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Extending Exchange Trading Hours

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1. Executive Summary

Currently, there is a momentum toward extended or 24/5[1] trading in the financial securities markets. Driven by perceived increased retail and international investor interest, major exchanges, especially in the U.S., are re-evaluating the conventional boundaries of trading hours.

This paper provides a comprehensive analysis of this trend by:

- Mapping the current landscape of trading hours across 60 security exchanges, revealing significant regional variation and historical evolution in trading session design.

- Discussing exchange-led initiatives, specifically U.S. exchanges, such as the proposed extended trading hour models by NYSE Arca, Nasdaq, and Cboe Global Markets, in contrast with the European counterparts that prioritize liquidity concentration and work-life balance.

- Identifying potential frictions in post-trade infrastructure, especially settlement mismatches due to asynchronous operating windows of central securities depositories (CSDs), central counterparties (CCPs), and real-time gross settlement (RTGS) systems.

- Analyzing potential temporal misalignments using foreign exchange (FX) and Continuous Linked Settlement (CLS) case studies.

- Examining the case of cryptocurrency markets, which offer 24/7 trading but experience lower liquidity, higher volatility, and increased risk of market manipulation during off-peak hours.

Key takeaway: While around-the-clock trading may enhance market accessibility and flexibility, its effective implementation depends on deep coordination across trading, clearing, settlement, and regulatory systems. The future of continuous security trading lies not only in extending access but also in coordinating the financial market infrastructure to support it.

[1] The subject of this paper is extended trading, which refers to the ability to buy and sell financial securities, such as equities, derivatives, bonds, nearly 24 hours per day. The terms around-the-clock trading, 24/5 trading, and extended trading hours are often used to describe this market trend. However, the current development in the traditional securities market is likely to result in a 22/5 or 23/5 trading week rather than a 24/5 one. In this paper, we use these terms interchangeably.

2. Introduction

The design of security market trading hours has historically been influenced by a combination of technological limitations and institutional norms. Most exchanges operate within fixed daily sessions, typically aligned with domestic working hours. Lately, discussions have arisen regarding extending exchange trading hours. To join the discussion, this paper aims to inform exchanges, policymakers, and other market infrastructure providers about the considerations associated with around-the-clock trading. As financial markets evolve toward greater automation and global integration, the question of how to align execution capabilities with settlement finality and adequate market liquidity remains a central concern for market design and stability.

In recent years, several developments have sparked interest in extending trading hours in financial markets. Trading brokerage firms[2] have offered extended hour trading, although the overnight trading volume is relatively low compared with the exchanges' regular session trading volume (Eaton *et al.*, 2025). One key driver is the growing participation of retail investors, some of whom may prefer to trade outside conventional business hours due to work or lifestyle constraints (Gurrola-Perez *et al.*, 2022). Extended trading sessions also offer the potential to attract foreign investors operating in different time zones, thereby enhancing market accessibility and cross-border participation (Eaton *et al.*, 2025).

In this paper, we examine the implications of extending trading in the securities markets, focusing on the effects on clearing, settlement, and market depth. First, we look at the evolution of exchange trading hours, which reflects a dynamic interplay of historical precedent, technological advancement, and investor demand. From the informal, daylight-based trading of the 17th century Amsterdam Exchange to the standardized hours of major modern exchanges like the New York Stock Exchange (NYSE), trading schedules have adapted in response to shifting operational and economic conditions. The 20th century saw gradual extensions in trading sessions, spurred by electronic trading and globalization, while regional differences, such as split sessions in East Asia, introduced different setups. A cross-sectional analysis of 60 exchanges reveals most operate between five to nine hours per day, with longer durations concentrated in high-income countries. Recently, the push for around-the-clock trading has gained momentum, with U.S. exchanges such as NYSE Arca, Nasdaq, and Cboe Global Markets proposing 22/5 or 24/5 models, driven by global investor demand. These efforts stand in contrast to more cautious approaches in Europe and the UK, where concerns over liquidity, infrastructure readiness, and work-life balance remain central to the debate (London Stock Exchange Group, 2020).

[2] Especially the U.S. retail brokers, such as Charles Schwab, Fidelity Investment, Interactive Brokers, Robinhood, and E*TRADE.

Moreover, the shift toward 24/5 equity trading introduces significant considerations for traditional post-trade infrastructure, particularly in aligning trade execution with clearing and settlement systems that currently operate on fixed weekday schedules. In response, the Depository Trust & Clearing Corporation (DTCC) plans to address this issue by extending the National Securities Clearing Corporation's (NSCC) clearing hours to a 24/5 model beginning in 2026. Yet, further adjustments—such as expanding payment system operating hours—are necessary. Temporal misalignment with other market infrastructure like Continuous Linked Settlement (CLS) and Real-Time Gross Settlement (RTGS) systems increase the risk of settlement failure, especially for international investors. Alternatively, investors need to prefund their foreign currency positions, which give rise to liquidity constraints and credit risks. Regulatory and policy bodies, including the Bank for International Settlements (BIS), the Committee on Payments and Market Infrastructures (CPMI), and the U.S. Securities and Exchange Commission (SEC), have acknowledged these factors, and are considering which infrastructure and policy reforms may support the evolving market landscape.

To further investigate the potential temporal misalignment between trading and settlement, the foreign exchange (FX) market serves as a reference point due to its over-the-counter structure and continuous global operation, with daily volumes surpassing USD 7 trillion. FX plays a vital role in supporting international securities trading, especially for foreign investors needing currency conversion. However, despite near-continuous trading, settlement processes could be affected by fixed operating windows, particularly through the CLS system, which operates on a 24/5.5 schedule and settles transactions via a payment-versus-payment (PvP) mechanism. While CLS mitigates Herstatt risk (a case of counterparty default risk) and reduces liquidity constraints through PvP and multilateral netting, its daily cutoff at 00:00 CET, where T+1 settlement applies, could in theory lead to temporal mismatches when paired with extended trading hours in equity markets, such as the extended hours proposed by NYSE Arca. Using hypothetical trading scenarios, our analysis shows that trades executed after the CLS cutoff, especially in the late evening session, would require pre-funding or alternate FX arrangements to ensure timely equity settlement. These findings underscore the structural challenges of synchronizing evolving trading hours with legacy settlement infrastructure, highlighting the need for reforms in the broader financial market to accommodate continuous market access.

Lastly, the cryptocurrency market serves as another natural laboratory for understanding the liquidity implications of 24/7 trading. Operating continuously without scheduled closures, it contrasts with traditional securities markets that close overnight, on weekends, and on holidays. Cryptocurrency trading is built on distributed ledger technology (DLT), which allows for near instantaneous, decentralized transaction verification and settlement. Despite the continuous operation, trading activity follows intraday and weekday patterns, with volume and volatility peaking at 00:00 and 16:00 UTC—corresponding to the Asian-Pacific morning and overlap with U.S. and European markets. Weekend activity is

significantly lower, with reduced trading volumes, volatility, and spreads. This finding is consistent with prior literature (Dorfleitner and Lung, 2018; Espel, 2024). These patterns suggest that while the crypto infrastructure enables 24/7 trading, market participants still concentrate their activity during conventional business hours.

The remainder of the paper is organized as follows. Section 3 discusses the evolution, current landscape, and proposed plans for extended trading hours. In Section 4, we discuss the implication of extending trading hours in the post-trade process. Sections 5 and 6 provide an analysis of the FX market and the cryptocurrency market. We provide a review of related academic literature in Section 7, and Section 8 concludes the paper.

3. Exchange trading hours

3.1 History and evolution of exchange trading hours

The development of trading hours in securities exchanges reflects the interplay of technological change, market structure, institutional needs, and global integration. From the earliest markets in the 17th century to current discussions of 24/5 equity trading, their evolution shows how exchanges adapt to shifting economic conditions and investor demands.

The Amsterdam Stock Exchange, founded in 1602, operated without formal hours, with trading taking place in open-air venues or coffee houses. Similar informal practices characterized the London Stock Exchange in the 18th century and the NYSE in the early 19th century. As volumes grew and institutions formalized, fixed trading hours emerged to bring order, improve transparency, and align with bank schedules. By the late 19th and early 20th centuries, major exchanges had standardized hours—NYSE initially trading from 10:00 to 15:00, later extended to 9:30 to 16:00, and LSE adopting comparable daily sessions.

The spread of telegraph and telephone networks gave markets a global dimension and highlighted the need for better synchronization across time zones. Yet reliance on physical floors and limited real-time data delayed the feasibility of extended sessions until the late 20th century, when electronic trading platforms enabled faster execution, lower costs, and the introduction of pre- and post-market sessions.

From the 1980s onward, regional differences became more pronounced. Asian exchanges often adopted split sessions with midday breaks, reflecting cultural and regulatory practices but complicating cross-border trading. European markets, by contrast, typically adopted

continuous sessions—usually from 8:00 to 16:30—providing a longer but more uniform trading window.

Box 1. The Evolution of NYSE Trading Hours

The history of NYSE trading hours reflects over two centuries of adaptation to market growth, technological change, and operational demands. Table 1 traces the evolution of trading sessions from their origin in 1792 through a series of regulatory and operational milestones that have continuously shaped the structure and duration of the trading day.

Table 1. Evolution of NYSE trading hours

This table outlines key changes in the trading hours of the New York Stock Exchange (NYSE) from its inception in 1792 to the present.

Year	Trading Session	Open	Close	Note	Lengthen/Shorten
1792-1871	Call Trading Sessions			No continuous trading	
1871-1887	Introduction of Continuous Trading	10:00	14:00-16:00	Trading hours vary	Lengthen
1887-1952	Standardized Six-Day Trading	10:00	15:00	10:00-12:00 on Saturdays	Lengthen
1952-1968	Eliminate Saturday Trading	10:00	15:00	No more Saturday session	Shorten
Jun-Dec 1968	Wednesday Closures	10:00	15:00	Paperwork crisis and closure on Wednesdays for six months	Shorten
Jan-Jul 1969	Shorter Trading Days	10:00	14:00	Wednesday trading resumed, but hours were shortened	Shorten
Jul-Sept 1969	Extension	10:00	14:30	Trading hours were extended by 30 minutes	Lengthen
1969-1970	Extension	10:00	15:00	Trading hours were extended by 30 minutes	Lengthen
1970-1974	Extension	10:00	15:30	Trading hours were extended by 30 minutes	Lengthen
1974-1985	4 pm Closing	10:00	16:00	Trading hours were extended by 30 minutes	Lengthen
1985-present	Modern Trading Hours	9:30	16:00	Trading hours were extended by 30 minutes	Lengthen
Proposed	NYSE Arca 22/5	1:30	23:30	NYSE Arca's proposed 22/5 extended trading hours	Lengthen

In the early years (1792–1871), NYSE operated call trading sessions without a continuous market. Trading was organized in discrete intervals, often limited to certain hours or securities, due to the absence of formal infrastructure and the limited number of participants. With the introduction of continuous trading in 1871, trading began to resemble modern market activity. Although trading hours were still somewhat variable, this period marked the beginning of a structured trading day, typically operating from 10:00 to between 14:00 and 16:00.

From 1887 to 1952, NYSE adopted standardized six-day trading, operating Monday through Saturday, with shortened Saturday sessions (10:00–12:00). This era reflected the growing maturity and centrality of financial markets to the U.S. economy. However, by 1952, Saturday trading was eliminated—likely due to evolving workweek norms, market efficiency considerations, and declining trading volume on weekends—representing a rare instance where trading hours were shortened in favor of more concentrated liquidity.

The mid-1960s and early 1970s were characterized by operational strain and regulatory response. Notably, a paperwork crisis in 1968—driven by overwhelming volumes and manual processing—led to the temporary closure of markets on Wednesdays for six months. Although trading resumed midweek in 1969, the exchange operated with reduced

hours, a measure aimed at easing the administrative burden. These disruptions marked one of the most significant moments of functional contraction in NYSE history.

Starting in July 1969, NYSE began a series of successive trading hour extensions, each adding 30 minutes to the closing time. This incremental lengthening—from 14:30 to 16:00—occurred over five years and was motivated by increased trading volume, improved automation, and a growing need to align more closely with global capital markets. The culmination of these changes occurred in 1985, when NYSE established the modern trading schedule of 9:30 to 16:00, a structure that remains in place today.

Recently, NYSE Arca (the electronic securities exchange on which equities and exchange-traded products are listed) seeks to implement a 22/5 trading model, offering trading from 1:30 to 23:30, five days a week. This marks a dramatic shift from historical norms and reflects the growing pressure on exchanges to provide extended access, particularly for globally distributed and digitally active investors. If adopted, this model would effectively create a 22-hour trading day, representing the most significant expansion in trading hours in NYSE history.

Overall, NYSE's trading time evolution has shown that lengthening trading hours is not the only option. Due to the lack of liquidity or insufficient infrastructure or operational support, it could be beneficial for an exchange to shorten their trading hours.

As of today, no major stock exchange operates on a full 24-hour basis for its core equity market. However, futures markets (e.g., CME Globex) and foreign exchange platforms offer near round-the-clock access, serving as models for what continuous trading might look like in equities. The U.S. exchanges, including NYSE Arca, Nasdaq, and Cboe Global Markets, have plans to significantly expand trading hours. This suggests that the shift toward around the clock trading is accelerating, at least for selected asset classes.

3.2 Current exchange trading hours

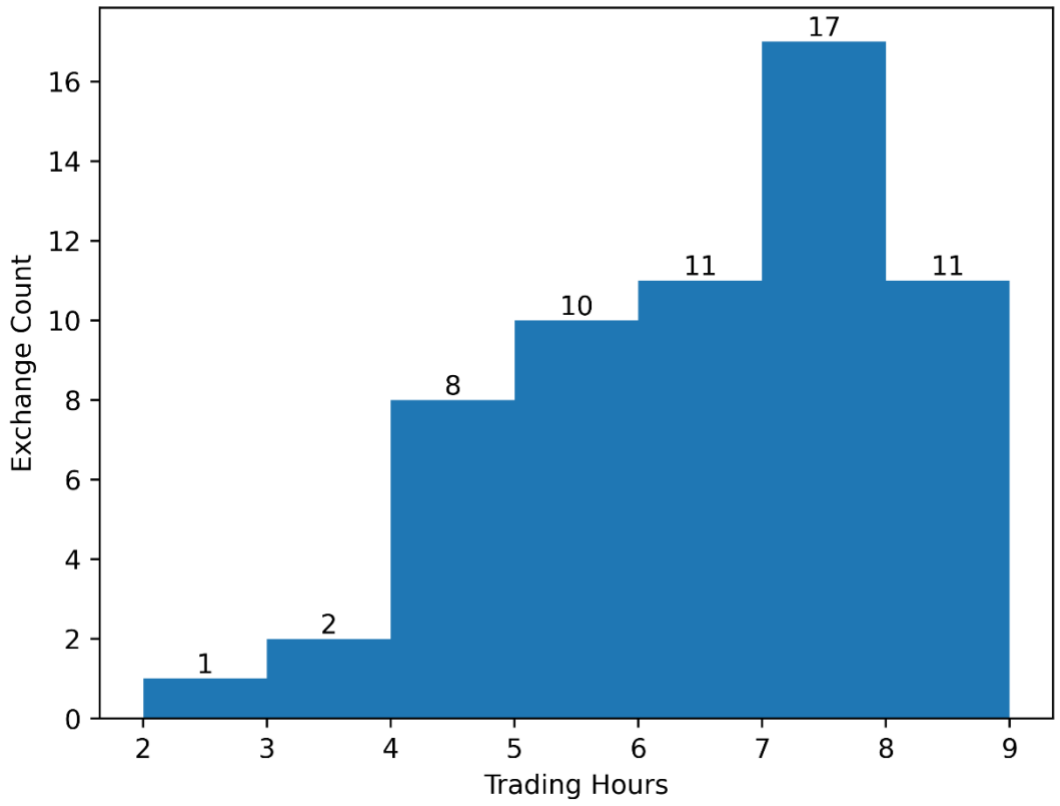
To gain a clearer understanding of current trading hour practices across global stock exchanges, we collected data on the duration of main equity market trading sessions for a sample of 60 stock exchanges. These trading hours are listed in Appendix Table A1. Trading hours are measured as the time between the official start of the continuous trading session and the end of the regular trading session, including closing auctions where applicable. This calculation excludes any after-hours or pre-market trading activity, and random opening/closing times are rounded to the nearest minute. Furthermore, we focus exclusively on full-day trading sessions and adjust for midday trading breaks by deducting the trading

break hours, which are commonly observed in exchanges across East Asia and Southeast Asia markets.

The histogram in Figure 1 shows the distribution of trading session durations across our sample stock exchanges. The figure illustrates a right-skewed pattern, with the majority (81.7%) of exchanges operating within a moderate duration range of 5 to 9 hours per day. The modal trading duration is 7-8 hours, observed in 17 exchanges (28.3%), indicating that many markets have adopted this length as a standard.

Figure 1. Stock exchange trading hours

This figure displays the distribution of the main trading session durations (in hours) across 60 stock exchanges. The x-axis represents the length of daily trading hours, while the y-axis shows the number of exchanges operating at each duration range.



Trading sessions of 6-7 and 8-9 hours are also relatively common, each adopted by 11 exchanges (18.3%), further reinforcing the view that most exchanges aim to provide substantial but bounded windows of market access. Ten exchanges (16.7%) operate 5-6 hour sessions, showing a modest but notable preference for shorter, more concentrated

trading periods—possibly to enhance liquidity during peak activity and reduce the operational burden of continuous trading.

At the lower end of the spectrum, a few exchanges operate very short sessions: only one exchange (1.7%) offers a 2-3 hour session, and two exchanges (3.4%) offer 3-4 hour sessions. These may reflect constraints such as low domestic liquidity, limited technological infrastructure, or regulatory designs intended to focus trading within narrow, high-activity intervals.

Table 2 presents the summary statistics on the trading hours of the main equity trading sessions for our sample of exchange. Panel A shows the aggregate global distribution, while Panel B breaks the data down by World Bank income group (high, upper-middle, and lower-middle income). Panel C categorizes exchanges by World Bank geographic region. The result reveals substantial variation in the duration of main equity trading sessions across global stock exchanges. On average, exchanges operate for approximately 5 hours and 51 minutes per day, with a standard deviation of 1 hour and 39 minutes. The shortest observed session lasts just 2 hours, while the longest extends to nearly 9 hours, highlighting the diversity in trading practices globally.

When broken down by income group, a clear pattern emerges. Exchanges in high-income countries maintain the longest average trading sessions, with a mean of 6 hours and 14 minutes and a median of 6 hours and 30 minutes. This reflects the well-developed infrastructure, broad investor participation, and continuous trading models adopted in advanced economies. These exchanges are able to operate longer trading days while supporting liquidity and efficient price discovery. Exchanges in upper-middle-income countries report slightly shorter average trading hours of 5 hours and 55 minutes. In contrast, exchanges in lower-middle-income economies maintain the shortest sessions, averaging 4 hours and 52 minutes, with lower variation, which may indicate limitations in market infrastructure, lower trading volumes, or deliberate efforts to concentrate activity into a narrower window to enhance liquidity and reduce operational costs.

A regional comparison provides further insight into these findings. Exchanges in Europe and Central Asia have the longest average trading hours, operating nearly 7 hours and 49 minutes per day. Similarly, North American exchanges average 6 hours and 48 minutes, reflecting the structure of U.S. and Canadian markets, which typically operate uninterrupted sessions from morning to late afternoon. In contrast, East Asia and Pacific markets exhibit a shorter average duration of 5 hours and 4 minutes, which is influenced by the prevalence of split sessions (morning and afternoon trading sessions with a midday break) in markets such as China, Japan, and Singapore. South Asia markets show also a similar average trading during.

Middle East and North Africa exchanges have an average of 4 hours and 58 minutes, which accounts for the shortest trading times.

Table 2. Summary statistics of stock Exchanges' trading hours

This table presents the summary statistics on the trading hours of the main equity trading sessions for a sample of 60 stock exchanges globally. Panel A shows the aggregate global distribution, while Panel B breaks the data down by World Bank income group (high, upper-middle, and lower-middle income). Panel C categorizes exchanges by the World Bank geographic region.

Panel A: Global

	count	mean	std	min	25%	50%	75%	max
Global	60	05:51:27	01:38:57	02:00:00	04:30:00	06:00:00	07:00:00	08:50:00

Panel B: By income group

	count	mean	std	min	25%	50%	75%	max
High income	31	06:14:17	01:36:01	03:30:00	05:00:00	06:30:00	07:07:30	08:40:00
Upper middle income	16	05:55:26	01:45:28	02:25:00	04:22:30	06:15:00	07:00:00	08:50:00
Lower middle income	13	04:52:04	01:17:27	02:00:00	04:30:00	05:00:00	05:57:00	06:45:00

Panel C: By region

	count	mean	std	min	25%	50%	75%	max
East Asia & Pacific	14	05:04:38	01:19:57	02:25:00	04:07:30	04:45:00	06:05:00	07:00:00
Europe & Central Asia	12	07:49:00	01:02:38	05:35:00	06:57:30	08:17:30	08:35:00	08:50:00
Latin America & Caribbean	6	06:30:20	00:18:59	06:00:00	06:30:00	06:30:00	06:31:30	07:00:00
Middle East & North Africa	13	04:36:09	01:21:25	02:00:00	03:40:00	04:30:00	05:10:00	07:15:00
North America	5	06:48:00	00:26:49	06:30:00	06:30:00	06:30:00	07:00:00	07:30:00
South Asia	4	05:03:00	01:39:13	03:00:00	04:07:30	05:13:30	06:09:00	06:45:00
Sub-Saharan Africa	6	05:35:00	01:19:11	04:30:00	04:37:30	05:15:00	05:52:30	08:00:00

3.3 Plans to extend trading hours

The landscape of equity trading is undergoing a fundamental shift as several major exchanges have announced plans to extend their trading hours significantly, moving toward a model of near-continuous or 24/5 operation. This evolution is driven by increasing demand for market access across time zones, appetite from retail and international traders, and competitive pressure from other markets which operate continuous models, such as cryptocurrencies.

The three largest and most prominent exchange groups in the U.S. are all planning to extend their trading hours. NYSE Arca, a subsidiary of the Intercontinental Exchange (ICE), submitted a filing to the U.S. SEC in early 2024 proposing a 22/5 trading model.[3] Under this

[3] For more information, see https://ir.theice.com/press/news-details/2024/The-New-York-Stock-Exchange-Plans-to-Extend-Weekday-Trading-on-its-NYSE-Arca-Equities-Exchange-to-22-Hours-a-Day

model, NYSE Arca would operate continuously from 1:30 to 23:30 Eastern Time, Monday through Friday. The exchange aims to offer this extended access across all U.S.-listed securities, including equities, exchange-traded funds (ETFs), and closed-end funds. NYSE Arca has framed the extension as a way to enhance market access for global investors, particularly those in Asia and Europe who currently face limited overlap with U.S. market hours. If approved, this would represent one of the most significant expansions of exchange-based equity trading hours in modern financial history.

Similarly, Cboe Global Markets has announced plans to offer 24/5 trading on its EDGX equities exchange.[4] This would establish a continuous daily trading cycle beginning Sunday evening and ending Friday evening, designed to facilitate cross-border activity and accommodate a globally distributed client base. Cboe has cited growing international demand, particularly from institutional clients in the Asia-Pacific region, as a core motivation behind the initiative. The proposal is currently under regulatory review.

Nasdaq, another major U.S. exchange, has also begun exploring a transition toward 24/5 trading, initiating engagement with regulators and market participants. The anticipated timeline indicates that this transition will take place in the second half of 2026.[5]

More recently, exchanges have aligned on proposed Hours of Operation which are to be set as close as technically feasible to 24 hours per day—from 8:00 pm Sundays to 8:00 pm (EST) Fridays, excluding holidays—with the incorporation of one technical pause during each 24-hour period (pending re-submission to SEC)[6]

Despite the momentum in the U.S., European and UK exchanges have been more conservative in their approach to trading hour reform. In July 2025, the LSE considered the launch of 24-hour trading but has not put forward a plan yet.[7]

[4] For more information, see https://ir.cboe.com/news/news-details/2025/Cboe-Announces-Plans-to-Launch-24x5-U.S.-Equities-Trading-2025-NwujmKvsxb

[5] For more information, see https://www.nasdaq.com/solutions/market-data-apac/24x5

[6] See, https://www.prnewswire.com/news-releases/sips-to-propose-extended-operating-hours-302447700.html

[7] See, https://www.ft.com/content/881341a6-9b16-4051-abbe-102572868fe2

4. Clearing and settlement

4.1 Consideration about 24/5 trading

The growing interest in 24/5 trading in equity markets has important implications for the traditional post-trade infrastructure. When trading hours extend, the clearing systems supporting securities markets need to adapt to reduce the time between trade execution and the clearing process of the CCP.

This is why the National Securities Clearing Corporation (NSCC) announced that it would operate 24/5, from Sunday at 20:00 EST to Friday at 20:00 EST to support overnight trading activity from Alternative Trading Systems (ATS) and exchanges, subject to regulatory review and approval of any necessary rule changes. NSCC is working closely with SIFMA, regulators, and the industry to support any required changes to post-trade processes, with implementation targeted for the second quarter of 2026.[8] This change is critical in reducing counterparty risk as NSCC will be able to apply its central counterparty guarantee to overnight activity. This marks an important infrastructural upgrade, without which true extended-hour trading would not be feasible.

Another important development in the U.S. context has been the announcement by the Securities Information Processors (SIPs) to propose significantly extended operating hours for consolidated market data. Under the proposal, SIPs would be available from 20:00 p.m. EST on Sunday through 20:00 EST on Friday, with a daily technical pause of up to one hour from Monday through Thursday to allow for system maintenance and refreshes.

The proposal also highlights several conditions that must be met before extended hours can be operationalized. Most importantly, (1) the DTCC, through its subsidiary NSCC, must be capable of providing clearing services during these extended periods. In addition, (2) SIPs must be technically able to disseminate all trades and quotes, including off-exchange activity, on a real-time basis, ensuring transparency and consistency across the market. Finally, (3) listing exchanges must adapt their systems to support operational updates such as symbol directory changes and corporate action adjustments in line with the extended schedule.

[8] https://www.dtcc.com/news/2025/march/18/dtccs-nscc-to-increase-clearing-hours-to-support-extended-trading

4.2 Potential consideration to 24/7

For 24/7 equity trading, a key issue is the temporal misalignment between trade execution and post-trade schedule. Modern securities markets already support near-instantaneous trade execution through electronic platforms, whereas the processes of clearing and settlement operate on T+1 or T+2 cycles within defined business hours. CSDs and CCPs currently process trades during weekday-only operational windows. In a 24/7 trading environment, trades executed during off-hours—overnight or over the weekend—may not be cleared or settled until the next trading day.

Traditional equity market infrastructures are designed to operate during well-defined business hours, which are aligned with the central bank payment systems (e.g., Fedwire in the U.S.[9] and TARGET2 in Europe). As equity markets push toward 24/7, the misalignment between trading and funding availability poses challenges to the timely settlement of trades. If trades occur outside central bank payment systems' operational windows, the necessary cash movements to settle them may not be able to be executed in real time. Also, margin calls issued by a CCP may occur outside traditional business hours, but the participants may be unable to meet them until funding channels reopen. In response to these challenges, some CCPs have sought to mitigate these challenges by creating arrangements with foreign banking institutions to facilitate out-of-hours margin movement, or by requiring prefunded margin buffers. However, these rules reflect product-specific risk profiles. A more scalable holistic approach might involve revisiting collateral eligibility, exploring weekend settlement mechanisms, and engaging with payment systems providers to extend operating hours where feasible.

Extending trading hours may also introduce geographic challenges with regard to liquidity. Markets operating across jurisdictions often settle in different currencies, and FX markets—while operating nearly 24/5—are themselves constrained by the CLS system's weekday-only window. A mismatch in currency conversion timing can create cash delivery failures, especially for international investors who must first convert foreign currency before purchasing assets in another market. We further explore the foreign exchange market temporal mismatch below in Section 5.

Running clearinghouses and settlement systems continuously would also require changes to operational risk management. Most current infrastructure is designed for end-of-day batch processing and assumes daytime staff availability. Operating systems on an extended trading model will require that systems be engineered for high availability, with limited-to-no

[9] The Board of Governors of the U.S. Federal Reserve System has proposed to expand the operating hours of the Fedwire Funds Service to 22 hours per day, 7 days per week, every day of the year. See, https://www.federalregister.gov/documents/2024/05/09/2024-10117/expansion-of-fedwire-funds-service-and-national-settlement-service-operating-hours

downtime for upgrades or maintenance. Real-time monitoring, automated alerts and robust incident response plans become even more critical, with greater emphasis placed on zero-downtime deployment practices. Systems operating in an extended trading model must embrace fault-tolerant architectures that allow for uninterrupted service. Redundancy, live-patching and continuous integration practices are vital to avoid unscheduled outages. System safeguard protocols should include real-time monitoring, frequent disaster recovery tests, and continuous vulnerability scanning adapted to minimize disruption in a live environment.

Regulatory bodies have begun to recognize the significance of this transformation. For example, the BIS and CPMI have published reports highlighting the operational and liquidity risks associated with limited settlement windows. The BIS (2023) report encourages payment and settlement systems to extend operating hours to accommodate the needs of global financial markets. In parallel, the U.S. SEC and the Financial Industry Regulatory Authority (FINRA) are reviewing proposals from the U.S. exchanges to extend trading sessions, with explicit discussions around the post-trade impacts of overnight market activity.

In summary, extended hour trading challenges the traditional assumptions of post-trade infrastructure, particularly with respect to timing, liquidity, and risk. Initiatives in the U.S. are paving the way for 24/5 equity trading, and the industry is working closely with SIFMA and regulators to support the alignment of extended trading hours and any required changes to post-trade processes. A potential move to more continuous market access including over the weekend (24/7) in any jurisdiction would require more significant transformations across much of the post-trade ecosystem.

5. Foreign Exchange Market and Continuous Linked Settlement (CLS)

The foreign exchange (FX) market offers one of the most relevant examples for studying the dynamics of 24/7 trading in the financial markets. As the world's largest and most liquid financial market, with daily trading volumes exceeding USD 7 trillion[10] (BIS, 2022), the FX market operates continuously across global time zones. This near-constant trading cycle is made possible by a decentralized network of banks, financial institutions, brokers, and electronic platforms spanning major financial centers all around the globe. FX trading relies on an over-the-counter (OTC) structure that allows participants to engage in currency transactions around the clock. The FX market also plays an essential role in financial security trading, especially for foreign investors, who benefit from the extended trading hours when

[10] In comparison, the U.S. equity market daily trading volume is about USD 800 billion, as of July 2025. See, https://www.cboe.com/us/equities/market_share/

needing to convert foreign currencies to local currencies. This setup makes the FX market a natural laboratory for examining 24/7 trading across global sessions.

The FX market operates as a decentralized OTC network in which transactions are executed bilaterally between counterparties, rather than through a centralized exchange. This market serves predominantly wholesale investors. In typical FX trades, two institutions agree to exchange a pair of currencies (e.g., USD/GBP) with settlement occurring at a future date. Due to differences in time zones, banking hours, and payment processing systems across jurisdictions, these bilateral arrangements may result in temporal mismatches between the delivery of the sold currency and the receipt of the purchased currency. Such mismatches give rise to settlement risks - specifically, that one party fulfills its payment obligation while the counterparty fails to deliver the corresponding amount. This type of risk is commonly referred to as Herstatt risk, named after the failure of Bankhaus Herstatt in 1974, which triggered a cascade of unsettled FX positions after the bank received Deutschemarks but failed to deliver U.S. dollars before it was closed by German regulators.

The systemic implications of Herstatt risk became increasingly evident during episodes of market stress[11], prompting coordinated international efforts in the 1990s—led by the G10 central banks and the BIS—to strengthen global FX settlement infrastructure. In response, Continuous Linked Settlement was established in 2002 as a global financial market utility designed to mitigate settlement risk through a payment-versus-payment (PvP) mechanism. Under PvP, both legs of an FX transaction are settled simultaneously and irrevocably, such that neither party is exposed to principal risk.

CLS operates the CLSSettlement system, which centralizes and synchronizes the settlement of FX transactions across participating currencies and institutions. According to the CLS Group, as of 2022, CLS had 74 settlement members, supported the settlement of 18 major currencies, and processed an average daily notional value of approximately USD 6.5 trillion. Settlement members include many of the world's largest commercial banks, and the system also accommodates third-party participants, such as smaller banks, corporates, and asset managers, through indirect access.

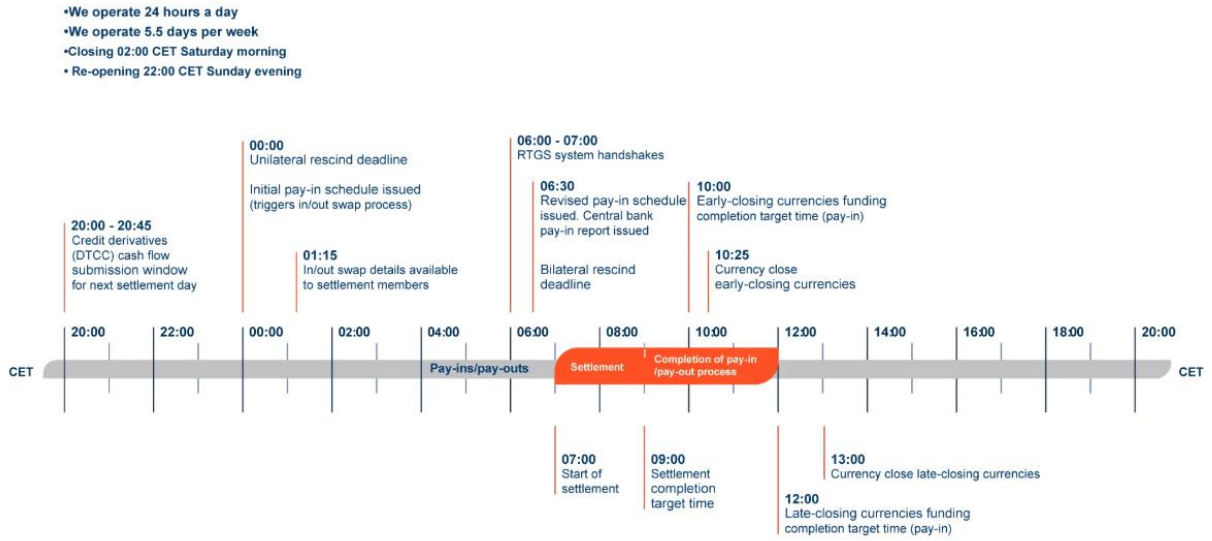
To support the near-continuous nature of FX trading, CLS maintains a defined operational window. Specifically, the system opens at 22:00 Central European Time (CET) on Sunday evening, coinciding with the start of trading in the Asia-Pacific region, and closes at 02:00 CET on Saturday morning, after the conclusion of trading in North America (see Figure 2). During this 24/5.5 operational cycle, CLS accepts payment instructions from settlement members and processes them through a centralized netting and funding mechanism. Final

[11] For example, the collapse of Bank for Credit and Commerce International London in 1991 and Barings PLC London in 1995.

settlement occurs across the central bank accounts of members in each eligible currency, ensuring legal finality and reducing bilateral liquidity exposures.

Figure 2. CLSSettlement daily schedule

This figure presents the daily operating schedule of the CLSSettlement system. The timestamps are in Central European Time (CET). Source: https://www.cls-group.com/



On each operating day, between 07:00 and 09:00 CET, CLS executes the PvP settlement process by simultaneously debiting and crediting the multicurrency accounts held by members. Settlement relies on the PvP protocol, whereby the payment instruction in one currency is executed only if the corresponding payment in the counter-currency is simultaneously settled. This synchronized settlement mechanism eliminates the principal risk associated with time lags in cross-border payments.

To finalize FX settlement, members must ensure that adequate funding liquidity is available in their CLS accounts. Although CLS settles transactions simultaneously on a gross basis, the associated liquidity requirement is mitigated through a multilateral netting process. Multilateral netting consolidates all incoming and outgoing payments across participants and calculates a single net funding position in each currency per member. This approach significantly reduces the overall amount of liquidity required. According to CLS Group (2023), multilateral netting reduces the funding obligation by approximately 96% compared to gross settlement without netting.

CLS also limits the duration for which funds are tied up in the system to mitigate the liquidity squeeze problem. Funding takes place between 07:00 and 12:00 CET, during which all 18 CLS-eligible currencies have overlapping Real-Time Gross Settlement (RTGS)[12] operating hours. During this five-hour window, member pay-ins and pay-outs are executed via the domestic RTGS infrastructure for each currency. At the conclusion of the funding period, remaining balances are redistributed to members, and CLS accounts are reset, ensuring that no overnight balances are maintained.

5.1 Settlement timing misalignment with 24/5 trading

The FX market plays a foundational role in enabling the globalization of capital markets, particularly in the context of emerging models of 24/5 trading in financial securities. Among the primary participants in such markets are international investors, who frequently need to convert their domestic currency into foreign currency to access trading venues abroad. In this context, timely and synchronized FX settlement becomes critical to ensuring efficient trading and post-trade operations.

Ideally, the proceeds of FX transactions should be settled and made available prior to the final settlement of the associated securities transaction. However, the asynchronous operating windows of CLS and trading venues can give rise to timing mismatches, leading to potential liquidity strains and settlement risks. This issue becomes more pronounced under extended trading regimes, where trade execution windows stretch beyond traditional operating hours for FX settlement systems.

To illustrate these challenges, we examine several scenarios involving temporal mismatches between the CLS settlement cycle and the proposed extended trading hours of NYSE Arca. In this hypothetical setup, a foreign institutional investor—holding a non-USD currency—intends to purchase USD-denominated securities traded on NYSE Arca during its proposed extended trading hours. The investor relies on CLS to convert its domestic currency into USD. For the purposes of this analysis, we assume that:

- FX settlement is processed through CLS
- Trade execution and payment instruction are submitted simultaneously at the same time
- No operational delays occur in the transmission of trade or payment instructions

[12] RTGS is a payment system used by central banks to settle high-value, time-critical transactions in real time and individually, without netting.

According to CLS operational procedures, transactions are eligible for T+1 settlement if payment instructions are submitted by 00:00 CET on day T+1. Meanwhile, NYSE Arca's proposed extended trading hours run from 16:00 to 23:30 EST in the evening session, and from 01:30 to 09:30 EST in the early morning session (i.e., 22/5). Securities settle at T+1 at the closing time of 23:30 EST. The daily operation windows between these two systems are illustrated in Figure 3, which presents the relevant timelines in both Central European Time (CET) and Eastern Standard Time (EST). The figure also highlights four scenarios for the settlement time alignment analysis: (1) As the base case, the current NYSE trading hours (09:30-16:00 EST); (2) During the evening extended session and before the CLS cutoff (16:00-18:00 EST); (3) During the evening extended session and after the CLS cutoff (18:00-23:30 EST); and (4) During the morning extended session (01:30-09:30 EST).

Figure 3. CLS and NYSE Arca settlement time

This figure outlines the daily operating windows of CLSSettlement alongside NYSE Arca's extended trading hours, with time converted to CET and EST for comparability.

To assess the implications of such timing mismatches, we list the CLS pay-out time and the security settlement time for the four scenarios, and Table 3 summarizes the critical timings in both EST and CET.

Table 3. CLS and trading settlements

This table presents four trading scenarios involving a foreign institutional investor purchasing USD-denominated securities on NYSE Arca while relying on CLS to convert foreign currency to USD. It compares the timing of payment instruction submission, CLS USD pay-out, and NYSE Arca equity settlement under each case. Time windows are expressed in both Eastern Standard Time (EST) and Central European Time (CET). The final column indicates whether USD funds are available in time to meet the equity settlement deadline.

Case	Payment instruction / Trading time		CLS pay-out		NYSE Arca settlement		USD available before equity settlement
	(1) EST	(2) CET	(3) EST	(4) CET	(5) EST	(6) CET	(7)
1	09:30 - 16:00, Day 0	15:00 - 22:00, Day 0	6:00, Day 1	12:00, Day 1	23:30, Day 1	05:30, Day 2	**Yes**
2	16:00 - 18:00, Day 0	22:00 - 00:00, Day 0	6:00, Day 1	12:00, Day 1	23:30, Day 1	05:30, Day 2	**Yes**
3	18:00 - 23:30, Day 0	00:00 - 05:30, Day 1	6:00, Day 2	12:00, Day 2	23:30, Day 1	05:30, Day 2	**No**
4	01:30 - 09:30, Day 0	07:00 - 15:00, Day 0	6:00, Day 1	12:00, Day 1	23:30, Day 1	05:30, Day 2	**Yes**

Case 1: Current Regular Market Hours (09:30–16:00 EST)
FX instructions submitted during regular trading hours are processed by CLS within the same day's operating cycle. With CLS payout occurring at 12:00 CET on Day 1, the investor receives USD well before NYSE Arca's equity settlement at 05:30 CET on Day 2. This scenario represents an ideal temporal alignment, with minimal liquidity or operational risk.

Case 2: Early Evening Hours (16:00–18:00 EST)
Although the trade occurs in the extended session, the FX instruction still falls within the CLS T+1 submission window (before 00:00 CET on Day 1). Thus, CLS settlement proceeds on Day 1 pay out at 12:00 CET. Like Case 1, USD is available well before equity settlement, implying low risk in temporal misalignment, being outside traditional hours. Yet, this case may present time constraints for third-party indirect clients. CLS indirect clients need to arrange their payment instructions through direct members, who may set cut-off times ahead of midnight CET to ensure compliance with the CLS deadline.[13]

Case 3: Late Evening Hours (18:00–23:30 EST)
In this case, when trading in the extended evening session after 18:00 EST, FX instructions are submitted after the CLS Day 1 cutoff (00:00 CET), pushing settlement to Day 2 with payout at 12:00 CET. However, NYSE Arca settles the equity trade earlier on Day 2 at 05:30 CET, resulting in a clear mismatch. USD proceeds are not available in time, potentially forcing the investor to pre-fund in USD, delay the settlement, or seek alternative to CLS for FX transactions. This scenario could expose the investor to liquidity constraints and potential settlement risks.

[13] See https://www.cls-group.com/media/ipencxv4/shapingfx06_part1_tplus1-the-fx-ecosystem-and-cls-what-difference-a-day-makes.pdf

Case 4: Extended Morning Session (01:30–09:30 EST)
Although the trade occurs early on Day 0, the CLS payout is still scheduled for 12:00 CET on Day 1. Given that NYSE Arca settles at 05:30 CET on Day 2, USD is available well in advance, ensuring timely settlement. This scenario does not pose a timing risk.

Overall, the settlement time misalignment identified here highlights a structural challenge in synchronizing extended trading hours with FX settlement cycles. As exchanges experiment with longer trading windows or continuous trading frameworks, current FX settlement infrastructure—particularly the cutoff timing of CLS—may create friction points that limit operational flexibility for cross-border investors.

6. Cryptocurrency market

In contrast to traditional securities markets, which operate within limited business hours, close on weekends, and observe national holidays, cryptocurrency markets function continuously—24 hours a day, 365 days a year—without centralized closures or scheduled breaks. This round-the-clock operation, coupled with global participation across multiple time zones, creates a decentralized and continuous trading environment that raises important questions about liquidity, market dynamics, and regulatory oversight.

At the foundation of cryptocurrency systems lies the distributed ledger technology (DLT), most notably embodied in blockchains, such as those supporting Bitcoin and Ethereum. These decentralized networks are maintained by a global array of nodes—validators or miners—who collectively sustain the security, integrity, and uninterrupted operation of the blockchain. When users transfer cryptocurrency, they broadcast transaction data to the network, where validators authenticate the transaction in accordance with the blockchain's consensus protocol. Once verified, the transaction is recorded onto the blockchain ledger, thereby completing the settlement process. However, the DLT near-instantaneous settlement process also introduces uncertainty into the settlement process, as the exact settlement time is unknow and is not overseen by trusted entities. Such inherent uncertainties can negatively affect the liquidity condition of cryptocurrency trading (Lin, 2025).

However, cryptocurrency trading introduces an additional layer of complexity beyond simple transactions—the trading infrastructure itself, which must handle order submission, matching, and execution. In traditional securities markets, these functions are managed through a centralized limit order book (CLOB), operated by exchanges to match buy and sell orders in real time. Efforts to replicate CLOB functionality directly on blockchain networks have encountered significant challenges. Because each action, whether order submission, modification, or cancellation, must pass through blockchain validation processes, the

system faces inherent latency, higher transaction costs, and scalability constraints. The decentralized validation process adds delays incompatible with the low-latency, high-throughput demands of modern electronic trading. Moreover, blockchain-specific issues such as network latency, competing chain forks, and incomplete propagation of transactions across nodes can result in inconsistent order books, requiring retransmissions and revalidations that further undermine speed and reliability. Consequently, fully on-chain CLOB implementations remain uncommon and underutilized, as they struggle to match the efficiency and responsiveness of centralized systems.[14]

To address these limitations, many cryptocurrency trading platforms have adopted off-chain CLOB models managed by centralized entities or consortia. In this hybrid approach, a centralized operator maintains the order book, handles quote dissemination, and executes trades, while the blockchain is used solely for post-trade settlement and custody of assets. Platforms such as Binance and Coinbase exemplify this model, functioning as centralized platforms (CEXs) that provide high-speed order matching and execution while preserving custody and settlement functions on the blockchain. Through robust server infrastructure and continuous system monitoring, these centralized platforms are able to maintain high uptime and facilitate uninterrupted, 24/7 trading of cryptocurrency assets, despite relying on off-chain trade execution mechanisms.

Alternatively, decentralized trading platforms (DEXs) have emerged as blockchain-native solutions that seek to circumvent the challenges of implementing a traditional CLOB on decentralized networks. Rather than matching individual buy and sell orders, DEXs, such as Uniswap, employ Automated Market Maker (AMM) protocols, relying on smart contracts to facilitate trades directly against liquidity pools. These pools are composed of pairs of cryptocurrencies, funded by liquidity providers (LPs) who deposit assets in proportional amounts to maintain balance. In exchange for supplying liquidity, LPs receive liquidity tokens representing their share of the pool's assets, which can be redeemed at any time for a proportional payout. AMM-based systems enable continuous, decentralized trading by providing guaranteed counterparty liquidity through the pool mechanism, eliminating the need for order books and centralized matching engines. Since AMMs operate autonomously via smart contracts on the blockchain, they inherently support 24/7 market access and execution, independent of traditional exchange hours or centralized intermediaries.

Despite the continuous, 24/7 nature of cryptocurrency markets, trading activity is not uniformly distributed across time but instead exhibits clear intraday patterns and fluctuations. Trading volumes tend to cluster around certain hours of the day, reflecting the influence of global time zones, investor behavior, and overlapping market activity across regions. To examine these intraday trading patterns, we analyze high-frequency trading data sourced from Kaiko, covering the six-month period from January 1 to June 30, 2021. The

[14] See Chen *et al*. (2023) for an in-depth overview of the cryptocurrency market infrastructure.

dataset includes minute-level transaction records for three major cryptocurrencies—Bitcoin (BTC), Ether (ETH), and Litecoin (LTC)—each traded against the U.S. Dollar on three large, centralized platforms[15]. By focusing on these trading pairs and platforms, the sample captures a significant portion of USD-based cryptocurrency trading activity across a range of institutional and retail participants.

Figure 4 presents the average trading volume for each hour of the day, expressed as a percentage of the total daily trading volume[16]. The vertical bars represent 95% confidence intervals, providing a measure of statistical variability around the mean estimates. The x-axis displays hourly timestamps, beginning with Coordinated Universal Time (UTC), which serves as the standard time reference for recording cryptocurrency transactions. Notably, UTC also aligns with the time zone used in the UK and serves as a reasonable proxy for the western European trading schedule. In addition to UTC, we include two alternative time references to contextualize trading patterns across major global regions. First, we provide timestamps adjusted to UTC-6, corresponding to Central Standard Time (CST) in the United States and Canada, which approximates the North American trading schedule. Second, we show timestamps in UTC+8, which corresponds to the time zones of China, Singapore, Malaysia, and parts of Western Australia, serving as a proxy for the Asia-Pacific trading schedule.

A clear and consistent intraday pattern emerges in trading volume across all three cryptocurrencies analyzed. Trading activity peaks at around 00:00 UTC, then gradually declines during the early morning hours, before picking up again starting at 12:00 UTC and reaching a second peak around 16:00 UTC. Following this peak, trading volume gradually tapers off as the day progresses.

The initial peak at 00:00 UTC corresponds with the daily reset of the cryptocurrency trading day, a time when many exchanges update balances and trading positions. This timing also coincides with heightened participation from traders in the Asia-Pacific region, as it aligns with morning hours in time zones such as UTC+8. The second peak, observed around 16:00 UTC, aligns with the overlap of U.S. market hours, capturing trading activity from both North American and European participants. Each of these peak hours accounts for approximately 6% of total daily trading volume, highlighting their significance as focal points of market activity. In contrast, trading volume is notably lower during the window between 05:00 UTC and 11:00 UTC, when neither the U.S. nor Asia-Pacific markets are fully active. During these hours, the average trading volume per hour drops to approximately 3% of the daily total, representing roughly half the contribution observed during the peak trading periods.

[15] Coinbase, Kraken, and FTX
[16] One day is UTC 0:00 to 23:59.

Figure 4. Hourly trading volume contribution

This figure plots the average trading volume during each hour of a day as a percentage of the daily trading volume for Bitcoin, Ether, and Litecoin, traded on Coinbase, Kraken, and FTX. The vertical bar represents the 95% confidence interval. The data span from January 1 to June 30, 2021.

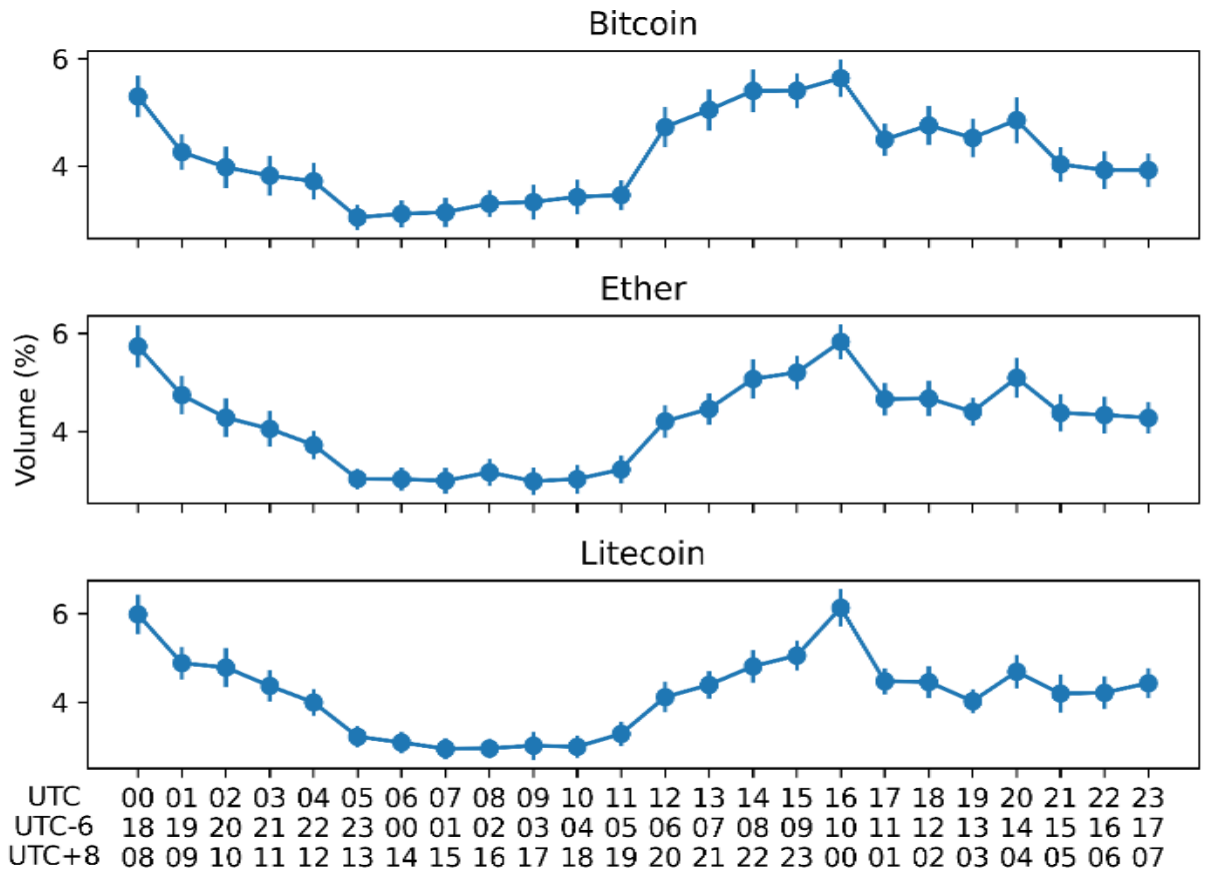


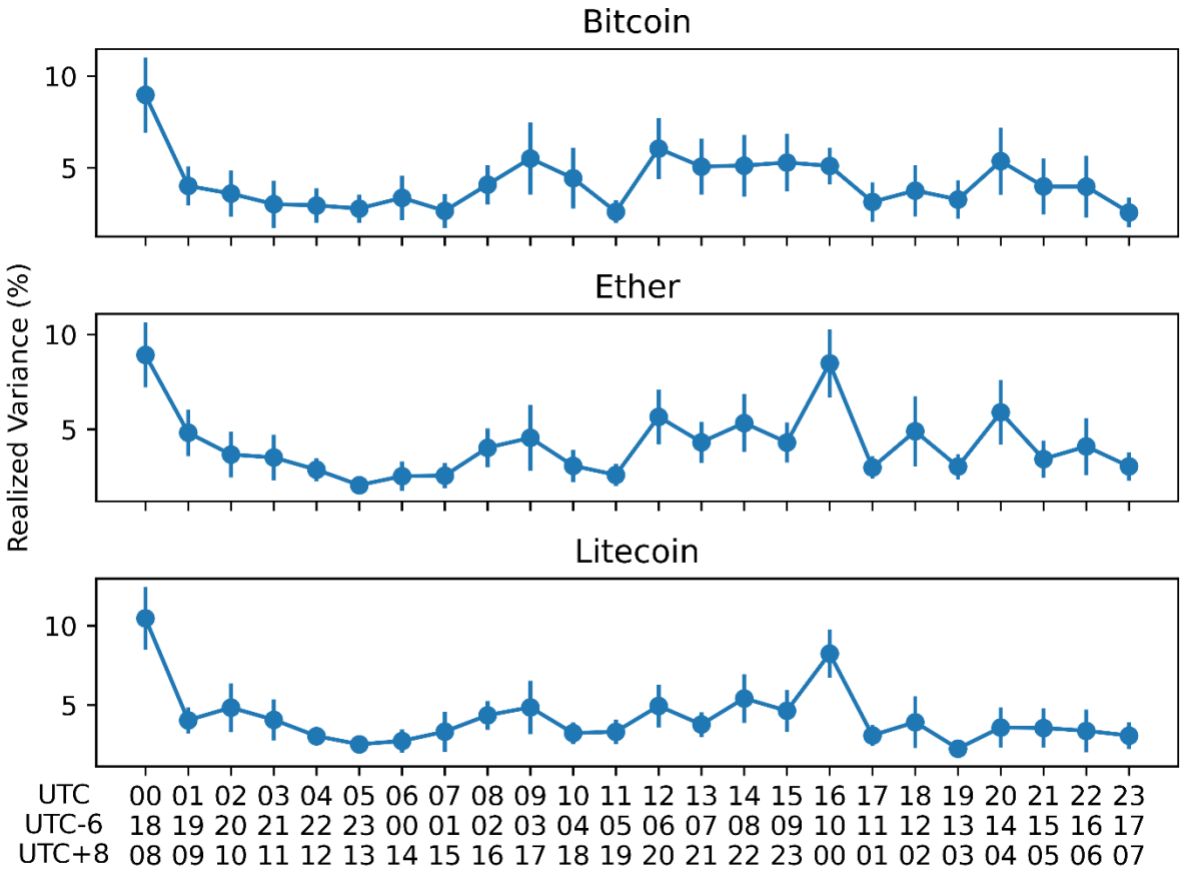
Figure 5 plots the hourly average realized variance (i.e., sum of squared returns during the hour) as a percentage of the daily realized variance, which reflects intraday return volatility, offering insights into market stability and risk at different hours.

We can observe that the realized variance is highest at 00:00 UTC, about 9.5% of the daily variation. This midnight peak aligns with the one in trading volume at the same time. Following this peak, realized variance declines significantly during the early hours of the day (01:00-11:00 UTC), mirroring the drop in trading volume observed in the previous figure. This indicates a period of lower market participation and reduced volatility, likely due to the overlap of off-peak hours for both U.S. and Asian markets. As trading volume begins to rise again after 12:00 UTC, return variance also increases, culminating in another volatility spike

around 16:00 UTC for Ether and Litecoin, as we do not observe a second peak in realized variance for Bitcoin.

Figure 5. Hourly realized variance contribution

This figure plots the average realized variance during each hour of a day as a percentage of the daily realized variance for Bitcoin, Ether, and Litecoin, traded on Coinbase, Kraken, and FTX. The vertical bar represents the 95% confidence interval. The data span from January 1 to June 30, 2021.



The trading volume and volatility peak at 16:00 UTC is also documented in the foreign exchange market, known as the "London 4pm fixing". The price at this time (the fixing rate) serves as the benchmark price of each currency on that day, and large trading activity centers around this timestamp due to hedging and the managing of foreign exchange risks (Melvin and Prins, 2015). In the case of cryptocurrencies, this 4pm pattern could be driven

by the fact that cryptocurrencies are traded against multiple fiat currencies and are affected by the "London 4pm fixing."

In addition to comparing the hour-of-the-day trading and liquidity pattern, we further compare these average weekend and weekday measures. The results are reported in Table 4. One of the most noticeable patterns is the decline in trading volume on weekends across all three cryptocurrencies. Bitcoin's volume drops from 42,503.05 on weekdays to 30,990.97 on weekends, Ether's volume falls from 639,781.90 to 478,694.43, and Litecoin experiences a similar decrease from 770,156.98 to 610,518.42. Such decreases are all statistically significant and suggest reduced market participation during weekends. Our results are in line with the findings of Espel (2024), who documents that overall volumes and trade counts are significantly lower during weekends compared with weekdays. In addition, the author also finds the 16:00 UTC peak observed above.

Table 4. Weekdays vs weekends

This table reports the weekday and weekend daily average trading volume, realized variance, and effective spread for Bitcoin, Ether, and Litecoin, traded on Coinbase, Kraken, and FTX. The last column reports the difference in the mean of these measures. The data span from January 1 to June 30, 2021. Note: * p<0.1; ** p<0.05; *** p<0.01.

Panel A: Bitcoin

Variable	Weekday	Weekend	Difference in mean
Volume	42,503.050	30,990.974	11,512.076***
Realized Variance	0.004	0.001	0.003*
Effective Spread	0.187	0.165	0.022*

Panel B: Ether

Variable	Weekday	Weekend	Difference in mean
Volume	639,781.904	478,694.433	161,087.47***
Realized Variance	0.891	0.002	0.889
Effective Spread	0.226	0.197	0.029*

Panel C: Litecoin

Variable	Weekday	Weekend	Difference in mean
Volume	770,156.983	610,518.423	159,638.56**
Realized Variance	0.044	0.004	0.04
Effective Spread	0.238	0.206	0.033*

Another key observation is the lower realized variance on weekends, indicating a less volatile market with fewer price fluctuations. Bitcoin's realized variance decreases from 0.004 to 0.001, Ether's from 0.891 to 0.002, and Litecoin's from 0.044 to 0.004, although only the decrease for Bitcoin is statistically significant at the 90% confidence level. The drop in variance suggests that weekend trading is less volatile, likely due to lower trading volume

and fewer market-moving events. Moreover, effective spreads[17] are significantly lower on weekends, suggesting that despite reduced volume, trading costs remain relatively low. Bitcoin's spread decreases from 0.187 to 0.165, Ether's from 0.226 to 0.197, and Litecoin's from 0.238 to 0.206. Our findings are consistent with Dorfleitner and Lung (2018), who find that returns of eight cryptocurrencies on Sundays are significantly lower than those on other days and suggest that this pattern is linked to the lower trading volume.

Overall, the results indicate a clear concentration of trading activity during traditional business hours, specifically intraday and on weekdays, even in markets that operate on a 24/7 basis. This pattern suggests that, despite the availability of continuous trading, participants overwhelmingly prefer to trade during periods that align with standard working hours, likely due to higher liquidity, greater market participation, and better access to supporting services during these times.

The lack of liquidity can contribute to wider bid-ask spreads, reduced price discovery efficiency, and greater susceptibility to volatility. In such conditions, prices may be more easily influenced by small trades or manipulative tactics, increasing the risk of market manipulation.

These findings highlight an important tension: while 24/7 trading offers flexibility and continuous access, market depth remains uneven across different time intervals. Addressing these findings will be crucial to ensuring fair, efficient, and resilient markets in a continuously traded environment.

Box 2. DLT Settlement

Distributed Ledger Technology (DLT) enables the settlement of trades and transactions outside of traditional business hours and has the potential to reduce settlement times to near-instantaneous speeds. This technological capability represents a significant advancement over the conventional settlement cycles of T+1 or T+2, which require one or two business days to finalize transactions. However, it is important to recognize that neither continuous, 24/7 settlement nor instantaneous settlement is a prerequisite for enabling 24/7 trading. Markets can operate continuously even if settlement continues to follow established timeframes, as long as appropriate mechanisms, such as collateralization, clearing, or other credit risk mitigants, are in place to manage the gap between trade execution and settlement. Therefore, while DLT offers the infrastructure for faster settlement, the decoupling of trading hours from settlement speed means that the

[17] Effective spread is the absolute difference between the traded price and the quoted mid-price scaled by the mid-price.

transition to 24/7 trading does not necessarily require a shift to real-time settlement practices.

7. Related academic literature

As continuous and extending hours to 24/7 trading is still at the early stage of development for traditional security exchanges, there is limited research directly studying this topic. In a theoretical model, Blonien and Ober (2024) show that a market closure coordinates liquidity, which can be substantial enough to improve allocative efficiency relative to a market open 24/7. Using a proprietary broker dataset, Eaton *et al.* (2025) investigate overnight trading condition in the U.S. and find that while effective spreads during the nocturnal hours are worse than during regular trading hours, realized spreads are about the same or better. The authors also find that significant price discovery takes place overnight, especially for exchange-traded products.

Earlier research focused on market liquidity and efficiency during the pre-open and after-hours periods. Biais *et al.* (1999) examine the pre-opening phase of the Paris Bourse, highlighting the role of quote revision and order placement in the price discovery process. Similarly, Cao *et al.* (2000) analyze Nasdaq's pre-open period—during which trading is absent, but market makers post indicative quotes—and find that meaningful price discovery can still occur through these mechanisms. Barclay and Hendershott (2008) provide further evidence on the informational efficiency of pre-open trading, documenting that increases in pre-opening volume led to more efficient opening prices for Nasdaq stocks.

Research on after-hours trading has generally found a limited impact on market quality. McInish *et al.* (2002) document after-hours activity for NYSE-listed stocks and show that most trades occur at the exchange's closing bid, ask, or last traded price, with minimal contribution to price discovery. In a series of studies, Barclay and Hendershott (2003) and Barclay and Hendershott (2004) analyze both pre-open and after-hours sessions on Nasdaq and find that off-hour trading is sparse, highly concentrated in large-cap, liquid securities, and often clustered around earnings announcements or other information events. Despite this activity, they find that trading costs are significantly elevated—three to four times higher than during regular hours—largely due to heightened adverse selection and thin liquidity.

8. Conclusion

The global shift toward extended and potentially continuous trading hours in security markets represents a profound evolution in market structure, driven by technological advancements, investor demand for around-the-clock access, and the growing influence of 24/7 markets such as cryptocurrencies and foreign exchange. This transformation challenges longstanding assumptions about the relationship between trading activity and the operational windows of financial infrastructure, raising critical questions about market depth, settlement efficiency, and systemic risk.

Our analysis highlights the promising potential of extended trading hours to improve market accessibility and better serve a globally distributed investor base. These developments offer meaningful opportunities for greater inclusivity and responsiveness to modern investment behaviors. However, realizing the full benefits of extended trading also calls for thoughtful modernization of existing market infrastructure. Without parallel adjustments to the broader financial ecosystem—still largely structured around traditional business hours—operational frictions and settlement mismatches may arise, particularly during weekends and holidays. Our case studies on the FX and cryptocurrency markets illustrate both the feasibility of round-the-clock trading and the importance of synchronized support systems to manage associated challenges such as liquidity timing, counterparty exposure, and cash flow alignment.

Ultimately, while round-the-clock trading is technologically feasible, its success and sustainability in the financial markets depend on coordinated reforms across the trading, clearing, and settlement landscape. Regulators, exchanges, and infrastructure providers must collaboratively address the risks associated with asynchronous operations, ensure liquidity provision during off-peak hours, and maintain robust mechanisms for price discovery and investor protection. Future research should continue to explore the implications of round-the-clock market access in terms of market liquidity, capital efficiency, and financial stability.

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Appendix

Table A1. Exchange trading hours

Exchange Name	Economy	Region	Income Group	Open	Close	Break Start	Break End	Duration
Abu Dhabi Securities Exchange	United Arab Emirates	Middle East & North Africa	High income	10:00	15:00			05:00
Amman Stock Exchange	Jordan	Middle East & North Africa	Lower middle income	10:30	12:30			02:00
Astana International Exchange	Kazakhstan	Europe & Central Asia	Upper middle income	11:30	17:05			05:35
Athens Stock Exchange	Greece	Europe & Central Asia	High income	10:30	17:20			06:50
Australian Securities Exchange	Australia	East Asia & Pacific	High income	10:00	16:10			06:10
B3 - Brasil Bolsa Balcão	Brazil	Latin America & Caribbean	Upper middle income	10:00	17:00			07:00
Bahrain Bourse	Kingdom of Bahrain	Middle East & North Africa	High income	09:30	13:00			03:30
Bermuda Stock Exchange	Bermuda	North America	High income	09:00	16:30			07:30
BME Spanish Exchanges	Spain	Europe & Central Asia	High income	09:00	17:35			08:35
Bolsa de Comercio de Buenos Aires	Argentina	Latin America & Caribbean	Upper middle income	11:00	17:00			06:00
Bolsa de Comercio de Santiago	Chile	Latin America & Caribbean	High income	09:30	16:00			06:30
Bolsa de Valores de Colombia	Colombia	Latin America & Caribbean	Upper middle income	09:30	16:00			06:30
Bolsa de Valores de Lima	Peru	Latin America & Caribbean	Upper middle income	08:30	15:02			06:32
Bolsa Mexicana de Valores	Mexico	Latin America & Caribbean	Upper middle income	08:30	15:00			06:30
Borsa İstanbul	Turkey	Europe & Central Asia	Upper middle income	10:00	18:05			08:05
Boursa Kuwait	Kuwait	Middle East & North Africa	High income	09:00	12:40			03:40
Bourse de Casablanca	Morocco	Middle East & North Africa	Lower middle income	09:30	15:30			06:00
Bursa Malaysia	Malaysia	East Asia & Pacific	Upper middle income	09:00	16:50	12:30	14:30	05:50
Cboe Global Markets	USA	North America	High income	09:00	16:00			07:00
Colombo Stock Exchange	Sri Lanka	South Asia	Lower middle income	11:30	14:30			03:00
Cyprus Stock Exchange	Cyprus	Europe & Central Asia	High income	10:30	17:08			06:38
Dar es Salaam Stock Exchange PLC	Tanzania	Sub-Saharan Africa	Lower middle income	10:30	16:00			05:30
Deutsche Börse AG	Germany	Europe & Central Asia	High income	09:00	17:35			08:35
Dhaka Stock Exchange Ltd	Bangladesh	South Asia	Lower middle income	10:00	14:30			04:30
Dubai Financial Market	United Arab Emirates	Middle East & North Africa	High income	10:00	14:00			04:00
The Egyptian Exchange	Egypt	Middle East & North Africa	Lower middle income	10:00	14:30			04:30
Ghana Stock Exchange	Ghana	Sub-Saharan Africa	Lower middle income	10:00	15:00			05:00
Hong Kong Exchanges and Clearing	Hong Kong SAR, China	East Asia & Pacific	High income	09:30	16:10	12:00	13:00	05:40
Indonesia Stock Exchange	Indonesia	East Asia & Pacific	Upper middle income	09:00	15:00	11:30	13:30	04:00
Intercontinental Exchange, Inc.	USA	North America	High income	09:30	16:00			06:30
Japan Exchange Group, Inc.	Japan	East Asia & Pacific	High income	09:00	15:30	11:30	12:30	05:30
Johannesburg Stock Exchange	Republic of South Africa	Sub-Saharan Africa	Upper middle income	09:00	17:00			08:00
Kazakhstan Stock Exchange	Republic of Kazakhstan	Europe & Central Asia	Upper middle income	10:30	17:30			07:00
Korea Exchange	Republic of Korea	East Asia & Pacific	High income	09:00	15:30			06:30
London Stock Exchange Group	United Kingdom	Europe & Central Asia	High income	08:00	16:30			08:30
Luxembourg Stock Exchange	Luxembourg	Europe & Central Asia	High income	09:00	17:40			08:40
Malta Stock Exchange	Malta	Middle East & North Africa	High income	09:30	15:30			06:00
Moscow Exchange	Russia	Europe & Central Asia	Upper middle income	10:00	18:50			08:50
Muscat Securities Market	Sultanate of Oman	Middle East & North Africa	High income	10:00	14:00			04:00
Nairobi Securities Exchange	Kenya	Sub-Saharan Africa	Lower middle income	09:00	15:00			06:00
Nasdaq	USA	North America	High income	09:30	16:00			06:30
National Stock Exchange of India Limited	India	South Asia	Lower middle income	09:15	16:00			06:45
Nigerian Exchange	Nigeria	Sub-Saharan Africa	Lower middle income	10:00	14:30			04:30
NZX Limited	New Zealand	East Asia & Pacific	High income	10:00	17:00			07:00
The Philippine Stock Exchange, Inc.	Philippines	East Asia & Pacific	Lower middle income	09:30	15:30	12:00	13:30	04:30
Pakistan Stock Exchange	Pakistan	South Asia	Lower middle income	09:33	15:30			05:57
Qatar Stock Exchange	Qatar	Middle East & North Africa	High income	09:30	13:10			03:40
Saudi Exchange	Saudi Arabia	Middle East & North Africa	High income	10:00	15:10			05:10
Shanghai Stock Exchange	China	East Asia & Pacific	Upper middle income	09:30	15:00	11:30	13:00	04:00
Shenzhen Stock Exchange	China	East Asia & Pacific	Upper middle income	09:30	15:00	11:30	13:00	04:00
Singapore Exchange	Singapore	East Asia & Pacific	High income	09:00	17:00	12:00	13:00	07:00
SIX Swiss Exchange	Switzerland	Europe & Central Asia	High income	09:00	17:30			08:30
Stock Exchange of Mauritius	Republic of Mauritius	Sub-Saharan Africa	Upper middle income	10:00	14:30			04:30
Stock Exchange of Thailand	Thailand	East Asia & Pacific	Upper middle income	09:55	14:15	12:30	14:25	02:25
Taipei Exchange	Chinese Taiwan	East Asia & Pacific	High income	09:00	13:30			04:30
Taiwan Stock Exchange Corp.	Chinese Taiwan	East Asia & Pacific	High income	09:00	13:30			04:30
Tel-Aviv Stock Exchange	Israel	Middle East & North Africa	High income	10:00	17:15			07:15
TMX Group Limited	Canada	North America	High income	09:30	16:00			06:30
Tunis Stock Exchange	Tunisie	Middle East & North Africa	Lower middle income	09:00	14:05			05:05
Warsaw Stock Exchange	Poland	Europe & Central Asia	High income	09:00	17:00			08:00