CRYPTOCURRENCIES: INSTRUMENTS FOR INVESTMENT SECURITY PROTECTION

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Abstract: The current research aims to reveal whether cryptocurrencies may be included in investors' portfolios as instruments for diversification and hedging against global systematic risk. The main contribution of the research is the fact that it provides proof of the usage of cryptos for hedging against global financial systematic risk. This seems to confirm the main hypothesis in the study about the role of money and cryptos in the contemporary global financial economy. The research reveals evidence that cryptocurrencies can play the role of global market predictors.

Key words: global systematic risk, cryptocurrency, diversification, hedging strategy.

1. INTRODUCTION

The traditional Capital Assets Pricing Model embodies just two main ideas- the portfolio diversification and the systematic risk. The individual financial assets are priced in accordance with their beta, reflecting the sensitivity to the systematic risk. The latter is usually assumed to reflect the specific fluctuations of the individual national economies, which cannot be avoided. However, the international diversification allows for eliminating of the specific country risks. Nevertheless, global financial risk, related to the world economy as whole will remain. This risk cannot be diversified away unless we introduce global financial instruments with negative beta. The cryptocurrencies are the best candidates for such tools since typically they are not related to any country. To do this, first, money is introduced as the most liquid financial asset with beta equaling to 1 (one). Then cryptocurrencies are instituted as quasi money. The advantage of the cryptocurrencies as hedging instrument against global systematic risk is the fact, that typically they are not related to any country.

The progress of the global financial innovations concerns the digitalization of payments and the role of money. By their nature, cryptocurrencies denote a digital representation of value; digital currencies backed by cryptography and not issued by central authorities of any country do not involve government intervention. Since the creation of the first cryptocurrency Bitcoin in 2008 the cryptocurrencies are increasingly used in payment systems and as speculative assets. They are an instrument that is

particularly attractive due to the high volatility in its value. The cryptocurrencies are the brand-new phenomena in the financial markets.

The current research aims to reveal whether cryptocurrencies may be included in the investors' portfolios as instruments for diversification and hedging against global systematic risk. These assumed strategies of diversification imply a modification of the CAPM and empirical test of the new hypotheses.

Restrictive conditions of this research are determined in the following aspects:

- *Time range* - this research is restricted in different time intervals for each cryptocurrency;
- *Methodological restrictions* –they are set by the statistical properties of the researched data imposing the application of specific econometric tests and models giving opportunity for the reflection. The proposed and used methodology does not claim to be the only possible and applicable when inspecting and proving the research thesis of this study.
- *Restrictions of the observations* – the analysis and the inspection of the research thesis are concentrated in the following 14 cryptocurrencies: Binance Coin, Bitcoin, Cardano, Dash, EOS, Ethereum, Holo, Litecoin, Monero, Neo, Ripple, Tether, Zcash, Zilliqa), Crypto Index, and Bloomberg Barclays Global Aggregate Total Return Index (BBGATRI).

2. LITERATURE REVIEW AND THEORETICAL BACKGROUND

The holding of cryptocurrencies in the investor's portfolio is a very arguable subject. To define whether cryptocurrencies are appropriate instruments for risk management, their ability to diversify and hedge should be explored. In the research of [1], cryptocurrencies are described as an asset class that is totally different from traditional asset classes, but they can be estimated by traditional and simple financial instruments. Three types of assets are distinguished and may be used as instruments for risk management: a diversifier, a hedge, and a safe haven [2]. Some authors [3] define the safe haven asset as "crucial in investment because it provides a means for shielding or growing the capital when it has to flight from the existing markets that are undergoing turbulence". Others consider that a financial asset may be accepted as a diversification instrument if it is in a weak and positive correlation with the other explored assets. Otherwise, if the asset is not correlated or if it is correlated negatively, it may be classified as a hedging instrument [4]. It is proved that BTC may be applied as a hedging instrument against stocks in the Financial Times Stock Exchange Index. According to the author, BTC can be used as a hedge against the American dollar in the short-term, either [5]. Contrary to these conclusions, it is revealed that dynamic conditional correlation is applied to reveal whether Bitcoin can be used as a hedging instrument. They prove that BTC is not suitable for hedging, but it is an asset that is good for diversification purposes [6].

According to [7] cryptocurrencies represent an asset diversification class for investors seeking for diversification benefits. They prove that Bitcoin, "could act as a diversifier in normal market conditions, and it might also have some borderline hedge to safe haven properties". The hedging abilities of cryptos are explored by [8], either. The

study concludes that Bitcoin can be useful as a hedge against the global equity market in the short term. There exist many studies that examine the impact of Bitcoin on an optimal portfolio and the main results prove that Bitcoin improves the performance of an investment portfolio [9]. The research [10] explores the effect of applying Bitcoin in portfolio diversification by analyzing the correlations between different assets and Bitcoin. The author reveals an important benefit in the investment of a small share of Bitcoin in a well-diversified portfolio.

The starting point of our approach is the classical Capital Assets Pricing Model (CAPM). The CAPM has never been an empirical success [11], [12]. The approach in the research is inspired by Tobin's interpretation of the Keynesian theory of liquidity preference [13]. It is assumed that the economic agents aim at maximizing monetary profits. If the market portfolio appreciates, the money holdings depreciate, and vice versa. Therefore, the correlation between the portfolio index and the price of money is defined in terms of purchasing power of money vis-a-vis the other financial assets equal by definition -1. Further, in the current study, the riskless asset is replaced by a combination of money and market portfolio with zero return and zero variance. In such a case, the capital market line goes through the origin. The beta of money is -1 by definition. It is started with the assumption that we have a portfolio consisting of just two parts- money and market portfolio. The variance of this composite portfolio equals:

$$\partial_p^2 = \omega_1\sigma_c^2 + (1 - w_1)\sigma_m^2 + 2\omega_1(1 - \omega_1)R_{cm}\sigma_c\sigma_m \quad (1)$$

Where ∂_p^2 is the variance of the composite portfolio, ω_1 is the share of money in the composite portfolio, σ_c^2 is the variance of the return on money, σ_m^2 is the variance of the market portfolio and R_{cm} is the coefficient of correlation between money and the market portfolio.

The intention is to find a composite portfolio with zero variance, which is also the minimum variance portfolio. If we consider the variance of the composite portfolio as a function of the share of money in this portfolio, we should find the first derivative of (1) with respect to ω_1 and obtain the solution of the equation $\frac{\partial\partial_p^2}{\partial\omega_1} = 0$.

$$\partial_p^2 = w_1\sigma_c^2 + \sigma_m^2 - \omega_1\sigma_m^2 + 2(w_1 - \omega_1^2)R_{cm}\sigma_c\sigma_m \quad (2)$$

Considering that by definition $R_{cm} = -1$, and that $\sigma_c = \sigma_m$, we arrive at:

$$\partial_p^2 = \sigma_m^2(1 - 2w_1 + 2\omega_1^2) \quad (3)$$

So:

$$\frac{\partial\partial_p^2}{\partial\omega_1} = \sigma_m^2(4\omega_1 - 2) \quad (4)$$

The first-order condition for the local minimum of the function (3) implies tha $\omega_1 = 0{,}5$. The second-order condition is also obviously fulfilled. This furthermore entails $\partial_p^2 = 0$.

Likewise, we assume that cryptocurrencies are money, so that they share with the money the negative beta property. However, the beta of cryptocurrencies is not necessarily -1.

Let us assume that the composite portfolio owner believes that the expected positive market non-monetary portfolio return will prevail in the next period with probability p. In such a case, it does make sense to borrow money and invest into a market portfolio or

take a short cryptocurrency position with leverage l with $= {}^{B}/_{P}$, where B is the quantity of the borrowed funds in the new portfolio and P is the monetary value of the investor's own funds in market portfolio. The liquid part of the portfolio is assumed to equal $1/l$, since it is based on the opposite guess of market decline.

At the same time, there is probability $(1-p)$ that a non-monetary market portfolio will generate losses. On the other hand, the market participants expect losses from the liquid part of the portfolio with probability p. We assume that the traders are risk averse. Consequently, the loss expectations from the monetary and non-monetary part of the portfolio should be equal. If the expected monetary losses are higher than the non-monetary counterpart, the portfolio is over-liquid and over-leveraged in the opposite case. Given this equals principle, it can be written:

$$l(1-p) = {}^{1}/_{l}\,p \tag{5}$$

And

$$l = \sqrt{\frac{p}{(1-p)}} \tag{6}$$

In Figure 1 the relationship between the probability of positive market development and the leverage is depicted. It can be expected a negative correlation between positive market expectations and the demand for cryptocurrencies. So, in addition to negative market beta, the quotations of cryptocurrencies are expected to be negatively related to the global market sentiment.

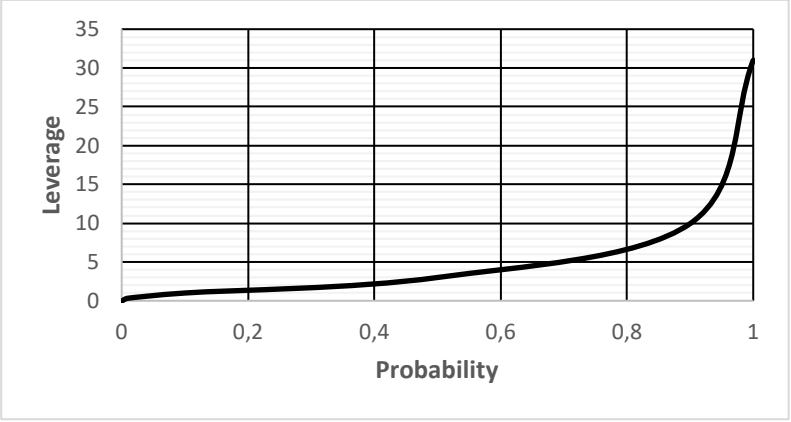

Figure 1. Portfolio Leverage/Probability Relationship

3. METHODOLOGY

The literature about cryptocurrency as an instrument for risk management is gaining more research interest. The current study contributes to this context by applying and modifying CAPM for fourteen cryptocurrencies. In this study the explored fourteen cryptocurrencies are - Binance Coin, Bitcoin, Cardano, Dash, EOS, Ethereum, Holo, Litecoin, Monero, Neo, Ripple, Tether, Zcash, Zilliqa, Crypto Index (CRIX), and Bloomberg Barclays Global Aggregate Total Return Index (BBGATRI). The BBGATRI

is assumed to be a proxy for the global market portfolio, bearing the global systematic risk. The data of the explored variables is available from coinmarketcap.com, thecrix.de, and ycharts.com. The data is with daily frequency.

Table 1. Explored cryptocurrencies and indices (Source: Authors' systematization).

Variable	Period
Binance Coin (BNB)	25.07.2017 – 26.06.2020
Bitcoin (BTC)	29.04.2013 – 26.06.2020
Cardano (ADA)	01.10.2017 – 26.06.2020
Dash (Dash)	14.02.2014 – 26.06.2020
EOS (EOS)	01.07.2017 - 26.06.2020
Ethereum (ETH)	07.08.2015 - 26.06.2020
Holo (HOT)	30.04.2018 - 26.06.2020
Litecoin (LTC)	29.04.2013 - 26.06.2020
Monero (XMR)	21.05.2014 - 26.06.2020
Neo (NEO)	09.09.2016 - 26.06.2020
Ripple (XPR)	04.08.2013 - 26.06.2020
Tether (USDT)	25.02.2015 - 26.06.2020
Zcash (ZEC)	29.10.2016 - 26.06.2020
Zilliqa (ZIL)	25.01.2018 - 26.06.2020
Crypto Index (CRIX)	31.07.2014 - 26.06.2020
Bloomberg Barclays Global Aggregate Total Return Index (BBGATRI)	29.04.2013 – 26.06.2020

The rates of change of the explored data series are calculated as their logged first differences.

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$$R_t = \log(\frac{PI_t}{PI_{t-1}}) \tag{7}$$

Where:

R_t - the return of the explored variable at time t;

PI_t - the value of the variable at time t;

PI_{t-1} - the value of the variable at time t-1;

We apply the ADF test to estimate stationarity. We prove that all variables are stationary in the form dlog (x) i.e., variables were integrated of order 1. The Augmented Dickey-Fuller (ADF) test constructs a parametric correction for higher-order correlation by assuming that the y series follows an AR (p) process and adding p lagged difference terms of the dependent variable y to the right-hand side of the test regression:

$$\Delta y_t = \alpha y_{t-1} + x_t'\delta + \beta_1 \Delta y_{t-1} + \beta_2 \Delta y_{t-2} + \ldots + \beta_p \Delta y_{t-p} + \nu_t \tag{8}$$

All of the explored variables are stationary at a 5% of the significance level of the ADF test.

The correlation is part of a broad class of statistical relationships involving dependence, though in common usage it most often refers to the extent to which two variables have a linear relationship with each other. A correlation coefficient is a number that quantifies a type of correlation and dependence, meaning statistical relationships between two or more values in fundamental statistics.

$$\hat{\rho}(X,Y) = \frac{\hat{\sigma}(X,Y)}{(\hat{\sigma}(X,X).\hat{\sigma}(Y,Y))^{1/2}} \quad (9)$$

To determine the direction of the causality relationship between explored variables; if it is one-way or bidirectional. According to this test, if time series X is Granger-Causes another time series Y that implies the past value of X should contain information about Y so that helps predict Y above and beyond the information contained in the prior value of "Y" alone.

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \ldots + \alpha_1 y_{t-1} + \beta_1 x_{t-1} + \ldots + \beta_1 x_{t-1} + \varepsilon_t \quad (10)$$

$$x_t = \alpha_0 + \alpha_1 x_{t-1} + \ldots + \alpha_1 x_{t-1} + \beta_1 y_{t-1} + \ldots + \beta_1 y_{t-1} + u_t \quad (11)$$

β-coefficient is a reliable risk measure, and it can be used as a risk control. The β-coefficient is a vital risk measure of a portfolio in comparison to the benchmark portfolio. In the current study, the β-coefficient for fourteen cryptocurrencies and the crypto index CRIX are estimated. Applying linear regression, it is aimed to explain the yield of the cryptocurrencies by the yield of the global market portfolio, represented by BBGATRI. BBGATRI measures the performance of global investment-grade fixed-income securities. The OLS regression from the following type is applied:

$$Return\ of\ the\ cryptocurrency = \alpha + \beta * Return\ of\ BBGATRI \quad (12)$$

Where the following restriction α=0 is applied. This means that it is assumed, that the security market line goes through the origin and that there is no global riskless asset. The regression through the origin may be appropriate in the case when we have theoretical reasons to assume, that the constant term is zero. According to the results from the linear regression, the sensitivity of the cryptocurrencies may be explained by the following values of the β-coefficient:

If β=1, it is assumed that the cryptocurrency is as volatile as the global market.

If β>1, it is assumed that the cryptocurrency is more volatile than the global market. If the cryptocurrency is included in the investor's portfolio, it will increase the portfolio risk and will act aggressively.

If 0<β<1, it is assumed that the cryptocurrency is less volatile than the global market. If the cryptocurrency is included in the investors' portfolio, it will diminish the portfolio risk and will act defensively.

If β<0, it is assumed that the cryptocurrency is negatively correlated to the global market. This may be explained by the following situation: In case of a global economic downturn, the profitability of the cryptocurrency should increase, and in case of global economic recovery, it should decrease.

4.RESULTS AND DISCUSSIONS

The results of the descriptive statistics are presented in Table 2. Skewness and kurtosis are observed in the descriptive statistic's analysis. They give information for the variability and location of the explored variables. They reveal that all the observed variables have excess kurtosis. This indicates that their distributions are leptokurtic. The following returns of the variables have negative skewness: BTC, BBGATRI, EOS, ETH, USDT, ZEC, ZIL, CRIX. Unlike traditional assets, the skewness for the following cryptocurrencies (BNB, ADA, DASH, HOT, LTC, XMR, NEO, XPR) is positive and the kurtosis is high indicating large deviations from normality. ZEC has the lowest mean value and BNB has the highest mean one. The lowest minimum is observed for ETH and the highest maximum for NEO.

Table 2. Descriptive Statistics of the returns of the cryptocurrencies, Crypto Index and BBGATRI (Source: Authors' calculations)

	Mean	Median	Max.	Min.	Std. Dev.	Skewness	Kurtosis	Jarque-Bera	Prob.	Sum	Sum Sq. Dev.
RBTC	0.002231	0.001842	0.520791	-0.464730	0.050608	-0.032488	16.43945	13998.28	0.00	4.149364	4.761238
RBBGATRI	7.21E-05	0.000156	0.015261	-0.021992	0.003033	-0.620542	8.262009	2265.250	0.00	0.134136	0.017096
RBNB	0.006591	0.001139	1.197400	-0.818310	0.098315	1.906426	40.84632	45757.63	0.00	5.002384	7.326759
RADA	0.001597	-0.002638	0.886875	-0.503638	0.094327	2.800604	28.25230	19792.80	0.00	1.133537	6.308330
RDASH	0.003174	-0.003013	1.354999	-0.860201	0.090291	2.476705	46.76725	133544.1	0.00	5.243577	13.45977
REOS	-0.000651	0.000281	0.419550	-0.503229	0.085121	-0.052923	8.707230	1052.181	0.00	-0.504327	5.608077
RETH	0.003484	-0.000443	0.510826	-1.363526	0.085451	-2.919339	58.57675	164991.4	0.00	4.417796	9.251392
RHOT	-0.000582	-0.005343	0.723257	-0.551065	0.088700	1.688252	18.30445	5741.528	0.00	-0.326625	4.405857
RLTC	0.001232	-0.000197	0.800050	-0.513925	0.074840	1.494930	22.37393	29782.37	0.00	2.291566	10.41230
RXMR	0.002330	-0.001177	0.709755	-0.494208	0.082099	0.811065	12.30233	5881.149	0.00	3.688567	10.66310
RNEO	0.002949	-0.003399	1.442449	-0.522543	0.111528	2.679018	36.06095	46037.88	0.00	2.904928	12.23942
RXPR	0.001946	-0.003483	0.750830	-0.512927	0.081660	1.598725	18.58462	18877.35	0.00	3.482601	11.92975
RUSDT	-0.000139	0.000000	0.500497	-0.690668	0.023839	-10.90103	651.2563	2425974	0.00	-0.191665	0.784815
RZEC	-0.003555	-0.005019	0.649948	-0.939667	0.087231	-1.226372	23.34153	16599.35	0.00	-3.373923	7.213635
RZIL	-0.003234	-0.001181	0.347172	-0.565899	0.080483	-0.524082	8.427703	799.6167	0.00	-2.030770	4.061362
RCRIX	0.002080	0.002297	0.220266	-0.446644	0.045779	-0.929200	12.71329	6243.007	0.00	3.185943	3.208578

The results from the applied regression are presented in Table 3. The β-coefficient estimates the cryptocurrencies' sensitivity to the market risk. The explored cryptocurrencies can be divided into three groups (Table 3):

Cryptocurrencies with β Coefficient>1;

Cryptocurrencies with 0<β Coefficient<1;

Cryptocurrencies with β Coefficient<0;

The returns of Zcash (RZEC) have a β-coefficient with a value much higher than 1. This is a type of cryptocurrency that will add risk to the investors' portfolio. Zcash is a specific type of zero-knowledge proof technology that allows nodes on a blockchain network to validate transactions without disclosure of users' transaction metadata. The main disadvantages of Zcash are the fact, that it requires a lot of calculations to finish the transaction and investors should act carefully because information leakage is possible. The returns of Zilliqa (RZIL) have a β-coefficient with a value equal to 0,531772. The returns of ZIL are changing in the same direction with the market portfolio but are less volatile than it. Zilliqa is a software that seeks to incentivize a global, distributed network of computers to run a blockchain platform that aims to increase user scalability through sharding. According to the economic theory, the value of the β-coefficient of RZIL is characterized by risk exposure which is lower than market risk. The low positive beta of Zilliqa is probably explained by its scalability and sharding properties, allowing for fast adjustment to the market trends.

Table 3. Results from the OLS regression (Source: Authors' calculations)

Variable	β Coefficient	T-statistics	p-value	R-squared
β Coefficient < 0				
RBTC	-0.345964	-2.902503	0.0069*	0.201775
RCRIX	-0,161880	-2,421358	0,0035*	0,210768
RADA	-0,195576	-2,913119	0,0014*	0,334271
RDASH	-0,835353	-2,119391	0,0031*	0,127538
RETH	-1,706502	-1,784396	0,0746***	0,455839
RLTC	-0,077580	-3,135562	0,0021*	0,213144
RXMR	-0,171765	-4,250868	0,0019*	0,156307
RXPR	-0,810595	-3,246858	0,0026*	0,329466
RUSDT	-0,371744	-1,791354	0,0734***	0,248148
0 < β Coefficient < 1				
RZIL	0,531772	2,321473	0,0068*	0,252701
β Coefficient > 1				
RZEC	2,202727	2,288727	0,0223**	0,74129
Statistically insignificant values of β Coefficient of the explored cryptocurrencies				
RNEO	1,094531	0,899910	0,3683	0,028676
RHOT	-0,127591	-0,095523	0,9239	0,004036
REOS	1.470286	1.305956	0.1920	0.002140
RBNB	1,025523	0,778572	0,4364	0,000799

The returns of the following nine cryptocurrencies Bitcoin (BTC), Cardano (RADA), Dash (RDASH), Ethereum (RETH), Litecoin (RLTC), Monero (RXMR), Ripple (RXPR), Tether (RUSDT), and the Crypto index CRIX have high negative values of their β-coefficients. The aforementioned may be used as instruments for global risk management. Investors may use them to hedge against global financial risks. In terms of

global market portfolio, we can use the negative beta cryptocurrencies as hedging instruments against global systematic financial risk.

Applying Granger Causality Test (Table 4), it is proved that six of the returns of the explored cryptocurrencies (BTC, ZEC, ZIL, XMR, CRIX and ADA) Granger cause the BBGATRI. The opposite relationship is observed between the following pairs of variables: Ripple (XPR) and BBGATRI; Litecoin (LTC) and BBGATRI.

Table 4. Granger Causality Test for establishing the relationship between the returns of cryptocurrencies and BBGATRI (Source: Authors' calculations)

Null hypothesis	F-Statistic	p-value
BBGATRI does not Granger Cause BTC	1.57842	0.1262
BTC does not Granger Cause BBGATRI *	2.01853	0.0409
ETH does not Granger Cause BBGATRI	0.02395	0.9763
BBGATRI does not Granger Cause ETH	0.28674	0.7508
ZEC does not Granger Cause BBGATRI *	3.04654	0.0165
BBGATRI does not Granger Cause ZEC	0.15765	0.9595
BBGATRI does not Granger Cause ZIL	1.11346	0.3291
ZIL does not Granger Cause BBGATRI *	2.32266	0.0089
BBGATRI does not Granger Cause USDT	0.74886	0.8393
USDT does not Granger Cause BBGATRI	0.64786	0.9325
BBGATRI does not Granger Cause XPR*	2.93941	0.0132
XPR does not Granger Cause BBGATRI	0.59283	0.5529
BBGATRI does not Granger Cause NEO	0.07275	0.9298
NEO does not Granger Cause BBGATRI	0.03520	0.9654
BBGATRI does not Granger Cause XMR	0.17534	0.8392
XMR does not Granger Cause BBGATRI*	3.20394	0.0409
BBGATRI does not Granger Cause LTC*	3.59665	0.0276
LTC does not Granger Cause BBGATRI	1.15321	0.3158
BBGATRI does not Granger Cause HOT	0.36038	0.6976
HOT does not Granger Cause BBGATRI	0.16187	0.8506
BBGATRI does not Granger Cause DASH	0.34967	0.7050
DASH does not Granger Cause BBGATRI	1.83759	0.1595
RCRIX does not Granger Cause BBGATRI*	3.04381	0.0279
BBGATRI does not Granger Cause RCRIX	0.92123	0.4298
BBGATRI does not Granger Cause BNB	0.25381	0.8142
BNB does not Granger Cause BBGATRI	0.67425	0.9341
BBGATRI does not Granger Cause ADA	1.63892	0.3186
ADA does not Granger Cause BBGATRI*	3.02817	0.0192
BBGATRI does not Granger Cause EOS	1.38722	0.7638
EOS does not Granger Cause BBGATRI	1.09328	0.6731

The fact, that typically the causality runs from cryptos to BBGATRI, or we observe mutual causality, probably reflects the circumstance, that the players on the crypto markets are better informed and more sophisticated, then those on the traditional financial markets.

Most theories claim that correlation is essential if the investor aims to diversify his portfolio. If the diversification strategy is successful, the investing risk will decrease,

and we will be sure that it will not doom if the price of a single variable decreases rapidly. The correlation matrix helps us to visualize which assets are appropriate for combining as trading pairs. If the correlation coefficient is strong and positive, it means very risky, and on the other side if the correlation is strong and negative the investment is meaningless because the decrease in one variable will be compensated with an increase in another. If we choose assets that are law-correlated it is possible to have a profitable and well-managed portfolio. By analyzing the existing correlation between the explored cryptocurrencies, we can compare the effects of market volatilities on combining different pairs of cryptocurrencies and check how they will diversify the portfolio risk if combined in the same one. We can utilize trading strategies of matching a long position in one cryptocurrency with a short position in another, either. In the correlation matrix (Table 5), it is revealed that the highest correlation is proved among the pairs of cryptocurrencies RBTC and RLTC with a coefficient equal to 0.671065. Trading Litecoin and Bitcoin as pairs aims to make the investor's position market neutral. This can be achieved by combining a pair's trade with two highly correlated stocks or equities that perform in a similar sector, making it possible to gain profits through simple and relatively low-risk investments.

Table 5. The Correlation Matrix

	RDASH	REOS	RETH	RHOLO	Rlitecoin	Rmonero	RNEO	Rripple	Rtether	Rzcash	Rzilliqa	RBinance	RBTC	Rcardano
RDASH	1													
REOS	-0,08715	1												
RETH	0,214929	-0,07506	1											
RHOLO	-0,01773	-0,0848	-0,04224	1										
Rlitecoin	0,027214	-0,0529	0,020365	-0,07386	1									
Rmonero	0,004914	-0,03207	0,036607	-0,04075	0,017118	1								
RNEO	-0,09943	-0,04398	-0,07409	0,018922	0,017563	-0,03081	1							
Rripple	-0,03964	0,03516	-0,05655	-0,07698	-0,01345	-0,02023	-0,04294	1						
Rtether	0,095452	-0,01332	0,112212	-0,02543	0,026821	-0,12747	0,05973	0,020422	1					
Rzcash	0,00646	0,130208	-0,03594	0,006467	0,025543	-0,00981	0,004589	-0,07006	0,017018	1				
Rzilliqa	0,005478	0,01417	-0,00285	0,012854	0,016901	0,0148	0,023836	0,083282	0,116418	0,034907	1			
RBinance	0,029413	0,058324	-0,02262	-0,08914	0,017314	-0,02867	0,009439	-0,01924	-0,0054	-0,06117	0,000569	1		
RBTC	0,031045	0,004906	0,033946	-0,10455	0,671065	0,003006	0,028687	-0,01762	0,058924	-0,00783	0,002475	0,050382	1	
Rcardano	-0,03287	-0,05716	-0,04874	-0,01622	0,07346	0,014902	0,022906	-0,07358	-0,05351	-0,03492	0,026473	0,051512	0,052352	1

The other cryptocurrencies are relatively law-correlated. These results prove the hypothesis that cryptocurrencies may be combined in a portfolio if the investor aims to benefit. If we comment on these results through the theory of [4], BTC is the most useful asset for the diversification of a crypto portfolio.

5. CONCLUSION

The present research is an attempt to investigate whether the cryptocurrencies can play the role of hedging instrument against the global systemic financial risk. The global systematic financial risk is a relatively new phenomenon, related to the financial globalization. The latter is defined as a risk, which cannot be diversified away through international diversification. The results confirm that the cryptocurrencies are

heterogeneous group with different risk parameters. Some of them, namely Zcash and Zilliqa have traditional diversification properties. However, the prevailing part of cryptos, specifically Bitcoin (BTC), Cardano (RADA), Dash (RDASH), Ethereum (RETH), Litecoin (RLTC), Monero (RXMR), Ripple (RXPR), Tether (RUSDT), and the Crypto index CRIX have high negative betas against our global financial market proxy. Consequently, they can be used for hedging against the global financial systematic risk. This seems to confirm our hypothesis about the role of money and cryptos in the contemporary global financial economy. The causality also reveals some evidence that cryptocurrencies can play the role of global market predictors.

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