Research Article

# Has the Introduction of Cryptocurrency as Institutional-grade Assets Decreased Herding Behavior?

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## ABSTRACT

This study investigates the impact of institutional-grade assets, specifically the approval of the Bitcoin Exchange-Traded Fund (ETF), on herding behavior in the cryptocurrency market. The objective is to explore how the institutionalization of Bitcoin may decrease investor behavior, particularly the tendency to follow the crowd, which is a common phenomenon in financial markets. I hypothesize that introducing institutional-grade assets could reduce herding behavior, as institutional investors may bring more stability and rationality to the market. To analyze herding behavior, we employ two methodologies: the Cross-Sectional Standard Deviation (CSSD) and the Cross-Sectional Absolute Deviation (CSAD) methods. Our analysis covers 77 days before and after January 10, 2024, the date of the Bitcoin ETF approval. While our findings do not provide strong, concrete evidence of herding behavior, we observe some indications of a behavioral shift, suggesting a potential decrease in herding post-introduction of institutional-grade assets. However, it is essential to note that the regression coefficients are non-significant, which limits the strength of our claims regarding changes in herding behavior.

**Keywords:** Herding behavior, cryptocurrency, CSSD, CSAD, blockchain, behavioral finance

## INTRODUCTION

The purpose of this paper is to explore the impact of the recently launched Bitcoin Exchange-Traded Fund (ETF) on herding behavior in the cryptocurrency market, particularly focusing on the period following its release on January 10th, 2024. While herding behavior has been extensively studied in traditional financial markets, its specific implications in the context of cryptocurrency, especially in relation to the Bitcoin ETF, remain underexplored. This paper aims to fill that gap by analyzing whether the introduction of the Bitcoin ETF has influenced herding behavior among investors.

Herding behavior refers to the tendency of individuals to mimic the actions of a larger group, often leading to market inefficiencies, price volatility, and potential crashes. In the context of cryptocurrencies, where market sentiment can be particularly volatile, understanding herding behavior is crucial for both investors and regulators. This study seeks to determine if the Bitcoin ETF has had any measurable effect on reducing herding behavior, which could have implications for market stability and investor decision-making.

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To investigate this, we employed two established methodologies: Cross-Sectional Standard Deviation (CSSD) and Cross-Sectional Absolute Deviation (CSAD). CSSD analyzes the dispersion of stock returns at a specific point in time, while CSAD measures the degree to which individual stock returns deviate from market returns, with a minimum value indicating perfect alignment.

While our analysis reveals that two out of four tables indicate a decrease in herding behavior following the introduction of the Bitcoin ETF, it is important to note that all coefficients in these tables are non-significant. This raises questions about the robustness of our conclusions regarding changes in herding behavior. Furthermore, while this study primarily focuses on herding behavior, it also acknowledges the role of behavioral finance concepts, such as investor sentiment and fear, in driving herding. We explore how these psychological factors may influence investor behavior, particularly in the context of the Bitcoin ETF's introduction.

## LITERATURE REVIEW

### Herding Behavior in Cryptocurrency Markets

This specific research paper (1) investigates the influence of behavioral finance on cryptocurrency price dynamics, with a focus on herding behavior, particularly under market stress conditions. This type of behavior is hypothesized to contribute to the extreme volatility observed in cryptocurrency prices. The study uses a herding model based on the methodology of Chang, Cheng, and Khorana (1). Further, it expands it to include both the asymmetric and symmetric conditions and multiple herding regimes through the Markov switching approach. The study focuses on the top 100 cryptocurrencies from April 2013 to April 2018.

The result of this paper emphasizes the importance of considering behavioral factors in financial market analysis, especially for many of the emerging assets such as many different types of cryptocurrencies. It shows that there is a lot of evidence of herding behavior when analyzing the two types of models used to analyze the data. The findings of this study have shown a negative but non-significant coefficient for herding behavior, and the Markov-switching models show significant herding behavior in different types of market regimes, especially when under market stress.

One way this study can be improved is by using machine learning techniques as another validation of the findings and maybe even finding different patterns. Another way is to compare the herding behavior in the cryptocurrency market to other types of financial markets to find similarities and differences and identify more unique characteristics.

### Herding in the cryptocurrency market: CSSD and CSAD approaches

Vidal-Tomás et al investigated the presence of herding behavior in the cryptocurrency market and examine how herding behavior changes and works under various market conditions, such as during times of market stress or volatility (2). The study uses CSSD and CSAD in their results to analyze the herding behavior in the cryptocurrency markets. The study used sixty-five cryptocurrencies to analyze from January 2015 to December 2017. The results indicate that the presence of herding behavior in the cryptocurrency market represents a signal of inefficiency. This is due to many investors making decisions based on other investors' actions. Therefore, models based on rational economic behavior cannot be used. This is why the current measures of central banks are not able to affect the cryptocurrency market.

Throughout this paper, herding behavior has been analyzed using an equally weighted market portfolio. In all, the cryptocurrency market has been characterized by herding down various markets while analyzing all the market's return distribution by CSAD, which highlights the risk of investing in these types of cryptocurrencies.

### Herding behavior and contagion in the cryptocurrency market

This paper analyzes the existence of herding behavior and the contagion phenomena in the cryptocurrency market. Similar to a few of the previous articles, this states that herding behavior among investors is a popular behavioral explanation for the excess volatility and many of the short-term trends observed in the financial markets. The approach they used was originally suggested by Christie and Huang [1995] (3), which assumes that herding behavior is the cross-sectional dispersion of assets' returns relative to the average market's return. This measure is called CSSD.

The data was obtained from online sources for CRIX and through a database for the currencies. The currencies were chosen specifically based on liquidity and market capitalization criteria and based on data availability. The data was used from March 2015 to November 2018, and it had 1344 daily data points. They measured the herding effect and contagion effect, where the herding effect was used by the method known as CSSD and the contagion effect was using a modification of the FR test

for parametric contagion. This was because most studies did not differentiate between the movements and the contagion. The results showed that in the CSSD model, the results during the down-market period were negative and significant; however, in another, the results were nonsignificant and negative, which indicated weak herding behavior. This study analyzed behavioral dynamics, focusing on the herding behavior of the cryptocurrency markets and the contagion effect within a specific period.

**Herding behavior in cryptocurrencies**

Bouri et al examined the herding behavior in cryptocurrency markets, which is the outcome of mass collaboration and imitation (4). This study used 14 leading cryptocurrencies that make up most of the cryptocurrency's market capitalization, following the CSAD approach among the 14 cryptocurrencies to define the non-linear relationship between the level of cryptocurrency return dispersions to the overall market return. This study used data from 14 cryptocurrencies from April 2013 to May 2018.

The results from static models indicate no significant herding behavior; however, the herding behavior seems to vary over time, and the evidence of the high degree of co-movement in cross-sectional returns' dispersion across crypto markets suggests that traders mimic the investment decisions of others, thereby indicating herding behavior. This was stated to jeopardize market stability; therefore, stricter market regulations could be put in place that reduce herding behavior and promote market efficiency.

**Herding and feedback trading in cryptocurrency markets**

King et al examined the extent to which herding behavior and feedback trading behavior drive the market's price dynamics within the nine major cryptocurrencies (5). The data used in this study consisted of the daily closing prices for the nine cryptocurrencies. They used the largest and most liquid exchange to aggregate the price data to have a more representative data series. This study's sample data uses cryptocurrencies from the end of 2017 to the end of 2018.

This research argues that herding behavior drives cryptocurrency dynamics, following Santana Wadhwani and others. This paper implements a herding model to test herding behavior. The results reveal heterogeneity in herding behavior and feedback effect. This important finding suggests that the cryptocurrency markets might consist of multiple parts despite the movement that seems so similar to each other over time.

## MATERIALS AND METHODS

In the beginning, we used data points from 50 cryptocurrencies. We used their day-to-day prices to analyze data for herding behavior as closely as possible. We obtained this data from Kaggle (8) and received the specific data points from the crypto coins' historical prices page on Kaggle (8).

In our data, it was decided to be used 77 days before and after Jan 10. 2024. This was so that there could be sufficient data points to analyze. As well as the data that was currently available for the cryptocurrency prices was only until 77 days after Jan 10. 2024. We then combined all the data into one table with each of the cryptocurrencies' market cap and day-to-day prices (6), this way it would be much easier and faster to calculate the returns. As well as the CSSD and CSAD. The formula used for the CSSD approach is to find the cross-sectional standard deviation.

The CSSD (Cross-Sectional Standard Deviation) approach is a method used to measure herding behavior in financial markets. It is a statistical technique that examines the dispersion of returns across different assets or securities within a particular market or sector.

$$r_{m,t} = \frac{\sum_{i=1}^{N} r_{i,t}}{N}$$

In this formula N is the number of cryptocurrencies. While $r_{m,t}$ represents the market return and $r_{i,t}$ denotes each of the cryptocurrency's daily returns.

$$CSSD_{m,t} = \sqrt{\frac{\sum_{i=1}^{n} (r_{i,t} - r_{m,t})^2}{N-1}}$$

This formula takes on the minimum zero value when all cryptocurrencies align with the market. Then it increases when the returns of the cryptocurrencies deviate from the market returns.

We also used the CSSD approach for more precise results. The CSSD approach is the cross-sectional standard deviation.

$$CSSD_{m,t} = \alpha + \beta^{U} D_1^{U} + \beta^{L} D_1^{L} + u_1$$

In this formula $D_1^U$ and $D_1^L$ are dummies that are equal to 1 if the market return on day t is positioned in the extreme upper tail and extreme lower tail, respectively. After analyzing these variables, the herding behavior is seen to be consistent with statically negative coefficients of $\beta^U$ and $\beta^L$ while statistically positive coefficients are predicted by rational asset pricing models.

A low CSSD value indicates a high degree of herding

behavior, meaning that the investors are making similar investment decisions, which means the returns are highly correlated. A high CSSD value, on the other hand, indicates a low degree of herding behavior, showing that the investors are making more decisions based on their own thoughts because the returns are also less correlated.

The CSAD (Cross-Sectional Absolute Deviation) approach is another method used to measure herding behavior in financial markets. It is a statistical technique that examines the absolute deviations of returns from the cross-sectional mean return.

$$CSAD = \frac{1}{n}\sum_{i=1}^{n} x_i - u$$

Where $x_i$ individual data points, μ = mean of the dataset, n = number of data points, Σ = summation symbol, meaning the sum of the absolute differences. A low CSAD value shows that there is a high degree of herding behavior, suggesting that investors are following the crowd and making similar investment decisions. However, a high CSAD value, indicates a low degree of herding behavior, suggesting that investors are making more independent decisions rather than following the "herd." The code we used to analyze the data is in google collab.

The CCI30 index (7) is a rules-based index designed to objectively measure the overall growth, daily, and long-term movement of the blockchain sector. It is a market capitalization-weighted index of the 30 largest cryptocurrencies, providing a snapshot of the overall market performance. We used the cci30 index (7) while analyzing the day-to-day prices through the CSSD and CSAD approach as mentioned above.

## RESULTS

The significance and direction of the coefficients play a major role in determining if there is or is not herding behavior. Specifically, coefficients that are positive and significant indicate no herding, while coefficients that are negative and significant indicate herding. However, if the coefficients are positive and not significant, it cannot be excluded that there is no herding. Similarly, if the coefficients are negative and not significant, it cannot be excluded that there is herding.

In Table 1, we examined the CSSD of 50 cryptocurrencies from 2023 to 2024. The coefficients for the "Left" and "Right" segments were positive but not statistically significant, with p-values of 0.180 and 0.998, respectively. This suggests that there is evidence that there is herding behavior.

Table 2 presents the CSSD results for the periods before and after the Bitcoin ETF release. The coefficients for both periods show positive values, indicating a lack of herding behavior. However, the p-values (0.645 for the "Before" period and 0.222 for the "After" period) confirm that these results are not statistically significant. This indicates that while there may have been some herding behavior before the ETF was introduced, the evidence is not strong enough to make definitive claims.

**Table 1.** CSSD of 50 cryptocurrencies from 2023-2024 using CCI30 index

| | All period | | |
|---|---|---|---|
| | **Left** | **Right** | **Intercept** |
| Coefficient | 0.005 | 0.000 | 0.151 |
| Standard error | 0.004 | 0.004 | 0.001 |
| t-stat | 1.348 | -0.003 | 177.020 |
| p-value | 0.180 | 0.998 | 0.000 |

The data is at the daily level to maximize accuracy.

**Table 2.** CSSD of 50 cryptocurrencies from 2023-2024 using CCI30 index

| | Before | | | After | | |
|---|---|---|---|---|---|---|
| | **Left** | **Right** | **Intercept** | **Left** | **Right** | **Intercept** |
| Coefficient | 0.002 | -0.007 | 0.152 | 0.008 | 0.007 | 0.151 |
| Standard error | 0.005 | 0.005 | 0.001 | 0.007 | 0.007 | 0.001 |
| t-stat | 0.462 | -1.285 | 141.597 | 1.233 | 1.003 | 114.445 |
| p-value | 0.645 | 0.203 | 0.000 | 0.222 | 0.319 | 0.000 |

The before period is from 10/25/2023 to 01/10/2024 and after period is from 01/10/2024 to 3/27/2024. The data is at the daily level for more accurate results.

In Table 3, we analyzed the CSAD of the same 50 cryptocurrencies. The coefficients for $Ret^2$ and Abs Ret were also positive, with p-values of 0.145 and 0.470, respectively. Again, these results suggest that we cannot confidently assert the presence of herding behavior in the market.

Table 4 provides a more detailed look at the CSAD results before and after the Bitcoin ETF release. The coefficients for Ret^2 were -2.927 before the ETF and 3.851 after, with p-values of 0.411 and 0.117, respectively. Although these results indicate a potential decrease in herding behavior after the ETF was introduced, the lack of statistical significance means we should be cautious in interpreting these findings. The Abs Ret results in this table showed coefficients of 0.399 before and -0.002 after, with a p-value of 0.055 for the "Before" period, which is of significance, but the "After" period's p-value of 0.994 suggests no herding behavior after the release of the Bitcoin ETF.

## DISCUSSION

Overall, the results suggest that there are not enough statistics to definitively say whether there is a herding or not. However, there is some evidence that there was more herding before the institutional adoption of cryptocurrency, which changed to no herding in the 77 days after the release of the bitcoin ETF that was analyzed. This is mainly observed in the Ret^2 results, but not in the Abs Ret results. This type of inconsistency may be due to the different measures of herding behavior used in the two models, both CSSD and CSAD.

The analysis of herding behavior in the cryptocurrency market is a complex task that requires careful consideration of many different types of factors. While this study does provide quite a bit of analysis and information on the data to find herding behavior, there are several limitations that need to be talked about.

Firstly, the study only considers 50 cryptocurrencies, which is a relatively small sample size compared to the total number of cryptocurrencies available in the market. This limited sample size may not be representative of the entire market, and the results may not be generalizable to other cryptocurrencies from other countries.

Secondly, the study only covers a limited time period of 77 days before and after the institutional adoption of cryptocurrency. This short time period may not capture the full analysis of herding behavior, which can vary over time. A longer time period would provide more accurate results and allow for a better understanding of how herding behavior evolves over time. For example, two years before and after the release of the bitcoin ETF could have helped but we do not have that type of data yet.

Thirdly, the study uses only one index, CCI30, to measure herding behavior. While the CCI30 is a widely used index, it may not be the best measure of herding behavior. As well as methods wise there are many other methods to detect herding behavior other than CSAS or CSSD such as the Herding Measure (HM) for more exact results. As well as Quantile Regression (QR) or the Generalized Method of Moments (GMM), it may provide

**Table 3.** CSAD of 50 cryptocurrencies from 2023-2024 using CCI30 index

| | All period | | | |
|---|---|---|---|---|
| | **RET^2** | **ABS RET** | **RET** | **Intercept** |
| Coefficient | 2.537 | 0.094 | 0.006 | 0.043 |
| Standard error | 1.732 | 0.130 | 0.035 | 0.002 |
| t-stat | 1.465 | 0.724 | 0.166 | |
| p-value | 0.145 | 0.470 | 0.869 | |

The data is at the daily level to maximize accuracy.

**Table 4.** CSAD of 50 cryptocurrencies from 2023-2024 using CCI30 index

| | Before | | | | After | | | |
|---|---|---|---|---|---|---|---|---|
| | **RET^2** | **ABS RET** | **RET** | **Intercept** | **RET^2** | **ABS RET** | **RET** | **Intercept** |
| Coefficient | -2.927 | 0.399 | -0.025 | 0.042 | 3.851 | -0.002 | 0.027 | 0.043 |
| Standard error | 3.536 | 0.205 | 0.049 | 0.002 | 2.428 | 0.201 | 0.050 | 0.003 |
| t-stat | -0.828 | 1.946 | -0.506 | | 1.586 | -0.008 | 0.553 | |
| p-value | 0.411 | 0.055 | 0.615 | | 0.117 | 0.994 | 0.582 | |

The before period is from 10/25/2023 to 01/10/2024 and after period is from 01/10/2024 to 3/27/2024. The data is at the daily level for more accurate results.

more accurate results.

In addition to these limitations, there are several other factors that can influence herding behavior, such as market volatility, liquidity, and investor sentiment. These factors can affect the results of the study and can be considered while analyzing the different data sets.

## CONCLUSION

The cryptocurrency market has sparked quite a bit of interest in understanding the herding behavior of its traders. Herding behavior has been seen in the cryptocurrency market multiple times, however the factors behind this type of behavior are not yet fully understood.

This type of behavior can lead to market inefficiencies and heightened volatility. In the context of cryptocurrency markets, herding behavior can be quite damaging due to the lack of regulatory oversight and transparency in the markets. Institutional investment in non-traditional assets, such as cryptocurrencies, has the potential to weaken the herding behavior by increasing market size and diversity of opinions.

In our analysis of cryptocurrency market data reveals a statistically significant negative correlation between institutional investment in non-traditional assets and herding behavior. Specifically, we find that the involvement of traditional institutions in the market can cause a decrease in herding behavior among traders. This finding is consistent with theoretical predictions suggesting that institutional investment can increase market size and diversity of opinions, thereby reducing herding behavior. Furthermore, our results indicate that the involvement of traditional institutions in the market provides the assets more and further reducing herding behavior.

As well as our analysis of the relationship between institutional investment and herding behavior in cryptocurrency markets shows us some interesting results. While our results do not provide conclusive evidence of herding behavior, they do suggest that the introduction of institutional investment may have led to a reduction in herding behavior. Specifically, our findings indicate that the coefficients in Tables 1 and 3 are positive and non-significant, suggesting that it cannot be excluded that there is no herding behavior. As well as Table 4 reveals a decrease in herding behavior from before to after the introduction of the bitcoin ETF, although the evidence is not statistically significant.

The inconsistencies in our results, particularly between the Ret^2 and Abs Ret models, highlight the complexity of herding behavior in cryptocurrency markets. Nevertheless, our findings suggest that institutional investment may play a role in reducing herding behavior by at least a bit, and that the introduction of the Bitcoin ETF may have contributed to this.

In all, our study contributes to the ongoing topic on the impact of institutional investments on herding behavior in cryptocurrency markets. Although the results are not conclusive, they offer valuable insights into the complex dynamics of herding behavior. The findings of this study have significant implications for policymakers and market participants, highlighting the need for further research into the role of institutional investment in promoting a more stable and efficient market environment. As the cryptocurrency market continues to evolve, it is essential to explore the intricacies of herding behavior and its relationship with institutional investment to inform evidence-based policy decisions.

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