Bitcoin volatility and the introduction of bitcoin futures: A portfolio construction approach

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Abstract

We evaluate the introduction of Bitcoin futures on Bitcoin return and volatility using realized volatility and GARCH model pre-and post-futures. We also assess the portfolio construction implications by building two portfolios containing the top 25 S&P stocks, one without futures and one with. GARCH and realized volatility show mixed results. We provide that futures make Bitcoin riskier and more vulnerable to fluctuations over time. However, Bitcoin futures improve the portfolio's volatility and returns profile. Our findings offer implications regarding portfolio strategies implemented by risk-averse and risk-seeking investors and managers as we show how Bitcoin futures can hedge investments.

Keywords*:* Realized volatility; Bitcoin; Bitcoin futures; GARCH model, portfolio construction.

1. Introduction

Financial markets move continuously, and prices are volatile as they incorporate new information. Bitcoin is not an exception; it is the world's most well-known and widely used cryptocurrency. However, it is infamous for its extreme price fluctuations. The volatility of Bitcoin has been a topic of much discussion since its inception. Investors, traders, and governments have different opinions on Bitcoin's value, safety, stability, and future. Introducing Bitcoin futures trading has recently added another layer of complexity to this issue.

The volatility of Bitcoin can be attributed to a variety of factors. A crucial factor is its limited supply, which means its value is not based on any intrinsic value like gold or silver – instead, it relies solely on supply and demand. Other factors include regulatory changes, investment trends, and news events – any news (positive or negative) can ignite dramatic price movements.

One way to mitigate price risk is through derivates. Futures have been used in the financial markets for decades, but the concept only recently entered the cryptocurrency world. Futures trading on Bitcoin enables investors to hedge against short-term volatility while still investing in the long-term growth of the cryptocurrency market. However, there are still concerns about Bitcoin futures. The introduction of futures trading may add stability to the price of Bitcoin, but it could also lead to increased speculation and manipulation. The lack of regulation in the cryptocurrency market also exacerbates these issues.

Since the inception of Bitcoin, its volatility has been studied due to high fluctuations reflecting the risk perception of market investors. Volatility affects prices and thus the demand for Bitcoin; demand can

be a real demand for Bitcoin used in physical transactions or a speculative demand where investors trade Bitcoin benefiting from price volatility (Hale et al., 2018).

Crypto assets, particularly Bitcoin, are considered risky and speculative investments, limitless and relationless. And whether Bitcoin is used as a medium of exchange or a speculative asset, hedging its risk is vital to well-functioning financial markets.

Consequently, Bitcoin derivative contacts have been introduced to cover the risk of Bitcoin transactions. In this study, we investigate whether the introduction of Bitcoin futures has contributed to lowering Bitcoin volatility by modeling Bitcoin volatility before and after the introduction of futures contracts on Bitcoin. And whether Bitcoin futures can replace the standard Bitcoin investment.

In this regard, Stein (1987) suggests that introducing derivative contracts, such as futures, can destabilize underlying asset prices if the contracts attract enough speculative traders. Since the introduction of Bitcoin Futures in December 2017, a few studies have been conducted to investigate their impact on the Bitcoin spot market. Two main distinct findings could be found; increase or decrease in Bitcoin spot market risk measures. Corbet et al. (2018) show that futures increase the spot market volatility and are not a good hedging instrument. Such results are also confirmed by (Hale et al. (2018), who provide that spot volatility increases due to short sale pressure by pessimistic investors in the futures markets, while a partial agreement comes from (Jalan et al. (2021) in distinguishing between downward effects on return and skewness, but upward results on volatility, kurtosis, and liquidity. Similarly, Zhang et al. (2021) find a short-run decrease in volatility but an increase in the long run. On the other hand, a reduction of spot volatility and jump risk, a more efficient spot market, and Bitcoin Futures is a good hedge found by (Alexander et al., 2020; Augustin et al., 2022; Zhang et al., 2023).

As provided by the previous literature, studies on the topic are recent, limited, and show mixed results. Therefore, we empirically contribute to this niche field of research using distinct methodologies and approaches from previous related research using recent data, including the COVID-19 pandemic and the Russa-Ukraine War. We use the GARCH model to determine the effects of Bitcoin Futures on the Bitcoin spot return and risk using volatility, skewness, and kurtosis. Furthermore, another contribution of this study is that we use a portfolio construction approach; we build two portfolios: one with some S&P 500 stocks plus Bitcoin spot and another with the same S&P 500 stocks plus Bitcoin futures.

Our empirical findings indicate that the average return declines with the introduction of futures, volatility, variance, and kurtosis increase, and the Skewness reduces. Perhaps our results are closely related to those of (Jalan et al., 2021), who found similar mixed results in the same study. This explains why futures generally make Bitcoin riskier and more vulnerable to significant returns and volatility variations. Furthermore, investing in Bitcoin futures boosts portfolio returns for a risk-seeking investor because investing in ordinary Bitcoin without options is more efficient. We also provide that the introduction of futures could potentially boost the portfolio of a risk-averse investor.

2. Data and Methodology

Our proposed volatility assessments before and after the launch of Bitcoin futures employ daily adjusted closing prices of Bitcoin and the Top 25 equities by market cap in the S&P 500 market from April 29th, 2013, to December 31st, 2022, according to Investopedia[1]. We divided the sample period into two sub-periods: before and after the introduction of Bitcoin futures: (i) the first from April 29th, 2013, to December 18th, 2017, and (ii) the second from December 19th, 2017, to December 31st, 2022.

Realized Volatility

We use historical volatility, also called Realized Volatility (RV). Typically, this measure is calculated by finding the average dispersion from the mean price of a Bitcoin over a certain period:

$$\sigma = \sqrt{\frac{\sum_i^N (r_i - \bar{r})^2}{N-1}} \quad (1)$$

Where r_i is the return[2] at time i, $\bar{r}$ is the mean return and N is the number of returns.

GARCH model

The GARCH model outperforms the historical technique by indicating data non-stationarity. So, the residuals obtained by the process can be considered returns cleaned of any conceivable errors that the stationarity assumption can involve. One of the finest models is the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) process (Namugaya et al., 2014). Bollerslev (1986) proposed the GARCH process to answer the problem of forecasting volatility in asset values, and it is an implementation of Engle (1982) introduction of the Autoregressive Conditional Heteroskedasticity (ARCH) model. The main objective of the GARCH model is to compute the conditional volatility of the returns Y_t and it is assumed that $E(Y_t) = 0$. The formula is as follows:

$$Y_t = \sigma_t Z_t \quad (2)$$

Where the residuals Z_t follow $Z_t \sim (0, 1)$. To fit this model, one must first calculate the historical logarithm returns. The GARCH model implements the ARCH model since one of the ARCH model's shortcomings is the lag lengths required to assess the impact of past returns on current volatility (Daníelsson, 2011). The lagged volatility during ARCH model building is added to capture the effect of past returns, resulting in the GARCH (L_1, L_2) model:

$$\sigma_t^2 = \omega + \sum_{i=1}^{L_1} \alpha_i Y_{t-i}^2 + \sum_{j=1}^{L_2} \beta_j \sigma_{t-j}^2 \quad (3)$$

We use the most common version of this model employing only one lag, which is a GARCH (1,1) model:

$$\sigma_t^2 = \omega + \alpha Y_{t-i}^2 + \beta \sigma_{t-j}^2 \quad (4)$$

Where ω, α, and β are constant. There are two types of volatility in GARCH-type models: conditional and unconditional. Unconditional volatility (σ) is a type of general volatility of a random variable that

[1] The Top 25 Stocks in the S&P 500, https://www.investopedia.com.

[2] Asset return is calculated as follows: $R_t = \frac{P_t - P_{t-1}}{P_{t-1}}$

depends on the entire sample when there is no extra information, i.e., no conditioning, and the formula is as follows:

$$\sigma^2 = \frac{\omega}{1-\alpha-\beta} \quad (5)$$

The conditional volatility σ^2 is determined by prior recent observations, and it uses the previous formula of the general GARCH (L_1, L_2). In this study, GARCH is important because it calculates the residuals, which are the difference between the predicted value $\hat{Y}$ and the observed value Y and so they are a sort of corrected returns, and in this case, they are computed with this formula, which refers to the returns formula as follows:

$$Z_t = \frac{Y_t}{\sigma_t} \quad (6)$$

It is also required to determine the correct volatility, beginning with residuals rather than returns and using the volatility formula.

Optimal Portfolio Weights, Risk, Return, and Efficient Frontier

We refer to the modern portfolio theory (Markowitz, 1952) and other seminal papers to verify whether Bitcoin futures benefit standard Bitcoin portfolios. Markowitz (1952) assumed that the investors were risk-averse and that they diversify their investments. Moreover, they decided where to invest according to the mean-variance approach to portfolio optimization providing the optimal weights of the assets in the portfolio, forming the efficient frontier. Then, S&P 500 index was used to select the Top 25 stocks by market cap. The stocks are used to construct two comparable portfolios, i.e., the first with just Bitcoin and the second with Bitcoin futures. To do this, we cover the period since the introduction of futures on Bitcoin from December 19th, 2017, to December 31st, 2022. We investigate the impact of Bitcoin futures on portfolio construction, employing the realized volatility approach and the GARCH process method. While the top 25 S&P stocks are traded from Monday to Friday, Bitcoin is traded seven days a week. Hence, we take only the corresponding prices to the correct date regarding the other stocks.

Firstly, we compute stock returns and provide summary statistics like mean, variance/volatility, covariance, Kurtosis, and Skewness. Secondly, we construct portfolios using the mean-covariance approach, finding the risk and return associated with different weights to draw an efficient portfolio. Efficient portfolios are found by maximizing the Sharpe Ratio - the excess return over the standard deviation of portfolio returns. We assume that the risk-free rate is equal to zero. We start our analysis with the portfolio without Bitcoin futures using the realized volatility method and hence the historical returns, and then continue by calculating the portfolio with futures. The main goal is to evaluate which portfolio is more efficient using the Sharpe ratio:

$$\text{Sharpe ratio} = \frac{R_p - r_f}{\sigma_p} \quad (7)$$

Where R_{pt} indicates the return of the portfolio, r_f denotes the risk-free rate, and σ_p is the portfolio standard deviation. We run a similar analysis employing the GARCH process. Lastly, we analyze the

efficient frontiers with and without futures every nine months because the mean and variance are not constant in the real market but change frequently.

3. Results

Estimating Results from Realized Volatility

We calculate the Realized volatility and GARCH volatility and returns. From Figure 1, we observe that Bitcoin has been highly fluctuating. Then, the trend remained stable with low fluctuations until the futures contracts on Bitcoin were introduced on December 17th, 2017, corresponding to observation 1695. After that, returns became more volatile, reaching the highest peak and one of the lowest.

Figure 1. Bitcoin returns of the entire period futures introduction.

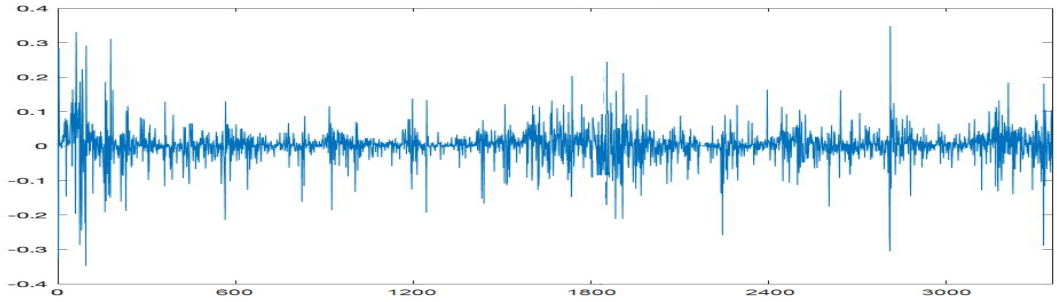


Table 1 presents summary statistics for Realized volatility method pre- and post-injection of Bitcoin futures starting from April 29th, 2013.

Table 1. Summary statistics of Realized volatility.

	Mean	Variance	Volatility	Kurtosis	Skewness
Pre-Bitcoin futures	0.00446	0.00206	0.04662	11.5422	0.46147
Post-Bitcoin future	0.00163	0.00212	0.04739	14.2905	-0.55159
Diff of means	-0.00283	0.00006	0.00077	2.7483	-1.01306
Prob(T>t)	***	**	*	**	***
Full sample	0.00329	0.00226	0.04886	15.233	-0.45433

Table 1 shows that the mean of returns is significantly higher pre-futures and a bit higher than the mean of the entire sample, suggesting that the drop in returns could be attributed to Bitcoin futures, i.e., futures introduction has brought 0.283% daily negative return compared to pre-futures period. As for volatility and variance, the values have slightly increased post-futures changing the risk profile of standard Bitcoin investment, indicating that, on average, futures ended up making the Bitcoin spot market riskier; similar results are documented by (Blau & Whitby, 2019; Jalan et al., 2021). Returns are right-skewed pre-futures but turn left-skewed post-futures, indicating that realizing losses is highly probable, affecting the investment decisions of risk-seeking and risk-averse investors that could result in a substitution of investors type in the Bitcoin, i.e., more speculators than hedgers due to the availability of Bitcoin futures. Kurtosis shows that in all periods, the distribution is Leptokurtic, meaning that, despite the introduction of futures, Bitcoin is generally a risky asset and confirms the prior premise that the returns are highly volatile. Furthermore, in post-futures, the Kurtosis is also higher than pre-Bitcoin

futures but lower than the whole sample, indicating a high probability of extreme values and return fluctuations. We also run a t-test of means (differences) before and after the futures introduction. Prob(T>t) suggests that the mean differences between pre-and post-futures are statistically significant, suggesting that such differences are attributed to the introduction of Bitcoin futures.

Estimating Results for GARCH Model

Here, we run the analysis using the GARCH model to improve the returns and avoid errors. The GARCH model is a process able to correct the errors in returns given the residuals. We focus on the residuals instead of the returns and find that the results have changed compared to the historical returns approach. Table 2 reports the summary statistics for the GARCH model volatility method.

Table 2. Summary statistics of the GARCH model

	Mean	Variance	Volatility	Kurtosis	Skewness
Pre-Bitcoin futures	0.0737	1.0777	1.06651	7.17472	-0.36141
Post-Bitcoin future	0.0186	1.06472	1.06007	11.1981	-0.70282
Diff of means	-0.0551	-0.01298	-0.00644	4.02338	-0.34141
Prob(T>t)	***	**	*	**	**
Full sample	0.0494	0.47912	0.71112	9.65836	-0.42636

From Table 2, we can see that the mean of the returns is significantly higher in pre-futures, indicating the adverse impact of futures on standard Bitcoin returns. The variance and the volatility are not considerably different but slightly higher in the pre-futures period, meaning, according to this model, that Bitcoin becomes a little less risky. Using the GARCH model, the Skewness is always negative and hence left-skewed, but also, the value diminishes in the post-futures period. This result implies that there should be more losses because the assets become more risky in the post-futures period. For Realized volatility measure, the Kurtosis shows that the distribution is Leptokurtic in all periods, indicating that Bitcoin is generally a risky asset despite introducing futures. Further, in the GARCH model, the Kurtosis is also higher in post-Bitcoin futures, and the Kurtosis of the entire sample is higher than in pre-futures. Using the residuals based on GARCH estimation, the findings have slightly changed; however, the Kurtosis rose post-futures, and the Skewness diminished in both methods, showing that the asset can have very high fluctuation in returns reaching extreme values and the Skewness become moderately skewed rather than before futures.

Based on the GARCH model, we now compare the returns and the residuals and analyze their conditional variance, autocorrelation, and partial-autocorrelation functions. It is interesting to compare the historical returns of Realized volatility and the calculated residuals, i.e., corrected returns with no errors, from the GARCH process.

Figure 2 plots the Bitcoin returns and the residuals. We see that residuals range from -0.4 to 0.4 for the return, and returns vary from -10 to 10 for the residuals. We also observe that residuals are more volatile, which aligns with the previous Kurtosis results. We already know that the Kurtosis based on GRACH model is higher than the one based on Realized volatility. Focusing on the date when futures were

introduced, which corresponds to the observation[3] 1695, we observe that the impact on returns is greater than on residual; and the effect of the event is seen in the return spike.

Figure 2. Bitcoin returns vs. Residuals.

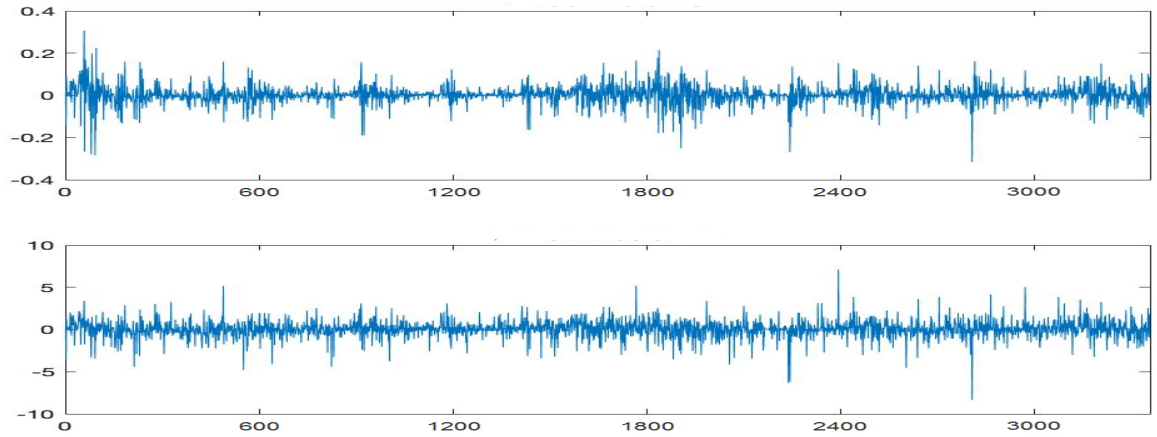
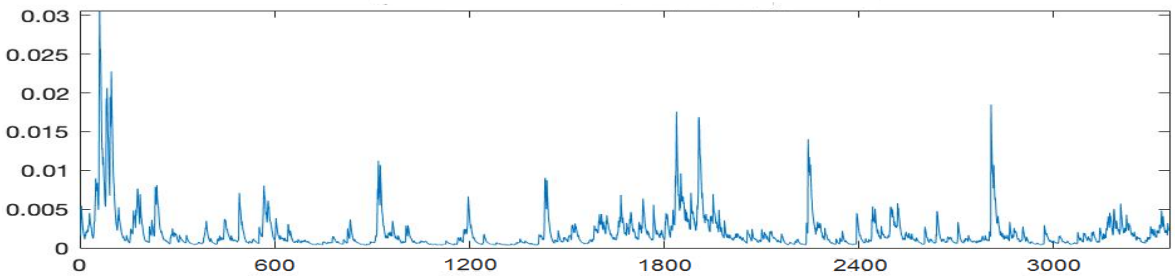


Figure 3 illustrates the conditional variance based on the GARCH model. We can observe that the conditional variance was unstable when the futures were introduced but rose immediately after that. Then, it declined though there were three large increases by the end of 2018 when cryptos registered more than 70% loss[4] which was regarded as the biggest cryptos bubble mainly due to speculative[5] short sales after the futures introduction in December 2017. In the first months of 2020 due to the COVID-19 pandemic and the first month of 2022 when the ongoing Russia-Ukraine War began.

Figure 3. Conditional Variance of Bitcoin



Estimating Portfolio Weights, Risk, Return, and Efficient Frontier

Table 3 shows the estimated results using the Realized volatility method between December 19th, 2017, and December 31st, 2022. We see an increment in the portfolio's risk and return with futures compared to those without. Figure 4 plots the efficient frontiers of both portfolios. The blue one is without futures, and the red one is with futures. These frontiers indicate that for low levels of variance, the portfolio without futures outperforms due to return destabilization by futures; however, when the volatility rises and the market becomes riskier, the portfolio with futures is better thanks to the hedging effect with

[3] Remember that we cover the period from April 29th, 2013, to December 31st, 2022

[4] Another possible reason for the strong short sales is Facebook's plans to launch a digital coin were leaked at the end of 2018 that saw the tech giant's reputation pummeled and cryptocurrencies crash and burn.

[5] Hedge fund manager Mark Dow wrote almost exactly a year in advance about his decision to short bitcoin after future trading on it first began. See the link of his interview https://behavioralmacro.com/so-you-want-to-short-bitcoin-heres-your-road-map/

futures. As shown in Figure 4, at a standard deviation of 0.035, investors are indifferent between the two portfolios. Looking at the portfolios that appear efficient on both frontiers, i.e., highlighted by a red point, it can be affirmed that the portfolio without futures, which maximizes the Sharpe ratio, seems more efficient. The Sharpe ratio values approve that the portfolio without futures appears more efficient (Portfolio without futures=0.0748 > Portfolio with futures= 0.0653). On the other hand, the portfolio that minimizes volatility seems more efficient on the frontier without futures because it generates higher returns at the same level of risk.

Figure 4. Portfolios' efficient frontiers with realized volatility.

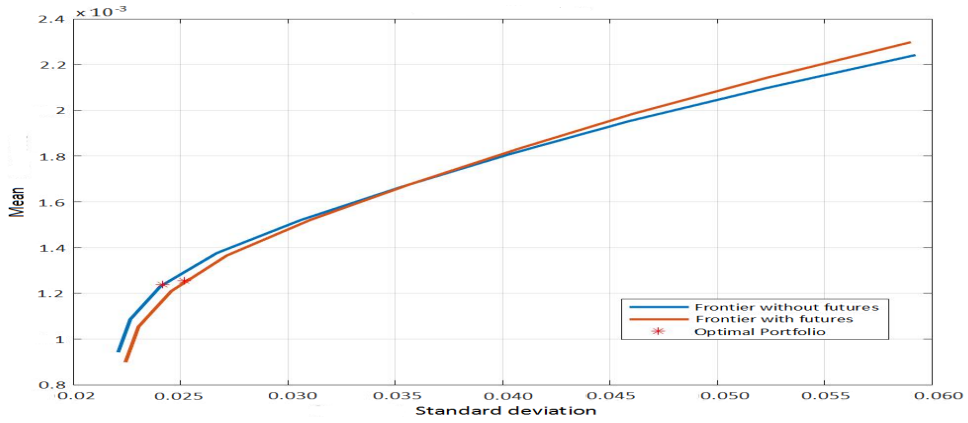


Table 3. Risk and Return estimates for Portfolios with realized volatility.

	Risk	Return
Without Bitcoin futures	0.015974	0.001196
With Bitcoin futures	0.017005	0.001112

We run similar portfolio analyses using the GARCH model. Table 4 reports that the risk and the return are slightly lower in the portfolio without futures. The two portfolios are equivalent at 0.04 of risk. A risk-averse investor should prefer a portfolio without futures, which is more efficient, whereas a risk-seeking investor prefers higher return values despite the increase in risk and hence the increase in volatility and will choose the portfolio with futures. Additionally, the portfolio without futures does not reach a high volatility value like those with futures. For the portfolios that look efficient on both frontiers and are highlighted by a red point, we can say that the portfolio without futures that maximizes the Sharpe ratio seems more efficient. The Sharpe ratio values approve that the portfolio without futures appears more efficient (Portfolio without futures=0.0567; Portfolio with futures= 0.0554). On the other hand, the portfolio that minimizes the volatility, which is the first portfolio on the left of an efficient frontier, seems more efficient on the frontier with futures because the red graph indicates slightly higher returns despite higher volatility.

Figure 5. Portfolios' efficient frontiers with GARCH model

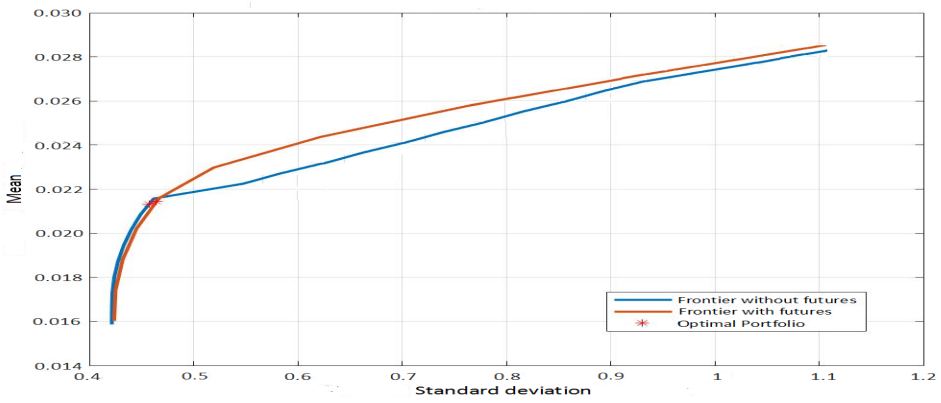


Table 4. Risk and Return estimates for Portfolios with the GARCH model

	Risk	Return
Without Bitcoin futures	0.37703	0.021402
With Bitcoin futures	0.38834	0.021526

Therefore, we have similar findings via the two methods. For a risk-seeking investor, choosing a portfolio with futures is more efficient because this option may protect against possible losses that could occur in the future due to strong price fluctuations. Conversely, a risk-averse investor should choose the portfolio without futures because the portfolio gives higher returns for a low level of volatility.

Next, given the fact in the real economy, the volatility can also change intraday. For more precise analysis, we account for the efficient frontiers of the portfolios calculated based on the GARCH model and split the sample period after futures introduction between December 19th, 2017, and December 31st, 2022, into five sub-periods of 12 months each.

Figure 6 shows the portfolios between December 19th, 2017, and December 19th, 2018, and demonstrates that the frontier of portfolios without Bitcoin futures is more efficient at high volatility but worsens at low volatility. This contradicts the previous result considering the whole period. It is possible to state that a risk-averse investor at low volatility will choose to invest in a portfolio with futures, while a risk-seeking investor will choose a portfolio without futures at a high level of volatility.

Figure 6. Portfolios' efficient frontiers for 2018

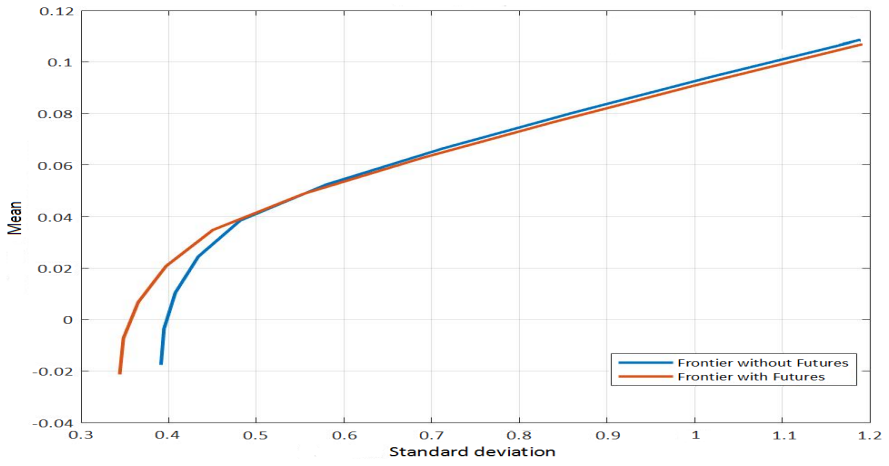


Figure 7 plots the efficient frontier of portfolios between December 20th, 2018, and December 19th, 2019, and suggests that at low volatility, the frontier of portfolios with futures is better, but when the standard deviation is high, the efficient frontier without futures is better. So, while a risk-seeking investor selects a portfolio without futures, a risk-averse investor will choose one with futures.

Figure 7. Portfolios' efficient frontiers for 2019

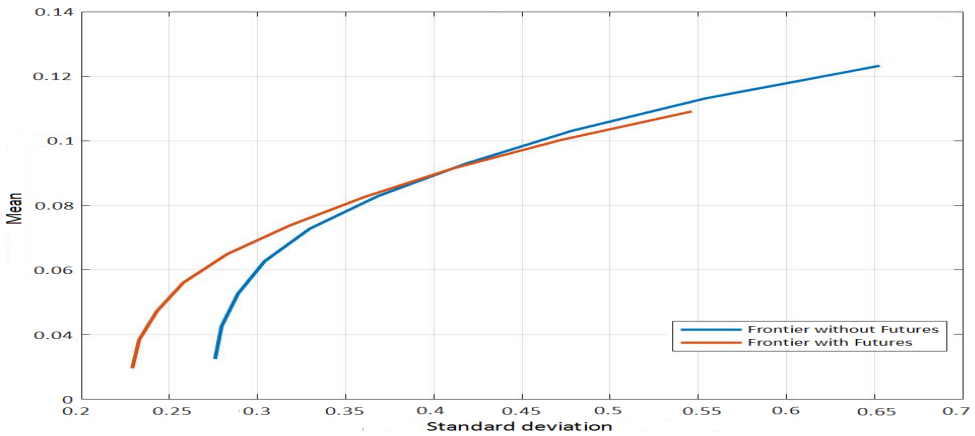


Figure 8 illustrates the efficient frontier of portfolios for the year 2020. In this case, we have a completely different situation when the period corresponds to the outbreak of COVID-19 pandemic and thereby affecting the international financial markets severely. Generally, COVID-19 contributed to the uncertainty causing the financial markets' volatility to increase. Given this scenario, we can see that while the frontier of the portfolio with futures is more efficient at high volatility, the portfolio without futures gives better results at low volatility.

Figure 8. Portfolios' efficient frontiers for 2020

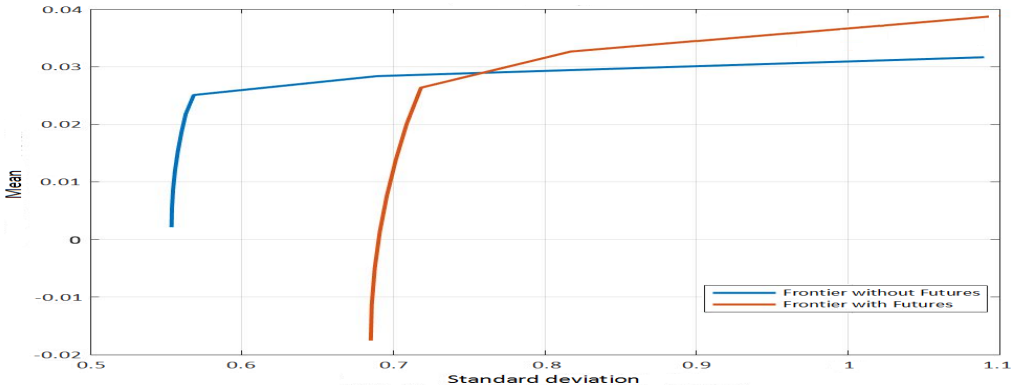


Figure 9 illustrates the efficient frontier of portfolios for the year 2021. At low volatility, the frontier of portfolios without futures is more efficient, whereas, at high volatility, a portfolio with futures is more efficient. While a risk-averse investor will invest in an efficient frontier portfolio without futures, a risk-seeking investor will select a frontier portfolio with futures. Additionally, the portfolio with futures minimizes volatility and is more efficient than the other.

Figure 9. Portfolios' efficient frontiers for 2021

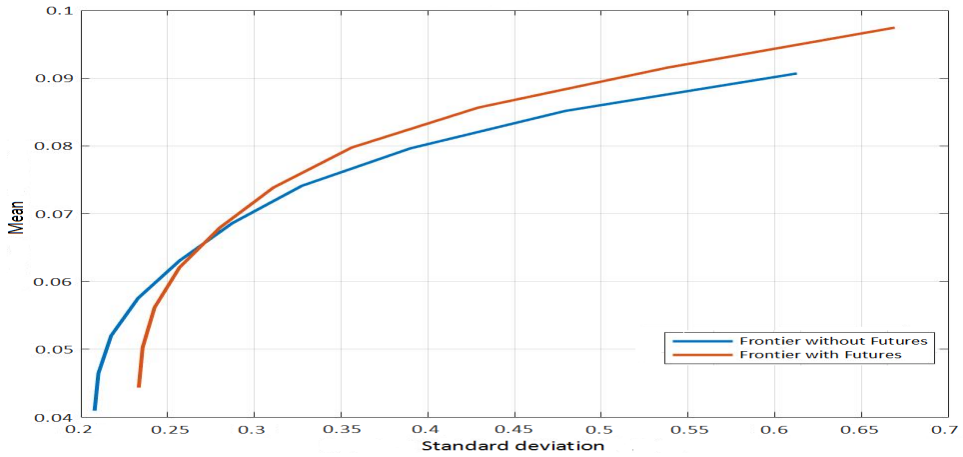
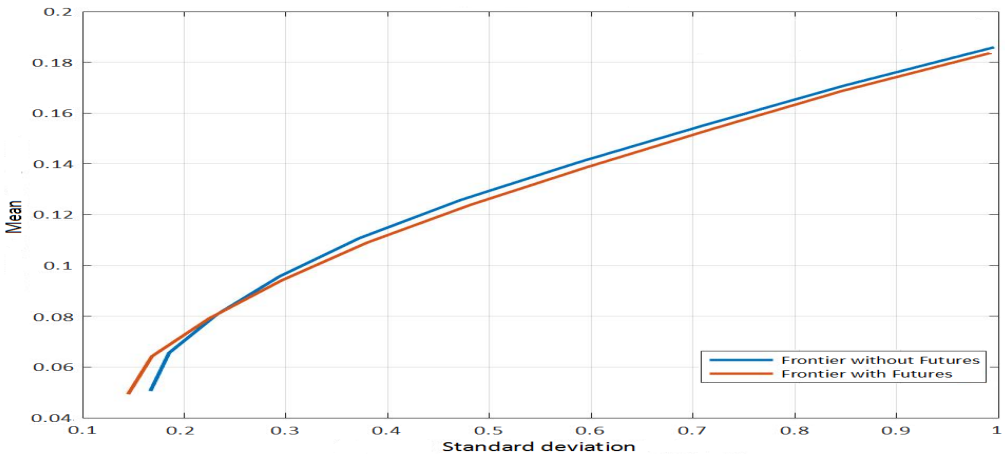


Figure 10 presents the efficient frontier of portfolios between December 20th, 2021, and December 19th, 2022, incorporating the influence of the Russia–Ukraine conflict on financial markets. The War negatively affected all cryptocurrencies in the short term; the global crypto market cap slid to as low as $1.57 trillion, losing almost 9.66% in 24 hours. Bitcoin fell 8.12%, and Ethereum was down 13.28%. Also, the economic sanctions imposed on Russia after the attack have barred Russian institutions from global financial and payments markets. In this situation, we observe that at very low volatility, the frontier of portfolios with futures is better, but in general, it seems to be worse than the frontier of portfolios without futures. Hence, there is a probability that both risk-averse and risk-seeking investors will invest in the frontier of portfolios without futures because it is more efficient. The introduction of futures in portfolios does not help to hedge the risk of losses, confirming those of (Corbet et al., 2018; Hale et al., 2018) in showing that Bitcoin futures are not a good hedge. Despite the minimal difference in volatility, the portfolio without futures is the one that minimizes the volatility and provides a higher return.

Figure 10. Portfolios' efficient frontiers for 2022



In conclusion, Comparing the entire period with various sub-periods, we notice changes in the results of efficient portfolios because of the frequent variations in volatility. This difference can be explained

by the fact that the volatility changes daily; therefore, the analysis of different periods should be more precise. Consequently, we conclude that introducing Bitcoin futures does not ameliorate risk-seeking investors' portfolios as they decide to invest in a portfolio without futures. In contrast, introducing Bitcoin futures can potentially ameliorate a portfolio for a risk-averse investor.

Moreover, GARCH and realized volatility approaches show mixed and contradicting results for efficient portfolios with/without futures. And splitting into yearly subperiods shows mixed results as well. Such findings are subject to the model used and the period, urging for continuous and active portfolio rebalancing by risk-averse and risk-seeking investors.

Generally speaking, the introduction of Bitcoin futures did not show a significant improvement in the mean-variance nexus of the portfolios containing them, which could be due to; the speculative activity and short sale that overlooks the hedging purpose of the futures trading (Nekhili, 2020), second, it could also be related to the fact that Bitcoin spot operates without stop whereas futures are traded on organized exchanges with limited time, making the Bitcoin spot to incorporate more information and faster than the futures market.

4. Conclusion

Since their introduction in December 2017 as regulated futures contracts on organized markets to mitigate risk in the Bitcoin spot market, it remains unclear how futures trading affects the risk-return nexus in the spot market. To address this question, we analyze the portfolio construction implications of introducing Bitcoin futures on the Bitcoin market. We use a high-quality dataset of Bitcoin prices and their futures. The literature affirms that after the futures introduction, there was an increment in volatility, turning the cryptocurrency market more unstable. We employ two different approaches to compute the volatility: the Realized volatility and the GARCH process, and we find that the return decreases after the introduction of futures, volatility, variance, and kurtosis increase, and the Skewness declines. This suggests that, generally, futures make Bitcoin riskier and subject to greater fluctuations.

Furthermore, we investigate the portfolio construction implications of bitcoin futures by building two portfolios, including top S&P stocks, one with futures and one without accounting for the COVID-19 pandemic and the ongoing R-U War. We build portfolios over the entire period but split yearly from 2018 to 2022. We find that the Bitcoin futures introduction has not improved the portfolio of risk-seeking investors since they will select a portfolio without futures investment. However, the future introduction can potentially enhance the portfolios of risk-averse investors.

We also provide insights for regulators and policymakers. Trading in futures, especially short sale, is a margin trading that leads to speculation, but speculation per se is not wrong; it turns out when becomes manipulation, leading to price distortions and inefficiencies. In this regard, regulators should be actively involved to prevent such actions and restore equilibrium quickly aftershocks. Moreover, Bitcoin futures can have a transmission effect not only on the Bitcoin spot but also on other crypto markets and asset classes; regulating these futures deserves significant policy attention, despite all the benefits they may entail.

In a nutshell, Bitcoin's volatility remains a significant issue, even with the introduction of Bitcoin futures trading. While futures have the potential to bring stability to the market, they also add complexity and risk, given the speculative nature of the market. Our mixed results are subject to the model used and the period, urging for continuous and active portfolio rebalancing by risk-averse and risk-seeking investors. Despite the challenges, the cryptocurrency market continues to grow, and Bitcoin remains a valuable asset class for long-term investors.

5. References

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