The Impact of Spot Bitcoin ETFs: Trading Activity and Volatility Patterns

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August 30, 2024

This research shows the impact of Bitcoin Exchange-Traded Funds (ETFs) on Bitcoin's trading activity and volatility patterns, with a specific focus on differences between weekdays and weekends. We analyze changes in realized and implied volatility pre- and post-ETF introduction. The analysis reveals that overall trading volume and realized volatility have increased since the launch of Bitcoin ETFs, but this increase is predominantly observed on weekdays. Post-ETF weekdays exhibit significantly higher price fluctuations than weekends, indicating a shift in trading activity towards traditional market hours. Despite these shifts, the anticipated reduction in implied volatility on weekends post-ETF is not statistically significant, suggesting stable market risk expectations. These findings highlight how Bitcoin ETFs are shaping trading behaviors, aligning Bitcoin's market dynamics more closely with those of traditional financial markets. Understanding these changes is essential for traders and investors seeking to optimize their strategies in the evolving cryptocurrency landscape.

Introduction

Bitcoin has long been known for its volatility, with dramatic price swings capturing the attention of traders, investors, and the media alike. However, the introduction of Bitcoin Exchange-Traded Funds (ETFs) has introduced a new dynamic to the cryptocurrency market, potentially altering trading behaviors and volatility patterns. Bitcoin ETFs, which allow investors to gain exposure to Bitcoin without directly purchasing the cryptocurrency, have been seen as a bridge between traditional finance and the digital asset world. Since the first Bitcoin ETFs began trading, there has been a growing interest in understanding how they impact the behavior of Bitcoin prices, particularly regarding volatility during different times of the week.

Traditionally, Bitcoin's volatility has been a round-the-clock affair, with significant price movements observed at all hours and on all days, including weekends. This is in contrast to traditional financial markets, where trading activity typically slows down on weekends when markets are closed. With the advent of Bitcoin ETFs, questions have arisen about whether this new investment vehicle could bring

about more conventional trading patterns to the Bitcoin market. Specifically, market participants and analysts have been keen to understand whether the introduction of ETFs has led to reduced volatility on weekends, mirroring the behavior of traditional assets.

This article seeks to explore these questions by analyzing hourly Bitcoin price (BTCUSD) and Bitcoin Volmex Implied Volatility Index (BVIV) data, along with trading volumes, over a two-year period. We aim to understand how the launch of Bitcoin ETFs has influenced realized and implied volatility during weekdays and weekends. By examining data from both pre- and post-ETF periods, we can identify trends and shifts in market behavior, and gain insights into market expectations for future price movements and how these expectations may have changed with the introduction of ETFs.

Our analysis not only sheds light on whether weekends have indeed become quieter since the trading of ETFs started but also examines the broader implications for Bitcoin's trading behavior and risk dynamics. By understanding these shifts, traders and investors can better navigate the evolving landscape of the cryptocurrency market, making more informed decisions about their trading strategies and risk management approaches.

Following sections cover the data and methodology, as well as the findings of our study. We will discuss how Bitcoin's realized volatility, implied volatility, and spot trading volumes have changed, comparing pre- and post-ETF periods. This exploration will provide valuable insights into how the integration of Bitcoin into more traditional financial instruments, such as ETFs, is shaping the future of cryptocurrency trading and market behavior. As Bitcoin continues to mature and its market infrastructure evolves, understanding these dynamics will be crucial for anyone looking to participate in the cryptocurrency space.

Data and Methodology

To understand how Bitcoin’s price and volatility behavior have changed, we analyzed hourly price and implied volatility open-high-low-close (OHLC) data from September 20, 2022, to August 26, 2024.

The data sources included Bitcoin price (BTCUSD) data from CoinMarketCap (CMC) and the Bitcoin Volmex Implied Volatility Index (BVIV) data from Volmex.

We focused on two distinct periods: before Bitcoin ETFs began trading (pre-ETF, up to the end of January 10, 2024) and after they were introduced (post-ETF, starting January 11, 2024).

We constructed several key variables to conduct our analysis:

1. **BTC Price Range:** This proxies the realized volatility of Bitcoin and is calculated as the high minus the low price, annualized.
2. **BTC Trade Volume:** This proxies the trading activity of Bitcoin. It is in billion USD.
3. **Average BVIV:** Represents the implied volatility levels for each hour, calculated using the open and close levels of the BVIV.

4. **BVIV Range:** To proxy the realized volatility of the BVIV.

We also categorized the data into two sets: (1) weekday versus weekend and (2) pre-ETF versus post-ETF periods.

The analysis uses regression techniques to explore how Bitcoin's volatility and trading behavior have evolved. Below is the template of these regressions:

$$y_t = c + \beta_{is\_weekend} \times 1_{is\_weekend} + \beta_{post-ETF} \times 1_{post-ETF} + \beta_{post-ETF-weekend} \times 1_{weekend} \times 1_{post-ETF}$$

where y_t is the dependent variable, c is the regression constant, $\beta_{is\_weekend}$ is the coefficient for the weekend dummy,[1] $\beta_{post-ETF}$ is the coefficient for the post-ETF era dummy,[2] and $\beta_{post-ETF-weekend}$ is the coefficient for the interaction term[3] which controls post-ETF weekends.

Results

BTC Price Range and Trading Volume

To understand how Bitcoin's realized volatility has changed, we regressed the BTC price range on three dummy variables mentioned above:

$$prc\_range_t = c + \beta_{is\_weekend} \times 1_{is\_weekend} + \beta_{post-ETF} \times 1_{post-ETF} + \beta_{post-ETF-weekend} \times 1_{weekend} \times 1_{post-ETF}$$

	coef	std err	t	P>|t|	[0.025	0.975]
const	49.6254	0.514	96.469	0.000	48.617	50.634
is_weekend	-20.8032	0.963	-21.599	0.000	-22.691	-18.915
post-ETF	25.3724	0.902	28.126	0.000	23.604	27.141
post-ETF-weekend	-9.0733	1.686	-5.382	0.000	-12.378	-5.769

Table 1: BTC Price Range Regression results

Our findings revealed some interesting patterns:

- Weekends have 20.80 points less volatility than weekdays, showing a clear pattern of reduced price movements on weekends.

[1] Indicates whether the observation is during a weekend
[2] Indicates whether the observation is from the post-ETF period
[3] Indicates whether the observation is a weekend in the post-ETF period

- Post-ETF era exhibits 25.37 points more volatility than the pre-ETF period, suggesting that Bitcoin ETFs have increased overall market activity.
- Weekends in the post-ETF era show 9.07 points less volatility compared to pre-ETF weekends.

All coefficients were statistically significant, indicating that these observations are robust and not due to random chance. This suggests that while the introduction of Bitcoin ETFs has increased overall market volatility, weekends have become relatively calmer.

To support this finding, we also analyzed trading volumes, and regressed the BTC trade volume (in billion USD) on three dummy variables:

$$volume_t = c + \beta_{is\_weekend} \times 1_{is\_weekend} + \beta_{post-ETF} \times 1_{post-ETF} + \beta_{post-ETF-weekend} \times 1_{weekend} \times 1_{post-ETF}$$

	coef	std err	t	P>|t|	[0.025	0.975]
const	23.1375	0.139	166.294	0.000	22.865	23.410
is_weekend	-6.6954	0.261	-25.702	0.000	-7.206	-6.185
post-ETF	11.6094	0.244	47.582	0.000	11.131	12.088
post-ETF-weekend	-3.9883	0.456	-8.747	0.000	-4.882	-3.095

Table 2: BTC Trade Volume (in billion USD) Regression results

Our findings are below:

- Weekends see 6.70 billion USD less trading per hour than weekdays.
- The post-ETF era sees 11.61 billion USD more trading per hour compared to the pre-ETF period.
- Post-ETF weekends experience 3.99 billion USD less trading than pre-ETF weekends.

The shift in trading volume towards weekdays in the post-ETF period aligns with the realized volatility patterns, suggesting that ETF trading has led to more concentrated trading activity during traditional market hours.

BVIV Levels and Range

Next, we examined the Bitcoin Volmex Implied Volatility Index (BVIV) to understand changes in implied volatility, which reflects market expectations of future price movements, and regressed the BVIV levels (i.e. average of open and close levels) on three dummy variables as shown below:

$$BVIV_t = c + \beta_{is\_weekend} \times 1_{is\_weekend} + \beta_{post-ETF} \times 1_{post-ETF} + \beta_{post-ETF-weekend} \times 1_{weekend} \times 1_{post-ETF}$$

	coef	std err	t	P>|t|	[0.025	0.975]
const	56.5616	0.123	458.009	0.000	56.319	56.804
is_weekend	-1.2576	0.231	-5.439	0.000	-1.711	-0.804
post-ETF	3.8838	0.217	17.934	0.000	3.459	4.308
post-ETF-weekend	-0.0967	0.405	-0.239	0.811	-0.890	0.697

Table 3: BVIV Levels Regression results

Results:

- Weekends have 1.26 points less implied volatility than weekdays, confirming that weekends are generally less volatile.
- Post-ETF period has 3.88 points more implied volatility than the pre-ETF period, suggesting that the market expects more price movements post-ETF.
- However, post-ETF weekends show only 0.10 points less implied volatility than pre-ETF weekends, which is not statistically significant.

This indicates that while realized volatility has declined on weekends post-ETF, the market's expectations (as reflected in implied volatility) have not adjusted in a statistically significant way. It suggests that option market participants may be pricing options similarly to pre-ETF weekends, perhaps due to existing hedging and risk management strategies.

Finally, we regressed the hourly BVIV ranges on three dummy variables:

$$BVIV\_range_t = c + \beta_{is\_weekend} \times 1_{is\_weekend} + \beta_{post-ETF} \times 1_{post-ETF} + \beta_{post-ETF-weekend} \times 1_{weekend} \times 1_{post-ETF}$$

	coef	std err	t	P>|t|	[0.025	0.975]
const	88.6928	0.956	92.747	0.000	86.818	90.567
is_weekend	-21.7063	1.790	-12.123	0.000	-25.216	-18.197
post-ETF	-13.1830	1.677	-7.861	0.000	-16.470	-9.896
post-ETF-weekend	8.2462	3.134	2.631	0.009	2.103	14.389

Table 4: BVIV Ranges Regression results

The analysis of BVIV range revealed:

- Weekends have 21.71 points less realized volatility of BVIV than weekdays, confirming a consistent pattern of lower weekend uncertainty in BVIV.
- Post-ETF era has 13.18 points less volatility than the pre-ETF period.
- Interestingly, post-ETF weekends show 8.25 points more volatility than pre-ETF weekends.

This increase in the BVIV range on post-ETF weekends might suggest increased option trading activity during weekends post-ETF, possibly as market participants engage in more hedging or speculative activities during these times.

Conclusion

Our analysis provides clear evidence that the introduction of BTC ETFs has significantly influenced trading behavior and volatility patterns within the BTC market. While BTC has always been known for its volatility, the trading of spot BTC ETFs has added a new layer of complexity to its market dynamics. The data shows that overall trading volume and realized volatility have increased since ETFs were introduced. However, this increased activity is more concentrated on weekdays as expected, leading to a noticeable divergence in volatility patterns between weekdays and weekends.

Before the introduction of ETFs, BTC was already exhibiting significant price movements between weekday and weekend trading behavior. In the Post-ETF era, our analysis reveals that weekdays now see considerably higher levels of trading activity and volatility compared to weekends. Specifically, the realized volatility of Bitcoin prices is markedly lower on weekends in the post-ETF era, suggesting that more trading and significant price movements are happening during traditional market hours. This shift may be attributed to the influence of institutional investors and more structured trading activities driven by the introduction of ETFs.

Interestingly, while realized volatility has decreased on weekends post-ETF, we show that the reduction in implied volatility on weekends is not statistically significant. This suggests that, although trading patterns have shifted, the market's expectations of future price movements and risk have remained relatively stable. It appears that while ETFs have indeed changed when and how Bitcoin is traded, they haven't fundamentally altered how market participants price in risk over the weekend. This stability in implied volatility may indicate that options market participants continue to maintain similar risk management and hedging strategies as before, even with the availability of ETFs.

The introduction of spot ETFs has brought BTC trading patterns closer to those seen in traditional financial markets, where activity typically peaks during weekdays when markets are open and institutional investors are active. This trend aligns with the growing institutional adoption of Bitcoin, as ETFs provide a familiar and regulated investment vehicle that bridges the gap between traditional finance and the crypto world. By drawing more traditional market participants into the Bitcoin space, ETFs have helped to integrate Bitcoin more deeply into the global financial ecosystem.

As Bitcoin continues to evolve and mature, the impact of spot ETFs and other institutional-grade financial products will likely become more pronounced. Understanding these dynamics is crucial for traders, investors, and analysts who aim to navigate the rapidly changing cryptocurrency landscape. For traders, recognizing that volatility may be higher during weekdays can inform strategies around timing trades and managing risk. For investors, understanding these shifts can help in making informed decisions about portfolio allocation and diversification.

In conclusion, the spot Bitcoin ETFs has undeniably altered the trading landscape for Bitcoin, bringing about more structured and traditional trading patterns. The cryptocurrency market is still in its early stages of integration with traditional financial systems, and as it evolves, new factors will likely influence trading behavior and volatility. For those actively participating in the market, keeping abreast of these changes will be key to maximizing opportunities and minimizing risks.

Appendix

A. BTC Price Range Regression: Full Set of Results

OLS Regression Results

Dep. Variable:	prc_range	**R-squared:**	0.097
Model:	OLS	**Adj. R-squared:**	0.097
Method:	Least Squares	**F-statistic:**	607.6
Date:	Fri, 30 Aug 2024	**Prob (F-statistic):**	0.00
Time:	16:30:51	**Log-Likelihood:**	-89230.
No. Observations:	16968	**AIC:**	1.785e+05
Df Residuals:	16964	**BIC:**	1.785e+05
Df Model:	3		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	49.6254	0.514	96.469	0.000	48.617	50.634
is_weekend	-20.8032	0.963	-21.599	0.000	-22.691	-18.915
post-ETF	25.3724	0.902	28.126	0.000	23.604	27.141
post-ETF-weekend	-9.0733	1.686	-5.382	0.000	-12.378	-5.769

Omnibus:	15528.548	**Durbin-Watson:**	1.030
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	902457.905
Skew:	4.265	**Prob(JB):**	0.00
Kurtosis:	37.694	**Cond. No.**	5.88

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

B. BTC Trade Volume Regression: Full Set of Results

OLS Regression Results

Dep. Variable:	volume	**R-squared:**	0.193
Model:	OLS	**Adj. R-squared:**	0.193
Method:	Least Squares	**F-statistic:**	1349.
Date:	Fri, 30 Aug 2024	**Prob (F-statistic):**	0.00
Time:	16:34:08	**Log-Likelihood:**	-67043.
No. Observations:	16968	**AIC:**	1.341e+05
Df Residuals:	16964	**BIC:**	1.341e+05
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	23.1375	0.139	166.294	0.000	22.865	23.410
is_weekend	-6.6954	0.261	-25.702	0.000	-7.206	-6.185
post-ETF	11.6094	0.244	47.582	0.000	11.131	12.088
post-ETF-weekend	-3.9883	0.456	-8.747	0.000	-4.882	-3.095

Omnibus:	9020.329	**Durbin-Watson:**	0.014
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	87740.441
Skew:	2.378	**Prob(JB):**	0.00
Kurtosis:	13.074	**Cond. No.**	5.88

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

C. BVIV Level Regression: Full Set of Results

OLS Regression Results

Dep. Variable:	iv_avg	**R-squared:**	0.028
Model:	OLS	**Adj. R-squared:**	0.028
Method:	Least Squares	**F-statistic:**	163.3
Date:	Fri, 30 Aug 2024	**Prob (F-statistic):**	2.22e-104
Time:	16:42:53	**Log-Likelihood:**	-65019.
No. Observations:	16968	**AIC:**	1.300e+05
Df Residuals:	16964	**BIC:**	1.301e+05
Df Model:	3		
Covariance Type:	nonrobust		

	coef	**std err**	**t**	**P>|t|**	**[0.025**	**0.975]**
const	56.5616	0.123	458.009	0.000	56.319	56.804
is_weekend	-1.2576	0.231	-5.439	0.000	-1.711	-0.804
post-ETF	3.8838	0.217	17.934	0.000	3.459	4.308
post-ETF-weekend	-0.0967	0.405	-0.239	0.811	-0.890	0.697

Omnibus:	735.393	**Durbin-Watson:**	0.002
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	833.057
Skew:	0.536	**Prob(JB):**	1.27e-181
Kurtosis:	3.174	**Cond. No.**	5.88

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.

D. BVIV Range Regression: Full Set of Results

OLS Regression Results

Dep. Variable:	iv_range	**R-squared:**	0.014
Model:	OLS	**Adj. R-squared:**	0.013
Method:	Least Squares	**F-statistic:**	77.68
Date:	Fri, 30 Aug 2024	**Prob (F-statistic):**	6.71e-50
Time:	16:52:25	**Log-Likelihood:**	-99750.
No. Observations:	16968	**AIC:**	1.995e+05
Df Residuals:	16964	**BIC:**	1.995e+05
Df Model:	3		
Covariance Type:	nonrobust		

	coef	std err	t	P>|t|	[0.025	0.975]
const	88.6928	0.956	92.747	0.000	86.818	90.567
is_weekend	-21.7063	1.790	-12.123	0.000	-25.216	-18.197
post-ETF	-13.1830	1.677	-7.861	0.000	-16.470	-9.896
post-ETF-weekend	8.2462	3.134	2.631	0.009	2.103	14.389

Omnibus:	29369.018	**Durbin-Watson:**	1.210
Prob(Omnibus):	0.000	**Jarque-Bera (JB):**	78248434.210
Skew:	11.742	**Prob(JB):**	0.00
Kurtosis:	334.851	**Cond. No.**	5.88

Notes:
[1] Standard Errors assume that the covariance matrix of the errors is correctly specified.