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Estimating Value at Risk Assuming Pareto Tails: a Semiparametric Approach

Case Study for Cryptocurrencies

Tomás Antunes Ricardo

Dissertation

presented as partial requirement for obtaining the Master Degree Program in Statistics and Information Management

NOVA Information Management School
Instituto Superior de Estatística e Gestão de Informação
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By

Tomás Antunes Ricardo

Master Thesis presented as partial requirement for obtaining the Master's degree in Statistics and Information Management, with a specialization in Risk Analysis and Management

Supervisor: Bruno Damásio

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STATEMENT OF INTEGRITY

I hereby declare having conducted this academic work with integrity. I confirm that I have not used plagiarism or any form of undue use of information or falsification of results along the process leading to its elaboration. I further declare that I have fully acknowledge the Rules of Conduct and Code of Honor from the NOVA Information Management School.

Lisbon, 11/07/2023

DEDICATION

This master thesis is dedicated to my beloved parents Ana Margarida Duarte Antunes and Carlos Manuel Bernardino Ricardo as a token of my deep gratitude for the immense love and support you have always given me throughout my academic journey. Your unwavering emotional and financial support have been the pillars of my success, and I cannot express in words how much it means to me.

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With all my love and gratitude,

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ABSTRACT

The main purpose of this master thesis is to determine the applicability of using Pareto tails to estimate the Value at Risk for cryptocurrencies. This study used five different cryptocurrencies, namely Bitcoin, Ether, Binance Coin, Ripple and Cardano. Concerning the methodology, six methods were used: Generalized Pareto Distribution, Normal Distribution, Historical Simulation, Gaussian GARCH, Student's-t GARCH and Integrated GARCH in order to determine VaR for investment horizons of one week, one month and one quarter, each with two confidence intervals of 95% and 99%. The general timeframe considered was from 06/11/2017 to 06/11/2022, but a smaller timeframe has also been analyzed to study the impact of extreme events, such as the COVID-19 pandemic. The main takeaway from this research is that the semiparametric approach can indeed estimate the VaR of cryptocurrencies with high levels of precision in terms of marginal coverage, for both larger timeframes and extreme events.

KEYWORDS

Value at Risk (VaR); Cryptocurrencies; Pareto Tails; GARCH; Kupiec; Christoffersen; Covid-19

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LIST OF ABBREVIATIONS AND ACRONYMS

ADA	Cardano Blockchain Coin (Cryptocurrency)
ALD	Asymmetric Laplace Distribution
BNB	Binance Blockchain Coin (Cryptocurrency)
BTC	Bitcoin (Cryptocurrency)
CAViaR	Conditional Autoregressive Value at Risk
CI	Confidence Interval
CRO	Crypto.com Coin (Cryptocurrency)
ETH	Ether or Ethereum Blockchain Coin (Cryptocurrency)
ES	Expected Shortfall
EVT	Extreme Value Theory
EWMA	Exponential Weighed Moving Average
GAS	Generalized Autoregressive Score
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GPD	Generalized Pareto Distribution
GRF	Generalized Random Forest
HS	Historical Simulation
IPSA	Index Price of Selective Stocks (Chile Market Index)
KLSE	Kuala Lumpur Stock Exchange (Malaysian Stock Exchange)
LRSTAT	Likelihood-Rate statistic value (from Kupiec or Christoffersen tests)
LTC	Litecoin (Cryptocurrency)
ND	Normal Linear Distribution
VaR	Value at Risk
XRP	Ripple Blockchain Coin (Cryptocurrency)
USDT	Tether (Cryptocurrency)
XLM	Stellar (Cryptocurrency)
XMR	Monero (Cryptocurrency)

1. INTRODUCTION

Since market risk is a major concern for financial institution owners and regulators, risk assessment is made using methods such as VaR (Danielsson & De Vries, 2000). Given that cryptocurrencies are the most recent financial asset, there is still a gap considering the implementation of a semiparametric approach using Pareto tails and there are not many articles about risk assessment compared with other assets.

This section will provide some more context information on the study, such as its relevance to both academic and industrial fields, its objectives, the methodology employed, the main contributions, and finally, the report's structure.

1.1. CONTEXT AND RESEARCH RELEVANCE

Baur, Hong & Lee (2018, p.179) found that Bitcoin's returns properties offer great diversification benefits and that about one-third are held by investors. These authors have also concluded that Bitcoin's returns distribution presents "Such large negative skewness", which indicates that "the tails on the left side of the distribution are longer or fatter than the right side". This suggests the potential of using a semiparametric approach with Pareto Tails for calculating VaR.

In another article, Liu, Semeyutin, Lau & Gozgor (2020) have concluded that future research should replicate VaR analysis with more observations, a wider pool of cryptocurrencies and methods to verify if the results of the article remain equal. This demonstrates that perhaps there are already studies on this topic, but it is still important to provide updates since new data and methods can lead to different results.

Considering these points, this study derives its relevance from fulfilling the Research Gap about the Estimation of VaR with a semiparametric approach assuming Pareto Tails for the concrete case study of cryptocurrencies. This study aims in this way to answer the Research Question "To what extent is suitable the estimation of VaR for cryptocurrencies using a semiparametric approach assuming Pareto Tails in order to help investors to identify and manage the risk of their portfolios?"

Concerning the Research Objectives, these are the following:

- To assess if the Generalized Pareto Distribution (GPD) approach is appropriate for the calculation of VaR in cryptocurrencies;
- Identify in which investment periods and Confidence Intervals (CIs) the semiparametric approach presents better results than other approaches;
- Determine the VaR of top cryptocurrencies in terms of market cap for different investment periods and compare results;
- Compare the VaR estimations from the Periods Before and During Covid-19 for the cryptocurrencies using GPD and verify their backtesting results.

1.2. Research Methodology

The methodological approach has its foundation in the comparison of the GPD method with other unconditional VaR approaches such as the parametric Normal Distribution (ND) and the non-parametric Historical Simulation (HS) and GARCH models such as Gaussian GARCH, Student's-t GARCH and Integrated GARCH. The Kupiec (Kupiec, 1995) and Christoffersen (Christoffersen, 1998) backtesting tests will be performed to verify if the VaR forecast presents significant marginal and conditional coverage, respectively, as in the original data.

The cryptocurrencies in the study are BTC, ETH, BNB, XRP and ADA. The general time frame period analyzed starts on 06/11/2017 and ends on 06/11/2022. Smaller timeframes periods are also studied to evaluate the impact of Covid-19 on the VaR of cryptocurrencies. The CIs studied will be 95% and 99% and the investment time horizons will be seven days, 30 days and 90 days. The currency used as parity for comparison will be the US dollar.

1.3. Main Contributions

This research evaluates the GPD method for calculating the VaR of cryptocurrencies and compares its effectiveness with other approaches. Three notable contributions set this study apart within the field.

Firstly, the analysis encompasses a more recent time period. This approach helps assess whether the conclusions drawn in prior studies hold true in a more recent context, providing a valuable temporal perspective.

Secondly, a different methodological approach is employed. Rather than fixating on determining an optimal threshold for the GPD method, the study calculates VaR for cryptocurrencies across various threshold values. This methodology allows to study the behavior of the final VaR estimations and its associated parameters as the threshold value increases.

Lastly, this thesis extends its focus to examine the reliability of the GPD method during extreme events, such as the Covid-19 pandemic. This inclusion adds depth to the research, considering the method's performance under diferent scenarios.

1.4. Report Structure

In order to guarantee a good comprehension of this report, the subsequent structure is followed. Firstly, Chapter 2 will explain the concept of VaR and the calculation methods used in this study and Chapter 3 will briefly describe the cryptocurrencies analyzed. An important literature review will be presented in Chapter 4 to help readers comprehend and defend the research aim and objectives. The methodology and cryptocurrency data statistics descriptions used in the calculations are described in Chapter 5, and the calculations' results are then presented and discussed in Chapter 6. The interpretations of the empirical findings are covered in Chapter 7, and Chapter 8 concludes.

2. VALUE AT RISK AND METHODS IMPLEMENTED

This section aims to define the VaR statistical measure and outline its objectives while also providing a brief overview of the study's research methods.

2.1. VALUE AT RISK

According to Siokos (2001), the VaR statistical measure is utilized to determine the monetary losses on a volatile asset or a portfolio of assets. To put it plainly, it is the maximum potential amount of money that could be lost during a specific investment period, having into consideration an also specific CI. Pension and investment funds frequently employ this metric in order to evaluate the level of overall risk that managers are tolerating in order to meet their portfolio returns.

2.2. METHODS

The VaR is calculated using a wide variety of techniques, of which were implemented in this study the GPD, the HS, the ND and three models from the standard GARCH family models.

The GPD approach for VaR is the main focus of this study and one of the two semiparametric approaches of the EVT. According to Pisarenko et al. (2014), this method records the excess function of a defined sample when increasing a predefined threshold to the most extreme observation, gathering in this way information for the distribution of extremes and for determination of parameters. This method assumes that the losses from an asset follow a Pareto Distribution. Gonzalo & Olmo (2004) have noted that the shape of the Pareto Distribution tails will be inaccurate if the threshold is far from the maximum, and ineffective if the threshold is close to the maximum. This makes it necessary to choose an adequate threshold.

Jondeau, Poon & Rockinger (2007) define the HS approach as a non-parametric approach since it does not need any assumption about the distribution of returns. From their perspective, this is the most straightforward method to calculate VaR. This technique entails determining the value that, given the specified CI VaR, corresponds to the quantile of a distribution of returns from a sample. Although this method is simple to implement, it also presents some limitations, such as the underlying assumption that the returns must be independent and identically distributed and the requirement for larger data samples in order to increase the accuracy of VaR estimations. Dowd (1998) also mentions the assumption that the historical distribution of the portfolio returns will reflect the future, which is possible to not happen.

The ND approach is an unconditional parametric approach used to calculate VaR. Siokos (2001) defines that the two main premises of the ND approach are that returns follow a normal distribution and that the distribution does not change over time. Since neither premise is true, this VAR approach is frequently not very precise. Using this method, the VaR is calculated by multiplying the sample's volatility by the inverse of a normal distribution corresponding to the predefined level of statistical confidence.

The Gaussian GARCH model is a mathematical process being mainly utilized in the financial industry to examine time-series data in order to determine a feasible estimation of the volatility of financial asset returns series. The main difference from this model to the previously mentioned is that it assumes a Conditional Volatility, instead of a Constant Volatility. This means that the error term of the variance of data following a Gaussian distribution is heteroskedastic. Cruz, Rodriguez & Giner (2003) have described the formula that leads to the conditional volatility of the Gaussian GARCH as the sum of a constant value with the weighted average of the last period forecasted volatility and the last period squared return observation. These authors mentioned that the parameters of the formula are determined by maximizing a Gaussian log-likelihood function.

The Student's-t GARCH is similar in the majority of characteristics already described for the Gaussian GARCH. The main difference as mentioned by Fonseca, Cerqueira, Migon, & Torres (2019) is that instead of the error terms presenting a Gaussian distribution, it presents a Student's-t distribution. This method can present better results than the Gaussian, since the majority of asset time series distributions have heavier tails than those supported by Gaussian distributions.

The Integrated GARCH model differs from the other GARCH models mentioned in the discovery of the volatility cluster by assuming that the sum of the autoregression and volatility coefficients is equal to one. Due to this characteristic, some metrics that can be calculated with standard GARCH models, such as unconditional variance, cannot with this method. However, Caporale, Pittis, & Spagnolo (2003) define that this model is more suitable when "the conditional volatility process is highly persistent and possibly not covariance-stationary, suggesting that a model in which shocks have a permanent effect on volatility might be more appropriate" (p.765).

3. CRYPTOCURRENCIES

This research determined the VaR of five different cryptocurrencies with a wide variety of methods. The cryptocurrencies chosen for this study were those with the highest market caps for the analyzed general timeframe, as well as those with the greatest volatility and number of observations. The goal was to employ high-quality data and research the most popular cryptocurrencies in terms of users and transactions in order to maximize the value of the conclusions. Each cryptocurrency used in this study is described briefly in this chapter.

Per Tikhomirov (2018), BTC is the first and the most well-known entirely decentralized digital currency introduced in 2008 and launched in 2009, by a programmer or group of programmers going by the pseudonym Satoshi Nakamoto. By acting as money and a means of payment independent of any one person, group, or entity, this cryptocurrency eliminates the need for third parties, such as banks to get involved in financial transactions. This is only possible due to the implemented proof of work protocol. This protocol ensures that users of BTC's blockchain network named miners receive monetary compensation in BTC for verifying transactions by resolving complex mathematical computational problems. On the 8th of November of 2021, BTC reached its largest market capitalization of around 1.28 trillion dollars.

ETH is the cryptocurrency from a decentralized blockchain platform named Ethereum that sets up a peer-to-peer network for safely executing and validating Smart contract application code. This platform has been systematized in 2013 by Buterin (2014), developed and crowdfunded in 2014 and launched in 2015. The Smart contracts allow participants to conduct business with each other without the need for reliable central authority. Ethereum accounts allow us to send and receive multiple transactions in ETH. Transaction records are unchangeable, provable, and securely disseminated over the network, giving participants full control and exposure over transaction data. Per Tikhomirov (2018) the ETH has a blockchain memory size of 52 GB and is able to perform 12406 transactions per hour in contrast to BTC, which has values of 158 GB and 5509, respectively, showing that Ethereum blockchain is more efficient. On the 9th of November of 2021, ETH reached its largest market capitalization of around 571.67 billion dollars.

BNB is the cryptocurrency issued by Binance exchange in July 2017. It was initially established on the Ethereum network but afterward has been moved to Binance's blockchain, the Binance chain. BNB was created as a utility token for discounting trading fees from the Binance exchange but since then it has expanded its applications. It is now employed as a means of payment which allows any person to book travel accommodations, buy lottery tickets, and pay for multiple online services, for work or leisure purposes. Inside the Binance exchange, BNB is additionally used for loans, investment in Initial Coin Offers from other coins listed on the exchange and in the Binance Card cashback program. Ho, Chiu, & Li (2020) have concluded that due to their constant community involvement, BNB has occasionally surpassed ETH to occupy the top spots for cryptocurrency used to develop applications during the pandemic period of COVID-19. On the 8th of November of 2021, BNB reached its largest market capitalization of around 109.14 billion dollars.

XRP is the cryptocurrency from a digital payment network for financial transactions named Ripple. Ripple was launched in 2012 by Chris Larsen and Jeb McCaleb and is an open-source decentralized platform that allows money transfers in any form, including traditional currencies and cryptocurrencies. These transactions can be done effortlessly without the need for the sender to have the currency that the receiver of the transaction needs. As mentioned by Kucheryavenko, Dmytryk & Golovashevych (2019), this is possible due to the fact that the blockchain platform has digital credit intermediaries that receive and send currencies in the network registering the debts as debt obligations inside the network. However, this advantage can lead to exposure to counterparty risk, in case the credit intermediary does not fulfill his obligations. Major banks and other financial institutions are among the clients of this platform. On the 7th of January of 2018, XRP reached its largest market capitalization of around 130.85 billion dollars.

ADA is the cryptocurrency from the decentralized proof of stake blockchain named Cardano. The development of Cardano, by Charles Hoskinson, one of the co-founders of Ethereum, started in 2015 being finally launched in 2017. In fact, the Cardano and Ethereum platforms provide similar applications such as Smart contracts and the building of decentralized applications. However, Cardano has been the pioneer in the implementation of a proof of stake protocol used for validating transactions. This protocol is more energetically efficient, more secure against cyberattacks and more scalable, allowing faster transactions than the alternative proof of work, which is used by BTC and had been used by ETH until September 2022. The authors Thin, Dong, Bai & Song Dong (2018) have concluded that this efficiency is possible since the Cardano proof of stake blockchain uses at least two-thirds of the blocks of the network to achieve a voting consensus which enables the creation of new blocks instead of using all blocks as the proof of work mechanism. On the 3rd of September of 2021, ADA reached its largest market capitalization of around 95.03 billion dollars.

Below are presented plots with the daily closed prices between 06/11/2017 and 06/11/2022, in order to provide a visual representation of the period of analysis and the changes that occurred in prices.

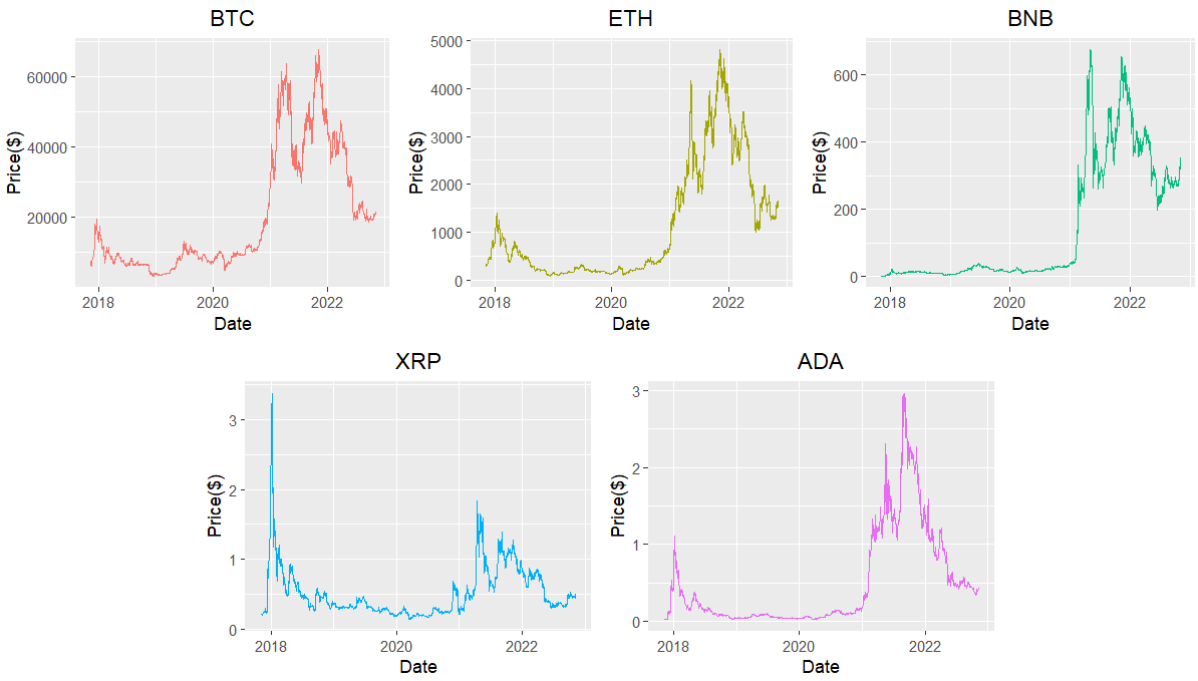

Figure 1: Daily Closed Prices

4. LITERATURE REVIEW

A brief analysis of Cryptocurrencies and VaR methods will be carried out in this section. The analysis is based on prior research on these subjects. The goals are to demonstrate the value of researching the use of a GPD method to calculate VaR for the particular case of Cryptocurrencies and to back up the study conclusions. This chapter is divided into four subsections: Cryptocurrencies definition, context and their statistical properties; VaR methods in cryptocurrencies; VaR with a semiparametric approach using Pareto Tails and the Impact of Covid-19 in the VaR of cryptocurrencies.

4.1. CRYPTOCURRENCIES DEFINITION, CONTEXT AND THEIR STATISTICAL PROPERTIES

By definition, the term cryptocurrency refers to a digital asset with the primary function of serving as a medium of exchange. To accomplish this, it employs cryptography to ensure the security of all transactions of its blockchain. Cryptocurrencies can be viewed as a subsection of digital currencies (Milutinović, 2018).

However, according to Baur et al. (2018), this function of a medium of exchange is not its main one, since around 33% of BTC is owned by speculators, individuals who mainly hold BTC as a means of investment by waiting for an appreciation on its value. BTC appears to be used as a medium of trade only by a small percentage of users, both in terms of numbers and transaction amounts. This article also explains how BTC's returns characteristics differ significantly from those of conventional assets and how this makes it an excellent asset for diversification in both calm and turbulent periods. The returns distribution of BTC exhibits a very significant negative skewness, indicating an asymmetric distribution, with the tails on the left side of the distribution being larger than the right side, and a very high kurtosis, indicating a greater probability of extreme events.

Chan, Chu, Nadarajah & Osterrieder (2017) have achieved similar conclusions regarding the returns' distribution, since these authors have discovered that a group of six cryptocurrencies, including BTC, Dash, LTC, XMR, XRP and Dogecoin exhibit heavy tails. The authors also mention that these findings have implications for risk management, specifically the calculation of VaR and ES and that new studies should try to implement methods such as GARCH models, nonparametric or semiparametric distributions.

Still concerning the study of the return's distribution of cryptocurrencies, Börner et al. (2021) have found that, in a set of 27 cryptocurrencies, stable distributions are suitable to model the body of distributions, but that for the case of tails, a GPD approach is better suited and precise given that the distributions have presented fat tails.

It is also important to note that Mendes & Carneiro (2020) concluded and supported the notion that assumptions about cryptocurrencies return distributions previously defended by other authors had been validated by them. These include extremely large kurtosis, mean near zero, non-normality, the existence of extreme points, practically no autocorrelation of returns, volatility clustering, high persistence and long memory in the volatility.

All these articles demonstrate that in general, cryptocurrencies distribution returns are very different from other types of assets, that their main assumptions do not change over time and that these present heavy tails. Considering these points, for the calculation of VaR it is reasonable to assume that

the semiparametric approach using Pareto tails is appropriate for this purpose and that it is fundamental to conduct studies in this area.

4.2. Value at Risk Methods in Cryptocurrencies

This section examines the results of earlier studies about estimating the VaR of cryptocurrencies in order to find tendencies of performance of various approaches and to compare with the results of this study.

Regarding the previously stated authors, Mendes et al. (2020, p. 208) have concluded that for capturing conditional volatility, some GARCH models such as ARFIMA-GARCH and FIGARCH can provide efficient and accurate metrics. Considering the unconditional volatility, it has been concluded that for the calculation of VaR, the GPD approach for tails has "an excellent adherence to the data" and the Kupiec test verified that the provided risk measures are accurate with CIs of 95% and 99% for both tails. The VaR calculations have determined that for the log daily returns, BTC presents a risk of 12.08% and 6.29% and ETH presents a risk of 17.56% and 9.5%, for CIs of 99% and 95%, respectively.

Liu et al. (2020) have performed for BTC, ETH and LTC returns a set of EWMA VaR models, which includes the GAS; the Student's-t GAS; the Laplace GAS and its skewed version; the double Generalized Pareto GAS and the reflected Gamma distribution GAS. The estimations were backtested using the tests of Kupiec, Christoffersen, Engle and Manganelli and Model Confidence Set. In general, these accuracy tests have concluded that these models are suitable to forecast the VaR of cryptocurrencies. However, it was also noticed that the double Generalized Pareto from the family of the EVT models tends to overestimate their estimations.

Concerning the HS and ND approaches, Likitratcharoen, Ranong, Chuengsuksomboon, Sritanee & Pansriwong (2018) have performed these methods with a rolling window technique adaptation in BTC, ETH and XRP daily returns. Their performance was tested by using the Kupiec, the Christoffersen and a Joint test of both tests. Using the Kupiec test, it was found that the HS are able to produce a fairly accurate estimation over the ND. Christoffersen's test has found that HS and ND VaR estimations present independent exceptions for the CI of 99%, but that for 90% and 95% these present dependency exceptions. Also using the joint test, this study shows that the HS presents better estimations than the ND. This mainly occurs because the return's distribution from the cryptocurrencies mentioned did not follow a normal distribution as shown by other studies.

In another article, Trucíos & Taylor (2022) performed a set of models for determining VaR and ES for the daily returns of BTC and ETH with data from 17/08/2017 to 22/07/2022. These models are the NAGARCH, FIGARCH, Robust bootstrap GARCH, MSGARCH, GAS, CAViaR-EVT and CAViaR-ALD. This study also implemented forecast combinations from a set of model results. These combinations have been implemented as simple average, median value, minimum value, maximum value and scoring function minimization. The authors have concluded that in general, all the individual models are suitable to determine the VaR accurately for these cryptocurrencies. However, the most important discovery was that the combination of models was not able to outperform the individual models, perhaps still providing reasonable results. The main justifications given are the presence of some outliers in the distributions which can negatively influence the model's performance and the models being univariate time series restricting in this way the variety of information provided. Considering

these conclusions, the authors suggest that it is important to try to find models with adequate robustness to deal with outliers and work with time frame data.

Considering the GRF method, Görgen, Meirer & Schienle (2022) have analyzed the performance of this method in order to determine the VaR in a set of 105 cryptocurrencies and compared the results with GARCH and CAViaR models. The authors have concluded that GRF with a quantile prediction adaptation outperforms the other models mentioned, given these methods often miscalculate the risks and the detection of possible speculative bubbles. This benefit is particularly noticeable during turbulent periods and for highly volatile cryptocurrencies that have a large number of active users and may thus be more susceptible to speculation. The backtesting of these results has been made with methods such as Dynamic Quantile, Kupiec and Christoffersen tests. The authors of this study have also concluded that for the calculation of VaR, it can be relevant to use real-time factors such as social media information.

Concerning high-frequency returns data, Zhang, Chan & Nadarajah (2019) have performed the GPD approach to calculate VaR considering the log hourly returns distribution data for four cryptocurrencies: BTC, ETH, LTC and XRP. The data used ranged from midnight on 25/02/2017 to 5 pm on 20/06/2018. This study has concluded that for both positive and negative hourly log returns at every percentile and threshold, XRP is the cryptocurrency with the highest potential gain or loss, followed by LTC, ETH and at last the least risky cryptocurrency is BTC. Considering the GPD method, from the graphical results, it is possible to observe the impact that a change in the threshold has in determining and changing the values of the VaR. For all cryptocurrencies, the impact of this change diminishes as the CI in consideration increases. In short, the VaR metric is more sensible to changes for lower CIs.

From all the articles from this section, it is possible to understand that there is a great diversity of methods suitable to determine the VaR from the cryptocurrencies, from parametric to non-parametric, semiparametric, GARCH, CAViaR and GRF. Also, some tendencies emerge such as:

- Cryptocurrencies are selected based on their market cap during the period studied;
- Articles usually use log daily returns distribution for their studies;
- The big impact that returns distributions and outliers have in the VaR calculations can lead to simple methods leading to better results;
- The use of Kupiec and Christoffersen tests to verify the accuracy and precision of the results;
- GPD approach is used frequently due to its simplicity and adequacy.

The already mentioned great number of articles that only consider log daily returns data justifies the choice of using bigger log period returns data such as weekly, monthly and quarterly. This is executed in order to test if the performance of the methods remains the same and also because there is a lack of information concerning these circumstances.

4.3. Value at Risk with a Semiparametric Approach Using Pareto Tails

This section is focused on analyzing articles that use the GPD approach to determine the VaR of assets that are not cryptocurrencies such as stocks, bonds, commodities and national currencies to try to find any similarities and predict future results concerning cryptocurrencies.

Concerning Emergent Stock Exchanges, Chin (2008) performed the GPD and two ARCH models with residuals as normal distribution and a student's-t distribution to determine the VaR from KLSE indices. The authors analyzed a market index and four major sectoral indices. The data ranges from 25/10/1993 to 31/01/2007. This article has concluded that although the ARCH Student's-t method can capture the heavy-tailed property, it was unable to account for the asymmetric behavior at both ends of the tails. However, the GPD approach was able to do it. All indices presented heavy tails, with three indexes presenting positive skewness and other two presenting negative skewness.

In another article, Gençay and Selçuk (2004) performed the ND, the HS and the GPD methods to calculate the VaR for log daily returns of nine emerging stock markets: Argentina, Brazil, Hong Kong, Indonesia, Korea, Mexico, Philippines, Singapore, Taiwan and Turkey. An important point to highlight is the different initial dates used for each country's data, with periods ranging from between 01/01/1973 and 06/06/1995, and all markets concluding on 29/12/2000. The authors concluded that the tails of the return distributions in these markets are shown to fit the GPD well. In terms of VaR forecasting, the GPD model outperforms the other two already mentioned, especially at the CIs of 99% or higher. This study concluded that in emerging markets, the GPD and the EVT are essential components of risk management.

In a different study, Fernandez (2003) determined the VaR with the GARCH-EVT with Pareto Tails, Gaussian GARCH, Student's-t GARCH, GARCH with non-parametric innovations and the unconditional GPD method. The assets studied were the IPSA with data from 1990 to 2002; the Chilean peso/US dollar exchange from 1988 to 2002; the spot price of copper from 1998 to 2002 and a one-year zero coupon bond proxy from 1993 to 2001. Overall, the findings indicate that in general a GARCH-EVT model substantially outperforms a GARCH model with typical innovations. However, when the return's distribution is symmetric, meaning that tails are equal or almost equal, the Student's-t GARCH can be a viable substitute for the Pareto tails innovations. Additionally, GARCH models with non-parametric innovations provide better results than the Gaussian GARCH. Ultimately, both for conditional and unconditional VaR determined using Pareto tails, the backtesting tests reject the majority of null hypotheses for the exchange rate and the bond. These results arise due to a specific combination of low volatility, high kurtosis, and the presence of outliers, which pose challenges in achieving a good fit for the Pareto tails.

Concerning gold, Chinhamu, Huang, C.-K., Huang, C.-S., & Chikobvu (2014) performed the GPD method to calculate the VaR and the ES and compare them with other methods such as the ND and the Student's t distribution. The authors concluded that the GPD method is suitable to estimate the VaR of gold due to the presence of a large kurtosis of 6.729, indicating that the return distribution is leptokurtic and has heavy tails. The authors have tested the VaR results using the Kupiec and the Christoffersen tests for the CIs of 90%, 95% and 99%. For all the cases, the VaR estimates from the Pareto tails were not rejected. Finally, this study has shown that the GPD method outperforms the other two methods mentioned.

To conclude, for assets that are not cryptocurrencies, the reliability of the GPD method depends on the kurtosis of the returns distribution since higher kurtosis presents heavier tails which are better for the adherence of the Pareto distribution. From these studies, it is also possible to verify the recurrent use of the Kupiec and Christoffersen methods to verify the performance of the estimations.

4.4. Impact of Covid-19 on the Value at Risk of Cryptocurrencies

The GPD approach has also been used in this study to examine the effect that Covid-19 has on the VaR of cryptocurrencies. In this manner, a few articles that have researched this subject with relevant conclusions are listed below.

The authors Khairunnisa, Purwanto, & Ermawati (2022) performed the standard GARCH model to determine the VaR of ten cryptocurrencies, namely: BTC, ETH, USDT, XRP, BTC Cash, BTC SV, LTC, BNB, ADA and CRO. The period analyzed was between 11/03/2020 and 11/06/2020, using the daily closed prices. It was concluded that CRO and ADA are the two cryptocurrencies with the biggest volatility, making them highly risky/return investments. Also, BNB, BTC SV, XRP, BTC Cash and LTC have the highest average negative returns in descending order. This indicates that these cryptocurrencies are the most likely to experience significant losses and hazards during the COVID-19 epidemic. BTC SV and BNB are the cryptocurrencies with the highest potential risk and expected low return, because of the significant standard deviation of the returns.

In another article, Conlon, Corbet & McGee (2020) studied the use of the cryptocurrencies BTC, ETH and USDT as safe havens investments examining the downside risk reduction for six international equity markets. The markets analyzed were the MSCI World, S&P 500, FTSE 100, FTSE MIB, IBEX and CSI 300, during a bear market in cryptocurrencies, consequence of the Covid-19. This study concluded that in general, it is not believed that BTC and ETH serve as a safe haven for global equity markets, since their inclusion has increased the downside risk of the portfolios due to higher volatility values, with the CSI 300 index being the only exception. On the other hand, it has been concluded that USDT served as a safe haven investment during the COVID-19 crisis. However, due to significant short-term historical losses in USDT as a result of an unsteady peg with the US dollar, it was discovered that such negative risk hedging features are not consistent over time.

Concerning VaR comparison before and after Covid-19 starts, Almeida, Dionísio, Vieira & Ferreira (2022) performed unconditional and conditional VaR analysis using log daily returns to calculate the VaR of one-year returns periods. These periods were from 08/08/2019 to 07/08/2020 and from 08/08/2020 to 07/08/2021. For the cryptocurrencies BTC, ETH, XRP, USDT, LTC, XLM and XMR, this study has concluded that in the interval from the first mentioned period when Covid-19 started to the second, the majority of cryptocurrencies showed a positive increase in the unconditional and conditional VaR metrics in contrast with a negative change of entropy. The only exception to this trend has been USDT.

From the articles above is possible to conclude that Covid-19 has led to an increase in the VaR of cryptocurrencies due to a period of high volatility. Almost all the cryptocurrencies followed the same pattern of risk and presented bigger VaR metrics than other types of financial assets.

5. METHODOLOGY

This chapter consists of two distinct sections. The first section is the empirical approach, which describes the process of collecting and treating data in order to perform VaR calculations. It also identifies the methods and formulas, as well as the statistical tests used to determine the significance of the results. The second section is the Data Description in which are presented the main characteristics of the data used to perform the VaR calculations.

5.1. EMPIRICAL APPROACH

The empirical part of this project consists of the VaR calculation for five distinct cryptocurrencies: BTC, ETH, BNB, XRP and ADA. For this purpose, six different methods were used: the GPD, the HS, the ND, Gaussian GARCH, Student's-t GARCH and Integrated GARCH.

5.1.1. Collection and Treatment of Data

The first step in conducting this empirical study was gathering the "closed prices" from the cryptocurrencies mentioned on the websites of Yahoo Finance and CoinMarketCap. The closing price is the last transacted price in a security before the market officially closes for regular trading. Investors frequently use the closing price as a benchmark when evaluating the performance of a stock.

For purposes of comparison of results, it was defined that the number of observations and the temporal period of analysis would be equal for all the assets, being this period between 06/11/2017 and 06/11/2022, which corresponds to five years of "closed prices" observations. For the specific comparison of VaR before and during Covid-19 using the GPD method, the selected periods are from 01/07/2018 to 31/12/2019 and 01/01/2020 to 30/06/2022. The date 01/01/2020 was chosen since it demarks the beginning of the year in which Covid-19 had the most impact and is between the beginning of the virus in November/December 2019 and the declaration as a pandemic in March 2020.

After the collection of data, the log returns to determine the VaR for each cryptocurrency were determined using the following formula:

$$\boldsymbol{r_{t,n} = Log\left(\frac{P_t}{P_{t-n}}\right)} \quad (1)$$

Where, $r_{t,n}$ is the return, Log is the natural logarithm and P_t and P_{t-n} is the closing price observed in day t and day $t-n$, respectively. Normally, the variable n is equal to 1 since most of the studies focus on the daily log returns. However, under the aim of this study, it will be used as n the numbers seven, 30 and 90, which are the log weekly returns, the log monthly returns and the log quarter returns, respectively for a 30/360 base.

5.1.2. Methods and their Respective Formulas

With all the data required already available, the VaR calculation starts. In this study, all methods are tested with two specific CIs of 95% and 99%. These CIs have been chosen in order to test the difference in the performance of the methods concerning if the VaR calculations focus more on the body of the distribution (95%) or in the tail of the distribution (99%).

Considering the methods already mentioned in this chapter, the formulas associated with each method are presented below.

The GPD approach to calculate the VaR has the following formula:

$$\boldsymbol{VaR_{\alpha}} = \boldsymbol{\eta} - \frac{\boldsymbol{\psi(\eta)}}{\boldsymbol{\xi}}\left(\mathbf{1} - \left(\frac{\boldsymbol{T}}{\boldsymbol{N_{\eta}}}(\boldsymbol{\alpha})\right)^{-\xi}\right) \quad (2)$$

$\eta = threshold$

$\psi(\eta) = scale$

$\xi = shape$

$T = sample\ size$

$N_{\eta} = number\ of\ exceedances$

$\alpha = significance\ level$

The GPD analysis takes a different approach by avoiding clustering and mean residual life plots for threshold determination. Instead, multiple VaR metrics are calculated across varying thresholds to visually depict the changes in performance and accuracy. This approach provides a clearer understanding of the threshold's impact on risk assessment. This approach has already been implemented by Zhang, Chan, & Nadarajah (2019). For the estimation of the parameters shape (ξ) and scale $\big(\psi(\eta)\big)$, the probability weighted moment method was used in replacement of the maximum likelihood method since this presented for some cases problems of optimization.

The HS approach to calculate the VaR has the following formula:

$$\boldsymbol{VaR_{\alpha}} = -\boldsymbol{r}_{\alpha} \quad (3)$$

$r = Log\ distribution\ returns$

$\alpha = significance\ level$

The ND method to calculate the VaR has the following formula:

$$\boldsymbol{VaR_{\alpha}} = \boldsymbol{\Phi^{-1}(1-\alpha)} * \boldsymbol{\sigma} - \boldsymbol{\mu} \quad (4)$$

$\Phi^{-1} = standard\ normal\ distribution\ \alpha\ quantile$

$\alpha = significance\ level$

$\sigma = standard\ deviation$

$\mu = mean\ return$

The Gaussian GARCH, the Student's-t GARCH and the Integrated GARCH methods with the number of lags of the past squared residuals and the number of lags of the past forecast errors both equal to one have the following formula to calculate the VaR:

$$\boldsymbol{VaR_{\alpha,t+h}} = -\left(\boldsymbol{\mu_{t+h|t}} + \boldsymbol{q_{\alpha}^{\varepsilon}\sigma_{t+h|t}}\right) \quad (5)$$

$$\mu_{t+h|t} = E[r_{t+h}|F_t] \quad (5.1)$$

$$\sigma_t^2 = \omega + \alpha_1 u_{t-1}^2 + \beta_1 \sigma_{t-1}^2 \quad (5.2)$$

$$q_{\alpha}^{\varepsilon} = 100\alpha\%\ quantile\ from\ the\ distribution\ of\ \varepsilon_t$$

The calculation of VaR using GARCH models involved the use of a rolling estimation procedure. For this purpose, the data was divided into two sets: the training set and the testing set. The training set consists of two-thirds of the data and is used to fit the GARCH model. The testing set consists of the remaining one-third of the data and is used to evaluate the performance of the model.

5.1.3. Backtesting

Backtesting is the process of evaluating the performance of risk management models by applying it to historical data, which is necessary after the VaR is estimated. In the context of VaR, backtesting involves comparing the predicted VaR to the actual losses realized over a given period. This helps to assess the accuracy and reliability of the VaR model, as well as its ability to capture the true risk of the portfolio. Backtesting can be used to identify any weaknesses or biases in the VaR model in order to make any necessary adjustments to improve its performance.

For the backtesting of the VaR results from this study, two methods to test the marginal and conditional coverage will be used which are presented below. Both tests will be performed with a CI of 95%.

The Proportion of Failures test, more well known as the Kupiec test is a statistical parametric test used to determine if the number of losses (exceptions) that exceed the VaR projection are in accordance with the CI chosen. The test was developed by Paul Kupiec in 1995. In cases when one or more losses excess the predicted VaR, it is possible to use a binomial distribution in order to access its accuracy, determining the proportion of failures using the following formula:

$$\boldsymbol{POF} = -\mathbf{2}\,\mathbf{Log}\left(\frac{(\mathbf{1}-\boldsymbol{\alpha})^{N-V}\boldsymbol{\alpha}^{V}}{\left(\mathbf{1}-\frac{V}{N}\right)^{N-V}\left(\frac{V}{N}\right)^{V}}\right) \quad (6)$$

In which Log is the natural logarithm, N is the number of observations, V is the number of exceptions and α is the significance level.

The Kupiec test presents two statistical hypotheses, which are:

$$\begin{Bmatrix} H_0: & \text{The VaR estimation presents marginal coverage.} \\ H_1: & \text{The VaR estimation does not present marginal coverage.} \end{Bmatrix}$$

To interpret the results of the Kupiec test, the LRSTAT which is the POF metric is compared to a critical value. If the LRSTAT is greater than or equal to the critical value, it suggests that the time series exhibits a proportion of exceptions different from expected and the null hypothesis is rejected. On the other hand, if the test statistic is less than the critical value, it suggests that the time series exhibits are in accordance with expected and the null hypothesis is not rejected. The critical value is equal to a specific CI value in a Chi-square distribution with one degree of freedom.

The independence of exceptions test, also known as the Christoffersen test, is a statistical test used to evaluate the accuracy of VaR based on the assumption that the exceptions, or observations that exceed the predicted VaR, should be independent of each other assuming a Markov chain model. In other words, the occurrence of one exception should not affect the likelihood of another exception occurring. The test was developed by Peter Christoffersen in 1998. To perform the test, the data is divided into two periods: an in-sample period and an out-of-sample period. The VaR model is fit to the in-sample data and used to predict the VaR for the out-of-sample data. The number of exceptions in the out-of-sample data is then compared to the number of exceptions predicted by the VaR model. If the observed and predicted number of exceptions are significantly different, it indicates that the VaR model is not accurately capturing the risk of the portfolio. This comparison is usually done by using the following formula:

$$\boldsymbol{IND} = -\mathbf{2}\,\mathbf{Log}\left(\frac{\left(\mathbf{1}-\frac{N_{01}+N_{11}}{N-1}\right)^{N_{00}+N_{10}}\left(\frac{N_{01}+N_{11}}{N-1}\right)^{N_{01}+N_{11}}}{\left(\mathbf{1}-\frac{N_{01}}{N-V}\right)^{N_{00}}\left(\frac{N_{01}}{N-V}\right)^{N_{01}}\left(\mathbf{1}-\frac{N_{11}}{V}\right)^{N10}\left(\frac{N_{11}}{V}\right)^{N_{11}}}\right) \tag{7}$$

In which Log is the natural logarithm, N is the number of observations, V is the number of exceptions and N with i, j being equal to 0 or 1 indicating how many hold-out sample transitions there were from value i to value j in the following period.

The Christoffersen test presents two statistical hypotheses, which are:

$$\begin{Bmatrix} H_0: & \text{The VaR estimation presents conditional coverage.} \\ H_1: & \text{The VaR estimation does not present conditional coverage.} \end{Bmatrix}$$

To interpret the results of the Christoffersen test, the LRSTAT which is the IND metric is compared to a critical value. If the LRSTAT is less than the critical value, then the null hypothesis cannot be rejected, indicating that the model presents conditional coverage. If the LRSTAT is greater than or equal to the critical value, then the null hypothesis is rejected, indicating that the model does not present conditional coverage. The critical value is equal to a specific CI value in a chi-square distribution with two degrees of freedom.

5.2. Data Description

5.2.1. Main Period

The Figure 2 shows the descriptive statistics for the five cryptocurrencies and their respective log return distributions for seven, 30 and 90 days between 06/11/2017 and 06/11/2022.

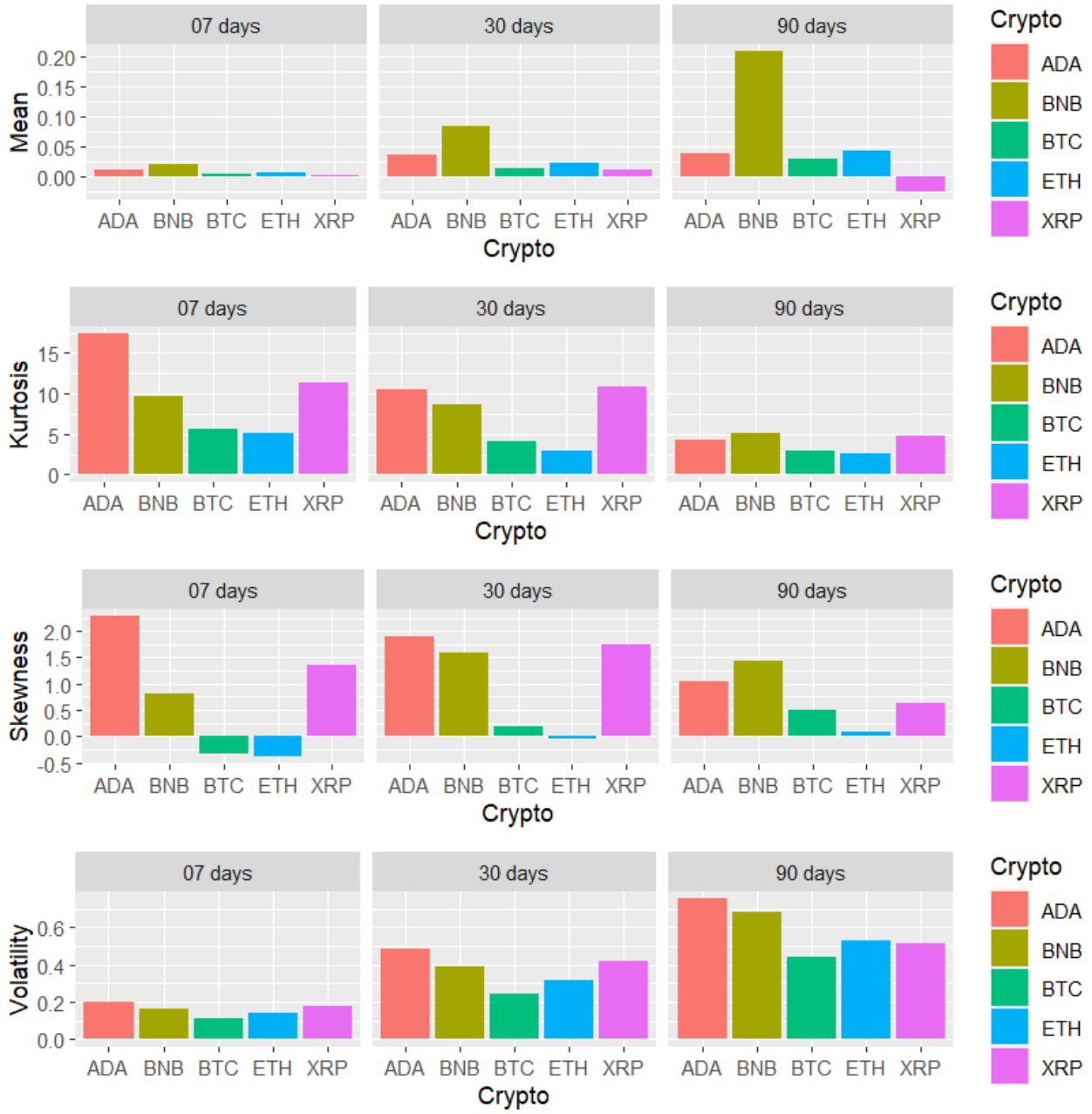

Figure 2: Data Description of All Five Cryptocurrencies

From the results shown above is possible to conclude several points. But firstly, it must be mentioned again that all five cryptocurrencies have the same period of analysis of five years. This condition allows to have the same number of observations in accordance if considering log weekly returns, log monthly returns and log quarter returns, being these 1820, 1797, and 1727, respectively.

Considering the tendency of returns, in general, all the cryptocurrencies have a positive tendency and with the increase of the time horizon investment period, the expected returns also increase. The only exception to this tendency is the cryptocurrency XRP which has an expected return for seven days of 0.313% which increases with a period of 30 days to 1.188%. However, for 90 days this value decrease and even becomes negative with an expected return of -2.622%. Also, for all log return periods, the cryptocurrency BNB presents the biggest expected values and the cryptocurrency XRP presents the lowest expected values. These results corroborate Mendes et al. (2020) who concluded that most of the distributions present means near zero.

Regarding kurtosis, almost all the cryptocurrencies in all the log period returns distributions are leptokurtic distributions, which means these present a high kurtosis. The exceptions are BTC log Quarter returns and ETH log Monthly and Quarter Returns since these present a kurtosis value smaller than three. This pattern is in accordance with the literature review which indicates that these cryptocurrencies distribution returns present heavy tales suitable to the implementation of the GPD approach. It is also important to mention that in these samples the kurtosis reduces with the increase of the time horizon investment period.

Taking the skewness into account, it is not possible to discover any trend in the distributions. From the study's data sample, the only distributions that present a negative skewness are BTC for log seven days returns and ETH for the log seven and 30 days returns. However, these results are different from the ones that previous studies have shown since these distributions do not present a negative skewness but instead a positive. This can be because this study focuses on larger periods of returns instead of log daily returns and the specific period of analysis.

At last, the unconditional volatility of all the cryptocurrencies increases as expected with the increase of the time horizon investment period returns. Another tendency that is present in this sample of five cryptocurrencies is that the smaller the market caps the larger it will be the volatility of the distributions except for the XRP for the log quarter returns.

5.2.2. Before and During Covid-19

Concerning the data description of the periods Before and During Covid-19, Figure 3 presents the key statistics derived from each log distribution return, enabling a comparison between the two periods for all five cryptocurrencies. The log distribution returns during the period Before Covid-19 encompassed 549 observations, spanning from 01/07/2018 to 31/12/2019. On the other hand, the log distribution returns during the period During Covid-19 consisted of 547 observations, covering the timeframe from 01/01/2020 to 30/06/2022.

The metrics presented below have shown that the transition from the Before Covid-19 period to During the Covid-19 period has increased the risk as well as the reward expected from investing in these assets.

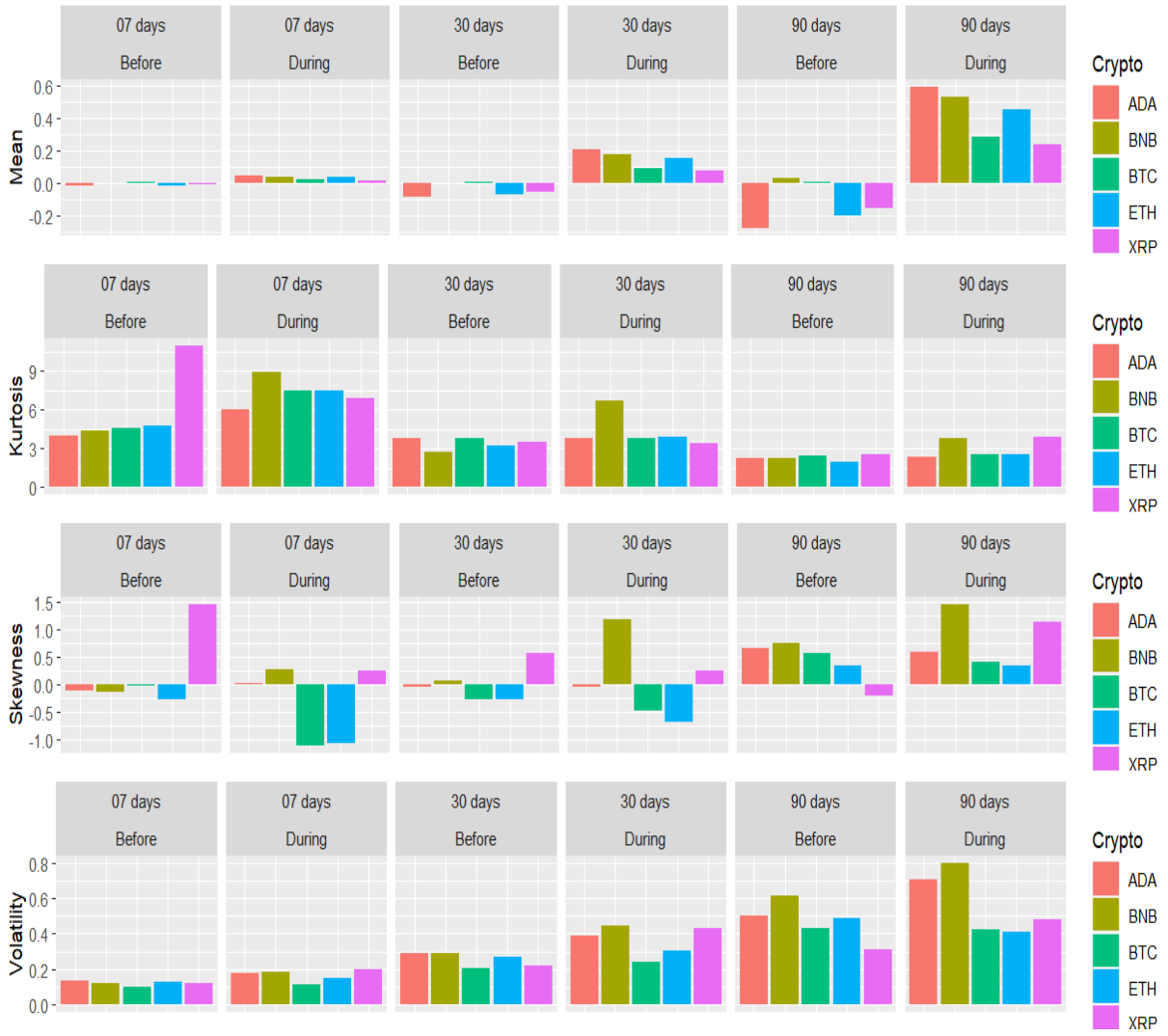

Figure 3: Data Description for the Periods Before and During Covid-19

In regard to the tendency of returns from the cryptocurrencies, it was observed that all of them displayed a substantial increase in the expected return across each investment time horizon when comparing the period Before Covid-19 with the Period During Covid-19. In contrast with that increase in the expected return, the minimum observations for all the distributions of seven days and 30 days presented a smaller value in the During Covid-19 period than in the Before Covid-19 period as shown by comparing the boxplots from Appendix B and C.

Comparing the values of the Kurtosis Before Covid-19 with During Covid-19, it has been registered an increase in this metric for the majority of the distributions except for XRP of seven days and 30 days and ADA for 30 days. On the other hand, concerning the skewness of the distributions, in general, it has not been found any significant tendency.

Regarding Volatility, the majority of the distributions presented an increase in this metric from the period Before Covid-19 to the Period During Covid-19. The only exceptions to this trend are BTC and ETH for an investment time horizon of 90 days. The biggest increase between periods in terms of Volatility has been in the cryptocurrency XRP for an investment time horizon period of 30 days with a difference of 0.213.

6. RESULTS AND DISCUSSION

In the last chapter, the methodology for calculating and backtesting VaR has been presented. This chapter presents the results of this methodology. These results demonstrate the effectiveness of the techniques outlined and provide insight into the potential risk of the cryptocurrencies being analyzed. This chapter is divided into different subsections for each method concerning all the cryptocurrencies and investment time horizons. The order in which the methods are presented is the same as in the previous chapters. In these different methods, for some of the VaR metrics that were determined using the log returns (continuous returns), the equivalent values as discrete returns were also shown. These values are obtained using the following formula:

$$\boldsymbol{R_{t,n} = e^{r_{t,n}} - 1} \tag{8}$$

This approach was developed to enhance the understanding of outcomes, since for longer time horizon investments, the Continuous VaR is sometimes over 100%, which is not comparable to reality. By adopting this approach, the study maintains the best performance of calculation and capability of comparison with other articles, without compromising the interpretation.

6.1. THE GENERALIZED PARETO DISTRIBUTION APPROACH

There are two figures below concerning the method using Pareto tails. The Figure 4 below illustrates the VaR using the GPD method for the several cryptocurrency assets included in this study. The Figure 4 shows the VaR as a function of the threshold level, providing a visual representation of the risk associated with each asset at different CIs, in concrete 95% and 99%. The Figure 5 shows the parameters shape (ξ) and scale $(\psi(\eta))$ also dependent on the threshold level concerning the cryptocurrencies mentioned.

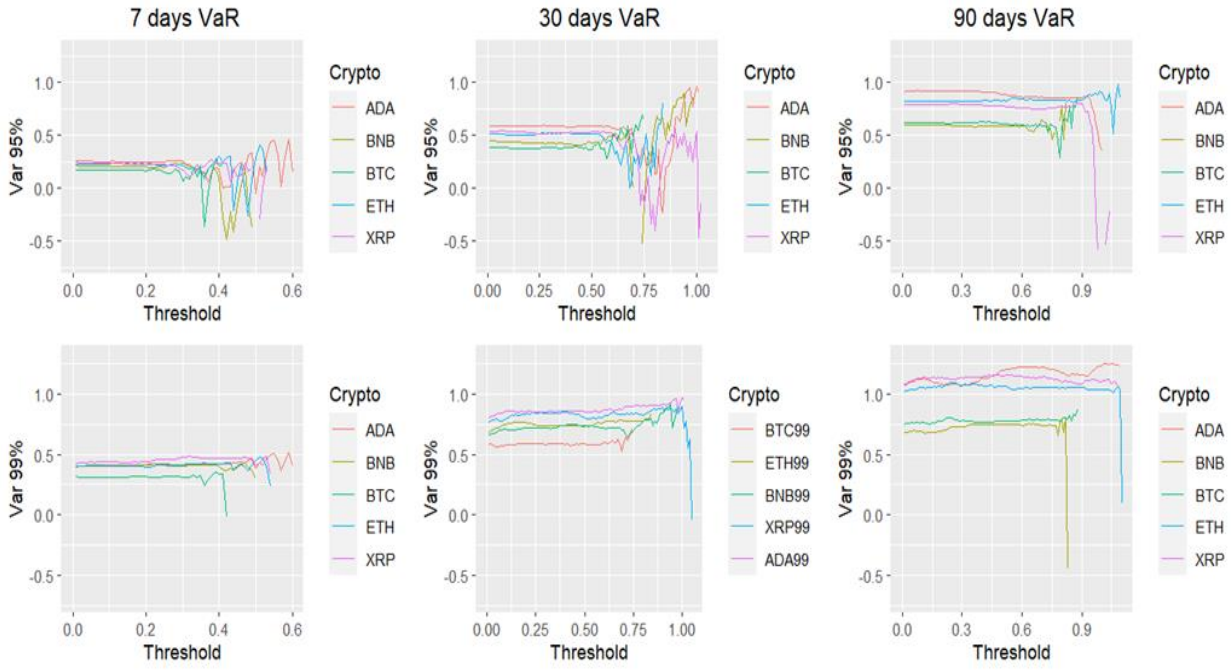

Figure 4: VaR in Function of the Threshold

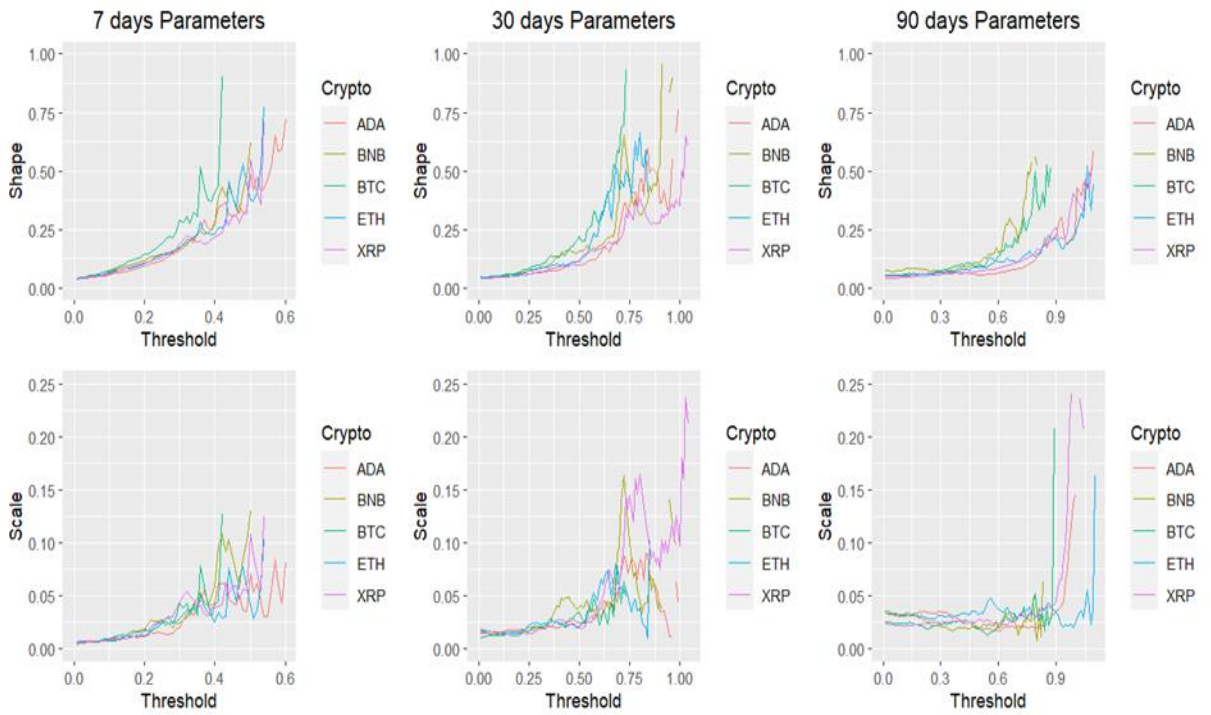

Figure 5: Shape and Scale in Function of the Threshold

From Figure 4 is possible to identify a trend in VaR for the majority of the cryptocurrencies and CIs. In the lower values of the threshold, the estimations of VaR remain almost constant until the threshold becomes so high that the estimation of the parameters becomes inefficient and starts to provide inaccurate VaR estimations. This data behavior identified combined with the Kupiec tests realized have shown that these constant VaR estimates present marginal coverage for almost all the cases. Concluding, it is possible to find precise VaR estimates with different levels of threshold, and the search for a specific threshold is only needed for high levels of precision.

As observed, while multiple thresholds offer marginal coverage, only certain thresholds yield the most precise values. It is typically the case that the optimal thresholds for a CI of 95% differ from those for 99%. In this study, only one singular set of parameters has been discovered that maximizes the accuracy of VaR for both 95% and 99% CIs. Specifically, considering the VaR of seven days from BNB, the employed threshold was 0.09, with a shape of 0.069 and a scale of 0.008, resulting in VaR values of 0.205 and 0.406 for the 95% and 99% CIs, respectively.

Considering the Conditional Coverage, the GPD method is an unconditional model, for this reason, it does not present any Conditional Coverage rejecting the null hypothesis from the Christoffersen test.

From Figure 5 is possible to verify the tendency of the Shape and Scale parameters to increase in function of the Threshold. The most important insight to take is that when the rate of increase from these parameters changes, the constant VaR metric estimates also start to change to other values. In this way, these plots can be used to verify from which threshold the VaR estimates will become less accurate.

By virtue of presenting numerical values from the VaR estimations, the Table 1 has the approximate average VaR rounded to the hundredths, since the majority of the metrics determined only changed from the thousandths furthermore.

Table 1: VaR with GPD Method Rounded to the Hundredths

Crypto	Days	VaR 95% (Continuous)	VaR 99% (Continuous)	VaR 95% (Discrete)	VaR 99% (Discrete)
BTC	**7**	0.17	0.32	0.16	0.27
	30	0.38	0.58	0.32	0.44
	90	0.60	0.79	0.45	0.55
ETH	**7**	0.22	0.43	0.20	0.35
	30	0.52	0.77	0.41	0.54
	90	0.83	1.04	0.56	0.65
BNB	**7**	0.21	0.41	0.19	0.34
	30	0.41	0.70	0.34	0.50
	90	0.59	0.74	0.45	0.52
XRP	**7**	0.23	0.48	0.21	0.38
	30	0.53	0.87	0.41	0.58
	90	0.76	1.09	0.53	0.66
ADA	**7**	0.25	0.41	0.22	0.34
	30	0.58	0.91	0.44	0.60
	90	0.85	1.22	0.57	0.70

The Table 1 shows the VaR estimates for each of these cryptocurrencies over three time periods: seven days, 30 days and 90 days. The estimates are given for two different CIs, 95% and 99%. The VaR metrics are presented in Continuous Returns and also Discrete Returns as mentioned at the beginning of this chapter.

Considering the risk of the cryptocurrencies, BTC is the least risky cryptocurrency for investment periods of seven days and 30 days for both CIs. On the other hand, BNB is the least risky cryptocurrency for investment periods of 90 days for both CIs.

Regarding the riskiest cryptocurrencies, ADA is the riskiest for almost all the investments' periods and CIs. The only exception is the VaR estimation of seven days with a CI of 99% in which XRP presents a higher risk of 0.48 and ETH of 0.43. In this way, XRP is the third in terms of risk having a VaR of 0.41, which is the same value as BNB.

With the VaR estimations already presented, the Tables 2 and 3 below show the results of the Kupiec with a CI of 95% in function of the threshold.

The right or check symbol indicates that the Kupiec test did not reject the null hypothesis and that the VaR estimation presents marginal coverage. The wrong or cross symbol indicates that the Kupiec test rejected the null hypothesis and that the VaR estimation does not present marginal coverage. The optimal thresholds are underlined in green being the ones that have the smallest LRSTATs and by consequence the highest marginal coverage.

Table 2: Kupiec Test Results with the GPD Approach until 0.6 of Threshold

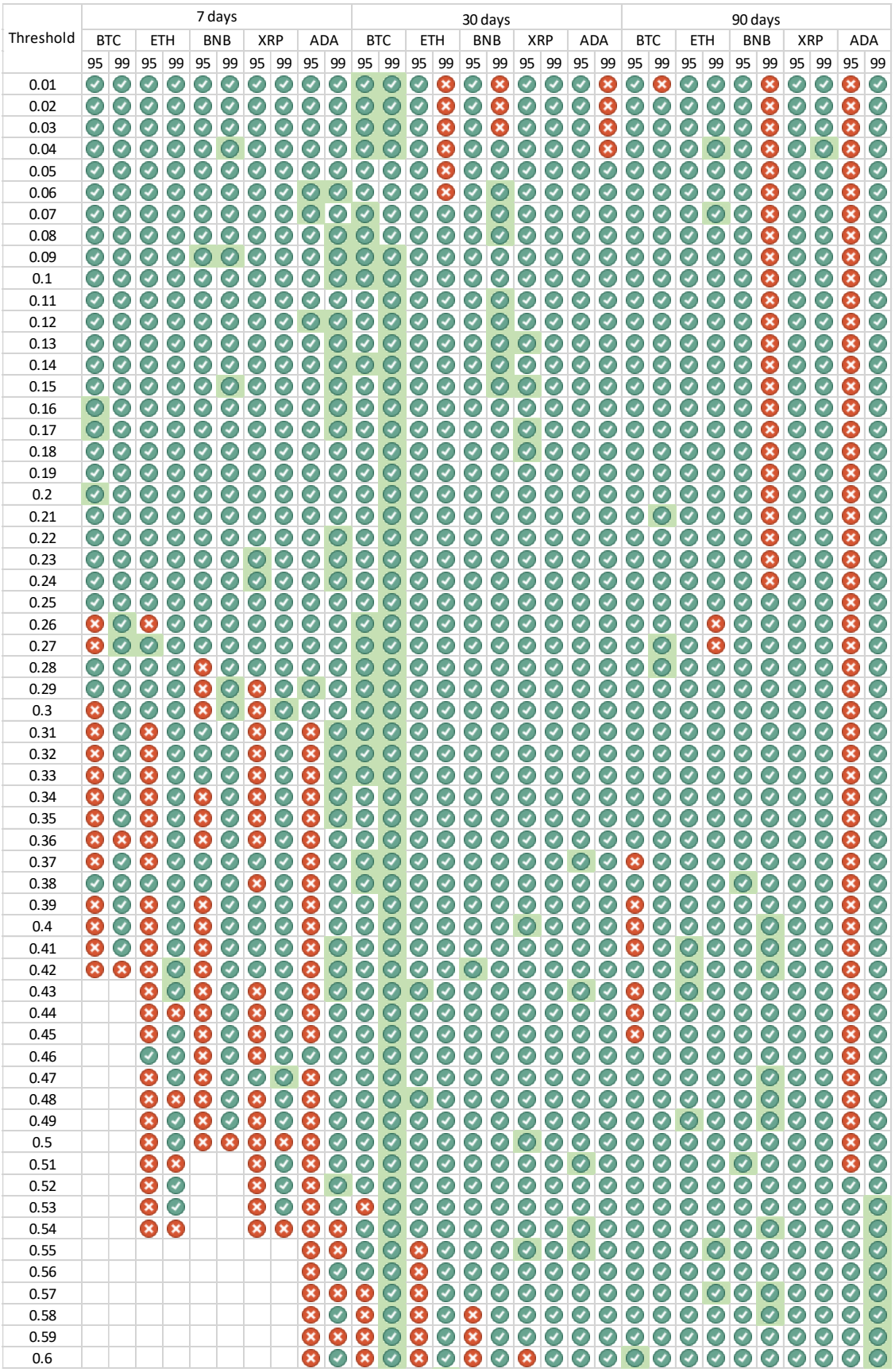

Table 3: Kupiec Test Results with the GPD Approach above 0.6 of Threshold

Threshold	7 days										30 days										90 days									
	BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA	
	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99
0.61									✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.62									✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.63									✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
0.64									✗	✗	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.65									✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
0.66											✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.67											✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.68											✗	✓	✗	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.69											✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.7											✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.71											✗	✗	✗	✓	✗	✗	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.72											✗	✓	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.73											✗	✗	✗	✓	✗	✗	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.74											✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.75											✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.76											✗	✗	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓
0.77													✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.78													✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
0.79													✗	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓
0.8													✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
0.81													✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
0.82													✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
0.83													✗	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✓	✓	✓	✓
0.84													✗	✗	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓			✓	✓	✓	✓
0.85													✗	✗	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓			✓	✓	✓	✓
0.86															✗	✓	✗	✓	✗	✓	✗	✓	✓	✓			✓	✓	✓	✓
0.87															✗	✓	✗	✓	✗	✓	✗	✓	✓	✓			✓	✓	✓	✓
0.88															✗	✓	✓	✓	✗	✓	✗	✗	✓	✓			✓	✓	✓	✓
0.89															✗	✗	✗	✓	✗	✓	✗	✗	✓	✓			✓	✓	✓	✓
0.9															✗	✓	✗	✓	✗	✓			✓	✓			✓	✓	✓	✓
0.91															✗	✗	✗	✓	✗	✓			✓	✓			✓	✓	✓	✓
0.92															✗	✗	✗	✓	✗	✓			✓	✓			✓	✓	✓	✓
0.93															✗	✗	✗	✓	✗	✓			✗	✓			✓	✓	✓	✓
0.94															✗	✗	✓	✓	✗	✓			✗	✓			✗	✓	✓	✓
0.95															✗	✓	✗	✓	✗	✓			✗	✓			✗	✓	✗	✓
0.96															✗	✓	✗	✓	✗	✓			✗	✓			✗	✓	✗	✓
0.97															✗	✓	✗	✓	✗	✓			✗	✓			✗	✓	✗	✓
0.98															✗	✗	✗	✓	✗	✓			✗	✓			✗	✓	✗	✓
0.99															✗	✗	✗	✓	✗	✓			✗	✓			✗	✓	✗	✓
1																	✓	✓	✗	✗			✗	✓			✗	✓	✗	✓
1.01																	✗	✓	✗	✓			✓	✓			✗	✓	✗	✓
1.02																	✗	✓	✗	✗			✓	✓			✗	✓	✗	✓
1.03																	✗	✗					✓	✓			✗	✓	✗	✓
1.04																	✗	✗					✗	✓			✗	✓	✗	✓
1.05																	✗	✗					✗	✓			✗	✓	✗	✓
1.06																							✗	✓			✗	✓	✗	✓
1.07																							✓	✓			✗	✓	✗	✓
1.08																							✗	✓			✗	✗	✗	✓
1.09																							✓	✓					✗	✗
1.1																							✗	✗						

As mentioned, the estimations of VaR dependent on the value of the threshold usually present an almost constant estimation for the threshold's lowest values, only starting this trend to be false to bigger values. This explains why in Table 2 and Table 3 for the majority of the combinations, the Kupiec test has a sequence of values of threshold that starts in zero which does not reject the null hypothesis. This shows that the estimations which are constant most of the time also present marginal coverage.

The exceptions to this trend which only presents marginal coverage from a specific threshold forward are the following:

- BTC for 90 days with a CI of 99% from the value of 0.02;
- ETH for 30 days with a CI of 99% from the value of 0.07;
- BNB for 30 days and 90 days with a CI of 99% from the values of 0.04 and 0.25, respectively;
- ADA for 30 days with a CI of 99% from the value of 0.05 forward and also for 90 days being the only case for a CI of 95% from the value of threshold of 0.52 forward.

The thresholds which present the better marginal coverage are presented in Tables 2 and 3 underlined in green as already mentioned. The respective LRSTATs and p-values are in the Table 4 below:

Table 4: LRSTAT and P-VALUE of Optimal Thresholds from the GPD Approach

Crypto	Days	VAR 95%		VAR 99%	
		LRSTAT	P-VALUE	LRSTAT	P-VALUE
BTC	7	0	1	0.00223	0.96
	30	0.00026	0.99	0.00005	0.99
	90	0.00027	0.99	0.00802	0.93
ETH	7	0.01153	0.91	0.00223	0.96
	30	0.00026	0.99	0.00005	0.99
	90	0.00878	0.93	0.00802	0.93
BNB	7	0	1	0.00223	0.96
	30	0.04036	0.84	0.00005	0.99
	90	0.00027	0.99	0.00802	0.93
XRP	7	0	1	0.00223	0.96
	30	0.00026	0.99	0.00005	0.99
	90	0.00027	0.99	0.00802	0.93
ADA	7	0	1	0.00223	0.96
	30	0.00849	0.93	0.00005	0.99
	90	0.00027	0.99	0.02281	0.88

From the values in Table 4 is possible to conclude that with the most accurate estimations from the thresholds, it is possible to obtain an almost perfect marginal coverage since almost all the metrics present a p-value superior to 0.9. The exceptions are BNB for 30 days and a CI of 95% and ADA for 90 days and a CI of 99%. Notably, four metrics demonstrate perfect marginal coverage with a p-value of one, namely all cryptocurrencies for seven days with a CI of 95%, except for ETH.

As a final note, the VaR values and parameters estimated in function of the threshold that were used to create the graphical representations shown in this section are presented in Appendix A.

6.2. THE HISTORICAL SIMULATION APPROACH

Table 5 and Table 6 enable us to compare the VaR results for the five cryptocurrencies from this study using the HS approach.

Table 5: VaR Results with Continuous Returns Derived from the HS Approach

Days	CI	BTC	ETH	BNB	XRP	ADA
7	**0.95**	0.16748	0.22220	0.20475	0.22490	0.25333
7	**0.99**	0.31493	0.42723	0.40089	0.46960	0.41162
30	**0.95**	0.38215	0.51588	0.40886	0.53107	0.58352
30	**0.99**	0.57211	0.77348	0.69489	0.86555	0.90957
90	**0.95**	0.59947	0.82816	0.58602	0.76142	0.84998
90	**0.99**	0.78206	1.03206	0.73746	1.06772	1.23666

Table 6: VaR Results with Discrete Returns Derived from the HS Approach

Days	CI	BTC	ETH	BNB	XRP	ADA
7	**0.95**	0.15421	0.19925	0.18515	0.20140	0.22379
7	**0.99**	0.27016	0.34768	0.33028	0.37475	0.33742
30	**0.95**	0.31761	0.40303	0.33559	0.41203	0.44207
30	**0.99**	0.43567	0.53860	0.50087	0.57918	0.59730
90	**0.95**	0.45090	0.56315	0.44346	0.53300	0.57258
90	**0.99**	0.54254	0.64373	0.52167	0.65621	0.70965

From Table 5 and Table 6, the conclusions are similar to the results found using the GPD method. ADA is the cryptocurrency that presents in general the bigger estimations of VaR. The only exception is the estimate for the weekly returns and a CI of 99% which is the third behind XRP and ETH. The continuous returns VaR for ETH, XRP and ADA are respectively 0.42723, 0.46960 and 0.41162 which are consequently the respective discrete returns VaR of 0.34768; 0.37475 and 0.33742.

In general terms, the second place in terms of risk is from XRP which presents the biggest VaR for the log weekly returns with a CI of 99% with 0.46960; four second biggest VaR metrics and one-third followed by ETH which has bigger VaR estimates than BTC and BNB. At last, BNB and BTC are the least risky cryptocurrencies. BNB is riskier than BTC except for the VaR estimates of 90 days.

The Kupiec and Christoffersen tests were not implemented on this approach since these methods do not apply to an unconditional non-parametric model without applying some adaptations such as the rolling window technique.

6.3. THE NORMAL DISTRIBUTION APPROACH

The Table 7 shows the VaR metrics calculated using the ND method and the Kupiec test to verify the marginal coverage of the results.

Table 7: VaR Results with the ND Approach

Crypto	Days	CI	VaR (Continuous)	VAR (Discrete)	Nº of Exceptions	Prop of Exceptions (%)	Kupiec Chi-Squared	Kupiec P-VALUE	Kupiec Rejects H0
BTC	7	**0.95**	0.1765	0.1618	85	4.67	0.43	0.5143	FALSE
		0.99	0.2514	0.2223	36	1.98	13.69	0.0002	TRUE
	30	**0.95**	0.3848	0.3194	90	5.01	0.0002	0.9870	FALSE
		0.99	0.5503	0.4232	24	1.34	1.85	0.1739	FALSE
	90	**0.95**	0.6924	0.4996	43	2.48	28.40	0.0000	TRUE
		0.99	0.9911	0.6288	0	0.00	34.91	0.0000	TRUE
ETH	7	**0.95**	0.2273	0.2033	85	4.67	0.43	0.5143	FALSE
		0.99	0.3241	0.2768	38	2.09	16.57	0.0000	TRUE
	30	**0.95**	0.5035	0.3956	99	5.51	0.95	0.3295	FALSE
		0.99	0.7212	0.5138	26	1.45	3.18	0.0743	FALSE
	90	**0.95**	0.8290	0.5635	86	4.95	0.01	0.9253	FALSE
		0.99	1.1900	0.6958	1	0.06	27.19	0.0000	TRUE
BNB	7	**0.95**	0.2459	0.2180	68	3.74	6.68	0.097	TRUE
		0.99	0.3561	0.2996	25	1.37	2.30	0.1295	FALSE
	30	**0.95**	0.5616	0.4297	52	2.89	19.66	0.0000	TRUE
		0.99	0.8295	0.5637	11	0.61	3.17	0.0750	FALSE
	90	**0.95**	0.9157	0.5997	0	0.00	178.19	0.0000	TRUE
		0.99	1.3815	0.7488	0	0.00	34.91	0.0000	TRUE
XRP	7	**0.95**	0.2935	0.2543	54	2.97	18.42	0.0000	TRUE
		0.99	0.4163	0.3405	26	1.43	2.98	0.0843	FALSE
	30	**0.95**	0.6748	0.4908	36	2.00	43.53	0.0000	TRUE
		0.99	0.9594	0.6169	12	0.67	2.27	0.1320	FALSE
	90	**0.95**	0.8665	0.5796	52	2.99	17.09	0.0000	TRUE
		0.99	1.2146	0.7032	14	0.81	0.71	0.4003	FALSE
ADA	7	**0.95**	0.3191	0.2732	41	2.25	36.05	0.0000	TRUE
		0.99	0.4558	0.3660	16	0.88	0.28	0.5967	FALSE
	30	**0.95**	0.7607	0.5326	34	1.89	47.43	0.0000	TRUE
		0.99	1.0913	0.6642	1	0.06	28.32	0.0000	TRUE
	90	**0.95**	1.2000	0.6988	18	1.04	83.88	0.0000	TRUE
		0.99	1.7129	0.8196	6	0.35	10.06	0.0015	TRUE

No clear pattern can be observed in Table 7 in terms of VaR metrics with marginal coverage. This lack of consistency arises from the fact that the accurate metrics, as determined by the Kupiec test, differ across cryptocurrencies in relation to the number of days considered for log returns and the CIs used. This finding further reinforces previous studies that have demonstrated the inadequacy of this method in determining VaR for cryptocurrencies. The primary reason behind this limitation is the substantial presence of kurtosis in cryptocurrency distributions. As a result, the assumption that returns follow a normal distribution becomes invalid, significantly compromising the accuracy of the results obtained through this method.

However, one trend is identifiable for both accurate and inaccurate metrics accordingly to the Kupiec test. The VaR metrics with a CI of 95% tend to be overestimated. From all the 15 metrics calculated only two present a proportion of exceptions bigger than 5%. The two cases in consideration present marginal coverage.

From all the 30 VaR metrics calculated only 13 presented marginal coverage, which represents a percentage of correct results of about 43%. Besides that, the results concerning each cryptocurrency, returns period and CI are presented below.

Considering the cryptocurrencies, ETH presented the bigger percentage of metrics with marginal coverage under the Kupiec test with two-thirds, followed by BTC and XRP with half of the sample. BNB had one-third of the sample and ADA only had one in six VaR metrics.

Analyzing the accuracy by log returns investment period, the Log monthly returns have the bigger amount of metrics presenting marginal coverage with six, followed by the log weekly returns with five and at last the log quarter returns with only two. The cryptocurrencies BTC, BNB and ADA do not have any metric presenting marginal coverage for the log quarter returns.

Regarding the CI, the CI of 99% demonstrated marginal coverage for eight metrics, while the CI of 95% exhibited marginal coverage for only five. The three metrics of XRP that presented marginal coverage are from the CI of 99%.

Two metrics stand out from others in terms of marginal coverage. These are the VaR metric of BTC for the log monthly returns and the CI of 95% with a continuous returns VaR of 0.3848 and correspondent discrete returns VaR of 0.3194 and ETH for the log quarter returns and the CI of 95% with a continuous returns VaR of 0.829 and correspondent discrete VaR of 0.5635. Both these metrics present a Kupiec p-value bigger than 0.9 which indicates without a margin of doubt that the hypothesis cannot be rejected and consequently, the presence of marginal coverage.

At last, as was already shown and mentioned for the GPD, the ND approach being an unconditional VaR approach also rejected all the null hypotheses for the Christoffersen test, demonstrating that it is not suitable to verify the conditional likelihood of exceptions for the VaR.

6.4. THE GAUSSIAN GARCH

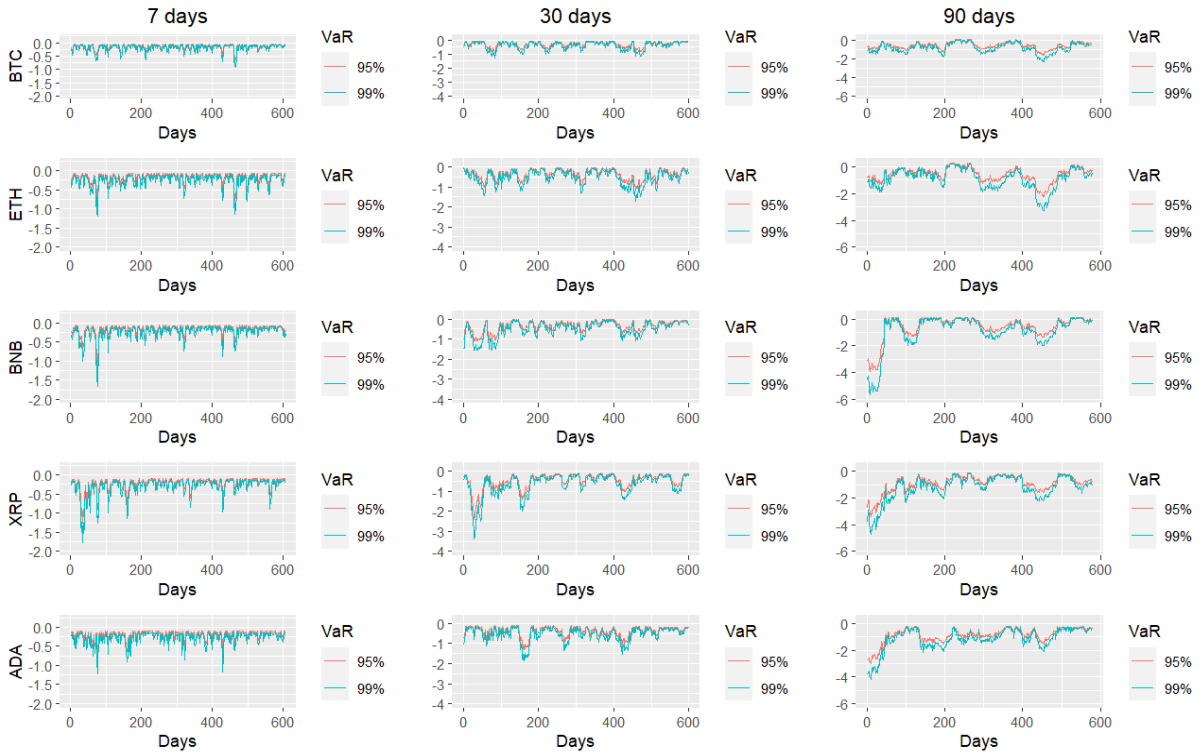

Figure 6: Conditional VaR with Gaussian GARCH

Concerning the Gaussian GARCH, the Figure 6 represents the conditional VaR estimations from one-third of the data used as testing for the cryptocurrencies mentioned for the log weekly (607 Obs), monthly (599 Obs) and quarter (577 Obs) returns each one for the CIs of 95% and 99%. The Figure 7 indicates the number of exceptions by cryptocurrency and investment period in which the returns of the testing sample presented a smaller value than the VaR estimated at a CI of 95% or 99% for the specific day, meaning an underestimation from the method.

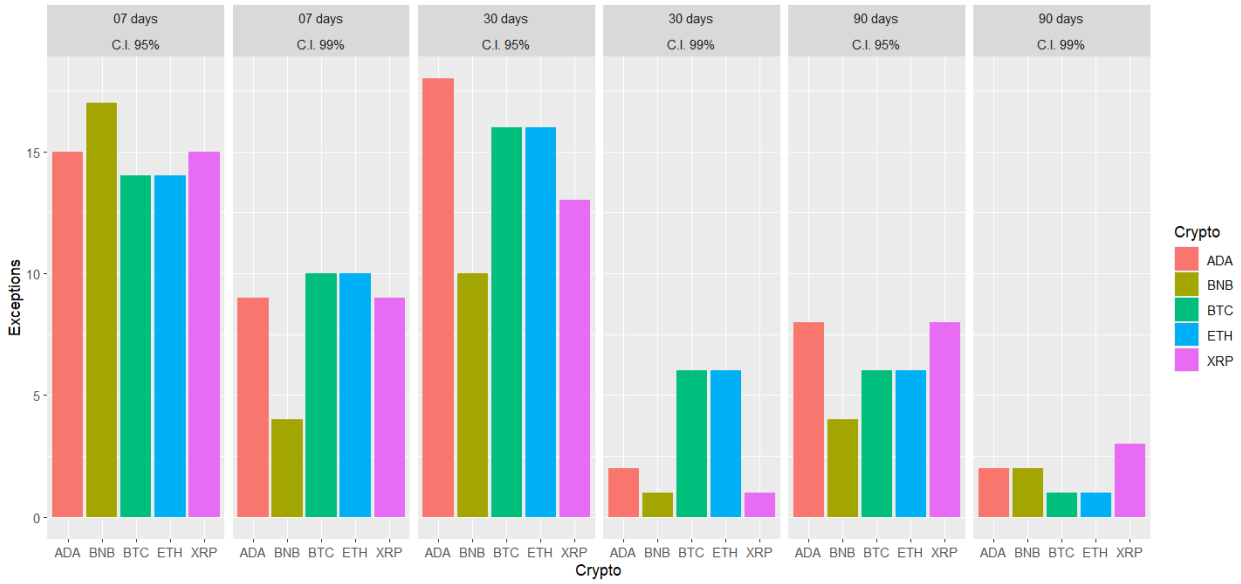

Figure 7: Exceptions of Gaussian GARCH

Table 8: Backtesting of Gaussian GARCH

Crypto	Days	CI	LR Kupiec Statistic	Kupiec P-VALUE	Kupiec Rejects H0	LR Christoffersen Test	Christoffersen P-VALUE	Christoffersen Rejects H0
BTC	7	0.95	1.502	0.2204	FALSE	7.761	0.0206	TRUE
		0.99	2.15	0.1426	FALSE	4.231	0.1206	FALSE
	30	0.95	2.437	0.1185	FALSE	2.482	0.2891	FALSE
		0.99	0	1.0000	FALSE	0.122	0.9408	FALSE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0471	TRUE
ETH	7	0.95	0.688	0.4068	FALSE	1.32	0.5169	FALSE
		0.99	0.001	0.9748	FALSE	0.121	0.9413	FALSE
	30	0.95	21.021	0.0000	TRUE	21.296	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	Out of Boundaries		TRUE	Out of Boundaries		TRUE
BNB	7	0.95	3.383	0.0659	FALSE	3.482	0.1753	FALSE
		0.99	0.811	0.3678	FALSE	0.864	0.6492	FALSE
	30	0.95	16.488	0.0000	TRUE	18.21	0.0001	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	27.959	0.0000	TRUE	28.085	0.0000	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.1857	FALSE
XRP	7	0.95	1.502	0.2204	FALSE	4.683	0.0962	FALSE
		0.99	1.244	0.2647	FALSE	1.515	0.4688	FALSE
	30	0.95	11.05	0.0009	TRUE	25.921	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	15.191	0.0001	TRUE	16.857	0.0002	TRUE
		0.99	1.648	0.1992	FALSE	1.68	0.4317	FALSE
ADA	7	0.95	1.502	0.2204	FALSE	1.505	0.4712	FALSE
		0.99	1.244	0.2647	FALSE	1.515	0.4688	FALSE
	30	0.95	3.921	0.0477	TRUE	4.075	0.1304	FALSE
		0.99	3.619	0.0571	FALSE	3.632	0.1627	FALSE
	90	0.95	17.286	0.0000	TRUE	17.602	0.0002	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.1857	FALSE

Note: The Kupiec Critical Value = 3.841 and the Christoffersen Critical Value = 5.991 for 95% of CI with one and two degrees of freedom, respectively.

To test the accuracy of the Gaussian GARCH, the Kupiec and Christoffersen tests were used. The results are presented in the Table 8. In the majority of the cases in which the Kupiec test rejected the null hypothesis the same happened to the Christoffersen test and vice-versa. The only exceptions were BTC for the log weekly returns and ADA for the log monthly returns both with a CI of 95%.

These tests results allow us to conclude that the Gaussian GARCH was able to estimate accurately the conditional VaR for the log weekly returns independently of the cryptocurrency and CI since the Kupiec tests never rejected the null hypothesis and the Christoffersen test only rejects once for the case already mentioned. On the other hand, the accuracy of the estimations for the log monthly and quarter returns depended more on the distribution characteristics.

6.5. THE STUDENT'S-T GARCH

Figure 8: Conditional VaR with Student's-t GARCH

Regarding the Student's-t GARCH, the Figure 8 represents the conditional VaR estimations from one-third of the data used as testing for the cryptocurrencies mentioned for the log weekly (607 Obs), monthly (599 Obs) and quarter (577 Obs) returns each one for the CIs of 95% and 99%. The Figure 9 indicates the number of exceptions by cryptocurrency and investment period in which the returns of the testing sample presented a smaller value than the VaR estimated at a CI of 95% or 99% for the specific day, meaning an underestimation from the method.

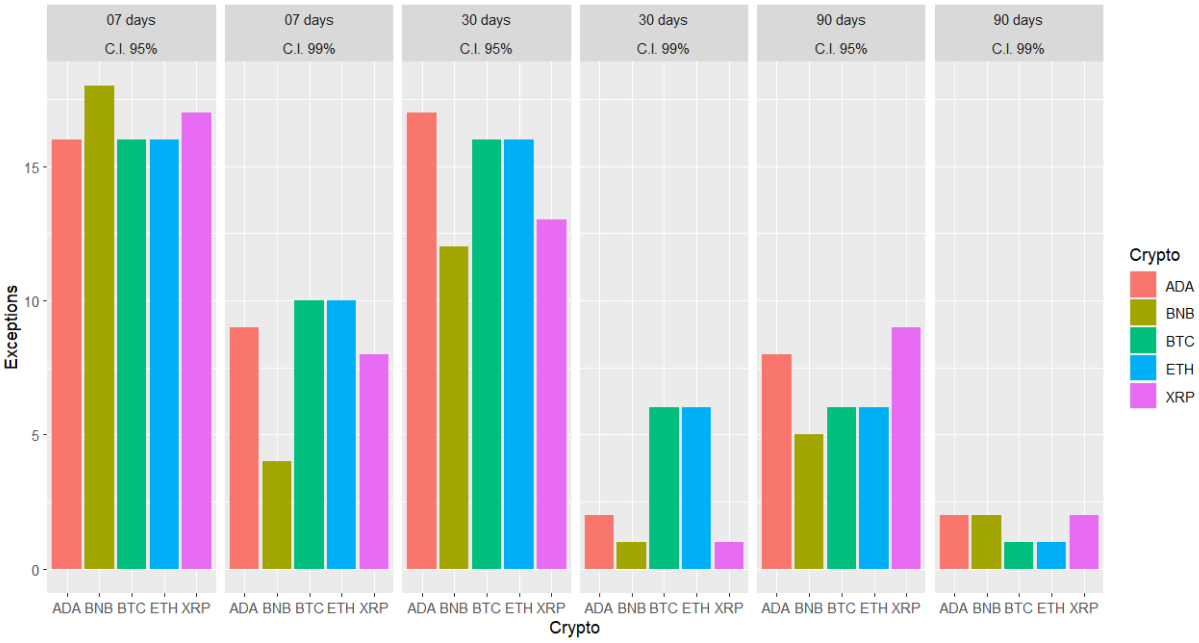

Figure 9: Exceptions of Student's-t GARCH

Table 9: Backtesting of Student's-t GARCH

Crypto	Days	CI	LR Kupiec Statistic	Kupiec P-VALUE	Kupiec Rejects H0	LR Christoffersen Test	Christoffersen P-VALUE	Christoffersen Rejects H0
BTC	7	0.95	0.688	0.4068	FALSE	5.846	0.0538	FALSE
		0.99	2.15	0.1426	FALSE	4.231	0.1206	FALSE
	30	0.95	2.437	0.1185	FALSE	2.482	0.2891	FALSE
		0.99	0	1	FALSE	0.122	0.9408	FALSE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0471	TRUE
ETH	7	0.95	0.404	0.5250	FALSE	0.894	0.6395	FALSE
		0.99	0.001	0.9748	FALSE	0.121	0.9413	FALSE
	30	0.95	21.021	0.0000	TRUE	21.296	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	15.191	0.0001	TRUE	15.617	0.0004	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0471	TRUE
BNB	7	0.95	2.663	0.1027	FALSE	2.714	0.2574	FALSE
		0.99	0.811	0.3678	FALSE	0.864	0.6492	FALSE
	30	0.95	12.701	0.0004	TRUE	13.877	0.0010	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.1857	FALSE
XRP	7	0.95	1.053	0.3048	FALSE	1.054	0.5904	FALSE
		0.99	0.564	0.4527	FALSE	0.778	0.6777	FALSE
	30	0.95	11.05	0.0009	TRUE	25.921	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0399	TRUE
	90	0.95	15.191	0.0001	TRUE	16.857	0.0002	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.1857	FALSE
ADA	7	0.95	1.053	0.3048	FALSE	1.054	0.5904	FALSE
		0.99	1.244	0.2647	FALSE	1.515	0.4688	FALSE
	30	0.95	4.816	0.0282	TRUE	5.05	0.0801	FALSE
		0.99	3.619	0.0571	FALSE	3.632	0.1627	FALSE
	90	0.95	17.286	0.0000	TRUE	17.602	0.0002	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.1857	FALSE

Note: The Kupiec Critical Value = 3.841 and the Christoffersen Critical Value = 5.991 for 95% of CI with one and two degrees of freedom, respectively.

To test the accuracy of the Student's-t GARCH, the Kupiec and Christoffersen tests were used. The results are presented in the Table 9. In the majority of the cases in which the Kupiec test rejected the null hypothesis the same happened to the Christoffersen test and vice-versa. The only exception was ADA for the log monthly returns with a CI of 95%.

As was the case for the Gaussian GARCH, also the Student's-t GARCH was suitable to estimate significantly accurately the conditional VaR for the log weekly returns independently of the cryptocurrency and CI since the Kupiec and Christoffersen tests never rejected the null hypothesis for both tests. In the same way for the log monthly and quarterly returns, the rejection of the null hypothesis did not present any trend, depending more on the specific distribution of returns characteristics from the cryptocurrencies studied.

6.6. THE INTEGRATED GARCH

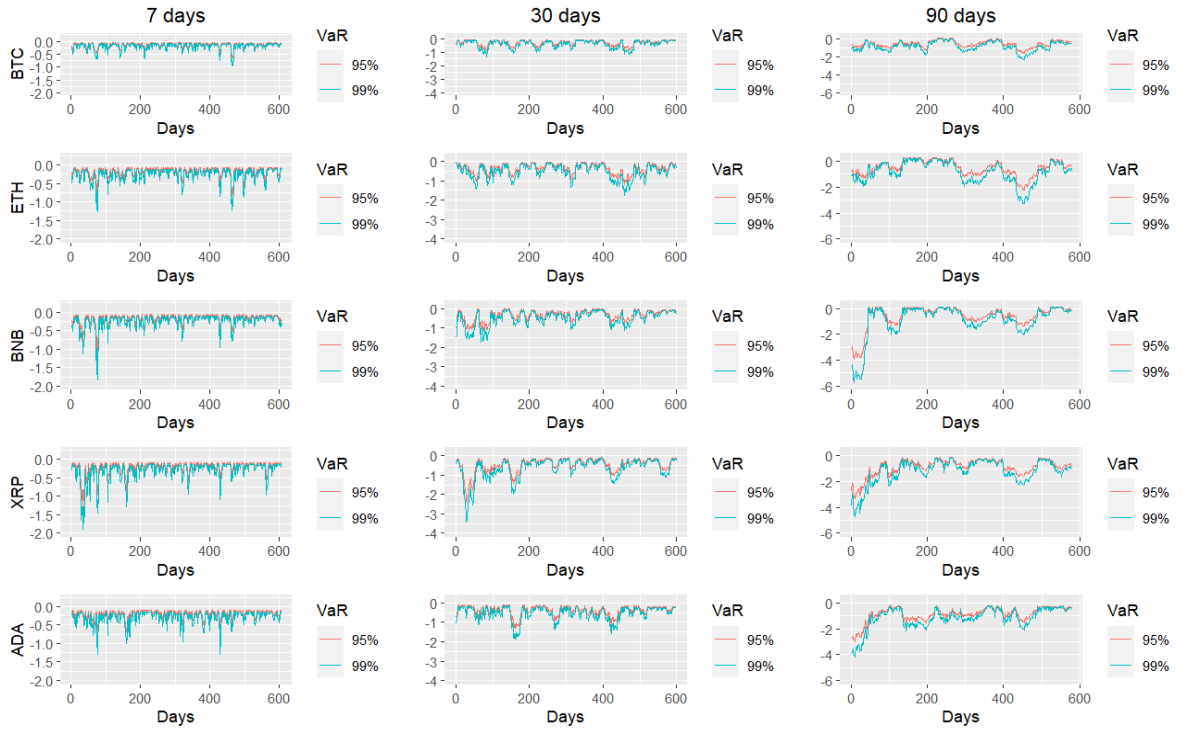

Figure 10: Conditional VaR with Integrated GARCH

Considering the Integrated GARCH, the Figure 10 represents the conditional VaR estimations from one-third of the data used as testing for the cryptocurrencies mentioned for the log weekly (607 Obs), monthly (599 Obs) and quarter (577 Obs) returns each one for the CIs of 95% and 99%. The Figure 11 indicates the number of exceptions by cryptocurrency and investment period in which the returns of the testing sample presented a smaller value than the VaR estimated at CIs of 95% or 99% for the specific day, meaning an underestimation from the method.

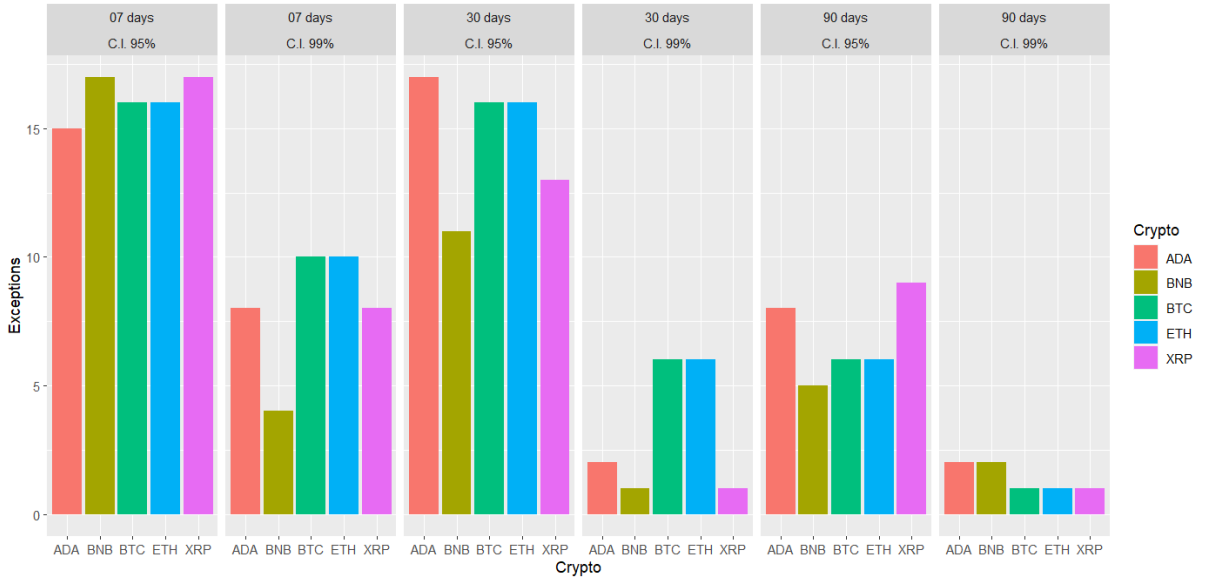

Figure 11: Exceptions of Integrated GARCH

Table 10: Backtesting of Integrated GARCH

Crypto	Days	CI	LR Kupiec Statistic	Kupiec P-VALUE	Kupiec Rejects H0	LR Christoffersen Test	Christoffersen P-VALUE	Christoffersen Rejects H0
BTC	7	0.95	0.688	0.4068	FALSE	5.846	0.0156	TRUE
		0.99	2.15	0.1426	FALSE	4.231	0.0397	TRUE
	30	0.95	2.437	0.1185	FALSE	2.482	0.1152	FALSE
		0.99	0	1.0000	FALSE	0.122	0.7269	FALSE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0134	TRUE
ETH	7	0.95	0.196	0.6580	FALSE	0.565	0.4523	FALSE
		0.99	0.203	0.6523	FALSE	0.286	0.5928	FALSE
	30	0.95	21.021	0.0000	TRUE	21.296	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0111	TRUE
	90	0.95	17.286	0.0000	TRUE	17.638	0.0000	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0134	TRUE
BNB	7	0.95	3.383	0.0659	FALSE	3.482	0.0620	FALSE
		0.99	0.811	0.3678	FALSE	0.864	0.3526	FALSE
	30	0.95	14.509	0.0001	TRUE	15.94	0.0001	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0111	TRUE
	90	0.95	24.889	0.0000	TRUE	25.061	0.0000	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.0665	FALSE
XRP	7	0.95	1.053	0.3048	FALSE	1.054	0.3046	FALSE
		0.99	0.564	0.4527	FALSE	0.778	0.3778	FALSE
	30	0.95	11.05	0.0009	TRUE	25.921	0.0000	TRUE
		0.99	6.442	0.0111	TRUE	6.445	0.0111	TRUE
	90	0.95	17.286	0.0000	TRUE	19.285	0.0000	TRUE
		0.99	6.108	0.0135	TRUE	6.111	0.0134	TRUE
ADA	7	0.95	2.037	0.1535	FALSE	2.057	0.1515	FALSE
		0.99	0.564	0.4527	FALSE	0.778	0.3778	FALSE
	30	0.95	4.816	0.0282	TRUE	5.05	0.0246	TRUE
		0.99	3.619	0.0571	FALSE	3.632	0.0567	FALSE
	90	0.95	17.286	0.0000	TRUE	17.602	0.0000	TRUE
		0.99	3.353	0.0671	FALSE	3.367	0.0665	FALSE

Note: The Kupiec Critical Value = 3.841 and the Christoffersen Critical Value = 5.991 for 95% of CI with one and two degrees of freedom, respectively.

To test the accuracy of the Integrated GARCH, the Kupiec and Christoffersen tests were used. The results are presented in the Table 10. In the majority of the cases in which the Kupiec test rejected the null hypothesis the same happened to the Christoffersen test and vice-versa. The only exceptions were BTC for log weekly returns for both the CIs of 95% and 99%.

As in other GARCH methods, the Integrated GARCH was able to estimate accurately the VaR for the log weekly returns, only rejecting the null hypothesis of the Christoffersen method for BTC.

6.7. Before and During Covid-19 with GPD

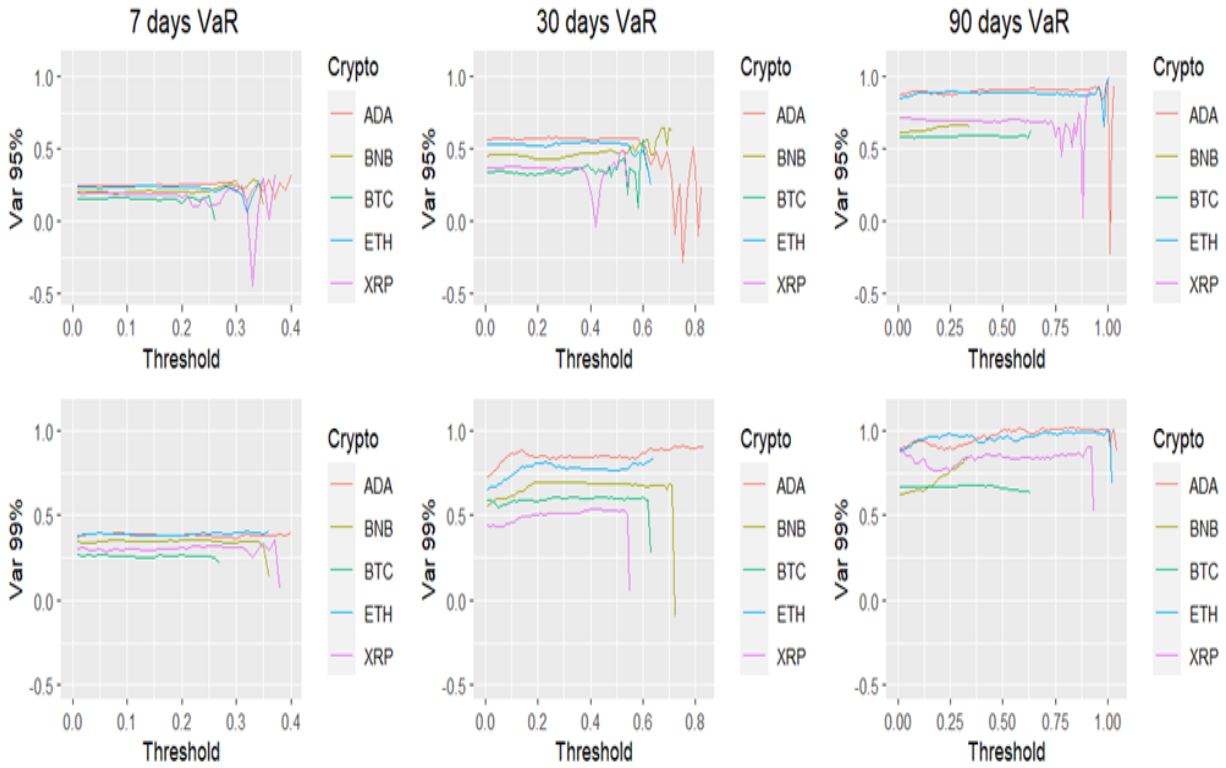

Figure 12: VaR in Function of the Threshold - Before Covid-19

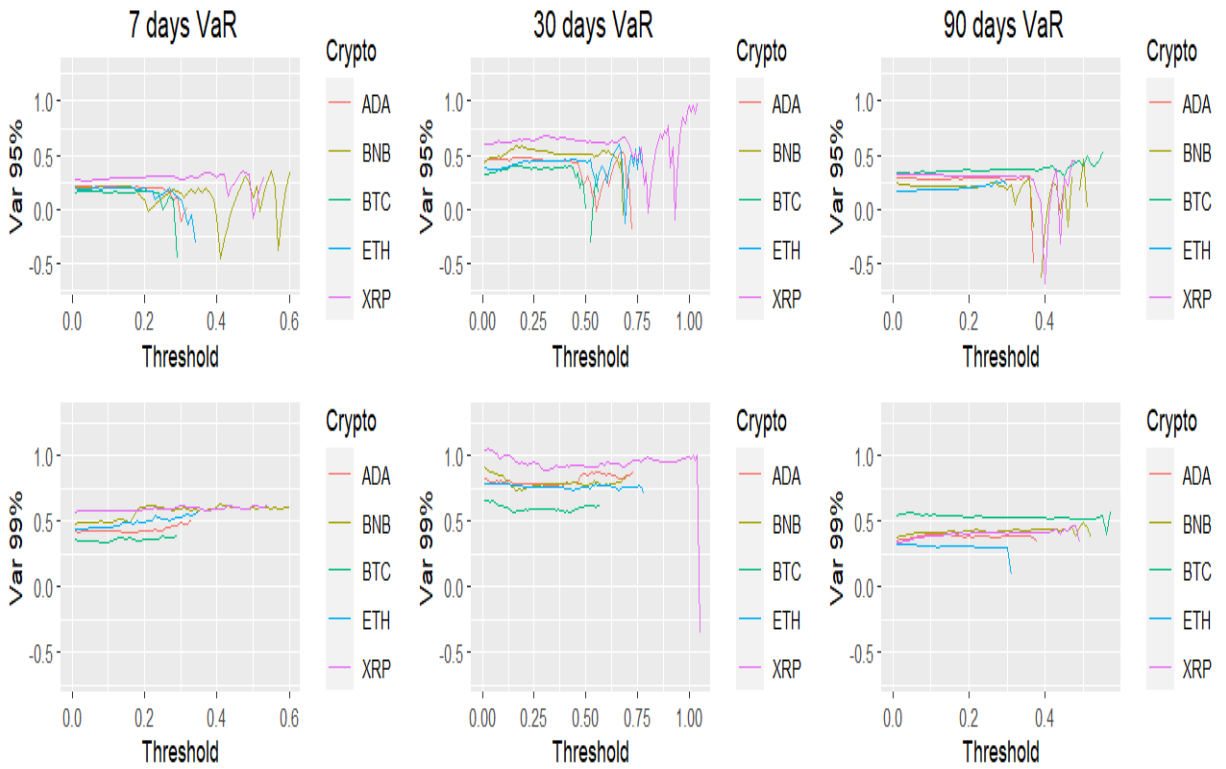

Figure 13: VaR in Function of the Threshold - During Covid-19

The Figure 12 and the Figure 13 show the plots with the VaR estimates in function of the threshold for all the combinations of investment periods, cryptocurrencies and the CIs concerning the periods Before Covid-19 and During Covid-19. Analyzing and comparing the VaR estimations presented in the Figure 12 and the Figure 13 with the Figure 4 is possible to achieve some conclusions.

Firstly, as shown in Figure 13 is verifiable that for the Period During Covid-19, all the VaR estimations for the log quarter returns distribution are smaller than for the log monthly returns and for some specific cases even smaller than the log weekly returns. This phenomenon is unusual but there is an explanation. The fact that Covid-19 has been an extreme event has induced a short-term major fluctuation of a great diversity of assets including cryptocurrencies in which the prices have fallen and recovered their original price in a very short amount of time. This led to investors who have held for small periods being more susceptible to bigger losses than the ones who have held during bigger periods. These estimations can also be better understood by looking at the data description between the periods and comparing the log distributions statistics of the log weekly returns and log monthly returns with the log quarter returns from the Period During Covid-19. The analysis reveals that during the Covid-19 period, the volatility of the log quarter returns distribution for cryptocurrencies surpassed the ones from the other two distributions. Notably, the skewness of these returns experienced a substantial increase, transforming into a predominantly positive value across most cases. Another point to consider is that in the period During Covid-19, the minimum observations from the log quarter returns distribution are less negative than the log weekly and monthly returns distributions for all the cryptocurrencies as can be seen in the boxplots from Appendix C.

Secondly, it is possible to verify that all the cryptocurrencies without exception have increased their VaR for the time investment horizon of seven days with a CI of 99% with the most accurate constant estimations for the Period Before Covid-19 being 0.26 for BTC, 0.41 to ETH, 0.35 to BNB, 0.31 to XRP and 0.39 to ADA. On the other hand, for the Period During Covid-19, BTC had a VaR of 0.36; ETH of 0.55, BNB of 0.62, XRP of 0.62 and ADA of 0.48. This also validates the assumption that the Period During Covid-19 had a short-term major fluctuation since the increases in the VaR are substantial with values of 38% for BTC, 34% for ETH, 77% for BNB, 100% for XRP and 23% for ADA.

Lastly, as an implication of the extreme event that has been Covid-19 and the explanation that has been given in the first point of this page, the VaR for the investment period of 90 days registered a significant decrease for all the cryptocurrencies and for both CIs of 95% and 99%. For the CI of 95%, the most accurate constant estimations for the Period Before Covid-19 have been 0.59 for BTC, 0.88 for ETH, 0.66 for BNB, 0.69 for XRP and 0.92 for ADA. In contrast, for the Period During Covid-19, BTC had a VaR of 0.37, ETH of 0.2, BNB of 0.21, XRP of 0.31 and ADA of 0.28. For the CI of 99%, the most accurate estimations for the Period Before Covid-19 have been 0.64 for BTC, 0.99 for ETH, 0.78 for BNB, 0.86 for XRP and 1.01 for ADA. Contrarily, on the Period During Covid-19, BTC had a VaR of 0.52, ETH of 0.3, BNB of 0.45, XRP of 0.41 and ADA of 0.39.

As in the general time frame period, most combinations present an almost constant estimation for VaR which was verified to be accurate using the Kupiec test. The accurate constant estimations provided are concluded from searching for the lowers LRSTAT possible.

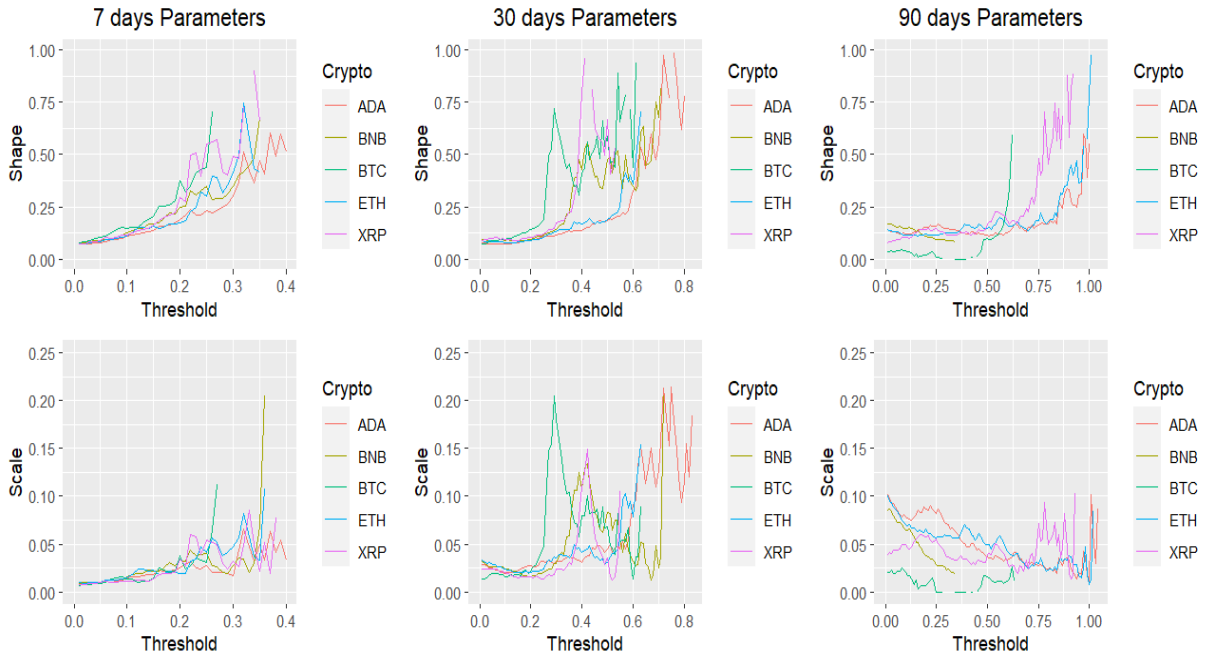

Figure 14: Shape and Scale in Function of the Threshold - Before Covid-19

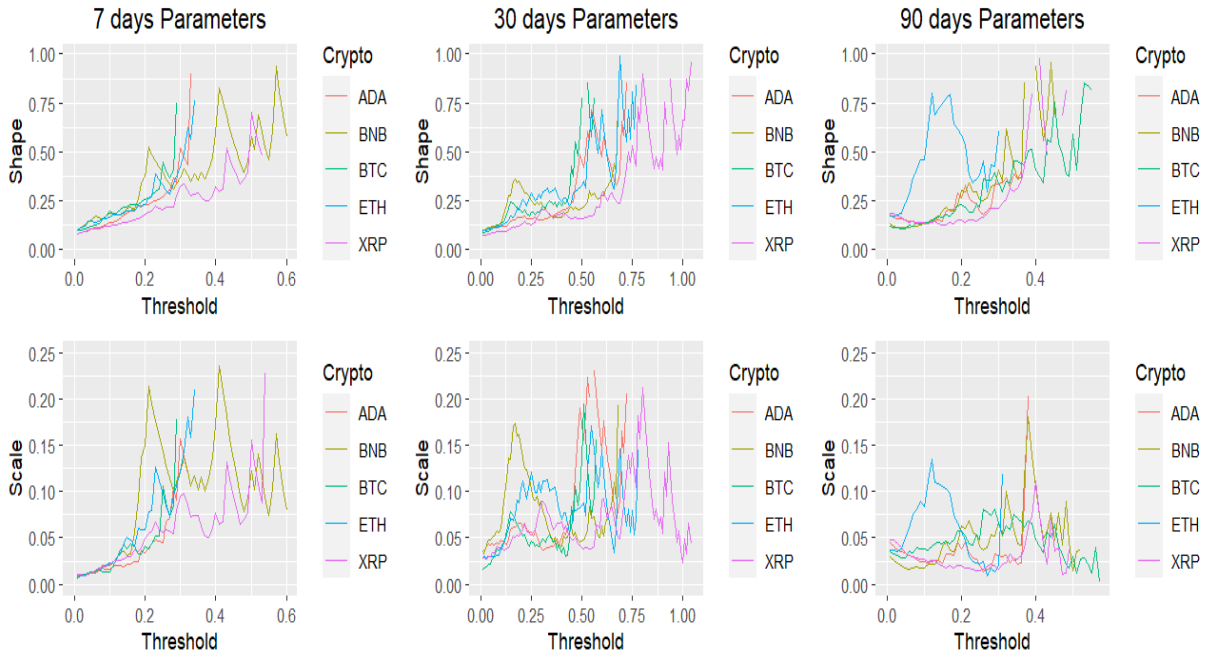

Figure 15: Shape and Scale in Function of the Threshold - During Covid-19

Figure 14 and Figure 15 show the shape and scale parameters in function of the threshold for the periods Before Covid-19 and During Covid-19. As in the analysis that has been made for the bigger time frame, the shape and scale parameters tend to increase with the increase of the threshold.

However, it is important to note that this trend may not exhibit consistent behavior during smaller periods. This inconsistency can be attributed to the limited number of observations, where even a slight change in the threshold can result in a significant impact on the number of exceedances. This, in turn, affects the estimation of parameters and subsequently the VaR estimations.

Table 11: VaR with GPD - Before Covid-19

Crypto	Days	VaR 95% (Continuous)	VaR 99% (Continuous)	VaR 95% (Discrete)	VaR 99% (Discrete)
BTC	**7**	0.16	0.26	0.15	0.23
	30	0.38	0.6	0.32	0.45
	90	0.59	0.64	0.45	0.47
ETH	**7**	0.24	0.41	0.21	0.34
	30	0.54	0.8	0.42	0.55
	90	0.88	0.99	0.59	0.63
BNB	**7**	0.21	0.35	0.19	0.30
	30	0.49	0.68	0.39	0.49
	90	0.66	0.78	0.48	0.54
XRP	**7**	0.19	0.31	0.17	0.27
	30	0.37	0.53	0.31	0.41
	90	0.69	0.86	0.50	0.58
ADA	**7**	0.26	0.39	0.23	0.32
	30	0.57	0.91	0.43	0.60
	90	0.92	1.01	0.60	0.64

Table 12: VaR with GPD - During Covid-19

Crypto	Days	VaR 95% (Continuous)	VaR 99% (Continuous)	VaR 95% (Discrete)	VaR 99% (Discrete)
BTC	**7**	0.16	0.36	0.15	0.30
	30	0.39	0.62	0.32	0.46
	90	0.37	0.52	0.31	0.41
ETH	**7**	0.19	0.55	0.17	0.42
	30	0.46	0.77	0.37	0.54
	90	0.2	0.3	0.18	0.26
BNB	**7**	0.17	0.62	0.16	0.46
	30	0.52	0.87	0.41	0.58
	90	0.21	0.45	0.19	0.36
XRP	**7**	0.29	0.62	0.25	0.46
	30	0.62	0.98	0.46	0.62
	90	0.31	0.41	0.27	0.34
ADA	**7**	0.2	0.48	0.18	0.38
	30	0.44	0.88	0.36	0.59
	90	0.28	0.39	0.24	0.32

Table 11 and Table 12 show the most accurate constant VaR metrics for all the combinations possible for the Periods Before and During Covid-19. Concerning changes between Periods, the biggest absolute increase was XRP for 30 days with a CI of 99% with a value of 0.45 or 84.9% and the biggest absolute decrease was ETH for 90 days and a CI of 99% with a value of 0.69 or 69.7%. The only case in which the VaR did not change between periods was BTC for seven days and a CI of 95%.

Table 13: Kupiec Test of GPD with Threshold until 0.6 - Before Covid-19

Threshold	7 days										30 days										90 days									
	BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA	
	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99
0.01	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.02	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.03	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.04	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.05	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.06	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.07	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✗	✗	✓	✓	✓	✗
0.08	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.09	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✓	✓	✗
0.15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗
0.16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.19	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.2	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓	✗
0.21	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.22	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.23	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗
0.24	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.25	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗
0.26	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.27	✗	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.28			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.29			✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.3			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.31			✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗
0.32			✗	✓	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗
0.33			✗	✓	✗	✓	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗
0.34			✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗
0.35			✓	✓	✗	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✗
0.36			✗	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✗
0.37							✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.38							✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.39									✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.4									✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.41									✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.42											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.43											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.44											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✗
0.45											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.46											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.47											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.48											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.49											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
0.5											✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.51											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.52											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
0.53											✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.54											✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.55											✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.56											✓	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.57											✓	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.58											✗	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.59											✓	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✗			✓	✓	✓	✓
0.6											✗	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✗			✓	✓	✓	✓

Table 14: Kupiec Test of GPD with Threshold above 0.6 - Before Covid-19

Threshold	7 days										30 days										90 days									
	BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA	
	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99
0.61											✓	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✓			✓	✓	✓	✓
0.62											✓	✓	✗	✓	✓	✓			✗	✓	✓	✓	✓	✓			✓	✓	✓	✓
0.63											✗	✗	✗	✓	✓	✓			✗	✓	✗	✓	✓	✓			✓	✓	✓	✓
0.64													✗	✗	✓	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.65															✗	✓			✗	✓			✓	✗			✓	✓	✓	✓
0.66															✗	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.67															✗	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.68															✗	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.69															✓	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.7															✗	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.71															✗	✓			✗	✓			✓	✓			✓	✓	✓	✓
0.72															✗	✗			✗	✓			✓	✓			✓	✓	✓	✓
0.73																			✗	✓			✓	✓			✓	✓	✓	✓
0.74																			✗	✓			✓	✓			✓	✓	✓	✓
0.75																			✗	✓			✓	✓			✗	✓	✓	✓
0.76																			✗	✓			✓	✓			✗	✓	✓	✓
0.77																			✗	✓			✓	✓			✗	✓	✓	✓
0.78																			✗	✓			✓	✓			✗	✓	✓	✓
0.79																			✓	✓			✓	✓			✗	✓	✓	✓
0.8																			✗	✓			✓	✓			✓	✓	✓	✓
0.81																			✗	✓			✓	✓			✗	✓	✓	✓
0.82																			✗	✓			✓	✓			✗	✓	✓	✓
0.83																			✗	✗			✓	✓			✗	✓	✓	✓
0.84																							✓	✓			✓	✓	✓	✓
0.85																							✓	✓			✗	✓	✓	✓
0.86																							✓	✓			✗	✓	✓	✓
0.87																							✓	✓			✓	✓	✓	✓
0.88																							✓	✓			✗	✓	✓	✓
0.89																							✓	✓			✗	✓	✓	✓
0.9																							✓	✓			✗	✓	✓	✓
0.91																							✓	✓			✗	✓	✓	✓
0.92																							✓	✓			✗	✓	✓	✓
0.93																							✓	✓			✗	✗	✓	✓
0.94																							✓	✓					✓	✓
0.95																							✗	✓					✓	✓
0.96																							✗	✓					✓	✓
0.97																							✓	✓					✗	✓
0.98																							✗	✓					✗	✓
0.99																							✗	✓					✗	✓
1																							✗	✓					✗	✓
1.01																							✗	✓					✗	✗
1.02																							✗	✗					✗	✓
1.03																													✓	✓
1.04																													✗	✗

Table 13 and Table 14 show the results of the Kupiec test with a CI of 95% for all the combinations for the Period Before Covid-19 considering the investment periods, cryptocurrencies and CIs. The right or check symbol indicates that the Kupiec test did not reject the null hypothesis and the wrong or cross symbol indicates that the Kupiec test rejected the null hypothesis. Additionally, the optimal thresholds which have the smallest LRSTATs are underlined in green. And, by last, the respective VaR values and parameters estimated in function of the threshold are presented in Appendix B.

Table 15: Kupiec Test Results of GPD with Threshold until 0.6 - During Covid-19

Threshold	7 days										30 days										90 days									
	BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA	
	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99
0.01	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗
0.02	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓
0.03	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓
0.04	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓
0.05	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✗	✓	✓
0.06	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
0.07	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
0.08	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.09	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.13	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.14	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.15	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.16	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.17	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.18	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.19	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.2	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.21	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.22	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.23	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.24	✓	✓	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.25	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.26	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.27	✗	✓	✓	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
0.28	✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.29	✗	✗	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
0.3			✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
0.31			✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓
0.32			✗	✓	✗	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✓	✓	✓	✓
0.33			✗	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✓	✓	✓	✓
0.34			✗	✓	✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
0.35			✗	✗	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
0.36					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
0.37					✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✓	✓	✗	✓
0.38					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓	✗	✗
0.39					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓		
0.4					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓		
0.41					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓		
0.42					✗	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✗	✓		
0.43					✗	✓	✗	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✗	✓		
0.44					✗	✓	✗	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓		
0.45					✗	✓	✓	✓			✗	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓		
0.46					✓	✓	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✗	✓	✗	✓		
0.47					✓	✓	✓	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓			✗	✓	✗	✓		
0.48					✓	✓	✓	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓			✗	✓	✗	✓		
0.49					✓	✓	✓	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓			✗	✓	✗	✗		
0.5					✗	✓	✗	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓			✗	✓				
0.51					✓	✓	✗	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✗	✓			✗	✓				
0.52					✗	✓	✗	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓			✗	✓				
0.53					✗	✓	✓	✓			✗	✓	✓	✓	✓	✓	✓	✓	✗	✓	✓	✓								
0.54					✓	✓	✗	✗			✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓								
0.55					✗	✓					✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓								
0.56					✓	✓					✗	✓	✗	✓	✓	✓	✓	✓	✗	✓	✗	✗								
0.57					✗	✓					✗	✗	✓	✓	✓	✓	✓	✓	✗	✓	✗	✗								
0.58					✗	✓							✓	✓	✓	✓	✓	✓	✗	✓										
0.59					✓	✓							✓	✓	✓	✓	✓	✓	✗	✓										
0.6					✗	✓							✗	✓	✓	✓	✓	✓	✗	✓										

Table 16: Kupiec Test Results of GPD with Threshold above 0.6 - During Covid-19

Threshold	7 days										30 days										90 days									
	BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA		BTC		ETH		BNB		XRP		ADA	
	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99	95	99
0.61					✗	✓							✓	✓	✓	✓	✓	✓	✗	✓										
0.62					✓	✓							✓	✓	✓	✓	✓	✓	✗	✓										
0.63					✗	✓							✓	✓	✓	✓	✓	✓	✗	✓										
0.64					✗	✓							✓	✓	✓	✓	✓	✓	✓	✓										
0.65					✓	✓							✗	✓	✓	✓	✓	✓	✓	✓										
0.66					✗	✓							✗	✓	✗	✓	✓	✓	✓	✓										
0.67					✗	✓							✗	✓	✓	✓	✓	✓	✗	✓										
0.68					✗	✓							✗	✓	✗	✓	✓	✓	✗	✓										
0.69					✗	✗							✗	✓	✗	✓	✓	✓	✓	✓										
0.7													✗	✓	✗	✗	✓	✓	✗	✓										
0.71													✓	✓			✓	✓	✗	✓										
0.72													✓	✓			✗	✓	✗	✓										
0.73													✓	✓			✗	✓	✗	✗										
0.74													✗	✓			✗	✓												
0.75													✓	✓			✗	✓												
0.76													✗	✓			✗	✓												
0.77													✓	✓			✓	✓												
0.78													✗	✗			✗	✓												
0.79																	✗	✓												
0.8																	✗	✓												
0.81																	✗	✓												
0.82																	✗	✓												
0.83																	✗	✓												
0.84																	✗	✓												
0.85																	✓	✓												
0.86																	✓	✓												
0.87																	✓	✓												
0.88																	✗	✓												
0.89																	✓	✓												
0.9																	✗	✓												
0.91																	✗	✓												
0.92																	✓	✓												
0.93																	✗	✓												
0.94																	✗	✓												
0.95																	✓	✓												
0.96																	✗	✓												
0.97																	✗	✓												
0.98																	✗	✓												
0.99																	✗	✓												
1																	✗	✓												
1.01																	✗	✓												
1.02																	✗	✓												
1.03																	✗	✓												
1.04																	✗	✓												
1.05																	✗	✗												

Table 15 and Table 16 show the results of the Kupiec test with a CI of 95% for all the combinations for the Period During Covid-19 considering the investment periods, cryptocurrencies and CIs. The right or check symbol indicates that the Kupiec test did not reject the null hypothesis and the wrong or cross symbol indicates that the Kupiec test rejected the null hypothesis. Additionally, the optimal thresholds which have the smallest LRSTATs are underlined in green. And, by last, the respective VaR values and parameters estimated in function of the threshold are presented in Appendix C.

Table 17: LRSTAT and P-VALUE of Optimal Thresholds with GPD - Before Covid-19

Crypto	Days	VAR 95%		VAR 99%	
		LRSTAT	P-VALUE	LRSTAT	P-VALUE
BTC	7	0.23697	0.63	0.04554	0.83
	30	0.00781	0.93	0.04554	0.83
	90	0.00781	0.93	0.04645	0.83
ETH	7	0.00781	0.93	0.04554	0.83
	30	0.00781	0.93	0.38595	0.53
	90	0.00781	0.93	0.04554	0.83
BNB	7	0.00781	0.93	0.04554	0.83
	30	0.00781	0.93	0.04554	0.83
	90	1.53422	0.22	1.01582	0.31
XRP	7	0.00781	0.93	0.04645	0.83
	30	0.00781	0.93	0.04554	0.83
	90	0.00781	0.93	0.04554	0.83
ADA	7	0.01153	0.91	0.04554	0.83
	30	0.00781	0.93	0.04645	0.83
	90	0.00781	0.93	0.04554	0.83

Table 18: LRSTAT and P-VALUE of Optimal Thresholds with GPD -During Covid-19

Crypto	Days	VAR 95%		VAR 99%	
		LRSTAT	P-VALUE	LRSTAT	P-VALUE
BTC	7	0.00473	0.95	0.39717	0.53
	30	0.00473	0.95	0.04200	0.84
	90	0.00473	0.95	0.04200	0.84
ETH	7	0.00473	0.95	0.04200	0.84
	30	0.07126	0.79	0.04200	0.84
	90	0.00473	0.95	0.04200	0.84
BNB	7	0.01614	0.90	0.04200	0.84
	30	0.00473	0.95	0.04200	0.84
	90	0.00473	0.95	0.04200	0.84
XRP	7	0.00473	0.95	0.04200	0.84
	30	0.00473	0.95	0.04200	0.84
	90	0.00473	0.95	0.05029	0.82
ADA	7	0.01614	0.90	0.05029	0.82
	30	0.00473	0.95	0.04200	0.84
	90	0.00473	0.95	0.04200	0.84

Table 17 and Table 18 above show the LRSTATs and their respective p-values for the optimal thresholds for each combination. From all the results is possible to assume that these smaller periods are similar in terms of accuracy with the general time frame, since for all the combinations the GPD presents very good marginal coverage, but never presents conditional coverage.

7. INTERPRETATIONS

The solutions to the research question posed at the thesis's outset will be presented in this chapter. One subsection will be created for each of the objectives.

7.1. Objective №1: To Assess if the GPD Approach Is Appropriate for the Calculation of VaR in Cryptocurrencies

To assess if the semiparametric approach using Pareto tails is appropriate for the calculation of VaR in cryptocurrencies, some metrics have been determined for five distinct cryptocurrencies already mentioned which are: BTC, ETH, BNB, XRP and ADA, each one for three investment periods of seven, 30 and 90 days and two CIs of 95% and 99%. For all these possible combinations, the results in terms of backtesting have been the same.

The Kupiec test, conducted across a wide range of thresholds, consistently fails to reject the null hypothesis, indicating that the metrics exhibit marginal coverage. Also, the left tail of the distribution of returns, which represents losses, exhibits a pronounced adherence to a Pareto distribution, as corroborated by previous research findings. However, the Christoffersen test rejects all null hypotheses for every VaR estimation, thereby indicating the unsuitability of this method in verifying the conditional likelihood of exceptions for VaR.

To conclude, the GPD method is suitable to determine the unconditional VaR estimates with a high degree of accuracy but is not adequate for conditional VaR estimates without adaptations such as the window rolling technique.

7.2. Objective №2: Identify in which Investment Periods and CIs the Semiparametric Approach Presents Better Results than other Approaches;

This study also has focused on understanding if it is possible to achieve better results in terms of marginal and conditional coverage with other methods instead of the GPD method. For this purpose, as already mentioned, the following methods have been implemented: HS, ND, Gaussian GARCH, Student’s-t GARCH and Integrated GARCH.

When comparing the GPD and HS methods for VaR estimation in cryptocurrencies, both have demonstrated accurate results, making it challenging to favor one method over the other in terms of accuracy. However, the HS method carries limitations absent in the GPD. These include assumptions of independent and identically distributed returns, the need for larger data samples to achieve accurate estimations and reliance on the historical distribution's ability to reflect future outcomes, which may not always hold true (Dowd, 1998). On the other hand, the GPD method offers precise modeling of the loss distribution's tail through specific parameter settings, enabling reliable VaR predictions for future scenarios.

The GPD method consistently outperforms the ND method across various investment periods and CIs. Out of 30 possible VaR combinations, only 13 show marginal coverage with the ND method, while the GPD method covers all combinations. Additionally, the GPD method achieves higher p-values in the Kupiec test, indicating greater accuracy. Both methods are unsuitable for conditional VaR estimation, as confirmed by rejecting the null hypothesis in the Christoffersen test.

Comparing the GPD with GARCH family models reveals a mixed performance, with no clear superiority in all circumstances.

Overall, GARCH models tend to outperform the GPD for a seven-day investment period, as these frequently do not reject the null hypotheses in the Kupiec and Christoffersen tests across various cryptocurrencies and CIs. Exceptions include the Gaussian GARCH for BTC in the Christoffersen test at a 95% CI, as well as the Integrated GARCH at 95% and 99% CIs. For 30-day and 90-day periods, neither the GPD nor GARCH models can be definitively deemed superior. In terms of the Kupiec test, the GPD method demonstrates higher levels of marginal coverage with larger p-values when the GARCH models do not reject the null hypothesis. Conversely, GARCH estimations that do not reject the null hypothesis in the Kupiec test also do not reject it in the Christoffersen test, which is not the case with the GPD approach.

In summary, for unconditional VaR determination, the GPD is preferable, while for studying conditional VaR, GARCH family models can be considered, although coverage issues may arise, requiring backtesting.

The underperformance of GARCH models for longer investment periods aligns with existing literature, as highlighted by Danielsson et al. (2000), who observed the diminishing presence of conditional volatility in return series spanning 30 days or more. This sheds light on the reason behind the rejection of the null hypothesis in the Christoffersen test for these extended investment periods.

7.3. Objective №3: Determine the VaR of Top Cryptocurrencies in Terms of Market Cap for Different Investment Periods and Compare Results

The study aimed to determine the VaR of top cryptocurrencies based on their market cap, considering different investment periods. Daily closed price data from 06/11/2017 to 06/11/2022 was utilized for analysis. The findings, previously discussed, indicated that cryptocurrencies with higher volatility during the specified data and investment periods also exhibited larger VaR estimations. ADA emerged as the riskiest cryptocurrency, followed by XRP, ETH, BNB, and finally BTC. Table 19 indicates the percentiles distribution of the risk of each cryptocurrency by investment period and CI.

Table 19: VaR Percentiles Distribution

Days	CI	BTC	ETH	BNB	XRP	ADA
7	0.95	0%	63%	50%	75%	100%
	0.99	0%	69%	56%	100%	56%
30	0.95	0%	70%	15%	75%	100%
	0.99	0%	58%	36%	88%	100%
90	0.95	4%	92%	0%	65%	100%
	0.99	10%	63%	0%	73%	100%

7.4. Objective №4: Compare the VaR Estimations from the Periods Before and During Covid-19 for the Cryptocurrencies Using GPD and Verify their Backtesting Results

The final objective of this study is to compare VaR estimations for cryptocurrencies using the GPD method across two distinct periods: Before Covid-19 and During Covid-19. The periods have been delineated as previously stated, with the date set as 01/01/2020. The Period Before Covid-19 comprises 549 observations spanning one year and a half leading up to this date, while the During Covid-19 period encompasses 547 observations spanning one year and a half after this date.

Furthermore, alongside the estimation comparisons, it is crucial to assess the accuracy of marginal coverage by the GPD Approach when employing small sample sizes. It is important to acknowledge that the Christoffersen test for marginal coverage is not applicable in this context, given the unconditional nature of the GPD approach.

Regarding the comparison of VaR estimations between the Periods Before Covid-19 and During Covid-19, Table 20 displays the absolute changes in VaR. In the table, red cells indicate an increase in VaR estimates between the periods, green cells represent a decrease, and yellow cells denote little to no change in the VaR metric.

Table 20: Absolute Variations of VaR between Covid-19 Periods

Crypto	BTC			ETH			BNB			XRP			ADA		
Days	**7**	**30**	**90**	**7**	**30**	**90**	**7**	**30**	**90**	**7**	**30**	**90**	**7**	**30**	**90**
VaR 95%	0	0.01	-0.22	-0.05	-0.08	-0.68	-0.04	0.03	-0.45	0.10	0.25	-0.38	-0.06	-0.13	-0.64
VaR 99%	0.10	0.02	-0.12	0.14	-0.03	-0.69	0.27	0.19	-0.33	0.31	0.45	-0.45	0.09	-0.03	-0.62

By examining Table 20 becomes evident that all cryptocurrencies, under the log weekly returns period and a 99% CI, have witnessed an increase in their VaR estimations. Conversely, for the log quarter returns period, both the 95% and 99% CIs have shown a decrease in VaR estimations.

BTC, BNB, and XRP experienced predominantly increased VaR estimations for shorter investment periods of seven and 30 days, particularly focused on the 99% CI. However, exceptions to this trend occurred in the 95% CI for seven-day returns, which can be attributed to short-term significant price fluctuations that resulted in substantial VaR increases for higher CIs while decreasing for lower CIs. Notably, XRP was the only cryptocurrency that exhibited an increase in VaR for a seven-day period with a 95% CI. On the contrary, ETH and ADA generally demonstrated decreased VaR estimations, with the aforementioned exceptions in the seven-day period with a 99% CI.

Regarding the marginal coverage, optimal thresholds were identified for both periods, resulting in accurate VaR estimates comparable to those of the general time frame. However, certain metrics exhibit lower p-values compared to the larger sample studied. Consequently, it can be inferred that larger samples contribute to improved marginal coverage. Nonetheless, it is noteworthy that accurate results can still be achieved with smaller samples.

8. CONCLUSIONS AND FUTURE WORKS

This research studied the implementation of the GPD approach to determine the VaR of five cryptocurrencies being: BTC, ETH, BNB, XRP and ADA for the investment time horizons of seven, 30 and 90 days and the CIs of 95% and 99%. This study aimed to answer the research question "To what extent is suitable the estimation of VaR for cryptocurrencies using a semiparametric approach assuming Pareto Tails in order to help investors to identify and manage the risk of their portfolios?".

Based on this study and considering all the answers provided to the research objectives, it can be concluded that the GPD approach is highly suitable for determining the VaR of cryptocurrencies across various investment periods, CIs and sample sizes. Interestingly, the study reveals that even with incremental increases in the number of observations between samples, there have been only minimal improvements in the accuracy of marginal coverage.

The GPD approach consistently outperformed the ND approach in terms of backtesting results for unconditional methods. However, neither method demonstrated conditional coverage. The GPD method exhibited marginal coverage, unlike the ND approach. Comparatively, the HS method, being non-parametric, cannot be directly compared in terms of backtesting results, but the GPD method is considered superior for estimation. The HS method has limitations such as assuming independent and identically distributed returns and requiring larger data samples to improve VaR estimation accuracy.

Among the studied GARCH family models being Gaussian GARCH, Student's-t GARCH and Integrated GARCH, the GPD approach generally outperformed them in estimating VaR for 30-day and 90-day returns, with a few exceptions. Specifically, the GARCH VaR estimations for these periods consistently rejected both the null hypothesis in the Kupiec and Christoffersen tests. However, in the case of seven-day investment periods, the GPD approach was surpassed by the GARCH family models, again with some exceptions. Notably, the GARCH models exhibited both marginal and conditional coverage for this time horizon, which was not observed with the GPD approach.

In conclusion, based on the evidence presented, the research question can be answered positively. The GPD approach demonstrates nearly perfect marginal coverage in VaR estimations. Other methods like GARCH models are preferred only when these provide good conditional coverage, although this exception is still subject to debate. Some literature, such as Danielsson et al. (2000), suggests that unconditional models like GPD are more appropriate for calculating VaR in assets with longer time horizons. Additionally, even for shorter timeframes, investors often prefer unconditional methods to avoid frequent adjustments in risk limits, which hinder the establishment of a definitive risk strategy.

Besides the main scope of this study, other two conclusions have been possible to find in the development and implementation of the methods to determine the VaR metrics.

This study has found that as already shown by Zhang et al. (2019), the GPD approach does not have a single optimal threshold for determining VaR metrics in different timeframes, including the largest timeframe, as well as the periods Before Covid-19 and During Covid-19. Instead, a range of optimal thresholds exists that can maximize marginal coverage, and these vary based on the chosen CI. Significantly, it should be emphasized that certain thresholds, while not optimal, still offer marginal coverage as these do not result in the rejection of the null hypothesis in the Kupiec tests.

During the periods Before Covid-19 and During Covid-19, a noteworthy finding emerged, challenging the assumption that VaR metrics increase with longer investment periods. Specifically, in the period During Covid-19, VaR metrics for log quarter returns were found to be smaller than those for log monthly returns, and in some cases, even smaller than log weekly returns. This unexpected trend can be attributed to a short-term extreme event where prices experienced a sharp decline followed by a rapid recovery. Consequently, VaR metrics significantly increased compared to the period Before Covid-19, particularly for shorter timeframes like seven and 30 days with a 99% CI. Moreover, a significant decrease in VaR was observed for 90-day periods across both 95% and 99% CIs.

With all the main conclusions presented, it should also be mentioned the main limitations of the work developed and suggestions for forward studies. In this way is suggested that the following studies should try to surpass the biggest theoretical limitation found in this study, which was the fact that the semiparametric method using Pareto tails does not allow good conditional coverage of the VaR estimations, because of being an unconditional method. The reason it has not been tried to surpass this limitation was that it was intended to test this method without adaptations.

For future studies focused on using Pareto tails to accurately determine VaR and achieve good conditional coverage, a potential solution involves utilizing a GARCH-EVT model with Pareto tails. This statistical model combines the GARCH model with the assumption that the distribution of returns follows a Pareto distribution, offering a comprehensive framework for capturing volatility and extreme events.

Finally, it should be remembered that all the methods considered in this study are univariate, being easier to implement than multivariate methods. However, multivariate methods provide more information that can be used to estimate the VaR of cryptocurrencies with greater accuracy and precision. The Multivariate Markov Chain method can be a suitable solution to test, since this nonlinear method, as explained by Damásio & Mendonça (2019), is able to “capture complex relationships that go beyond the first moment (conditional mean) or even the second moment (conditional variance) as in multivariate GARCH family models” (p.847). As for Covid-19, the results showed that this event was disruptive. Therefore, it may be relevant to investigate the existence of structural breaks in the VaR of cryptocurrencies during this period. For this purpose, the Multivariate Markov Chain method is still appropriate, as shown by Damásio & Nicolau (2020), who were able to detect the breaks in the NASDAQ stock index during the dotcom crash and the financial crisis of 1998 and 2012.

REFERENCES

Almeida, D., Dionísio, A., Vieira, I., & Ferreira, P. (2022). Uncertainty and Risk in the Cryptocurrency Market. Journal of Risk and Financial Management, 15(11), 532–548. https://doi.org/10.3390/jrfm15110532

Baur, D. G., Hong, K., & Lee, A. D. (2018). Bitcoin: Medium of exchange or speculative assets? Journal of International Financial Markets, Institutions and Money, 54, 177–189. https://doi.org/10.1016/j.intfin.2017.12.004

Börner, C. J., Hoffmann, I., Krettek, J., Kürzinger, L. M., & Schmitz, T. (2021). On the Return Distributions of a Basket of Cryptocurrencies and Subsequent Implications (arXiv:2105.12334). arXiv. http://arxiv.org/abs/2105.12334

Buterin, V. (2014). A NEXT GENERATION SMART CONTRACT & DECENTRALIZED APPLICATION PLATFORM. https://finpedia.vn/wp-content/uploads/2022/02/Ethereum_white_paper-a_next_generation_smart_contract_and_decentralized_application_platform-vitalik-buterin.pdf

Caporale, G. M., Pittis, N., & Spagnolo, N. (2003). IGARCH models and structural breaks. Applied Economics Letters, 10(12), 765–768. https://doi.org/10.1080/1350485032000138403

Chan, S., Chu, J., Nadarajah, S., & Osterrieder, J. (2017). A Statistical Analysis of Cryptocurrencies. Journal of Risk and Financial Management, 10(2), 12–34. https://doi.org/10.3390/jrfm10020012

Chin, W. C. (2008). Heavy-tailed value-at-risk analysis for Malaysian stock exchange. Physica A: Statistical Mechanics and Its Applications, 387(16–17), 4285–4298. https://doi.org/10.1016/j.physa.2008.01.075

Chinhamu, K., Huang, C.-K., Huang, C.-S., & Chikobvu, D. (2014). Extreme Risk, Value-At-Risk And Expected Shortfall In The Gold Market. International Business & Economics Research Journal (IBER), 14(1), 107–122. https://doi.org/10.19030/iber.v14i1.9035

Chirstoffersen, P. F. (1998). Evaluating Interval Forecasts. International Economic Review, 39(4), 841–862. https://doi.org/10.2307/2527341

Conlon, T., Corbet, S., & McGee, R. J. (2020). Are cryptocurrencies a safe haven for equity markets? An international perspective from the COVID-19 pandemic. Research in International Business and Finance, 54(101248). https://doi.org/10.1016/j.ribaf.2020.101248

Damásio, B., & Mendonça, S. (2019). Modelling insurgent-incumbent dynamics: Vector autoregressions, multivariate Markov chains, and the nature of technological competition. Applied Economics Letters, 26(10), 843-849. https://www.tandfonline.com/doi/abs/10.1080/13504851.2018.1502863

Damásio, B., & Nicolau, J. (2020). Time inhomogeneous multivariate Markov chains: detecting and testing multiple structural breaks occurring at unknown dates. https://www.repository.utl.pt/bitstream/10400.5/20164/1/REM_WP_0136_2020.pdf

Danielsson & De Vries. (2000). Value-at-Risk and Extreme Returns. Annales d'Économie et de Statistique, 60, 239–270. https://doi.org/10.2307/20076262

Dowd, K. (1998). Beyond value at risk: The new science of risk management. Wiley. https://www.wiley.com/enus/Beyond+Value+at+Risk%3A+The+New+Science+of+sk+Management-p-9780471976226

Fernandez, V. (2023). EXTREME VALUE THEORY AND VALUE AT RISK. REVISTA DE ANALISIS ECONOMICO, 18(1), 57–85. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1255482

Fonseca, T. C. O., Cerqueira, V. S., Migon, H. S., & Torres, C. A. C. (2019). The effects of degrees of freedom estimation in the Asymmetric GARCH model with Student-t Innovations (arXiv:1910.01398). arXiv. http://arxiv.org/abs/1910.01398

Gençay, R., & Selçuk, F. (2004). Extreme value theory and Value-at-Risk: Relative performance in emerging markets. International Journal of Forecasting, 20(2), 287–303. https://doi.org/10.1016/j.ijforecast.2003.09.005

Gonzalo, J., & Olmo, J. (2004). Which Extreme Values Are Really Extreme? Journal of Financial Econometrics, 2(3), 349–369. https://doi.org/10.1093/jjfinec/nbh014

Görgen, K., Meirer, J., & Schienle, M. (2022). Predicting Value at Risk for Cryptocurrencies with Generalized Random Forests (arXiv:2203.08224). arXiv. http://arxiv.org/abs/2203.08224

Ho, K.-H., Chiu, W.-H., & Li, C. (2020). A Network Analysis of the Cryptocurrency Market. 2020 IEEE Symposium Series on Computational Intelligence (SSCI), 2178–2185. https://doi.org/10.1109/SSCI47803.2020.9308282

Jondeau, E., Poon, S.-H., & Rockinger, M. (2007). Financial modeling under non-gaussian distributions. Springer. https://doi.org/10.1007/978-1-84628-696-4

Khairunnisa, D., Purwanto, B., & Ermawati, W. J. (2022). Cryptocurrency Risk Analysis During the Covid-19 Pandemic: Value at Risk (VaR) Approach. Jurnal Manajemen Dan Organisasi, 13(1), 61–73. https://doi.org/10.29244/jmo.v13i1.40428

Kucheryavenko, M. P., Dmytryk, O. O., & Golovashevych, O. O. (2019). CRYPTOCURRENCIES - DEVELOPMENT, FEATURES AND CLASSIFICATION. Financial and Credit Activity Problems of Theory and Practice, 3(30), 371–378. https://doi.org/10.18371/fcaptp.v3i30.179737

Kupiec, P. H. (1995). Techniques for Verifying the Accuracy of Risk Measurement Models. The Journal of Derivatives, 3(2), 73–84. https://doi.org/10.3905/jod.1995.407942

Likitratcharoen, D., Na Ranong, T., Chuengsuksomboon, R., Sritanee, N., & Pansriwong, A. (2018). VALUE AT RISK PERFORMANCE IN CRYPTOCURRENCIES. 22(1), 11–27. https://jrmi.au.edu/index.php/jrmi/article/view/171

Liu, W., Semeyutin, A., Lau, C. K. M., & Gozgor, G. (2020). Forecasting Value-at-Risk of Cryptocurrencies with RiskMetrics type models. Research in International Business and Finance, 54(101259). https://doi.org/10.1016/j.ribaf.2020.101259

Maung Maung Thin, W. Y., Dong, N., Bai, G., & Dong, J. S. (2018). Formal Analysis of a Proof-of-Stake Blockchain. 2018 23rd International Conference on Engineering of Complex Computer Systems (ICECCS), 197–200. https://doi.org/10.1109/ICECCS2018.2018.00031

Milutinović, M. (2018). Cryptocurrency. Ekonomika, 64(1), 105–122. https://doi.org/10.5937/ekonomika1801105M

Pérez-cruz, F., Afonso-rodríguez, J. A., & Giner, J. (2003). Estimating GARCH models using support vector machines*. Quantitative Finance, 3(3), 163–172. https://doi.org/10.1088/1469-7688/3/3/302

Pisarenko, V. F., Sornette, A., Sornette, D., & Rodkin, M. V. (2014). Characterization of the Tail of the Distribution of Earthquake Magnitudes by Combining the GEV and GPD Descriptions of Extreme Value Theory. Pure and Applied Geophysics, 171(8), 1599–1624. https://doi.org/10.1007/s00024-014-0882-z

Siokos, S. (2001). What you need to know about VAR. IPE. https://www.ipe.com/what-you-need-to-know-about-var/14562.article

Tikhomirov, S. (2018). Ethereum: State of Knowledge and Research Perspectives. In A. Imine, J. M. Fernandez, J.-Y. Marion, L. Logrippo, & J. Garcia-Alfaro (Eds.), Foundations and Practice of Security (Vol. 10723, pp. 206–221). Springer International Publishing. https://doi.org/10.1007/978-3-319-75650-9_14

Trucıos, C., & Taylor, J. W. (2022). A Comparison of Methods for Forecasting Value-at-Risk and Expected Shortfall of Cryptocurrencies. http://dx.doi.org/10.2139/ssrn.4005619

Tsay, R. S. (2012). An Introduction to Analysis of Financial Data with R. Wiley. https://www.wiley.com/endk/An+Introduction+to+Analysis+of+Financial+Data+with+R-p-9780470890813

Vaz de Melo Mendes, B., & Fluminense Carneiro, A. (2020). A Comprehensive Statistical Analysis of the Six Major Crypto-Currencies from August 2015 through June 2020. Journal of Risk and Financial Management, 13(9), 192–212. https://doi.org/10.3390/jrfm13090192

Zhang, Y., Chan, S., & Nadarajah, S. (2019). Extreme value analysis of high-frequency cryptocurrencies. High Frequency, 2(1), 61–69. https://doi.org/10.1002/hf2.10032

APPENDIX A (GPD METHOD)

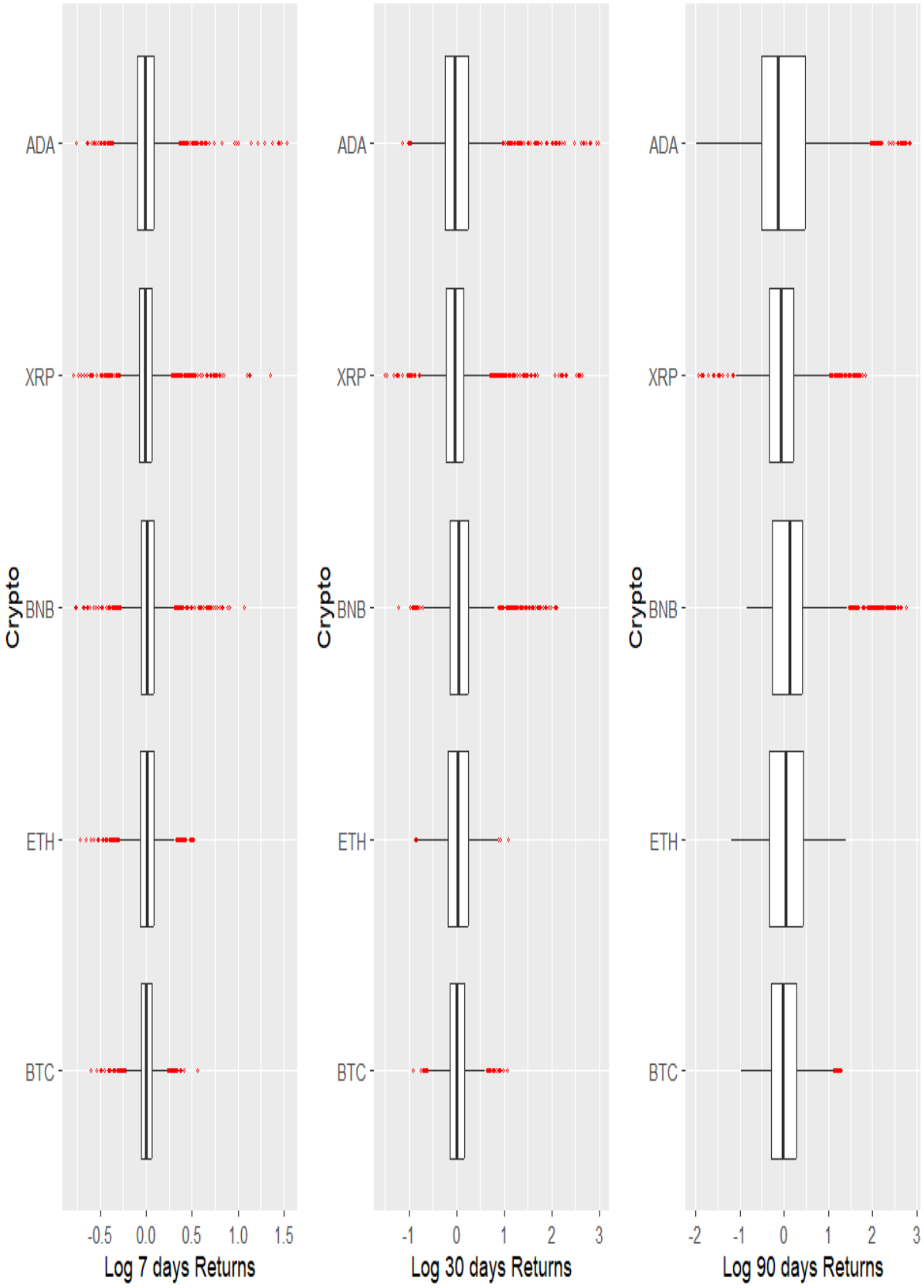

Figure 16: Boxplots with Log Returns Distributions

Table 21: VaR in Function of the Threshold for Seven days

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.1755	0.3159	0.2314	0.3994	0.2114	0.3953	0.2447	0.4210	0.2573	0.3987
0.02	0.1782	0.3076	0.2296	0.4065	0.2096	0.4001	0.2430	0.4290	0.2572	0.3994
0.03	0.1787	0.3058	0.2296	0.4066	0.2094	0.4003	0.2420	0.4320	0.2570	0.4001
0.04	0.1780	0.3068	0.2274	0.4116	0.2084	0.4020	0.2408	0.4352	0.2559	0.4058
0.05	0.1766	0.3091	0.2262	0.4136	0.2035	0.4065	0.2394	0.4378	0.2546	0.4102
0.06	0.1750	0.3104	0.2286	0.4098	0.2045	0.4061	0.2426	0.4325	0.2534	0.4136
0.07	0.1760	0.3095	0.2294	0.4089	0.2031	0.4064	0.2394	0.4366	0.2539	0.4120
0.08	0.1755	0.3094	0.2295	0.4089	0.2069	0.4060	0.2401	0.4358	0.2529	0.4139
0.09	0.1744	0.3097	0.2323	0.4071	0.2050	0.4056	0.2398	0.4358	0.2509	0.4170
0.1	0.1719	0.3090	0.2306	0.4079	0.2070	0.4062	0.2382	0.4365	0.2516	0.4160
0.11	0.1717	0.3090	0.2332	0.4071	0.2092	0.4073	0.2369	0.4365	0.2550	0.4126
0.12	0.1703	0.3064	0.2364	0.4064	0.2085	0.4065	0.2361	0.4364	0.2536	0.4139
0.13	0.1719	0.3101	0.2356	0.4064	0.2100	0.4083	0.2341	0.4354	0.2531	0.4141
0.14	0.1719	0.3116	0.2326	0.4057	0.2108	0.4097	0.2320	0.4337	0.2513	0.4146
0.15	0.1716	0.3132	0.2339	0.4062	0.2087	0.4039	0.2307	0.4316	0.2511	0.4146
0.16	0.1692	0.3193	0.2306	0.4036	0.2083	0.4012	0.2326	0.4353	0.2526	0.4148
0.17	0.1689	0.3196	0.2297	0.4016	0.2081	0.4071	0.2330	0.4359	0.2528	0.4147
0.18	0.1729	0.3157	0.2301	0.4034	0.2074	0.4110	0.2324	0.4329	0.2496	0.4123
0.19	0.1730	0.3152	0.2298	0.3999	0.2076	0.4100	0.2328	0.4370	0.2503	0.4132
0.2	0.1673	0.3186	0.2300	0.3981	0.2085	0.4092	0.2317	0.4443	0.2498	0.4118
0.21	0.1771	0.3134	0.2300	0.3970	0.1984	0.4220	0.2327	0.4418	0.2503	0.4128
0.22	0.1816	0.3109	0.2257	0.4066	0.1942	0.4255	0.2295	0.4492	0.2496	0.4177
0.23	0.1787	0.3121	0.2179	0.4159	0.1977	0.4230	0.2251	0.4554	0.2509	0.4133
0.24	0.1749	0.3130	0.2154	0.4177	0.2012	0.4210	0.2249	0.4559	0.2503	0.4143
0.25	0.1563	0.3161	0.2170	0.4167	0.2006	0.4209	0.2232	0.4574	0.2529	0.4097
0.26	0.1473	0.3167	0.2132	0.4189	0.2219	0.4088	0.2197	0.4590	0.2563	0.4050
0.27	0.1471	0.3166	0.2221	0.4147	0.2193	0.4104	0.2169	0.4605	0.2605	0.4000
0.28	0.1880	0.3155	0.2212	0.4150	0.2383	0.4007	0.2172	0.4603	0.2601	0.4007
0.29	0.1665	0.3153	0.2243	0.4140	0.2297	0.4053	0.1966	0.4685	0.2540	0.4057
0.3	0.0655	0.3116	0.2172	0.4161	0.2329	0.4045	0.1691	0.4758	0.2550	0.4056
0.31	0.1145	0.3146	0.1996	0.4198	0.2251	0.4064	0.1395	0.4809	0.2282	0.4145
0.32	0.0911	0.3121	0.1799	0.4228	0.2027	0.4101	0.1147	0.4842	0.2238	0.4157
0.33	0.1936	0.3243	0.1924	0.4215	0.1961	0.4107	0.1425	0.4804	0.1895	0.4209
0.34	0.1128	0.3120	0.1797	0.4228	0.1792	0.4118	0.1692	0.4769	0.2236	0.4170
0.35	0.2197	0.3306	0.1889	0.4223	0.1400	0.4128	0.1990	0.4724	0.1537	0.4222
0.36	-0.359	0.2458	0.0876	0.4271	0.1161	0.4131	0.2050	0.4719	0.1492	0.4223
0.37	-0.033	0.2890	0.1820	0.4251	0.1878	0.4145	0.2537	0.4653	0.0590	0.4233
0.38	0.1604	0.3253	0.2235	0.4246	0.2147	0.4157	0.2677	0.4635	0.1618	0.4238
0.39	0.2763	0.3555	0.2640	0.4247	0.1610	0.4114	0.2362	0.4672	0.1990	0.4246
0.4	0.2115	0.3365	0.3011	0.4259	0.1096	0.4071	0.2424	0.4668	0.1842	0.4244
0.41	0.2138	0.3369	0.2497	0.4246	-0.277	0.3770	0.2409	0.4677	0.0077	0.4173
0.42	-1.996	-0.012	0.2948	0.4280	-0.480	0.3647	0.2350	0.4684	0.0129	0.4181
0.43			0.3061	0.4291	-0.224	0.3835	0.0667	0.4649	0.0097	0.4187
0.44			-0.212	0.3740	-0.410	0.3695	0.1796	0.4689	0.1734	0.4313
0.45			0.0519	0.4002	-0.154	0.3918	0.1096	0.4660	0.2121	0.4350
0.46			0.2233	0.4239	0.0353	0.4128	0.1192	0.4671	0.2480	0.4396
0.47			-0.042	0.3893	0.1763	0.4325	0.2355	0.4757	0.1733	0.4285
0.48			-0.264	0.3663	-0.130	0.3923	0.1635	0.4696	0.3079	0.4508
0.49			0.0849	0.4105	-0.373	0.3650	0.1815	0.4711	0.3339	0.4572
0.5			0.2864	0.4472	-1.174	0.2966	-0.746	0.4035	-0.048	0.3865
0.51			0.4033	0.4775			-0.295	0.4332	0.2068	0.4320
0.52			0.3744	0.4677			0.0065	0.4603	0.1094	0.4140
0.53			0.1554	0.4036			0.2087	0.4849	0.3165	0.4614
0.54			-0.766	0.2381			-1.578	0.3347	0.4349	0.4989
0.55									0.4510	0.5063
0.56									0.3088	0.4515
0.57									0.0180	0.3614
0.58									0.3042	0.4523
0.59									0.4585	0.5172
0.6									0.1547	0.4009
0.61									0.4006	0.4962
0.62									0.5279	0.5608
0.63									0.5949	0.6042
0.64									0.5656	0.5847
0.65									-75.46	-8.087

Table 22: Parameters in Function of the Threshold for Seven days

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0413	0.0039	0.0410	0.0055	0.0422	0.0048	0.0387	0.0051	0.0400	0.0062
0.02	0.0450	0.0047	0.0426	0.0054	0.0447	0.0049	0.0403	0.0050	0.0415	0.0064
0.03	0.0481	0.0051	0.0449	0.0057	0.0475	0.0053	0.0424	0.0052	0.0431	0.0065
0.04	0.0509	0.0053	0.0470	0.0057	0.0504	0.0055	0.0446	0.0054	0.0442	0.0064
0.05	0.0537	0.0054	0.0495	0.0059	0.0544	0.0054	0.0471	0.0055	0.0455	0.0064
0.06	0.0568	0.0055	0.0524	0.0067	0.0578	0.0060	0.0499	0.0064	0.0472	0.0064
0.07	0.0610	0.0061	0.0554	0.0072	0.0619	0.0063	0.0524	0.0063	0.0497	0.0068
0.08	0.0648	0.0064	0.0583	0.0077	0.0647	0.0076	0.0553	0.0068	0.0517	0.0070
0.09	0.0691	0.0067	0.0621	0.0087	0.0689	0.0077	0.0583	0.0073	0.0537	0.0069
0.1	0.0739	0.0065	0.0645	0.0087	0.0723	0.0088	0.0616	0.0075	0.0567	0.0074
0.11	0.0796	0.0072	0.0688	0.0099	0.0760	0.0100	0.0651	0.0077	0.0610	0.0085
0.12	0.0865	0.0071	0.0740	0.0114	0.0799	0.0104	0.0689	0.0081	0.0633	0.0086
0.13	0.0921	0.0090	0.0766	0.0115	0.0840	0.0118	0.0734	0.0083	0.0662	0.0089
0.14	0.0988	0.0103	0.0778	0.0108	0.0882	0.0130	0.0790	0.0084	0.0686	0.0089
0.15	0.1058	0.0116	0.0824	0.0118	0.0925	0.0118	0.0850	0.0087	0.0722	0.0093
0.16	0.1171	0.0149	0.0843	0.0108	0.0981	0.0119	0.0880	0.0104	0.0769	0.0103
0.17	0.1237	0.0158	0.0884	0.0107	0.1023	0.0145	0.0924	0.0113	0.0808	0.0109
0.18	0.1258	0.0147	0.0937	0.0121	0.1073	0.0166	0.0989	0.0115	0.0828	0.0099
0.19	0.1330	0.0154	0.0983	0.0117	0.1120	0.0171	0.1023	0.0134	0.0879	0.0110
0.2	0.1448	0.0181	0.1041	0.0120	0.1166	0.0177	0.1062	0.0164	0.0921	0.0111
0.21	0.1472	0.0162	0.1106	0.0127	0.1275	0.0239	0.1109	0.0165	0.0975	0.0122
0.22	0.1555	0.0161	0.1173	0.0168	0.1354	0.0265	0.1161	0.0199	0.1060	0.0150
0.23	0.1660	0.0181	0.1298	0.0218	0.1373	0.0259	0.1231	0.0233	0.1081	0.0138
0.24	0.1774	0.0202	0.1373	0.0235	0.1402	0.0255	0.1277	0.0243	0.1144	0.0151
0.25	0.1947	0.0250	0.1411	0.0236	0.1455	0.0265	0.1331	0.0258	0.1190	0.0142
0.26	0.2090	0.0277	0.1498	0.0256	0.1447	0.0212	0.1394	0.0277	0.1261	0.0136
0.27	0.2196	0.0289	0.1492	0.0238	0.1514	0.0231	0.1456	0.0294	0.1370	0.0130
0.28	0.2173	0.0235	0.1559	0.0249	0.1617	0.0194	0.1502	0.0302	0.1454	0.0145
0.29	0.2361	0.0286	0.1608	0.0250	0.1664	0.0231	0.1660	0.0364	0.1511	0.0177
0.3	0.2912	0.0427	0.1714	0.0275	0.1747	0.0238	0.1862	0.0432	0.1595	0.0188
0.31	0.2816	0.0381	0.1880	0.0319	0.1822	0.0271	0.2071	0.0494	0.1723	0.0263
0.32	0.3052	0.0419	0.2062	0.0362	0.1916	0.0331	0.2248	0.0539	0.1814	0.0284
0.33	0.2794	0.0305	0.2066	0.0347	0.2002	0.0357	0.2154	0.0494	0.2035	0.0357
0.34	0.3264	0.0424	0.2211	0.0375	0.2112	0.0401	0.2072	0.0452	0.1969	0.0307
0.35	0.3075	0.0305	0.2244	0.0368	0.2288	0.0476	0.1983	0.0406	0.2346	0.0427
0.36	0.5160	0.0778	0.2839	0.0501	0.2429	0.0522	0.2017	0.0403	0.2445	0.0441
0.37	0.4338	0.0588	0.2460	0.0391	0.2312	0.0428	0.1886	0.0324	0.2913	0.0552
0.38	0.3766	0.0426	0.2351	0.0342	0.2346	0.0401	0.1920	0.0310	0.2564	0.0438
0.39	0.3702	0.0294	0.2284	0.0293	0.2550	0.0500	0.2093	0.0377	0.2500	0.0398
0.4	0.4086	0.0415	0.2304	0.0248	0.2766	0.0583	0.2149	0.0379	0.2661	0.0427
0.41	0.4364	0.0441	0.2579	0.0341	0.3840	0.0952	0.2232	0.0393	0.3454	0.0609
0.42	0.9019	0.1267	0.2571	0.0292	0.4343	0.1077	0.2334	0.0413	0.3542	0.0605
0.43			0.2713	0.0294	0.3886	0.0910	0.3017	0.0625	0.3666	0.0607
0.44			0.4569	0.0760	0.4377	0.1027	0.2699	0.0506	0.3152	0.0466
0.45			0.3887	0.0588	0.3899	0.0859	0.3036	0.0591	0.3123	0.0436
0.46			0.3379	0.0441	0.3496	0.0707	0.3095	0.0586	0.3120	0.0408
0.47			0.4508	0.0659	0.3200	0.0572	0.2784	0.0466	0.3576	0.0499
0.48			0.5305	0.0768	0.4145	0.0854	0.3139	0.0557	0.3218	0.0365
0.49			0.4412	0.0573	0.4802	0.1002	0.3186	0.0548	0.3322	0.0348
0.5			0.3783	0.0409	0.6195	0.1301	0.5520	0.1080	0.4864	0.0705
0.51			0.3707	0.0277			0.4772	0.0878	0.4164	0.0523
0.52			0.4070	0.0356			0.4107	0.0700	0.4730	0.0611
0.53			0.5165	0.0625			0.3566	0.0543	0.4148	0.0437
0.54			0.7735	0.1025			0.7107	0.1247	0.4240	0.0297
0.55									0.4669	0.0302
0.56									0.5206	0.0558
0.57									0.6559	0.0843
0.58									0.5853	0.0614
0.59									0.5948	0.0425
0.6									0.7182	0.0812
0.61									0.6640	0.0575
0.62									0.7572	0.0386
0.63										
0.64									1.1868	0.0460
0.65									2.7107	0.4054

Table 23: VaR in Function of the Threshold until 0.6 for 30 Days

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.3828	0.5836	0.5127	0.6816	0.4488	0.6611	0.5411	0.7681	0.5901	0.8014
0.02	0.3825	0.5859	0.5128	0.6910	0.4482	0.6667	0.5411	0.7718	0.5907	0.8148
0.03	0.3832	0.5804	0.5128	0.6984	0.4479	0.6681	0.5410	0.7843	0.5907	0.8161
0.04	0.3843	0.5714	0.5125	0.7061	0.4465	0.6764	0.5409	0.7839	0.5908	0.8208
0.05	0.3853	0.5644	0.5120	0.7159	0.4447	0.6851	0.5405	0.7913	0.5907	0.8269
0.06	0.3855	0.5635	0.5118	0.7181	0.4412	0.6994	0.5412	0.7807	0.5904	0.8372
0.07	0.3845	0.5683	0.5107	0.7287	0.4409	0.7006	0.5414	0.7776	0.5900	0.8439
0.08	0.3843	0.5690	0.5097	0.7367	0.4407	0.7008	0.5414	0.7781	0.5901	0.8433
0.09	0.3827	0.5745	0.5080	0.7471	0.4381	0.7079	0.5409	0.7816	0.5893	0.8507
0.1	0.3823	0.5759	0.5085	0.7443	0.4372	0.7101	0.5394	0.7927	0.5886	0.8575
0.11	0.3803	0.5808	0.5065	0.7530	0.4401	0.7035	0.5378	0.8015	0.5890	0.8543
0.12	0.3805	0.5802	0.5059	0.7554	0.4402	0.7033	0.5352	0.8135	0.5880	0.8605
0.13	0.3809	0.5794	0.5045	0.7603	0.4401	0.7034	0.5320	0.8261	0.5883	0.8586
0.14	0.3815	0.5781	0.5021	0.7676	0.4424	0.6993	0.5327	0.8236	0.5884	0.8582
0.15	0.3810	0.5790	0.5046	0.7607	0.4392	0.7043	0.5317	0.8268	0.5900	0.8506
0.16	0.3760	0.5858	0.5044	0.7611	0.4362	0.7082	0.5335	0.8215	0.5905	0.8485
0.17	0.3768	0.5847	0.5029	0.7645	0.4340	0.7106	0.5321	0.8249	0.5904	0.8492
0.18	0.3742	0.5873	0.5046	0.7610	0.4311	0.7133	0.5317	0.8256	0.5889	0.8540
0.19	0.3722	0.5889	0.5015	0.7669	0.4281	0.7154	0.5303	0.8284	0.5903	0.8497
0.2	0.3726	0.5885	0.5015	0.7669	0.4255	0.7170	0.5290	0.8307	0.5900	0.8508
0.21	0.3750	0.5872	0.5063	0.7593	0.4290	0.7153	0.5257	0.8357	0.5880	0.8559
0.22	0.3808	0.5845	0.5069	0.7584	0.4266	0.7162	0.5268	0.8342	0.5889	0.8537
0.23	0.3794	0.5850	0.5078	0.7571	0.4275	0.7159	0.5222	0.8397	0.5855	0.8610
0.24	0.3777	0.5853	0.5141	0.7490	0.4263	0.7160	0.5172	0.8444	0.5909	0.8500
0.25	0.3796	0.5850	0.5187	0.7433	0.4259	0.7158	0.5181	0.8437	0.5925	0.8467
0.26	0.3816	0.5849	0.5217	0.7397	0.4256	0.7157	0.5193	0.8426	0.5908	0.8497
0.27	0.3829	0.5848	0.5241	0.7366	0.4255	0.7154	0.5160	0.8444	0.5944	0.8439
0.28	0.3833	0.5847	0.5192	0.7419	0.4241	0.7147	0.5153	0.8446	0.5942	0.8442
0.29	0.3834	0.5847	0.5235	0.7375	0.4259	0.7159	0.5192	0.8432	0.5914	0.8481
0.3	0.3825	0.5837	0.5216	0.7391	0.4259	0.7158	0.5232	0.8421	0.5897	0.8503
0.31	0.3819	0.5833	0.5195	0.7407	0.4262	0.7161	0.5228	0.8423	0.5882	0.8520
0.32	0.3820	0.5842	0.5207	0.7399	0.4252	0.7144	0.5238	0.8423	0.5867	0.8536
0.33	0.3820	0.5846	0.5198	0.7405	0.4232	0.7094	0.5249	0.8423	0.5863	0.8537
0.34	0.3813	0.5873	0.5201	0.7403	0.4251	0.7156	0.5271	0.8423	0.5861	0.8538
0.35	0.3802	0.5896	0.5193	0.7407	0.4258	0.7181	0.5268	0.8421	0.5876	0.8528
0.36	0.3790	0.5909	0.5208	0.7400	0.4258	0.7205	0.5233	0.8406	0.5857	0.8541
0.37	0.3822	0.5876	0.5230	0.7391	0.4237	0.7310	0.5256	0.8421	0.5846	0.8547
0.38	0.3836	0.5865	0.5215	0.7395	0.4211	0.7360	0.5267	0.8429	0.5819	0.8560
0.39	0.3852	0.5852	0.5228	0.7392	0.4174	0.7409	0.5284	0.8442	0.5792	0.8567
0.4	0.3891	0.5822	0.5184	0.7395	0.4189	0.7392	0.5318	0.8475	0.5791	0.8567
0.41	0.3860	0.5844	0.5177	0.7391	0.4072	0.7482	0.5303	0.8454	0.5805	0.8566
0.42	0.3938	0.5796	0.5173	0.7390	0.4110	0.7459	0.5294	0.8436	0.5834	0.8566
0.43	0.4028	0.5740	0.5162	0.7379	0.4073	0.7480	0.5283	0.8402	0.5847	0.8567
0.44	0.3898	0.5806	0.5150	0.7357	0.4068	0.7482	0.5273	0.8358	0.5870	0.8567
0.45	0.3864	0.5823	0.5151	0.7365	0.4059	0.7487	0.5270	0.8319	0.5871	0.8566
0.46	0.3793	0.5843	0.5152	0.7381	0.4167	0.7438	0.5268	0.8305	0.5874	0.8567
0.47	0.3874	0.5822	0.5153	0.7378	0.4227	0.7410	0.5272	0.8259	0.5888	0.8572
0.48	0.3692	0.5858	0.5160	0.7352	0.4350	0.7346	0.5284	0.8147	0.5873	0.8557
0.49	0.3680	0.5864	0.5178	0.7305	0.4371	0.7337	0.5291	0.8088	0.5863	0.8543
0.5	0.3612	0.5878	0.5184	0.7296	0.4324	0.7359	0.5308	0.8012	0.5856	0.8523
0.51	0.3997	0.5835	0.5151	0.7345	0.4335	0.7351	0.5325	0.7947	0.5848	0.8487
0.52	0.4179	0.5821	0.5133	0.7361	0.4426	0.7314	0.5331	0.7936	0.5851	0.8503
0.53	0.4412	0.5800	0.5119	0.7372	0.4332	0.7348	0.5341	0.7919	0.5851	0.8487
0.54	0.3745	0.5813	0.5084	0.7396	0.4157	0.7400	0.5292	0.8004	0.5840	0.8534
0.55	0.3760	0.5819	0.4885	0.7487	0.4492	0.7306	0.5311	0.7982	0.5840	0.8536
0.56	0.3766	0.5820	0.4518	0.7589	0.4707	0.7237	0.5353	0.7933	0.5813	0.8579
0.57	0.2820	0.5773	0.4246	0.7643	0.4596	0.7270	0.5204	0.8077	0.5856	0.8522
0.58	0.3158	0.5802	0.4475	0.7605	0.4935	0.7175	0.5251	0.8047	0.5861	0.8516
0.59	0.4355	0.5901	0.4535	0.7596	0.4960	0.7173	0.5303	0.8009	0.5815	0.8563
0.6	0.5148	0.6000	0.3824	0.7688	0.4967	0.7175	0.4943	0.8194	0.5722	0.8631

Table 24: VaR in Function of the Threshold above 0.6 for 30 Days

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.61	0.5027	0.5982	0.3265	0.7734	0.5211	0.7124	0.4882	0.8219	0.5706	0.8640
0.62	0.4524	0.5869	0.3582	0.7712	0.5091	0.7152	0.4773	0.8254	0.5535	0.8718
0.63	0.4894	0.5953	0.2740	0.7761	0.4826	0.7184	0.4357	0.8355	0.5520	0.8724
0.64	0.5682	0.6188	0.2129	0.7789	0.4555	0.7205	0.3939	0.8425	0.5675	0.8668
0.65	0.5050	0.5965	0.3402	0.7732	0.4840	0.7193	0.3685	0.8457	0.5836	0.8604
0.66	0.4944	0.5941	0.4398	0.7671	0.4756	0.7203	0.4174	0.8397	0.5554	0.8705
0.67	0.5848	0.6304	0.2898	0.7745	0.5332	0.7200	0.4623	0.8338	0.5506	0.8715
0.68	0.4914	0.5889	0.0040	0.7813	0.3845	0.7162	0.5037	0.8281	0.5414	0.8735
0.69	0.3315	0.5271	0.0587	0.7802	0.0942	0.7038	0.5201	0.8262	0.5636	0.8686
0.7	0.5008	0.5951	0.3002	0.7760	0.0092	0.7004	0.4826	0.8303	0.4700	0.8840
0.71	0.6045	0.6467	0.2425	0.7765	-0.872	0.6671	0.4133	0.8339	0.4031	0.8908
0.72	0.5473	0.6146	0.3167	0.7758	-1.804	0.6409	0.2595	0.8370	0.2684	0.8997
0.73	0.6361	0.6663	0.1982	0.7774	-1.064	0.6623	-0.155	0.8348	0.2790	0.8993
0.74	0.6935	0.7055	0.2864	0.7775	-0.528	0.6826	-0.022	0.8368	0.3891	0.8934
0.75	0.6486	0.6738	0.3866	0.7781	-0.139	0.7021	-0.151	0.8347	0.3284	0.8966
0.76	-114.6	-12.48	0.5102	0.7789	0.1426	0.7206	-0.011	0.8380	0.2188	0.9011
0.77			0.3176	0.7762	0.3469	0.7382	0.1120	0.8414	0.2324	0.9007
0.78			0.1225	0.7732	0.2983	0.7341	-0.335	0.8278	0.2444	0.9006
0.79			0.3835	0.7790	0.4702	0.7541	-0.156	0.8338	0.4025	0.8957
0.8			0.1949	0.7741	0.5927	0.7728	-0.402	0.8252	0.1263	0.9017
0.81			0.5338	0.7879	0.6802	0.7903	-0.204	0.8330	0.1465	0.9012
0.82			0.6133	0.7933	0.6413	0.7823	-0.031	0.8409	0.3699	0.8978
0.83			0.6066	0.7949	0.6495	0.7854	0.1174	0.8489	-0.147	0.9022
0.84			0.8017	0.8272	0.6666	0.7897	0.2467	0.8570	-0.227	0.9028
0.85			-15192	-14.19	0.4570	0.7362	0.3587	0.8652	0.1943	0.9020
0.86					0.6179	0.7785	0.4558	0.8735	0.2084	0.9026
0.87					0.5487	0.7587	0.4198	0.8704	0.2410	0.9032
0.88					0.6877	0.8030	0.5127	0.8803	0.3149	0.9036
0.89					0.7797	0.8396	0.4850	0.8771	0.4026	0.9047
0.9					0.7735	0.8376	0.5725	0.8887	0.6592	0.9104
0.91					0.8408	0.8718	0.3735	0.8622	0.6760	0.9101
0.92					0.8595	0.8823	0.4860	0.8783	0.6324	0.9088
0.93					0.8573	0.8813	0.4080	0.8668	0.7350	0.9163
0.94					0.9009	0.9119	0.5206	0.8852	0.8180	0.9262
0.95					0.5874	0.7141	0.4398	0.8713	0.9133	0.9439
0.96					0.6987	0.7801	0.2993	0.8474	0.9321	0.9512
0.97					0.7855	0.8360	0.4421	0.8726	0.9540	0.9609
0.98					0.8533	0.8834	0.2455	0.8380	0.7683	0.8625
0.99					-162.0	-17.72	0.4066	0.8677	0.8884	0.9247
1,00							0.5398	0.8956	0.9565	0.9684
1.01							-0.463	0.7225	0.9099	0.9376
1.02							-0.139	0.7715	-85.70	-8.932
1.03							-1.906	0.5532		
1.04							-1.230	0.6281		
1.05							-10.94	-0.039		

Table 25: Parameters in Function of the Threshold until 0.6 for 30 Days

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0416	0.0101	0.0492	0.0180	0.0479	0.0153	0.0408	0.0142	0.0433	0.0171
0.02	0.0424	0.0102	0.0487	0.0175	0.0481	0.0151	0.0413	0.0141	0.0428	0.0165
0.03	0.0441	0.0106	0.0485	0.0170	0.0488	0.0151	0.0411	0.0137	0.0433	0.0165
0.04	0.0463	0.0114	0.0483	0.0166	0.0487	0.0147	0.0419	0.0139	0.0436	0.0164
0.05	0.0486	0.0120	0.0478	0.0160	0.0486	0.0142	0.0421	0.0136	0.0438	0.0162
0.06	0.0499	0.0122	0.0484	0.0160	0.0479	0.0134	0.0437	0.0144	0.0436	0.0158
0.07	0.0503	0.0120	0.0479	0.0154	0.0489	0.0135	0.0448	0.0147	0.0438	0.0156
0.08	0.0515	0.0122	0.0478	0.0150	0.0500	0.0137	0.0456	0.0148	0.0446	0.0158
0.09	0.0517	0.0119	0.0475	0.0145	0.0502	0.0133	0.0461	0.0148	0.0447	0.0155
0.1	0.0529	0.0119	0.0489	0.0148	0.0512	0.0134	0.0459	0.0143	0.0449	0.0153
0.11	0.0533	0.0117	0.0487	0.0144	0.0534	0.0144	0.0460	0.0139	0.0460	0.0156
0.12	0.0549	0.0120	0.0494	0.0144	0.0547	0.0147	0.0458	0.0133	0.0463	0.0154
0.13	0.0567	0.0123	0.0499	0.0142	0.0561	0.0149	0.0458	0.0128	0.0474	0.0157
0.14	0.0588	0.0127	0.0500	0.0138	0.0583	0.0158	0.0471	0.0132	0.0483	0.0160
0.15	0.0602	0.0128	0.0522	0.0147	0.0584	0.0153	0.0479	0.0132	0.0501	0.0167
0.16	0.0595	0.0119	0.0533	0.0149	0.0589	0.0149	0.0495	0.0139	0.0513	0.0171
0.17	0.0618	0.0124	0.0539	0.0148	0.0597	0.0147	0.0503	0.0139	0.0522	0.0172
0.18	0.0627	0.0121	0.0559	0.0155	0.0606	0.0144	0.0514	0.0141	0.0524	0.0170
0.19	0.0640	0.0120	0.0560	0.0150	0.0616	0.0141	0.0523	0.0141	0.0541	0.0176
0.2	0.0665	0.0125	0.0574	0.0153	0.0629	0.0140	0.0532	0.0141	0.0550	0.0177
0.21	0.0699	0.0135	0.0607	0.0168	0.0655	0.0153	0.0539	0.0138	0.0551	0.0174
0.22	0.0762	0.0158	0.0624	0.0172	0.0668	0.0151	0.0555	0.0144	0.0566	0.0178
0.23	0.0774	0.0157	0.0642	0.0177	0.0690	0.0158	0.0561	0.0138	0.0563	0.0172
0.24	0.0784	0.0154	0.0693	0.0199	0.0708	0.0160	0.0570	0.0133	0.0599	0.0189
0.25	0.0827	0.0166	0.0741	0.0217	0.0727	0.0163	0.0588	0.0139	0.0619	0.0196
0.26	0.0877	0.0179	0.0780	0.0229	0.0748	0.0167	0.0605	0.0145	0.0622	0.0193
0.27	0.0920	0.0189	0.0816	0.0240	0.0770	0.0172	0.0619	0.0143	0.0654	0.0206
0.28	0.0954	0.0195	0.0787	0.0222	0.0789	0.0172	0.0636	0.0146	0.0665	0.0208
0.29	0.0984	0.0199	0.0843	0.0241	0.0819	0.0186	0.0659	0.0160	0.0662	0.0201
0.3	0.0983	0.0191	0.0840	0.0234	0.0843	0.0191	0.0685	0.0175	0.0667	0.0198
0.31	0.1003	0.0190	0.0837	0.0227	0.0869	0.0199	0.0702	0.0179	0.0673	0.0197
0.32	0.1057	0.0202	0.0868	0.0234	0.0889	0.0198	0.0723	0.0187	0.0680	0.0195
0.33	0.1099	0.0209	0.0877	0.0232	0.0908	0.0185	0.0745	0.0196	0.0692	0.0196
0.34	0.1202	0.0236	0.0899	0.0235	0.0948	0.0216	0.0772	0.0208	0.0707	0.0199
0.35	0.1312	0.0263	0.0911	0.0234	0.0985	0.0234	0.0789	0.0211	0.0731	0.0207
0.36	0.1394	0.0278	0.0953	0.0244	0.1023	0.0251	0.0794	0.0201	0.0737	0.0204
0.37	0.1334	0.0251	0.1008	0.0259	0.1131	0.0315	0.0826	0.0218	0.0748	0.0203
0.38	0.1348	0.0246	0.1001	0.0250	0.1218	0.0354	0.0854	0.0230	0.0751	0.0198
0.39	0.1364	0.0241	0.1053	0.0262	0.1323	0.0397	0.0887	0.0246	0.0755	0.0192
0.4	0.1351	0.0226	0.0985	0.0230	0.1320	0.0387	0.0950	0.0281	0.0775	0.0197
0.41	0.1446	0.0246	0.0991	0.0225	0.1528	0.0471	0.0945	0.0268	0.0803	0.0206
0.42	0.1408	0.0221	0.1010	0.0225	0.1504	0.0451	0.0950	0.0261	0.0845	0.0224
0.43	0.1389	0.0197	0.1005	0.0215	0.1581	0.0473	0.0952	0.0248	0.0877	0.0235
0.44	0.1556	0.0245	0.0990	0.0200	0.1616	0.0477	0.0958	0.0234	0.0921	0.0251
0.45	0.1651	0.0262	0.1035	0.0211	0.1658	0.0483	0.0975	0.0226	0.0943	0.0255
0.46	0.1772	0.0285	0.1096	0.0228	0.1578	0.0440	0.1002	0.0228	0.0968	0.0260
0.47	0.1781	0.0273	0.1125	0.0230	0.1554	0.0420	0.1029	0.0221	0.1014	0.0276
0.48	0.1983	0.0316	0.1122	0.0219	0.1481	0.0377	0.1076	0.0198	0.0999	0.0260
0.49	0.2070	0.0324	0.1111	0.0200	0.1502	0.0375	0.1137	0.0194	0.0996	0.0250
0.5	0.2200	0.0341	0.1145	0.0203	0.1574	0.0396	0.1220	0.0188	0.0996	0.0240
0.51	0.2039	0.0284	0.1234	0.0234	0.1602	0.0396	0.1322	0.0187	0.0989	0.0223
0.52	0.2033	0.0262	0.1296	0.0249	0.1583	0.0376	0.1387	0.0197	0.1030	0.0238
0.53	0.2038	0.0233	0.1355	0.0262	0.1682	0.0407	0.1463	0.0206	0.1048	0.0236
0.54	0.2471	0.0348	0.1437	0.0283	0.1830	0.0455	0.1437	0.0241	0.1119	0.0267
0.55	0.2574	0.0354	0.1679	0.0355	0.1685	0.0381	0.1509	0.0248	0.1151	0.0274
0.56	0.2688	0.0362	0.2072	0.0459	0.1632	0.0338	0.1620	0.0249	0.1233	0.0306
0.57	0.3271	0.0469	0.2368	0.0523	0.1731	0.0372	0.1542	0.0310	0.1201	0.0278
0.58	0.3244	0.0440	0.2225	0.0470	0.1662	0.0306	0.1611	0.0312	0.1229	0.0281
0.59	0.2804	0.0317	0.2232	0.0456	0.1715	0.0312	0.1701	0.0313	0.1314	0.0314
0.6	0.2769	0.0218	0.2827	0.0582	0.1776	0.0323	0.1642	0.0422	0.1445	0.0364

Table 26: Parameters in Function of the Threshold above 0.6 for 30 Days

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.61	0.2986	0.0261	0.3257	0.0657	0.1810	0.0285	0.1680	0.0451	0.1495	0.0375
0.62	0.3345	0.0359	0.3120	0.0603	0.1891	0.0324	0.1722	0.0490	0.1691	0.0441
0.63	0.3467	0.0331	0.3680	0.0693	0.2015	0.0388	0.1801	0.0592	0.1741	0.0448
0.64	0.4152	0.0227	0.4073	0.0739	0.2157	0.0446	0.1907	0.0686	0.1651	0.0403
0.65	0.4112	0.0379	0.3467	0.0595	0.2150	0.0412	0.1990	0.0742	0.1570	0.0359
0.66	0.4361	0.0424	0.2913	0.0468	0.2242	0.0439	0.1937	0.0664	0.1821	0.0443
0.67	0.5279	0.0300	0.3886	0.0616	0.2222	0.0357	0.1916	0.0592	0.1894	0.0457
0.68	0.5180	0.0527	0.5186	0.0792	0.2655	0.0593	0.1938	0.0525	0.1999	0.0480
0.69	0.5886	0.0781	0.5089	0.0734	0.3539	0.0888	0.1991	0.0508	0.1902	0.0434
0.7	0.5793	0.0585	0.4171	0.0561	0.3819	0.0950	0.2037	0.0598	0.2522	0.0612
0.71	0.6875	0.0427	0.4551	0.0581	0.5427	0.1383	0.2150	0.0736	0.2937	0.0710
0.72	0.6982	0.0633	0.4332	0.0516	0.6526	0.1633	0.2443	0.0981	0.3620	0.0866
0.73	0.9333	0.0485	0.5018	0.0562	0.5841	0.1403	0.3204	0.1452	0.3636	0.0841
0.74			0.4797	0.0496	0.5190	0.1192	0.3021	0.1323	0.3201	0.0707
0.75	1.3229	0.0683	0.4472	0.0424	0.4582	0.1001	0.3270	0.1447	0.3538	0.0763
0.76	2.7107	0.6251	0.3898	0.0335	0.4027	0.0827	0.3079	0.1316	0.4048	0.0850
0.77			0.5206	0.0422	0.3547	0.0672	0.2906	0.1191	0.4068	0.0822
0.78			0.6244	0.0461	0.3803	0.0716	0.3659	0.1597	0.4099	0.0796
0.79			0.5433	0.0354	0.3371	0.0569	0.3435	0.1451	0.3523	0.0648
0.8			0.6614	0.0383	0.3106	0.0441	0.3835	0.1638	0.4644	0.0839
0.81			0.5289	0.0260	0.3143	0.0332	0.3593	0.1487	0.4663	0.0805
0.82			0.5151	0.0216	0.3319	0.0417	0.3368	0.1343	0.3939	0.0641
0.83			0.5870	0.0205	0.3468	0.0427	0.3161	0.1208	0.5651	0.0896
0.84			0.4082	0.0085	0.3655	0.0429	0.2979	0.1081	0.5952	0.0894
0.85			4.4647	0.1018	0.4350	0.0705	0.2827	0.0961	0.4938	0.0694
0.86					0.4077	0.0545	0.2712	0.0850	0.5024	0.0665
0.87					0.4458	0.0654	0.2828	0.0911	0.5056	0.0628
0.88					0.4368	0.0498	0.2738	0.0801	0.4941	0.0574
0.89					0.5037	0.0371	0.2841	0.0856	0.4761	0.0514
0.9					0.5275	0.0427	0.2790	0.0749	0.3615	0.0349
0.91					0.9555	0.0370	0.3145	0.1025	0.3690	0.0335
0.92							0.3027	0.0902	0.4185	0.0360
0.93							0.3215	0.1014	0.3747	0.0287
0.94							0.3108	0.0890	0.3358	0.0218
0.95					0.8346	0.1401	0.3300	0.1009	0.3475	0.0107
0.96					0.8974	0.1197	0.3597	0.1178	0.5521	0.0107
0.97					1.0530	0.1028	0.3436	0.1038		
0.98					1.5833	0.0976	0.3823	0.1257	0.6640	0.0616
0.99					2.7107	0.8836	0.3636	0.1107	0.7631	0.0431
1,00							0.3509	0.0969		
1.01							0.5030	0.1798	1.0347	0.0548
1.02							0.4693	0.1602	2.7107	0.4699
1.03							0.6508	0.2367		
1.04							0.6044	0.2125		
1.05							1.0020	0.3627		

Table 27: VaR in Function of the Threshold until 0.6 for 90 Days

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.6180	0.7458	0.8239	1.0189	0.5974	0.6784	0.7944	1.0786	0.9132	1.0715
0.02	0.6189	0.7521	0.8249	1.0290	0.5972	0.6772	0.7942	1.0761	0.9156	1.0820
0.03	0.6193	0.7545	0.8249	1.0292	0.5975	0.6787	0.7948	1.0882	0.9189	1.0969
0.04	0.6192	0.7539	0.8256	1.0377	0.5992	0.6892	0.7948	1.0868	0.9190	1.0974
0.05	0.6203	0.7635	0.8250	1.0298	0.5998	0.6934	0.7951	1.1003	0.9206	1.1055
0.06	0.6198	0.7587	0.8253	1.0338	0.6004	0.6977	0.7951	1.1164	0.9203	1.1040
0.07	0.6201	0.7634	0.8254	1.0358	0.5996	0.6910	0.7951	1.1221	0.9228	1.1181
0.08	0.6200	0.7611	0.8258	1.0459	0.5997	0.6920	0.7951	1.1197	0.9242	1.1270
0.09	0.6199	0.7599	0.8259	1.0523	0.5997	0.6917	0.7951	1.1221	0.9238	1.1247
0.1	0.6199	0.7611	0.8259	1.0506	0.5995	0.6898	0.7946	1.1293	0.9234	1.1218
0.11	0.6199	0.7609	0.8259	1.0531	0.5990	0.6847	0.7939	1.1408	0.9237	1.1242
0.12	0.6199	0.7586	0.8259	1.0426	0.5983	0.6764	0.7943	1.1357	0.9232	1.1207
0.13	0.6198	0.7544	0.8257	1.0519	0.5984	0.6773	0.7947	1.1309	0.9232	1.1206
0.14	0.6197	0.7494	0.8256	1.0554	0.5985	0.6795	0.7947	1.1304	0.9223	1.1128
0.15	0.6196	0.7626	0.8258	1.0511	0.5987	0.6833	0.7942	1.1353	0.9211	1.1037
0.16	0.6199	0.7540	0.8254	1.0582	0.5985	0.6778	0.7936	1.1394	0.9193	1.0884
0.17	0.6193	0.7655	0.8255	1.0576	0.5986	0.6825	0.7955	1.1267	0.9193	1.0887
0.18	0.6190	0.7709	0.8253	1.0607	0.5985	0.6863	0.7942	1.1339	0.9197	1.0928
0.19	0.6188	0.7720	0.8250	1.0639	0.5983	0.6931	0.7952	1.1280	0.9174	1.0720
0.2	0.6180	0.7787	0.8257	1.0568	0.5984	0.6912	0.7943	1.1325	0.9182	1.0802
0.21	0.6167	0.7875	0.8245	1.0668	0.5979	0.6985	0.7953	1.1277	0.9174	1.0720
0.22	0.6149	0.7980	0.8231	1.0777	0.5977	0.7000	0.7954	1.1272	0.9171	1.0688
0.23	0.6141	0.8022	0.8225	1.0812	0.5967	0.7080	0.7948	1.1299	0.9174	1.0726
0.24	0.6139	0.8027	0.8216	1.0863	0.5957	0.7146	0.7970	1.1210	0.9173	1.0711
0.25	0.6141	0.8017	0.8216	1.0863	0.5936	0.7255	0.7973	1.1202	0.9179	1.0804
0.26	0.6164	0.7933	0.8214	1.0878	0.5935	0.7256	0.7968	1.1218	0.9180	1.0828
0.27	0.6180	0.7876	0.8203	1.0928	0.5938	0.7246	0.7968	1.1216	0.9179	1.0795
0.28	0.6187	0.7856	0.8241	1.0766	0.5935	0.7258	0.7965	1.1227	0.9178	1.0779
0.29	0.6232	0.7711	0.8257	1.0697	0.5925	0.7291	0.7950	1.1268	0.9174	1.0647
0.3	0.6205	0.7790	0.8266	1.0657	0.5922	0.7300	0.7908	1.1376	0.9175	1.0672
0.31	0.6202	0.7796	0.8258	1.0685	0.5918	0.7308	0.7950	1.1276	0.9175	1.0694
0.32	0.6224	0.7741	0.8233	1.0773	0.5915	0.7315	0.7923	1.1336	0.9175	1.0736
0.33	0.6210	0.7772	0.8244	1.0735	0.5889	0.7374	0.7917	1.1347	0.9175	1.0725
0.34	0.6235	0.7716	0.8252	1.0710	0.5851	0.7448	0.7911	1.1359	0.9172	1.0805
0.35	0.6230	0.7727	0.8230	1.0773	0.5839	0.7469	0.7891	1.1395	0.9169	1.0869
0.36	0.6249	0.7690	0.8219	1.0807	0.5816	0.7506	0.7920	1.1345	0.9164	1.0940
0.37	0.6262	0.7666	0.8235	1.0763	0.5836	0.7477	0.7930	1.1329	0.9160	1.0978
0.38	0.6250	0.7686	0.8248	1.0732	0.5861	0.7442	0.7909	1.1361	0.9154	1.1037
0.39	0.6267	0.7658	0.8249	1.0732	0.5864	0.7437	0.7906	1.1366	0.9141	1.1136
0.4	0.6266	0.7658	0.8275	1.0675	0.5875	0.7425	0.7895	1.1382	0.9122	1.1256
0.41	0.6279	0.7641	0.8297	1.0627	0.5872	0.7427	0.7815	1.1477	0.9115	1.1303
0.42	0.6250	0.7679	0.8291	1.0640	0.5877	0.7421	0.7797	1.1497	0.9123	1.1261
0.43	0.6289	0.7630	0.8293	1.0636	0.5856	0.7439	0.7801	1.1493	0.9115	1.1291
0.44	0.6271	0.7651	0.8270	1.0679	0.5848	0.7444	0.7768	1.1520	0.9103	1.1347
0.45	0.6260	0.7662	0.8272	1.0674	0.5849	0.7443	0.7807	1.1490	0.9075	1.1454
0.46	0.6231	0.7690	0.8335	1.0568	0.5870	0.7430	0.7824	1.1478	0.9057	1.1515
0.47	0.6191	0.7723	0.8339	1.0561	0.5881	0.7423	0.7779	1.1508	0.9041	1.1562
0.48	0.6160	0.7744	0.8323	1.0586	0.5868	0.7429	0.7764	1.1516	0.8996	1.1688
0.49	0.6148	0.7751	0.8294	1.0629	0.5865	0.7428	0.7765	1.1515	0.8950	1.1802
0.5	0.6151	0.7749	0.8272	1.0659	0.5847	0.7430	0.7830	1.1485	0.8915	1.1880
0.51	0.6126	0.7755	0.8317	1.0599	0.5862	0.7431	0.7789	1.1500	0.8895	1.1921
0.52	0.6100	0.7755	0.8279	1.0646	0.5871	0.7434	0.7745	1.1510	0.8854	1.1993
0.53	0.6064	0.7738	0.8364	1.0543	0.5874	0.7434	0.7722	1.1513	0.8815	1.2053
0.54	0.6040	0.7711	0.8445	1.0443	0.5870	0.7425	0.7742	1.1513	0.8812	1.2059
0.55	0.6044	0.7717	0.8513	1.0361	0.5868	0.7438	0.7728	1.1510	0.8793	1.2084
0.56	0.6049	0.7739	0.8538	1.0330	0.5873	0.7433	0.7691	1.1503	0.8775	1.2105
0.57	0.6051	0.7721	0.8498	1.0375	0.5880	0.7427	0.7645	1.1482	0.8728	1.2149
0.58	0.6048	0.7749	0.8454	1.0422	0.5890	0.7421	0.7635	1.1476	0.8668	1.2196
0.59	0.6032	0.7771	0.8433	1.0444	0.5831	0.7452	0.7613	1.1454	0.8678	1.2189
0.6	0.6002	0.7807	0.8408	1.0468	0.5932	0.7398	0.7598	1.1437	0.8620	1.2216

Table 28: VaR in Function of the Threshold above 0.6 for 90 Days

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.61	0.5989	0.7817	0.8396	1.0478	0.5931	0.7398	0.7570	1.1394	0.8591	1.2225
0.62	0.5919	0.7857	0.8369	1.0501	0.5872	0.7423	0.7556	1.1368	0.8661	1.2208
0.63	0.5956	0.7839	0.8364	1.0505	0.5589	0.7496	0.7548	1.1352	0.8699	1.2201
0.64	0.5746	0.7914	0.8400	1.0477	0.5439	0.7516	0.7541	1.1327	0.8684	1.2204
0.65	0.5960	0.7848	0.8415	1.0466	0.5507	0.7508	0.7526	1.1263	0.8686	1.2202
0.66	0.5916	0.7858	0.8361	1.0502	0.5375	0.7522	0.7538	1.1356	0.8680	1.2203
0.67	0.6082	0.7812	0.8347	1.0510	0.5679	0.7490	0.7535	1.1309	0.8691	1.2204
0.68	0.5750	0.7888	0.8347	1.0509	0.5810	0.7477	0.7535	1.1308	0.8615	1.2173
0.69	0.6066	0.7832	0.8318	1.0520	0.6024	0.7453	0.7531	1.1377	0.8583	1.2153
0.7	0.5854	0.7866	0.8314	1.0520	0.6573	0.7381	0.7535	1.1357	0.8634	1.2194
0.71	0.5861	0.7866	0.8338	1.0514	0.6215	0.7414	0.7513	1.1436	0.8598	1.2155
0.72	0.5839	0.7868	0.8355	1.0509	0.6260	0.7412	0.7535	1.1380	0.8597	1.2155
0.73	0.5222	0.7905	0.8359	1.0508	0.5422	0.7405	0.7584	1.1252	0.8562	1.2089
0.74	0.6136	0.7869	0.8370	1.0505	0.5691	0.7423	0.7588	1.1243	0.8551	1.2061
0.75	0.6038	0.7875	0.8367	1.0505	0.4581	0.7384	0.7588	1.1244	0.8532	1.2000
0.76	0.5743	0.7878	0.8373	1.0505	0.5275	0.7408	0.7623	1.1180	0.8525	1.1979
0.77	0.5785	0.7882	0.8372	1.0499	0.5195	0.7411	0.7616	1.1191	0.8520	1.1948
0.78	0.4403	0.7842	0.8374	1.0491	-1.533	0.6556	0.7655	1.1134	0.8518	1.1883
0.79	0.2922	0.7788	0.8379	1.0478	0.6324	0.7591	0.7697	1.1078	0.8518	1.1811
0.8	0.5708	0.7925	0.8372	1.0488	0.7792	0.7900	0.7799	1.0946	0.8522	1.1707
0.81	0.6577	0.7998	0.8373	1.0488	0.4639	0.6822	0.7717	1.1040	0.8523	1.1695
0.82	0.6578	0.8003	0.8384	1.0477	0.7983	0.8046	0.7661	1.1091	0.8539	1.1593
0.83	0.6336	0.7973	0.8277	1.0532	-10.25	-0.441	0.7738	1.1028	0.8544	1.1572
0.84	0.7750	0.8242	0.8302	1.0522			0.7820	1.0962	0.8570	1.1474
0.85	0.5684	0.7771	0.8209	1.0552			0.7718	1.1028	0.8502	1.1638
0.86	0.7763	0.8280	0.8169	1.0560			0.7863	1.0939	0.8519	1.1605
0.87	0.7702	0.8240	0.8247	1.0542			0.7940	1.0896	0.8554	1.1555
0.88	0.8556	0.8652	0.8276	1.0535			0.8022	1.0853	0.8505	1.1628
0.89	-60.09	-3.026	0.8310	1.0526			0.8024	1.0853	0.8558	1.1566
0.9			0.8356	1.0514			0.8012	1.0853	0.8533	1.1593
0.91			0.8417	1.0498			0.7514	1.0994	0.8622	1.1515
0.92			0.8640	1.0441			0.7206	1.1057	0.8669	1.1480
0.93			0.8807	1.0390			0.7307	1.1045	0.8661	1.1484
0.94			0.8881	1.0365			0.6354	1.1131	0.8458	1.1602
0.95			0.8813	1.0381			0.5735	1.1163	0.7668	1.1864
0.96			0.8885	1.0360			0.3568	1.1193	0.7273	1.1952
0.97			0.8926	1.0353			-0.243	1.1134	0.6078	1.2128
0.98			0.8920	1.0358			-0.581	1.1081	0.5330	1.2191
0.99			0.9183	1.0334			-1.139	1.0980	0.4110	1.2264
1			0.9060	1.0335			-0.921	1.1027	0.3598	1.2286
1.01			0.8745	1.0343			-0.720	1.1074	-1.405	1.2440
1.02			0.8383	1.0335			-0.536	1.1122	-1.176	1.2442
1.03			0.8340	1.0333			-0.368	1.1172	-0.966	1.2446
1.04			0.8927	1.0383			-0.214	1.1223	-1.724	1.2431
1.05			0.7590	1.0268			-1.680	1.0791	-1.453	1.2443
1.06			0.5160	1.0079			-1.379	1.0876	-1.204	1.2457
1.07			0.8278	1.0370			-1.106	1.0961	-2.224	1.2405
1.08			0.9797	1.0612			-2.320	1.0610	-1.887	1.2429
1.09			0.8511	1.0366					-3.654	1.2320
1.1			-38.93	0.0995						

Table 29: Parameters in Function of the Threshold until 0.6 for 90 Days

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0548	0.0249	0.0556	0.0342	0.0735	0.0350	0.0431	0.0228	0.0518	0.0342
0.02	0.0544	0.0243	0.0549	0.0332	0.0745	0.0349	0.0437	0.0230	0.0511	0.0334
0.03	0.0546	0.0241	0.0553	0.0332	0.0746	0.0345	0.0435	0.0225	0.0501	0.0322
0.04	0.0553	0.0241	0.0548	0.0325	0.0720	0.0326	0.0440	0.0226	0.0505	0.0322
0.05	0.0544	0.0233	0.0562	0.0331	0.0714	0.0318	0.0437	0.0220	0.0501	0.0315
0.06	0.0558	0.0237	0.0562	0.0328	0.0708	0.0310	0.0432	0.0213	0.0506	0.0316
0.07	0.0557	0.0232	0.0564	0.0326	0.0736	0.0318	0.0434	0.0212	0.0497	0.0306
0.08	0.0567	0.0234	0.0557	0.0317	0.0739	0.0315	0.0441	0.0215	0.0493	0.0300
0.09	0.0577	0.0235	0.0554	0.0311	0.0748	0.0313	0.0445	0.0215	0.0500	0.0301
0.1	0.0581	0.0234	0.0561	0.0313	0.0762	0.0315	0.0446	0.0212	0.0506	0.0303
0.11	0.0589	0.0234	0.0563	0.0311	0.0788	0.0321	0.0445	0.0208	0.0508	0.0301
0.12	0.0601	0.0236	0.0582	0.0321	0.0831	0.0335	0.0454	0.0212	0.0516	0.0304
0.13	0.0618	0.0240	0.0575	0.0312	0.0836	0.0331	0.0463	0.0217	0.0521	0.0304
0.14	0.0637	0.0245	0.0575	0.0308	0.0833	0.0324	0.0469	0.0218	0.0533	0.0310
0.15	0.0614	0.0230	0.0587	0.0313	0.0824	0.0314	0.0472	0.0217	0.0548	0.0317
0.16	0.0643	0.0239	0.0583	0.0306	0.0860	0.0322	0.0475	0.0216	0.0572	0.0331
0.17	0.0623	0.0226	0.0589	0.0307	0.0845	0.0310	0.0492	0.0227	0.0577	0.0330
0.18	0.0618	0.0219	0.0591	0.0304	0.0835	0.0300	0.0492	0.0223	0.0576	0.0325
0.19	0.0624	0.0218	0.0592	0.0301	0.0811	0.0284	0.0504	0.0229	0.0611	0.0346
0.2	0.0616	0.0210	0.0609	0.0309	0.0830	0.0286	0.0506	0.0227	0.0603	0.0336
0.21	0.0604	0.0201	0.0599	0.0298	0.0803	0.0270	0.0518	0.0233	0.0622	0.0345
0.22	0.0588	0.0190	0.0589	0.0287	0.0807	0.0266	0.0525	0.0235	0.0632	0.0348
0.23	0.0590	0.0187	0.0590	0.0284	0.0778	0.0249	0.0530	0.0234	0.0631	0.0342
0.24	0.0598	0.0187	0.0589	0.0279	0.0759	0.0237	0.0547	0.0244	0.0639	0.0343
0.25	0.0612	0.0189	0.0596	0.0280	0.0722	0.0218	0.0556	0.0247	0.0628	0.0332
0.26	0.0647	0.0201	0.0601	0.0280	0.0733	0.0217	0.0561	0.0247	0.0629	0.0328
0.27	0.0678	0.0210	0.0599	0.0275	0.0750	0.0219	0.0569	0.0249	0.0641	0.0331
0.28	0.0697	0.0214	0.0637	0.0296	0.0757	0.0216	0.0575	0.0250	0.0650	0.0333
0.29	0.0772	0.0239	0.0658	0.0305	0.0754	0.0210	0.0577	0.0247	0.0684	0.0349
0.3	0.0746	0.0223	0.0675	0.0311	0.0762	0.0208	0.0569	0.0236	0.0684	0.0345
0.31	0.0755	0.0222	0.0675	0.0307	0.0772	0.0206	0.0594	0.0251	0.0685	0.0340
0.32	0.0799	0.0234	0.0662	0.0295	0.0782	0.0205	0.0592	0.0245	0.0682	0.0334
0.33	0.0793	0.0227	0.0680	0.0301	0.0760	0.0193	0.0599	0.0245	0.0690	0.0334
0.34	0.0843	0.0239	0.0694	0.0306	0.0731	0.0177	0.0605	0.0246	0.0678	0.0323
0.35	0.0850	0.0236	0.0686	0.0296	0.0734	0.0174	0.0608	0.0243	0.0670	0.0313
0.36	0.0895	0.0246	0.0686	0.0292	0.0728	0.0167	0.0628	0.0254	0.0661	0.0304
0.37	0.0932	0.0253	0.0707	0.0300	0.0768	0.0176	0.0641	0.0259	0.0659	0.0298
0.38	0.0929	0.0246	0.0726	0.0307	0.0818	0.0187	0.0643	0.0255	0.0653	0.0291
0.39	0.0975	0.0254	0.0736	0.0308	0.0841	0.0189	0.0652	0.0257	0.0639	0.0278
0.4	0.0991	0.0252	0.0766	0.0320	0.0877	0.0195	0.0658	0.0256	0.0621	0.0264
0.41	0.1035	0.0259	0.0795	0.0331	0.0894	0.0195	0.0642	0.0237	0.0620	0.0259
0.42	0.0999	0.0242	0.0800	0.0328	0.0924	0.0198	0.0648	0.0236	0.0636	0.0265
0.43	0.1098	0.0263	0.0812	0.0330	0.0913	0.0188	0.0661	0.0240	0.0637	0.0261
0.44	0.1080	0.0251	0.0802	0.0319	0.0925	0.0186	0.0663	0.0235	0.0633	0.0255
0.45	0.1079	0.0243	0.0815	0.0321	0.0952	0.0188	0.0687	0.0249	0.0618	0.0242
0.46	0.1041	0.0226	0.0884	0.0351	0.1020	0.0200	0.0705	0.0257	0.0614	0.0235
0.47	0.0985	0.0204	0.0899	0.0353	0.1075	0.0208	0.0702	0.0248	0.0613	0.0230
0.48	0.0954	0.0188	0.0894	0.0344	0.1070	0.0200	0.0711	0.0247	0.0596	0.0216
0.49	0.0959	0.0184	0.0878	0.0331	0.1088	0.0198	0.0724	0.0251	0.0583	0.0203
0.5	0.0995	0.0187	0.0870	0.0321	0.1064	0.0184	0.0762	0.0277	0.0578	0.0195
0.51	0.0968	0.0173	0.0926	0.0343	0.1160	0.0202	0.0759	0.0266	0.0581	0.0192
0.52	0.0942	0.0158	0.0901	0.0325	0.1279	0.0222	0.0757	0.0255	0.0578	0.0184
0.53	0.0904	0.0136	0.1007	0.0368	0.1328	0.0225	0.0763	0.0251	0.0579	0.0178
0.54	0.0905	0.0123	0.1127	0.0414	0.1274	0.0204	0.0786	0.0263	0.0590	0.0181
0.55	0.0956	0.0132	0.1250	0.0457	0.1445	0.0233	0.0796	0.0262	0.0598	0.0180
0.56	0.1027	0.0150	0.1310	0.0473	0.1459	0.0226	0.0799	0.0252	0.0607	0.0179
0.57	0.1054	0.0147	0.1251	0.0440	0.1474	0.0219	0.0803	0.0237	0.0610	0.0173
0.58	0.1136	0.0168	0.1191	0.0407	0.1493	0.0213	0.0819	0.0239	0.0615	0.0164
0.59	0.1221	0.0187	0.1171	0.0391	0.1759	0.0253	0.0833	0.0234	0.0632	0.0170
0.6	0.1341	0.0214	0.1147	0.0374	0.1502	0.0195	0.0850	0.0232	0.0641	0.0162

Table 30: Parameters in Function of the Threshold above 0.6 for 90 Days

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.61	0.1419	0.0226	0.1144	0.0365	0.1572	0.0198	0.0871	0.0223	0.0656	0.0161
0.62	0.1589	0.0261	0.1117	0.0347	0.1772	0.0223	0.0895	0.0222	0.0681	0.0182
0.63	0.1591	0.0251	0.1128	0.0344	0.2414	0.0309	0.0922	0.0226	0.0705	0.0198
0.64	0.1939	0.0321	0.1211	0.0367	0.2738	0.0337	0.0950	0.0227	0.0719	0.0199
0.65	0.1730	0.0261	0.1262	0.0377	0.2727	0.0316	0.0991	0.0220	0.0736	0.0204
0.66	0.1843	0.0276	0.1167	0.0335	0.3026	0.0332	0.1001	0.0253	0.0753	0.0208
0.67	0.1747	0.0240	0.1160	0.0325	0.2707	0.0274	0.1035	0.0249	0.0774	0.0217
0.68	0.2151	0.0317	0.1179	0.0324	0.2654	0.0248	0.1064	0.0258	0.0779	0.0195
0.69	0.1942	0.0258	0.1130	0.0299	0.2487	0.0213	0.1081	0.0287	0.0800	0.0190
0.7	0.2217	0.0302	0.1142	0.0296	0.1907	0.0123	0.1111	0.0290	0.0825	0.0217
0.71	0.2306	0.0305	0.1233	0.0319	0.2525	0.0189	0.1133	0.0324	0.0842	0.0206
0.72	0.2425	0.0311	0.1326	0.0342	0.2677	0.0188	0.1162	0.0316	0.0866	0.0213
0.73	0.2995	0.0391	0.1374	0.0348	0.3758	0.0270	0.1213	0.0289	0.0894	0.0199
0.74	0.2438	0.0278	0.1478	0.0370	0.3789	0.0245	0.1248	0.0298	0.0926	0.0199
0.75	0.2643	0.0297	0.1473	0.0359	0.4996	0.0301	0.1282	0.0310	0.0972	0.0193
0.76	0.2996	0.0335	0.1617	0.0390	0.4847	0.0258	0.1340	0.0304	0.1012	0.0198
0.77	0.3120	0.0333	0.1475	0.0339	0.5376	0.0251	0.1372	0.0320	0.1058	0.0201
0.78	0.4110	0.0443	0.1422	0.0315	1.1307	0.0472	0.1438	0.0316	0.1124	0.0198
0.79	0.4967	0.0514	0.1361	0.0288	0.5617	0.0174	0.1515	0.0314	0.1210	0.0197
0.8	0.3745	0.0341	0.1463	0.0308	0.5243	0.0070	0.1695	0.0294	0.1354	0.0192
0.81	0.3355	0.0268	0.1497	0.0307	1.0438	0.0379	0.1641	0.0336	0.1420	0.0204
0.82	0.3617	0.0276	0.1482	0.0294	0.9788	0.0112	0.1644	0.0369	0.1639	0.0205
0.83	0.4090	0.0305	0.1855	0.0378	2.7107	0.0628	0.1749	0.0363	0.1752	0.0218
0.84	0.3493	0.0163	0.1829	0.0359			0.1890	0.0358	0.2143	0.0231
0.85	0.5282	0.0389	0.2115	0.0411			0.1849	0.0402	0.1758	0.0263
0.86	0.4348	0.0210	0.2242	0.0423			0.2051	0.0385	0.1889	0.0275
0.87	0.5145	0.0264	0.2140	0.0386			0.2223	0.0388	0.2089	0.0285
0.88	3.0207	0.0334	0.2138	0.0371			0.2457	0.0394	0.1966	0.0314
0.89	2.3473	0.2084	0.2135	0.0356			0.2535	0.0416	0.2206	0.0322
0.9			0.2118	0.0338			0.2602	0.0442	0.2193	0.0346
0.91			0.2083	0.0318			0.2171	0.0565	0.2595	0.0356
0.92			0.1841	0.0257			0.2111	0.0651	0.2940	0.0379
0.93			0.1705	0.0217			0.2178	0.0650	0.3000	0.0404
0.94			0.1707	0.0204			0.2123	0.0863	0.2408	0.0448
0.95			0.1864	0.0226			0.2172	0.0995	0.1956	0.0642
0.96			0.1892	0.0217			0.2404	0.1363	0.1943	0.0746
0.97			0.1965	0.0217			0.3141	0.2096	0.2006	0.1002
0.98			0.2087	0.0228			0.3525	0.2405	0.2106	0.1150
0.99			0.2045	0.0192			0.4063	0.2819	0.2277	0.1361
1			0.2262	0.0226			0.3900	0.2659	0.2367	0.1447
1.01			0.2603	0.0283			0.3741	0.2504	0.4261	0.3108
1.02			0.2986	0.0334			0.3588	0.2355	0.4097	0.2944
1.03			0.3174	0.0345			0.3442	0.2210	0.3936	0.2785
1.04			0.2986	0.0288			0.3302	0.2071	0.4575	0.3257
1.05			0.3963	0.0419			0.4633	0.3083	0.4395	0.3082
1.06			0.5230	0.0552			0.4439	0.2905	0.4219	0.2914
1.07			0.4016	0.0367			0.4250	0.2732	0.4993	0.3463
1.08			0.3332	0.0223			0.5141	0.3345	0.4793	0.3276
1.09			0.4440	0.0373					0.5845	0.3997
1.1			1.7676	0.1634						

APPENDIX B (GPD METHOD FOR PERIOD BEFORE COVID-19)

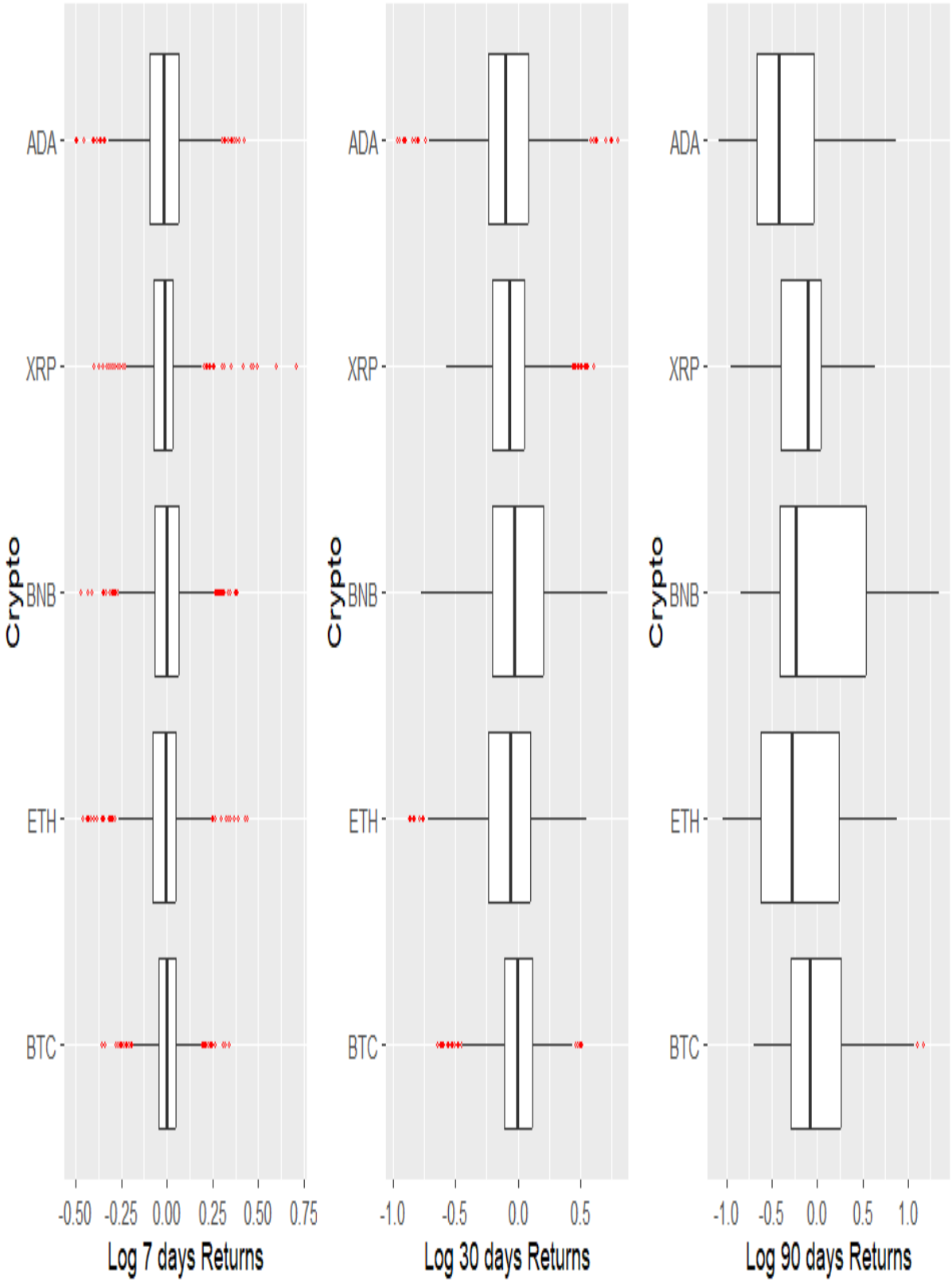

Figure 17: Boxplots with Log Returns Distributions - Before Covid-19

Table 31: VaR in Function of Threshold for Seven Days - Before Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.1567	0.2700	0.2374	0.3753	0.2072	0.3475	0.1926	0.3023	0.2483	0.3780
0.02	0.1596	0.2599	0.2349	0.3921	0.2084	0.3411	0.1919	0.3082	0.2480	0.3810
0.03	0.1576	0.2652	0.2351	0.3917	0.2087	0.3401	0.1935	0.2972	0.2470	0.3887
0.04	0.1587	0.2628	0.2347	0.3937	0.2079	0.3421	0.1935	0.2974	0.2461	0.3934
0.05	0.1574	0.2647	0.2326	0.3985	0.2051	0.3481	0.1928	0.2996	0.2447	0.3980
0.06	0.1574	0.2644	0.2369	0.3884	0.2065	0.3458	0.1966	0.2898	0.2463	0.3921
0.07	0.1631	0.2591	0.2343	0.3931	0.2020	0.3517	0.1924	0.2982	0.2477	0.3878
0.08	0.1654	0.2568	0.2343	0.3932	0.1988	0.3541	0.1912	0.2998	0.2441	0.3954
0.09	0.1661	0.2562	0.2360	0.3916	0.1980	0.3539	0.1923	0.2980	0.2432	0.3970
0.1	0.1625	0.2575	0.2358	0.3917	0.2070	0.3508	0.1896	0.3005	0.2499	0.3872
0.11	0.1610	0.2572	0.2424	0.3865	0.2105	0.3495	0.1896	0.2998	0.2515	0.3851
0.12	0.1578	0.2538	0.2506	0.3801	0.2119	0.3491	0.1912	0.2990	0.2496	0.3872
0.13	0.1570	0.2521	0.2501	0.3803	0.2102	0.3491	0.1903	0.2985	0.2494	0.3872
0.14	0.1572	0.2510	0.2459	0.3828	0.2134	0.3495	0.1871	0.2964	0.2505	0.3865
0.15	0.1567	0.2543	0.2464	0.3824	0.2119	0.3491	0.1880	0.2973	0.2503	0.3862
0.16	0.1491	0.2642	0.2405	0.3830	0.2110	0.3482	0.1879	0.3013	0.2555	0.3841
0.17	0.1541	0.2616	0.2404	0.3828	0.2113	0.3503	0.1879	0.3013	0.2532	0.3847
0.18	0.1606	0.2585	0.2420	0.3838	0.2112	0.3528	0.1886	0.3002	0.2527	0.3846
0.19	0.1611	0.2579	0.2409	0.3815	0.2120	0.3504	0.1888	0.2992	0.2530	0.3851
0.2	0.1238	0.2671	0.2405	0.3797	0.2104	0.3536	0.1714	0.3104	0.2538	0.3853
0.21	0.1670	0.2593	0.2405	0.3776	0.2121	0.3524	0.1834	0.3050	0.2548	0.3862
0.22	0.1656	0.2603	0.2376	0.3887	0.2007	0.3584	0.1041	0.3213	0.2553	0.3869
0.23	0.1440	0.2628	0.2366	0.3904	0.2083	0.3554	0.1076	0.3206	0.2564	0.3836
0.24	0.1561	0.2630	0.2252	0.3967	0.2065	0.3562	0.1642	0.3136	0.2565	0.3818
0.25	0.1773	0.2628	0.2315	0.3939	0.2036	0.3565	0.1086	0.3203	0.2552	0.3834
0.26	-0.000	0.2510	0.2112	0.4001	0.2299	0.3477	0.1127	0.3196	0.2614	0.3758
0.27	-0.745	0.2166	0.2169	0.3989	0.2347	0.3456	0.1209	0.3185	0.2638	0.3731
0.28			0.2428	0.3918	0.2508	0.3402	0.2076	0.3139	0.2659	0.3726
0.29			0.2361	0.3940	0.2588	0.3381	0.2319	0.3131	0.2727	0.3689
0.3			0.2225	0.3964	0.2466	0.3410	0.2086	0.3129	0.2816	0.3635
0.31			0.1911	0.3997	0.2271	0.3433	0.2431	0.3136	0.2193	0.3807
0.32			0.0658	0.4068	0.2368	0.3437	0.1305	0.2985	0.1344	0.3883
0.33			0.1779	0.4013	0.2905	0.3446	-0.444	0.2525	0.2144	0.3837
0.34			0.2550	0.3950	0.2769	0.3441	0.1092	0.3008	0.2726	0.3795
0.35			0.2728	0.3936	0.1128	0.3202	0.2965	0.3349	0.2114	0.3829
0.36			-0.549	0.4077	-4.574	0.1389	0.0118	0.2910	0.2842	0.3830
0.37							0.3209	0.3513	0.1511	0.3787
0.38							-2.535	0.0705	0.2664	0.3859
0.39									0.2132	0.3824
0.4									0.3184	0.3954
0.41									-22.24	0.0642

Table 32: Parameters in Function of Threshold for Seven Days - Before Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0763	0.0069	0.0731	0.0104	0.0733	0.0087	0.0700	0.0077	0.0705	0.0103
0.02	0.0857	0.0086	0.0734	0.0095	0.0787	0.0098	0.0730	0.0076	0.0729	0.0104
0.03	0.0887	0.0083	0.0775	0.0101	0.0834	0.0104	0.0806	0.0090	0.0745	0.0102
0.04	0.0965	0.0093	0.0813	0.0104	0.0871	0.0106	0.0854	0.0094	0.0772	0.0102
0.05	0.1017	0.0094	0.0845	0.0103	0.0896	0.0101	0.0894	0.0096	0.0799	0.0101
0.06	0.1091	0.0100	0.0917	0.0124	0.0960	0.0112	0.1024	0.0118	0.0854	0.0113
0.07	0.1278	0.0133	0.0944	0.0120	0.0993	0.0104	0.0998	0.0103	0.0910	0.0123
0.08	0.1429	0.0152	0.0996	0.0127	0.1055	0.0102	0.1046	0.0104	0.0924	0.0115
0.09	0.1537	0.0161	0.1062	0.0141	0.1127	0.0108	0.1131	0.0114	0.0970	0.0119
0.1	0.1479	0.0138	0.1114	0.0147	0.1245	0.0154	0.1169	0.0109	0.1086	0.0151
0.11	0.1520	0.0132	0.1253	0.0186	0.1365	0.0181	0.1248	0.0115	0.1161	0.0165
0.12	0.1543	0.0105	0.1502	0.0246	0.1467	0.0199	0.1359	0.0130	0.1185	0.0161
0.13	0.1709	0.0109	0.1538	0.0244	0.1493	0.0192	0.1426	0.0130	0.1241	0.0166
0.14	0.1896	0.0119	0.1474	0.0217	0.1681	0.0232	0.1490	0.0115	0.1319	0.0178
0.15	0.2072	0.0153	0.1551	0.0226	0.1699	0.0222	0.1626	0.0134	0.1374	0.0182
0.16	0.2515	0.0249	0.1464	0.0186	0.1735	0.0216	0.1848	0.0180	0.1588	0.0228
0.17	0.2534	0.0229	0.1536	0.0192	0.1929	0.0254	0.1977	0.0192	0.1575	0.0213
0.18	0.2586	0.0208	0.1677	0.0221	0.2213	0.0305	0.2087	0.0195	0.1626	0.0213
0.19	0.2800	0.0222	0.1681	0.0203	0.2146	0.0275	0.2225	0.0202	0.1747	0.0230
0.2	0.3771	0.0380	0.1739	0.0197	0.2491	0.0332	0.2962	0.0340	0.1882	0.0249
0.21	0.3203	0.0242	0.1817	0.0194	0.2510	0.0318	0.2742	0.0278	0.2108	0.0284
0.22	0.3503	0.0269	0.2259	0.0316	0.3273	0.0436	0.4994	0.0600	0.2349	0.0316
0.23	0.4123	0.0353	0.2476	0.0348	0.3047	0.0377	0.5079	0.0576	0.2119	0.0255
0.24	0.4258	0.0337	0.3197	0.0474	0.3274	0.0392	0.3943	0.0395	0.2128	0.0241
0.25	0.4372	0.0304	0.3008	0.0418	0.3494	0.0405	0.5482	0.0547	0.2339	0.0269
0.26	0.7039	0.0646	0.3976	0.0561	0.2835	0.0275	0.5629	0.0523	0.2185	0.0206
0.27	1.2264	0.1120	0.3914	0.0522	0.2907	0.0264	0.5722	0.0493	0.2299	0.0200
0.28			0.3166	0.0378	0.2874	0.0209	0.4172	0.0297	0.2451	0.0209
0.29			0.3561	0.0417	0.3113	0.0199	0.4020	0.0245	0.2615	0.0192
0.3			0.4095	0.0471	0.3474	0.0270	0.4937	0.0318	0.3012	0.0171
0.31			0.4993	0.0563	0.3997	0.0352	0.4801	0.0259	0.3685	0.0436
0.32			0.7471	0.0817	0.4174	0.0345	0.7272	0.0485	0.5140	0.0660
0.33			0.5769	0.0572	0.4466	0.0208	1.2779	0.0854	0.4203	0.0473
0.34			0.4314	0.0373	0.4785	0.0292	0.9010	0.0490	0.3660	0.0319
0.35			0.4183	0.0328	0.6721	0.0682	0.6640	0.0222	0.4713	0.0500
0.36			1.3296	0.1077	1.8875	0.2050	1.2442	0.0520	0.4085	0.0330
0.37							0.8194	0.0197	0.6006	0.0631
0.38							2.7107	0.0775	0.4924	0.0419
0.39									0.5962	0.0541
0.4									0.5145	0.0336
0.41									2.7362	0.2561

Table 33: VaR in Function of Threshold until 0.6 for 30 Days - Before Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.3422	0.5869	0.5302	0.6493	0.4559	0.5530	0.3758	0.4392	0.5667	0.7272
0.02	0.3411	0.5921	0.5326	0.6650	0.4584	0.5712	0.3746	0.4343	0.5675	0.7338
0.03	0.3439	0.5795	0.5333	0.6709	0.4599	0.5850	0.3754	0.4380	0.5701	0.7571
0.04	0.3487	0.5596	0.5332	0.6695	0.4606	0.5960	0.3744	0.4336	0.5714	0.7742
0.05	0.3512	0.5497	0.5349	0.6874	0.4606	0.5972	0.3747	0.4355	0.5719	0.7845
0.06	0.3492	0.5566	0.5348	0.6870	0.4606	0.6011	0.3737	0.4307	0.5726	0.8119
0.07	0.3480	0.5600	0.5358	0.7094	0.4606	0.5988	0.3743	0.4341	0.5726	0.8226
0.08	0.3445	0.5681	0.5358	0.7113	0.4605	0.5976	0.3769	0.4533	0.5720	0.8403
0.09	0.3421	0.5725	0.5358	0.7246	0.4603	0.6032	0.3763	0.4480	0.5713	0.8507
0.1	0.3354	0.5829	0.5353	0.7384	0.4594	0.6160	0.3770	0.4570	0.5696	0.8699
0.11	0.3324	0.5867	0.5345	0.7491	0.4593	0.6167	0.3770	0.4609	0.5703	0.8622
0.12	0.3362	0.5825	0.5337	0.7570	0.4575	0.6313	0.3769	0.4734	0.5690	0.8718
0.13	0.3307	0.5871	0.5313	0.7760	0.4555	0.6423	0.3758	0.4896	0.5681	0.8762
0.14	0.3301	0.5873	0.5296	0.7857	0.4556	0.6414	0.3758	0.4902	0.5664	0.8842
0.15	0.3288	0.5876	0.5297	0.7847	0.4537	0.6491	0.3744	0.4984	0.5706	0.8652
0.16	0.3232	0.5878	0.5286	0.7890	0.4486	0.6652	0.3745	0.4976	0.5727	0.8565
0.17	0.3325	0.5879	0.5276	0.7923	0.4439	0.6776	0.3750	0.4951	0.5739	0.8517
0.18	0.3329	0.5874	0.5277	0.7918	0.4395	0.6864	0.3735	0.5001	0.5748	0.8484
0.19	0.3234	0.5837	0.5227	0.8057	0.4339	0.6953	0.3736	0.4994	0.5776	0.8391
0.2	0.3261	0.5853	0.5215	0.8086	0.4315	0.6981	0.3724	0.5021	0.5762	0.8431
0.21	0.3309	0.5890	0.5234	0.8048	0.4338	0.6959	0.3684	0.5091	0.5734	0.8503
0.22	0.3318	0.5899	0.5223	0.8068	0.4306	0.6986	0.3722	0.5033	0.5717	0.8542
0.23	0.3360	0.5943	0.5186	0.8123	0.4364	0.6946	0.3703	0.5055	0.5718	0.8539
0.24	0.3396	0.5984	0.5230	0.8062	0.4332	0.6959	0.3636	0.5114	0.5809	0.8352
0.25	0.3421	0.6018	0.5239	0.8052	0.4338	0.6955	0.3620	0.5124	0.5800	0.8368
0.26	0.3458	0.6102	0.5324	0.7948	0.4336	0.6953	0.3640	0.5113	0.5772	0.8419
0.27	0.3401	0.6062	0.5407	0.7839	0.4369	0.6947	0.3678	0.5104	0.5801	0.8372
0.28	0.3380	0.6052	0.5369	0.7882	0.4352	0.6946	0.3636	0.5104	0.5756	0.8438
0.29	0.3234	0.6004	0.5447	0.7797	0.4438	0.6951	0.3642	0.5100	0.5707	0.8499
0.3	0.3301	0.6017	0.5424	0.7818	0.4435	0.6949	0.3689	0.5125	0.5743	0.8458
0.31	0.3369	0.6028	0.5480	0.7761	0.4512	0.6958	0.3687	0.5120	0.5747	0.8452
0.32	0.3439	0.6037	0.5461	0.7778	0.4540	0.6957	0.3681	0.5116	0.5730	0.8467
0.33	0.3510	0.6041	0.5449	0.7785	0.4525	0.6952	0.3678	0.5095	0.5773	0.8425
0.34	0.3583	0.6040	0.5437	0.7791	0.4628	0.6966	0.3678	0.5120	0.5771	0.8425
0.35	0.3567	0.6038	0.5393	0.7815	0.4638	0.6963	0.3673	0.5147	0.5796	0.8409
0.36	0.3657	0.6028	0.5429	0.7798	0.4701	0.6944	0.3691	0.5122	0.5749	0.8437
0.37	0.3748	0.6006	0.5544	0.7737	0.4722	0.6915	0.3570	0.5204	0.5750	0.8437
0.38	0.3760	0.6002	0.5500	0.7758	0.4726	0.6910	0.3420	0.5253	0.5703	0.8452
0.39	0.3867	0.5960	0.5509	0.7754	0.4724	0.6883	0.2925	0.5328	0.5678	0.8455
0.4	0.3649	0.6024	0.5464	0.7766	0.4736	0.6897	0.2017	0.5376	0.5630	0.8451
0.41	0.3636	0.6025	0.5477	0.7760	0.4708	0.6871	0.1300	0.5392	0.5678	0.8462
0.42	0.3292	0.6063	0.5487	0.7759	0.4697	0.6861	-0.036	0.5408	0.5694	0.8465
0.43	0.3579	0.6032	0.5505	0.7756	0.4738	0.6872	0.1265	0.5389	0.5697	0.8462
0.44	0.3528	0.6038	0.5457	0.7743	0.4781	0.6880	0.2455	0.5360	0.5753	0.8482
0.45	0.3471	0.6042	0.5428	0.7719	0.4828	0.6880	0.3314	0.5317	0.5742	0.8476
0.46	0.3346	0.6052	0.5431	0.7720	0.4834	0.6877	0.3447	0.5305	0.5755	0.8485
0.47	0.3779	0.6007	0.5415	0.7676	0.4896	0.6863	0.3642	0.5288	0.5757	0.8481
0.48	0.3089	0.6064	0.5411	0.7673	0.4915	0.6856	0.3827	0.5277	0.5744	0.8454
0.49	0.3708	0.6016	0.5406	0.7600	0.4861	0.6869	0.4139	0.5255	0.5729	0.8414
0.5	0.3591	0.6028	0.5410	0.7598	0.4744	0.6884	0.3701	0.5276	0.5735	0.8436
0.51	0.4194	0.5968	0.5398	0.7656	0.4739	0.6883	0.4727	0.5246	0.5734	0.8470
0.52	0.4267	0.5962	0.5380	0.7690	0.4915	0.6857	0.4922	0.5252	0.5745	0.8383
0.53	0.4448	0.5936	0.5381	0.7689	0.4746	0.6880	0.4869	0.5277	0.5735	0.8424
0.54	0.1912	0.6037	0.5374	0.7702	0.4733	0.6880	0.2429	0.5053	0.5731	0.8428
0.55	0.3715	0.5991	0.5257	0.7797	0.5004	0.6841	-55.82	0.0507	0.5754	0.8376
0.56	0.3542	0.5995	0.4635	0.8033	0.5246	0.6783			0.5702	0.8451
0.57	0.3401	0.5991	0.4483	0.8067	0.4856	0.6858			0.5786	0.8339
0.58	0.0907	0.6017	0.4790	0.8002	0.5230	0.6799			0.5700	0.8440
0.59	0.4466	0.6029	0.4648	0.8035	0.5353	0.6773			0.5479	0.8595
0.6	0.5686	0.6055	0.4980	0.7963	0.5490	0.6748			0.5229	0.8695

Table 34: VaR in Function of Threshold above 0.6 for 30 Days - Before Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.61	0.4027	0.5933	0.4197	0.8095	0.5653	0.6716			0.5149	0.8718
0.62	0.3571	0.5881	0.3630	0.8153	0.5654	0.6717			0.4394	0.8869
0.63	-25.96	0.2743	0.2522	0.8224	0.4660	0.6800			0.3889	0.8928
0.64			-1.719	0.8449	0.4661	0.6795			0.4360	0.8874
0.65					0.5727	0.6764			0.4790	0.8813
0.66					0.5886	0.6776			0.4333	0.8875
0.67					0.6481	0.6783			0.3594	0.8940
0.68					0.6463	0.6777			0.4247	0.8884
0.69					0.5229	0.6537			0.4826	0.8821
0.7					0.6472	0.6837			0.4190	0.8884
0.71					0.6308	0.6774			0.2835	0.8970
0.72					-6.965	-0.095			-0.087	0.9085
0.73									0.1012	0.9041
0.74									0.2562	0.8994
0.75									-0.280	0.9108
0.76									-0.002	0.9066
0.77									0.2132	0.9021
0.78									0.3804	0.8972
0.79									0.5093	0.8919
0.8									0.3641	0.8966
0.81									-0.094	0.9031
0.82									0.2428	0.8994
0.83									-1.036	0.9070

Table 35: Parameters in Function of Threshold until 0.6 for 30 Days - Before Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0716	0.0138	0.0878	0.0328	0.0960	0.0319	0.0897	0.0238	0.0768	0.0289
0.02	0.0736	0.0139	0.0851	0.0309	0.0913	0.0293	0.0935	0.0243	0.0768	0.0284
0.03	0.0775	0.0155	0.0849	0.0303	0.0886	0.0276	0.0935	0.0237	0.0743	0.0265
0.04	0.0834	0.0181	0.0864	0.0305	0.0869	0.0263	0.0973	0.0242	0.0730	0.0253
0.05	0.0884	0.0198	0.0835	0.0286	0.0881	0.0262	0.0980	0.0238	0.0729	0.0247
0.06	0.0890	0.0193	0.0850	0.0287	0.0885	0.0258	0.1026	0.0244	0.0707	0.0228
0.07	0.0906	0.0192	0.0813	0.0264	0.0909	0.0263	0.1024	0.0237	0.0709	0.0224
0.08	0.0912	0.0183	0.0824	0.0264	0.0930	0.0265	0.0938	0.0206	0.0705	0.0214
0.09	0.0929	0.0180	0.0812	0.0252	0.0928	0.0258	0.0988	0.0214	0.0709	0.0209
0.1	0.0938	0.0164	0.0800	0.0240	0.0903	0.0242	0.0961	0.0200	0.0707	0.0199
0.11	0.0971	0.0163	0.0796	0.0232	0.0920	0.0243	0.0962	0.0194	0.0730	0.0209
0.12	0.1016	0.0182	0.0799	0.0227	0.0894	0.0225	0.0922	0.0177	0.0738	0.0205
0.13	0.1047	0.0172	0.0785	0.0211	0.0882	0.0213	0.0873	0.0157	0.0751	0.0206
0.14	0.1090	0.0179	0.0789	0.0205	0.0906	0.0217	0.0900	0.0158	0.0762	0.0203
0.15	0.1135	0.0184	0.0810	0.0210	0.0906	0.0209	0.0892	0.0150	0.0801	0.0227
0.16	0.1193	0.0174	0.0823	0.0210	0.0884	0.0189	0.0928	0.0153	0.0833	0.0241
0.17	0.1235	0.0220	0.0838	0.0210	0.0883	0.0176	0.0976	0.0160	0.0859	0.0252
0.18	0.1280	0.0230	0.0861	0.0216	0.0895	0.0167	0.0982	0.0155	0.0885	0.0260
0.19	0.1344	0.0196	0.0861	0.0202	0.0917	0.0157	0.1023	0.0159	0.0925	0.0279
0.2	0.1390	0.0221	0.0881	0.0203	0.0952	0.0158	0.1043	0.0157	0.0934	0.0276
0.21	0.1442	0.0264	0.0914	0.0216	0.0992	0.0172	0.1031	0.0143	0.0935	0.0268
0.22	0.1498	0.0283	0.0936	0.0218	0.1030	0.0171	0.1134	0.0166	0.0946	0.0265
0.23	0.1587	0.0338	0.0951	0.0212	0.1077	0.0198	0.1153	0.0162	0.0969	0.0271
0.24	0.1713	0.0402	0.0994	0.0234	0.1111	0.0195	0.1127	0.0137	0.1057	0.0318
0.25	0.1869	0.0468	0.1027	0.0244	0.1153	0.0205	0.1180	0.0139	0.1072	0.0318
0.26	0.3088	0.0913	0.1103	0.0286	0.1196	0.0214	0.1262	0.0156	0.1071	0.0309
0.27	0.4911	0.1467	0.1199	0.0331	0.1247	0.0237	0.1388	0.0186	0.1120	0.0328
0.28	0.5301	0.1543	0.1189	0.0316	0.1287	0.0239	0.1389	0.0166	0.1108	0.0311
0.29	0.7190	0.2045	0.1300	0.0365	0.1378	0.0296	0.1467	0.0177	0.1100	0.0294
0.3	0.6578	0.1808	0.1300	0.0355	0.1417	0.0303	0.1707	0.0240	0.1152	0.0317
0.31	0.5984	0.1589	0.1402	0.0394	0.1568	0.0376	0.1760	0.0241	0.1181	0.0324
0.32	0.5409	0.1385	0.1406	0.0386	0.1666	0.0410	0.1818	0.0241	0.1197	0.0322
0.33	0.4856	0.1197	0.1417	0.0381	0.1666	0.0396	0.1835	0.0227	0.1260	0.0349
0.34	0.4327	0.1024	0.1430	0.0376	0.2135	0.0574	0.2025	0.0265	0.1286	0.0354
0.35	0.4550	0.1044	0.1404	0.0352	0.2221	0.0590	0.2273	0.0311	0.1343	0.0375
0.36	0.4011	0.0880	0.1493	0.0384	0.3042	0.0843	0.2252	0.0288	0.1325	0.0352
0.37	0.3507	0.0731	0.1769	0.0490	0.3833	0.1057	0.2931	0.0417	0.1360	0.0360
0.38	0.3519	0.0709	0.1692	0.0448	0.3945	0.1059	0.3657	0.0528	0.1348	0.0338
0.39	0.3046	0.0575	0.1754	0.0461	0.4741	0.1246	0.5465	0.0787	0.1363	0.0331
0.4	0.4137	0.0792	0.1675	0.0417	0.4259	0.1078	0.7942	0.1096	0.1367	0.0308
0.41	0.4312	0.0796	0.1743	0.0433	0.5235	0.1294	0.9596	0.1243	0.1447	0.0353
0.42	0.5599	0.1010	0.1819	0.0451	0.5619	0.1343	1.2424	0.1497	0.1505	0.0375
0.43	0.4780	0.0814	0.1929	0.0480	0.5015	0.1151	1.0212	0.1132	0.1545	0.0384
0.44	0.5076	0.0828	0.1766	0.0403	0.4437	0.0976	0.8121	0.0822	0.1690	0.0455
0.45	0.5348	0.0834	0.1705	0.0359	0.3890	0.0817	0.6186	0.0566	0.1704	0.0448
0.46	0.5851	0.0869	0.1767	0.0372	0.3959	0.0801	0.6024	0.0503	0.1789	0.0478
0.47	0.4821	0.0667	0.1731	0.0331	0.3422	0.0656	0.5725	0.0432	0.1825	0.0482
0.48	0.6637	0.0889	0.1789	0.0340	0.3370	0.0620	0.5544	0.0373	0.1789	0.0446
0.49	0.5372	0.0666	0.1797	0.0298	0.3889	0.0699	0.4958	0.0292	0.1761	0.0408
0.5	0.5887	0.0686	0.1867	0.0310	0.4757	0.0831	0.6688	0.0362	0.1849	0.0444
0.51	0.4583	0.0484	0.1978	0.0365	0.4876	0.0815	0.4050	0.0155	0.1969	0.0493
0.52	0.4634	0.0455	0.2091	0.0407	0.4096	0.0643	0.4349	0.0123	0.1882	0.0416
0.53	0.4376	0.0396	0.2162	0.0419	0.4964	0.0755	0.5281	0.0160	0.1991	0.0465
0.54	0.8908	0.0814	0.2253	0.0443	0.5181	0.0748	1.1649	0.0395	0.2056	0.0481
0.55	0.6581	0.0535	0.2533	0.0554	0.4231	0.0567	4.0311	0.1056	0.2050	0.0448
0.56	0.7239	0.0536	0.3767	0.0955	0.3398	0.0413			0.2217	0.0530
0.57	0.7846	0.0525	0.4131	0.1033	0.4985	0.0607			0.2140	0.0445
0.58	1.1382	0.0669	0.3685	0.0875	0.3913	0.0432			0.2329	0.0546
0.59	0.7143	0.0345	0.4024	0.0944	0.3700	0.0377			0.2773	0.0737
0.6	0.4370	0.0131	0.3571	0.0789	0.3506	0.0325			0.3257	0.0906

Table 36: Parameters in Function of Threshold above 0.6 for 30 Days - Before Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.61	0.9377	0.0363	0.4832	0.1100	0.3290	0.0270			0.3446	0.0953
0.62	1.1362	0.0367	0.5680	0.1270	0.3553	0.0281			0.4637	0.1321
0.63	3.6343	0.0893	0.7025	0.1534	0.6047	0.0522			0.5364	0.1509
0.64			1.6663	0.3544	0.6342	0.0505			0.4846	0.1313
0.65					0.4483	0.0294			0.4358	0.1131
0.66					0.4564	0.0265			0.5038	0.1294
0.67					0.4682	0.0119			0.5951	0.1507
0.68					0.5809	0.0176			0.5323	0.1293
0.69					0.7527	0.0485			0.4731	0.1097
0.7					0.6796	0.0252			0.5560	0.1272
0.71					0.8144	0.0364			0.6992	0.1570
0.72					2.7107	0.2043			0.9770	0.2132
0.73									0.8707	0.1816
0.74									0.7681	0.1527
0.75									1.1167	0.2143
0.76									0.9839	0.1792
0.77									0.8557	0.1475
0.78									0.7332	0.1192
0.79									0.6181	0.0941
0.8									0.7782	0.1146
0.81									1.0966	0.1545
0.82									0.9175	0.1203
0.83									1.4876	0.1839

Table 37: VaR in Function of Threshold until 0.6 for 90 Days - Before Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.5825	0.6665	0.8490	0.8726	0.6147	0.6260	0.7202	0.8873	0.8738	0.8904
0.02	0.5823	0.6664	0.8554	0.8831	0.6125	0.6229	0.7158	0.8647	0.8765	0.8943
0.03	0.5813	0.6659	0.8559	0.8840	0.6133	0.6240	0.7192	0.8825	0.8833	0.9044
0.04	0.5824	0.6665	0.8626	0.8955	0.6171	0.6297	0.7138	0.8536	0.8843	0.9060
0.05	0.5823	0.6664	0.8655	0.9007	0.6198	0.6339	0.7131	0.8503	0.8894	0.9138
0.06	0.5813	0.6659	0.8685	0.9063	0.6240	0.6408	0.7132	0.8511	0.8927	0.9191
0.07	0.5812	0.6658	0.8735	0.9161	0.6229	0.6388	0.7107	0.8377	0.9002	0.9314
0.08	0.5797	0.6650	0.8806	0.9306	0.6245	0.6415	0.7050	0.8092	0.9040	0.9380
0.09	0.5809	0.6657	0.8842	0.9384	0.6275	0.6469	0.7051	0.8099	0.8984	0.9284
0.1	0.5818	0.6662	0.8880	0.9470	0.6293	0.6500	0.7052	0.8106	0.9022	0.9349
0.11	0.5827	0.6667	0.8884	0.9479	0.6287	0.6489	0.7078	0.8253	0.9023	0.9352
0.12	0.5827	0.6667	0.8870	0.9447	0.6265	0.6450	0.7090	0.8324	0.9043	0.9386
0.13	0.5837	0.6673	0.8908	0.9538	0.6296	0.6509	0.7072	0.8208	0.9045	0.9391
0.14	0.5858	0.6686	0.8914	0.9552	0.6341	0.6598	0.7020	0.7905	0.8975	0.9266
0.15	0.5841	0.6675	0.8935	0.9605	0.6400	0.6728	0.7000	0.7800	0.8936	0.9200
0.16	0.5873	0.6695	0.8957	0.9664	0.6392	0.6710	0.6985	0.7727	0.8863	0.9078
0.17	0.5862	0.6688	0.8934	0.9602	0.6451	0.6858	0.6961	0.7613	0.8874	0.9097
0.18	0.5860	0.6687	0.8940	0.9619	0.6480	0.6939	0.6960	0.7611	0.8867	0.9085
0.19	0.5859	0.6686	0.8961	0.9678	0.6528	0.7092	0.6967	0.7645	0.8790	0.8962
0.2	0.5858	0.6685	0.8908	0.9531	0.6558	0.7203	0.6966	0.7644	0.8798	0.8974
0.21	0.5846	0.6677	0.8955	0.9664	0.6574	0.7268	0.6959	0.7604	0.8807	0.8988
0.22	0.5839	0.6673	0.8962	0.9687	0.6591	0.7342	0.6977	0.7721	0.8749	0.8897
0.23	0.5831	0.6668	0.8984	0.9754	0.6593	0.7354	0.6983	0.7770	0.8771	0.8932
0.24	0.5850	0.6681	0.8991	0.9777	0.6614	0.7471	0.6980	0.7742	0.8796	0.8972
0.25	0.5875	0.6698	0.8999	0.9807	0.6640	0.7669	0.6973	0.7675	0.8805	0.8987
0.26	0.5887	0.6707	0.8983	0.9751	0.6648	0.7752	0.6984	0.7798	0.8749	0.8897
0.27	0.5899	0.6716	0.8978	0.9734	0.6647	0.7746	0.6988	0.7892	0.8788	0.8959
0.28	0.5902	0.6718	0.8973	0.9715	0.6650	0.7802	0.6989	0.7956	0.8829	0.9029
0.29	0.5942	0.6749	0.8954	0.9650	0.6653	0.7894	0.6988	0.8070	0.8871	0.9105
0.3	0.5917	0.6728	0.8958	0.9663	0.6651	0.8104	0.6978	0.8279	0.8886	0.9133
0.31	0.5922	0.6732	0.8949	0.9634	0.6651	0.8102	0.6975	0.8307	0.8885	0.9132
0.32	0.5944	0.6751	0.8952	0.9645	0.6636	0.8290	0.6972	0.8330	0.8929	0.9218
0.33	0.5941	0.6754	0.8965	0.9698	0.6627	0.8362	0.6962	0.8395	0.8919	0.9197
0.34	0.5973	0.6773	0.8959	0.9673	0.6603	0.8506	0.6956	0.8435	0.8950	0.9263
0.35	0.5965	0.6766	0.8963	0.9690			0.6949	0.8465	0.8968	0.9304
0.36	0.5960	0.6767	0.8958	0.9670			0.6974	0.8345	0.8988	0.9351
0.37	0.5989	0.6785	0.8915	0.9483			0.6989	0.8279	0.9034	0.9465
0.38	0.5970	0.6777	0.8885	0.9366			0.6960	0.8391	0.9058	0.9530
0.39	0.5966	0.6769	0.8852	0.9250			0.6956	0.8406	0.9071	0.9568
0.4	0.5959	0.6760	0.8865	0.9297			0.6964	0.8379	0.9106	0.9677
0.41	0.5954	0.6749	0.8870	0.9316			0.6912	0.8525	0.9112	0.9698
0.42	0.5920	0.6719	0.8900	0.9445			0.6874	0.8614	0.9068	0.9553
0.43	0.5935	0.6730	0.8898	0.9439			0.6901	0.8556	0.9057	0.9521
0.44	0.5930	0.6727	0.8917	0.9548			0.6862	0.8632	0.9087	0.9623
0.45	0.5936	0.6727	0.8906	0.9480			0.6918	0.8528	0.9117	0.9736
0.46	0.5935	0.6717	0.8887	0.9369			0.6936	0.8498	0.9105	0.9690
0.47	0.5930	0.6694	0.8896	0.9427			0.6904	0.8547	0.9117	0.9744
0.48	0.5908	0.6659	0.8913	0.9567			0.6887	0.8571	0.9137	0.9841
0.49	0.5889	0.6628	0.8917	0.9614			0.6889	0.8567	0.9154	0.9949
0.5	0.5893	0.6619	0.8916	0.9593			0.6991	0.8441	0.9157	0.9964
0.51	0.5890	0.6592	0.8914	0.9568			0.7007	0.8418	0.9166	1.0047
0.52	0.5881	0.6563	0.8917	0.9686			0.6997	0.8428	0.9161	1.0000
0.53	0.5868	0.6518	0.8915	0.9555			0.7043	0.8377	0.9164	1.0047
0.54	0.5863	0.6493	0.8913	0.9522			0.7097	0.8320	0.9157	0.9936
0.55	0.5864	0.6509	0.8910	0.9385			0.7086	0.8329	0.9158	0.9968
0.56	0.5865	0.6506	0.8907	0.9336			0.7067	0.8347	0.9160	1.0006
0.57	0.5877	0.6489	0.8908	0.9380			0.7050	0.8359	0.9159	1.0043
0.58	0.5905	0.6445	0.8907	0.9430			0.7028	0.8375	0.9158	1.0125
0.59	0.5907	0.6428	0.8901	0.9521			0.7009	0.8385	0.9160	1.0040
0.6	0.5905	0.6432	0.8893	0.9593			0.6965	0.8404	0.9158	1.0074

Table 38: VaR in Function of Threshold above 0.6 for 90 Days - Before Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.61	0.5920	0.6429	0.8886	0.9641			0.6919	0.8408	0.9161	1.0013
0.62	0.5793	0.6448	0.8882	0.9668			0.6930	0.8411	0.9169	0.9909
0.63	0.6225	0.6364	0.8883	0.9660			0.6920	0.8405	0.9178	0.9792
0.64			0.8893	0.9617			0.6895	0.8365	0.9179	0.9789
0.65			0.8897	0.9596			0.6885	0.8329	0.9173	0.9841
0.66			0.8867	0.9699			0.6884	0.8395	0.9153	0.9964
0.67			0.8846	0.9757			0.6885	0.8383	0.9161	0.9917
0.68			0.8834	0.9784			0.6923	0.8299	0.9130	1.0048
0.69			0.8792	0.9873			0.6838	0.8422	0.9102	1.0141
0.7			0.8763	0.9926			0.6956	0.8308	0.9147	1.0004
0.71			0.8788	0.9882			0.6789	0.8430	0.9132	1.0041
0.72			0.8808	0.9851			0.6753	0.8446	0.9147	1.0006
0.73			0.8804	0.9857			0.6989	0.8341	0.9107	1.0093
0.74			0.8838	0.9811			0.6797	0.8424	0.9123	1.0058
0.75			0.8830	0.9819			0.5898	0.8578	0.9116	1.0071
0.76			0.8885	0.9756			0.6499	0.8508	0.9121	1.0065
0.77			0.8831	0.9810			0.6434	0.8523	0.9117	1.0071
0.78			0.8790	0.9843			0.4528	0.8632	0.9101	1.0087
0.79			0.8753	0.9866			0.5816	0.8585	0.9080	1.0109
0.8			0.8765	0.9859			0.6733	0.8538	0.9071	1.0117
0.81			0.8767	0.9857			0.6507	0.8561	0.9085	1.0104
0.82			0.8755	0.9859			0.6193	0.8566	0.9051	1.0125
0.83			0.8768	0.9863			0.5119	0.8570	0.9063	1.0118
0.84			0.8760	0.9850			0.6814	0.8590	0.9017	1.0127
0.85			0.8766	0.9869			0.5971	0.8580	0.9100	1.0113
0.86			0.8747	0.9879			0.7534	0.8650	0.9090	1.0116
0.87			0.8760	0.9872			0.6946	0.8637	0.9088	1.0112
0.88			0.8737	0.9879			0.0277	0.8404	0.9090	1.0115
0.89			0.8754	0.9873			0.6552	0.8693	0.9085	1.0115
0.9			0.8670	0.9890			0.8501	0.8919	0.9098	1.0110
0.91			0.8660	0.9889			0.8879	0.9023	0.9146	1.0086
0.92			0.8813	0.9864			0.8898	0.9061	0.9188	1.0059
0.93			0.8821	0.9866			-2.917	0.5215	0.9220	1.0038
0.94			0.8815	0.9869					0.9309	0.9981
0.95			0.9153	0.9820					0.9194	1.0026
0.96			0.9270	0.9786					0.9291	1.0006
0.97			0.8900	0.9801					0.8386	1.0108
0.98			0.6524	0.9735					0.8632	1.0097
0.99			0.9338	0.9874					0.9492	1.0069
1			0.9865	0.9970					0.9837	1.0065
1.01			0.9887	0.9997					-0.222	0.9131
1.02			-2.135	0.6850					0.6404	0.9684
1.03									0.9353	1.0079
1.04									-0.919	0.8761

Table 39: Parameters in Function of Threshold until 0.6 for 90 Days - Before Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0332	0.0204	0.1439	0.1003	0.1654	0.0853	0.0802	0.0394	0.1402	0.1011
0.02	0.0339	0.0205	0.1381	0.0950	0.1703	0.0864	0.0850	0.0419	0.1384	0.0986
0.03	0.0381	0.0229	0.1382	0.0939	0.1697	0.0847	0.0827	0.0399	0.1330	0.0935
0.04	0.0336	0.0196	0.1325	0.0888	0.1633	0.0800	0.0890	0.0434	0.1326	0.0922
0.05	0.0346	0.0199	0.1305	0.0863	0.1594	0.0767	0.0907	0.0437	0.1289	0.0884
0.06	0.0386	0.0220	0.1283	0.0838	0.1528	0.0721	0.0914	0.0436	0.1268	0.0859
0.07	0.0395	0.0221	0.1244	0.0801	0.1558	0.0723	0.0956	0.0454	0.1215	0.0811
0.08	0.0444	0.0247	0.1189	0.0753	0.1539	0.0701	0.1048	0.0500	0.1192	0.0785
0.09	0.0413	0.0224	0.1164	0.0728	0.1493	0.0667	0.1055	0.0497	0.1241	0.0810
0.1	0.0381	0.0201	0.1139	0.0702	0.1471	0.0645	0.1062	0.0493	0.1217	0.0784
0.11	0.0336	0.0172	0.1143	0.0696	0.1493	0.0643	0.1024	0.0466	0.1222	0.0777
0.12	0.0340	0.0171	0.1162	0.0700	0.1545	0.0654	0.1013	0.0453	0.1212	0.0761
0.13	0.0282	0.0136	0.1135	0.0674	0.1493	0.0619	0.1061	0.0471	0.1216	0.0754
0.14	0.0166	0.0072	0.1137	0.0667	0.1416	0.0574	0.1195	0.0533	0.1286	0.0790
0.15	0.0265	0.0122	0.1124	0.0650	0.1317	0.0521	0.1258	0.0556	0.1330	0.0808
0.16	0.0091	0.0030	0.1111	0.0634	0.1343	0.0522	0.1310	0.0572	0.1417	0.0852
0.17	0.0152	0.0060	0.1141	0.0644	0.1245	0.0471	0.1396	0.0603	0.1411	0.0837
0.18	0.0161	0.0063	0.1143	0.0637	0.1203	0.0445	0.1410	0.0599	0.1426	0.0834
0.19	0.0174	0.0068	0.1128	0.0620	0.1125	0.0405	0.1397	0.0582	0.1531	0.0886
0.2	0.0183	0.0070	0.1195	0.0652	0.1081	0.0379	0.1410	0.0578	0.1528	0.0871
0.21	0.0264	0.0106	0.1148	0.0615	0.1062	0.0364	0.1454	0.0587	0.1523	0.0856
0.22	0.0316	0.0126	0.1148	0.0606	0.1041	0.0348	0.1378	0.0543	0.1619	0.0899
0.23	0.0378	0.0151	0.1131	0.0588	0.1049	0.0344	0.1357	0.0524	0.1591	0.0869
0.24	0.0241	0.0088	0.1130	0.0579	0.1011	0.0323	0.1392	0.0529	0.1561	0.0839
0.25	0.0065	2,00E-06	0.1128	0.0570	0.0948	0.0291	0.1462	0.0548	0.1554	0.0823
0.26	0.0062	2,00E-06	0.1159	0.0579	0.0932	0.0279	0.1378	0.0503	0.1657	0.0865
0.27	0.0058	2,00E-06	0.1176	0.0580	0.0951	0.0280	0.1324	0.0471	0.1597	0.0820
0.28	0.0059	2,00E-06	0.1194	0.0582	0.0946	0.0272	0.1296	0.0451	0.1537	0.0775
0.29			0.1234	0.0594	0.0929	0.0260	0.1238	0.0419	0.1476	0.0731
0.3			0.1238	0.0587	0.0877	0.0233	0.1136	0.0369	0.1462	0.0711
0.31			0.1262	0.0591	0.0897	0.0235	0.1139	0.0363	0.1471	0.0704
0.32			0.1267	0.0584	0.0859	0.0214	0.1143	0.0357	0.1408	0.0661
0.33			0.1249	0.0565	0.0858	0.0207	0.1126	0.0342	0.1435	0.0663
0.34	2,00E-06	2,00E-06	0.1273	0.0568	0.0842	0.0193	0.1125	0.0335	0.1392	0.0631
0.35	2,00E-06	2,00E-06	0.1275	0.0560			0.1127	0.0328	0.1370	0.0610
0.36	2,00E-06	2,00E-06	0.1299	0.0562			0.1223	0.0358	0.1346	0.0588
0.37	2,00E-06	2,00E-06	0.1436	0.0617			0.1294	0.0377	0.1277	0.0546
0.38	2,00E-06	2,00E-06	0.1546	0.0656			0.1229	0.0344	0.1248	0.0523
0.39	2,00E-06	2,00E-06	0.1679	0.0703			0.1242	0.0341	0.1235	0.0508
0.4	2,00E-06	2,00E-06	0.1639	0.0673			0.1287	0.0349	0.1184	0.0476
0.41			0.1632	0.0657			0.1193	0.0307	0.1184	0.0467
0.42	0.0085	2,00E-06	0.1517	0.0595			0.1153	0.0283	0.1285	0.0502
0.43	0.0105	2,00E-06	0.1536	0.0592			0.1229	0.0304	0.1319	0.0506
0.44			0.1453	0.0546			0.1190	0.0282	0.1261	0.0472
0.45	0.0131	2,00E-06	0.1529	0.0566			0.1320	0.0321	0.1202	0.0439
0.46	0.0235	0.0034	0.1664	0.0607			0.1389	0.0336	0.1243	0.0447
0.47	0.0350	0.0058	0.1612	0.0574			0.1355	0.0316	0.1222	0.0430
0.48	0.0918	0.0171	0.1482	0.0513			0.1355	0.0307	0.1178	0.0404
0.49	0.0942	0.0167	0.1455	0.0492			0.1396	0.0312	0.1132	0.0378
0.5	0.0967	0.0161	0.1492	0.0495			0.1682	0.0393	0.1138	0.0372
0.51	0.0938	0.0146	0.1536	0.0500			0.1767	0.0406	0.1109	0.0353
0.52	0.0952	0.0130	0.1435	0.0453			0.1774	0.0396	0.1151	0.0362
0.53	0.0976	0.0111	0.1591	0.0496			0.1980	0.0440	0.1139	0.0349
0.54	0.1079	0.0104	0.1652	0.0505			0.2277	0.0503	0.1229	0.0374
0.55	0.1172	0.0115	0.1885	0.0567			0.2256	0.0481	0.1223	0.0363
0.56	0.1289	0.0116	0.2001	0.0589			0.2208	0.0454	0.1215	0.0352
0.57	0.1416	0.0110	0.1933	0.0552			0.2166	0.0428	0.1206	0.0341
0.58	0.1659	0.0092	0.1859	0.0515			0.2099	0.0399	0.1170	0.0320
0.59	0.2147	0.0100	0.1722	0.0461			0.2042	0.0371	0.1251	0.0339
0.6	0.2651	0.0118	0.1633	0.0423			0.1860	0.0315	0.1244	0.0328

Table 40: Parameters in Function of Threshold above 0.6 for 90 Days - Before Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.61	0.3400	0.0135	0.1586	0.0398			0.1699	0.0261	0.1318	0.0343
0.62	0.5926	0.0258	0.1575	0.0383			0.1830	0.0283	0.1450	0.0373
0.63	1.0400	0.0107	0.1615	0.0383			0.1836	0.0271	0.1634	0.0415
0.64			0.1718	0.0399			0.1721	0.0218	0.1667	0.0412
0.65			0.1789	0.0404			0.1753	0.0198	0.1609	0.0385
0.66			0.1619	0.0349			0.1997	0.0270	0.1458	0.0333
0.67			0.1548	0.0321			0.2061	0.0269	0.1554	0.0348
0.68			0.1529	0.0305			0.2033	0.0216	0.1396	0.0297
0.69			0.1409	0.0266			0.2418	0.0334	0.1312	0.0266
0.7			0.1361	0.0245			0.2254	0.0243	0.1542	0.0315
0.71			0.1482	0.0265			0.2724	0.0375	0.1509	0.0297
0.72			0.1599	0.0283			0.2933	0.0406	0.1617	0.0312
0.73			0.1630	0.0279			0.2652	0.0295	0.1481	0.0270
0.74			0.1832	0.0311			0.3111	0.0403	0.1590	0.0284
0.75			0.1847	0.0302			0.4824	0.0711	0.1605	0.0277
0.76			0.2218	0.0359			0.3998	0.0534	0.1677	0.0282
0.77			0.1945	0.0294			0.4300	0.0557	0.1711	0.0278
0.78			0.1782	0.0251			0.7013	0.0934	0.1693	0.0263
0.79			0.1676	0.0219			0.5676	0.0694	0.1658	0.0245
0.8			0.1812	0.0234			0.4531	0.0491	0.1681	0.0239
0.81			0.1912	0.0240			0.5157	0.0543	0.1814	0.0252
0.82			0.1917	0.0229			0.5876	0.0597	0.1708	0.0221
0.83			0.2227	0.0269			0.7472	0.0732	0.1852	0.0236
0.84			0.2060	0.0226			0.5651	0.0481	0.1669	0.0189
0.85			0.2667	0.0305			0.7217	0.0595	0.2725	0.0354
0.86			0.3146	0.0352			0.5296	0.0355	0.2580	0.0314
0.87			0.3104	0.0325			0.6818	0.0452	0.2448	0.0277
0.88			0.3477	0.0348			1.3117	0.0823	0.3097	0.0346
0.89			0.3530	0.0329			0.8808	0.0454	0.3373	0.0357
0.9			0.4242	0.0377			0.5808	0.0192	0.3342	0.0328
0.91			0.4474	0.0368			0.8175	0.0132	0.2784	0.0244
0.92			0.3988	0.0291			0.8816	0.0172	0.2567	0.0200
0.93			0.4300	0.0286			2.7107	0.1023	0.2565	0.0181
0.94			0.4712	0.0284					0.2453	0.0134
0.95			0.3623	0.0176					0.3081	0.0205
0.96			0.3702	0.0152					0.3138	0.0182
0.97			0.5397	0.0254					0.5957	0.0423
0.98			1.0428	0.0471					0.5767	0.0365
0.99			0.5730	0.0181					0.3934	0.0177
1			0.7877	0.0083					0.5516	0.0098
1.01			0.9742	0.0136					1.4584	0.1012
1.02			2.7107	0.0838					1.0546	0.0610
1.03									0.7175	0.0302
1.04									1.9735	0.0862

APPENDIX C (GPD METHOD FOR PERIOD DURING COVID-19)

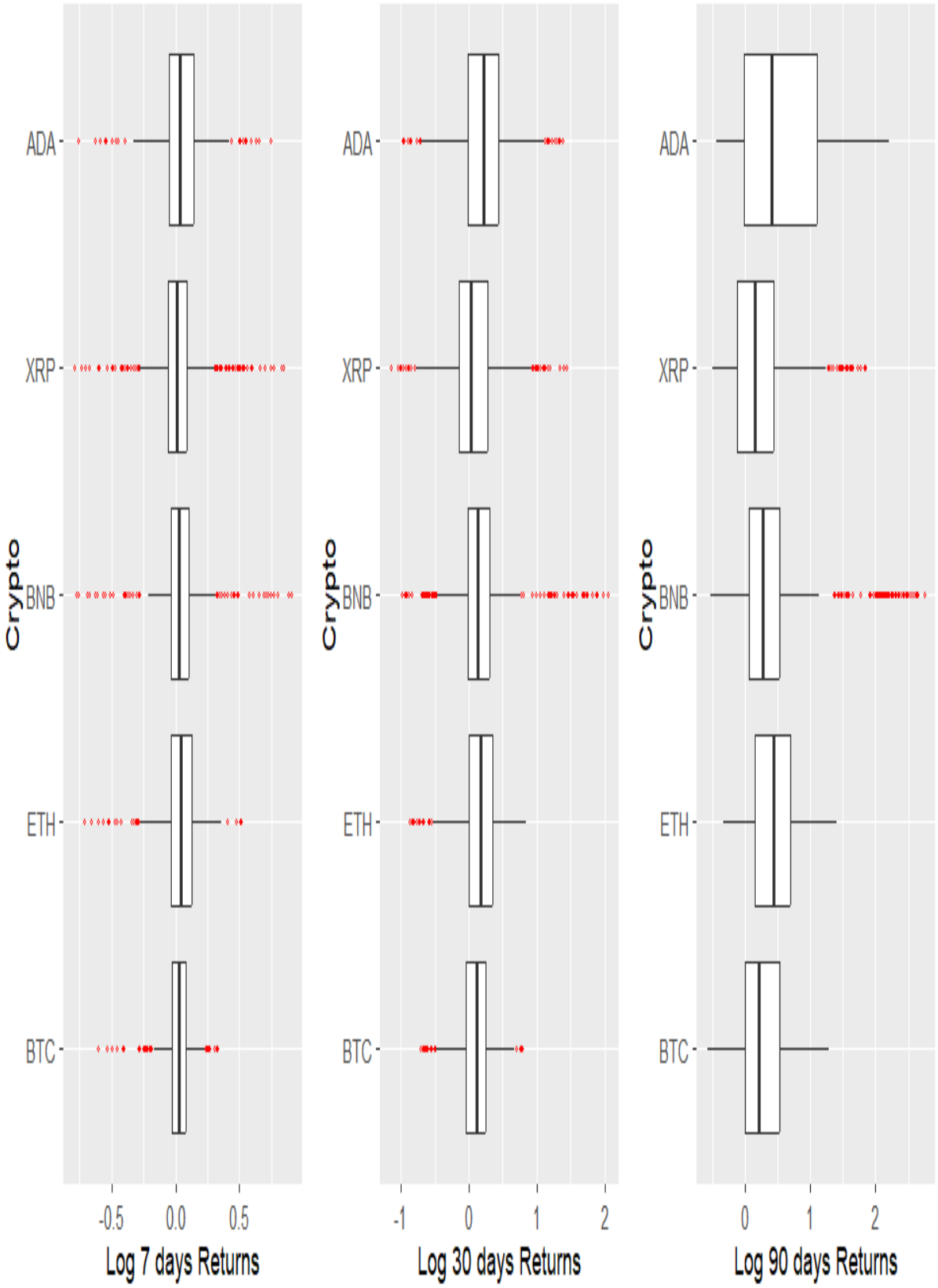

Figure 18: Boxplots with Log Returns Distributions - During Covid-19

Table 41: VaR in Function of Threshold for Seven Days - During Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.1545	0.3560	0.1910	0.4424	0.2046	0.4833	0.2749	0.5704	0.2145	0.4203
0.02	0.1628	0.3502	0.1858	0.4454	0.2004	0.4855	0.2718	0.5762	0.2155	0.4184
0.03	0.1641	0.3490	0.1848	0.4454	0.1970	0.4858	0.2630	0.5863	0.2125	0.4223
0.04	0.1666	0.3480	0.1799	0.4441	0.1973	0.4865	0.2631	0.5862	0.2120	0.4225
0.05	0.1677	0.3481	0.1829	0.4461	0.1949	0.4852	0.2623	0.5861	0.2070	0.4260
0.06	0.1658	0.3476	0.1900	0.4513	0.1933	0.4843	0.2753	0.5808	0.2048	0.4264
0.07	0.1686	0.3486	0.1924	0.4534	0.1972	0.4893	0.2781	0.5797	0.2098	0.4257
0.08	0.1593	0.3409	0.1876	0.4475	0.2063	0.5008	0.2803	0.5791	0.2148	0.4249
0.09	0.1564	0.3366	0.1908	0.4529	0.2018	0.4939	0.2773	0.5792	0.2090	0.4241
0.1	0.1554	0.3331	0.1932	0.4583	0.2003	0.4896	0.2828	0.5796	0.2064	0.4224
0.11	0.1583	0.3456	0.1908	0.4515	0.2019	0.4936	0.2887	0.5796	0.2094	0.4248
0.12	0.1588	0.3574	0.1937	0.4614	0.2048	0.5034	0.2874	0.5793	0.2100	0.4255
0.13	0.1560	0.3702	0.1938	0.4669	0.2066	0.5148	0.2870	0.5790	0.2090	0.4238
0.14	0.1538	0.3740	0.1935	0.4848	0.2066	0.5150	0.2870	0.5791	0.2054	0.4140
0.15	0.1578	0.3681	0.1923	0.4916	0.2067	0.4972	0.2886	0.5797	0.2059	0.4171
0.16	0.1524	0.3738	0.1941	0.4867	0.2071	0.4965	0.2891	0.5795	0.2050	0.4124
0.17	0.1579	0.3687	0.1991	0.4739	0.1955	0.5394	0.2945	0.5845	0.2050	0.4144
0.18	0.1705	0.3557	0.1849	0.4974	0.1641	0.5761	0.2925	0.5818	0.2059	0.4098
0.19	0.1724	0.3532	0.1873	0.4948	0.1127	0.6003	0.2947	0.5848	0.1976	0.4325
0.2	0.1629	0.3607	0.1900	0.4924	0.0937	0.6056	0.2980	0.5922	0.2027	0.4240
0.21	0.1707	0.3565	0.1668	0.5085	-0.013	0.6227	0.2997	0.5955	0.1984	0.4303
0.22	0.1657	0.3582	0.1652	0.5093	0.0184	0.6190	0.3002	0.5965	0.1969	0.4327
0.23	0.1514	0.3631	0.0830	0.5364	0.0490	0.6146	0.2997	0.6015	0.1927	0.4360
0.24	0.1557	0.3614	0.1126	0.5295	0.0783	0.6097	0.3015	0.5959	0.1982	0.4325
0.25	-0.007	0.3863	0.1404	0.5218	0.1063	0.6040	0.3023	0.5933	0.2048	0.4276
0.26	0.0578	0.3805	0.1667	0.5131	0.1329	0.5977	0.3011	0.5952	0.1659	0.4463
0.27	0.1143	0.3747	0.1914	0.5035	0.1584	0.5905	0.3027	0.5926	0.1593	0.4493
0.28	0.0819	0.3772	0.1438	0.5196	0.1827	0.5826	0.3046	0.5893	0.0724	0.4691
0.29	-0.451	0.3911	0.1213	0.5244	0.1671	0.5880	0.2865	0.6068	0.1183	0.4614
0.3			0.0817	0.5314	0.1433	0.5943	0.2716	0.6141	-0.120	0.4886
0.31			0.0096	0.5407	0.1078	0.6012	0.2678	0.6153	-0.038	0.4828
0.32			-0.138	0.5528	0.1455	0.5940	0.2835	0.6092	0.0334	0.4770
0.33			-0.051	0.5470	0.1806	0.5862	0.2988	0.6018	-0.929	0.5106
0.34			-0.313	0.5611	0.1515	0.5922	0.2986	0.6022		
0.35			-1.111	0.5779	0.1903	0.5842	0.2986	0.6019		
0.36					0.1558	0.5910	0.3170	0.5928		
0.37					0.1988	0.5831	0.3347	0.5823		
0.38					0.1563	0.5908	0.3395	0.5794		
0.39					0.0867	0.5990	0.3251	0.5876		
0.4					-0.067	0.6114	0.2942	0.5985		
0.41					-0.452	0.6270	0.3244	0.5891		
0.42					-0.288	0.6220	0.3204	0.5911		
0.43					-0.147	0.6169	0.1237	0.6215		
0.44					-0.026	0.6115	0.1921	0.6149		
0.45					0.0766	0.6059	0.2520	0.6079		
0.46					0.1645	0.6002	0.3042	0.6005		
0.47					0.2394	0.5945	0.3498	0.5928		
0.48					0.3030	0.5886	0.3379	0.5948		
0.49					0.2518	0.5928	0.3161	0.5972		
0.5					0.1075	0.6005	-0.079	0.6171		
0.51					0.2157	0.5972	0.0701	0.6136		
0.52					-0.020	0.6023	0.1913	0.6102		
0.53					0.1345	0.6009	0.2889	0.6071		
0.54					0.2560	0.5999	-1.145	0.6150		
0.55					0.3508	0.5994				
0.56					0.2002	0.6006				
0.57					-0.380	0.5919				
0.58					-0.055	0.5982				
0.59					0.1745	0.6047				
0.6					0.3360	0.6115				
0.61					0.4488	0.6185				
0.62					0.2902	0.6083				
0.63					0.4382	0.6215				
0.64					-0.177	0.5822				
0.65					0.2056	0.6083				
0.66					0.4308	0.6317				
0.67					0.5607	0.6525				
0.68					0.3575	0.6202				
0.69					-524.5	-1.919				

Table 42: Parameters in Function of Threshold for Seven Days - During Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0979	0.0065	0.0976	0.0082	0.1003	0.0084	0.0801	0.0101	0.0828	0.0101
0.02	0.0987	0.0091	0.1123	0.0085	0.1140	0.0089	0.0857	0.0103	0.0873	0.0111
0.03	0.1049	0.0102	0.1227	0.0094	0.1298	0.0096	0.0966	0.0097	0.0920	0.0110
0.04	0.1112	0.0119	0.1455	0.0100	0.1388	0.0110	0.1023	0.0107	0.0972	0.0117
0.05	0.1182	0.0134	0.1466	0.0119	0.1561	0.0120	0.1088	0.0115	0.1044	0.0113
0.06	0.1255	0.0136	0.1399	0.0150	0.1737	0.0134	0.1049	0.0151	0.1121	0.0117
0.07	0.1328	0.0161	0.1437	0.0172	0.1673	0.0159	0.1085	0.0168	0.1161	0.0142
0.08	0.1506	0.0126	0.1620	0.0168	0.1526	0.0205	0.1124	0.0184	0.1212	0.0169
0.09	0.1733	0.0128	0.1618	0.0199	0.1707	0.0200	0.1180	0.0185	0.1287	0.0157
0.1	0.1972	0.0137	0.1640	0.0235	0.1863	0.0207	0.1212	0.0215	0.1377	0.0157
0.11	0.1831	0.0193	0.1790	0.0227	0.1876	0.0234	0.1252	0.0248	0.1428	0.0185
0.12	0.1858	0.0265	0.1765	0.0280	0.1822	0.0280	0.1295	0.0253	0.1497	0.0203
0.13	0.2032	0.0370	0.1813	0.0322	0.1806	0.0341	0.1339	0.0261	0.1581	0.0207
0.14	0.2176	0.0417	0.1892	0.0444	0.1867	0.0359	0.1385	0.0273	0.1766	0.0183
0.15	0.2154	0.0378	0.2004	0.0512	0.2088	0.0310	0.1432	0.0293	0.1831	0.0212
0.16	0.2335	0.0443	0.2010	0.0484	0.2176	0.0327	0.1477	0.0305	0.2009	0.0215
0.17	0.2326	0.0409	0.2013	0.0411	0.2064	0.0559	0.1554	0.0366	0.2087	0.0241
0.18	0.2321	0.0325	0.2253	0.0609	0.2549	0.0928	0.1579	0.0352	0.2280	0.0245
0.19	0.2441	0.0330	0.2271	0.0596	0.3410	0.1367	0.1648	0.0391	0.2165	0.0372
0.2	0.2571	0.0409	0.2297	0.0587	0.3745	0.1503	0.1806	0.0487	0.2285	0.0343
0.21	0.2655	0.0388	0.2654	0.0776	0.5241	0.2144	0.1940	0.0548	0.2347	0.0400
0.22	0.2794	0.0433	0.2731	0.0796	0.4891	0.1952	0.2018	0.0573	0.2428	0.0434
0.23	0.2976	0.0518	0.3904	0.1275	0.4553	0.1769	0.2266	0.0677	0.2520	0.0480
0.24	0.3074	0.0520	0.3582	0.1123	0.4227	0.1596	0.2106	0.0586	0.2605	0.0470
0.25	0.4477	0.1057	0.3290	0.0981	0.3917	0.1434	0.2086	0.0559	0.2724	0.0456
0.26	0.4037	0.0884	0.3034	0.0850	0.3625	0.1281	0.2182	0.0592	0.2893	0.0667
0.27	0.3692	0.0728	0.2827	0.0729	0.3354	0.1137	0.2174	0.0570	0.3011	0.0715
0.28	0.4061	0.0836	0.3419	0.0969	0.3108	0.1003	0.2161	0.0543	0.3698	0.1053
0.29	0.7509	0.1778	0.3724	0.1066	0.3362	0.1096	0.2745	0.0794	0.3446	0.0907
0.3			0.4200	0.1212	0.3701	0.1216	0.3208	0.0951	0.5189	0.1579
0.31			0.4956	0.1438	0.4144	0.1368	0.3349	0.0981	0.4744	0.1381
0.32			0.6244	0.1806	0.3807	0.1206	0.3046	0.0849	0.4338	0.1198
0.33			0.5668	0.1580	0.3500	0.1056	0.2778	0.0728	0.9003	0.2694
0.34			0.7589	0.2096	0.3860	0.1177	0.2855	0.0738		
0.35			1.1245	0.3043	0.3542	0.1025	0.2914	0.0741		
0.36					0.3949	0.1159	0.2676	0.0626		
0.37					0.3616	0.1004	0.2510	0.0521		
0.38					0.4091	0.1158	0.2542	0.0507		
0.39					0.4760	0.1364	0.2782	0.0605		
0.4					0.6001	0.1729	0.3229	0.0766		
0.41					0.8270	0.2366	0.2970	0.0639		
0.42					0.7542	0.2083	0.3107	0.0671		
0.43					0.6839	0.1819	0.5204	0.1321		
0.44					0.6164	0.1575	0.4657	0.1126		
0.45					0.5525	0.1350	0.4159	0.0948		
0.46					0.4931	0.1144	0.3728	0.0787		
0.47					0.4395	0.0956	0.3393	0.0642		
0.48					0.3942	0.0786	0.3617	0.0696		
0.49					0.4510	0.0931	0.3929	0.0774		
0.5					0.5791	0.1232	0.7035	0.1558		
0.51					0.5100	0.1017	0.6213	0.1307		
0.52					0.6894	0.1404	0.5453	0.1080		
0.53					0.6030	0.1156	0.4777	0.0876		
0.54					0.5252	0.0934	1.1505	0.2286		
0.55					0.4603	0.0738				
0.56					0.6037	0.1029				
0.57					0.9376	0.1630				
0.58					0.8077	0.1317				
0.59					0.6869	0.1038				
0.6					0.5806	0.0793				
0.61					0.4998	0.0582				
0.62					0.6711	0.0870				
0.63					0.5664	0.0632				
0.64					1.0174	0.1262				
0.65					0.8345	0.0934				
0.66					0.6769	0.0654				
0.67					0.5797	0.0424				
0.68					0.8415	0.0772				
0.69					4.6026	0.4375				

Table 43: VaR in function of Threshold until 0.6 for 30 Days - During Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.3209	0.6636	0.3778	0.7816	0.4343	0.9168	0.6070	1.0377	0.4475	0.8250
0.02	0.3208	0.6635	0.3779	0.7813	0.4465	0.9028	0.6048	1.0470	0.4498	0.8207
0.03	0.3263	0.6565	0.3713	0.7871	0.4627	0.8828	0.6011	1.0612	0.4558	0.8101
0.04	0.3311	0.6502	0.3720	0.7861	0.4732	0.8692	0.6071	1.0386	0.4606	0.8018
0.05	0.3304	0.6511	0.3705	0.7870	0.4722	0.8703	0.6067	1.0395	0.4584	0.8049
0.06	0.3409	0.6399	0.3696	0.7872	0.4747	0.8674	0.6138	1.0143	0.4588	0.8042
0.07	0.3497	0.6301	0.3664	0.7882	0.4781	0.8633	0.6150	1.0108	0.4569	0.8064
0.08	0.3622	0.6156	0.3658	0.7884	0.4864	0.8538	0.6262	0.9733	0.4603	0.8022
0.09	0.3592	0.6191	0.3635	0.7885	0.4843	0.8558	0.6231	0.9834	0.4558	0.8075
0.1	0.3645	0.6135	0.3769	0.7870	0.4900	0.8496	0.6215	0.9880	0.4640	0.7978
0.11	0.3690	0.6086	0.3817	0.7859	0.5156	0.8203	0.6176	0.9983	0.4598	0.8024
0.12	0.3749	0.6024	0.3916	0.7838	0.5322	0.7997	0.6155	1.0034	0.4557	0.8063
0.13	0.3863	0.5901	0.4001	0.7816	0.5462	0.7819	0.6151	1.0045	0.4512	0.8101
0.14	0.3960	0.5795	0.4071	0.7792	0.5623	0.7616	0.6198	0.9942	0.4602	0.8029
0.15	0.4045	0.5701	0.4199	0.7742	0.5625	0.7613	0.6258	0.9812	0.4764	0.7884
0.16	0.4021	0.5724	0.4166	0.7755	0.5812	0.7389	0.6408	0.9481	0.4794	0.7856
0.17	0.3990	0.5755	0.4231	0.7726	0.5828	0.7368	0.6375	0.9550	0.4786	0.7862
0.18	0.3958	0.5785	0.4352	0.7667	0.5779	0.7422	0.6421	0.9451	0.4824	0.7828
0.19	0.3922	0.5816	0.4337	0.7675	0.5792	0.7406	0.6391	0.9509	0.4823	0.7828
0.2	0.3884	0.5846	0.4431	0.7621	0.5741	0.7462	0.6443	0.9410	0.4823	0.7827
0.21	0.3846	0.5871	0.4484	0.7586	0.5687	0.7520	0.6477	0.9345	0.4781	0.7856
0.22	0.3863	0.5860	0.4434	0.7615	0.5630	0.7580	0.6548	0.9217	0.4823	0.7828
0.23	0.3796	0.5894	0.4385	0.7638	0.5628	0.7580	0.6468	0.9353	0.4743	0.7872
0.24	0.3754	0.5905	0.4462	0.7600	0.5569	0.7641	0.6412	0.9441	0.4703	0.7887
0.25	0.3790	0.5896	0.4507	0.7570	0.5507	0.7702	0.6384	0.9481	0.4695	0.7889
0.26	0.3778	0.5898	0.4471	0.7592	0.5442	0.7762	0.6424	0.9423	0.4655	0.7895
0.27	0.3749	0.5892	0.4437	0.7607	0.5427	0.7774	0.6435	0.9407	0.4680	0.7892
0.28	0.3759	0.5893	0.4440	0.7604	0.5464	0.7740	0.6605	0.9173	0.4643	0.7891
0.29	0.3755	0.5887	0.4473	0.7588	0.5399	0.7794	0.6686	0.9058	0.4574	0.7873
0.3	0.3766	0.5894	0.4450	0.7596	0.5430	0.7767	0.6777	0.8933	0.4506	0.7828
0.31	0.3769	0.5907	0.4474	0.7585	0.5367	0.7815	0.6792	0.8911	0.4464	0.7779
0.32	0.3768	0.5887	0.4475	0.7583	0.5302	0.7857	0.6766	0.8945	0.4463	0.7776
0.33	0.3761	0.5910	0.4476	0.7581	0.5237	0.7891	0.6695	0.9032	0.4468	0.7781
0.34	0.3758	0.5917	0.4474	0.7581	0.5170	0.7913	0.6664	0.9066	0.4463	0.7754
0.35	0.3778	0.5896	0.4478	0.7579	0.5137	0.7915	0.6587	0.9150	0.4462	0.7764
0.36	0.3801	0.5866	0.4479	0.7577	0.5101	0.7912	0.6504	0.9230	0.4460	0.7740
0.37	0.3794	0.5869	0.4481	0.7575	0.5121	0.7914	0.6535	0.9201	0.4457	0.7768
0.38	0.3875	0.5780	0.4503	0.7562	0.5068	0.7887	0.6575	0.9164	0.4451	0.7817
0.39	0.3826	0.5830	0.4528	0.7537	0.5056	0.7877	0.6578	0.9159	0.4468	0.7684
0.4	0.3943	0.5723	0.4556	0.7499	0.5043	0.7863	0.6583	0.9153	0.4435	0.7821
0.41	0.3884	0.5767	0.4531	0.7527	0.5076	0.7932	0.6506	0.9210	0.4424	0.7851
0.42	0.4038	0.5644	0.4537	0.7521	0.5071	0.7905	0.6546	0.9181	0.4446	0.7803
0.43	0.4062	0.5627	0.4594	0.7467	0.5075	0.7907	0.6470	0.9225	0.4422	0.7858
0.44	0.3769	0.5772	0.4653	0.7396	0.5073	0.7951	0.6427	0.9242	0.4370	0.7936
0.45	0.2832	0.5989	0.4625	0.7426	0.5068	0.7967	0.6384	0.9252	0.4270	0.8034
0.46	0.3330	0.5914	0.4465	0.7533	0.5094	0.7899	0.6370	0.9253	0.4263	0.8044
0.47	0.1958	0.6062	0.4461	0.7534	0.5089	0.7917	0.6395	0.9248	0.3716	0.8325
0.48	0.2749	0.6000	0.4452	0.7538	0.5133	0.7827	0.6328	0.9239	0.2892	0.8539
0.49	0.1930	0.6065	0.4435	0.7543	0.5158	0.7778	0.6309	0.9233	0.2288	0.8633
0.5	-0.009	0.6146	0.4405	0.7554	0.5152	0.7779	0.6275	0.9204	0.2675	0.8578
0.51	-0.702	0.6245	0.4354	0.7571	0.5139	0.7789	0.6254	0.9183	0.3040	0.8517
0.52	-0.312	0.6208	0.4578	0.7498	0.5111	0.7817	0.6260	0.9188	0.2369	0.8618
0.53	-0.030	0.6171	0.3576	0.7707	0.5049	0.7875	0.6256	0.9169	0.1174	0.8731
0.54	0.1712	0.6134	0.3047	0.7760	0.4703	0.8060	0.6251	0.9145	0.1770	0.8682
0.55	0.3148	0.6100	0.2171	0.7813	0.4911	0.7971	0.6251	0.9121	-0.016	0.8808
0.56	0.1500	0.6136	0.2858	0.7773	0.4903	0.7972	0.6255	0.9147	0.0649	0.8764
0.57	-0.880	0.6185	0.3466	0.7725	0.5122	0.7872	0.6224	0.9363	0.1396	0.8716
0.58			0.4004	0.7669	0.5329	0.7759	0.6237	0.9345	0.2079	0.8663
0.59			0.3491	0.7720	0.5373	0.7740	0.6250	0.9321	0.2701	0.8606
0.6			0.2431	0.7788	0.5180	0.7833	0.6072	0.9493	0.3269	0.8543

Table 44: VaR in Function of Threshold above 0.6 for 30 Days - During Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.61			0.3327	0.7738	0.5444	0.7725	0.6059	0.9500	0.2163	0.8648
0.62			0.4081	0.7680	0.5136	0.7847	0.6164	0.9441	0.2872	0.8588
0.63			0.4714	0.7615	0.5060	0.7866	0.6269	0.9367	0.3508	0.8524
0.64			0.5243	0.7543	0.4879	0.7910	0.6158	0.9436	0.4080	0.8454
0.65			0.5685	0.7462	0.4588	0.7955	0.6147	0.9440	0.4592	0.8380
0.66			0.6053	0.7375	0.3915	0.8038	0.6298	0.9360	0.5051	0.8301
0.67			0.5347	0.7487	0.4565	0.7979	0.6445	0.9264	0.5461	0.8218
0.68			0.2899	0.7600	-0.070	0.8216	0.6588	0.9153	0.5304	0.8252
0.69			-0.131	0.7647	-1.666	0.8367	0.6634	0.9121	0.4996	0.8302
0.7			0.1715	0.7627	-52.98	0.8615	0.6360	0.9289	0.1539	0.8531
0.71			0.3795	0.7610			0.6044	0.9401	0.2774	0.8484
0.72			0.5212	0.7598			0.5247	0.9575	-0.191	0.8616
0.73			0.3954	0.7605			0.4647	0.9657	-3.360	0.8815
0.74			0.5557	0.7625			0.5186	0.9591		
0.75			0.3666	0.7610			0.4437	0.9675		
0.76			0.5725	0.7676			0.5077	0.9610		
0.77			0.4112	0.7605			0.5645	0.9541		
0.78			-2.373	0.7078			0.2257	0.9785		
0.79							0.3435	0.9732		
0.8							-0.032	0.9858		
0.81							0.1543	0.9810		
0.82							0.3088	0.9760		
0.83							0.4362	0.9707		
0.84							0.5410	0.9651		
0.85							0.6271	0.9594		
0.86							0.6975	0.9536		
0.87							0.6550	0.9571		
0.88							0.7288	0.9525		
0.89							0.6950	0.9543		
0.9							0.7687	0.9516		
0.91							0.3802	0.9551		
0.92							0.5706	0.9568		
0.93							-0.093	0.9502		
0.94							0.3060	0.9563		
0.95							0.5690	0.9627		
0.96							0.7401	0.9694		
0.97							0.8504	0.9766		
0.98							0.7958	0.9723		
0.99							0.8988	0.9850		
1							0.9608	0.9973		
1.01							0.8973	0.9771		
1.02							0.9679	1.0017		
1.03							0.8873	0.9717		
1.04							0.9695	1.0063		
1.05							-12.20	-0.356		

Table 45: Parameters in Function of Threshold until 0.6 for 30 Days - During Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.0871	0.0164	0.0989	0.0291	0.0974	0.0313	0.0756	0.0282	0.0984	0.0358
0.02	0.0902	0.0171	0.1012	0.0298	0.1009	0.0360	0.0763	0.0278	0.1012	0.0373
0.03	0.0932	0.0193	0.1027	0.0285	0.1075	0.0429	0.0768	0.0269	0.1060	0.0405
0.04	0.0965	0.0214	0.1052	0.0294	0.1140	0.0483	0.0797	0.0297	0.1106	0.0433
0.05	0.0994	0.0220	0.1076	0.0298	0.1152	0.0483	0.0810	0.0301	0.1110	0.0426
0.06	0.1051	0.0264	0.1101	0.0303	0.1184	0.0501	0.0850	0.0335	0.1131	0.0433
0.07	0.1124	0.0307	0.1127	0.0301	0.1222	0.0524	0.0868	0.0345	0.1137	0.0428
0.08	0.1256	0.0376	0.1156	0.0309	0.1298	0.0576	0.0945	0.0407	0.1179	0.0451
0.09	0.1252	0.0364	0.1186	0.0310	0.1299	0.0567	0.0938	0.0394	0.1169	0.0433
0.1	0.1338	0.0400	0.1225	0.0375	0.1364	0.0607	0.0943	0.0389	0.1246	0.0481
0.11	0.1423	0.0433	0.1264	0.0406	0.1672	0.0802	0.0938	0.0376	0.1235	0.0463
0.12	0.1542	0.0478	0.1334	0.0469	0.1963	0.0964	0.0944	0.0371	0.1228	0.0446
0.13	0.1799	0.0576	0.1418	0.0532	0.2282	0.1129	0.0958	0.0375	0.1221	0.0429
0.14	0.2095	0.0678	0.1507	0.0590	0.2750	0.1365	0.0995	0.0400	0.1306	0.0485
0.15	0.2419	0.0782	0.1698	0.0710	0.2775	0.1356	0.1045	0.0434	0.1487	0.0595
0.16	0.2355	0.0741	0.1672	0.0682	0.3523	0.1716	0.1175	0.0524	0.1546	0.0620
0.17	0.2274	0.0696	0.1801	0.0751	0.3623	0.1735	0.1161	0.0506	0.1558	0.0617
0.18	0.2190	0.0651	0.2090	0.0905	0.3418	0.1605	0.1219	0.0538	0.1633	0.0650
0.19	0.2099	0.0605	0.2078	0.0885	0.3499	0.1616	0.1207	0.0521	0.1656	0.0652
0.2	0.2007	0.0559	0.2377	0.1029	0.3292	0.1489	0.1274	0.0558	0.1680	0.0655
0.21	0.1916	0.0514	0.2591	0.1121	0.3091	0.1368	0.1328	0.0584	0.1638	0.0620
0.22	0.2023	0.0539	0.2421	0.1018	0.2895	0.1253	0.1433	0.0640	0.1732	0.0661
0.23	0.1828	0.0458	0.2262	0.0921	0.2915	0.1240	0.1351	0.0581	0.1626	0.0591
0.24	0.1738	0.0412	0.2638	0.1092	0.2721	0.1130	0.1309	0.0545	0.1589	0.0558
0.25	0.1904	0.0461	0.2932	0.1211	0.2535	0.1026	0.1299	0.0530	0.1606	0.0556
0.26	0.1903	0.0448	0.2730	0.1097	0.2356	0.0928	0.1358	0.0559	0.1573	0.0523
0.27	0.1817	0.0404	0.2538	0.0989	0.2335	0.0902	0.1389	0.0569	0.1643	0.0555
0.28	0.1908	0.0424	0.2572	0.0986	0.2477	0.0947	0.1639	0.0703	0.1611	0.0522
0.29	0.1922	0.0415	0.2866	0.1100	0.2292	0.0850	0.1801	0.0778	0.1544	0.0457
0.3	0.2057	0.0449	0.2656	0.0987	0.2423	0.0889	0.2015	0.0874	0.1511	0.0398
0.31	0.2235	0.0494	0.2983	0.1109	0.2236	0.0794	0.2074	0.0890	0.1526	0.0366
0.32	0.2140	0.0448	0.3056	0.1118	0.2062	0.0704	0.2033	0.0855	0.1569	0.0376
0.33	0.2372	0.0507	0.3142	0.1131	0.1903	0.0621	0.1896	0.0774	0.1613	0.0393
0.34	0.2504	0.0530	0.2896	0.1009	0.1764	0.0544	0.1853	0.0740	0.1651	0.0389
0.35	0.2435	0.0493	0.2971	0.1018	0.1715	0.0508	0.1726	0.0665	0.1701	0.0409
0.36	0.2341	0.0448	0.3048	0.1027	0.1668	0.0470	0.1610	0.0595	0.1746	0.0409
0.37	0.2433	0.0460	0.3148	0.1043	0.1752	0.0501	0.1686	0.0623	0.1801	0.0440
0.38	0.2211	0.0365	0.2883	0.0920	0.1654	0.0431	0.1783	0.0660	0.1865	0.0487
0.39	0.2446	0.0429	0.2637	0.0806	0.1670	0.0423	0.1814	0.0664	0.1902	0.0423
0.4	0.2272	0.0335	0.2416	0.0701	0.1687	0.0414	0.1851	0.0669	0.1971	0.0522
0.41	0.2468	0.0392	0.2644	0.0775	0.1898	0.0523	0.1719	0.0594	0.2033	0.0558
0.42	0.2404	0.0301	0.2664	0.0765	0.1870	0.0492	0.1827	0.0634	0.2065	0.0540
0.43	0.2528	0.0307	0.2437	0.0659	0.1924	0.0505	0.1697	0.0560	0.2137	0.0593
0.44	0.2901	0.0476	0.2250	0.0561	0.2099	0.0579	0.1646	0.0522	0.2239	0.0668
0.45	0.4302	0.0845	0.2396	0.0609	0.2209	0.0615	0.1600	0.0486	0.2396	0.0773
0.46	0.3756	0.0681	0.2913	0.0794	0.2062	0.0526	0.1608	0.0478	0.2456	0.0794
0.47	0.5533	0.1062	0.2984	0.0800	0.2160	0.0559	0.1683	0.0506	0.3146	0.1179
0.48	0.4775	0.0859	0.3072	0.0810	0.2044	0.0474	0.1589	0.0438	0.4157	0.1638
0.49	0.5834	0.1038	0.3174	0.0824	0.2045	0.0444	0.1598	0.0427	0.4850	0.1912
0.5	0.7758	0.1351	0.3312	0.0848	0.2113	0.0460	0.1579	0.0392	0.4510	0.1729
0.51	1.1593	0.1949	0.3493	0.0882	0.2192	0.0484	0.1598	0.0379	0.4186	0.1556
0.52	1.0028	0.1588	0.3137	0.0746	0.2294	0.0523	0.1649	0.0396	0.4922	0.1832
0.53	0.8526	0.1266	0.4961	0.1255	0.2450	0.0591	0.1679	0.0391	0.6044	0.2238
0.54	0.7107	0.0982	0.5852	0.1451	0.3041	0.0838	0.1713	0.0385	0.5606	0.2020
0.55	0.5806	0.0736	0.7052	0.1708	0.2799	0.0717	0.1754	0.0382	0.7181	0.2563
0.56	0.7739	0.0954	0.6305	0.1465	0.2874	0.0730	0.1818	0.0413	0.6662	0.2313
0.57	1.3342	0.1559	0.5591	0.1244	0.2683	0.0616	0.2191	0.0646	0.6157	0.2077
0.58			0.4917	0.1042	0.2579	0.0514	0.2192	0.0630	0.5669	0.1855
0.59			0.5761	0.1193	0.2640	0.0509	0.2186	0.0609	0.5200	0.1647
0.6			0.7179	0.1445	0.2863	0.0625	0.2875	0.0905	0.4753	0.1452

Table 46: Parameters in Function of Threshold above 0.6 for 30 Days - During Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.61			0.6265	0.1199	0.2788	0.0518	0.2971	0.0924	0.5788	0.1765
0.62			0.5404	0.0978	0.3073	0.0675	0.2726	0.0806	0.5276	0.1552
0.63			0.4611	0.0782	0.3222	0.0721	0.2515	0.0696	0.4790	0.1355
0.64			0.3915	0.0609	0.3459	0.0802	0.2820	0.0809	0.4337	0.1172
0.65			0.3367	0.0460	0.3786	0.0909	0.2898	0.0822	0.3925	0.1004
0.66			0.3080	0.0335	0.4426	0.1108	0.2664	0.0706	0.3567	0.0850
0.67			0.4120	0.0584	0.4020	0.0936	0.2481	0.0600	0.3282	0.0711
0.68			0.6944	0.1059	0.7405	0.1928	0.2368	0.0504	0.3517	0.0780
0.69			0.9893	0.1465	1.2285	0.3166	0.2404	0.0489	0.3889	0.0891
0.7			0.8302	0.1146	3.0202	0.7547	0.2768	0.0676	0.6541	0.1653
0.71			0.6814	0.0867			0.3217	0.0847	0.5862	0.1416
0.72			0.5489	0.0630			0.4234	0.1186	0.8526	0.2057
0.73			0.7156	0.0809			0.4967	0.1389	1.5701	0.3698
0.74			0.5633	0.0563			0.4485	0.1202		
0.75			0.8059	0.0796			0.5328	0.1423		
0.76			0.6144	0.0529			0.4789	0.1225		
0.77			0.8396	0.0710			0.4291	0.1043		
0.78			1.8079	0.1443			0.7260	0.1828		
0.79							0.6515	0.1575		
0.8							0.8987	0.2134		
0.81							0.8059	0.1835		
0.82							0.7166	0.1560		
0.83							0.6314	0.1309		
0.84							0.5514	0.1082		
0.85							0.4784	0.0878		
0.86							0.4154	0.0698		
0.87							0.4765	0.0809		
0.88							0.4131	0.0630		
0.89							0.4655	0.0722		
0.9							0.4074	0.0548		
0.91							0.7560	0.1210		
0.92							0.6386	0.0947		
0.93							1.0347	0.1532		
0.94							0.8708	0.1198		
0.95							0.7181	0.0905		
0.96							0.5848	0.0655		
0.97							0.4894	0.0447		
0.98							0.5870	0.0577		
0.99							0.5148	0.0374		
1							0.6627	0.0226		
1.01							0.6657	0.0499		
1.02							0.8703	0.0327		
1.03							0.8138	0.0652		
1.04							0.9561	0.0443		
1.05							2.7107	0.3540		

Table 47: VaR in Function of Threshold for 90 Days - During Covid-19

Threshold	BTC95	BTC99	ETH95	ETH99	BNB95	BNB99	XRP95	XRP99	ADA95	ADA99
0.01	0.3447	0.5388	0.1598	0.3297	0.2410	0.3710	0.3152	0.3426	0.2905	0.3505
0.02	0.3382	0.5542	0.1592	0.3299	0.2358	0.3816	0.3150	0.3418	0.2895	0.3574
0.03	0.3357	0.5594	0.1588	0.3299	0.2295	0.3922	0.3162	0.3484	0.2880	0.3651
0.04	0.3311	0.5677	0.1609	0.3287	0.2230	0.4011	0.3172	0.3558	0.2873	0.3677
0.05	0.3297	0.5698	0.1685	0.3249	0.2181	0.4061	0.3178	0.3647	0.2865	0.3707
0.06	0.3404	0.5532	0.1735	0.3215	0.2110	0.4107	0.3179	0.3727	0.2845	0.3773
0.07	0.3372	0.5578	0.1798	0.3164	0.2122	0.4102	0.3179	0.3745	0.2828	0.3819
0.08	0.3472	0.5435	0.1819	0.3144	0.2125	0.4097	0.3174	0.3812	0.2797	0.3892
0.09	0.3432	0.5486	0.1842	0.3120	0.2100	0.4096	0.3174	0.3818	0.2767	0.3954
0.1	0.3435	0.5481	0.1838	0.3123	0.2075	0.4089	0.3170	0.3844	0.2761	0.3962
0.11	0.3415	0.5502	0.1863	0.3075	0.2121	0.4104	0.3154	0.3929	0.2740	0.3992
0.12	0.3474	0.5436	0.1870	0.3040	0.2114	0.4096	0.3167	0.3869	0.2764	0.3956
0.13	0.3494	0.5415	0.1876	0.3059	0.2092	0.4074	0.3166	0.3870	0.2766	0.3953
0.14	0.3522	0.5385	0.1877	0.3053	0.2125	0.4133	0.3135	0.3970	0.2767	0.3952
0.15	0.3492	0.5412	0.1874	0.3051	0.2165	0.4226	0.3115	0.4023	0.2730	0.3984
0.16	0.3520	0.5388	0.1871	0.3047	0.2167	0.4239	0.3084	0.4082	0.2837	0.3885
0.17	0.3499	0.5403	0.1867	0.3046	0.2173	0.4182	0.3119	0.4016	0.2845	0.3875
0.18	0.3537	0.5374	0.1931	0.3059	0.2181	0.4169	0.3077	0.4081	0.2831	0.3884
0.19	0.3624	0.5304	0.1947	0.3061	0.2155	0.4230	0.3112	0.4032	0.2930	0.3800
0.2	0.3624	0.5303	0.1976	0.3062	0.2050	0.4315	0.3098	0.4048	0.2896	0.3827
0.21	0.3589	0.5327	0.2022	0.3061	0.2073	0.4304	0.3056	0.4085	0.2940	0.3790
0.22	0.3525	0.5361	0.2149	0.3045	0.1994	0.4336	0.3061	0.4080	0.2892	0.3825
0.23	0.3512	0.5365	0.2197	0.3030	0.2133	0.4281	0.3039	0.4091	0.2869	0.3837
0.24	0.3581	0.5334	0.2205	0.3026	0.2173	0.4262	0.2999	0.4091	0.2863	0.3838
0.25	0.3555	0.5344	0.2211	0.3023	0.2323	0.4179	0.2994	0.4090	0.2844	0.3826
0.26	0.3671	0.5272	0.2160	0.3032	0.2398	0.4126	0.3000	0.4089	0.2835	0.3771
0.27	0.3666	0.5276	0.2558	0.2947	0.2382	0.4141	0.3004	0.4100	0.2837	0.3790
0.28	0.3664	0.5278	0.2367	0.2995	0.2138	0.4233	0.3002	0.4120	0.2837	0.3792
0.29	0.3679	0.5261	0.2563	0.2993	0.2187	0.4220	0.3014	0.4093	0.2667	0.3893
0.3	0.3672	0.5276	0.2326	0.2973	0.1801	0.4305	0.3051	0.4023	0.2695	0.3880
0.31	0.3669	0.5281	-63.12	0.0922	0.2231	0.4226	0.3008	0.4083	0.2721	0.3871
0.32	0.3659	0.5280			0.0447	0.4406	0.3021	0.4076	0.2715	0.3876
0.33	0.3670	0.5277			0.1345	0.4346	0.2856	0.4149	0.2932	0.3825
0.34	0.3625	0.5272			0.2054	0.4282	0.3027	0.4093	0.2793	0.3844
0.35	0.3635	0.5271			0.2612	0.4214	0.3032	0.4101	0.3037	0.3819
0.36	0.3651	0.5269			0.2706	0.4201	0.2962	0.4123	0.3059	0.3819
0.37	0.3673	0.5265			-0.180	0.4330	0.2757	0.4140	-0.497	0.3812
0.38	0.3597	0.5270			-1.406	0.4355	0.1567	0.4172	-38.40	0.3550
0.39	0.3617	0.5267			-0.647	0.4357	0.0512	0.4168		
0.4	0.3793	0.5243			-0.183	0.4364	-0.687	0.4140		
0.41	0.3869	0.5224			0.0953	0.4376	-0.044	0.4198		
0.42	0.3960	0.5199			0.2605	0.4396	0.2471	0.4261		
0.43	0.3499	0.5270			0.2061	0.4381	0.3747	0.4331		
0.44	0.3598	0.5260			-0.028	0.4297	-0.321	0.4061		
0.45	0.3047	0.5293			0.2630	0.4436	0.2863	0.4345		
0.46	0.3805	0.5245			-0.153	0.4244	0.2153	0.4272		
0.47	0.4026	0.5223			0.2847	0.4511	0.4472	0.4629		
0.48	0.4361	0.5177			-1.364	0.3868	0.4509	0.4686		
0.49	0.4510	0.5155			0.1601	0.4511	-0.900	0.3424		
0.5	0.3997	0.5183			0.4639	0.4901				
0.51	0.4858	0.5181			0.0148	0.4521				
0.52	0.4184	0.5164			-0.836	0.3760				
0.53	0.3935	0.5175								
0.54	0.4506	0.5234								
0.55	0.5254	0.5398								
0.56	-0.939	0.4008								
0.57	0.4949	0.5620								

Table 48: Parameters in Function of Threshold for 90 Days - During Covid-19

Threshold	BTC Shape	BTC Scale	ETH Shape	ETH Scale	BNB Shape	BNB Scale	XRP Shape	XRP Scale	ADA Shape	ADA Scale
0.01	0.1179	0.0359	0.1710	0.0368	0.1317	0.0292	0.1829	0.0481	0.1777	0.0450
0.02	0.1112	0.0320	0.1732	0.0364	0.1230	0.0256	0.1870	0.0477	0.1681	0.0411
0.03	0.1107	0.0309	0.1760	0.0360	0.1155	0.0223	0.1755	0.0432	0.1581	0.0372
0.04	0.1086	0.0289	0.1889	0.0386	0.1112	0.0195	0.1640	0.0389	0.1568	0.0357
0.05	0.1099	0.0287	0.2367	0.0500	0.1112	0.0181	0.1521	0.0347	0.1549	0.0341
0.06	0.1242	0.0349	0.2835	0.0596	0.1122	0.0160	0.1433	0.0314	0.1478	0.0313
0.07	0.1228	0.0334	0.3666	0.0761	0.1179	0.0173	0.1436	0.0305	0.1442	0.0294
0.08	0.1402	0.0402	0.4059	0.0815	0.1232	0.0182	0.1372	0.0279	0.1365	0.0265
0.09	0.1363	0.0376	0.4614	0.0892	0.1280	0.0180	0.1396	0.0275	0.1314	0.0243
0.1	0.1396	0.0381	0.4570	0.0845	0.1340	0.0178	0.1389	0.0264	0.1337	0.0240
0.11	0.1393	0.0370	0.6278	0.1118	0.1415	0.0214	0.1307	0.0237	0.1326	0.0228
0.12	0.1530	0.0415	0.7997	0.1356	0.1472	0.0218	0.1429	0.0254	0.1435	0.0247
0.13	0.1601	0.0433	0.6914	0.1107	0.1533	0.0211	0.1464	0.0252	0.1487	0.0250
0.14	0.1698	0.0457	0.7236	0.1093	0.1649	0.0271	0.1335	0.0216	0.1546	0.0254
0.15	0.1662	0.0433	0.7457	0.1059	0.2015	0.0411	0.1297	0.0199	0.1478	0.0228
0.16	0.1771	0.0461	0.7755	0.1031	0.2174	0.0450	0.1241	0.0179	0.1964	0.0322
0.17	0.1747	0.0441	0.7922	0.0982	0.1972	0.0364	0.1413	0.0206	0.2058	0.0327
0.18	0.1897	0.0480	0.6446	0.0738	0.2005	0.0358	0.1319	0.0178	0.2033	0.0308
0.19	0.2266	0.0582	0.6197	0.0655	0.2310	0.0449	0.1502	0.0205	0.2922	0.0447
0.2	0.2305	0.0578	0.5849	0.0567	0.3013	0.0630	0.1508	0.0196	0.2615	0.0375
0.21	0.2183	0.0527	0.5363	0.0472	0.2992	0.0603	0.1421	0.0169	0.3272	0.0456
0.22	0.1943	0.0441	0.3827	0.0298	0.3431	0.0690	0.1511	0.0177	0.2635	0.0339
0.23	0.1929	0.0424	0.3411	0.0238	0.2979	0.0558	0.1517	0.0167	0.2420	0.0290
0.24	0.2347	0.0530	0.3596	0.0229	0.2937	0.0527	0.1470	0.0140	0.2400	0.0271
0.25	0.2215	0.0479	0.3832	0.0222	0.2577	0.0413	0.1568	0.0147	0.2019	0.0200
0.26	0.3624	0.0818	0.4521	0.0238	0.2494	0.0365	0.1684	0.0158	0.1802	0.0138
0.27	0.3575	0.0778	0.2968	0.0094	0.2647	0.0391	0.1856	0.0182	0.2019	0.0166
0.28	0.3524	0.0738	0.4339	0.0174	0.3234	0.0530	0.2096	0.0216	0.2194	0.0180
0.29	0.3974	0.0807	0.4266	0.0135	0.3264	0.0514	0.2098	0.0197	0.3334	0.0331
0.3	0.3441	0.0664	0.6070	0.0202	0.4096	0.0672	0.2104	0.0156	0.3339	0.0311
0.31	0.2949	0.0537	3.9791	0.1189	0.3490	0.0517	0.2395	0.0216	0.3422	0.0299
0.32	0.3511	0.0629			0.6168	0.1003	0.2548	0.0223	0.3705	0.0306
0.33	0.3412	0.0583			0.5177	0.0784	0.3176	0.0323	0.3230	0.0226
0.34	0.4540	0.0758			0.4306	0.0595	0.2963	0.0258	0.3910	0.0283
0.35	0.4513	0.0717			0.3628	0.0434	0.3190	0.0273	0.3632	0.0219
0.36	0.4425	0.0667			0.3691	0.0418	0.3580	0.0315	0.3997	0.0231
0.37	0.4331	0.0617			0.8508	0.1163	0.4224	0.0386	1.3095	0.0889
0.38	0.5082	0.0691			1.3824	0.1807	0.6407	0.0619	3.4492	0.2025
0.39	0.5146	0.0657			1.1564	0.1397	0.7965	0.0731		
0.4	0.4091	0.0481			0.9395	0.1040	1.3083	0.1117		
0.41	0.3735	0.0407			0.7373	0.0738	0.9787	0.0736		
0.42	0.3418	0.0341			0.5613	0.0489	0.6814	0.0435		
0.43	0.5674	0.0565			0.6747	0.0570	0.4793	0.0215		
0.44	0.5502	0.0503			0.9540	0.0776	1.3352	0.0713		
0.45	0.7575	0.0641			0.6897	0.0476	0.8283	0.0348		
0.46	0.5404	0.0403			1.1526	0.0763	1.0634	0.0389		
0.47	0.4899	0.0323			0.7850	0.0426	0.6813	0.0109		
0.48	0.3884	0.0217			1.7921	0.0895	0.8145	0.0122		
0.49	0.3760	0.0179			1.1549	0.0448	2.7107	0.0371		
0.5	0.5926	0.0297			0.6664	0.0144				
0.51	0.4089	0.0114			1.6834	0.0351				
0.52	0.6756	0.0265			2.7107	0.0362				
0.53	0.8500	0.0279								
0.54	0.8420	0.0213								
0.55	0.8161	0.0115								
0.56	2.7107	0.0400								
0.57	2.7107	0.0020								