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Review Article

THE IMPACT OF DIVERSIFICATION IN TRADITIONAL AND DIGITAL FINANCIAL TOOLS ON REDUCING RISKS AND IMPROVING RETURNS OF THE INVESTMENT PORTFOLIO[1]

GELENEKSEL VE DİJİTAL FİNANSAL ARAÇLARDA ÇEŞİTLENDİRMENİN YATIRIM PORTFÖYÜNÜN RİSKLERİNİN AZALTILMASI VE GETİRİLERİNİN ARTIRILMASINA ETKİSİ

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ABSTRACT
The purpose of this study is to find out the impact of traditional financial tools and digital tools on the investment portfolio's risk and return in United State American financial market. It examined which portfolio can be an optimal portfolio when compared to two other portfolios, where first portfolio consists of traditional financial tools, second one is formed from digital tools or crypto currency, and the third one is the combination of both mentioned portfolios. The sample is taken from traditional financial tools (oil index, gold index, dollar index, and S&P 500 index), and digital tools or crypto currency (Bitcoin, Ethereum, and Ripple). The daily secondary data is taken from August 7,2015, to December 31, 2021. Sharp ratio was applied three times for each portfolio separately to extract logical findings by using solver subprogram of excel, further stepwise regression equation is utilized for dependent and independent variables, as a statistical analysis with the help of spss program. This study determines that the traditional financial tools and digital tools have a significant impact on the risk and return of the investment portfolio, and after comparing the three investment portfolios the study concludes that the combination of traditional financial tools and digital tools will achieve the optimal portfolio.

ÖZ
Bu çalışmanın amacı, geleneksel ve dijital finansal araçların çeşitlendirmesinin yatırım portföyünün risk ve getirisi üzerindeki etkisini Amerika Birleşik Devletleri finans piyasasında araştırmaktır. Çalışmada, geleneksel finansal araçlardan oluşan birinci portföy, dijital araçlardan veya kripto para birimlerinden oluşan ikinci portföy ve her iki portföyün bir kombinasyonundan oluşan üçüncü portföy arasında karşılaştırma yapılarak hangi portföyün optimal bir portföy olduğu incelenmiştir. Örneklem geleneksel finansal araçlardan (petrol endeksi, altın endeksi, dolar endeksi ve S&P 500 endeksi) ve dijital araçlardan veya kripto para birimlerinden (Bitcoin, Ethereum ve Ripple) oluşmaktadır. Günlük ikincil veriler 7 Ağustos 2015'ten 31 Aralık 2021'e kadar alınmıştır. Her bir portföy için üç kez Sharpe oranı uygulanmış, Excel'in çözücü alt programı kullanılarak mantıklı bulgular elde edilmiş ve daha sonra SPSS programının yardımıyla bağımlı ve bağımsız değişkenler için adım adım regresyon denklemi istatistiksel analiz olarak kullanılmıştır. Bu çalışma, geleneksel finansal araçların ve dijital araçların yatırım portföyünün riski ve getirisi üzerinde önemli bir etkiye sahip olduğunu belirlemiştir. Üç yatırım portföyü karşılaştırıldığında, geleneksel finansal araçlar ve dijital araçların birleşiminden oluşan portföy ile optimal portföy elde edileceği sonucuna ulaşılmıştır.

[1] **Bu çalışma "The Impact of Diversification in Traditional and Digital Financial Tools On Reducing Risks And Improving Returns On The Investment Portfolio" adlı doktora tezinden türetilmiştir.**

1| INTRODUCTION

Investment portfolios are one of the important topics in the world of diffusion and the portfolio, and their importance comes from the nature of the current financial and economic markets, which are characterized by great changes and the most prominent of them in the international conditions. Developing the investment concept to form a portfolio capable of investing funds, the area that has been greatly increased due to the high equipment of surplus funds and the optimum utilization of financial resources by employing them in different tools and fields in the best possible investments to meet the desires of the continuous And managing the portfolio with the aim of increasing its capital and maintaining its real value, in addition to achieving stubbornness with the least degree of risk.

The main purpose of this study is to find whether the investment portfolio which consist of traditional financial tools and digital financial tools (crypto currency) can be an optimal portfolio with the lower level of risk and higher return, when compared with the portfolio include traditional financial tools or digital currencies (crypto currencies). The idea of the study grew out of it's problem, which is a clear question follows: Does combining traditional and digital tools into an investment portfolio have an impact on reducing risks and improving investment returns?

Additionally, two hypotheses have been tested in this study. The hypotheses are as follows:

1.Diversification of investment between the traditional financial tools and the digital financial tools contributes to improving the returns of the investment portfolio and reducing its risks.

2.There is an impact of all variables of the traditional and digital financial tools in the diversification portfolio at statistically significant level of (0.05).

To achieving the aim of the study the researcher chose a sample from USA financial market, the sample period covers from August 7,2015, to December 31, 2021. It includes secondary daily data of traditional financial tools (Gold, Oil, USD Dollars, and S&P 500 index), and digital financial tools (Bitcoin, Ethereum, and ripple), which are independent variable. While the risk and return are dependent variable.

The financial analysis used to determine the levels of risk and return by adopting Sharp ratio, with the help of Excel's subprogram Slover. In statistical analysis the stepwise regression equation employed with the help of SPSS, to determining the impact of independent variable on the dependent variable.

2 | CONCEPTUAL FRAMEWORK

The existence of financial and monetary markets is an essential tool for distributing funds for a variety of purposes, to every financial institution's key focus being to collect deposits and allocate them to different investment sectors. It may also make predictions about the future and explain the state's economic situation, which encourages fund owners to invest in and join these markets. This is significant considering the vital role that these markets play in national economies. (Mishkin, 2011 :3)

2.1 | Traditional Financial Tools

Financial instruments like public loans, public equity or venture capital, or credit guarantees are increasingly used in regional and local economic development (Brown, R., & Lee, N., 2018). To support investments in small and medium-sized firms (SMEs), financial tools were first introduced in the early 1990s, nonetheless, they have experienced a major growth throughout the course of the last three Multiannual Financial Frameworks (Ferrer, J. et al., 2017: 27)

Financial instruments may be divided into three primary classes, as shown in (Ferrer, J. et al., 2017: 27):

- Equity tool – Share (common stock) securities issued by a company (legal entity) denote ownership, a claim to

residual assets after liquidation, and limited liability (Only the small amount is the owner's responsibility).

- Debt tool – tool for fixed income Loans, credits, bills, bonds, fixed and variable interests are a few examples. Leasing, factoring, forfeiting, mortgages, and reverse mortgages are specific debt management tools.

- Derivatives - Financial tools their value is set by the price of one or more additional assets, such as stocks, bonds, foreign currencies, or commodities.

The core and distinguishing characteristics of financial instruments are represented by these three categories (Viney, C., & Phillips, P., 2019: 11).

A financial index is another term for a statistical measure of volatility in a securities market. A fake portfolio of securities that represents a certain market or a segment of it makes up the stock and bond market indexes for financial markets (Gupte et al., 2012: 133-149).

For many dealers in the financial market, the general stock market indexes are quite essential since they might provide crucial market clues. The ability to use it to discover the actual valuation of stocks through time series comparisons supports investors in making investment decisions, whether they are buying or selling. It should be mentioned that each financial market has its own index, for instance the (Standard & Poor's 500 Index (P&S)), and (The Dow Jones) in the New York Stock Exchange, the (Nikkei (Japanese)), and (The Financial Times 100 FT) in the London Stock Exchange, and the (Cac Index) in the France Stock Exchange.

2.2 | Digital Financial Tools

Cryptocurrencies are a wholly digital phenomenon. As a result of its neutral meanings, "digital currency" is frequently preferred to "virtual currency." (Lee, 2015: 6; Ertz, M., & Boily, É., 2019: 2). The development of cryptographic money began in the 1980s with David Chaum's work. He is usually credited as the inventor of secure digital currency as a result of his essay on the blind signature's cryptographic foundations (Judmayer, A. et al., 2017:16).

On global trading platforms, cryptocurrencies are traded using the peer-to-peer exchange model (such as Coinbase). Despite the fact that some cryptocurrencies can be used for trade and payments, they are not backed by governments or central banks and are not regarded as legal tender (Ertz, M., & Boily, É., 2019: 2). The most well-known cryptocurrency is Bitcoin. It still dominates the market for digital currencies despite being the most costly one currently available (Ghilal & Nach, 2019: 113-131).

In light of the cryptocurrency market's rapid ascent, the blockchain has attracted a lot of interest. This technology has a variety of applications outside of banking and business, including supply chain management, commerce, health care, and public administration, while being most famous for its use with digital money (Ghilal & Nach, 2019: 113-131; Ertz, M., & Boily, É., 2019: 2).

When Bitcoin originally became accessible in 2009, there wasn't much competition. However alternative cryptocurrencies began to emerge in 2011 in new forms. Cryptocurrency comes in a variety of forms nowadays. Three major categories of digital financial tools—Bitcoin (BTC), Ethereum (ETH), and Ripple—were the subject of our article.

2.3 | Investment Portfolio

The first person to write about investment portfolios was the American analyst Harry Markowitz, who did so in 1952 with his well-known paper (Portfolio Selection), Moreover, he is regarded as one of the founding figures of modern investment portfolio theory, for which he received the Nobel Prize in Economics, and he served as the primary model for many who followed him, including scholars like Sharpe and Tobin (Abdulaziz,2018: 31).

Investment portfolios are significant because of their capacity to lower the risks associated with making investments that affect the investor (Abdulaziz,2018: 32). Analyzing investment risks is the crucial component of the relevance of the investment portfolio. as it strives to ensure an acceptable level of income and raise the market value of the capital by diversifying the invested instruments in order to prevent the risks associated with investing in just one instrument. (Ben Moussa, 2004) Due to the rise in investment opportunities and financial surpluses in many agencies and sectors, investment portfolios have become more crucial. Contribute such surpluses to wise investment opportunities. (Al Shabib, 2009; 119)

Each investment portfolio's primary goal should be to strike a balance between return, risk, and liquidity—that is, to get the highest return while taking the fewest risks feasible and having access to the required liquidity (Al Shabib, 2009: 120). Portfolio diversification is a business technique whereby organizations invest in multiple asset classes that do not have a linearly positive connection with one another, according to (Lyandres et al., 2018), such that gains in other classes of assets, which are unaffected by the risk particular to those assets, offset losses in one class of assets (Osewe, L. A., 2020: 2-3). It is possible to diversify a portfolio in terms of assets, markets, styles, asset classes, currencies, geographical, economic development levels, and even risk categories (CFA Montreal, 2016: 1).

Researchers that examine the link between bitcoin and other assets claim that cryptocurrencies have a relatively low association with other assets. This discovery may indicate that bitcoin is an asset that might help portfolio diversification. (Baumöhl, 2018). Moreover, Bitcoin is a powerful hedge against fluctuations in commodity indexes, as demonstrated by (Bouri et al., 2017), whereas (Corbet et al., 2018) 's research indicates that cryptocurrencies are mostly unrelated to other financial assets. (Kajtazi, A., & Moro, A., 2019: 8-9)

The potential benefit of include bitcoin in a portfolio is further supported by research on how bitcoin affects other assets (Burnie, 2018; Guesmi et al., 2018), which shows that it allows for risk hedging. The study's findings suggest that a well-diversified portfolio may include bitcoin as an asset class. Unfortunately, there hasn't been much study done on portfolio diversification that takes bitcoin or cryptocurrencies in general into account. The majority of study focuses on portfolios of American assets. (e.g. Adrianto & Diputra, 2017; Bouri et al., 2017; Brière et al., 2015; Carrick, 2016; Guesmi et al., 2018; Wu & Pandey, 2014). A portfolio of already varied U.S. assets, including bitcoin, increases the expected return and risk, according to one of the initial research (Eisl et al., 2015). To raise the Sharpe Ratio of this portfolio, they advise incorporating some bitcoin. (Brière et al. 2015) claim that adding bitcoin to a portfolio of various U.S. assets causes the Sharpe Ratio (Sharpe, 1963) to rise.

3 | METHODS AND FINDINGS

The financial analysis of the performance of the investment portfolio when it is constructed using traditional financial tools and later on the basis of digital financial tools is covered in the present paragraph. Lastly, the following financial study of the performance of the investment portfolio is carried out using a combination of traditional and digital tools:

3.1 | Traditional Tools Portfolio

In order to determine performance outcomes for the time period from 2015 to 2021 and on a daily basis, the researcher estimated the returns and risks of the portfolio depending on the Sharpe ratio. Following is demonstrated by the findings in Table (1):

The Sharpe ratio outlines the potential excess return an investor might earn in exchange for the increased volatility he must bear while holding a riskier asset. One of the sub-programs inside the Excel application, the Solver, was employed to compute the Sharpe equation.

$$S(X) = \frac{(r_x - R_f)}{Std\ Dev\ (r_x)}$$

Where:

X = The investment tool.

r_x = The average rate of return of x.

R_f =The best available rate of return of a risk-free security

$Std\ Dev\ (r_x)$ = The standard deviation of r_x.

As a starting point for the greatest available rate of return on the tools or assets in the portfolio, the risk-free rate was established at (0.05%) as a minimum return that investors should anticipate. The return around an investment with no risk is indicated by the risk-free rate. Additionally, it depicts the rate of interest a shareholder would anticipate from a risk-free investment across a particular time frame.

It should be emphasized that throughout the study period, the expected return from the portfolio's traditional tools was (0.04%) for oil, (1.19%) for gold, (1.19%) for the stock of (S&P) business, and (0.33%) for the USD.

The best investment mix for this portfolio is made up of the metal Gold at a ratio of (52%), followed by S&P company stock at a proportion of (40%), and dollar investments at a rate of (8%). This portfolio also contains no oil at all at a percentage of (0%). When it is noted that the Sharpe ratio indicates that the optimal return for the portfolio and for this combination of traditional tools will be equal to (0.719).

A daily return of (0.6%) is produced by the portfolio of the four mentioned traditional tools.

Table 1. The Optimal Solution for Traditional Tools Portfolio - Sharpe Method

Risk Free Rate	0.05%				
Tools		Oil	Gold	S&P	Dollar
Expected Return %		0.04%	1.19%	1.19%	0.33%
Variance - Covariance Matrix		Oil	Gold	S&P	Dollar
Optimal Weights		0.00	0.52	0.40	0.08
Oil	0.00	0.0001	0.0005	-0.0001	-0.0001
Gold	0.52	0.0001	0.0001	-0.0001	-0.0001
S & P	0.40	0.0001	0.0003	-0.0001	-0.0001
Dollar	0.08	-0.0001	-0.0001	0.0001	0.0001
Contribution to variance		0.00000	0.00000	0.00007	0.00000
Expected Sharpe ratio		0.719	Portfolio Expected returns		0.006

3.2 | Digital Tools Portfolio

It should be mentioned that throughout the research period, the expected return from the cryptoassets in this portfolio was equal to (8.9%) for Bitcoin, (6.58%) for Ripple, and (7.74%) for Ethereum.

This portfolio's optimal financing structure should be formed of Bitcoin with a proportion of 50%, Ripple with a proportion of 20%, and Ethereum with a proportion of 30%. The Sharpe ratio of (0.832) represents the best scenario for investment returns in the portfolio, although it is not always the best case for risk. This is where the optimal return for the portfolio and for this set of digital tools will be.

The amount of returns that are expected from a portfolio's three tools or assets, which together show an average daily return of 8.3%, is known as the expected return.

Table 2. The Optimal Solution for Digital Tools Portfolio - Sharpe Method

Risk Free Rate	0.05%			
Tools		Bitcoin	Ripple	Ethereum
Expected Return %		8.90%	6.58%	7.74%
Variance - Covariance Matrix		Bitcoin	Ripple	Ethereum
Optimal Weights		0.50	0.20	0.30
Bitcoin	0.50	0.0276	0.0386	0.0335
Ripple	0.20	0.0386	0.0831	0.0587
Ethereum	0.30	0.0335	0.0587	0.0525
Contribution to variance		0.0304	0.0252	0.0165
Expected Sharpe ratio		0.832	Portfolio Expected returns	0.083

3.3 | Diversification Portfolio

It should be mentioned that the expected return from the traditional and digital tools of the diversification portfolio during the research period was (0.04%) for oil, (1.19%) for both gold and S&P stock, (0.33%) for dollar currency, (8.9%) for bitcoin, (6.58%) for ripple, and (7.74%) for ethereum.

The best mix of investments for this portfolio is 4% for Oil, 21% for Gold, 18% for S&P stock, 9% for Dollars, 34% for Bitcoin, 3% for Ripple, and 11% for Ethereum. When using this mix of traditional and digital tools, it is seen that the Sharpe ratio predicts that the portfolio's optimal return will be equal to (0.897).

Oil, Gold, S&P Stock, Dollar Currency, Bitcoin, Ripple, and Ethereum currencies make up the traditional and digital tools in the Diversification portfolio, which delivers a daily return of (9.5%).

Table 3. The Optimal Solution for Diversification Portfolio - Sharpe Method

Risk Free Rate	0.05%							
Tools	Oil	Gold	S&P	Dollar	BIT	RIPP	ETH	
Expected Return	0.04%	1.19%	1.19%	0.33%	8.90%	7.74%	6.58%	
Variance - Covariance Matrix		Oil	Gold	S&P	Dollar	BIT	RIPP	ETH
	Weights	0.04	0.21	0.18	0.09	0.34	0.03	0.11
Oil	0.04	0.0016	0.0001	0.0005	-0.0001	0.0037	0.0034	0.0044
Gold	0.21	0.0001	0.0001	0.0001	-0.0001	0.0005	0.0006	0.0010
S & P	0.18	0.0005	0.0001	0.0003	-0.0001	0.0015	0.0013	0.0021
Dollar	0.09	-0.0001	-0.0001	-0.0001	0.0001	-0.0008	-0.0012	-0.0012
BIT	0.34	0.0037	0.0005	0.0015	-0.0008	0.0276	0.0386	0.0335
RIPP	0.03	0.0034	0.0006	0.0013	-0.0012	0.0386	0.0831	0.0587
ETH	0.11	0.0044	0.0010	0.0021	-0.0012	0.0335	0.0587	0.0525
Contribution to variance		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Expected Sharpe ratio			0.8966		Portfolio Expected returns			0.0954

We may draw the conclusion from the preceding findings that the performance of the investment portfolio made up of traditional and digital financial tools was much preferable to the performance of the traditional and digital financial tools portfolios taken individually.

The initial hypothesis, which relate to (Diversification of investment between the traditional financial tools and the digital financial tools contributes to improving the returns of the investment portfolio and reducing its risks). In light of the financial analysis, we will therefore accept this hypothesis.

4 | STATISTICAL HYPOTHESES TEST

Numerous parametric statistical tests, some of which are mentioned below, were utilized by the researcher to analyze the data. The following procedures were followed in order to validate these tests and acquire their findings using the Statistical Packages for Social Science (SPSS) V.26 program.

This model was initially built on the equation below and was intended to manage the effects of the following variables on the diversity portfolio variable: gold, oil, the s&p 500, the dollar, bitcoin, ripple, and ethereum.

$$Y_3 = B_0 + B_1 * X_1 + B_2 * X_2 + B_3 * X_3 + B_4 * X_4 + B_5 * X_5 + B_6 * X_6 + B_7 * X_7 + e_i \ldots\ldots\ldots$$

In order to explore the equation, the researcher used the stepwise regression test. The investigation produced the seven models for impact analysis alone that are displayed in the table (4):

- The first Model: We can infer from the explanatory coefficient (R2) (0.402) that variations in the bitcoin variable account for (40.2%) of changes in the diversification portfolio, and that the remaining 59.8% is caused by variations in traditional and digital financial tools combined, or by other variables that were not taken into account in the regression equation. Additionally, the calculated value of significance (0.000) confirms that, which was lower than the study's default level of significance (0.05).

- The Second Model: The (R2) was equal to (0.425), which means that the bitcoin and gold explain the percentage (42.5%) of the change that occurs in the diversification portfolio variable, leaving the remaining percentage (57.5%) to the variables of other factors not mentioned in the regression equation.

-The Third Model: The (R2) was equal to (0.494), which indicates that the variables relating to bitcoin, gold, and the stock market only account for (49.4%) of the change in the variable relating to diversification in a portfolio. The remaining portion (50.6%) is attributed to variables relating to additional factors not taken into account in the regression equation.

-The Fourth Model: The (R2) was equal to (0.540), which indicates that the variables bitcoin, gold, the S&P 500, and ethereum account for (54%) of the change in the diversity portfolio variable, leaving (46%) to be accounted for by variables from other factors not taken into account in the regression equation.

- The Fifth Model: The bitcoin, gold, s&p, ethereum, and dollar variables explain the percentage (54.3%) of the change that happens in the diversification portfolio variable, leaving the remaining percentage (45.7%) to be explained by the variables of other components not included in the regression equation.

- The Sixth Model: (R2) was (0.706), which signifies that the variables of bitcoin, gold, the S&P 500, ripple, the dollar, and ethereum account for (70.6%) of the change in the diversification portfolio variable, leaving the remaining percentage (29.4%) to the variables of other factors not taken into account in the regression equation.

- The Seventh Model: (R2) was (0.787), which indicates that the bitcoin, gold, S&P 500, ripple, dollar, ethereum, and oil account for (78.7%) of the change in the diversification portfolio. The remaining portion (21.3%) is attributed to variables were not taken into account in the regression equation.

Table 4. Regression Test for the Equation

Models	Dependent Variables	B_0	B_1	R^2	Estimated t value	Critical t value	Degree of Freedom	P-vale
First	Bitcoin	1.268	.014	0.402	19.561	1.646	1652	0.000
Second	Bitcoin	.912	.011	0.425	15.019	1.646	1651	0.000
	Gold		.002		10.124			0.000
Third	Bitcoin	1.067	.013	0.494	16.409	1.646	1650	0.000
	Gold		.002		11.815			0.000
	S & P		.003		6.215			0.000

Fourth	Bitcoin	.867	.010	0.540	12.921	1.646	1649	0.000
	Gold		.001		7.113			0.000
	S & P		.001		9.716			0.000
	Ethereum		.074		8.806			0.000
Fifth	Bitcoin	.954	.011	0.543	13.112	1.646	1648	0.000
	Gold		.001		5.565			0.000
	S & P		.001		5.980			0.000
	Ethereum		.074		8.885			0.000
	Dollar		.001		2.213			0.027
Sixth	Bitcoin	.927	.010	0.706	12.599	1.646	1647	0.000
	Gold		.001		5.648			0.000
	S & P		.001		1.861			0.045
	Ethereum		.082		9.253			0.000
	Dollar		.001		2.609			0.009
	Ripple		.001		2.605			0.009
Seventh	Bitcoin	.927	.010	0.787	12.546	1.646	1646	0.000
	Gold		.001		5.533			0.000
	S & P		.084		9.445			0.000
	Ethereum		.187		3.644			0.000
	Dollar		.122		6.428			0.000
	Ripple		.001		2.605			0.009
	Oil		.001		1.905			0.037
Significant Value ≤ 0.05					N = 1655			

The second study hypothesis, which claims that (there is an impact of all variables of the traditional and digital financial tools in the diversification portfolio at statistically significant level of (0.05)), is accepted based on the earlier findings of the analysis of the regression equation.

5 | CONCLUSION

Based on study findings, the study makes a number of conclusions. First, regarding the sharp ratio, the study concludes that the Oil (4%), Gold (21%), S&P stock (18%), Dollar (9%), Bitcoin (34%), Ripple (3%), and Ethereum (11%), in that proportion, make up the best investment composition for a diversified portfolio. The study further conclude that The Sharpe ratio (0.897), which represents the best case for investment returns in the portfolio but may not be the optimum case for risk. This mix of traditional and digital tools will provide the portfolio's optimal return.

Finally, regarding the effect of the traditional and digital financial tools on the diversification portfolio's risk and return risk and return, as a result of the study, the gold and bitcoin variables in this study give some high returns with reduced risk compared to other financial instruments. They also represent the best sources of variations in the return and risk of the diversification portfolio. (Guesmi et al., 2019: 431-437) found the same results, including bitcoin in a portfolio is thought to be the greatest crucial combination for creating an optimal portfolio. Furthermore, these findings are support by (Eisl et al., 2015: 2-4; Brière et al., 2015: 58–61; Wu and Pandey, 2014: 44-52; Kajtazi, 2019: 8-9; Boiko et al., 2021: 1-9).

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