Crypto's Circadian Rhythm

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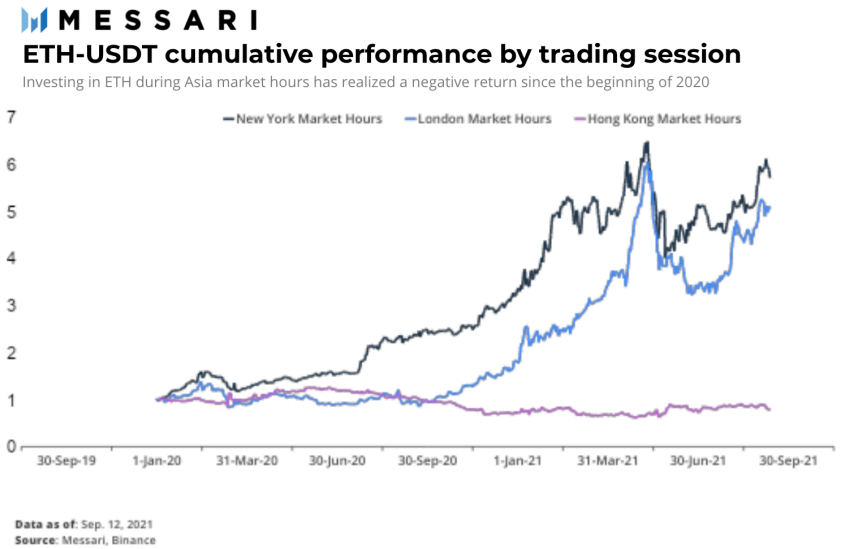
An interesting anomaly in traditional markets is the difference between returns during trading hours and those accrued overnight. A buy and hold investor in the SPY ETF (which tracks the S&P 500 index) would have made over 7x on their investment since it began in 1993. However, if they had only held during market opening hours (between U.S. open and U.S. close) over the same period, they would have made no returns - all of the performance in the SPY ETF was generated overnight, between the previous day's close and the market open.

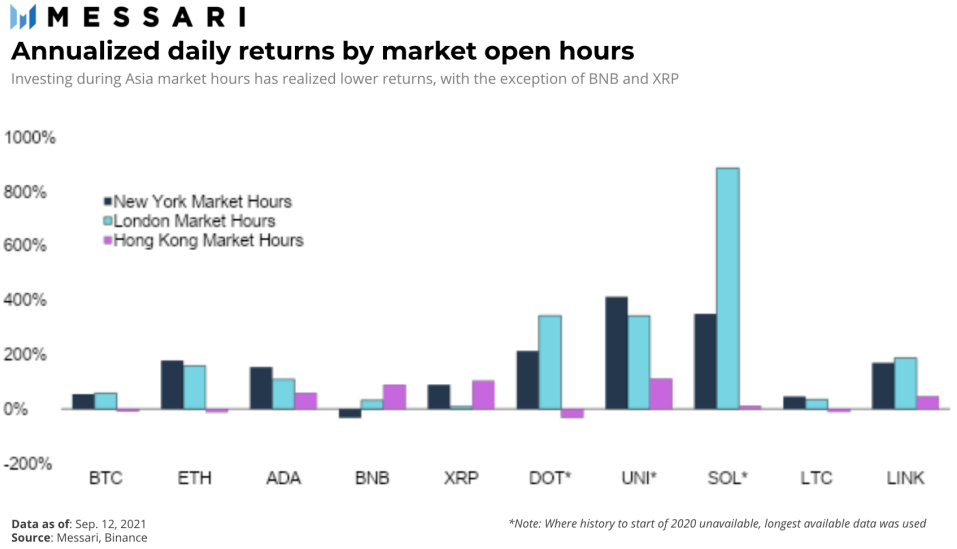
A key distinction between cryptocurrencies and traditional markets is the 24/7 nature of digital assets - unlike stocks, trading is not bound by exchange opening days and times. But even if tokens are global in nature, market participants are still beholden to differences in time zones and the need for sleep (though the average crypto trader may get less of it than most!). And when disaggregating the trading day to look like traditional market open hours (New York, London, Hong Kong), it becomes apparent that returns to holding cryptocurrencies do not accrue linearly over time.



Were an investor to have held ETH since the beginning of 2020, they would have increased their initial investment over 26x (to 12 September 2021). However, if the same investor only held ETH during Hong Kong market hours, they would instead have realized a negative return. Conversely, if they had held ETH during New York or London market hours instead, they would have still captured a large proportion of the returns.

We have seen similar behavior across the majority of the largest coins during this period. With a couple of exceptions, the Asia trading session has broadly seen a significantly weaker

performance, with negative cumulative returns in the cases of BTC, ETH, and LTC. In contrast, BNB appears to display the opposite pattern, experiencing extremely poor returns during U.S. market hours, whilst generating the majority of its gains when Hong Kong is open. Interestingly, XRP has seen its returns accumulate during the U.S. and Asia trading sessions but has been much weaker during London hours. In spite of the differences in the level of returns experienced by these assets during different trading sessions, correlations between the cryptocurrencies have been stable across all three trading sessions - they have co-moved around their trends in a similar way throughout the day.



What Drives Returns in Crypto?

Traditional asset pricing theory dictates that asset returns are the reward for bearing risk. Proxying risk with volatility, the majority of these cryptocurrencies are slightly less volatile during Hong Kong market hours over this period (10% to 15% lower, using 1-minute data), pointing to a smaller risk premium. But this is not enough to explain the stark difference in performance, especially in the cases where realized returns are negative during Asia hours.

When considering tail risk (the skew of 1-minute returns), results look more nuanced. All cryptocurrencies have displayed significant negative skewness during U.S. market hours (namely, their largest moves have been to the downside), which is not the case during Asia market hours, where all but XRP have had positively skewed returns. Thus, compensation for additional tail risk during New York market hours could be a contributor to the additional returns during US hours. Yet skewness doesn't explain the London trading session, which has broadly shown performance on par (or in excess of) the U.S. in this particular sample but without the tail risk - returns during London hours have in fact been positively skewed for the majority of these assets since January 2020. It is worth noting that the usefulness of volatility and skew are limited by the noise in the data, but during this period at least, there is limited evidence that the difference in returns across market hours is driven by these traditional measures of risk.

Other commonly cited drivers for cryptocurrency prices, such as monetary policy, inflation, token supply, and network effects also lack the nuance to explain intraday differences.

Supply schedules, central bank policy, and network adoption are linear and/or slower moving phenomena that don't vary systematically between Asia and U.S. market hours on a daily basis.

Conclusion

The disparity in returns for the largest cryptocurrencies during different times of day are an anomaly that cannot be fully explained by the main economic arguments supporting these assets as a store of value. The most likely drivers are intraday nuances in market microstructure. Whether this anomaly can be exploited for profit going forward depends on the extent to which the drivers persist. For example, if selling pressure from miners in Asia are driving the difference, will the recent changes in geographic distribution of mining operations break this pattern? How will changes in mining incentives (such as EIP-1559) and evolving regulation for institutional investors alter the landscape? Crypto's circadian rhythm will be interesting to monitor going forward as it might shed light on changes in supply and demand dynamics.