation, interest rates, and geopolitical risk. In periods of high inflation or monetary expansion, demand increases as Bitcoin serves as an alternative store of value. Likewise, global financial instability often boosts demand, though Bitcoin does not fully mimic traditional safe-haven assets.

Implication: Bitcoin's near-zero supply elasticity and demand-driven nature explain its very high price volatility.

Ethereum – Hybrid and Network-Dependent: Ethereum does not have a fixed supply cap, but after the transition to EIP-1559 and Proof-of-Stake, supply has become partially controllable and even deflationary at times. Network activity, staking participation, and protocol-level burns moderate price fluctuations. Ethereum demand reflects both speculative investment and usage in DeFi, smart contracts, and payments. Inflation impacts Ethereum indirectly, largely through investor activity in the technology sector. Interest rate increases reduce demand for risky assets, affecting Ethereum prices, while global financial instability has a mixed effect depending on the state of the broader technology sector.

Implication: Ethereum's hybrid supply and network-driven demand explain its high—but moderated—price volatility and primarily price-based adjustment.

Stablecoin - Quantity-Driven and Trust-Dependent: Stablecoin maintain fixed prices through fiat collateralization, crypto backing, or algorithmic pegs, with supply adjusting to meet demand (Hafner et all. 2024). The largest stablecoin (e.g., USDT) dominate circulation, and trust in issuers and reserve

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management is critical for maintaining stability. Regulatory strengthening in 2023–2025[1] has further increased the role of trust in shaping demand. Stablecoin supply is highly elastic, responding directly to demand, while price elasticity is minimal. They are widely used for fast, low-cost transfers, especially in regions with emerging financial systems, and often serve as "safe havens" within the crypto market.

Implication: Elastic supply and quantity-based adjustment explain stablecoin's low volatility and monetary-like function.

While demand–supply models provide useful structure for analyzing virtual -assets, their explanatory power varies substantially by asset type. Empirically robust research typically integrates on-chain metrics with macroeconomic variables and institutional constraints, rather than relying on static equilibrium frameworks alone. Bitcoin, Ethereum, and stablecoins are digital assets with different economic logics, with supply and demand mechanisms that respond differently to both internal technological and external macroeconomic factors. These differences make the crypto market a multi-layered and heterogeneous economic system, where asset-specific supply and demand mechanisms respond differently to internal technological factors and external macro-financial conditions. Methodologically, the transparency and granularity of on-chain data provide unique insights, but endogeneity, regime dependence, and narrative-driven valuation shifts challenge classical demand–supply frameworks.

Conclusion. The application of demand–supply frameworks to crypto-assets presents both novel opportunities and substantial methodological challenges. Unlike traditional financial assets or commodities, crypto-assets exhibit algorithmically governed or institutionally mediated supply mechanisms, heterogeneous and evolving demand drivers, and high degrees of reflexivity between prices and user behavior.

Virtual assets prices are highly sensitive to changes in monetary policy and interest rates, which influence investors' allocations to outside assets such as Bitcoin and Ethereum. Uncertainty over Federal Reserve policy fuels speculative movements as investors reduce positions in riskier assets. Regulatory development in 2025–26, including ETF approvals and the EU MiCA framework[2], supports institutional efforts and enhance market stability.

As highlighted in table 1:

Bitcoin – The most sensitive to institutional flows and macroeconomic conditions, with price volatility reflecting shifts in market expectations.

Ethereum – Driven primarily by technical fundamentals and DeFi demand, but also impacted by market sentiment and speculative activity.

Stablecoin – While price remain stable, it provide liquidity, enable payment infrastructure, and foster financial confidence, indirectly influencing BTC and ETH price movements.

Findings allow us to say that supply design and market mechanisms are critical determinants of volatility, risk, and economic function across virtual assets. Understanding these dynamics is essential for investors, market participants, and regulators, informing both portfolio strategy and policy frameworks. Moreover, the study underscores the importance of considering demand composition—including speculative, transactional, and network-driven components—when modeling price behavior. Future research can build on these insights by examining cross-asset interactions, the role of emerging DeFi protocols, and the impact of macro-financial shocks, providing a more comprehensive understanding of virtual asset markets.

1 United United States Congress. Guiding and Establishing National Innovation for U.S. Stablecoins (GENIUS) Act. Washington, DC: U.S. Government Publishing Office, 2023.

2 European Parliament and Council of the European Union. *Regulation (EU) 2023/1114 of 31 May 2023 on markets in crypto-assets (MiCA)*. Official Journal of the European Union, 2023.

ISSN 2524-2547 *Соціальна економіка / Social Economics*. 2026. *Випуск/Issue 74*

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РИНОК ВІРТУАЛЬНИХ АКТИВІВ ТА МОДЕЛЬ ПОПИТУ ТА ПРОПОЗИЦІЇ

Віртуальні активи є рушійною силою нового етапу технологічного прогресу та стають дедалі важливішою складовою цифрової економіки, набираючи популярності в усьому світі. Ціна цих активів відображає не лише їхню внутрішню вартість, а й довіру ринку, рівень використання та очікування інвесторів. У цьому сенсі ціни сигналізують про міцність, надійність та попит на ці активи в межах екосистеми. Загальні механізми ціноутворення часто пояснюються класичною економічною моделлю попиту та пропозиції. У цій статті досліджуються механізми ціноутворення на ринку віртуальних активів із використанням стандартної моделі попиту та пропозиції з диференційованими структурами еластичності пропозиції. Шляхом моделювання біткойна, ефіріуму та стабільних монет, забезпечених фіатною валютою, в рамках єдиної мікроекономічної системи, дослідження продемонструвало, що закономірності волатильності структурно визначаються дизайном пропозиції на рівні протоколу. Чисельне моделювання та аналіз еластичності показують, що біткойн поводиться як актив, що визначається попитом, через майже нульову еластичність пропозиції; Ефіріум демонструє гібридне пристосування завдяки частково еластичній пропозиції; а стейблкоіни змінюють класичний механізм пристосування, фіксуючи ціну та дозволяючи обсягу поглинати шоки попиту. Для оцінки еластичності попиту та пропозиції запропоновано емпіричну специфікацію з використанням логарифмічно-лінійних регресійних моделей.

Дослідження показує, що застосовність моделі суттєво варіюється залежно від типу активу, а ринок віртуальних активів потребує гібридних теоретичних підходів. Аналіз має суто теоретичний характер через складність вимірювання попиту та пропозиції на ринку віртуальних активів. Цьому ринку бракує прозорості, а на ціни значний вплив мають емоції інвесторів. Хоча отримані висновки можуть не давати практичних результатів через динамічний характер ринку віртуальних активів, стаття містить цінні узагальнення для економістів, аналітиків, інвесторів та трейдерів. Вона допомагає оцінити справедливу ринкову вартість, потенційні ризики та те, як зміни попиту чи пропозиції можуть вплинути на ціни, пропонуючи стратегічні рекомендації для учасників криптопростору.

Отримані висновки мають значні регуляторні наслідки, вказуючи на те, що нагляд за віртуальними активами повинен орієнтуватися на еластичність, а не на технології. Рекомендації щодо політики включають диференційований пруденційний підхід, резервні вимоги до стейблкоїнів та механізми захисту інвесторів, що враховують волатильність.

Ключові слова: *віртуальні активи, аналіз попиту та пропозиції, еластичність пропозиції, біткойн, ефіріум, стейблкоіни*.

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Автор підтверджує, що під час підготовки наукової статті використовувалися ресурси штучного інтелекту. Зокрема, ChatGPT застосовувався для перевірки бібліографії на предмет узгодженості, а також для коректури англійської мови та стилістичного редагування. Автор переглянув і перевірив весь зміст та бере на себе повну відповідальність за остаточну версію рукопису.

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