

Asymmetric return reversals and
volatility dynamics for cryptocurrencies
and mainstream asset classes

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ABSTRACT

This paper examines asymmetric return reversals and volatility dynamics for cryptocurrencies and other mainstream asset classes with the methodology by Nam et al. (2006). For the period that covers the end of 2014 to June 2018, there is evident for heterogeneous return series across cryptocurrencies and mainstream asset classes concerning the sign, and economic and statistical significance of the model estimates for the serial correlation and asymmetry term. Nevertheless, numerous cryptocurrencies possess a strong asymmetric reverting pattern that becomes even more pronounced after consecutive negative price drops, which indicate that negative returns for numerous cryptocurrencies tend to revert quicker than daily positive returns, on average. Several mainstream asset classes also tend to share the corresponding return characteristics.

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INTRODUCTION

Cryptocurrencies have taken the financial world by storm and attracted interest from media, finance professionals, and academics alike. The cryptocurrency market has experienced explosive price growth and significant short-term fluctuations in both market capitalisation and market share for numerous cryptocurrencies. As a consequence, cryptocurrencies are predominately characterised as risky due to its potentially speculative nature that may arise as a result of its uncertain future potential, and undefined future characteristics. Nevertheless, studies show an improved portfolio performance by incorporating cryptocurrencies as a return enhancer and risk diversifier. Corbet et al. (2018) show

that cryptocurrencies portray an isolated behaviour from external market-driven shocks, and may, therefore, offer useful short-term portfolio diversification benefits. Similarly, Baur et al. (2017) find that Bitcoin returns are uncorrelated to mainstream assets. Chuen et al. (2017) explore the risk and return characteristics for a collection of cryptocurrencies represented by the CRIX index and traditional asset classes. Their results indicate that cryptocurrencies have an uncorrelated behaviour to conventional economic and financial assets, and may, therefore, by incorporate cryptocurrencies in a portfolio, improve the overall portfolio performance. Notably, the plot of the efficient frontier expands when CRIX is incorporated into the collection of mainstream assets classes. The author state that the intrinsic value of cryptocurrencies are difficult to value, and therefore suggest that the cryptocurrency market is mainly driven by investor sentiment that leads to the high volatility. The authors examine the investor sentiment to reveal more information about the risk-return relationship in the cryptocurrency market, and further hypothesises that cryptocurrencies with increased investors sentiment will have a lower subsequent returns than cryptocurrencies with lower investor sentiment. The authors furthermore explain that any rational investors trades in response to exploit any mispricings or bubble tendencies, and present results that show that a portfolio of cryptocurrencies with high (low) investor sentiment, lead to low (high) future returns. Brauneis and Mestel (2018) use the mean-variance framework of Markowitz to examine the risk and returns of cryptocurrency portfolios and show that a combination of cryptocurrency investments enriches a set of low-risk cryptocurrency investment opportunities.

Although portfolios that incorporate cryptocurrencies may likely reduce the overall volatility, single cryptocurrencies may impose a considerable amount of risk. Particular in the short-term, cryptocurrencies have shown unanticipated large price swings that arise as a result of investors revision of future expectation in response to the arrival of new information. Differences in the information processing among investors may lead to asymmetric reactions to the good and bad news that lead return processes to evolve asymmetrically (Nam et al., 2006). The response to positive and negative news may be significantly guided by the strength of memory inherent in the return series (Cheah et al., 2018) and may arise of induced investor sentiment present (Chuen et al., 2017). The assessment of similarities and differences for the return characteristics of digital and financial instruments may, therefore, provide relevant information for investors to make better-informed investment decisions.

This paper uses Asymmetric Nonlinear Autoregressive (ANAR) models to capture the nonlinearity in the return dynamics of digital and financial instruments. The parameter estimation of ANAR(1)-EGARCH(1,1) and ANAR(1)-EGARCH-M(1,1) mod-

els are carried out jointly in a single step with the quasi-maximum likelihood estimation, using different distributional specifications for better efficiency that provide more reliable empirical results (Nam et al., 2006). The results that cover the period from the end of 2014 to June 2018, indicate daily reverting processes for the return series of numerous cryptocurrencies. Whereas the data for traditional assets indicate less pronounced statistically significant estimates for the daily return reversal. The asymmetric reverting property implies that negative returns revert quicker and with a greater magnitude than positive returns, on average (Nam et al., 2006). The empirical results indicate that the asymmetric reverting property is present for numerous cryptocurrencies. The estimates become even more pronounced concerning economic and statistical significance with consecutive price drops, although differences between single cryptocurrencies occur. This paper's result indicates that the asymmetric reverting property in return series for all cryptocurrencies cannot be entirely dissipated by the EGARCH-M model that incorporates the correlation between future volatility and expected return. Thus, the asymmetric reverting behaviour for cryptocurrencies and traditional assets are not necessarily justified by the time-varying rational expectation theory, which has been suggested as an explanation for the asymmetry in return processes witnessed for the stock market. Although several assets portray estimates in line with the assumptions. For other cryptocurrencies and traditional assets, the asymmetric nonlinearity in cryptocurrency returns may be significantly better explained by the price overreaction and any correction of mispricing. Moreover, a limited number of cryptocurrencies show a strong reverting behaviour after a substantial daily price change, which is defined by a price change of less than negative two standard deviations. Thus, it may suggest that investors possess uncertainty and fear regarding a substantial price change, then for more normalised daily return series. Overall for the cryptocurrency market, there is evident for heterogeneity in the return series across cryptocurrencies concerning the sign of estimates, and the economic and statistical significance for the asymmetric reverting property. Nevertheless, numerous cryptocurrencies possess strong asymmetric reverting tendency and provide evidence that indicates a stronger negative returns reversals than similar positive returns, on average.

DATA

Daily closing price data are obtained for all the assets included in the paper. The closing price data for cryptocurrencies are collected from www.coinmarketcap.com, except for the CRYPTOcurrency IndeX (CRIX) that is obtained from the CRIX website¹. The total number of cryptocurrencies included in the paper consists of 34 digital instruments to represent most of the characteristics for the overall cryptocurrency market. Representatives for mainstream asset classes are included in the paper to compare and contrast the price dynamics for the daily asymmetric mean reversion and volatility dynamics of cryptocurrencies. The representatives for energy commodities include the spot closing price data for Crude Oil WTI Cushing US FOB and Brent Crude spot FOB Sullom Voe North Sea. Furthermore, price data for precious metals include the Gold spot Multi-Contributor Commodity Cash and the Silver spot Multi-Contributor Commodity Cash price data. For currencies, four major currency pairs are considered and include the EUR/USD, USD/JPY, GBP/USD, and USD/CHF. For equities, sizeable popular stock indices include the S&P 500 that comprises of the 500 largest publicly traded companies in the U.S. The FTSE 100 index, which represents the 100 stocks with highest market capitalisation listed on the London Stock Exchange. Besides, the FTSE Eurotop 100 is used as a reference for the stock market performance of the 100 highly liquid and capitalised blue chip stocks that originate from a European country that form part of the European Monetary Union. Furthermore, the Nikkei 225, represents a leading benchmark for the 225 highly liquid stocks listed on the Tokyo Stock Exchange. The closing price data of the representatives for commodities, except for the Nikkei 225 stock index, are collected from Thomson Reuters Eikon web access². The closing prices for the Nikkei index are obtained from FRED economic data under Nikkei Stock Average, Nikkei. 225³.

Table 1 presents an overview of the digital and financial instruments included in the study⁴. The closing prices for cryptocurrencies are collected from 1 January 2015, whereas some of the closing price data for the traditional assets are obtained from the end of 2014 due to lack of available data at 1 January 2015. Some of the periods differ for the conventional assets and cryptocurrencies, and it is attributed to the fact that cryptocurrencies are traded every day with a few expectations, while most traditional assets do not possess daily closing price data during weekends⁵. Moreover,

¹<http://thecrix.de>

²<https://eikon.thomsonreuters.com>.

³<https://fred.stlouisfed.org/series/NIKKEI225>.

⁴The choice of the starting point is such that it balances the tradeoff between the number of cryptocurrencies included in the study and the length of the time series for any reliable statistical inferences.

⁵Have not restricted equal trading days for cryptocurrencies and traditional assets to have returns series as close proxies to the reality for the statistical inferences for asymmetric return reversals and volatility dynamics.

⁶The continuously compounded rate of return offers several advantages as compared to arithmetic returns, including the approximating raw-log equality for short time periods, and the time-additivity. Moreover, it allows for a more reliable interpretation of the daily variation in

to render the price series stationary, the continuously compounded rate of returns are computed for each asset as shown in (1)⁶.

$$r_t = \ln(P_t) - \ln(P_{t-1}) \quad (1)$$

Where r_t is the return for each asset at date t , $\ln(P_t)$ is the natural logarithm of the closing price at date t , and $\ln(P_{t-1})$ is the natural logarithm of the closing price at the date, $t-1$. Table 2 presents the summary statistics of the return series for each cryptocurrency and financial asset. Evident from Table 2, cryptocurrencies portray extreme statistical features compared to traditional assets. The mean return for daily return series of all cryptocurrencies exhibits exceptional higher values than the traditional assets. However, cryptocurrencies display also an increasingly higher risk as evident from the values of the standard deviations. Moreover, the massive range between the maximum and minimum values for numerous cryptocurrencies and traditional assets also provides a flavour of the extreme price dynamics witnessed for the cryptocurrency market in comparison to the return series for traditional assets. The returns series under examination are non-normal as indicated by the skewness and kurtosis for all assets included in the paper, which are also indicated by the Jerque Barra statistics that exhibit statistical evidence against the null hypothesis for normality of the return series. As indicated by Table 2, the returns series for all assets exhibit statistical evidence against the null for a non-stationary series as observed by the Augmented Dickey-Fuller statistics. Evident from the weighted Ljung-Box test, indicate the presence of autocorrelation in the return and the squared return series for numerous digital and financial instruments.

Table 3 presents the preliminary result for the asymmetric reverting patterns of cryptocurrencies and traditional assets, by assessing the daily, two consecutive, three consecutive, and four consecutive positive and negative returns. As indicated by Panel A in Table 3, the asymmetry for the return series is not as uniform across all the cryptocurrencies. Bitcoin, for example, exhibits an asymmetry in the return series, as indicated by an additional number of consecutive positive returns in comparison to the number of negative returns. CRIX, also display the same asymmetry tendency, with several additional positive returns than negative returns. Interestingly, Ripple as one of the largest cryptocurrencies, measured by market capitalisation, displays a negative asymmetry relationship regarding additional negative returns over positive returns. The preliminary results for the asymmetry in the

financial returns and more readily comparable to the existing literature.

⁶Model 3, and 4 are presented in (3), and (4), respectively.

$$r_t = \mu + [\phi + \rho D_3(r_{t-1} < 0, r_{t-2} < 0, r_{t-3} < 0)] \cdot r_{t-1} + \varepsilon_t \quad (3)$$

$$r_t = \mu + [\phi + \rho D_4(r_{t-1} < 0, r_{t-2} < 0, r_{t-3} < 0, r_{t-4} < 0)] \cdot r_{t-1} + \varepsilon_t \quad (4)$$

⁸Similarly for Model 3 and 4, respectively. D_3 takes on value 1, only if r_{t-1} , r_{t-2} , and r_{t-3} are less than zero, and zero otherwise. D_4 takes on value 1, only if r_{t-1} , r_{t-2} , r_{t-3} , and r_{t-4} are less than zero, and zero otherwise.

return series indicate large differences between the return series for cryptocurrencies. Heterogeneity is also seen for numerous traditional assets for Panel B in Table 3, although the asymmetry relationship is marginally different. Equities, on the other hand, show a more pronounced asymmetry, and which are in line with Nam et al. (2006).

METHODOLOGY

Asymmetric Nonlinear Autoregressive Models (ANAR)—The Asymmetric Nonlinear Autoregressive Models (ANAR) models used in this paper represent refined versions of the conventional linear Autoregressive model to capture the asymmetry and nonlinearity in the return processes better. Model 1 that capture the asymmetry property of daily negative returns is presented in (2).

$$r_t = \mu + [\phi + \rho D_1(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t \quad (2)$$

Where r_t is the return at date, t . μ is the intercept. D_1 is an indicator function to represent a dummy variable that takes on value one, if r_{t-1} is less than zero. Otherwise, D_1 will take on a value of zero. $\phi + \rho D_1$ measure the serial correlation of a previously return and are restricted to be $|\phi + \rho D_1| < 1$ for the stationarity condition. ε_t represents a classical error term. Model 1 adjust the serial correlation in response to previous daily negative or positive returns, r_{t-1} . If $r_{t-1} < 0$. then the serial correlation is defined to be $\phi + \rho D_1$. If the return, $r_{t-1} > 0$, then the autocorrelation is only measured by ϕ . According to Nam et al. (2006), an asymmetric return reversal is present if $\rho < 0$, and it illustrates that a negative return will have a quicker and greater reverting magnitude, on average. To further explore the asymmetry and price dynamics in returns processes in response to a number of consecutive negative returns, Model 2, Model 3, and Model 4 are considered⁷. Model 2 is presented in (5).

$$r_t = \mu + [\phi + \rho D_2(r_{t-1} < 0, r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t \quad (5)$$

Where D_2 is dummy variables in model 2 and takes on value 1, only if r_{t-1} and r_{t-2} are less than zero, and zero otherwise⁸. To investigate an asymmetric reverting pattern for a substantial price change, model 5 is proposed and further shown in (6). The potential shock or overreaction is measured by -2σ , which is defined by a negative daily shock of less than negative two standard deviation for each asset. $D_{-2\sigma}$ takes on a value of 1 if $r_{t-1} < 0$, and zero otherwise.

$$r_t = \mu + [\phi + \rho D_{-2\sigma}] \cdot r_{t-1} + \varepsilon_t \quad (6)$$

Conditional Heteroscedasticity of Returns—Financial assets possess numerous stylize features that include volatility clustering and leptokurtosis of the return series (Mandelbrot, 1997). Additionally, the leverage effect that denotes the negatively correlated behaviour of price changes with changes in volatility is also commonly observed in financial time series data (Smith, 2016). The ARCH model by Engle (1982) and GARCH model by Bollerslev (1986) are capable of capturing the second moment of return dynamics, and are extensively used to model the volatility dynamics in financial time series data. The ordinary GARCH model has primarily been used in studies to analyses thick tails and volatility clustering since it addresses some of the drawbacks faced by a conventional ARCH model. However, the ordinary GARCH model possesses several limitations such as assuming that the positive and negative errors have a similar impact on volatility. Furthermore, it assumes that there are no asymmetric volatility shocks to the series, and the parameters in the model are therefore restricted to be non-negative to ensure a positive effect on the conditional variance (Nelson and Cao, 1992). To study the asymmetric response to the second moment of the return dynamics, the Exponential Generalized Autoregressive Conditional Heteroscedastic (EGARCH) model by Nelson (1991) will be used and is further shown in (7)⁹. The EGARCH model addresses especially two limitations faced by the standard GARCH model. First, it includes no artificial imposition of non-negative constraints. Secondly, it possesses the ability to capture the asymmetric relationship between volatility and returns (Brooks, 2014).

σ_t^2 for the EGARCH model in (7) denotes the conditional variance. α_j captures the sign effect, and if $\alpha_j \neq 0$, then the conditional variance evolves in a non-linear manner (Smith, 2016). If $\alpha_j < 0$, then negative standardised return innovations tend to generate higher volatility than an equal amount of positive standardised return innovations. Vice versa, if $\alpha_j > 0$, then positive standardised return innovations tend to generate higher conditional volatility, than negative returns. γ_j show the size effect and captures the effect of standardised return innovations on future conditional volatility. If $\gamma_j > 0$, it indicates that larger standardised return innovations have a greater impact on future volatility than smaller sized standardised return innovations. Furthermore, β_j measures the correlation of the volatility, and are used to describe the volatility clustering effect in the return series. Meaning, a larger (smaller) conditional volatil-

ity, is likely to be followed by larger (smaller) conditional volatility. According to Nam et al. (2006), studies show that empirical results are either economically or statistically sensitive to time-varying conditional heteroskedasticity dynamics. Hence, by incorporating the time-varying second order movement, it may lead to a more reliable interpretation of the empirical results. Therefore, estimation of the conditional mean equation with ANAR(1), and the conditional variance equation with EGARCH and EGARCH-M is carried out jointly in a single step with the maximisation of the likelihood function for better efficiency. The EGARCH-M model is included to capture the relation between future conditional volatility and expected returns. Hence, the contemporaneous volatility parameter is included in the conditional mean equation for the ANAR(1) models.

Model and Distributional Specification—Financial time series are usually not best described by a normal distribution (Zivot, 2009). Financial time series possess leptokurtosis with fatter tails. Besides, the distribution of the data is not always symmetric, but slightly skewed. Therefore, a conditional normal distributional assumption of the standardised return innovations may not necessarily be the most sufficient and optimal way to capture the second order of the return dynamics. Instead, a non-Gaussian conditional density with fatter tails, show to improve the estimation for the conditional variance of asymmetric GARCH models (Alberg et al., 2008). Cryptocurrencies that exhibit extreme statistical features may likewise be optimally modelled with a non-Gaussian parametric distribution. Furthermore, studies have identified various parametric distributional densities for the return series of cryptocurrencies that do not jointly fit all (Chu et al., 2017). Therefore, alternative parametric conditional distributions may be desirable for the estimation procedures of the standardised return innovations of cryptocurrencies¹⁰. The quasi-maximum likelihood estimation is carried out in the computer software R with the use of a “hybrid” numerical optimisation procedure to obtain the parameter values for the models¹¹. The model specification for the conditional distribution of the standardized innovations in the variance equation is based on 4 information criteria, and include the Akaike information criterion (AIC), the Bayesian information criterion (BIC), the Hannan-Quinn information criterion (HQIC), and the Shibata information criterion (SIC) to penalizing overfitted values and discriminate among

$$\log_e(\sigma_t^2) = \omega + \sum_{j=1}^q (\alpha_j z_{t-j} + \gamma_j (|z_{t-j}| - E|z_{t-j}|)) + \sum_{j=1}^p \beta_j \log_e(\sigma_{t-j}^2) \quad (7)$$

⁹In the empirical estimation, 10 parametric distributions are utilised, and these include the Normal Distribution (“norm”), the Generalized Error Distribution (“ged”), the Students t-distribution (“std”), and their skew variants (“snorm”), (“sged”), and (“sstd”) that are based on transformations outlined in Fernández and Steel (1998) and Ferreira and Steel (2006). Moreover, the rest of the distributions include the Generalized Hyperbolic Distribution (“ghyp”), the Normal Inverse Gaussian (“nig”), the Generalized Hyperbolic Skew Student’s t-distribution (“ghst”), and the Johnson’s reparametrized SU Distribution (“jsu”).

¹¹R is used in conjunction with the rugarch package by Ghalanos (2018)

the most appropriate models¹². The test for the statistical significance of the coefficients is determined with the robust standard error based on the method of White (1982), which produce asymptotically valid confidence intervals.

RESULTS & DISCUSSION

Table 4 presents the quasi-maximum likelihood estimation of the parameters estimates for Model 1 with the ANAR(1)-EGARCH(1, 1) specification. Indicated by Panel A in table 4, the returns for most cryptocurrencies possess a negative serial correlation, which suggests that one previously positive (negative) return is, on average, more likely to be followed by a negative (positive) return. There are only four cryptocurrencies that exhibit positive autoregressive coefficients. However, two are not statistically significant. CRIX is the only financial instrument that maintains a positive economic and statistically significant parameter of 0.0119, whereas XVG is not economically significant. Bitcoin, on the other hand, provides an insignificant statistical estimate of -0.0258 . For Panel B in table 4, neither of the positive estimates for traditional assets is statistically significant. Gold, GBP/USD, and S&P 500 are the only assets that possess statistically significant estimates of -0.062 , -0.1115 , and -0.0943 , respectively. Hence, the empirical results show that the daily reverting behaviour is more pronounced for cryptocurrencies compared to traditional assets.

Evident for Panel A in Table 4, there exist large differences concerning the sign, economic and statistical significance of the parameter estimates for ρ . The CRIX benchmark, which captures most of the price dynamics for the overall cryptocurrency market regarding size, present a negative and highly statistically significant estimate of -0.1448 at the 1% significance level. Bitcoin, on the other hand, shows a weakly statistically significant estimate of -0.1018 , and may, therefore, indicate a more considerable variation in the price dynamics for Bitcoin compared to the CRIX index. BCN, XCP, BLK, VIA, BLOCK and EAC exhibit positive economically and statistically significant estimates for ρ . Hence, the empirical results indicate distinct and heterogeneous dynamics of ρ for individual cryptocurrencies, and that the cryptocurrency market is not jointly

equal across all cryptocurrencies. Neither are the empirical results for mainstream asset classes. Panel B in Table 4 show that Gold and GBP/USD exhibit positive and statistically significant estimates of 0.0790 and 0.2118, respectively. Whereas Silver, USD/CHF, and S&P 500 provide negative and statistically significant estimates of -0.0778 , -0.0097 , and -0.0129 , respectively. These results indicate the disparity concerning the asymmetric return series across both cryptocurrencies and traditional asset classes.

For Panel A in Table 4, all the estimates for α of cryptocurrencies that portray statically significant estimates, are positive. Hence, the leverage effect identified for the stock market and return series for other financial assets, are not as pronounced for the cryptocurrency market. On the contrary, higher positive return shocks tend to generate more excessive future conditional volatility, although only a limited number of the cryptocurrencies exhibit statistically significant estimates. Bitcoin and CRIX for example, show positive and highly statistically significant estimates of 0.0743 and 0.0688, respectively. Moreover, the significant γ show that more substantial standardised innovation shocks tend to cause more significant impacts on future conditional volatility than smaller normalised innovations for most of the financial instruments in the paper. Estimates of the Traditional assets reported in Panel B for Table 4, on the other hand, tend to show results in line with the leverage effect. All the estimates that are significantly different from 0 are negative, except for gold that shows a positive and highly statically significant estimate of 0.0343. All the representatives for equities show negative and highly statistically significant estimates of α , which are in line with expectations. For γ , most estimates are positive and statically significant, expect for GBP/USD and USD/CHF. Whereas GBP/USD is positive and statistically insignificant, USD/CHF is negative and highly statistically significant.

Model 2, Model 3, and Model 4 are moreover reported in Table 5, Table 6, and Table 7, respectively. An interestingly feature shown by Model 2 in Table 5, compared to Model 1 in Table 4 for cryptocurrencies, indicate that all the statistically significant estimates of ρ in Table 4 are negative and economically signifi-

¹²These information criteria are furthermore defined in 8 to 11, respectively. The model selection process is based on looping through the various models and discriminate among the most appropriate order of the EGARCH and EGARCH-M, with the corresponding optimal conditional parametric distribution. Most of the models with the lowest information criterion posses order (1,1). For simplicity, the (1,1) order of the variance equation is presented in the Tables.

$$AIC = \frac{-2LL}{N} + \frac{2m}{N} \quad (8)$$

$$BIC = \frac{-2LL}{N} + \frac{2m \log_e(N)}{N} \quad (9)$$

$$HQIC = \frac{-2LL}{N} + \frac{2m \log_e(\log_e(N))}{N} \quad (10)$$

$$SIC = \frac{-2LL}{N} + \log_e\left(\frac{N+2m}{N}\right) \quad (11)$$

Where LL denotes the maximised Log Likelihood value of the likelihood function for the given model, N denotes the total number of observations, and m denotes the number of parameters for each model.

cant. Hence, it implies that two consecutive returns are more likely to revert for most cryptocurrencies than for one negative daily return. Bitcoin, for example, shows a stronger mean-reverting tendency in Model 2, compared to Model 1. The digital asset provides a weakly statistically significant estimate of -0.1018 for Model 1, and exhibit a high economic and a statically significant estimate of -0.1855 for Model 2. CRIX also provides an increase in economically and statistically significant, from -0.1448 for Model 1 to -0.2362 for Model 2. For traditional assets, on the other hand, results are somewhat more diverse. There are only two statistically significant estimates, and these represent the parameters for S&P500 and Nikkei 225. Table 6 for Model 3 also displays some interesting characteristics for the cryptocurrency market. Numerous cryptocurrencies that show positive and statistically significant estimates in Model 2 turn insignificant for Model 3. There is also evident from Table 6 that cryptocurrencies that were statistically significant in Table 5 become even more economically significant in Table 6 for Model 3 with three consecutive negative returns. For example, Bitcoin increases the reverting tendency by -0.1855 to -0.3029 , from Model 2 to Model 3, respectively. However, CRIX exhibit insignificant parameter estimate concerning three consecutive negative returns. Moreover, differences in the price dynamics are also evident for Model 4 with four consecutive negative returns. Interestingly, while CRIX is statistically insignificant for Model 3, it becomes highly statistically significant for Model 4. Hence, it may indicate that the cryptocurrency market is not uniform across all the return series, but instead, possess differences in return series characteristics across the different number of consecutive negative returns. Interestingly, Bitcoin shows an insignificant ϕ , but display a significant ρ across all models, which may indicate that negative returns for Bitcoin are likely to revert with quicker speed and magnitude. Consequently, it may provide an indication of the induced investor's sentiment that leads to specific pronounced asymmetric return patterns.

The overreaction hypothesis¹³ and the time-varying rational expectation hypothesis¹⁴ are among theories that have been proposed to explain the asymmetric reverting behaviour for the stock returns (Nam et al., 2001). The features of the EGARCH-M model allows for modelling future volatility dynamics with the expected return. Consequently, the model may be used to examine the risk-return relationship for the cryptocurrency market, and accordingly, the time-varying rational hypothesis reported for the stock market. Evident in Table 8 for Model 1, there are considerable differences among the sign, economic and statistical significance of δ for cryptocurrencies, and the param-

eter estimates exhibit no definite evidence for a mutual relation between future volatility and the expected return for the overall cryptocurrency market. Although, for most of the cryptocurrencies, the empirical results indicate a positive relationship between δ and expected returns. There are only three cryptocurrencies that show negative and statically significant parameters, and these are BAY, NLG, and BLOCK, compared to the thirteen cryptocurrencies that show positive and statistically significant estimates. Hence, most cryptocurrencies provide a positive risk and return relationship. Moreover, by comparing the estimates for ANAR(1)-EGARCH(1, 1) in Table 4 to Model 1 presented in Table 8 with the ANAR(1)-EGARCH-M(1, 1) estimates, there is evident that ρ becomes less pronounced economically and statistically for some cryptocurrencies that exhibit negative and statistically significant estimates of ρ in Table 4. Nevertheless, numerous cryptocurrencies exhibit positive δ with no statistical and economic estimates $\rho < 0$, which seem to corroborate on the time-varying ration expectation hypothesis. The effect is also seen for some of the traditional assets. FTSE 100 and S&P 500 show positive δ and positive ρ that further corroborate on the time-varying ration hypothesis, in addition to USD/CHF and USD/JPY. The effect becomes even less pronounced for some cryptocurrencies when dummy variables including two, three, and four consecutive returns are incorporated with the ANAR(1)-EGARCH-M(1,1) model. Although some cryptocurrencies still seem to exhibit positive δ in addition to not any economic and statistical estimates with $\rho < 0$ for a higher number of consecutive negative returns.

The estimation results indicate that the asymmetry in higher order consecutive returns for the overall cryptocurrency market may be partially associated with the intertemporal risk-return relation. Still, other cryptocurrencies provide strong evidence for the asymmetry property that implies that negative returns tend to revert quicker than positive returns, on average, and further corroborate on the overreaction and possible correction of any mispricing. The empirical results presented for cryptocurrencies may therefore not be sufficient to establish a link for the overall cryptocurrency market to any of the theories. Similarly, there are also large differences in the estimates concerning sign, economical and statistical significance with the corresponding number of consecutive negative returns to establish any link to either theory for all the traditional assets. In line with Corbet et al. (2017), the empirical results indicate considerable heterogeneity in the return series across individual cryptocurrencies. Nevertheless, the return series for a vast amount of single cryptocurrencies and a limited number of traditional assets possess

¹³Attributed to mispricing due to investors intentionally overreact to news

¹⁴The time-varying rational expectation hypothesis indicates that financial returns are due to investors rational revision for the future expectation of the intertemporal trade-off between changing risk and risk premium. Further, require a positive link between the future volatility and risk premium. If the time-varying rational expectation theory is an explanation for the asymmetry, then ρ should not be less than zero (Nam et al., 2006)

strong asymmetric reverting behaviour that becomes even more pronounced for higher consecutive negative returns. Therefore, assessing the daily price overreaction may be of interest. However, for Panel A in Table 10, the models do not indicate as sizeable reverting behaviour after a substantial price change for most cryptocurrencies. Interestingly, even though Bitcoin estimates are negative and statistically significant for models 1 to 4, it is not statistically significant for model 7. Neither is the estimate for CRIX, which does not provide any indication of a robust reverting behaviour after a substantial price change. However, Ripple shows a highly statistically significant estimate for the reverting pattern after one daily substantial price change, even though it shows no statistically significant estimates for the other models. Furthermore, it may indicate psychological differences among the investors' sentiment for various cryptocurrencies associated with a substantial price change. Nevertheless, some cryptocurrencies exhibit strong reverting pattern after a considerable price change, on average.

SUMMARY & CONCLUSION

This paper examines the daily asymmetric return reversals and volatility dynamics for cryptocurrencies and mainstream asset classes. The results for the period that covers the end of 2014 to June 2018 indicate a strong anti-persistence for the daily returns processes of approximately all cryptocurrencies in the sample. Whereas, the parameter estimates for traditional assets exhibit more disparity across models regarding economic and statistical significance. Moreover, the empirical results of numerous cryptocurrencies concerning the asymmetric reverting property, indicate the presence of strong asymmetric return reversal for negative returns. Furthermore, the parameter estimates become even more pronounced regarding economic and statistical significance for an additional number of consecutive negative return drops, although differences across single cryptocurrencies occur. However,

Bitcoin as the largest and best-known cryptocurrency, exhibit economic and statically significant estimates across all the ANAR(1)-EGARCH(1,1) models. The results presented in this paper also indicate the presence of an asymmetric reverting behaviour of the return series for some traditional assets. Moreover, the volatility dynamics for a limited number of cryptocurrencies show some interesting features. Even though the empirical results indicate highly economically and statistically significant volatility clustering effects for cryptocurrencies and traditional assets, the leverage effect that denotes the negatively correlated behaviour of financial price changes with changes in volatility, are not as pronounced for cryptocurrencies in comparison to most traditional assets. Hence, the asymmetric reverting property that implies that previously negative returns possess a quicker return reversal with greater magnitude than positive returns, cannot be entirely dissipated for all cryptocurrencies by the EGARCH-M model, which incorporate the correlation between future volatility and expected return. Hence, the empirical results exhibit different results regarding cryptocurrencies with some digital assets do seem to corroborate on this theory, while other exhibit results in line with strong asymmetric return reversals and overreaction and corrected mispricing. Moreover, a limited number of cryptocurrencies and mainstream economic and financial instruments exhibit the presence of a strong asymmetric reverting behaviour for a subsequent day, after a previous daily substantial price change. Thus, the results across all models indicate distinct differences in the return dynamics across all digital and financial instruments incorporated in the study. Hence, overall, the asymmetric return dynamics for the cryptocurrency market are likely heterogeneous across single cryptocurrencies and for the different number of consecutive negative returns. Nevertheless, the results in this paper indicate that numerous cryptocurrencies do possess a strong daily asymmetric reverting pattern after consecutive negative price drops.

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APPENDIX A: DATA

Table 1: Overview of Data

<i>Panel A: Cryptocurrencies</i>				
Number	Name	Abbreviation	Time period	Total No. Obs
1	Bitcoin	BTC	01.01.2015 - 07.06.2018	1254
2	Ripple	XRP	01.01.2015 - 07.06.2018	1254
3	Litecoin	LTC	01.01.2015 - 07.06.2018	1254
4	Dash	DASH	01.01.2015 - 07.06.2018	1254
5	BitShares	BTS	01.01.2015 - 07.06.2018	1254
6	Monero	XMR	01.01.2015 - 07.06.2018	1254
7	Bytecoin	BCN	01.01.2015 - 07.06.2018	1253
8	Stellar	XLM	01.01.2015 - 07.06.2018	1254
9	Dogecoin	DOGE	01.01.2015 - 07.06.2018	1254
10	MaidSafeCoin	MAID	01.01.2015 - 07.06.2018	1254
11	GameCredits	GAME	01.01.2015 - 07.06.2018	1254
12	DigiByte	DGB	01.01.2015 - 07.06.2018	1254
13	Nxt	NXT	01.01.2015 - 07.06.2018	1254
14	BitecoinDark	BTCD	01.01.2015 - 07.06.2018	1254
15	Syscoin	SYS	01.01.2015 - 07.06.2018	1254
16	Peercoin	PPC	01.01.2015 - 07.06.2018	1254
17	ReddCoin	RDD	01.01.2015 - 07.06.2018	1254
18	Storjcoin X	SJCX	01.01.2015 - 07.06.2018	1241
19	Verge	XVG	01.01.2015 - 07.06.2018	1254
20	Namecoin	NMC	01.01.2015 - 07.06.2018	1254
21	BitBay	BAY	01.01.2015 - 07.06.2018	1254
22	MonaCoin	MONA	01.01.2015 - 07.06.2018	1254
23	CloakCoin	CLOAK	01.01.2015 - 07.06.2018	1254
24	Counterparty	XCP	01.01.2015 - 07.06.2018	1254
25	BlackCoin	BLK	01.01.2015 - 07.06.2018	1254
26	Gulden	NLG	01.01.2015 - 07.06.2018	1254
27	Viacoin	VIA	01.01.2015 - 07.06.2018	1254
28	Burst	BURST	01.01.2015 - 07.06.2018	1254
29	Vertcoin	VTC	01.01.2015 - 07.06.2018	1254
30	Blocknet	BLOCK	01.01.2015 - 07.06.2018	1254
31	NavCoin	NAV	01.01.2015 - 07.06.2018	1254
32	EarthCoin	EAC	01.01.2015 - 07.06.2018	1197
33	Ubiq	UBQ	01.01.2015 - 07.06.2018	1243
34	CRyptocurrency IndeX	CRIX	01.01.2015 - 15.05.2018	1231
<i>Panel B: Traditional Assets</i>				
Number	Name	Abbreviation	Time period	Total No. Obs
35	Gold spot	XAU	01.01.2005 - 07.06.2018	893
36	Silver spot	XAG	01.01.2005 - 07.06.2018	893
37	WTI Crude spot	WTI	31.12.2014 - 07.06.2018	886
38	Brent Crude spot	BRT	31.12.2014 - 07.06.2018	874
39	EUR/USD spot	EUR/USD	01.01.2005 - 07.06.2018	896
40	GBP/USD spot	GBP/USD	01.01.2005 - 07.06.2018	896
41	USD/CHF spot	USD/CHF	01.01.2005 - 07.06.2018	896
42	USD/JPY spot	USD/JPY	01.01.2005 - 07.06.2018	896
43	FTSE 100	FTSE 100	31.12.2014 - 07.06.2018	868
44	S&P 500	S&P 500	31.12.2014 - 07.06.2018	865
45	FTSE Eurotop 100	FTSE.E 100	31.12.2014 - 07.06.2018	882
46	NI225	NI225	30.12.2014 - 07.06.2018	842

Notes: The Table presents an overview of all the assets, including Number, Name, Abbreviation, Time period, and the Total Number of Observations for each asset.

Table 2: Summary Statistics

<i>Panel A: Cryptocurrencies</i>											
Abbreviation	Mean	Med.	Std. dev.	Max	Min	Skew.	Kurt.	JB	ADF	LB(12)	LB ² (12)
BTC	0.26	0.25	4.04	22.51	-23.76	-0.41	8.61	1685.21***	-10.02***	16.10	213.40***
XRP	0.27	-0.35	7.39	102.74	-61.63	3.12	44.94	94172.49***	-9.01***	46.79***	184.04***
LTC	0.30	0.00	6.21	51.03	-51.39	0.71	17.02	10405.71***	-10.52***	35.73***	79.75***
DASH	0.41	-0.12	6.12	43.77	-24.32	0.88	8.62	1821.26***	-9.93***	14.33	94.08***
BTS	0.21	-0.19	7.95	52.00	-39.17	0.91	10.15	2856.87***	-10.01***	26.82***	143.18***
XMR	0.47	0.00	7.28	58.46	-32.54	0.92	9.78	2585.19***	-10.09***	42.91***	148.86***
BCN	0.53	0.00	12.57	159.78	-91.03	3.39	45.00	94740.90***	-11.17***	55.25***	67.15***
XLM	0.32	-0.32	8.29	72.31	-36.64	2.06	18.90	14134.55**	-9.50***	28.44***	333.61***
DOGE	0.24	0.00	6.61	51.83	-49.29	0.81	15.36	8144.34***	-10.55***	14.12	145.98***
MAID	0.17	0.15	7.05	34.31	-37.94	-0.04	5.87	434.52***	-10.70***	25.21**	79.38***
GAME	0.61	-0.19	12.53	109.57	-65.31	1.52	16.07	9432.75***	-10.56***	27.40***	164.30***
DGB	0.53	-0.32	10.66	116.56	-43.04	2.44	24.18	24755.87***	-10.34***	7.02	44.33***
NXT	0.17	-0.55	8.20	58.81	-60.08	0.56	13.13	5446.97***	-9.28***	26.04**	215.88***
BTCD	0.32	0.07	10.94	171.02	-89.58	2.76	59.03	166054.95***	-10.30***	66.56***	102.80***
SYS	0.52	-0.19	11.34	138.63	-110.09	1.18	30.31	39366.09***	-10.59***	82.44***	227.43***
PPC	0.09	-0.11	6.47	40.52	-36.78	0.23	9.12	1977.78**	-10.94***	11.49	119.11***
RDD	0.41	0.00	15.33	146.41	-155.64	0.80	24.83	25104.02***	-10.97***	108.06***	161.13***
SJCX	0.23	0.03	11.64	134.28	-129.29	1.10	40.95	74913.28***	-12.12***	49.39***	28.90***
XVG	0.73	0.00	18.24	191.69	-69.31	1.32	15.19	8152.32***	-10.33***	107.75***	50.32***
NMC	0.07	-0.22	7.14	70.56	-49.44	0.79	17.99	11911.42***	-11.01***	26.29***	94.12***
BAY	0.42	0.00	11.63	103.57	-90.55	0.58	14.12	6555.34***	-11.20***	42.72***	171.16***
MONA	0.38	-0.24	8.55	85.22	-53.49	1.88	19.76	15466.84***	-10.50***	26.34***	292.50***
CLOAK	0.56	0.09	15.23	131.79	-102.94	1.15	15.59	8587.04***	-10.89***	54.23***	324.90***
XCP	0.09	-0.53	9.57	81.72	-38.46	1.03	9.89	2716.68***	-10.68***	42.77***	27.17***
BLK	0.15	-0.18	7.84	80.33	-44.72	1.39	18.05	12271.22***	-10.71***	18.04	65.95***
NLG	0.32	-0.33	8.60	52.09	-55.06	0.59	11.03	3456.25***	-9.39***	51.22***	281.13***
VIA	0.30	-0.34	10.61	75.97	-42.46	0.81	7.64	1265.59***	-11.61***	23.80**	49.68***
BURST	0.32	0.00	10.02	92.38	-47.90	0.86	11.50	3940.91***	-10.90***	16.75	51.15***
VTC	0.35	-0.44	10.84	87.77	-59.71	1.35	12.43	5045.11***	-10.24***	20.77*	373.26***
BLOCK	0.52	-0.10	14.21	106.03	-87.37	0.28	10.53	2993.43***	-11.08***	44.76***	85.41***
NAV	0.56	-0.34	13.99	205.25	-151.26	2.26	53.28	133480.84***	-10.78***	79.95***	256.94***
EAC	0.31	0.00	16.32	236.80	-142.33	2.70	50.82	115842.69***	-10.20***	70.70***	135.17***
UBQ	0.40	-0.14	12.65	75.42	-206.90	-3.35	64.71	200085.33***	-11.12***	39.92***	6.78
CRIX	0.31	0.33	3.99	19.85	-25.33	-0.81	9.73	2469.34***	-9.54***	19.59*	217.17***

<i>Panel B: Traditional Assets</i>											
Abbreviation	Mean	Med.	Std. dev.	Max	Min	Skew.	Kurt.	JB	ADF	LB(12)	LB ² (12)
XAU	0.01	0.02	0.81	4.69	-3.38	0.20	5.60	260.65***	-9.47***	17.09	21.24**
XAG	0.01	0.00	1.35	5.45	-6.98	-0.21	5.51	242.54***	-9.99***	13.95	9.03
WTI	0.02	0.06	2.83	18.32	-10.76	0.45	7.08	648.03***	-9.32***	347.55***	1325.48***
BRT	0.03	0.00	2.42	9.99	-8.39	0.41	4.52	109.63***	-9.59***	8.59	95.57***
EUR/USD	0.00	-0.01	0.58	3.04	-2.40	0.16	5.06	163.77***	-10.13***	6.42	66.14***
GBP/USD	-0.02	0.00	0.65	3.03	-8.41	-2.38	34.87	38917.35***	-9.52***	10.63	34.55***
USD/CHF	0.00	0.03	0.80	2.53	-17.14	-11.03	237.57	2079475.76***	-15.80***	29.50***	0.94
USD/JPY	-0.01	-0.01	0.60	2.22	-3.78	-0.65	7.30	758.03***	-9.79***	14.10	42.78***
FTSE 100	0.02	0.05	0.91	3.51	-4.78	-0.17	5.58	247.81***	-10.11***	25.23**	431.91***
S&P 500	0.03	0.03	0.82	3.83	-4.18	-0.61	6.59	520.96***	-10.71***	14.89	359.41***
FTSE.E 100	0.01	0.03	1.05	4.21	-6.66	-0.42	7.10	647.07***	-10.08***	22.39**	307.47***
NI225 225	0.03	0.07	1.31	7.43	-8.25	-0.28	9.30	1411.22***	-9.21***	10.09	146.09***

Notes: The Table presents the summary statistics, which include the Mean, Median, Standard deviation, Maximum value, Minimum value, Skewness, Kurtosis, Jarque-Bera statistics, Augmented-Dickey-Fuller statistics, Ljung-Box test for 12 lags of returns, and Ljung-Box test for 12 lags of squared returns, respectively. The mean, median, and Standard deviation are in %. ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 3: Consecutive Returns

<i>Panel A: Cryptocurrencies</i>									
Abbreviation	Returns	1+	1-	2+	2-	3+	3-	4+	4-
BTC	1253	705	546	385	229	200	89	102	32
XRP	1253	562	690	266	394	132	226	71	122
LTC	1253	595	593	264	258	107	113	45	39
DASH	1253	596	632	276	303	121	143	53	66
BTS	1253	602	646	269	317	137	152	76	70
XMR	1253	627	620	299	291	131	130	58	53
BCN	1252	521	523	188	187	73	71	31	24
XTM	1253	572	674	237	339	94	173	35	86
DOGE	1253	578	599	244	254	117	107	58	43
MAID	1253	641	611	302	272	137	126	58	53
GAME	1253	607	633	290	318	131	161	55	77
DGB	1253	579	630	242	297	103	138	45	54
NXT	1253	565	688	239	363	113	189	52	88
BTCD	1253	631	591	300	257	145	103	75	34
SYS	1253	610	638	281	308	133	145	65	65
PPC	1253	596	644	257	306	107	134	44	52
RDD	1253	536	540	170	182	56	68	22	30
SJCX	1240	622	613	281	272	115	112	47	41
XVG	1253	495	514	156	174	65	58	33	20
NMC	1253	572	663	243	336	98	164	38	76
BAY	1253	613	623	259	271	115	108	55	39
MONA	1253	591	659	262	329	121	159	55	71
CLOAK	1253	630	620	293	283	130	121	50	59
XCP	1253	580	651	237	307	95	136	39	53
BLK	1253	598	655	246	302	96	125	36	41
NLG	1253	594	656	260	323	124	154	65	70
VIA	1253	600	646	269	315	121	141	62	61
BURST	1253	615	612	282	280	127	125	57	57
VTC	1253	580	670	254	344	106	173	45	89
BLOCK	1253	623	630	285	292	139	127	70	56
NAV	1253	596	649	248	302	92	135	31	52
EAC	1196	492	548	178	219	71	85	30	30
UBQ	1242	605	626	250	273	96	113	35	52
CRIX	1230	715	514	410	210	238	89	141	33

<i>Panel B: Traditional Assets</i>									
Abbreviation	Returns	1+	1-	2+	2-	3+	3-	4+	4-
XAU	887	448	439	222	213	121	103	67	52
XAG	887	438	439	210	213	96	103	41	54
WTI	857	438	416	218	195	107	97	46	51
BRT	867	429	432	213	216	106	111	54	59
EUR/USD	890	441	448	213	219	98	101	45	42
GBP/USD	890	441	442	220	221	107	112	51	55
USD/CHF	890	460	418	231	192	116	84	52	36
USD/JPY	890	437	449	205	215	92	107	41	55
FTSE 100	862	454	407	250	203	132	95	71	42
S&P 500	859	451	407	218	173	103	67	46	26
FTSE.E 100	876	448	428	227	206	115	96	60	43
NI225	836	448	388	245	185	131	81	70	38

Notes: The Table presents the preliminary data for the number of consecutive daily returns of either sign. Returns denote the number of returns for each asset. 1+ and 1- represents the total number of positive and negative consecutive returns, respectively. 2+ and 2- represents the total number of two positive and two consecutive negative returns, respectively. 3+ and 3- represents the total number of three positive and three consecutive negative returns, respectively. 4+ and 4- represents the total number of four positive and four consecutive negative returns, respectively.

APPENDIX B: RESULTS

Table 4: Model 1 ANAR(1)-EGARCH(1,1)

<i>Panel A: Cryptocurrencies</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0011***	-0.0258	-0.1018*	-0.0821	0.0743***	0.9882***	0.2870***	-0.1022*	0.3842***	2631.53
XRP	nig	-0.0013	-0.0073	-0.0236	-0.6587	-0.0249	0.8894***	0.5146**	0.1832**	0.2550***	2189.65
LTC	jsu	0.0008	-0.1096***	-0.0150	-0.0504	0.0706	0.9928***	0.1974	0.0748	0.8668***	2341.91
DASH	jsu	-0.0002	0.0267	-0.1890**	-0.4411***	-0.0195	0.9244***	0.4069***	0.3015***	1.3031***	1972.79
BTS	jsu	-0.0002	-0.1203***	0.0671	-0.1485*	0.0334	0.9729***	0.2434***	0.1487***	1.1975***	1728.55
XMR	sstd	0.0000	0.0118	-0.1972**	-0.3979***	0.0845***	0.9253***	0.3407***	1.1146***	3.4533***	1711.69
BCN	ged	0.0000	-0.1883***	0.1883***	0.1704	0.0577	0.9747***	1.0649		0.1081	1441.19
XLM	jsu	-0.0022***	-0.1323***	-0.0730*	-0.3441**	0.0341	0.9379***	0.3641***	0.2349***	1.1365***	1805.30
DOGE	nig	-0.0009	-0.0914***	-0.1032***	-0.1851***	0.0497*	0.9700***	0.3638***	0.1398**	0.5478***	2151.15
MAID	jsu	-0.0004	-0.0997**	-0.0646	-0.3329**	0.0022	0.9384***	0.2512***	-0.0717	1.4096***	1670.65
GAME	nig	0.0051	-0.0987	0.0041	-0.1184***	0.0039	0.9740***	0.2119***	0.2304***	0.6064***	1163.69
DGB	sstd	-0.0007	-0.0643	-0.0619	-0.1359***	0.0485*	0.9723***	0.1925***	1.1640***	3.4341***	1390.53
NXT	std	-0.0050**	-0.1163*	0.0130	-0.2234**	0.0025	0.9576***	0.3757***		3.1746***	1737.21
BTCD	std	0.0020	-0.1620**	0.0314	-0.6825**	0.0592	0.8575***	0.3049**		3.0574***	1421.09
SYS	jsu	0.0061*	-0.1758***	0.0370	-0.5960***	0.0602	0.8729***	0.3216***	0.3445***	1.2674***	1279.45
PPC	nig	-0.0021	-0.0459	-0.1079	-0.1371***	0.0628***	0.9768***	0.2335***	0.1261**	0.5369***	1960.27
RDD	std	-0.0101*	-0.1744***	-0.2629***	-0.2122***	0.0171	0.9492***	0.2290***		4.3809***	895.66
SJCX	std	-0.0030	-0.1333	-0.0185	-0.4528	-0.0414	0.9013***	0.3442***		2.7575***	1396.79
XVG	ged	0.0000	0.0000**	-0.0001**	-0.0092	0.1958	0.9538***	1.0200		0.1471***	1059.77
NMC	nig	-0.0016	-0.1003*	-0.0632	-0.2273***	0.0571*	0.9603***	0.3183***	0.1534**	0.3506***	1950.80
BAY	sstd	-0.0027	-0.0733***	-0.2127***	-0.4325***	0.0700**	0.9044***	0.3010***	1.0944***	4.0890***	1151.15
MONA	jsu	-0.0028**	-0.0413**	-0.1665***	-0.5124***	0.0753**	0.9070***	0.5700***	0.1362**	1.1806***	1805.32
CLOAK	ghst	0.0028	-0.1587***	-0.0219	-0.3245***	0.0361	0.9198***	0.2891***	0.4091***	4.9456***	831.00
XCP	sstd	0.0041*	-0.1940***	0.0648*	-0.1096***	0.0486**	0.9773***	0.1188*	1.2288***	4.3988***	1338.93
BLK	nig	0.0020***	-0.2377***	0.1464***	-0.1960**	0.0350	0.9648***	0.2600***	0.1453***	0.4376***	1785.42
NLG	jsu	0.0029	-0.1166***	-0.0164	-1.6008***	0.0622	0.6877***	0.4976**	0.3010***	1.2169***	1578.32
VIA	jsu	0.0095**	-0.1933***	0.1869**	-0.3760***	0.0605**	0.9191***	0.2742***	0.3851***	1.4349***	1199.14
BURST	nig	0.0012	-0.0822**	-0.0866*	-0.7460***	0.0304	0.8445***	0.4250***	0.1454***	0.7611***	1316.37
VTC	nig	-0.0024	-0.0261	-0.1491***	-0.4443***	0.1167***	0.9073***	0.3316***	0.2399***	0.6119***	1342.09
BLOCK	sstd	0.0115***	-0.2053***	0.0852**	-0.5133	0.1644**	0.8732***	0.2838**	1.1454***	3.7740***	900.86
NAV	nig	0.0012	-0.1190	-0.1286	-0.5732***	0.0268	0.8707***	0.3998***	0.2932***	0.6803***	1117.56
EAC	ged	0.0000	-0.2476***	0.2476***	-0.1875	0.0011	0.9558***	0.5525		0.6158***	1244.46
UBQ	sstd	-0.0031***	-0.0889***	-0.2487***	-0.5301***	0.0682**	0.8825***	0.3350***	1.0846***	3.5981***	1171.98
CRIX	nig	0.0010	0.0119**	-0.1448***	-0.1325	0.0688***	0.9808***	0.3241	-0.1549***	0.4014***	2639.53

<i>Panel B: Traditional Assets</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0004	-0.0620***	0.0790***	-0.1089***	0.0343***	0.9889***	0.0596***		5.8936***	3073.58
XAG	ged	-0.0002***	0.0071	-0.0778***	-0.0045***	0.0200	0.9996***	0.0180***		1.1597***	2628.60
WTI	std	-0.0006	0.0046	-0.1607	-0.1532***	-0.0850***	0.9802***	0.1372***		17.5327	2085.76
BRT	ged	-0.0004	0.0673	-0.0827	-0.0577***	-0.0585***	0.9925***	0.0303***		1.5900***	2072.06
EUR/USD	std	0.0003	-0.0896	0.1703	-0.0387***	-0.0171	0.9963***	0.0361***		8.8661***	3393.02
GBP/USD	std	0.0003	-0.1155**	0.2118**	-0.7115***	0.0118	0.9309***	0.1414		5.6607***	3362.00
USD/CHF	sstd	-0.0001***	-0.0006	-0.0097***	-0.0174***	-0.0590***	0.9984***	-0.0181***	0.8692***	5.4090***	3425.94
USD/JPY	ghst	-0.0003	0.0030	-0.0605	-0.2438***	-0.0255	0.9764***	0.1134***	-0.3024**	5.3494***	3387.35
FTSE 100	nig	-0.0002	0.0512	-0.0193	-0.4490***	-0.1893***	0.9534***	0.1566***	-0.2224***	2.6312***	2990.41
S&P 500	ged	0.0004***	-0.0943***	-0.0129**	-0.6724***	-0.2233***	0.9331***	0.2238***		1.1860***	3107.04
FTSE.E 100	std	0.0000	0.0473	0.0059	-0.3121***	-0.1835***	0.9675***	0.1580***		8.3755***	2950.12
NI225	jsu	-0.0004	0.0868	-0.1728	-0.7449***	-0.2266***	0.9176***	0.1757***	-0.2696**	1.5419***	2640.88

Notes: The Table present the empirical results for Model 1 with ANAR(1)-EGARCH(1,1) specification. ANAR(1) is specified as $r_t = \mu + [\phi + \rho D_1(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_1 takes a value of 1, only if $r_{t-1} < 0$, and 0 otherwise. EGARCH(1, 1) is specified as $\log_e(\sigma_t^2) = \omega + \alpha_1 z_{t-1} + \gamma_1 (|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log_e(\sigma_{t-1}^2)$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 5: Model 2 ANAR(1)-EGARCH(1,1)

<i>Panel A: Cryptocurrencies</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0013***	-0.0397	-0.1855**	-0.0696	0.0798***	0.9901***	0.2649***	-0.1047*	0.3863***	2634.44
XRP	nig	-0.0012	-0.0190	-0.0010	-0.6388	-0.0251	0.8928***	0.5042**	0.1792**	0.2523***	2189.26
LTC	jsu	0.0007	-0.1048**	-0.0707	-0.0462*	0.0752*	0.9935***	0.1901*	0.0732*	0.8620	2344.88
DASH	jsu	0.0010***	-0.0108	-0.1892**	-0.3998***	-0.0212	0.9315***	0.3835***	0.3029***	1.3096***	1974.33
BTS	jsu	-0.0009	-0.0940***	0.0338	-0.1525*	0.0355	0.9721***	0.2485***	0.1487***	1.1955***	1727.22
XMR	sstd	0.0017	-0.0458	-0.1560**	-0.3917***	0.0797***	0.9271***	0.3268***	1.1052***	3.5394***	1709.24
BCN	ghst	0.0065***	-0.2196***	-0.0439	-0.3330***	0.0422	0.9226***	0.2868***	0.3194***	4.1354***	1283.59
XLM	jsu	-0.0020	-0.1427***	-0.1531	-0.3121**	0.0326	0.9436***	0.3440***	0.2285	1.1285***	1807.32
DOGE	nig	-0.0002	-0.1405***	-0.0183	-0.1892***	0.0478*	0.9694***	0.3590***	0.1277**	0.5429***	2150.23
MAID	jsu	0.0008	-0.1287***	0.0049	-0.3486*	0.0002	0.9355***	0.2589***	-0.0741	1.4103***	1669.35
GAME	nig	0.0043	-0.0834**	-0.0539	-0.1167***	0.0065	0.9744***	0.2097***	0.2323***	0.6022***	1164.40
DGB	sstd	-0.0004	-0.0730*	-0.1075	-0.1312***	0.0492**	0.9733***	0.1864***	1.1624***	3.4232***	1390.11
NXT	nig	-0.0025	-0.0855***	-0.1050	-0.2343**	0.0026	0.9576***	0.3419***	0.2556***	0.6395***	1749.41
BTCD	std	0.0005***	-0.1265***	-0.0794	-0.6951**	0.0609	0.8550***	0.3066***		3.0591***	1420.19
SYS	jsu	0.0043	-0.1515***	-0.0609	-0.5998***	0.0612	0.8721***	0.3297***	0.3358***	1.2649***	1281.44
PPC	nig	-0.0016	-0.0616*	-0.1287**	-0.1366***	0.0622***	0.9770***	0.2264***	0.1223**	0.5391***	1963.00
RDD	std	-0.0028***	-0.2725***	-0.2406***	-0.2017***	0.0238	0.9516***	0.2184***		4.3237***	894.41
SJCX	std	-0.0037**	-0.1196***	-0.1228*	-0.4682	-0.0428	0.8974***	0.3512***		2.7254***	1400.32
XVG	ged	0.0000	-0.1804***	-0.2010***	-0.6797	0.0609	0.7980***	0.5326*		0.6131***	687.02
NMC	nig	-0.0019	-0.0872	-0.1653	-0.2155*	0.0585*	0.9623***	0.3110***	0.1576**	0.3433***	1955.55
BAY	std	-0.0023	-0.1274***	-0.2572***	-0.4751**	0.0621*	0.8952***	0.3072***		3.9010***	1150.78
MONA	jsu	-0.0019**	-0.0856***	-0.1692***	-0.5212***	0.0697**	0.9057***	0.5576***	0.1201**	1.1810***	1804.32
CLOAK	ghst	0.0030	-0.1550***	-0.0635	-0.3230***	0.0406	0.9199***	0.2830***	0.4174***	4.9196***	833.04
XCP	sstd	0.0027	-0.1702***	0.0240	-0.1130	0.0502	0.9765***	0.1257	1.2268***	4.3532***	1337.86
BLK	nig	0.0006	-0.1567***	-0.0143	-0.2242***	0.0447***	0.9593***	0.2880***	0.1675***	0.4312***	1784.15
NLG	jsu	0.0024***	-0.1019***	-0.1177***	-1.5740***	0.0727	0.6926***	0.4860***	0.2993***	1.2123***	1579.57
VIA	jsu	0.0044***	-0.0871	-0.0426	-0.4002***	0.0668**	0.9131***	0.3006***	0.3990***	1.4200***	1197.37
BURST	nig	0.0009	-0.0797**	-0.1882**	-0.7345***	0.0342	0.8470***	0.4184***	0.1378**	0.7467***	1319.32
VTC	nig	-0.0005***	-0.0716***	-0.0995***	-0.4372***	0.1102***	0.9091***	0.3186***	0.2359***	0.6074***	1342.05
BLOCK	sstd	0.0083***	-0.1522***	-0.0221	-0.5074	0.1658**	0.8741***	0.2937**	1.1466***	3.7374***	899.29
NAV	nig	0.0038	-0.1583***	-0.0678	-0.5588***	0.0233	0.8742***	0.3843***	0.2853***	0.6742***	1117.75
EAC	nig	-0.0032**	-0.1534***	-0.2784***	-0.1504**	0.0221	0.9681***	0.4448***	0.1464***	0.3072***	1242.83
UBQ	std	-0.0015	-0.1672***	-0.2116**	-0.4889***	0.0614**	0.8921***	0.3149***		3.6091***	1167.93
CRIX	nig	0.0012	-0.0164	-0.2362***	-0.1127	0.0743	0.9837***	0.3030**	-0.1745***	0.3932***	2642.73

<i>Panel B: Traditional assets</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0002	-0.0354	0.0463	-0.1100***	0.0351***	0.9887***	0.0608***		5.7985***	3070.74
XAG	ged	-0.0001*	-0.0043	-0.0965	-0.0036***	0.0177	0.9997***	0.0194***		1.1597***	2627.13
WTI	std	0.0005	-0.0700	0.0134	-0.1299***	-0.0885***	0.9832***	0.1377***		16.9644	2083.58
BRT	ged	0.0004	0.0217	0.0252	-0.0487***	-0.0591***	0.9937***	0.0338***		1.5771***	2068.97
EUR/USD	std	-0.0001	-0.0015	-0.0338	-0.0423***	-0.0166	0.9960***	0.0359***		8.8104***	3387.90
GBP/USD	std	-0.0001	-0.0182	0.0258	-0.9774***	0.0230	0.9050***	0.1745***		5.7917***	3356.09
USD/CHF	sstd	-0.0002***	-0.0125	-0.0138	-0.0264***	-0.0570***	0.9975***	-0.0162***	0.8672***	5.9042***	3422.01
USD/JPY	jsu	-0.0002	0.0068	-0.1154	-0.2141***	-0.0253	0.9794***	0.1060***	-0.2279**	1.6271***	3384.69
FTSE 100	nig	-0.0003	0.0724*	-0.1170	-0.4279***	-0.1814***	0.9557***	0.1491***	-0.2057***	2.5535***	2988.65
S&P 500	nig	0.0002	-0.0573	-0.1923*	-0.6398***	-0.2093***	0.9360***	0.2196***	-0.1577**	1.4874***	3107.16
FTSE.E 100	sstd	-0.0002	0.0664	-0.1115	-0.3391*	-0.1773***	0.9645***	0.1653	0.9281***	8.2301*	2949.02
NI225	std	0.0002	0.0767	-0.2841**	-0.7185***	-0.2354***	0.9217***	0.1882***		4.6727***	2640.45

Notes: The Table present the empirical results for Model 2 with ANAR(1)-EGARCH(1,1) specification. ANAR(1) is specified as $r_t = \mu + [\phi + \rho D_2(r_{t-1} < 0, r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_2 takes a value of 1, only if $r_{t-1} < 0$ and $r_{t-2} < 0$, and 0 otherwise. EGARCH(1,1) is specified as $\log \sigma_t^2 = \omega + \alpha_1 z_{t-1} + \gamma_1 (|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log \sigma_{t-1}^2$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 6: Model 3 ANAR(1)-EGARCH(1,1)

<i>Panel A: Cryptocurrencies</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0014**	-0.0399	-0.3029***	-0.0569**	0.0876***	0.9920**	0.2410***	-0.1044*	0.3687***	2641.63
XRP	jsu	-0.0024**	-0.0102	-0.0803	-0.5957	-0.0370	0.8974***	0.5553**	0.0778	0.9227***	2191.20
LTC	jsu	0.0008	-0.1010***	-0.1774**	-0.0451	0.0808	0.9935***	0.1889*	0.0729	0.8501***	2348.93
DASH	jsu	0.0014	-0.0314	-0.2033*	-0.4088***	-0.0253	0.9299**	0.3919**	0.2865***	1.2941***	1972.47
BTS	jsu	-0.0011	-0.0895**	0.0197	-0.1499*	0.0355	0.9725***	0.2478***	0.1468**	1.1899***	1726.54
XMR	sstd	0.0023*	-0.0560**	-0.2876***	-0.3788***	0.0873***	0.9292**	0.3169***	1.1075***	3.473***	1711.40
BCN	ghst	0.0070**	-0.2247***	0.0317	-0.3367***	0.0416	0.9235***	0.2678***	0.3427***	4.1911***	1282.74
XLM	jsu	-0.0018	-0.1504***	-0.2075***	-0.3051**	0.0330	0.9449***	0.3358**	0.2261***	1.1198***	1807.47
DOGE	nig	-0.0002	-0.1361***	-0.0951***	-0.1873***	0.0477*	0.9697***	0.3589***	0.1297***	0.5386***	2150.03
MAID	std	0.0014***	-0.1226***	-0.0628	-0.3554*	0.0050	0.9338***	0.2631***		4.1239***	1669.33
GAME	nig	0.0045	-0.0753*	-0.1885**	-0.1112***	0.0111	0.9755***	0.2027***	0.2555***	0.6300***	1169.72
DGB	sstd	-0.0005	-0.0695	-0.2567**	-0.1342***	0.0495**	0.9727***	0.1909***	1.1684***	3.4326***	1391.80
NXT	nig	-0.0020	-0.1007***	-0.0961	-0.2410**	0.0011	0.9564***	0.3461***	0.2545***	0.6334***	1748.41
BTCD	sstd	0.0031	-0.1354***	-0.0895	-0.6984**	0.0642	0.8539***	0.3105***	1.066***	3.071***	1421.37
SYS	jsu	0.0043	-0.1390***	-0.1583**	-0.6126***	0.0645*	0.8692**	0.3368***	0.3487***	1.271***	1284.13
PPC	nig	-0.0014	-0.0691**	-0.1883***	-0.1332***	0.0640***	0.9776**	0.2184***	0.1168**	0.5425***	1963.92
RDD	std	0.0004	-0.3031***	0.0110	-0.2171***	0.0169	0.9477***	0.2323***		4.3207***	889.88
SJCX	sstd	-0.0014	-0.1240***	-0.3082***	-0.4771	-0.0226	0.8971***	0.3435***	1.0600***	2.8055***	1403.46
XVG	ged	0.0000	-0.1572***	-0.0445***	-0.6529	0.0464	0.8071***	0.5200		0.6164***	683.83
NMC	nig	-0.0013	-0.1128***	-0.1553*	-0.2336***	0.0552*	0.9592***	0.3178***	0.1526**	0.3482***	1953.21
BAY	std	-0.0005	-0.1552***	-0.2436**	-0.4771**	0.0543	0.8946**	0.3130***		3.9364***	1147.35
MONA	std	-0.0030*	-0.0968**	-0.2509***	-0.5010***	0.0715	0.9064***	0.6093***		3.0338***	1801.39
CLOAK	ghst	0.0050	-0.1771***	0.0985	-0.3140***	0.0449	0.9219***	0.2789***	0.4337***	4.9095***	834.99
XCP	sstd	0.0018	-0.1571	-0.0719	-0.1139	0.0480	0.9764	0.1308	1.2241	4.3535	1336.56
BLK	nig	0.0006	-0.1470***	-0.1053*	-0.2360**	0.04390	0.9570***	0.2976***	0.1767***	0.4227***	1785.21
NLG	jsu	0.0022	-0.1039	-0.2823	-1.5033**	0.0845	0.7062***	0.4628***	0.2842	1.1996***	1582.58
VIA	jsu	0.0040	-0.0794**	-0.1474	-0.3966***	0.0671**	0.9139**	0.2966***	0.3962***	1.4212***	1198.00
BURST	nig	0.0024	-0.1110***	-0.1356	-0.7475***	0.0265	0.8441***	0.4261***	0.1354**	0.7413***	1315.70
VTC	nig	0.0000	-0.0876***	-0.0872	-0.4273***	0.1104***	0.9113**	0.3109**	0.2333***	0.6105***	1341.11
BLOCK	sstd	0.0087***	-0.1580***	0.0056	-0.4937	0.1654**	0.8775**	0.2876**	1.1435***	3.7379***	898.10
NAV	nig	0.0033	-0.1535***	-0.2001	-0.5778***	0.0163	0.8701***	0.3978***	0.2828***	0.6831***	1118.01
EAC	nig	-0.0026***	-0.1702***	-0.3202***	-0.1454**	0.0162	0.9693**	0.4356**	0.1507***	0.3182***	1243.64
UBQ	sstd	0.0026	-0.1817***	-0.1797	-0.5501***	0.0611**	0.8781**	0.3217***	1.0774**	3.5868**	1167.50
CRIX	nig	0.0013*	-0.0242	-0.3228	-0.1096	0.0764***	0.9842**	0.2978	-0.1755	0.3874**	2646.55

<i>Panel B: Traditional assets</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0001	-0.0265	0.0175	-0.1056***	0.0336***	0.9892***	0.0610***		5.7734***	3067.86
XAG	ged	0.0000	-0.0251	-0.0701	-0.0065***	0.0167	0.9993***	0.0198***		1.1490***	2624.65
WTI	std	0.0006	-0.0755*	0.0818	-0.1289**	-0.0888***	0.9833***	0.1410***		16.8545	2082.91
BRT	ged	0.0003	0.0331	-0.0299	-0.0495***	-0.0571***	0.9936**	0.0360***		1.5958***	2070.12
EUR/USD	std	-0.0001	0.0035	-0.1599	-0.0432***	-0.0161	0.9959**	0.0370***		8.7802***	3384.61
GBP/USD	std	-0.0002**	0.0157	-0.2356***	-1.1158***	0.0345	0.8916**	0.1784***		5.6426***	3354.66
USD/CHF	sstd	-0.0002***	-0.0244	0.0540***	-0.0231***	-0.0593***	0.9978**	-0.0194***	0.8737	5.9008***	3418.58
USD/JPY	jsu	-0.0002	-0.0218	-0.0903	-0.2334***	-0.0236	0.9775***	0.1133**	-0.2236**	1.6169***	3381.48
FTSE 100	nig	-0.0002	0.0572*	-0.1459**	-0.4192***	-0.1788***	0.9566**	0.1533***	-0.2116***	2.4578***	2984.86
S&P 500	ged	0.0004***	-0.0966***	-0.0218***	-0.6591***	-0.2192***	0.9343**	0.2260***		1.1864***	3101.73
FTSEE.E 100	sstd	-0.0001	0.0471	-0.0377	-0.3230***	-0.1759***	0.9662***	0.1707	0.9268***	8.2461***	2944.67
NI225	jsu	0.0002	0.0231	-0.0865	-0.7330***	-0.2346***	0.9189**	0.1937***	-0.2652*	1.5597***	2635.45

Notes: The Table present the empirical results for Model 3 with ANAR(1)-EGARCH(1,1) specification. ANAR(1) is specified as $r_t = \mu + [\phi + \rho D_3(r_{t-1} < 0, r_{t-2} < 0, r_{t-3} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_3 takes a value of 1, only if r_{t-1} , r_{t-2} , and $r_{t-3} < 0$, and 0 otherwise. EGARCH(1,1) is further specified with $\log_e(\sigma_t^2) = \omega + \alpha_1 z_{t-1} + \gamma_1 (|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log_e(\sigma_{t-1}^2)$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 7: Model 4 ANAR(1)-EGARCH(1,1)

<i>Panel A: Cryptocurrencies</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0014***	-0.0493	-0.2962***	-0.0656	0.0846***	0.9908***	0.2551***	-0.1100*	0.3679***	2637.17
XRP	jsu	-0.0021	-0.0201	0.0098	-0.5710	-0.0409	0.9013***	0.5446**	0.0853*	0.9161***	2190.12
LTC	jsu	0.0009	-0.1085***	-0.1221**	-0.0481	0.0773	0.9932***	0.1882	0.0759	0.8607***	2345.24
DASH	jsu	0.0017	-0.0360	-0.3311***	-0.3913***	-0.0204	0.9329***	0.3772***	0.2971***	1.2997***	1971.32
BTS	jsu	-0.0012*	-0.0832***	-0.0395	-0.1492*	0.0356	0.9726***	0.2472***	0.1487***	1.1894***	1725.06
XMR	sstd	0.0029***	-0.0713***	-0.2491	-0.3988***	0.0814***	0.9257***	0.3240***	1.1095***	3.5276***	1706.70
BCN	ghst	0.0069***	-0.2183***	-0.1213	-0.3412***	0.0396	0.9220***	0.2753***	0.3464***	4.1859***	1282.31
XLM	jsu	-0.0014	-0.1571***	-0.2676***	-0.3112**	0.0348	0.9437***	0.3419***	0.2347***	1.1266***	1807.12
DOGE	nig	-0.0002	-0.1447***	-0.1433	-0.1863***	0.048*	0.9699***	0.3557***	0.1262**	0.5405***	2147.68
MAID	std	0.0016	-0.1261***	-0.0250	-0.3701	0.0036	0.9310***	0.2696***		4.0898***	1669.54
GAME	nig	0.0049***	-0.0825***	-0.2436***	-0.1157***	0.0107	0.9745***	0.2029***	0.2523***	0.6079***	1168.99
DGB	sstd	0.0002	-0.0884***	-0.1639**	-0.1395**	0.0463*	0.9718***	0.1927***	1.1647***	3.4751***	1386.99
NXT	nig	-0.0015	-0.1122*	0.0865	-0.2371**	0.0012	0.9572***	0.3397***	0.2587***	0.6435***	1746.84
BTCD	sstd	0.0033	-0.1434**	0.0172	-0.7031**	0.0656	0.8537***	0.3057***	1.0603***	3.1123***	1419.49
SYS	jsu	0.0043	-0.1463***	-0.2457	-0.6265***	0.0612	0.8665***	0.3378***	0.3368***	1.2717***	1282.48
PPC	nig	-0.0010	-0.0838***	-0.1953***	-0.1412***	0.0640***	0.9762***	0.2235***	0.1220**	0.5385***	1960.90
RDD	std	-0.0005	-0.3054***	0.0662	-0.2187***	0.0153	0.9474***	0.2350***		4.3612***	889.09
SJCX	sstd	-0.0009**	-0.1336***	-0.3863***	-0.4538	-0.0236	0.9028***	0.3306***	1.0571***	2.8482***	1400.87
XVG	ged	0.0000	0.0000***	-0.9940***	0.2724***	0.2108	0.9620***	1.2740		0.1012***	1537.62
NMC	nig	-0.0011	-0.1239*	-0.1269*	-0.2300**	0.0560	0.9599***	0.3117***	0.1511	0.3536***	1950.16
BAY	sstd	0.0029	-0.1680***	-0.1142	-0.4470***	0.0601*	0.9011***	0.2960***	1.0840***	3.9900***	1145.05
MONA	jsu	-0.0014	-0.1102***	-0.2690***	-0.5110***	0.0678*	0.9076***	0.5539***	0.1155	1.1730***	1800.79
CLOAK	ghst	0.0042***	-0.1669***	-0.0659	-0.3162***	0.0432	0.9213***	0.2811***	0.4339***	4.8986***	834.38
XCP	sstd	0.0024*	-0.1678***	0.0509	-0.1106	0.0501	0.9771***	0.1246	1.2269***	4.4090***	1334.77
BLK	nig	0.0005	-0.1599***	-0.2069	-0.2277**	0.0434	0.9586***	0.2899***	0.1672***	0.4266***	1783.00
NLG	jsu	0.0030	-0.1173	-0.1818	-1.5923***	0.0707	0.6888***	0.4867***	0.2994	1.2041***	1578.12
VIA	jsu	0.0045***	-0.0930***	-0.1049	-0.3973***	0.0657**	0.9139***	0.2984***	0.3972***	1.4204***	1195.41
BURST	nig	0.0026	-0.1178***	-0.1946	-0.7526***	0.0252	0.8429***	0.4291***	0.1331	0.7306***	1314.18
VTC	nig	0.0005	-0.0961***	-0.0187	-0.4234***	0.1124***	0.9122***	0.3041***	0.2337***	0.6132***	1339.33
BLOCK	sstd	0.0083***	-0.1510***	-0.2031	-0.4858	0.1632**	0.8795***	0.2876*	1.1495***	3.7492***	897.79
NAV	nig	0.0046	-0.1700***	0.0453	-0.5579***	0.0249	0.8745***	0.3784***	0.2854***	0.6760***	1117.15
EAC	nig	-0.0025*	-0.1879***	-0.1248	-0.1485**	0.0106	0.9686***	0.4426***	0.1296**	0.3228***	1241.94
UBQ	sstd	0.0032	-0.1934***	-0.0379	-0.5773**	0.0591**	0.8719***	0.3360***	1.0743***	3.5536***	1165.50
CRIX	nig	0.0015**	-0.0430	-0.3029***	-0.1217	0.0733***	0.9824***	0.3063	-0.1791***	0.3872***	2640.67

<i>Panel B: Traditional assets</i>											
Abbreviation	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0002	-0.0342	0.0972	-0.1065***	0.0347***	0.9891***	0.0598***		5.7637***	3064.95
XAG	ged	0.0001	-0.0358	-0.0246	-0.0071***	0.0168	0.9993***	0.0200***		1.1523***	2620.69
WTI	std	0.0005	-0.0636	-0.0101	-0.1366***	-0.0877***	0.9823***	0.1448***		17.0257	2080.33
BRT	ged	0.0005	0.0218	0.0956	-0.0447***	-0.0562***	0.9942***	0.0370***		1.5747***	2067.54
EUR/USD	std	0.0000	-0.0132	0.0730	-0.0409***	-0.0149	0.9961***	0.0377***		8.7828***	3379.79
GBP/USD	std	-0.0001	-0.0003	-0.2401**	-0.9877***	0.0269	0.9040***	0.1689***		5.6705***	3349.56
USD/CHF	sstd	-0.0001	-0.0100	-0.0144	-0.0182***	-0.0489***	0.9984***	-0.0144***	0.8795***	5.8440	3414.41
USD/JPY	ghst	-0.0002	-0.0143	-0.1540*	-0.2097***	-0.0242	0.9797***	0.1061***	-0.3022**	5.3425	3378.75
FTSE 100	nig	-0.0002	0.0581*	-0.3468**	-0.4002***	-0.1743***	0.9586***	0.1466***	-0.2090***	2.3210***	2983.51
S&P 500	ged	0.0004	-0.1020	0.0363	-0.6577***	-0.2209***	0.9345***	0.2248***		1.1833***	3099.21
FTSE.E 100	sstd	-0.0001	0.0521***	-0.1168	-0.3284***	-0.1781***	0.9657***	0.1660	0.9278***	8.3303***	2942.21
NI225	jsu	0.0002	0.0230	-0.2109	-0.7254***	-0.2328***	0.9197***	0.1920***	-0.2659**	1.5443***	2633.52

Notes: The Table present the empirical results for Model 4 with ANAR(1)-EGARCH(1,1) specification. ANAR(1) is specified as $r_t = \mu + [\phi + \rho D_4(r_{t-1} < 0, r_{t-2} < 0, r_{t-3} < 0, \text{and } r_{t-4} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_4 takes a value of 1, only if $r_{t-1}, r_{t-2}, r_{t-3}$, and $r_{t-4} < 0$, and 0 otherwise. EGARCH(1,1) is specified with $\log_e(\sigma_t^2) = \omega + \alpha_1 z_{t-1} + \gamma_1 (|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log_e(\sigma_{t-1}^2)$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 8: Model 1 and 2 with ANAR(1)-EGARCH-M(1,1)

Panel A: Cryptocurrencies								
Abbreviation	Model 1				Model 2			
	μ	δ	ϕ	ρ	μ	δ	ϕ	ρ
BTC	0.0008***	0.0223	-0.0377	-0.0810	0.0011**	0.0378	-0.0326	-0.1960***
XRP	-0.0044***	0.1070***	-0.0704	0.0884	-0.0038***	0.0763***	-0.0345	0.0316
LTC	-0.0001	0.0567	-0.1341***	0.0339	0.0000	0.0390***	-0.1096***	-0.0510
DASH	-0.0017	0.0430	0.0120	-0.1569*	-0.0028	0.0850	-0.0150	-0.1614
BTS	-0.0074***	0.1896***	-0.1921***	0.1908*	-0.0064***	0.1202***	-0.1103***	0.0624
XMR	0.0019	-0.0377	0.0246	-0.2204**	-0.0020	0.0671	-0.0554*	-0.1370*
BCN	0.0000	0.0000	-0.1885***	0.1885***	0.0246***	-0.1863***	-0.2080***	-0.0987
XTM	-0.0056	0.0952**	-0.1704***	0.0030	-0.0055***	0.0786**	-0.1476***	-0.1250*
DOGE	-0.0019	0.0488	-0.1162**	-0.0532	-0.0020	0.0706	-0.1456***	0.0061
MAID	-0.0103***	0.2007***	-0.1504***	0.0368	-0.0103**	0.1906***	-0.1408***	0.0287
GAME	0.0032	0.0263	-0.1055**	0.0196	0.0039	0.0048	-0.0836**	-0.0528
DGB	-0.0073***	0.109***	-0.0975*	-0.0021	-0.0072***	0.0936***	-0.0759***	-0.0952
NXT	-0.0064***	0.1058***	-0.1239***	0.0269	-0.0062**	0.0821*	-0.0962***	-0.0800
BTC.D	0.0151	-0.1790	-0.1077	-0.0650	0.0142***	-0.1649***	-0.1188**	-0.1105*
SYS	-0.0028	0.1165*	-0.2127***	0.1022*	0.0027	0.0175	-0.1527***	-0.0585
PPC	-0.0041***	0.0640	-0.0704	-0.0655	-0.0043*	0.0730	-0.0697**	-0.1131**
RDD	-0.0042	-0.0575	-0.1632**	-0.2850**	-0.0111***	0.0743**	-0.2756***	-0.2243**
SJCX	-0.0011	-0.0243	-0.1264***	-0.0344	-0.0011	-0.0075	-0.1190***	-0.1411**
XVG	0.0000	0.0000	-0.3564***	0.3564***	0.0003***	-0.0014***	-0.1477***	-0.2329***
NMC	-0.0041***	0.0835***	-0.1356***	0.0038	-0.0040***	0.0593**	-0.0922***	-0.1485**
BAY	0.0064	-0.1127***	-0.0424**	-0.2667***	-0.0010	-0.0146	-0.1265***	-0.2595***
MONA	-0.0040***	0.0349***	-0.0611	-0.1316*	-0.0047***	0.0297***	-0.0873***	-0.1587**
CLOAK	-0.0172**	0.1844***	-0.1995***	0.0646	-0.0129***	0.1279***	-0.1565***	-0.0483
XCP	0.0079	-0.0489	-0.1881***	0.0544	0.0084*	-0.0695	-0.1683***	0.0208
BLK	-0.0046***	0.181***	-0.3072***	0.2782***	-0.0014	0.0444***	-0.1641***	0.0046
NLG	0.0102***	-0.1166***	-0.0704*	-0.0956	0.0047***	-0.0308***	-0.0997***	-0.1217***
VIA	0.0121	-0.0344	-0.1841	0.1690	0.0220***	-0.2039***	-0.0788***	-0.0812
BURST	0.0025	-0.0189	-0.0756**	-0.0986*	0.0018	-0.0114	-0.0782**	-0.1920**
VTC	0.0006	-0.0500	-0.0064	-0.1836	-0.0030**	0.0340***	-0.0759***	-0.0903**
BLOCK	0.0285***	-0.1673***	-0.1520**	-0.0007	0.0298	-0.1834	-0.1387***	-0.0468
NAV	0.0179	-0.2104	-0.0416	-0.2676	0.0023	0.0159	-0.1598***	-0.0551
EAC	0.0000	0.0000	-0.2381***	0.2381***	-0.0042***	0.0270***	-0.1545***	-0.2662***
UBQ	-0.0122***	0.0819**	-0.1292**	-0.1895	-0.0165***	0.1616***	-0.1849***	-0.1719
CRUX	-0.0001***	0.0776***	-0.0253***	-0.0793*	-0.0001	0.0822	-0.0296	-0.2057*

Panel B: Traditional assets								
Abbreviation	Model 1				Model 2			
	μ	δ	ϕ	ρ	μ	δ	ϕ	ρ
XAU	0.0012***	-0.1168	-0.0516	0.0612	0.0016***	-0.1811***	-0.0327	0.0427
XAG	0.0064***	-0.5415***	0.1042***	-0.1901***	0.0036***	-0.3025***	0.0053	-0.1168
WTI	0.0021	-0.1745	0.0435	-0.2563	0.0012	-0.0345	-0.0720	0.0082
BRT	0.0029	-0.1714	0.0784***	-0.1128**	0.0028***	-0.1193***	0.0242***	0.0048
EUR/USD	0.0008***	-0.0951***	-0.0844**	0.1585**	0.0013***	-0.2556***	0.0024	-0.0557
GBP/USD	0.0010	-0.1214	-0.1042***	0.1865**	0.0021***	-0.3810***	-0.0035	-0.0132
USD/CHF	-0.0001***	0.0518***	-0.0881***	0.1214***	-0.0027*	0.5362	-0.0311	0.0618
USD/JPY	-0.0007***	0.1263***	-0.0081	-0.0403	-0.0006***	0.0690**	0.0048**	-0.1075***
FTSE 100	-0.0023***	0.3475***	-0.0164	0.1385***	-0.0015**	0.1827*	0.0687***	-0.0750
S&P 500	-0.0005***	0.2028***	-0.1316***	0.1096**	-0.0003	0.0926	-0.0597	-0.1606
FTSE.E 100	-0.0005	0.0894	0.0313	0.0575	-0.0003	0.0200	0.0655	-0.1038
NI225	-0.0002	-0.0160	0.0891	-0.1813	-0.0002*	-0.0085	0.0771***	-0.2864***

Notes: The Table present the empirical results for Model 1 and Model 2 with ANAR(1)-EGARCH-M(1,1) specification. Model 1 specification for ANAR(1)-EGARCH-M(1,1) of ANAR(1) is $r_t = \mu + \delta\sigma_t + [\phi + \rho D_1(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_1 takes a value of 1, only if $r_{t-1} < 0$, and 0 otherwise. Model 2 specification for ANAR(1)-EGARCH-M(1,1) of ANAR(1) is $r_t = \mu + \delta\sigma_t + [\phi + \rho D_2(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_2 takes a value of 1, only if $r_{t-1} < 0$ and $r_{t-2} < 0$, and 0 otherwise. EGARCH-M(1,1) specification in both models are specified as $\log_e(\sigma_t^2) = \omega + \alpha_1 z_{t-1} + \gamma_1(|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log_e(\sigma_{t-1}^2)$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 9: Model 3 and 4 with ANAR(1)-EGARCH-M(1,1)

Panel A: Cryptocurrencies								
Abbreviation	Model 3				Model 4			
	μ	δ	ϕ	ρ	μ	δ	ϕ	ρ
BTC	0.0009**	0.0280**	-0.0407***	-0.2968***	0.0007	0.0401	-0.0521*	-0.2905***
XRP	-0.0037***	0.0457**	-0.0151	-0.0588	-0.0037	0.0708	-0.0257	0.0372
LTC	0.0002	0.0327	-0.1043***	-0.1623	0.0000	0.0434	-0.1107***	-0.1183
DASH	-0.0035**	0.1111***	-0.0342	-0.1777*	-0.0036	0.1184	-0.0379	-0.3033
BTS	-0.0064	0.1058**	-0.0963**	0.0416	-0.0062*	0.1067*	-0.0919**	-0.0405
XMR	-0.0016	0.0675	-0.0609**	-0.2794***	-0.0021***	0.0856***	-0.0770***	-0.2327
BCN	0.0232***	-0.1681***	-0.2184***	-0.0229	0.0223***	-0.2298***	-0.2158***	-0.1909
XTM	-0.0058	0.0877	-0.1531***	-0.1922**	-0.0055*	0.0880	-0.1583***	-0.2504***
DOGE	-0.0018**	0.0619	-0.1386***	-0.0706	-0.0020**	0.0687***	-0.1433***	-0.1179
MAID	-0.0091	0.1707	-0.1305***	-0.0419	-0.0087***	0.1660**	-0.1313***	-0.0106
GAME	0.0042	0.0034	-0.0753*	-0.1958**	0.0038**	0.0136**	-0.0823***	-0.2425***
DGB	-0.0072	0.0923	-0.0714**	-0.2503**	-0.0073***	0.1062***	-0.0903***	-0.1583
NXT	-0.0062***	0.0903***	-0.1052***	-0.0795	-0.0064***	0.1025***	-0.1167***	0.1071
BTC.D	0.0133***	-0.1266***	-0.1323***	-0.1010	0.0122***	-0.1280**	-0.1431***	0.0271
SYS	0.0030	0.0150	-0.1400***	-0.1569*	0.0016***	0.0301***	-0.1468**	-0.2443
PPC	-0.0042***	0.0765***	-0.0768***	-0.1745***	-0.0044	0.0876	-0.0918***	-0.1800***
RDD	-0.0208***	0.1783***	-0.3070***	0.0519	-0.0208***	0.1788***	-0.3070***	0.0979
SJCX	-0.0006	-0.0088**	-0.1238***	-0.3097***	-0.0010	-0.0215***	-0.1315***	-0.3784***
XVG	0.0000	0.0000	-0.1829***	-0.0183***	-0.0015**	0.0009**	-0.0010***	-0.3402***
NMC	-0.0040***	0.0725	-0.1149	-0.1481	-0.0042***	0.0833***	-0.1243***	-0.1304*
BAY	-0.0041***	0.0632***	-0.1533***	-0.2522**	-0.0061*	0.0964***	-0.1717***	-0.1090
MONA	-0.0056***	0.0868***	-0.1035***	-0.2386***	-0.0057*	0.0978*	-0.1130**	-0.255**
CLOAK	-0.0127***	0.1411***	-0.178***	0.1017**	-0.0131**	0.1355***	-0.1651***	-0.0706
XCP	0.0093	-0.0907	-0.1545***	-0.0817	0.0091**	-0.0791**	-0.1663***	0.0503
BLK	-0.0010	0.0343	-0.1506***	-0.0961	-0.0017	0.0461	-0.1606**	-0.2106
NLG	0.0047*	-0.0364	-0.1027**	-0.2862**	0.0040	-0.0127	-0.1161***	-0.1834
VIA	0.0220***	-0.2071***	-0.0802***	-0.1959	0.0208	-0.1847	-0.0920	-0.1185
BURST	-0.0010	0.0433	-0.1131***	-0.1245	-0.0026	0.0652	-0.1199***	-0.1824
VTC	-0.0044***	0.0589***	-0.0933***	-0.0792	-0.0040	0.0596	-0.1001***	-0.0202
BLOCK	0.0277	-0.1594	-0.1528***	0.0005	0.0278	-0.1637	-0.1458	-0.2097
NAV	0.0023	0.0099	-0.1541***	-0.1980	0.0018**	0.0305*	-0.1721***	0.0506
EAC	-0.0042*	0.0436	-0.1702***	-0.2920***	-0.0043***	0.0501***	-0.1863***	-0.1112
UBQ	-0.0199***	0.2085***	-0.2047***	-0.1596	-0.0207**	0.2520**	-0.2111***	-0.0374
CRUX	-0.0003	0.0955	-0.0340	-0.3015	-0.0004	0.1109	-0.0505	-0.2880***

Panel B: Traditional assets								
Abbreviation	Model 3				Model 4			
	μ	δ	ϕ	ρ	μ	δ	ϕ	ρ
XAU	0.0017***	-0.2010***	-0.0242	0.0132	0.0016***	-0.1921***	-0.0323	0.0969
XAG	0.0010***	-0.0844***	-0.0222***	-0.0778	-0.0004	0.0356*	-0.0359	-0.0262
WTI	0.0006	0.0014	-0.0755	0.0821	0.0007	-0.0129**	-0.0647**	-0.0120
BRT	0.0026***	-0.1122***	0.0328	-0.0432	0.0022***	-0.0849***	0.0225***	0.0818
EUR/USD	0.0009	-0.1829	0.0039	-0.1743	0.0004**	-0.0746**	-0.0136	0.0665
GBP/USD	0.0021***	-0.3990***	0.0183	-0.2533**	0.0018**	-0.3315***	0.0026	-0.2458**
USD/CHF	-0.0026***	0.4776***	-0.0297	0.0850***	-0.0023***	0.4703***	0.0025	0.0075
USD/JPY	-0.0007***	0.1055***	-0.0171*	-0.0899	-0.0007***	0.0995***	-0.0150	-0.1411
FTSE 100	-0.0015***	0.1939***	0.0630***	-0.1048*	-0.0014	0.1724	0.0660**	-0.3020*
S&P 500	-0.0003***	0.1314***	-0.0931***	0.0102	-0.0003***	0.1365***	-0.0953***	0.0672
FTSE.E 100	-0.0004*	0.0509***	0.0476**	-0.0183	-0.0004	0.0417	0.0537	-0.1018
NI225	-0.0007	0.0912*	0.0224	-0.0571	-0.0006	0.0779	0.0235	-0.1848

Notes: The Table present the empirical results for Model 1 and Model 2 with ANAR(1)-EGARCH-M(1,1) specification. Model 1 specification for ANAR(1)-EGARCH-M(1,1) of ANAR(1) is $r_t = \mu + \delta \sigma_t + [\phi + \rho D_3(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_3 takes a value of 1, only if r_{t-1} , r_{t-2} , and $r_{t-3} < 0$, and 0 otherwise. Model 4 specification for ANAR(1)-EGARCH-M(1,1) of ANAR(1) is $r_t = \mu + \delta \sigma_t + [\phi + \rho D_4(r_{t-1} < 0)] \cdot r_{t-1} + \varepsilon_t$, where D_4 takes a value of 1, only if r_{t-1} , r_{t-2} , r_{t-3} , and $r_{t-4} < 0$, and 0 otherwise. EGARCH-M(1,1) specification in both models are specified as $\log_e(\sigma_t^2) = \omega + \alpha_1 z_{t-1} + \gamma_1(|z_{t-1}| - E|z_{t-1}|) + \beta_1 \log_e(\sigma_{t-1}^2)$. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively.

Table 10: Model 5 with ANAR(1)-EGARCH(1,1) and ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>									
		ANAR(1) EGARCH(1,1)			ANAR (1) EGARCH-M(1,1)				
Abbreviation	Dist	μ	ϕ	ρ	Dist	μ	ϕ	ρ	
BTC	nig	0.0014**	-0.0549**	-0.1373	nig	0.0009	-0.0588**	-0.1234	
XRP	nig	-0.0011	-0.0069	-0.3557***	nig	-0.0030***	-0.0132	-0.3288***	
LTC	jsu	0.0009	-0.1154***	-0.0119	jsu	0.0000	-0.1186***	0.0029	
DASH	jsu	0.0019	-0.0445	-0.1205	jsu	-0.0033	-0.0478	-0.0677	
BTS	jsu	-0.0012*	-0.0803***	-0.0348	nig	-0.0063***	-0.0953***	0.0107	
XMR	sstd	0.0031**	-0.0526*	-0.3234***	sstd	0.0014	-0.0544**	-0.3158***	
BCN	ghyp	0.0077***	-0.2350***	0.2263	ghst	0.0212	-0.2287***	0.1659	
XLM	jsu	-0.0012	-0.1612***	-0.0750	jsu	-0.0052**	-0.1637***	-0.0452	
DOGE	nig	-0.0002*	-0.1491***	0.0222	nig	-0.0021	-0.1473***	0.0494	
MAID	jsu	0.0004	-0.1078***	-0.1544*	std	-0.0067***	-0.1150***	-0.1248	
GAME	nig	0.0051	-0.0758*	-0.1764**	nig	0.0066*	-0.0754**	-0.1809**	
DGB	sstd	0.0006	-0.0858***	-0.1302	sstd	-0.0063	-0.0901***	-0.0990	
NXT	nig	-0.0018***	-0.1074***	-0.0494	nig	-0.0063***	-0.1122***	-0.0113	
BTCD	sstd	0.0032	-0.1411***	-0.0237	std	0.0132***	-0.1379***	-0.0487	
SYS	jsu	0.0051**	-0.1644***	0.0282***	jsu	0.0012	-0.1677***	0.0468***	
PPC	nig	-0.0009	-0.0822***	-0.1284*	nig	-0.0037***	-0.0913***	-0.1047	
RDD	std	-0.0009	-0.2944***	-0.1120	std	-0.0178***	-0.3002***	-0.0823	
SJCX	std	-0.0026	-0.1466***	0.0734	std	-0.0034***	-0.1465***	0.0773	
XVG	ged	0.0000	0.0000**	-0.6099***	sGED	0.0000	-0.0001	-0.7314***	
NMC	nig	-0.0009***	-0.1163***	-0.2007**	nig	-0.0034***	-0.1169***	-0.1879***	
BAY	sstd	0.0029	-0.1554***	-0.1733	std	-0.0013	-0.1623***	-0.1565	
MONA	jsu	-0.0011	-0.1245***	0.0501	std	-0.0058***	-0.1334***	0.1058	
CLOAK	ghyp	0.0037***	-0.1711***	0.0085	ghst	-0.0156***	-0.1757***	0.0749	
XCP	sstd	0.0021	-0.1610**	-0.0365	sstd	0.0101***	-0.1570***	-0.0512	
BLK	nig	0.0006	-0.1780***	0.2094	nig	-0.0027***	-0.1820	0.2582	
NLG	jsu	0.0033	-0.1132***	-0.1088	jsu	0.0067***	-0.1094***	-0.1249	
VIA	jsu	0.0047***	-0.0972***	-0.0105	jsu	0.0231***	-0.0889***	-0.0688	
BURST	nig	0.0030	-0.0972***	-0.2234***	nig	0.0056	-0.0953***	-0.2353***	
VTC	nig	0.0004	-0.0965***	0.0045	nig	-0.0041	-0.1018***	0.0225	
BLOCK	sstd	0.0085**	-0.1568***	-0.0029	sstd	0.0317***	-0.1411***	-0.0474	
NAV	nig	0.0046	-0.1586***	-0.2380	nig	0.0068	-0.1568***	-0.2497	
EAC	nig	-0.0026*	-0.2055***	0.1651	ged	-0.0060***	-0.1908***	0.2016***	
UBQ	sstd	0.0029	-0.1757***	-0.5991**	std	-0.0123***	-0.1949***	-0.5322**	
CRIX	nig	0.0015**	-0.0344	-0.1704	nig	-0.0001	-0.0458	-0.1379	

<i>Panel B: Traditional Assets</i>									
		ANAR(1) EGARCH(1,1)			ANAR (1) EGARCH-M(1,1)				
Abbreviation	Dist	μ	ϕ	ρ	Dist	μ	ϕ	ρ	
XAU	std	0.0001	-0.0241	0.0207	std	0.0014***	-0.0222	0.0119	
XAG	ged	0.0000	-0.0019	-0.1045	ged	0.0065***	0.0154	-0.1206	
WTI	jsu	0.0001	-0.0485	-0.4007***	std	0.0022***	-0.0585	-0.3750**	
BRT	ged	0.0003	0.0244	0.0196	ged	0.0028***	0.0244***	0.0075	
EUR/USD	std	0.0000	-0.0312	0.1888*	std	0.0005	-0.0298	0.1790	
GBP/USD	std	-0.0001	-0.0297**	0.1845***	std	0.0016	-0.0228	0.1482**	
USD/CHF	sstd	-0.0001***	-0.0043	-0.0463***	ghst	-0.0003***	-0.0108	-0.0260***	
USD/JPY	jsu	-0.0002	-0.0078	-0.1209	jsu	-0.0005**	-0.0083	-0.1134	
FTSE 100	nig	-0.0002	0.0586	-0.1462	nig	-0.0014***	0.0636*	-0.0988	
S&P500	ged	0.0004***	-0.0986***	-0.0072	ged	-0.0003***	-0.0931***	0.0353	
FTSE.E 100	std	0.0000	0.0553*	-0.0462	ghst	-0.0004***	0.0505*	-0.0218	
NI225	jsu	0.0002***	0.0240***	-0.0924	jsu	-0.0006	0.0241	-0.0630	

Notes: The Table presents the empirical results for Model 5 with ANAR(1)-EGARCH(1,1) and ANAR(1)-EGARCH-M(1,1) to examine a likely price overreaction. The daily overreaction is defined as the daily price change of less than negative two standard deviations. The significance level is computed with the robust standard error, based on the method from White (1982). ***, ** and * indicate the significance at the 1%, 5% and 10% levels, respectively. The estimates of only the conditional mean equation are reported. Full estimates of all parameters are presented in the appendix.

APPENDIX C: TOTAL TABLES

Table 11: Model 1 ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0008***	0.0223	-0.0377	-0.081	-0.0813	0.0741***	0.9883***	0.2887	-0.0956*	0.3837***	2631.621
XRP	nig	-0.0044***	0.107***	-0.0704	0.0884	-0.6123*	-0.0255	0.897***	0.5054***	0.2096***	0.2513***	2191.256
LTC	jsu	-0.0001	0.0567	-0.1341***	0.0339	-0.0419***	0.0724***	0.9939***	0.1986***	0.1106**	0.8657***	2343.045
DASH	jsu	-0.0017	0.043	0.012	-0.1569*	-0.4349**	-0.0193	0.9254***	0.4066***	0.3052***	1.3012***	1972.908
BTS	nig	-0.0074***	0.1896***	-0.1921***	0.1908*	-0.1432*	0.0305*	0.9736***	0.2517***	0.204***	0.5767***	1732.095
XMR	sstd	0.0019	-0.0377	0.0246	-0.2204**	-0.4085***	0.0838***	0.9234***	0.3391***	1.1123***	3.459***	1711.747
BCN	ged	0.0000	0.0000	-0.1885***	0.1885***	-0.0002	0.1478*	0.9766***	0.4953***		0.2527***	1299.098
XLM	jsu	-0.0056	0.0952**	-0.1704***	0.003	-0.3155**	0.0291	0.9427***	0.3644***	0.2576***	1.1345***	1806.254
DOGE	nig	-0.0019	0.0488	-0.1162**	-0.0532	-0.1773***	0.0508*	0.9711***	0.3611***	0.1565***	0.5449***	2151.496
MAID	std	-0.0103***	0.2007***	-0.1504***	0.0368	-0.3883***	-0.0011	0.9276***	0.2745***		4.1094***	1670.741
GAME	nig	0.0032	0.0263	-0.1055**	0.0196	-0.1211**	0.0042	0.9734***	0.2168***	0.2331***	0.6052***	1163.731
DGB	sstd	-0.0073***	0.109***	-0.0975*	-0.0021	-0.1186***	0.0475**	0.9757***	0.1955***	1.1812***	3.413***	1391.707
NXT	nig	-0.0064***	0.1058**	-0.1239**	0.0269	-0.2275***	0.0032	0.9587***	0.353***	0.2786***	0.6413***	1750.487
BTCD	std	0.0151	-0.179	-0.1077	-0.065	-0.7134	0.073	0.851***	0.2976		3.0421***	1422.313
SYS	jsu	-0.0028	0.1165*	-0.2127***	0.1022*	-0.5417***	0.0524	0.8846***	0.3222***	0.3485***	1.2705***	1279.843
PPC	nig	-0.0041* * *	0.064	-0.0704	-0.0655	-0.1203**	0.0611***	0.9795***	0.2303***	0.1422**	0.5337***	1960.733
RDD	std	-0.0042	-0.0575	-0.1632**	-0.285**	-0.2107**	0.0224	0.9496***	0.2251***		4.3858***	895.7669
SJCX	std	-0.0011	-0.0243	-0.1264***	-0.0344	-0.4614	-0.0382	0.8995***	0.3479***		2.7593***	1396.824
XVG	ged	0.0000	0.0000	-0.3564***	0.3564***	-0.216***	-0.0184	0.9255***	0.5714**		0.4319***	759.707
NMC	nig	-0.0041***	0.0835***	-0.1356***	0.0038	-0.2182**	0.053*	0.9615***	0.3297***	0.1855***	0.3461***	1951.683
BAY	sstd	0.0064	-0.1127***	-0.0424**	-0.2667***	-0.4641***	0.0747**	0.8975***	0.3001***	1.0912***	4.0885***	1151.506
MONA	jsu	-0.004***	0.0349***	-0.0611	-0.1316*	-0.5053***	0.0729*	0.9082***	0.5697***	0.1437**	1.1811***	1805.427
CLOAK	ghst	-0.0172**	0.1844***	-0.1995***	0.0646	-0.2993*	0.0242	0.9258***	0.299***	0.4088*	4.8946***	832.0209
XCP	sstd	0.0079	-0.0489	-0.1881***	0.0544	-0.1181**	0.0477*	0.9756***	0.1186***	1.2259***	4.3997***	1339.005
BLK	nig	-0.0046***	0.181***	-0.3072***	0.2782***	-0.1562***	0.0316	0.9717***	0.2473***	0.2019***	0.435***	1788.882
NLG	jsu	0.0102***	-0.1166***	-0.0704*	-0.0956	-1.7216**	0.0703	0.6635***	0.5002***	0.3108***	1.2134***	1578.421
VIA	jsu	0.0121	-0.0344	-0.1841	0.169	-0.385***	0.0607**	0.9172***	0.2743***	0.3849***	1.4332***	1199.183
BURST	nig	0.0025	-0.0189	-0.0756**	-0.0986*	-0.7516***	0.0314	0.8433***	0.4249***	0.1443**	0.762***	1316.376
VTC	nig	0.0006	-0.05	-0.0064	-0.1836	-0.4757**	0.1184***	0.901***	0.3372***	0.2339**	0.6073***	1342.213
BLOCK	sstd	0.0285***	-0.1673***	-0.152**	-0.0007	-0.6432**	0.1781***	0.8417***	0.2954***	1.1433***	3.7698***	901.6401
NAV	nig	0.0179	-0.2104	-0.0416	-0.2676	-0.6799	0.0476	0.8471***	0.3946**	0.2861	0.6754***	1118.289
EAC	ged	0.0000	0.0000	-0.2381***	0.2381***	-0.1531	0.0138	0.9641***	0.5155		0.6055***	1245.212
UBQ	std	-0.0122***	0.0819**	-0.1292**	-0.1895	-0.4929***	0.0585**	0.8913***	0.3324***		3.648***	1169.899
CRIX	nig	-0.0001* * *	0.0776***	-0.0253***	-0.0793*	-0.1305***	0.0709***	0.9811***	0.324***	-0.1286***	0.4003***	2640.434
<i>Panel B: Traditional assets</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0012***	-0.1168	-0.0516	0.0612	-0.1156***	0.0335***	0.9882***	0.0564***		5.8744***	3073.677
XAG	nig	0.0064***	-0.5415***	0.1042***	-0.1901***	-0.0939***	0.0431***	0.9892***	-0.0126***	0.0346	1.0238***	2633.439
WTI	std	0.0021	-0.1745	0.0435	-0.2563	-0.1301	-0.089***	0.9832***	0.1464		16.0307	2086.743
BRT	ged	0.0029	-0.1714	0.0784***	-0.1128**	-0.0202**	-0.0572***	0.9974***	0.0268***	1.5688***	1.5688***	2072.614
EUR/USD	std	0.0008***	-0.0951***	-0.0844**	0.1585**	-0.0317***	-0.017	0.997***	0.0354***		8.8954***	3339.064
GBP/USD	std	0.001	-0.1214	-0.1042***	0.1865**	-0.7856***	0.0145	0.9237***	0.1485*		5.6767***	3362.104
USD/CHF	ghst	-0.0001***	0.0518***	-0.0881***	0.1214***	-0.005***	-0.0443***	0.9997***	-0.0132***	-0.8432	7.4999***	3428.206
USD/JPY	std	-0.0007***	0.1263***	-0.0081	-0.0403	-0.2957***	-0.0258	0.9715***	0.1169***		5.0585***	3385.42
FTSE 100	sged	-0.0023***	0.3475***	-0.0164	0.1385***	-0.7223***	-0.1773***	0.9257***	0.1822***	0.8568***	1.468127	2992.452
S&P 500	ged	-0.0005***	0.2028***	-0.1316***	0.1096**	-0.815***	-0.2182***	0.9192***	0.2406***		1.1812***	3108.462
FTSE.E 100	std	-0.0005	0.0894	0.0313	0.0575	-0.3558***	-0.1806***	0.9631***	0.1594***		8.3818***	2950.484
NI225	jsu	-0.0002	-0.016	0.0891	-0.1813	-0.7356***	-0.2276***	0.9186***	0.1751***	-0.2708*	1.5436***	2640.885

Table 12: Model 2 ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	std	0.0011**	0.0378	-0.0326	-0.196***	-0.0241	0.104***	0.9961***	0.2768***		2.6998***	2631.799
XRP	nig	-0.0038***	0.0763***	-0.0345	0.0316	-0.6146***	-0.0217	0.8965***	0.5028***	0.2066***	0.2494***	2190.64
LTC	jsu	0.0000	0.039***	-0.1096***	-0.051	-0.039	0.0767	0.9944***	0.1897	0.1043	0.8628***	2345.568
DASH	jsu	-0.0028	0.085	-0.015	-0.1614	-0.4107	-0.0205	0.9295***	0.3965	0.3076	1.3030***	1975.004
BTS	nig	-0.0064***	0.1202***	-0.1103***	0.0624	-0.1399	0.0351	0.9743***	0.2443**	0.184***	0.5778***	1729.085
XMR	sstd	-0.002	0.0671	-0.0554*	-0.137*	-0.3804***	0.0826***	0.929***	0.3345***	1.1115***	3.5080***	1709.537
BCN	ghst	0.0246***	-0.1863***	-0.208**	-0.0987	-0.3438***	0.0378	0.9215***	0.2658***	0.2856***	4.1234***	1286.072
XLM	jsu	-0.0055***	0.0786***	-0.1476***	-0.125*	-0.3037*	0.0314	0.9447***	0.3544***	0.2527***	1.1269***	1808.239
DOGE	nig	-0.002	0.0706	-0.1456***	0.0061	-0.1773**	0.0509*	0.971***	0.3597***	0.1603*	0.5411***	2151.334
MAID	nig	-0.0103**	0.1906***	-0.1408***	0.0287	-0.3682	-0.0036	0.9321***	0.2541***	-0.0346	0.9323***	1670.847
GAME	nig	0.0039	0.0048	-0.0836**	-0.0528	-0.1171***	0.0067	0.9743***	0.2105***	0.2329***	0.6021***	1164.402
DGB	sstd	-0.0072**	0.0936***	-0.0759***	-0.0952	-0.1144***	0.049*	0.9766***	0.191***	1.1736***	3.3994***	1391.286
NXT	nig	-0.0062**	0.0821*	-0.0962***	-0.08	-0.2289***	0.0058	0.9584***	0.351***	0.2767***	0.6295***	1750.288
BTCD	std	0.0142***	-0.1649***	-0.1188***	-0.1105*	-0.6869***	0.0655	0.8569***	0.2896***		3.0566***	1421.857
SYS	jsu	0.0027	0.0175	-0.1527***	-0.0585	-0.5929***	0.0607	0.8735***	0.3311***	0.3373***	1.2654***	1281.46
PPC	nig	-0.0043*	0.073	-0.0697**	-0.1131**	-0.1153**	0.062***	0.9804***	0.2243***	0.1454*	0.5358***	1963.764
RDD	std	-0.0111***	0.0743**	-0.2756***	-0.2243**	-0.2097**	0.0176	0.9496***	0.2275***		4.3276***	894.594
SJCX	sstd	-0.0011	-0.0075	-0.119***	-0.1411**	-0.4802	-0.0294	0.8959***	0.3499***	1.0558***	2.7819***	1401.413
XVG	ged	0.0003***	-0.0014***	-0.1477***	-0.2329***	-0.3382***	0.0861**	0.9063***	0.3156***		0.6593***	682.1169
NMC	nig	-0.004***	0.0593**	-0.0922***	-0.1485**	-0.2049**	0.0584**	0.9638***	0.3196***	0.1851***	0.3395***	1956.217
BAY	std	-0.001	-0.0146	-0.1265***	-0.2595***	-0.4773**	0.0625*	0.8947***	0.3069***		3.8971***	1150.79
MONA	std	-0.0047***	0.0297***	-0.0873***	-0.1587**	-0.5047***	0.0703*	0.9062***	0.6103***		3.0955***	1802.084
CLOAK	ghst	-0.0129***	0.1279***	-0.1565***	-0.0483	-0.2987***	0.0341	0.9257***	0.2906***	0.4131***	4.8684***	833.7944
XCP	sstd	0.0084*	-0.0695	-0.1683***	0.0208	-0.1253***	0.0486**	0.9741***	0.1242**	1.2223***	4.3554***	1338.02
BLK	nig	-0.0014	0.0444***	-0.1641***	0.0046	-0.2039**	0.045	0.9629***	0.2803***	0.1793***	0.4295***	1784.444
NLG	jsu	0.0047***	-0.0308***	-0.0997***	-0.1217***	-1.6022***	0.0742	0.687***	0.4837***	0.2999***	1.2110***	1579.615
VIA	jsu	0.022***	-0.2039***	-0.0788***	-0.0812	-0.4736*	0.0618**	0.8977***	0.3***	0.3835***	1.4102***	1199.296
BURST	nig	0.0018	-0.0114	-0.0782**	-0.192**	-0.738***	0.0345	0.8463***	0.4184***	0.1369**	0.7472***	1319.32
VTC	nig	-0.003**	0.034**	-0.0759**	-0.0903**	-0.4223***	0.1101***	0.9121***	0.3188***	0.2398***	0.6094***	1342.146
BLOCK	sstd	0.0298	-0.1834	-0.1387***	-0.0468	-0.6755*	0.1775***	0.8336***	0.3073***	1.1433***	3.7536***	900.7756
NAV	nig	0.0023	0.0159	-0.1598***	-0.0551	-0.5546***	0.022	0.8751***	0.386***	0.286***	0.6753***	1117.77
EAC	nig	-0.0042***	0.027***	-0.1545***	-0.2662***	-0.1454**	0.0243	0.9688***	0.444***	0.1707***	0.3054***	1243.085
UBQ	std	-0.0165***	0.1616***	-0.1849***	-0.1719	-0.5058	0.0583*	0.8885***	0.3282**		3.643***	1169.464
CRIX	nig	-0.0001	0.0822	-0.0296	-0.2057*	-0.1043	0.0786***	0.9848***	0.2991**	-0.1311	0.3944***	2644.228
<i>Panel B: Traditional Assets</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0016***	-0.1811***	-0.0327	0.0427	-0.123***	0.0338***	0.9874***	0.0556***		5.7696***	3071.031
XAG	ged	0.0036***	-0.3025***	0.0053	-0.1168	-0.0198***	0.0178*	0.9978***	0.012		1.1652***	2628.211
WTI	std	0.0012	-0.0345	-0.072	0.0082	-0.1203***	-0.0892***	0.9844***	0.1378***		16.5678*	2083.604
BRT	ged	0.0028***	-0.1193***	0.0242***	0.0048	-0.0212***	-0.0582***	0.9973***	0.0308***		1.5574***	2069.234
EUR/USD	std	0.0013***	-0.2556***	0.0024	-0.0557	-0.0259***	-0.0156	0.9976***	0.033***		8.9449***	3388.356
GBP/USD	std	0.0021***	-0.381***	-0.0035	-0.0132	-1.3475***	0.0276	0.8691***	0.1976***		5.7678***	3357.268
USD/CHF	std	-0.0027*	0.5362	-0.0311	0.0618	-0.1268	-0.0491	0.9882***	-0.0167***		5.6317	3422.98
USD/JPY	jsu	-0.0006***	0.069***	0.0048**	-0.1075***	-0.2294***	-0.0249	0.9779***	0.107***	-0.2257**	1.6320***	3384.774
FTSE 100	nig	-0.0015**	0.1827*	0.0687***	-0.075	-0.5649***	-0.1751***	0.9419***	0.1542***	-0.2061***	2.6327***	2989.766
S&P 500	nig	-0.0003	0.0926	-0.0597	-0.1606	-0.7156***	-0.2061***	0.9287***	0.2235***	-0.1494**	1.455**	3107.624
FTSE.E 100	sstd	-0.0003	0.02	0.0655	-0.1038	-0.3515***	-0.1766***	0.9633***	0.1651	0.9288***	8.2484**	2949.038
NI225	jsu	-0.0002*	-0.0085	0.0771***	-0.2864***	-0.7423***	-0.2271***	0.918***	0.1768***	-0.2803*	1.5668***	2642.964

Table 13: Model 3 ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	-0.0009**	0.028**	-0.0407***	-0.2968***	-0.0512*	0.0883***	0.9928***	0.24***	-0.0909	0.3698***	2641.874
XRP	jsu	-0.0037***	0.0457**	-0.0151	-0.0588	-0.5861**	-0.0314	0.899***	0.5507***	0.104**	0.9225***	2191.761
LTC	jsu	0.0002	0.0327	-0.1043***	-0.1623	-0.0384	0.0824	0.9944***	0.1883	0.0993*	0.8501***	2349.395
DASH	jsu	-0.0035**	0.1111***	-0.0342	-0.1777*	-0.4239**	-0.0227	0.9271***	0.4085***	0.3015***	1.2862***	1973.654
BTS	jsu	-0.0064	0.1058**	-0.0963**	0.0416	-0.1402	0.036	0.9741***	0.2542	0.1742**	1.186***	1728.234
XMR	sstd	-0.0016	0.0675	-0.0609**	-0.2794***	-0.3658***	0.0903***	0.9313***	0.3254***	1.1134***	3.4424***	1711.727
BCN	ghst	0.0232***	-0.1681***	-0.2184***	-0.0229	-0.3423***	0.0402	0.9222***	0.2586**	0.29**	4.1313***	1284.866
XML	jsu	-0.0058	0.0877	-0.1531***	-0.1922***	-0.2948*	0.0317	0.9463***	0.3466***	0.2526***	1.1178***	1808.693
DOGE	nig	-0.0018**	0.0619	-0.1386***	-0.0706	-0.1766	0.0505*	0.9711***	0.3596***	0.1597	0.5353***	2150.892
MAID	std	-0.0091	0.1707	-0.1305***	-0.0419	-0.3618	0.0058	0.9325***	0.2633*		4.0847***	1670.719
GAME	nig	0.0042	0.0034	-0.0753*	-0.1958**	-0.1109**	0.0111	0.9756***	0.2031***	0.2568***	0.6307***	1169.716
DGB	sstd	-0.0072	0.0923	-0.0714**	-0.2503**	-0.1159**	0.0502**	0.9762***	0.1942***	1.1802***	3.4023***	1392.998
NXT	nig	-0.0062***	0.0903***	-0.1052***	-0.0795	-0.2372***	0.0053	0.9568***	0.3576***	0.279***	0.6241***	1749.54
BTCD	sstd	0.0133***	-0.1266***	-0.1323***	-0.101	-0.6894***	0.0664	0.8562***	0.2928***	1.0551***	3.0789***	1422.283
SYS	jsu	0.003	0.015	-0.14***	-0.1569*	-0.6064***	0.0642*	0.8705***	0.3378***	0.3498***	1.2712***	1284.137
PPC	nig	-0.0042***	0.0765***	-0.0768***	-0.1745***	-0.111**	0.064***	0.9812***	0.2162***	0.1433**	0.5384***	1964.721
RDD	std	-0.0208***	0.1783***	-0.307***	0.0519	-0.2511***	-0.0027	0.9394***	0.259***		4.3214***	891.1285
SJCX	sstd	-0.0006	-0.0088**	-0.1238***	-0.3097***	-0.4798	-0.0218	0.8965***	0.344***	1.0588***	2.8065***	1403.471
XVG	ged	0.0000	0.0000	-0.1829***	-0.0183***	-0.7303	0.0393	0.783***	0.5534		0.6183***	683.9007
NMC	nig	-0.004**	0.0725	-0.1149	-0.1481	-0.2208**	0.0554**	0.961***	0.3289***	0.1888	0.3425***	1954.196
BAY	sstd	-0.0041***	0.0632***	-0.1533***	-0.2522**	-0.4628***	0.06**	0.8975***	0.3071***	1.0884***	3.9831***	1149.634
MONA	jsu	-0.0056***	0.0868***	-0.1035***	-0.2386***	-0.5061***	0.0724**	0.9079***	0.5617***	0.1432*	1.168***	1805.232
CLOAK	ghst	-0.0127***	0.1411***	-0.178***	0.1017**	-0.2895***	0.0363	0.9277***	0.2903***	0.4292***	4.8482***	835.9035
XCP	sstd	0.0093	-0.0907	-0.1545***	-0.0817	-0.1317***	0.0456*	0.9728***	0.1308***	1.2195***	4.3492***	1336.852
BLK	nig	-0.001	0.0343	-0.1506***	-0.0961	-0.2185	0.0447	0.9601***	0.2911***	0.1867***	0.4214***	1785.358
NLG	jsu	0.0047*	-0.0364	-0.1027**	-0.2862**	-1.5386***	0.0847	0.6994***	0.461***	0.2817***	1.1986***	1582.631
VIA	jsu	0.022***	-0.2071***	-0.0802***	-0.1959	-0.46	0.0603*	0.9008***	0.2918***	0.3798***	1.4133***	1200.086
BURST	nig	-0.001	0.0433	-0.1131***	-0.1245	-0.7366***	0.026	0.8462***	0.4269***	0.1397**	0.7405***	1315.797
VTC	nig	-0.0044***	0.0589***	-0.0933***	-0.0792	-0.4055***	0.1103**	0.9156***	0.3136***	0.2412***	0.6128***	1341.426
BLOCK	sstd	0.0277	-0.1594	-0.1528***	0.0005	-0.6248	0.1766	0.8459***	0.2938	1.14***	3.747***	899.3627
NAV	nig	0.0023	0.0099	-0.1541***	-0.198	-0.5756***	0.0158	0.8706***	0.399***	0.2838***	0.6831***	1118.011
EAC	nig	-0.0042*	0.0436	-0.1702***	-0.292***	-0.1389*	0.0202	0.9703***	0.4341***	0.1879*	0.3157***	1244.376
UBQ	std	-0.0199***	0.2085***	-0.2047***	-0.1596	-0.5494**	0.0554**	0.8787***	0.3417***		3.6355***	1168.105
CRIX	nig	-0.0003	0.0955	-0.034	-0.3015	-0.0965	0.0823***	0.986***	0.2896	-0.1234	0.3896***	2648.702
<i>Panel B: Traditional Assets</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0017***	-0.201***	-0.0242	0.0132	-0.1198***	0.0323***	0.9877***	0.0553***		5.7463***	3068.201
XAG	ged	0.001***	-0.0844***	-0.0222***	-0.0778	-0.0134***	0.018*	0.9985***	0.0192***		1.152***	2624.815
WTI	std	0.0006	0.0014	-0.0755	0.0821	-0.1292***	-0.0888***	0.9833***	0.141***		16.8543*	2082.914
BRT	ged	0.0026***	-0.1122***	0.0328	-0.0432	-0.0243***	-0.0564**	0.9969***	0.0337***		1.5776***	2070.357
EUR/USD	std	0.0009	-0.1829	0.0039	-0.1743	-0.0307***	-0.0158	0.9971***	0.0356***		8.8647***	3385.046
GBP/USD	std	0.0021***	-0.399***	0.0183	-0.2533**	-1.3646***	0.0294	0.8674***	0.194***		5.6191***	3356.004
USD/CHF	ghst	-0.0026***	0.4776***	-0.0297	0.085***	-0.1336***	-0.0467***	0.9873***	-0.0137	-1.0579	8.264232	3424.075
USD/JPY	ghst	-0.0007***	0.1055***	-0.0171*	-0.0899	-0.2565***	-0.0232	0.9752***	0.1148***	-0.2779**	5.140728	3381.958
FTSE 100	nig	-0.0015***	0.1939***	0.063***	-0.1048*	-0.5683***	-0.173***	0.9416***	0.1569***	-0.2093***	2.5613***	2986.167
S&P 500	ged	-0.0003***	0.1314***	-0.0931***	0.0102	-0.7768***	-0.2162***	0.923***	0.233***		1.1845***	3102.768
FTSE.E 100	sstd	-0.0004*	0.0509***	0.0476**	-0.0183	-0.3561***	-0.1744***	0.9629***	0.1695*	0.9291***	8.3067***	2944.826
NI225	jsu	-0.0007	0.0912*	0.0224	-0.0571	-0.7954***	-0.2269***	0.912***	0.1943***	-0.269**	1.5417***	2635.69

Table 14: Model 4 ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0007	0.0401	-0.0521*	-0.2905***	-0.058	0.0858***	0.9918***	0.2532***	-0.0863	0.3693***	2637.625
XRP	nig	-0.0037	0.0708	-0.0257	0.0372	-0.6213	-0.0228	0.8951	0.5109	0.2105	0.2465*	2191.37
LTC	jsu	0.0000	0.0434	-0.1107***	-0.1183	-0.0388	0.0797	0.9944***	0.1876	0.11	0.8595**	2346.136
DASH	jsu	-0.0036	0.1184	-0.0379	-0.3033	-0.4059	-0.0178	0.9302***	0.3958	0.3119***	1.2898***	1972.661
BTS	nig	-0.0062*	0.1067*	-0.0919**	-0.0405	-0.1336	0.0356	0.9754***	0.2392**	0.1831***	0.5713***	1726.661
XMR	sstd	-0.0021***	0.0856***	-0.077***	-0.2327	-0.3849***	0.0849***	0.9279***	0.336***	1.1177***	3.4868***	1707.269
BCN	std	0.0223***	-0.2298***	-0.2158***	-0.1909	-0.3453***	0.0327	0.9241***	0.255***		3.0123***	1281.036
XLM	jsu	-0.0055*	0.088	-0.1583***	-0.2504***	-0.3004***	0.0327	0.9453***	0.3536***	0.2579***	1.1238***	1808.489
DOGE	nig	-0.002***	0.0687***	-0.1433***	-0.1179	-0.1741***	0.0508*	0.9715***	0.3569***	0.1601***	0.5375***	2148.771
MAID	std	-0.0087***	0.166***	-0.1313***	-0.0106	-0.3762***	0.0043	0.9298***	0.2695***		4.0528***	1670.921
GAME	nig	0.0038**	0.0136**	-0.0823***	-0.2425***	-0.1166***	0.0113	0.9743***	0.2054***	0.2546***	0.6077***	1169.009
DGB	sstd	-0.0073***	0.1062***	-0.0903***	-0.1583	-0.1205***	0.0464**	0.9754***	0.1977***	1.1793***	3.4405***	1388.426
NXT	nig	-0.0064***	0.1025***	-0.1167***	0.1071	-0.2311**	0.0048	0.958***	0.3529***	0.2845***	0.6327***	1748.281
BTCD	std	0.0122***	-0.128***	-0.1431***	0.0271	-0.6943***	0.0683	0.8557***	0.2931***		3.0838***	1419.367
SYS	jsu	0.0016***	0.0301***	-0.1468***	-0.2443	-0.6148***	0.0608*	0.869***	0.3404***	0.3393***	1.2726***	1282.524
PPC	nig	-0.0044	0.0876	-0.0918***	-0.18***	-0.1151*	0.0637***	0.9804***	0.2215***	0.1503*	0.5326***	1962.057
RDD	std	-0.0208***	0.1788***	-0.307***	0.0979	-0.2529***	-0.0017	0.9391***	0.2595***		4.3668***	890.3712
SJCX	std	-0.001	-0.0215***	-0.1315***	-0.3784***	-0.4531	-0.0336	0.902***	0.3373***		2.7887***	1399.866
XVG	sged	-0.0015***	-0.0009***	-0.001***	-0.3402***	-0.3334***	0.1917***	0.8781***	0.5471***	0.9951***	0.4092***	743.4347
NMC	nig	-0.0042***	0.0833***	-0.1243***	-0.1304*	-0.2168***	0.0557**	0.9617***	0.3259***	0.1915***	0.3473***	1951.453
BAY	sstd	-0.0061*	0.0964***	-0.1717***	-0.109	-0.4384***	0.0585*	0.9028***	0.3041***	1.0899***	4.0062***	1145.52
MONA	jsu	-0.0057*	0.0978*	-0.113***	-0.255**	-0.4976***	0.0694*	0.9096***	0.5626***	0.1507**	1.1768***	1802.526
CLOAK	ghst	-0.0131**	0.1355***	-0.1651***	-0.0706	-0.2921***	0.0364	0.927***	0.2904***	0.4265***	4.8376***	835.2307
XCP	sstd	0.0091**	-0.0791**	-0.1663***	0.0503	-0.1244***	0.0485***	0.9743***	0.1226***	1.2229***	4.4151***	1334.986
BLK	nig	-0.0017	0.0461	-0.1606***	-0.2106	-0.2093**	0.0446	0.9618***	0.2841***	0.1822***	0.425***	1783.36
NLG	jsu	0.004	-0.0127	-0.1161***	-0.1834	-1.6038***	0.0717	0.6865***	0.4857***	0.3005***	1.2033***	1578.125
VIA	jsu	0.0208	-0.1847	-0.092	-0.1185	-0.4535	0.0619	0.9023	0.2926	0.3824	1.4142***	1197.052
BURST	nig	-0.0026	0.0652	-0.1199***	-0.1824	-0.7366	0.0242	0.8461***	0.4302**	0.1381	0.7296***	1314.391
VTC	nig	-0.004	0.0596	-0.1001***	-0.0202	-0.4021***	0.1116***	0.9163***	0.3081***	0.2414***	0.6158***	1339.676
BLOCK	sstd	0.0278	-0.1637	-0.1458	-0.2097	-0.6149	0.1734	0.8485***	0.2936	1.1455***	3.7642***	899.1399
NAV	nig	0.0018**	0.0305*	-0.1721***	0.0506	-0.5514***	0.0228	0.8758***	0.383***	0.2896**	0.6748***	1117.21
EAC	nig	-0.0043***	0.0501***	-0.1863***	-0.1112	-0.1411***	0.0153	0.9698***	0.4383***	0.1763***	0.3215***	1242.975
UBQ	sstd	-0.0207**	0.252**	-0.2111***	-0.0374	-0.6127***	0.058*	0.8639***	0.3621***	1.0868***	3.5779***	1169.093
CRIX	nig	-0.0004	0.1109	-0.0505	-0.288***	-0.1084	0.08***	0.9843***	0.2972*	-0.1187	0.391***	2643.539
<i>Panel B: Traditional Assets</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0016***	-0.1921***	-0.0323	0.0969	-0.1224***	0.0338***	0.9875***	0.0545***		5.7326***	3065.275
XAG	ged	-0.0004	0.0356*	-0.0359	-0.0262	-0.0043***	0.0162	0.9996***	0.02**		1.1509***	2620.637
WTI	std	0.0007	-0.0129**	-0.0647**	-0.012	-0.1331***	-0.088***	0.9828***	0.1449**		16.8924	2080.339
BRT	ged	0.0022***	-0.0849***	0.0225***	0.0818	-0.0257***	-0.0558***	0.9967***	0.0355***		1.5621***	2067.67
EUR/USD	std	0.0004***	-0.0746***	-0.0136	0.0665	-0.0357***	-0.0148	0.9966***	0.0376***		8.799***	3379.945
GBP/USD	std	0.0018**	-0.3315***	0.0026	-0.2458**	-1.2236***	0.0261	0.8811***	0.187* * *		5.6755***	3350.59
USD/CHF	ghst	-0.0023***	0.4703***	0.0025	0.0075	-0.1257***	-0.0492***	0.9884***	-0.0122	-1.2143	8.3927***	3418.604
USD/JPY	jsu	-0.0007***	0.0995***	-0.015	-0.1411	-0.2346***	-0.024	0.9774***	0.1088***	-0.2229*	1.6380* * *	3378.615
FTSE 100	nig	-0.0014	0.1724	0.066**	-0.302*	-0.5376***	-0.1702***	0.9448***	0.1515***	-0.2062***	2.4070***	2984.562
S& P500	ged	-0.0003***	0.1365***	-0.0953* * *	0.0672	-0.7836***	-0.218***	0.9224***	0.232***		1.1824***	3100.386
FTSE.E 100	sstd	-0.0004	0.0417	0.0537	-0.1018	-0.3579***	-0.1771***	0.9627***	0.1654***	0.9291***	8.3723***	2942.317
NI225	jsu	-0.0006	0.0779	0.0235	-0.1848	-0.7783***	-0.2261***	0.9139***	0.1921***	-0.2702**	1.5290***	2633.694

Table 15: Model 5 ANAR(1)-EGARCH(1,1)

Panel A: Cryptocurrencies												
Ticker	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	ghyp	LL
BTC	nig	0.0014**	-0.0549**	-0.1373	-0.0787	0.075***	0.9888***	0.2799***	-0.1173*	0.3866***		2632.179
XRP	nig	-0.0011	-0.0069	-0.3557***	-0.5851	-0.0137	0.9016***	0.4706**	0.1849**	0.242***		2193.843
LTC	jsu	0.0009	-0.1154***	-0.0119	-0.0504	0.0705	0.9929***	0.1966	0.0725	0.867***		2341.889
DASH	jsu	0.0019	-0.0445	-0.1205	-0.3908***	-0.0187	0.9332***	0.3717***	0.2893***	1.3143***		1970.873
BTS	jsu	-0.0012*	-0.0803***	-0.0348	-0.1526*	0.035	0.9721***	0.2498***	0.1492***	1.1995***		1728.208
XMR	sstd	0.0031**	-0.0526*	-0.3234***	-0.3734***	0.0939***	0.9302***	0.3055***	1.113***	3.489***		1714.22
BCN	ghyp	0.0077***	-0.235***	0.2263	-0.3278***	0.0371	0.9285***	0.2359***	0.6577**	0.25	-1.537409	1286.901
XLM	jsu	-0.0012	-0.1612***	-0.075	-0.3392**	0.0333	0.9388***	0.3593***	0.2345***	1.1348***		1805.105
DOGE	nig	-0.0002*	-0.1491***	0.0222	-0.1893***	0.0477*	0.9695***	0.3576***	0.1252**	0.5474***		2150.279
MAID	jsu	0.0004	-0.1078***	-0.1544*	-0.3243**	0.0056	0.94***	0.2473***	-0.0744	1.4088***		1672.132
GAME	nig	0.0051	-0.0758*	-0.1764**	-0.1195***	0.0068	0.9737***	0.2168***	0.2425***	0.6175***		1165.686
DGB	sstd	0.0006	-0.0858***	-0.1302	-0.1377***	0.0529**	0.972***	0.1871***	1.1678***	3.4283***		1391.018
NXT	nig	-0.0018***	-0.1074***	-0.0494	-0.2367**	-0.0003	0.9573***	0.3442**	0.2537**	0.6503***		1749.243
BTCD	sstd	0.0032	-0.1411***	-0.0237	-0.6969**	0.0656	0.8544***	0.3071***	1.0593***	3.0836***		1422.157
SYS	jsu	0.0051**	-0.1644***	0.0282***	-0.5977***	0.0609	0.8725***	0.3255***	0.3446***	1.2664***		1279.413
PPC	nig	-0.0009	-0.0822***	-0.1284*	-0.1387***	0.0614***	0.9766***	0.2268***	0.1186**	0.5436***		1960.661
RDD	std	-0.0009	-0.2944***	-0.112	-0.221***	0.0114	0.9468***	0.2394***		4.3601***		890.7577
SJCX	std	-0.0026	-0.1466***	0.0734	-0.4374	-0.0438	0.9045***	0.339***		2.7522***		1397.016
XVG	ged	0.0000	0.0000**	-0.6099***	0.3029	0.3564	0.9414***	1.1598		0.1034		1519.336
NMC	nig	-0.0009***	-0.1163***	-0.2007**	-0.2284***	0.0621**	0.96***	0.3106***	0.1516***	0.3421***		1953.208
BAY	sstd	0.0029	-0.1554***	-0.1733	-0.4398***	0.0668**	0.9029***	0.295***	1.0851***	4.0724***		1149.256
MONA	jsu	-0.0011	-0.1245***	0.0501	-0.522***	0.0637	0.9057***	0.5612***	0.1145	1.1781***		1803.026
CLOAK	ghyp	0.0037***	-0.1711***	0.0085	-0.3268***	0.0354	0.9197***	0.2845***	0.8523***	0.2501	-2.3995***	830.951
XCP	sstd	0.0021	-0.161**	-0.0365	-0.1142	0.0488	0.9763***	0.1301	1.2257***	4.3629***		1338.771
BLK	nig	0.0006	-0.178**	0.2094	-0.2219***	0.0415***	0.96***	0.2859***	0.1633***	0.4525***		1784.984
NLG	jsu	0.0033	-0.1132***	-0.1088	-1.5555***	0.0699	0.6963***	0.4897***	0.3065***	1.2182***		1578.802
VIA	jsu	0.0047***	-0.0972***	-0.0105	-0.3937***	0.0654**	0.9147***	0.2973***	0.3968***	1.4294***		1196.443
BURST	nig	0.003	-0.0972***	-0.2234***	-0.7507***	0.0315	0.8437***	0.4234***	0.1524**	0.7801***		1318.909
VTC	nig	0.0004	-0.0965***	0.0045	-0.4252***	0.1102***	0.9119***	0.3071***	0.2299***	0.6228***		1340.378
BLOCK	sstd	0.0085**	-0.1568***	-0.0029	-0.5064	0.1667**	0.8745***	0.2911**	1.1465***	3.7517***		900.264
NAV	nig	0.0046	-0.1586***	-0.238	-0.5706***	0.0319	0.8715***	0.3879***	0.2869***	0.6849***		1118.174
EAC	nig	-0.0026*	-0.2055***	0.1651	-0.1525**	0.0086	0.9678***	0.4472***	0.1231**	0.3265***		1238.375
UBQ	sstd	0.0029	-0.1757***	-0.5991**	-0.4243**	0.0914*	0.9058***	0.282***	1.0615***	3.5314***		1172.767
CRIX	nig	0.0015**	-0.0344	-0.1704	-0.1244	0.0692***	0.9819***	0.3167***	-0.1833***	0.3997***		2639.639
Panel B: Traditional assets												
Ticker	Dist	μ	ϕ	ρ	ω	α	β	γ	Skew	Shape	ghyp	LL
XAU	std	0.0001	-0.0241	0.0207	-0.1088***	0.0347***	0.9889***	0.0607***		5.8741***		3073.26
XAG	ged	0	-0.0019	-0.1045	-0.0049***	0.0201	0.9995***	0.0186***		1.1609***		2629.686
WTI	jsu	0.0001	-0.0485	-0.4007***	-0.1186***	-0.0919***	0.9847***	0.0936***	-0.5991	3.6037***		2088.98
BRT	ged	0.0003	0.0244	0.0196	-0.0487***	-0.0585***	0.9937***	0.0327***		1.5692***		2071.73
EUR/USD	std	0	-0.0312	0.1888*	-0.0405***	-0.0162	0.9962***	0.0389***		8.8194***		3393.462
GBP/USD	std	-0.0001	-0.0297**	0.1845***	-0.8166***	0.0217	0.9207***	0.1536**		5.7238***		3361.37
USD/CHF	sstd	-0.0001***	-0.0043	-0.0463***	-0.0211***	-0.0567***	0.9981***	-0.0168***	0.8745***	5.9318***		3425.92
USD/JPY	jsu	-0.0002	-0.0078	-0.1209	-0.2265***	-0.0245	0.9782***	0.1111***	-0.2406**	1.6403***		3387.95
FTSE 100	nig	-0.0002	0.0586	-0.1462	-0.4723***	-0.1919***	0.9511***	0.1482***	-0.2274***	2.7465***		2991.22
S&P 500	ged	0.0004***	-0.0986***	-0.0072	-0.6677***	-0.2232***	0.9335***	0.2241***		1.1857***		3107.01
FTSE.E 100	std	0.0000	0.0553**	-0.0462	-0.3211***	-0.1843***	0.9666***	0.1571***		8.3751***		2950.19
NI225	jsu	0.0002***	0.0240***	-0.0925	-0.7177***	-0.2306***	0.9206***	0.1855***	-0.2706**	1.5552***		2639.76

Table 16: Model 5 ANAR(1)-EGARCH-M(1,1)

<i>Panel A: Cryptocurrencies</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
BTC	nig	0.0009	0.0348	-0.0588**	-0.1234	-0.0756	0.0755***	0.9892***	0.2809***	-0.0973	0.387***	2632.51
XRP	nig	-0.0030***	0.0507***	-0.0132	-0.3288***	-0.5764***	-0.0115	0.9029***	0.4737***	0.2024***	0.2403***	2194.33
LTC	jsu	0.0000	0.0449	-0.1186**	0.0029	-0.0425***	0.0723***	0.9938***	0.1983**	0.1063	0.8653***	2342.89
DASH	jsu	-0.0033	0.1171	-0.0478	-0.0677	-0.4106**	-0.0193	0.9296***	0.3929***	0.3039***	1.3052***	1972.161
BTS	nig	-0.0063***	0.1085***	-0.0953***	0.0107	-0.1340*	0.0352	0.9754***	0.2390***	0.1811**	0.5797***	1729.62
XMR	sstd	0.0014	0.0304	-0.0544**	-0.3158***	-0.3673***	0.0949***	0.9312***	0.3097***	1.1160***	3.4757***	1714.27
BCN	ghst	0.0212	-0.1521	-0.2287***	0.1659	-0.3312**	0.0375	0.9258***	0.2440**	0.2909**	4.1532***	1286.42
XML	jsu	-0.0052***	0.0867***	-0.1637***	-0.0452	-0.3208***	0.0303	0.9417***	0.3669***	0.2567***	1.1329***	1806.37
DOGE	nig	-0.0021	0.0707***	-0.1473***	0.0494	-0.1763***	0.0502*	0.9713***	0.3574***	0.1573***	0.5450***	2151.45
MAID	std	-0.0067***	0.1287***	-0.1150***	-0.1248	-0.3371***	0.0065	0.9372***	0.2566***		4.0923***	1671.75
GAME	nig	0.0066*	-0.0178	-0.0754**	-0.1809**	-0.1189***	0.0062	0.9739***	0.2141***	0.2396***	0.6184***	1165.71
DGB	sstd	-0.0063	0.0956	-0.0901***	-0.0990	-0.1193**	0.0515**	0.9755***	0.1920***	1.1807***	3.4027***	1392.12
NXT	nig	-0.0063***	0.0956***	-0.1122***	-0.0113	-0.2300***	0.0037	0.9582***	0.3547***	0.2799***	0.6391***	1750.44
BTCD	std	0.0132***	-0.1405***	-0.1379***	-0.0487	-0.6934**	0.0699*	0.8554***	0.2937***		3.0562***	1422.23
SYS	jsu	0.0012	0.0463*	-0.1677***	0.0468***	-0.5775***	0.0597	0.8766***	0.3283**	0.3491***	1.2666***	1279.52
PPC	nig	-0.0037***	0.0727***	-0.0913***	-0.1047	-0.1182**	0.0607***	0.9799***	0.2256***	0.1406*	0.5379***	1961.42
RDD	std	-0.0178***	0.1501***	-0.3002***	-0.0823	-0.2455**	-0.0018	0.9408***	0.258***		4.36***	891.62
SJCX	std	-0.0034***	0.0096***	-0.1465***	0.0773	-0.4350	-0.0452	0.9050***	0.3377***		2.7501***	1397.03
XVG	sged	0.0000	-0.0104***	-0.0001	-0.7314***	-0.1089***	0.0234	0.9449***	0.6055***	0.9816***	0.2189***	931.11
NMC	nig	-0.0034***	0.0628**	-0.1169***	-0.1879***	-0.2150**	0.0611**	0.9621***	0.3200***	0.1780**	0.3374***	1953.93
BAY	std	-0.0013	0.0189	-0.1623***	-0.1565	-0.4443**	0.0585*	0.9021***	0.3055***		4.0398***	1147.14
MONA	std	-0.0058***	0.0687***	-0.1334***	0.1058	-0.5149***	0.0626	0.9041***	0.6262***		3.0904***	1801.67
CLOAK	ghst	-0.0156***	0.1599***	-0.1757***	0.0749	-0.3037***	0.0264	0.9261***	0.2830***	0.6169*	5.7909***	831.29
XCP	sstd	0.0101***	-0.0965*	-0.1570***	-0.0512	-0.1332**	0.0465	0.9725***	0.1298	1.2203***	4.3614***	1339.10
BLK	nig	-0.0027***	0.0752	-0.1820	0.2582	-0.1962	0.0434	0.9644***	0.2791***	0.1905**	0.4526***	1785.80
NLG	jsu	0.0067***	-0.0450**	-0.1094***	-0.1249	-1.5835***	0.0730	0.6909***	0.4840***	0.3062***	1.2172***	1578.88
VIA	jsu	0.0231***	-0.2080***	-0.0889***	-0.0688	-0.4660***	0.0638**	0.8997***	0.2930***	0.3887***	1.4252***	1198.25
BURST	nig	0.0056	-0.0332	-0.0953***	-0.2353***	-0.7601***	0.0322	0.8418***	0.4224***	0.1504**	0.7823***	1318.95
VTC	nig	-0.0041	0.0592	-0.1018***	0.0225	-0.4044**	0.1093***	0.916***	0.3104***	0.2367***	0.6245***	1340.70
BLOCK	sstd	0.0317***	-0.1948*	-0.1411***	-0.0474	-0.6879	0.1813**	0.8308***	0.3079*	1.1429***	3.7793***	901.83
NAV	nig	0.0068	-0.0230	-0.1568***	-0.2497	-0.5760***	0.0342	0.8704***	0.3840***	0.2847***	0.6847***	1118.21
EAC	ged	-0.0060***	0.0364***	-0.1908***	0.2016***	-0.1387***	0.0081***	0.9706***	0.4171***		0.7855***	1237.59
UBQ	std	-0.0123***	0.1392***	-0.1949***	-0.5322**	-0.4217**	0.0779**	0.9069***	0.3009***		3.6052***	1172.51
CRIX	nig	-0.0001	0.0937	-0.0458	-0.1379	-0.1177	0.0740	0.9829*	0.3121	-0.1303	0.4020**	2641.71
<i>Panel B: Traditional Assets</i>												
Ticker	Dist	μ	δ	ϕ	ρ	ω	α	β	γ	Skew	Shape	LL
XAU	std	0.0014***	-0.1650***	-0.0222	0.0119	-0.1197***	0.0334***	0.9877***	0.0561***		5.8492***	3073.51
XAG	ged	0.0065***	-0.5346***	0.0154	-0.1206	-0.0434**	0.0310***	0.9952***	-0.0071		1.1690**	2635.03
WTI	std	0.0022***	-0.1048**	-0.0585	-0.3750**	-0.0884***	-0.0918***	0.9886***	0.0958***		18.1416*	2088.45
BRT	ged	0.0028***	-0.1215***	0.0244***	0.0075	-0.0202***	-0.0580***	0.9974***	0.0302***		1.5507***	2072.02
EUR/USD	std	0.0005	-0.0984	-0.0298	0.1790	-0.0335***	-0.016	0.9968***	0.0383***		8.8473***	3393.53
GBP/USD	std	0.0016	-0.2839	-0.0228	0.1482**	-1.0140***	0.0258	0.9015***	0.1684***		5.7291***	3362.07
USD/CHF	ghst	-0.0003***	0.0171***	-0.0108	-0.0260***	-0.0155***	-0.0480***	0.9986***	-0.0187***	-1.2684***	9.7402	3427.95
USD/JPY	jsu	-0.0005**	0.0663	-0.0083	-0.1134	-0.2422***	-0.0242	0.9767***	0.1121***	-0.2373**	1.6449	3388.02
FTSE 100	nig	-0.0014***	0.1730***	0.0636*	-0.0988	-0.5986***	-0.1841***	0.9384***	0.1535***	-0.2220***	2.7741***	2992.28
S&P 500	ged	-0.0003***	0.1324***	-0.0931***	0.0353	-0.7817***	-0.2195***	0.9225***	0.2314***		1.1888***	3108.07
FTSE.E 100	ghst	-0.0004***	0.0386***	0.0505*	-0.0218	-0.3605***	-0.1887***	0.9622***	0.1608***	-0.4853*	7.7248***	2951.75
NI225	jsu	-0.0006	0.0792	0.0241	-0.0630	-0.7744***	-0.2250***	0.9143***	0.1871***	-0.2754*	1.5365***	2639.90