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Seeking sigma: Time-of-the-day effects on the Bitcoin network

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ABSTRACT

This research investigates and tests for the presence of time-of-the-day effects on the Bitcoin network. Results indicate that NYSE trading sessions lead Bitcoin trading activity, both on the blockchain and centralised exchanges. Effects are found to have strengthened over time, however, simultaneously diminished at the weekend indicating significant exchange interactions, and that Bitcoin has developed somewhat outside its intended design parameters and is influenced by other forces such as those originating from NYSE trading. While proponents consider Bitcoin trading to be '24/7', our findings suggest that both transaction and on-chain network activity are best described to be, at best, '12/5', presenting significant implications for traders, with regards to centralised exchange liquidity and the speed of their transaction inclusion on the blockchain. Finally, the role and influence of both algorithm and volatility traders cannot be eliminated.

1. Introduction

Digital finance proponents have for some time considered cryptocurrency, such as Bitcoin, to be a significant emancipator from the 'restrictive' fiat currencies and traditional banking services. The continued market capitalisation growth has, to date, failed to mitigate regulatory, legal, and cyber-criminality issues, amongst several other confidence and reputationally damaging events (Gandal et al., 2018; Foley et al., 2019; Griffin and Shams, 2020; Corbet et al., 2021). Considering time-varying mining relocation due to regulation and cost management and identifying significant interactions between Bitcoin's exchange-traded interactions with that of US and European markets, (Wang et al., 2020), this research develops upon the novel Cardiff University Bitcoin Database (CUB*i*D), which contains all of the blocks, transactions, and addresses of the Bitcoin blockchain. This research, for the first time, investigates the existence of time-of-the-day effects on Bitcoin blockchain (i.e., on-chain) activity. Further, to specifically test for exchange-driven influence and to provide methodological robustness, models are separated to identify weekday effects in comparison to weekend effects.

There has been substantial evidence indicating the growing interaction between stock markets and cryptocurrencies over time (Katsiampa, 2017; Urquhart, 2016, 2017). Further indications of growing levels of investment from the US have been sourced in a broad acceptance by hedge funds and those more focused on traditional investment markets to enter cryptocurrencies through a growing number of derivative and exchange-traded fund products that have become available in recent years (Corbet et al., 2018a), particularly those funds with investment mandates to seek volatile assets in which they can invest. However, considering the growing role of algorithmic trading in cryptocurrency markets (Petukhina et al., 2021), this route also possesses a potential avenue through which weekend and weekday differentials could be sourced, particularly those utilising time-weighted average price, or volume-weighted trading strategies for example. Further evidence of weekend effects can be sourced when analysing the days of the week

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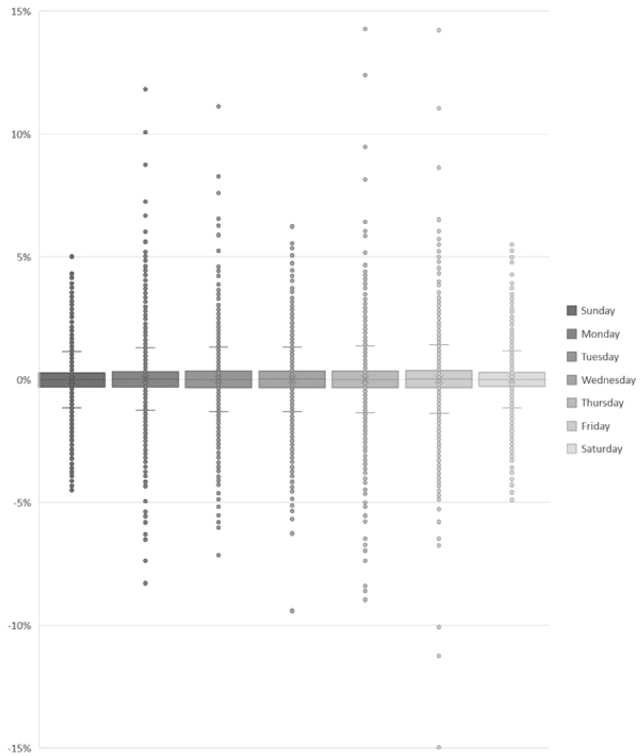

Fig. 1. Hourly volatility of Bitcoin prices as separated by day of the week. Note: The above figure is based on one-hour data obtained from the Bitfinex exchange. 36,693 observations were used between 1 January 2017 and 31 January 2021.

where more extreme outcomes occur, often a sign of reduced liquidity. In Fig. 1, we observe that at an hourly frequency of analysis, where data has been winsorized at a 0.1% level, weekends present the least volatility in a phenomenon often linked with periodic illiquidity.

2. Data

Two types of data are used in this paper. One is (CUB*i*D) where we obtain the information on all block headers, transactions, and both the input and output addresses to each transaction. Bitcoincharts is also used to obtain the exchange data that includes the time, volume, and price for each of the included exchanges. While CUB*i*D is updated constantly, our sample in this paper spans from 3 January 2009 through 31 December 2021, where sample selection allows for the comparison of entire yearly samples. The data obtained from CUB*i*D for the sample period includes 716,599 blocks, that further contain 699,372,899 transactions. The exchange data obtained from Bitcoincharts included 222,152,443 transactions, from 63 exchanges between 25 April 2010 and 31 December 2021. Both exchange and blockchain data are matched based on each respective timestamp.

3. Empirical approach and results

The separation of volatility and liquidity dynamics with Bitcoin pricing structures has proven to be quite a difficult concept to date. Specific effects and external influences have been identified, while time-varying aspects have also presented evidence of a rapidly maturing market, despite the many issues that remain (Cheah and Fry, 2015; Koutmos, 2018; Corbet et al., 2018b; Conlon et al., 2021). Research surrounding structural characteristics remains less coherent, particularly due to many phases of development that are evident when considering Bitcoin's relative youth. Recently, much evidence has pointed towards a gradual acceptance of cryptocurrency across professional traders and renowned international hedge funds, indicative of further evidence of maturity, and building upon the development of cryptocurrency derivatives products (Corbet et al., 2020). Such professional acceptance could potentially manifest in differential time-varying weekday and weekend effects, particularly due to further portfolio-based interactions with traditional financial markets (Białkowski, 2020). Developing upon a novel database, we examine whether identifiable effects exist in Bitcoin's internal structural network. Decentralisation and broad availability are two of the key characteristics of cryptocurrency that were envisaged and have been since advertised as key features by proponents. Under these circumstances, there should be little to differentiate between associated trading and network conditions. Due to the continuous mining and trading of Bitcoin, for example, we should not observe any direct relationships between the direct mining blockchain

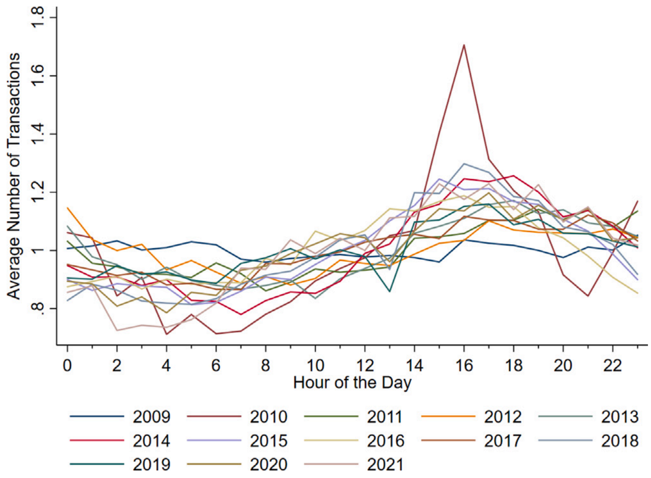

Fig. 2. Annually separated average number of transactions in Bitcoin network. Note: The above data used to create the above figure was obtained from CUBiD. Specifically, we observe the average number of Bitcoin blockchain transactions per hour, annually, for the period 2009 through 2021. The data illustrated in the above figure is normalised by dividing each observation by the average of that respective year. We complete this task to account for the varying magnitude of the number of transactions in each year.

of Bitcoin, its related trading exchanges, and that of the opening and closing times of major international exchanges. If Bitcoin was truly a decentralised digital currency and not that of a predominantly speculative investment vehicle, the Bitcoin network should not exhibit behavioural patterns similar to that of other traditional financial products during market open periods. Such behaviour would indicate significant influence sourced from sources such as professional, and potentially algorithmic sources, rather than that of retail investors.[1]

In Fig. 2, we observe the average number of Bitcoin blockchain transactions per hour, annually[2] for the period 2009 through 2021. Evidence suggests a peak in the number of Bitcoin network transactions at 14:00 GMT, with evidence becoming more pronounced over time. While the elevation in network activity coincides with the market opening hours of the NYSE exchange, it is also evident that the same elevation in activity subsequently declined sharply at 21:00 GMT, which is the same time at which the NYSE exchange closes each day.

We next establish whether further statistical evidence can validate this identified outcome during the operating hours of other major exchanges, such as that of the London Stock Exchange (LSE hereafter), and the Tokyo Stock Exchange (TSE hereafter). Table 1 presents summary statistics relating to the average number of on-chain transactions per block during the respective weekday trading days of the analysed exchange sessions. In Panel A of Table 1, we observe that in the period since 2010, there is significantly less network activity during TSE trading times (00:00 GMT through 06:00 GMT) relative to the remainder of the day as examined. Panel B presents further evidence supporting the existence of the same differential in behaviour, only that when considering the TSE lunch break (02:30 GMT through 03:30 GMT), there is not a firm statistically significant difference in behaviour, indicating a broad lack of influence upon the Bitcoin network during TSE trading hours.[3] In Panel C, to support and provide methodological robustness, we investigate the effects of LSE-only trading hours (between 08:30 GMT and 16:30 GMT), while Panel D presents results when the two overlapping hours of NYSE trading are omitted from the LSE trading session. Evidence suggests that there is a significant reduction in the number of on-chain transactions per block, further indicating the influence that the NYSE trading sessions present upon Bitcoin on-chain transaction activity.[4]

When considering the NYSE trading period alone, as considered in Panels E through G in Table 1, we verify that in each year since 2013, NYSE operating times have been significantly linked with increases in Bitcoin's on-chain trading activity, a result that again remains robust when considering overlapping exchange times. In Fig. 3 we report the normalised on-chain and exchange activities throughout the day.[5] This figure shows the high correlation between the on-chain and off-chain activity and also demonstrates

[1] Differential network behaviour surrounding exchange opening hours would present quite significant evidence against the decentralisation feature of Bitcoin, limiting its presence to little more than an unregulated extension of the FX market, ripe with fraud and criminality that raise significant concerns surrounding digital financial products. Direct exchange interconnectivity would indicate that the network is itself the only key distinguishing feature between Bitcoin and traditional FX products.

[2] The data illustrated in Fig. 2 is normalised by dividing each observation by the average of that respective year. We complete this task to account for the varying magnitude of the number of transactions in each year.

[3] A differential of behaviour during the TSE lunch break would have potentially signalled direct effects sourced within trading dynamics and on-chain transaction activity.

[4] However, we note that in both panels C and D, in the period before 2014, on-chain activity is moderately higher throughout the day in comparison. However, one can argue the financialization of Bitcoin was not significant up to these years.

[5] Data relating to the year 2009 is omitted from this presentation as the first Bitcoin trade did not occur until 2010.

Table 1
On-chain activity pattern during weekdays and different trading session.

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Panel A. TSE trading session (00:00 to 06:00)													
TSE	1.0	2.4	30.8	162.6	306.7	406.5	756.0	1425.3	1787.3	1324.2	2090.7	1856.0	1535.6
Rest	1.0	2.7	33.2	158.2	326.7	466.6	908.9	1635.6	1968.6	1654.9	2318.0	2317.7	2085.5
Diff	0.0	−0.3**	−2.4***	4.4**	−19.9***	−60.1***	−152.9***	−210.3***	−181.3***	−330.7***	−227.4***	−461.7***	−549.9***
Panel B. TSE lunch break (02:30 to 03:30) Compared with the rest of the TSE trading session													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
TSE LB	1.0	2.4	29.7	156.0	298.2	400.7	788.4	1428.6	1786.3	1361.9	2114.3	1844.2	1462.7
TSE	1.0	2.4	31.0	163.7	307.2	399.7	744.9	1393.3	1770.3	1298.9	2071.7	1836.1	1532.4
Diff	0.0	0.0	−1.2	−7.7	−8.9	1.0	43.5**	35.3	15.9	63.0***	42.6*	8.1	−69.7***
Panel C. LSE trading session (08:00 to 16:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE	1.0	2.7	31.1	151.4	306.1	446.3	913.8	1686.2	1924.2	1674.1	2304.7	2295.7	2078.7
Rest	1.0	2.7	32.4	160.9	320.5	434.2	824.0	1479.8	1870.2	1454.3	2193.4	2067.9	1791.8
Diff	0.0	0.0	−1.3***	−9.6***	−14.3***	12.1***	89.9***	206.4***	54.0***	219.8***	111.3***	227.9***	286.9***
Panel D. LSE trading session without NYSE overlap (08:00 to 14:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE-WO	1.0	2.4	29.7	148.1	293.0	416.1	871.1	1636.8	1889.9	1581.5	2247.0	2240.3	2008.6
Rest	1.0	2.8	32.7	161.1	323.2	444.8	846.2	1515.5	1886.4	1503.3	2222.0	2107.1	1841.2
Diff	0.0**	−0.4**	−3.1***	−12.9***	−30.3***	−28.7***	24.9***	121.3***	3.5	78.2***	25.1***	133.2***	167.4***
Panel E. LSE & NYSE trading session overlap (14:30 to 16:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE/NYSE	1.0	3.5	35.9	162.1	349.0	547.1	1049.7	1849.4	2035.6	1979.2	2485.0	2472.3	2306.6
Rest	1.0	2.7	31.3	155.0	308.2	420.4	829.2	1503.5	1855.0	1466.0	2195.2	2090.7	1826.4
Diff	0.0	0.8***	4.6***	7.0**	40.8***	126.7***	220.5***	346.0***	180.6***	513.2***	289.8***	381.6***	480.1***
Panel F. NYSE trading session (14:30 to 21:00)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NYSE	1.0	3.3	35.8	167.5	364.5	542.8	1024.5	1775.0	2087.9	1867.7	2446.4	2493.4	2292.4
Rest	1.0	2.6	30.4	152.2	296.1	397.0	793.5	1456.6	1805.6	1395.3	2148.0	2010.6	1736.8
Diff	0.0	0.8***	5.4***	15.3***	68.4***	145.8***	231.0***	318.4***	282.3***	472.3***	298.4***	482.8***	555.6***
Panel G. NYSE trading session without LSE overlap (16:30 to 21:00)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NYSE WO	1.0	3.3	35.8	169.9	371.5	541.0	1013.0	1742.6	2111.6	1821.0	2429.5	2502.8	2286.2
Rest	1.0	2.7	30.9	152.8	300.5	409.8	816.0	1490.1	1825.6	1446.8	2179.4	2052.0	1783.4
Diff	0.0	0.6***	4.8***	17.1***	71.0***	131.1***	197.0***	252.5***	285.9***	374.2***	250.1***	450.9***	502.7***
Panel H. After NYSE close (21:00 to 23:59)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
After	1.0	2.7	37.2	169.5	349.6	480.9	849.0	1447.9	2037.9	1546.7	2278.7	2320.9	2067.3
Rest	1.0	2.8	31.3	153.8	306.6	425.4	844.3	1526.3	1847.9	1498.1	2210.9	2102.5	1840.3
Diff	0.0***	−0.1	5.9***	15.7***	43.0***	55.5***	4.7	−78.4***	190.0***	48.6***	67.8***	218.4***	227.0***

Note: This table reports the average number of transactions per block during each respective exchange trading session during analysed weekdays. The row 'Rest' in each panel reports that of the trading session outside of this time. The row 'Diff' in each panel demonstrates the difference between the exchange's trading session and that of the rest of the data examined. TSE, LSE, and NYSE stand for Tokyo Stock Exchange, London Stock Exchange, and New York Stock Exchange, respectively.

*Denote significance at the 10% level.

**Denote significance at the 5% level.

***Denote significance at the 1% level.

the bell-shaped behaviour around the NYSE trading session. One key direction for future research would surround the role that algorithmic traders possess in driving such behaviour. In Panel H of Table 1, we verify that the identified effects reduce substantially in the period after the close of the NYSE exchange, until midnight when the cycle begins once again.

In Table 2, we repeat the differential analyses based on-exchange activity trading patterns for only weekends between 2009 and 2021. In Table 3, we present evidence of a basic difference in difference analysis to present the key differentials between weekend and weekday trading conditions. While minimal differentials exist between the trading times of the Tokyo Stock Exchange, since 2016, there has been evidence of small differentials in on-exchange activity during LSE trading times excluding NYSE times. When considering US trading hours between 14:30 GMT and 21:00 GMT, evidence suggests a significant decline in on-chain activity at the weekend when compared to weekdays, evidence of which has been growing significantly since 2014 but has been particularly

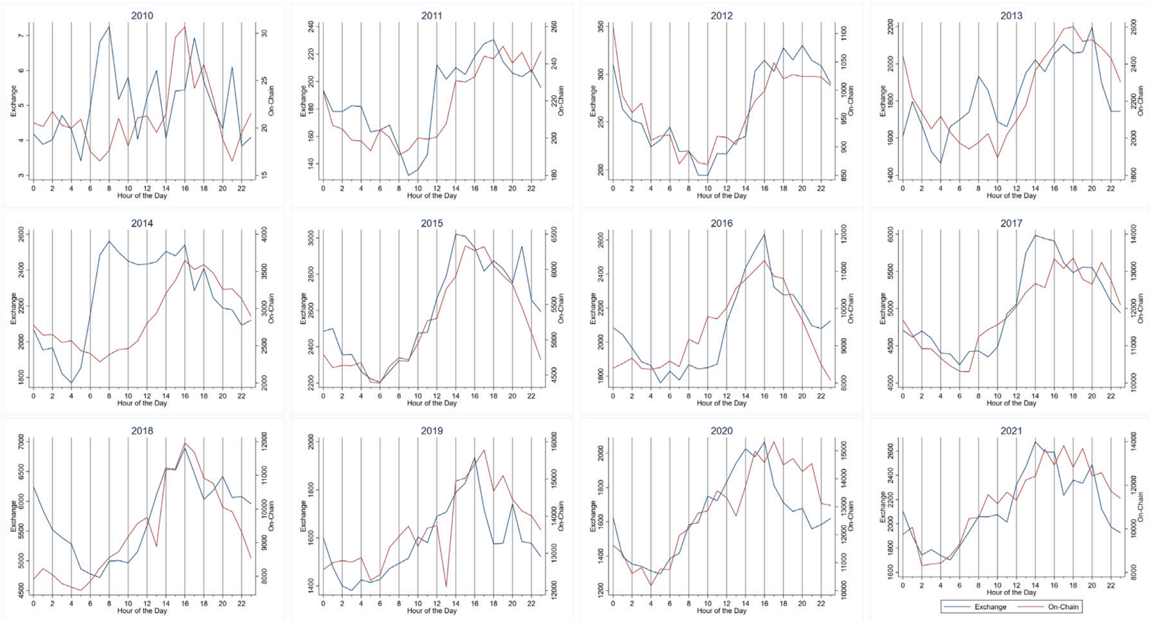

Fig. 3. Average number of transactions in Bitcoin network and exchanges. Note: The above data used to create the above figure was obtained from CUB*i*D. In the above figure, we report the normalised on-chain and exchange activities throughout the day. Data relating to the year 2009 is omitted from this presentation as the first Bitcoin trade did not occur until 2010.

pronounced since 2016. This result provides substantial evidence that not only does there exist evidence of elevated exchange activity while the NYSE exchange is open from Monday to Friday but while weekend volumes remain elevated, the same hour-of-the-day effects are found to diminish at the weekends. This latter result adds further evidence supporting the observations that NYSE traders are presenting a very significant influence upon Bitcoin exchange and on-chain activity.

In Table 4, we verify that since 2011, there has existed a significant large positive correlation between both on-chain and exchange transactions. Results indicate that there has long existed a strong correlation between these transactions (Corbet et al., 2019). It is interesting to note that even with such a high correlation when separating results by weekday and weekend statistics, both substantial and significant differentials are found to exist. Weekend correlations are found to fall by approximately one-third, providing further evidence of the decoupling behaviour identified at the weekend when compared to weekdays. Such a result further verifies that effects can be attributed directly to days when the NYSE is open.

To separate the effects of institutional and retail investors in the US, we focus on the origins of 60.2% of all Bitcoin trades between 3 January 2009 and 1 December 2017 (due to data availability constraints), where similar to Foley et al. (2019), the IP addresses of 166,794,643 transactions were verified.[6] No discernible hour-of-the-day patterns were identified to be sourced in the US, New York state, or New York City. This result indicates that the identified NYSE trading hour phenomenon is not due to trading activity sources in the US, but primarily due to the US, and in particular, New York's role as a facilitator of Bitcoin trading and exchange activity.

4. Conclusions

This research utilises both the Bitcoin network and exchange data to identify the existence of a significant hour-of-the-day effect across transaction volumes. Not only do we verify previously identified trading activity elevation of network activity during NYSE trading hours, but we also find that this behaviour is also identified between exchange and on-chain activity. Further evidence is presented of diminished weekend effects, through modelling both samples in isolation, but also through pairwise correlation analysis to provide additional methodological robustness. Such results indicate a heavily weekday-specific effect, directly reliant on NYSE exchange activity, Analysis of the US and New York sourced trading volumes appear to be relatively stable, indicating that the observed NYSE effect is most likely due to an investment facilitation presence through New York. The role of algorithmic trading cannot be eliminated.

[6] Results and further details of this analysis are omitted for brevity of presentation but are available from the authors upon request.

Table 2
On-chain activity pattern during weekend and different trading session.

Panel A. TSE trading session (00:00 to 06:00)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
TSE	1.0	3.1	30.0	147.8	279.8	370.9	743.4	1275.2	1637.7	1241.3	2036.4	1800.8	1518.5
Rest	1.0	2.9	30.4	143.2	276.9	373.9	766.1	1314.6	1696.4	1308.1	2077.0	1917.3	1649.6
Diff	0.0	0.2	−0.3	4.6*	2.8	−3.0	−22.7***	−39.4***	−58.8***	−66.8***	−40.6***	−116.5***	−131.2***
Panel B. TSE lunch break (02:30 to 03:30) Compared with the rest of the TSE trading session													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
TSE LB	1.0	3.1	30.1	146.0	275.3	370.7	740.9	1260.7	1612.3	1247.2	2032.5	1806.7	1524.4
TSE	1.0	3.0	30.8	155.2	294.1	386.5	749.8	1310.2	1694.8	1266.3	2052.8	1842.2	1559.8
Diff	0.0	0.1	−0.7	−9.2***	−18.9***	−15.8***	−8.9	−49.5***	−82.4***	−19.1	−20.3	−35.6***	−35.4***
Panel C. LSE trading session (08:00 to 16:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE	1.0	3.1	29.8	142.9	274.3	367.6	762.1	1316.7	1663.1	1293.7	2066.7	1873.8	1596.9
Rest	1.0	2.6	30.6	152.4	290.7	386.2	752.4	1356.0	1725.1	1300.5	2082.5	1876.0	1583.6
Diff	0.0	0.5**	−0.8*	−9.5***	−16.5***	−18.6***	9.6	−39.3***	−61.9***	−6.9	−15.8	−2.2	13.3
Panel D. LSE trading session without NYSE overlap (08:00 to 14:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE-WO	1.0	3.0	29.6	142.8	271.9	363.1	753.3	1295.6	1645.7	1264.3	2052.5	1848.3	1574.9
Rest	1.0	2.6	30.7	152.1	291.2	387.4	755.9	1363.1	1730.2	1311.5	2087.4	1885.5	1592.3
Diff	0.0	0.4*	−1.1**	−9.3***	−19.3***	−24.2***	−2.7	−67.5***	−84.4***	−47.2***	−34.9***	−37.3***	−17.4*
Panel E. LSE & NYSE trading session overlap (14:30 to 16:30)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
LSE/NYSE	1.0	3.2	30.5	145.6	276.9	376.3	751.2	1286.8	1633.8	1283.4	2050.1	1844.1	1563.7
Rest	1.0	2.5	30.2	150.0	289.9	391.4	787.9	1437.7	1774.2	1378.2	2130.2	1981.1	1707.6
Diff	0.0	0.7***	0.3	−4.4**	−13.0***	−15.2***	−36.7***	−150.9***	−140.3***	−94.9***	−80.0***	−137.0***	−143.9***
Panel F. NYSE trading session (14:30 to 21:00)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NYSE	1.0	3.1	30.9	145.6	281.5	386.8	763.4	1303.7	1673.9	1321.8	2078.8	1906.1	1630.9
Rest	1.0	2.6	30.0	150.2	289.1	389.2	786.1	1439.5	1768.7	1371.6	2125.6	1969.7	1695.1
Diff	0.0	0.5***	0.8**	−4.7**	−7.7***	−2.4	−22.7***	−135.9***	−94.8***	−49.8***	−46.8***	−63.6***	−64.2***
Panel G. NYSE trading session without LSE overlap (16:30 to 21:00)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NYSE WO	1.0	3.0	30.7	145.7	279.5	383.4	754.2	1280.4	1656.2	1292.0	2064.4	1881.0	1609.5
Rest	1.0	2.7	30.5	151.1	294.2	402.2	809.2	1475.1	1792.6	1424.7	2157.5	2014.6	1747.3
Diff	0.0	0.3	0.1	−5.3**	−14.7***	−18.7***	−55.1***	−194.6***	−136.5***	−132.7***	−93.1***	−133.5***	−137.8***
Panel H. After NYSE close (21:00 to 23:59)													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
After	1.0	3.0	30.6	145.3	274.0	371.4	732.9	1245.0	1626.4	1239.3	2029.4	1824.8	1553.3
Rest	1.0	2.7	31.4	153.9	306.5	425.1	843.2	1519.6	1844.4	1494.4	2205.3	2097.2	1838.0
Diff	0.0	0.2	−0.8*	−8.6***	−32.5***	−53.7***	−110.2***	−274.6***	−218.0***	−255.0***	−175.9***	−272.4***	−284.7***

This table reports the average number of transactions per block during each respective exchange trading session at the weekends. The row 'Rest' in each panel reports that of the trading session outside of this time. The row 'Diff' in each panel demonstrates the difference between the exchange's trading session and that of the rest of the data examined. TSE, LSE, and NYSE stand for Tokyo Stock Exchange, London Stock Exchange, and New York Stock Exchange, respectively.

*Denote significance at the 10% level.

**Denote significance at the 5% level.

***Denote significance at the 1% level.

Table 3
Weekend trading differentials compared to active weekday trading hours.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
TSE trading session (00:00 to 06:00)	0.1	0.5	−1.5	−10.0	−16.8	−52.4	−84.8	−98.3	−82.1	−62.9	−43.7	34.3
LSE trading session ex NYSE (08:00 to 14:30)	0.8	2.0	3.6	11.0	4.5	−27.6	−188.8	−87.9	−125.4	−60.0	−170.5	−184.8
NYSE trading session (14:30 to 21:00)	−0.3	−4.6	−20.0	−76.1	−148.2	−253.7	−454.3	−377.1	−522.1	−345.2	−546.4	−619.8
Post all market close (21:00 to 23:59)	0.3	−6.7	−24.3	−75.5	−109.2	−114.9	−196.2	−408.0	−303.6	−243.7	−490.8	−511.7

Note: In the above table, we present evidence of a basic difference in difference analysis to present the key differentials between weekend and weekday trading conditions.

Table 4
Pairwise correlation between exchange and on-chain activity.

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
All days	−0.03	0.79***	0.91***	0.65***	0.23	0.91***	0.78***	0.87***	0.73***	0.69***	0.77***	0.82***
Weekdays	0.27	0.81***	0.86***	0.65***	0.29	0.92***	0.82***	0.85***	0.75***	0.65***	0.72***	0.82***
Weekends	−0.07	0.58***	0.82***	0.35*	0.11	0.73***	0.61***	0.78***	0.54***	0.43**	0.59***	0.68***

Note:
*Denote significance at the 10% level.
**Denote significance at the 5% level.
***Denote significance at the 1% level.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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