



T.C.
TOKAT GAZİOSMANPAŞA UNIVERSITY
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**THE IMPACT OF DIVERSIFICATION IN TRADITIONAL AND
DIGITAL FINANCIAL TOOLS ON REDUCING RISKS AND
IMPROVING RETURNS OF THE INVESTMENT PORTFOLIO**

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SCIENTIFIC ETHICS PAGE

According to the thesis writing guide of Tokat Gaziosmanpaşa University Institute of Social Sciences, My Doctorate thesis titled “The Impact of Diversification In Traditional And Digital Financial Tools On Reducing Risks And Improving Returns Of The Investment Portfolio” that I have prepared under the consultancy of “Assoc. Prof. Dr. Mihriban COŞKUN ARSLAN” is based on scientific ethical values and rules. I hereby declare that it is an appropriate, original work, and I will accept any legal sanctions if it is determined otherwise.

Signature

Hanaa Ibraheem HUSSEIN

/ / 2023

JURY MEMBER'S PAGE



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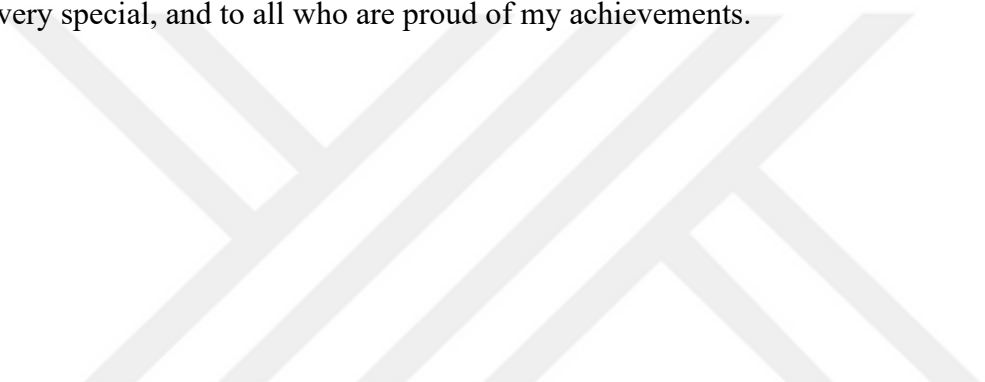
DEDICATION

To the reason of what I become today, my Father & Mother, whose affection, love, encouragement and prays of day and night make me able to get such success and honor.

To my husband, Muhammad, for being there for me throughout the entire doctorate program, for his patience, love, friendship, and making everything possible.

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ABSTRACT

The most fundamental issue in portfolio is determining which assets to include, in what quantities, and how often to rebalance the portfolio in light of changing market and economic conditions. The objective of each investor is to build a portfolio that generates the best possible return for the least level of risk, or that provides higher returns for the same level of risk. Consequently, the return and risk of the portfolio to be constructed are the most crucial factors affecting investing decisions. The purpose of this study is to determine the impact of diversifying traditional and digital financial tools on the return and risk of the portfolio. In order to achieve the research objective, daily secondary data from the US financial markets between August 7, 2015 and December 31, 2021 were collected to determine the most appropriate portfolio among the three portfolios to be created: traditional portfolio (Oil, Gold, S&P Stocks, Dollar), digital portfolio (Bitcoin, Ripple, Ethereum) and diversified portfolio. The return and risk of each of the three portfolios were calculated using the Sharpe ratio with Excel's Solver subprogram. In addition, the E-Views program was used to test the normal distribution and stationarity of the data, as well as a series of standard tests to determine the existence of the necessary conditions to test the working model. In order to determine the relationship between variables and the effect of independent variables on dependent variables, various statistical tests were applied using the SPSS program. As a result of the analysis, an optimal portfolio was obtained with a diversification portfolio formed by investing in both traditional and digital financial tools. Traditional and digital financial tools have a significant impact on the risk and return of the investment portfolio. As a result, it is suggested that investors and portfolio managers should balance between digital and traditional financial tools and focus on establishing appropriate fundamentals and regulations for investing.

Keywords: Traditional Financial Tools, Digital Financial Tools, Diversification, Optimal Portfolio, Risk and Return.

ÖZET

Portföy yönetimindeki en temel konu, portföyün hangi menkul kıymetlerden ve hangi oranlarda oluşacağına ve ekonomik koşullar değiştikçe portföyün ne zaman güncellenmesi gerektiğine karar vermektir. Yatırımcının hedefi, düşük riskle en yüksek getirili portföyü oluşturmak veya aynı risk seviyesinde daha yüksek getirili portföyler elde etmektir. Bu nedenle, yatırım kararlarını etkileyen en kritik faktör, oluşturulacak portföyün getirisi ve riskidir. Bu çalışmanın amacı, geleneksel ve dijital finansal araçları çeşitlendirerek oluşturulan portföyün getiri ve risk üzerindeki etkisini belirlemektir. Araştırma amacına ulaşmak için, geleneksel portföy (Petrol, Altın, S&P hisse senetleri, Dolar), dijital portföy (Bitcoin, Ripple, Ethereum) ve çeşitlendirilmiş portföy olmak üzere oluşturulan üç portföy arasında en uygun portföyü belirlemek için ABD finansal piyasalarından 7 Ağustos 2015 - 31 Aralık 2021 tarihleri arasındaki günlük ikincil veriler toplanmıştır. Üç portföyün her birinin getirisi ve riski Sharpe oranı kullanılarak Excel'in Solver alt programıyla hesaplanmıştır. Ayrıca, verilerin normal dağılımı ve durağanlık testleri ile çalışma modelini test etmek için gerekli koşulların varlığını tespit etmek amacıyla bir dizi standart test için E-Views programı kullanılmıştır. Değişkenler arasındaki ilişkiyi ve bağımsız değişkenlerin bağımlı değişkenler üzerindeki etkisini belirlemek için SPSS programı kullanılarak çeşitli istatistiksel testler uygulanmıştır. Analizler sonucunda hem geleneksel hem de dijital finansal araçlara yatırım yapılarak oluşturulan çeşitlendirme portföyü ile optimal portföy elde edilmiştir. Geleneksel ve dijital finansal araçların yatırım portföyünün riski ve getirisi üzerinde önemli bir etkiye sahip olduğunu belirlemiştir. Sonuç olarak, yatırımcıların ve portföy yöneticilerinin dijital ve geleneksel finansal araçlar arasında dengeleme yapmaları, yatırım yapmak için uygun temeller ve düzenlemeleri oluşturmaya odaklanmaları gerektiği önerilmektedir.

Anahtar Kelimeler: Geleneksel Finansal Araçlar, Dijital Finansal Araçlar, Çeşitlendirme, Optimal Portföy, Risk ve Getiri.

LIST OF CONTENTS

SCIENTIFIC ETHICS PAGE.....	I
ACKNOWLEDGEMENT	III
DEDICATION	IV
ABSTRACT	V
ÖZET	VI
LIST OF CONTENTS	VII
LIST OF TABLES	X
LIST OF FIGURES.....	XII
ABBREVIATIONS.....	XIII
INTRODUCTION.....	1
CHAPTER ONE: OVERVIEW OF THE FINANCIAL TOOLS	7
1.1. THE FINANCIAL MARKET.....	9
1.2. TRADITIONAL FINANCIAL TOOLS.....	10
1.2.1. <i>Types of Traditional Financial Tools</i>	11
1.2.1.1. <i>Shares</i>	11
1.2.1.2. <i>Bonds</i>	12
1.2.1.3. <i>Derivatives</i>	13
1.2.1.4. <i>Indexes</i>	15
1.3. THE RISE OF CRYPTOCURRENCIES (DIGITAL FINANCIAL TOOLS) .	16
1.4. BLOCKCHAIN	18
1.5. TYPES OF DIGITAL FINANCIAL TOOLS.....	19
1.5.1. Bitcoin (BTC)	20
1.5.2. Ethereum (ETH)	21
1.5.3. Ripple (XRP)	21
1.6. THE PROS AND CONS OF CRYPTOCURRENCY AS A DIGITAL INVESTMENT	22
CHAPTER TWO: INVESTMENT PORTFOLIO	24
2.1. TYPES OF PORTFOLIO INVESTMENT	25
2.1.1. The Aggressive Portfolio:.....	25
2.1.2. The Defensive Portfolio:	26
2.1.3. The Income Portfolio:.....	26
2.1.4. The Speculative Portfolio:	26
2.1.5. The Hybrid Portfolio:	26
2.2. BUILDING AN INVESTMENT PORTFOLIO	27
2.3. PORTFOLIO DIVERSIFICATION	29

2.4. TRADEOFF BETWEEN RETURN AND RISK IN THE FINANCIAL PORTFOLIO.....	32
2.5. SHARP RATIO	37
CHAPTER THREE: METHODS AND FINDINGS.....	40
3.1. AIM AND SCOPE OF THE RESEARCH	40
3.2. IMPORTANCE OF THE RESEARCH.....	40
3.3. DATA SET AND LIMITATION OF THE RESEARCH.....	41
3.3.1. Financial Analysis of the Independent Variables.....	41
3.3.1.1. <i>Gold Index</i>	41
3.3.1.2. <i>Oil Index</i>	43
3.3.1.3. <i>S&P Index</i>	46
3.3.1.4. <i>Dollar Index</i>	48
3.3.1.5. <i>Bitcoin Index</i>	51
3.3.1.6. <i>Ethereum Index</i>	53
3.3.1.7. <i>Ripple Index</i>	55
3.3.2. Financial Analysis of the Dependent Variables	57
3.3.2.1. <i>Traditional Tools Portfolio</i>	58
3.3.2.2. <i>Digital Tools Portfolio</i>	60
3.3.2.3. <i>Diversification Portfolio</i>	61
3.3.3. Limitation of the Research	64
3.4. STANDARD MODEL ANALYSIS	64
3.4.1. Stationary Approach.....	64
3.4.1.1. <i>Autocorrelation Test</i>	65
3.4.1.2. <i>Normal Distribution Test:</i>	65
3.4.1.3. <i>Unit Root Test</i>	71
3.4.2. Cointegration Approach	81
3.4.3. Causality Approach	86
3.5. STATISTICAL ANALYSIS	88
3.5.1. Homogeneity Test	88
3.5.2. Statistical Hypotheses Test.....	89
3.5.2.1. <i>Correlation Test</i>	89
3.5.2.1.1. Correlation between Traditional Tools and Diversification Portfolio .	89
3.5.2.1.2. Correlation between Digital Tools and Diversification Portfolio.....	91
3.5.2.1.3. Correlation at the level of Portfolios.....	92
3.5.2.2. <i>Impact Test</i>	94
3.5.2.3. <i>Analysis Of Variance</i>	106
3.5.2.3.1. Testing Hypothesis Nine:.....	106
3.5.2.3.2. Testing Hypothesis Ten	108
3.5.2.3.3. Testing Hypothesis Eleven:	109

CONCLUSIONS AND SUGGESTIONS.....	112
CONCLUSIONS.....	112
SUGGESTIONS	114
REFERENCE	117



LIST OF TABLES

Table 3.1. Annual Trend for Gold Prices.....	43
Table 3.2. Annual Trend for Oil Prices.....	45
Table 3.3. Annual Trend for S&P Prices.....	48
Table 3.4. Annual Trend for Dollar Prices.....	50
Table 3.5. Annual Trend for Bitcoin Prices.....	53
Table 3.6. Annual Trend for Ethereum Prices.....	55
Table 3.7. Annual Trend for Ripple Prices.....	57
Table 3.8. The Optimal Solution for Traditional Tools Portfolio - Sharpe Method.....	59
Table 3.9. The Optimal Solution for Digital Tools Portfolio - Sharpe Method.....	61
Table 3.10. The Optimal Solution for Diversification Portfolio - Sharpe Method.....	63
Table 3.11 Residuals Autocorrelation by Breusch – Godfrey.....	65
Table 3.12 Unit Root Test for the Gold Variable.....	73
Table 3.13. Unit Root Test for the Oil Variable.....	74
Table 3.14 Unit Root Test for the S&P Variable.....	75
Table 3.15 Unit Root Test for the Dollar Variable.....	76
Table 3.16 Unit Root Test for the Bitcoin Variable.....	77
Table 3.17 Unit Root Test for the Ethereum Variable.....	78
Table 3.18 Unit Root Test for the Ripple Variable.....	79
Table 3.19 Unit Root Test for the Diversification Portfolio Variable.....	81
Table 3.20. The Lag Selection Test for the study Time series.....	82
Table 3.21. The Trace Test for the Log Time Series of the Study.....	83
Table 3.22. The Maximum Eigenvalue Test for the Log Time Series of the Study.....	84
Table 3.23. The VECM test.....	86
Table 3.24. The Causality Test for the Study Variables.....	87
Table 3.25. Homogeneity Test.....	89
Table 3.26. The Correlation between Traditional Tools and Diversification Portfolio.....	91
Table 3.27. The Correlation between Digital Tools and Diversification Portfolio.....	92
Table 3.28. The Correlation at the level of Portfolios.....	93
Table 3.29. Regression Test for the Equation One.....	97
Table 3.30. Regression Test for the Equation Two	99
Table 3.31. Regression Test for the Equation Three.....	103

Table 3.32. Regression Test for the Equation Four.....	105
Table 3.33. Regression Test for the Equation Five	106
Table 3.34. The Variance between the Traditional Portfolio Variables.....	107
Table 3.35. The Post-Hoc Test for the Traditional Variables	107
Table 3.36. The Variance between the Digital Portfolio Variables	108
Table 3.37. The Post-Hoc Test for the Digital Variables.....	109
Table 3.38. The Variance between the Diversification Portfolio Variables.....	110
Table 3.39. The Post-Hoc Test for the Diversification Portfolio Variables	110



LIST OF FIGURES

Figure 1.1. Types Of Traditional Financial Tools.....	11
Figure 2.1. Sharp Ratio.....	38
Figure 3.1. Gold Prices Index for The Period 2015-2021.....	42
Figure 3.2. Oil Prices Index for The Period 2015-2021.....	44
Figure 3.3. S&P Prices Index for The Period 2015-2021.	47
Figure 3.4. Dollar Prices Index for The Period 2015-2021.....	49
Figure 3.5. Bitcoin Prices Index for The Period 2015-2021.....	52
Figure 3.6. Ethereum Prices Index for The Period 2015-2021.....	54
Figure 3.7. Ripple Prices Index for The Period 2015-2021.....	56
Figure 3.8. Normal Distribution for Gold Data.....	66
Figure 3.9. Normal Distribution for Oil Data.....	67
Figure 3.10. Normal Distribution for S&P Data.....	68
Figure 3.11. Normal Distribution for Dollar Data.....	68
Figure 3.12. Normal Distribution for Bitcoin Data.....	69
Figure 3.13. Normal Distribution for Ethereum Data.....	70
Figure 3.14. Normal Distribution for Ripple Data.....	70
Figure 3.15. Normal Distribution for Portfolio Performance Data.....	71

Abbreviations

VECM	Vector Error Correction Mechanism
SPSS	Statistical Packages Of Social Science
SME	Small And Medium-Sized Enterprises
S&P	Standard & Poor's 500 Index
BTC	Bitcoin
ETH	Ethereum
XRP	Ripple
REIT	Real Estate Investment Trusts
MPT	Modern Portfolio Theory
CAPM	Capital Assets Pricing Model
APT	Arbitrage Pricing Theory
ETF	Exchange Traded Funds
HHI	Herfindhal-Hirschman Index
VaR	Value-at-Risk
CVaR	Conditional Value-at-Risk
ASX	Australian Securities Exchange
TSX	Toronto Stock Exchange
MIB	Milano Italia Borsa
CNX	Credit Rating Information Services Of India Limited (C) Notional Stock Exchange Of India (NX)
ADF	Augmented Dickey Fuller
AIC	Akaike Information Criterion
LR	Likelihood Ratio
FPE	Final Prediction Error
SC	Schwarz Information Criterion
HQ	Hannan-Quinn Information Criterion
ARDL	Autoregressive Distributed Lags Model
ANOVA	Analysis Of Variance
LSD	Least Significant Differences

INTRODUCTION

There were many investment methods and varied instruments and tools, which required the investor to understand many important aspects to carry out his financial and investment operations in the most efficient way, and to make the appropriate and timely investment decision to achieve the best returns in light of a low level of risk. The importance of financial investments has increased recently, which has led to an increase in interest in this type of investment. In practical life, we witness the proliferation of many financial tools that differ in their price fluctuations, returns and risks, which made the process of investing in securities, especially in Emerging financial markets are processes that must be carefully studied and analyzed. Perhaps one of the most important investment tools at the present time is the formation of an investment portfolio. Investment portfolios are considered in light of the steady increase in risks in the business environment, and the expansion and diversification of available investment opportunities as an effective means in reducing risk to its limits, and achieving rewarding returns, depending on the principle of diversification, as Harry Markowitz (1952) emphasized in the framework of the investment portfolio theory the concept of diversification as an input In order to reduce the overall risk of the portfolio, the investor can, through the possession of investments or financial tools that are not related to the returns between them or have a negative correlation, to reduce the irregular risk to its lowest level.

Investment principles require that the investor estimate the return from a particular investment, because each return is associated with a certain degree of risk. Ensure that the expected return is not surrounded by a number of factors, most of which are outside the control of the investor, about the current satisfaction of the income unit. As for the return on investment, it is the consideration that the investor expects to obtain in the future in return for giving up the current saturation of the income unit. The concept of portfolio return refers to the potential for profit or loss resulting from the possession of a group of different investment tools within a portfolio, that is, it is the weighted average of the returns of the financial tools included in the formation of the portfolio. And reducing risks, simultaneously with achieving balanced returns during a certain period of time, and due to the many differences between investors in terms of priorities related to the investment process, the main mixing decision is considered one of the most important

strategic decisions for the portfolio manager, through which the basic composition of the portfolio assets is determined, with the aim of making the maximum diversification advantages and maximizing the expected return of the portfolio. The increased interest in analyzing time series at the end of the nineteenth century came with the expansion of human interest to include various phenomena, due to the availability of a group of observations taken over time periods, which formed the so-called time series and the inability of pure mathematical rules to describe the studied phenomenon as it does not take into account the nature randomness of the phenomenon. Based on this, mathematical methods were developed that allow the random factor and other non-measurable factors to contribute in the study, to become statistical in nature as a result of adopting statistical methods in finding appropriate models for various time series, and then using these Models in the statistical analysis, and the most important applications of time series analysis was in the field of financial markets to study the behavior of stock prices and its fluctuation.

Therefore, this study came within the framework of an attempt to determine the most appropriate model that can be used in the process of forecasting the returns of investment portfolios, with the aim of framing investment decisions and helping the investor to make a rational investment decision in the US financial market, which will reflect positively on the market as a whole and increasing market efficiency, which in turn is reflected in the local economy. In order to clarify the previous concepts, in addition to the concepts associated with them, the researcher presented the literature related to the concepts of traditional and digital financial tools, return and risk and their measurement methods, in addition to the concepts related to the investment portfolio and methods of diversification in the first and second chapter. The third chapter contained the applied study of the research, as the financial analysis depending on sharp ratio, and the formation of an investment portfolio within optimal conditions that maximize the return at a specific level of risk, and then the researcher proceeded to Testing the stability of the time series, and experimenting with a group of autoregressive and moving average models, and autoregressive models conditioned on the instability of variance by using standard analysis, with the aim of choosing the most appropriate model for determining the impact of independent variable on the dependent variable during the study's period through statistical analysis. Finally, we review the conclusions of the study and the suggestions.

Importance and the Aim of the study

The importance of the study appears in various aspects, including the importance of the knowledge field to which it belongs, which is the field of business administration in organizations aimed at achieving profitability. The importance, which is the return and risk, and they are two of the very important variables in financial thought, on which all financial decisions are based, represented by the investment decision, the financing decision, and the profit divider decision). On which the financial management is based, and perhaps even beyond that to reach its impact on the state's economy. The importance of the study also emerges from the importance of the study sample and society as it is one of the vital fields and aspects in society and the largest contributor to achieving economic and social development, which is the financial sector that forms the most important part in any country. The study has a special importance emanating from the intellectual frameworks and theoretical and applied proposals that it dealt with, in addition to the adopted measures and indicators that contributed to the research of the relationships between the study variables.

The main objective of this study

The study seeks to frame the investment decisions related to the formation of investment portfolios, according to a scientific methodology based on standard mathematical methods with the aim of maximizing returns and reducing risks. The study's problem gave rise to its idea, which is an obvious question, as follows:

Does combining traditional financial tools and digital tools into an investment portfolio have an impact on reducing risks and improving investment returns?

According to the above points, the main objective of this study are, as follows:

- To investigate whether the investment portfolio which consist of traditional financial tools and digital tools can be an optimal portfolio, in comparison to the portfolios include traditional financial tools or digital tools separately.
- Laying down the theoretical and cognitive foundations of the study's main variables and dimensions, by building on ideas and theories that touch the essence of the theoretical topics dealt with in the current study.

- Searching for the dimensions of the field relationship between the variables of the study, based on the data (time series) and related to each of the tests used for the study.
- Determining the role played by diversification in the investment portfolio in forming the optimal portfolio, by adopting appropriate financial, econometric and statistical analyses.
- Discuss the trends of the financial, measurement and statistical analysis of the data of the study variables and their dimensions, in the light of the indicators and measures adopted by the current study.
- Reaching a number of results, from which we aim to identify conclusions that indicate aspects of solutions to the dimensions of the problem in our current study, and then develop appropriate proposals that represent treatments for the negative indicators produced by those conclusions.

Hypotheses

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 a positive significant correlation between variables of the traditional financial tools and the diversification portfolio variable at a statistically significant level of (0.05).
3. There is a positive significant correlation between variables of the digital financial tools and the diversification portfolio variable at a statistically significant level of (0.05).
4. There is a positive significant correlation between traditional financial tools and digital financial tools variables with diversification portfolio variable at a statistically significant level of (0.05).
5. There is an impact of traditional financial tools variables in the diversification portfolio variable at a statistically significant level of (0.05).
6. There is an impact of digital financial tools variables in the diversification portfolio variable at a statistically significant level of (0.05).

7. 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).
8. There is an impact of traditional and digital financial tools variable both together in the diversification portfolio at statistically significant level of (0.05).
9. The returns and risks of a traditional financial portfolio vary with the differences of its tool or variables at a statistically significant level of (0.05).
10. The returns and risks of a digital financial portfolio vary with the differences of its tool or variables at a statistically significant level of (0.05).
11. The returns and risks of a diversification portfolio vary with the differences of its tool or variables at a statistically significant level of (0.05).

Data collection, techniques and method

The researcher chose a sample for achieving the aim of the study, from USA financial market, it's period covers from August 7, 2015, to December 31, 2021. The daily secondary data was taken and analyzed by applying some statistical analysis methods, building models, and testing hypotheses related to the reliability of these models by adopting software packages, as this data turns into information with clear logical significance and easy to understand. Where this will be done by selecting a sample of financial tools to making portfolios which are an investment portfolio for traditional tools (Oil, Gold, S&P stock, Dollar currency), investment portfolio consists of digital tools (Bitcoin, Ripple, Ethereum) and Diversification portfolio which includes the two mentioned portfolios above, and subjecting them to several tests in order to get acquainted with the performance of the investment portfolio, and then calculate the return and risk for each portfolio through the use of the Sharpe ratio, by using the Solver sub program of Excel, the weights of the tools were determined in order to build an optimal investment portfolio, which Achieve the greatest possible return at a given level of risk according to the data of the study for the period from 2015 to 2021 and on a daily basis.

To evaluate the study data, the researcher used a variety of tools and standard tests with the goal of identifying the normal distribution of data, stationarity tests, and identifying the availability of the necessary conditions in the study data to test its model. In addition, the (E-Views V.12) program was used to test these requirements and estimate the standard model using at the first stationary approach through Autocorrelation test, Normal distribution test, and unit root test. Secondly utilized Cointegration Approach by using Lag selection, Cointegration test and, VECM test. At the end the researcher applied Causality Approach to determine the direction of causality between the variables of the study.

In order to examine the data, the researcher used a number of parametric statistical tests, which are firstly Correlation test based on the Pearson method, to determine the relationship between the variables in the study, secondly the Impact test applied to achieve the study's purpose of exploring the impact of the independent variables on the dependent variables, by adopting three multiple regression models. At the end the one-way analysis of Variance (ANOVA) is used to check if the means of two or more dependent variables differ statistically or not. The Statistical Packages for Social Science (SPSS) V.26 program has also been used to verify these tests and obtain their results.

CHAPTER ONE: OVERVIEW OF THE FINANCIAL TOOLS

The primary challenge that a study of finance presents is its language. There are many new words to learn and those words are used to convey new ideas (Viney and Phillips, 2019: 4). New words and new ideas all at once. If we were to name four pieces of finance and economics that can help us organize our thoughts and make it easier to understand how financial institutions, tools and markets work, they would be: (1) risk and return; (2) supply and demand; (3) no arbitrage; and (4) the time value of money (Viney and Phillips, 2019: 4).

When a fund user receives financing from a fund provider, the fund user is required to create a legal document that explicitly states the terms of the contractual agreement. This document is referred to as a financial tool since it recognizes a debt and grants rights to future cash flows (Viney and Phillips, 2019: 11). All financial tools may be represented as bundles of cash flows. They are intended to allow market players to exchange cash flows with varying features and risks (Kirk, 2008: 2). The financial tool is converted into a financial asset on the source of funds' balance sheet (Viney and Phillips, 2019: 11).

Money, like other needs represented by a product or service, is undeniably one of the most basic requirements in everyday living, money is the backbone of every business organization's life since it is the major driver of jobs and activities inside that company, therefore money must be available at the appropriate time and in the correct amount, and to satisfy this need, the different financial and monetary markets must be available (Mishkin, 2012: 3).

The presence of financial and monetary markets is a crucial instrument for delivering money for diverse activities, with each financial institution's principal job being to accumulate deposits and direct them to various investment sectors. It may also forecast the future and clarify the state's economic status, which motivates fund owners to invest in and enter these markets, which is important given the essential relevance of these markets in the economies of countries. Therefore, traditional financial tools may be

viewed as packets of money that can be exchanged or as assets that can be traded in the aforementioned marketplaces (Mishkin, 2012: 3).

Traditional financial tools used in finance might be primary or derivative. With the use of derivatives, the parties to a primary financial tool can shift one or more of the financial risks inherent in that tool between them, they do not result in the transfer of the underlying principal tool, and the transfer is not always triggered by contract maturity (Kirk, 2008: 2).

The introduction of "digital currency," or cryptocurrencies, which are founded on the idea of decentralization and can only be utilized through the World Wide Web, brought about a new revolution in the commercial world some time ago (Mishkin, 2012: 3). We discuss both traditional and digital financial tools that are traded in the aforementioned marketplaces in this chapter.

In accordance to (Głuchowski, 2001: 111; Owsiak, 2002: 296; Lemmonier, 2011: 76; Antkiewicz, 2012: 16; Jajuga i Jajuga, 2015: 23), there are several definitions for financial tools in Polish literature and they are frequently utilized:

- J. Głuchowski [2001]: financial tools used to influence several facets of social and economic life.
- S. Owsiak [2002]: a collection of financial tools employed by various entities to accomplish various aims in many spheres of social and economic life and within various relationships (transactions).
- M. Lemmonier [2011]: a group of financial tools that have an influence on the economy and monetary form and are employed for a variety of objectives, in a wide range of social contexts, and in a wide range of economic interactions.
- S. Antkiewicz [2012]: Cash is the topic of a contract that relates to raising capital and hedging against financial risk.
- K. Jajuga, T. Jajuga [2015]: a deal reached between two parties that outlines the continued financial dependence of the parties to the deal.

Financial tools may be characterized in a variety of ways, according to our concept, and are separated into traditional and digital financial tools. Furthermore,

traditional financial tools may be classified into asset classes based on whether they are debt-based or equity-based.

Traditional financial tools may be categorized into three main groups (Núñez Ferrer et al., 2017: 27-29), these three groups capture the essence and key traits of financial tools (Viney and Phillips, 2019: 11). Each of which is covered in much more detail in the following sections of this chapter:

- **Equity tool** – Shares, often referred to as common stock, are securities that are issued by a legal organization (business) and signify ownership, limited liability (just a tiny portion is the owner's obligation), and a claim to any remaining assets following liquidation.
- **Debt tool** – Tool for fixed income, examples include credits, loans, bills, bonds, fixed and variable interest rates. Specific debt management tools include leasing, factoring, forfeiting, mortgages, and reverse mortgages.
- **Derivatives** – The price of one or more other assets, such as stocks, bonds, foreign currencies, or commodities, determines the value of some financial tools, such as commodities.

Cryptocurrencies, a digital component of financial tools, are categorized as a part of digital currencies as well as a part of alternative currencies and virtual currencies, see Page 16.

1.1. THE FINANCIAL MARKET

The primary issues of the field of financial markets and capital market theory include the analysis of the financial system, interest rate structure, and the price of risky assets (Drake and Fabozzi, 2010: 3). The financial system of an economy is composed of three components: financial markets, financial intermediaries, and financial regulators (Drake and Fabozzi, 2010: 3), because of this, we usually refer to this area as financial markets and institutions.

The definition of the financial market is a market where securities are exchanged (sold and bought), because of the frequent, quick changes that affect today's financial markets, whose structures and procedures, in particular, have undergone substantial modifications in recent decades and should continue to do so (Bärsch, 2012: 13). In order

to reflect the circumstances and demands of economic growth in the nations where it was found, Financial markets were historically not established in a vacuum or by a government decision, but rather as a result of the demands of economic expansion, as shown by the gradualism and realism in their development. The stock market has existed from the beginning of the fourteenth century, and the name of one of the famous merchants is where the phrase "stock exchange" first appeared (Van den Burs), who lived in the Belgian city of Bruges, where a great number of European traders were meeting with him to swap goods and do business, the location where traders and investors gather to finalize existing and future contracts and agreements is referred to as a "bourse" (Atack and Neal, 2009: 11-13).

Financial markets in the past were mostly of a commodity character since they were first restricted to the purchasing and selling of actual commodities (such wheat and cattle) and to simple procedures like exchanging one commodity for another through the barter system (Barter) (Atack and Neal, 2009: 11-13).

The first stock exchange was established in the city of Anvers in Belgium in 1576, followed by those in Amsterdam in the Netherlands in 1608, London in 1666, Paris in 1808, and finally the New York Stock Exchange in 1819. Regarding the Securities Exchange's emergence in its current form, it happened relatively late (1893). Beginning in the nineteenth century, the growing buying and selling of securities made it necessary to create a market to protect the continuous operations of the stock exchange, an organized financial market. Different assets (stocks and bonds) are exchanged, and their prices are controlled by supply and demand (Mosselaar, 2018: 50-60).

1.2. TRADITIONAL FINANCIAL TOOLS

Financial tools like public loans, public equity or venture capital, or credit guarantees are increasingly used in regional and local economic growth (Brown and Lee, 2018: 5). Financial tools were originally launched in the early 1990s for investments in small and medium-sized enterprises (SMEs), but since then, in the previous three Multiannual Financial Frameworks, they have seen a significant growth (Núñez Ferrer et al., 2017: 1). Numerous reasons have driven this movement, including the European Union's limited financial resources and the need to more clearly distinguish between projects that require grants and subsidies and those that experience market failure or unfavorable investment conditions but are still bankable (at least partially, as grants and

Financial tools can be combined) (Núñez Ferrer et al., 2017: 1). Due to the processes of globalization and the rapidity of environmental change, the procedures for financing and depositing cash surpluses are changing.

1.2.1. Types of Traditional Financial Tools

Most sorts of financial tools enable effective money movement and transfer among international investors. These assets might include cash, a legal right to receive or distribute money or another type of financial asset, or proof of ownership of a firm or legal person (Gupte et al., 2012: 133-149). Equity, Bonds, and Derivatives, these three major kinds of financial tools are the ones on which we will depend on in our thesis. Figure (1.1) shows types of traditional financial tools:

Figure 1.1. Types of Traditional financial tools.

Types of Traditional financial tools		
Shares •Common •Preffered	Bonds •Corporate •Municipal •Government •Agency	Derivatives •Futures •Options •Forwards •Swaps

1.2.1.1. Shares

Shares in accordance with (Luminor Bank, 2019: 12) are capital share securities. The shareholder or shareowner is a co-owner of the business. In some circumstances, Dividends must be paid out to shareholders as a portion of the company's profits. The stake a shareholder holds increases with the number of shares they possess and corresponds to the proportion of distributable earnings the shareholder is entitled to. In addition, there is a chance that investments in the company's shares might lose all or part of their value if it files for bankruptcy (Luminor Bank, 2019: 12). The right to the company's net assets in the case of a liquidation and the right to any distribution of profits(dividend) are only a few of the rights that the share frequently offers its owner (the shareholder) (Horne and Wachowicz, 2005: 486-487). When trading shares in the financial markets, it is also taken into account that the investors are making money if the

market value exceeds the book value or if there are changes to the prices on the secondary market (Raziyeh and Zohreh, 2013: 28-39).

In accordance to (Block and Hirt, 2005: 420-421) shares are divided into two main types:

- **Common Shares:** The most prevalent kind of sharing is this one. The typical shareholder rights are attached to a common share. Holders of common shares have the opportunity to take part in the business management by casting a ballot at shareholders' meetings (Luminor Bank, 2019: 2). There is no expiration date for common shares; they are valid for the duration of the corporation (Viney and Phillips, 2019: 11). A common shareholder is qualified to receive a portion of the company's earnings. Dividend payments are often made to shareholders in the form of a part of the company's profits (Karmazin and Bondar, 2013: 3).
- **Preferred Shares:** is a type of share that has particular "privileges" above regular stock. The holder of a preferred share has preference over the holder of a common share and the top priority right normally applies when the firm is liquidated or when the dividends are paid. A preferred share, does not normally grant voting rights (Reymond, 2020: 15).

Nowadays, due to globalization and the development of technology, the physical stock market is no longer the only place where stocks are traded, as stocks are traded over the world wide web.

1.2.1.2. Bonds

One type of investment is a bond that symbolizes the repayment of a loan between a borrower and a lender. A transferable document known as a bond represents a share of a government loan, supranational agency, or corporation to support its investments (Investment industry association of Canada, 2008: 4). Bonds are sometimes referred to as fixed-income tools since interest payments are normally issued at regular intervals and are reasonably predictable (Brigham and Houston, 2006: 207-234). The market's many bond kinds mirror the various types of issuers and their corresponding needs. Some types are more secure than others (Choudhry, 2006: 3-5). According to (C. Paramasivan and T. Subramanian, 2009: 33) Bonds in the market are classified into four types:

- **Corporate bonds** are issued by companies. In many circumstances, Bond markets provide better conditions and lower interest rates, so businesses issue bonds rather than applying for bank loans to finance their debt. Corporate bonds come in a variety of forms, including secured bonds, debenture bonds, mortgage bonds, convertible bonds, collateral bonds, guaranteed bonds, equipment trust certificates, and high-yield corporate bonds.
- **Municipal bonds** are issued by states and municipalities. Investors can get tax-free coupon income from some municipal bonds.
- **Government bonds** are a type of financial tools that governments issue to finance their spending and other commitments like Treasury bonds. Coupon payments are the term for periodic interest payments on government bonds.
- **Agency bonds** the ones that are issued by businesses with ties to the government, such Freddie Mac or Fannie Mae.

There are several bond issuers to select from, each with a different coupon rate and maturity date. This enables investors to choose bonds with cash flows that meet their income requirements while complementing their other portfolio assets (Horne and Wachowicz, 2005: 210-213).

The buying and selling of different debt instruments issued by diverse corporations is collectively referred to as the "bond market." Governments and corporations issue bonds to generate debt financing for operating costs or to look for expansion prospects. They agree to pay back the initial investment plus interest in exchange. When buying and selling bonds, bids and offers are matched, just as when buying and selling stocks or any other tradable asset (Harwood, 2002: 13-16).

1.2.1.3. Derivatives

A derivative is a financial product or contract whose value is derived from an underlying asset. The buyer pledges to acquire the item on a specific date for a specific price gold, oil, and other commodities are regularly traded as derivatives. The US dollar is widely used as a unit of currency. There are derivatives based on bonds or stocks,

among the most well-known underlying assets include stocks, bonds, commodities, currencies, interest rates, and market indexes (Block and Hirt, 2005: 570-572). Derivatives may be thought of as bets based on how the underlying basic tools will behave (Giulia Lori, 2008: 11).

According to (Ramesh, 2018: 5) and (Chui, 2012: 24) there are several forms of derivative contracts, The most popular varieties include swaps, forwards, futures, and options.

Forward Contracts: An agreement between a buyer and a seller to buy or sell something at a later date for a fixed price is known as a forward contract.

Future Contracts: An agreement to acquire or sell something at a later time between two parties—a buyer and a seller—is known as a futures contract.

To acquire a specified quantity of a commodity at a given future period for a predetermined price, investors can contract to buy or sell futures related to the performance of a particular commodity, such as oil, metals, and agricultural goods, Investors who purchase commodity futures may, in some cases, take physical delivery of the underlying commodity upon expiration (Swiss Bankers Association, 2019: 39).

Options Contracts: There are two sorts of options: calls and puts. The call buyer has the choice, but not the responsibility, to buy a certain quantity of the underlying asset on or before a predetermined future date at a predetermined price. The option, but not the duty, to sell a certain quantity of the underlying asset at a specific price on or before a specific date is provided to the buyer when they purchase a put.

Swaps: In a private agreement known as a swap, two parties agree to trade future cash flows based on a predetermined formula. The interest rate market ("interest-rate swaps") is where swaps are most often employed. An interest-rate swap is the substitution of one interest rate for another on a specified notional principal at a specified currency (Ramesh, 2018: 5).

Derivatives help holders adjust the risk characteristics of their portfolios in a suitable way. Trading in the market when derivatives are present helps to eliminate market gluts and shortages as well as price volatility, price spreads, and time-integrated pricing structures (Ranjan, 2017: 12). Many people think of commodity derivatives as a strategy to protect against the volatility of commodity prices (Lu and Neftci, 2008: 4).

Utilizing derivatives, as reported by (Sundaram, 2012: 14), poses a risk due to the combination of three components that, which are leverage, volatility and the third is liquidity.

1.2.1.4. Indexes

A statistical measure of change in a securities market is referred to as a financial index. Stock and bond market indices for financial markets are made up of a hypothetical portfolio of securities that reflect a certain market or a subset of it (The Committee for Economic Development, 2019: 5). An adopted methodology, which outlines a set of guidelines controlling the development of the index, is used to choose and weight a list of instruments (bonds, stocks, etc.) in order to monitor the performance of the index (Clare and Thomas, 2015: 2).

While the Dow Jones Industrial Average's founding in 1896 is typically credited with ushering in the modern stock market index, the intellectual underpinnings of "investing in market indices" were actually developed some 60 years later by Harry Markowitz and William Sharpe, who introduced modern portfolio theory in the 1950s and the capital asset pricing model in the 1960s, respectively. According to their study, investors should only consider risk-free investment and the (efficient) market portfolio, They supported a two-fund separation; the necessary percentages in each category depended on investors' attitudes toward risk. Burton Malkiel and Charles Ellis then each made a compelling argument for investing in accordance with financial market indices as opposed to seeking to choose the winning funds of active fund managers in an effort to get higher returns (Clare and Thomas, 2015: 2).

Institutional investors now frequently use the performance assessment methodologies created by Treynor, Sharpe, and Jensen to assess the success of their investments, particularly in comparison to benchmarks (Mosselaar, 2018: 19).

Stock Market Indexes: It is a statistical indicator used to measure the overall performance of the market for which the indicator is being calculated. As a measure of the general movement of the stock market. The general stock market index usually consists of a group of securities that are believed to reflect the state of the market as a whole (Abdulaziz, 2018: 32).

The general stock market indexes are of great importance to various dealers in the financial market, as they can give important hints about the market. This helps investors determine their investment decisions, whether in terms of buying or selling, as well as the possibility of using it to know the real valuation of investments through time series comparisons. It is noted that each financial market has its own index, such as the **(Standard & Poor's 500 Index (S&P))**, 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.

1.3. THE RISE OF CRYPTOCURRENCIES (DIGITAL FINANCIAL TOOLS)

Numerous disciplines and contexts, including economics, sociology, political science, and the humanities, have investigated the idea of cryptocurrencies, the International Monetary Fund, the European Central Bank, the Committee on Payments and Market Infrastructures, the European Banking Authority, and the World Bank have all supplied definitions of this notion that have recently been categorized in a paper by the European Parliament (Ertz and Boily, 2019: 2). These many institutional points of view all agree that there is no widely recognized and regulated definition of cryptocurrency. Although most of these jurisdictions see cryptocurrencies as a type of virtual currency sometimes known as a "digital currency," (Houben and Snyers, 2018: 20-24). Cryptographic technology, not a bank or other dependable third party, guarantees ownership records and transfers for digital financial assets known as cryptocurrencies. Although they don't reflect any corresponding liabilities of any other party and aren't backed by any tangible assets of value, they can be considered financial assets because they have some value for bitcoin holders (such as gold, or the equipment stock of an enterprise) (Giudici et al., 2020: 2). Since the term "cryptocurrency" and other terms using "coin" and "wallets" were used in the initial whitepaper that proposed the enabling technology for Bitcoin (Ertz and Boily, 2019: 2). These imply that the initial inventors made an intentional effort to create a digital transfer mechanism that equated to the direct transfer of physical money used for payments or other financial assets, including precious metals and "bearer bonds," that, like cash, also exchange hands physically (Giudici et al., 2020: 2). Cryptocurrency, also known as digital currency or virtual currency, is a type of medium of exchange that, unlike traditional money, is not bound by or controlled by

national borders, central banks, sovereigns, or fiats. It performs the same functions as money in that it can be used to purchase goods and services (Maese et al., 2016: 468).

Cryptocurrencies are purely a digital phenomenon. Using those considerations "digital currency" is typically favored over "virtual currency," as well as the fact that it has neutral implications. In reality, when referring to money that is kept in a "digital" or "electronic register," the term "virtual" conveys negative since it suggests something that is "apparently real," but not quite "real" (Lee, 2015: 6). With David Chaum's work (Chaum, 1981: 84-90), the history of cryptographic currency began in the 1980s. Because of his article on the cryptographic fundamentals of blind signatures, he is frequently regarded to as the creator of safe digital money. In 1990, Chaum established DigiCash to put his thoughts about digital money into practice. Despite several marketing efforts, this initial generation of cryptographic currencies did not succeed in gaining widespread acceptance (Judmayer et al., 2017: 16).

Bitcoin, the first decentralized cryptocurrency, was developed in 2009 by an anonymous programmer named Satoshi Nakamoto (Nakamoto, 2008). There have been other different cryptocurrencies developed, but few of them have been successful due to the lack of technical innovation they contributed. On August 6, 2014, the United Kingdom declared that the Treasury had been asked to do research on cryptocurrencies and determine it, if they have an economic impact on the country. Additionally, the study sought to assess if regulation was a viable option (Victor, 2017: 2). Through a process made possible by the principles of cryptography, digital information is integrated and exchanged using cryptocurrencies, enabling safe and verifiable transactions (Ertz and Boily, 2019: 2).

Cryptocurrencies are built on the peer-to-peer exchange concept and are exchanged on international platforms (such as Coinbase). Although some cryptocurrencies can be used for trade and payment, they are not issued by governments or central banks and are not considered legal cash (Ertz and Boily, 2019: 2). Bitcoin is the cryptocurrency that is most well-known. Because it is now the most expensive digital currency accessible, it continues to rule the market for digital currencies (Ghilal and Nach, 2019: 113). As a result, the transaction is not involving any financial institutions. In order to overcome the flaws in commerce as represented by the financial institutions' intermediation, Nakamoto suggested this electronic payment method based on

cryptographic proof in a White Paper issued in October 2008, includes the expenses of the mediation for the payment to a third party, the ability to unilaterally cancel transactions, the requirement that transactions be of a minimum size, and the potential for fraud (Nakamoto, 2008: 1-3). Additionally, there was no way to send money through a communication channel without a reliable third party, with the exception of paying in person. The development of several alternative cryptocurrencies that offer new functionalities based on various algorithmic underpinnings has been driven by the birth of Bitcoin (Ertz and Boily, 2019: 3). Cryptocurrencies may be regarded from a variety of views because to its many distinct elements, including the financial and economic perspective, the legal perspective, the political and social perspective, the technological and socio-technical perspective, as well as others. There is still more room for separating these quite dissimilar points of view.

Academic interest in cryptocurrencies started to soar in 2014. The Scopus database lists 127 publications containing the word 'Bitcoin' in the title or abstract or keywords and 24 containing 'cryptocurrency' or 'cryptocurrencies' in 2014. In 2017 and especially in 2018 the number of publications grew fast, and in 2019 the trend is continuing. Interestingly, academic work focuses much more on the Bitcoin than on the more general topic of cryptocurrencies, although in 2018 and in 2019 the gap narrowed.

1.4. BLOCKCHAIN

The blockchain has gained a lot of attention as a result of the cryptocurrency market's explosive rise. Although this technology is most recognized for its usage with digital money, it also has a wide range of uses in industries other than finance and business, including as supply chain management, commerce, health care, and public administration (Ertz and Boily, 2019: 3).

The Princeton Definition describes a blockchain as a linked list data structure that employs hash sums over each of its items as pointers to the individual elements. According to this definition, the design of a blockchain assures that anybody may verify every other block of the chain when given the whole chain as long as they have saved or retrieved the right block at the head of the chain (Judmayer et al., 2017: 24).

Since ancient times, financial transactions have been recorded in ledgers. Initially maintained on clay tablets or papyrus, they later transitioned to paper and, with the

development of digital information systems, finally to bytes (Rosati and Paulsson, 2017: 13-23). Regardless of the format in which they were maintained, ledgers have historically relied on human inputs; as a result, they have been prone to mistakes that result in extra costs and inefficiencies for companies as well as for the economy at large. Through a special blend of distributed networks and cryptography, digital distributed ledgers promise to address these problems (Rosati and Čuk, 2019: 151).

The most well-known instance of distributed ledger technology is unquestionably blockchain technology (Beck et al., 2017: 381–384). Under the alias Satoshi Nakamoto, it was initially introduced in 2008 by a programmer or group of programmers (Nakamoto, 2008) It is now mostly recognized as the technology that powers Bitcoin, possibly the most well-known open-source peer-to-peer digital money. The primary use of blockchain is to conduct financial and monetary transactions. However, it may also make sure that deals adhere to particular guidelines that parties have established in the form of "smart contracts." (Rosati and Čuk, 2019: 151).

1.5. TYPES OF DIGITAL FINANCIAL TOOLS

There are dozens of types of digital currencies, and the importance of each digital currency is determined by the number of users, the structure of each network, and the sites in which it is exchanged. According to (Coinmarket cap, 2017)¹ there is crowding in the digital currency scene, especially since the issue of development is of interest to many stakeholders (Aljohani, 2017: 1), as the number of cryptocurrency assets increased and reached 5,500 currencies in July 2021. In the end, it is not possible to limit the exact number of digital currencies, because there is no law that regulates their issuance, or a specific authority responsible for issuing them that can be referred to, and for this reason we also find them uneven in terms of dealing with them. In 2009, when Bitcoin first became available, there was virtually little rivalry. But by 2011, other varieties of crypto money started to appear as rivals. There are several varieties of crypto money available today. Our thesis focused on three main types of digital financial tools which are Bitcoin (BTC), Ethereum (ETH), and Ripple.

¹ <https://coinmarketcap.com>

1.5.1. Bitcoin (BTC)

Bitcoin is a group of ideas and innovations that serve as the foundation for a digital currency ecosystem, participants in the bitcoin network store and transfer value using bitcoin currency units (Antonopoulos, 2017: 1). The bitcoin protocol is typically utilized by internet users to connect with one another, while alternative transport networks may also be employed. The technology is freely accessible thanks to the open source bitcoin protocol stack, which can be operated on a variety of computers, including laptops and smartphones (Antonopoulos, 2017: 1). Almost anything that can be done with conventional currencies can be done with bitcoin, including buying and selling items, sending money to individuals or organizations, and extending credit. At specialist exchanges, bitcoin may be bought, sold, and traded for other currencies. Due to its speed, security, and lack of geographical boundaries, bitcoin is in some ways the ideal form of money for the internet (Antonopoulos, 2017: 1).

With the release of a paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" in 2008, a person using the moniker Satoshi Nakamoto claimed to have created bitcoin. In order to develop a fully decentralized electronic cash system that does not rely on a central authority for currency issue, settlement, and transaction validation, Nakamoto merged a number of past technologies, including b-money and HashCash. The major innovation was to perform a worldwide "election" every 10 minutes using a distributed computation system (known as a "Proof-of-Work" algorithm), which allowed the decentralized network to reach consensus regarding the state of transactions. This ingeniously addresses the double-spend problem, which allows a single monetary unit to be used twice. Previously, a drawback of digital money was the double-spend issue, which was fixed by clearing all transactions through a central clearinghouse (Antonopoulos, 2017: 3).

The protocol, a peer-to-peer network, and a distributed computing invention are all called bitcoin. Actually, the use of this idea in the bitcoin currency is just the beginning. With four major advances combined in a singular and potent way, Bitcoin is the result of decades of study in distributed systems and cryptography. Bitcoin is made from (Antonopoulos, 2017: 2):

- A peer-to-peer network that is decentralized (the bitcoin protocol)

- A public ledger of transactions (the blockchain)
- A collection of guidelines for the independent validation of transactions and the issuing of money (consensus rules)
- A system for worldwide decentralized consensus on the trustworthy block chain (Proof-of-Work algorithm)

The bitcoin system is founded on decentralized trust, in contrast to conventional banking and payment systems. In bitcoin, trust is achieved as an emergent attribute via the interactions of many system members, as opposed to a single trusted authority (Antonopoulos, 2017: 15).

1.5.2. Ethereum (ETH)

A public record that stores all digital transactions is the Ethereum blockchain. It's important to note that this database is run by the society and is not under the authority of a third party. Additionally, the society manages and protects the database. The Ethereum money, Ether, is used to conduct transactions inside the Ethereum database (network) (Van der Wei, 2021: 1). Ethereum is a blockchain network, just like Bitcoin. ETH is created with a proof-of-work algorithm as well. However, there is no cap on the quantity of ETHs that may be generated, unlike with Bitcoin (Bholane, 2021: 74). Vitalik Buterin invented the cryptocurrency platform Ethereum by using Turing-complete technology. In 2014, it sold ether tokens to a crowd for a total of US\$18 million. On top of its platform, Ethereum enables the creation of smart contracts and tokens. The same function as Ethereum may be served by a wide variety of cryptocurrencies. The magnitude of Ethereum, though, presents a significant challenge for rivals. Additionally, Ethereum's technology is always being improved, so the likelihood of a superior substitute is low (Van der Wei, 2021: 12).

1.5.3. Ripple (XRP)

The Ripple blockchain, in contrast to bitcoin and ether, was designed with restrictions that let the business choose when and how much currency to release to the community. Up until the crypto community demanded a change, this control gave the currency a distinctive feature. Its detractors have compared it to the Federal Reserve, which manages the availability of money.

Jed McCaleb and Chris Larsen developed Ripple, which was released in 2012. In 2013, Ripple held its initial coin offering for XRP. The 100 billion currencies that will be present within the virtual framework were mined as soon as Ripple released its blockchain. Twenty billion of the coins were presented to the company's founders and early leaders, and the remaining coins were kept by the business. This sparked worries that the company would suddenly flood the market with Ripple tokens, fueling worries about the digital coin's inflation. There are particular aspects that affect the movement of price inside the cryptocurrency, which doesn't happen to most other names, because Ripple has established a reputation and because of choices the corporation took when developing the currency. The most contentious distinction is that it's a cryptocurrency that started close to the corporate vest, meaning it initially controlled supply to an extent that leads to serious debates over whether or not the coin is decentralized (Abdulaziz, 2018: 172).

1.6. THE PROS AND CONS OF CRYPTOCURRENCY AS A DIGITAL INVESTMENT

Cryptocurrency is extremely difficult to understand intellectually and practically. The majority of bitcoin owners have little to no understanding of how encryption works in general. In accordance to (Bholane, 2021: 77), the pros and cons of cryptocurrencies must be considered before investing. Pros of Cryptocurrency:

- Networks using cryptocurrencies are by nature secure.
 - Anyone may access the mining industry.
 - Price changes can result in enormous gains.
 - Cryptocurrency functions like conventional money.
 - Cryptocurrency offers a possible inflation hedge.
 - Compared to conventional electronic financial transactions, crypto transactions are typically less expensive.
 - International transactions might be less expensive thanks to cryptocurrencies.
- Cryptocurrencies do not differentiate between domestic and foreign transactions.

Cons of Cryptocurrency:

- The volatility of cryptocurrencies is really high.

- Compared to conventional money or the stock market, cryptocurrency is less liquid.
- In the past, governments have mostly stayed out of cryptocurrency regulation and have taxed cryptocurrencies at a comparatively lenient rate. Laws governing cryptocurrencies are constantly evolving.
- There is no remedy for recovering digital assets.
- Mining may be a lucrative industry, but it takes time and money to succeed.
- In some countries, the use of cryptocurrencies raises the risk of tax avoidance.
- Black market activity is facilitated by a lack of regulation.



CHAPTER TWO: INVESTMENT PORTFOLIO

Investment portfolios are considered a relatively modern financial science, and their importance stems from the diversity of investment tools, financial and economic markets that are characterized by many changes and are affected by economic openness, globalization and technological development (Abdulaziz, 2018: 32). The concept of the portfolio is a development of the concept of investment to meet the need to have a portfolio to invest significantly increasing funds and optimally utilize resources by employing them in appropriate investment fields and managing them well by making the right decisions in buying and selling investment tools and following an appropriate investment strategy to achieve the goals and desires of the investor and identifying risks that the investor can bear, because following a wrong strategy or an error in estimating the risks that can be tolerated will cause the investor great losses (Bremo, 2016: 5-6).

The American analyst Harry Markowitz was the first to write about investment portfolios in his famous article (Portfolio Selection) in 1952 (Markowitz, 1952: 77-91). He is considered one of the first pioneers of modern investment portfolio theory, for which he was awarded the Nobel Prize in Economics, and the main reference for those who came after him from researchers like Sharpe and Tobin (Osewe, 2020: 1-6). The portfolio concept that the dictionaries of the language defined is the word wallet as a large or small bag of leather or cloth, it contains money and important papers, hence the concept of an investment portfolio that has the same meaning. It may hold a group of securities such as stocks, bonds, certificates of deposit or title deeds. Real assets such as real estate and precious metals (Levišauskait, 2010: 51-53). However, the financiers differed about a specific definition of the investment portfolio. Some of them defined it as a group of assets owned by the investor, whether real or financial, to obtain the largest return with the least risks in line with his inclinations and desires (Abdulaziz, 2018: 32). Others defined it as a complex investment tool consisting of two or more assets and subject to the management of a person responsible for it called the portfolio manager, who is its owner or a lessor, and these assets may be financial or real or a combination of them. (Konovalova et al., 2019: 930). In addition, it can also be considered as a group of various individual investments that are chosen in a systematic way that takes into account

the return and risk resulting from these investments, in order to compare among them and choose the best to include it in the portfolio (Mayo, 2013: 4). Others believed that it is the total value of the investor's investment, by investing in more than one investment tools (foreign currency, gold, cash, bonds, shares and treasury bills) with the same or different characteristics (Salimov, 2019: 9).

The importance of investment portfolios lies in their ability to reduce the investment risks that afflict the investor when carrying out investment operations (Kapoor, 2014: 1363).

Objectives of the investment portfolio differ from one investor to another, as some investors prefer to be conservative when investing because they do not like to take risks or cannot. They consider security to achieve a greater return (Mantha and Srinivasa, 2015: 1-2). The main and most important objective of any investment portfolio is the balance between return, risk and liquidity, that is, achieving the largest return with the least possible risks with the availability of the necessary liquidity.

2.1. TYPES OF PORTFOLIO INVESTMENT

Choosing the type of investment portfolio is critical because of the implications for diversifying investment in accordance with the investor's plan and objectives, as well as his ability to bear risk, and this is linked to the multiplicity of its types, which will explain in detail in the following paragraphs.

2.1.1. The Aggressive Portfolio:

A diversified, pre-packaged mix of investment possibilities based on an aggressive investing strategy seeking relatively high levels of risk and possible return is what the Aggressive Profile Portfolio aims to give. This portfolio aims to experience long-term capital growth in order to attain a high overall return on investment. Strategies for attaining better than average returns often place a greater emphasis on capital growth than on income or principal safety. As a result, this strategy's asset allocation would heavily favor equities, with little to no emphasis placed on bonds or cash (Morningstar Investment Profiles, 2022: 1).

2.1.2. The Defensive Portfolio:

The risk level is a little lower than the income and aggressive type in this investment portfolio. However, the portfolio aims to withstand the negative effects of recessions and economic turmoil. The profit and return on investment are not significantly tied to the movement of stocks, whereas the return on investment is heavily linked to the movement of stocks and the business market. However, when it's profit compared to the profit in the case of an aggressive portfolio, the rate of profit in recessionary periods is modest. They depend on delivering essential products and services and that there is a steady and ongoing need for them, defensive stocks often maintain their value over time. Many businesses also offer dividend distributions, which minimize capital risk and encourage most investors to choose a defensive portfolio (Baz et al., 2019: 1-4).

2.1.3. The Income Portfolio:

Stocks that pay dividends or other forms of distributions to stakeholders are the source of income for this sort of portfolio. The source of income for this kind of portfolio is stocks that distribute money to shareholders in the form of dividends or other payments. Examples of assets that generate income include real estate investment trusts (REITs) (Draho et al., 2018: 4-5).

2.1.4. The Speculative Portfolio:

The speculative portfolio necessitates a high tolerance for risk; in fact, it is sometimes contrasted with gambling. In this case, the portfolio is not just aggressive but also a wager on what good product or service may be offered in the future. Not all investors are willing to take such big risks. Financial consultants advise keeping the percentage of speculative assets in a portfolio at 10 percent or less. Additionally, novice investors need to make a wise decision. To discover the businesses, you can trust to provide exceptional profits, you need to conduct extensive study and gain expertise (Mensah, 2022: 206).

2.1.5. The Hybrid Portfolio:

The strategy of a hybrid portfolio diversifies across asset types. It's necessary to invest in stocks, bonds, commodities, real estate, and ect, when creating a hybrid portfolio. A hybrid portfolio often includes fairly constant ratios of stocks, bonds, and

alternative assets. This is advantageous since historically, there haven't always been perfect correlations between stocks, bonds, and alternatives (Goudarzi et al., 2017: 602-604).

2.2. BUILDING AN INVESTMENT PORTFOLIO

Harry Markowitz laid the groundwork for Modern Portfolio Theory ("MPT"), with the completion of his PhD statistics dissertation in 1952. The most crucial component of Markowitz's model was his explanation of how the number of securities in a portfolio and their covariance connections affect portfolio diversification (Megginson, 1996: 325). The results of his dissertation, "Portfolio Selection," were originally published in *The Journal of Finance* in 1952. After the release of his book *Portfolio Selection: Efficient Diversification*, these conclusions were further broadened (1959). A little over 30 years later, Markowitz shared the Nobel Prize for his MPT contributions to corporate finance and economics (Mangram, 2013: 60).

In 1958, economist James Tobin created the "Efficient Frontier" and "Capital Market Line" notions based on works by Markowitz in his essay, "Liquidity Preference as Behavior Toward Risk," in the *Review of Economic Studies*. According to Tobin's model, market participants will keep their stock portfolios in the same proportions regardless of their levels of risk tolerance as long as they "maintain identical expectations for the future." (Megginson, 1996, citing Tobin, 1958). Consequently, concluded Tobin, their investment portfolios will differ only in their relative proportions of stocks and bonds (Mangram, 2013: 60).

Another significant capital markets theory that was independently established by William Sharpe, John Lintner, and Jan Mossin grew out of Markowitz and Tobin's previous works: The Capital Asset Pricing Model (CAPM) (Megginson, 1996: 325). Investors may now value securities as a function of systematic risk more effectively thanks to the CAPM, which represented a fundamental step forward in the theory of capital markets equilibrium. In his development of the CAPM, Sharpe (1964) made substantial advancements to the notions of the Efficient Frontier and Capital Market Line. Sharpe's groundbreaking efforts would subsequently earn him the Nobel Prize in Economics. After a year, Lintner (1965) developed the CAPM from the viewpoint of a company issuing stock. Finally, Mossin independently developed the CAPM in 1966 and

specifically mentioned quadratic utility functions. (Megginson, 1996: 327). There have been several MPT extensions and variations since the first studies of Markowitz and later Sharpe, Lintner, and Mossin (Mangram, 2013: 60).

Ross (1976) created the Arbitrage Pricing Theory (APT) in particular (Huberman, 2005: 1). The Capital Asset Pricing Model (CAPM) and the Asset Pricing Theory (APT) both state a linear relationship between the expected returns on an asset and its covariance with other random variables. (In the CAPM, the covariance is with the market portfolio's return). The covariance is seen as a gauge of risk that diversification cannot shield investors against. Interpreted as a risk premium is the slope coefficient in the linear relationship between expected returns and covariance. Mean-variance efficiency is strongly related to such a relationship (Huberman, 2005: 1). It also particularly builds on the theoretical foundations laid by Dr. Simon Bennis, a professor at Wharton, in his 2006 book, *Principles of Finance with Excel*, in which he makes the case for a less complex method of comprehending and computing the numerous mathematical ideas underpinning MPT (Mangram, 2013: 60).

In portfolio management, the trade-off between risk and return is a well-known issue. Investors search for the optimal portfolio to use in order to maximize returns. Risk tolerance, which reflects how much a person is ready to take risks, is one of the main elements influencing their portfolio selections (Liu et al., 2022: 1). A key element of investing is risk tolerance, which is a person's attitude toward accepting risk. It affects both users and suppliers of financial services. It is a crucial factor for financial service users to decide on the best asset mix for their portfolios in terms of risk and relative return (Droms, 1987: 114). (Jacobs and Levy, 1996: 10 - 16) show that for fund managers, the inability to accurately gauge investor risk aversion can lead to uniformity among investment funds. Additionally, (Schirripa and Tecotzky, 2000: 29–40) claim that by combining investors with various levels of risk tolerance into a single efficient portfolio while maintaining the group's average risk tolerance, it is feasible to maximize the traditional Markowitz portfolio optimization procedure (Massol and Molines, 2015: 2).

2.3. PORTFOLIO DIVERSIFICATION

A group of investment vehicles assembled by an individual to achieve certain investing goals is known as an investment portfolio. The investor must handle the concerns of diversity, timing, and selection throughout the portfolio-formation phase. Selectivity is a term for micro forecasting that focuses on predicting the price changes of individual tools. Timing entails macro-forecasting of price changes for a specific kind of financial asset in comparison to fixed-income securities as a whole. In order to lower or restrict investment risk, diversification entails creating a portfolio for the investor.

Two methods of diversification exist, Random diversification, the random addition of various financial assets to a portfolio; and objective diversification occurs when financial assets are chosen for the portfolio based on investment goals and utilizing the right methodologies for each financial tools analysis and evaluation (Levišauskait, 2010: 25).

One of the most influential concepts in finance is diversity, which is also the sole "free lunch" offered to investors. Many financial services that assist us in managing risk and uncertainty are based on this Nobel Prize-winning theory, including mutual funds, exchange-traded funds (ETFs), and various forms of collective investment vehicles. These services range from car, life, and health insurance to mutual funds and ETFs. (Lyandres et al., 2018: 12-19) noted that Portfolio diversification is a business strategy whereby companies invest in various asset classes that do not have a linearly positive relationship with one another so that losses in one class of assets are offset by returns in the other classes that are unaffected by the risk specific to those assets. According to (Purkayastha et al., 2012: 18-38) diversification is the practice of a company entering new product markets. According to (Chkir and Cosset, 2001: 17-37) diversification is the act of distributing an organization's wealth across several asset classes in order to get the best possible returns. A portfolio can be diversified in terms of assets, markets, styles, asset classes, currencies, geographies, economic development levels, and even risk categories (risk factors) (CFA Montreal, 2016: 1).

The goal of product or market diversification is to let an investor benefit from economies of scale and goods to spread the diversifiable risks. Given the current economic situation, the diversification approach allows the company the chance to

allocate resources to diverse asset classes, markets, and portfolios, holding optimal portfolios that ensure underperforming assets are offset by performing assets or not (Aw et al., 2018: 90-104). Thus, Portfolio diversification seeks to provide the investor a diverse range of income sources so that means an economic event affecting one business does not have to hit other industries simultaneously and in the same way. In principle, portfolio diversification is based on allocating the diversifiable risks among different asset classes in such a way that the systematic risk is either zero or insignificant (Osewe, 2020: 2-3).

When just the systematic risk is present for the whole portfolio, it is considered to be optimally diversified (Bergin and Pyun, 2016: 52-71). Empirical studies often use a variety of portfolio diversification metrics. Herfindhal-Hirschman index (HHI) was used by (Mulwa and Kosgei, 2016: 31-52) to quantify corporate income and geographic diversification. The study utilized the metric employed by (Mulwa and Kosgei, 2016: 31-52) which uses the Herfindhal-Hirschman index to quantify portfolio diversity (HHI).

Diversification of a portfolio is believed to help in lowering the related risk involved in it. Nevertheless, it is important to note that diversification does not completely eliminate risk. There would still be some amount of risk attached to a given portfolio even if the number of component securities were to be infinitely raised. Nevertheless, when additional assets are added to the portfolio, the benefits of diversity in terms of decreased associated risk rapidly decline (Gurrib and Alshahrani, 2012: 449).

As a result of its significant volatility (Katsiampa, 2017: 3-6), cryptocurrencies are often regarded as high-risk investments. Strangely, professional investors have just lately begun trading cryptocurrencies, and they do not do it using algorithms, (Dyhrberg et al., 2018: 140-143), suggesting that cryptocurrencies in general and bitcoin in particular are investible tools (Phillip et al., 2018: 95-100). Cryptocurrencies have a relatively low correlation with other tools, according to researchers that study the relationship between bitcoin and other financial tools. This finding may point to bitcoin as a tool that might aid in portfolio diversification. (Baumöhl, 2019: 119-129). Additionally, (Bouri et al., 2017: 5063-5073) show that bitcoin is a strong hedge against changes in commodities indexes, while (Corbet et al., 2018: 21-34) find that cryptocurrencies are relatively isolated from other financial tools.

Research on the effects of bitcoin on other tools also supports the potential advantage of integrating bitcoin in a portfolio because it reveals that it enables risk hedging (Guesmi et al., 2019: 431-437). Overall, the research indicates that bitcoin is an asset class that may be incorporated in a portfolio that is well-diversified. Actually, very little research has been done so far on portfolio diversification that includes bitcoin or cryptocurrencies in general (Kajtazi, 2019: 8-9). Most research is primarily centered on portfolios of U.S. assets (e.g. Brière et al., 2015: 58–61; Carrick, 2016: 2321–2334; Adrianto and Diputra, 2017: 229–238; Bouri et al., 2017: 5063-5073; Guesmi et al., 2019:431-437). One of the earliest studies by (Eisl et al., 2015: 2-4) demonstrates that adding bitcoin to a portfolio of already diverse U.S. tools raises the portfolios' expected return and risk. They recommend including some bitcoin in this portfolio to increase the Sharpe Ratio. According to (Brière et al., 2015: 58–61), the Sharpe Ratio (Sharpe, 1963: 277–293) increases when bitcoin is included in a portfolio of diverse U.S. tools. When compared to other metrics like the Omega Ratio and variants of the Sharpe ratio where VaR and CVaR substitute the standard deviation as a measure of risk, such as those identified in (Wu and Pandey, 2014: 44-52)'s study, it is discovered that Bitcoin improves portfolio efficiency. Recent studies offer more evidence to support the claim that the right combination of bitcoin and American stocks can lower a portfolio's overall risk (Kajtazi, 2019: 8-9). Surprisingly, the same findings are obtained in portfolios that contain stocks, commodities, foreign currencies, and ETFs (Adrianto and Diputra, 2017: 229–238) as well as portfolios including global and emerging market indices (Guesmi et al., 2019: 431-437).

(Boiko et al., 2021: 1-9) and (Wang and Ngene, 2020: 1-12) stated that while the performance of a cryptocurrency portfolio might be significantly improved by include a variety of cryptocurrencies under various portfolio optimization methodologies, Bitcoin remained the market leader. (Ma et al., 2020: 1-11), on the other hand, stated that Multiple cryptocurrencies might improve portfolio performance, but Ethereum presented greater potential for diversification than Bitcoin. (Guesmi et al., 2019: 431-437) demonstrated that the addition of Bitcoin might improve portfolio diversification from the perspective of volatility spillover because there aren't any discernible spillover effects between Bitcoin and other financial tools (Bakry et al., 2021: 4).

2.4. TRADEOFF BETWEEN RETURN AND RISK IN THE FINANCIAL PORTFOLIO

Risk and return are two important characteristics that jointly define the value of the portfolio, and these outcomes may be used to gauge the performance of the portfolio, therefore, two crucial components of a portfolio investment are risk and return (Kamwaro, 2013: 6). The decision-making process in general includes the future, and the financial decision-making process is no exception to this general rule, as risk is the important factor in all financial decision-making processes (McLaney, 2000: 4). Since risk is an integral part of the investment instinct (Adavelli and Rathipelli, 2014: 1), It is important to note two points in investing which are the expected relative change in price (equity returns) and the uncertainty associated with these returns (risk) (Mehrra, et al., 2014: 373). Therefore, the risk and return are the two main variables in deciding the types of investments that should be entered into. The efficiency of the investment that the investor demands cannot be predicted. Therefore, risks must be taken. In fact, both the size of the risk and the return on investment should be taken into account (Bakry et al., 2021: 42). Financial decisions are generally based on the trade-off between risk and return, it can be said that the rational investor seeks to achieve the maximum return, at a given level of risk (Simister and Whittle, 2013: 146).

Investors in the stock market face many financial products through which investment decisions can be made (Aroni et al., 2014: 155). An important activity in investment is the optimal allocation of resources. At the same time, investors always strive to achieve the best performance using the financial resources at their disposal (Moodi and Hajiha, 2013: 3925). Therefore, diversified business activities require making smart decisions at the right time in light of the available information. It takes into account a wide range of factors in making investment decisions (Addin et al., 2013: 925). One of the important issues that investors consider when making the right and timely equity investment decisions is returns (Chambers et al., 2013: 279).

Investment is defined as the current sacrifice of certain financial values in order to obtain uncertain values in the future, while the investor sacrifices part of his wealth or by freezing all his money and using it in investments in the hope of increasing these funds. Hence, investing has two characteristics; First, the investment must generate returns, and

secondly, these returns are not certain and subject to fluctuations. Thus, the return on investment is the amount expected to be added to the wealth or is the returns during the next period of time. As long as these returns are related to the future, they are uncertain, in other words they carry some amount of risk that is usually quantified by the variance or standard deviation of the potential returns (Al-Qudah and Laham, 2013: 136).

The return is defined as the net income resulting from the investment of funds, and the return is usually in the form of absolute amounts (Mehrra, et al., 2014: 377). We must be assured we understand what return is and how to quantify it if we intend to evaluate risk based on return variability. The overall gain or loss on an investment over a specific time period is the total rate of return. The sum of all cash distributions (such as dividends or interest payments) and the change in the investment's value, divided by the investment's beginning-of-period value, is referred to mathematically as the investment's total return (Gitman et al., 2015: 313).

The expression for calculating the total rate of return earned on any asset over period t , r_t , is commonly defined as:

$$r_t = \frac{c_t + P_t - P_{t-1}}{P_{t-1}}$$

Where

r_t = actual, expected, or required rate of return during period t

c_t = cash (flow) received from the asset investment in the time period $t-1$ to t

P_t = price (value) of asset at time t

P_{t-1} = price (value) of asset at time $t-1$

The return, r_t , reflects the combined effect of cash flow, c_t , and changes in value, $P_t - P_{t-1}$, over the period.

Equation 1 is used to determine the rate of return over a time period as short as 1 day or as long as 10 years or more. However, in most cases, t is 1 year, and r therefore represents an annual rate of return (Gitman et al., 2015: 313).

The return on a portfolio is a weighted average of the returns on the individual assets from which it is formed (Gitman et al., 2015: 321).

The risk is defined as the deviation of the actual return from the expected return (Ross et al., 2008: 401).

Risk affects each individual differently. To categorize how investors react to risk, economists utilize three categories. Risk aversion is the first category, and it best explains how most individuals act most of the time. Investors that are risk-averse choose less risky assets over riskier ones while maintaining a stable rate of return. A risk-averse investor who thinks that the expected return on two different investments is the same would pick the investment with the higher degree of certainty (Buongiorno et al., 2017: 801-804). Risk neutrality is a second perspective on risk. A risk-neutral investor makes investment decisions by ignoring the risks and focusing only on the potential profits. A risk-neutral investor will always select the investment with the larger predicted return, regardless of the risk, when deciding between two investments (Muendler, 2005: 2).

A risk-seeking investor, on the other hand, favors assets with more risk and may even forego part of the projected return in favor of a riskier investment (Scholer et al., 2010: 215-216).

The total risk of an investment can be broken down into:

- Systematic or non-diversifiable risk or beta or market risk
- Unsystematic or diversifiable or company-specific risk,

Systematic risk is non-diversifiable risk in that it exists through-out the system and affects everyone, albeit some more than others. For example, recession or inflation (Hamzaee and Hughs, 2006: 90). Systematic risk as defined by (Jordan and Miller, 2009, 383) are those that have a significant impact on the majority of assets; in other words, there is only one type of systemic risk that has widespread market repercussions.

The **beta coefficient**, b , is a relative measure of non-diversifiable risk. It measures how much a tool's return fluctuates in reaction to changes in the market return. The beta coefficient of an asset is calculated using the asset's previous returns. The return on the market portfolio of all traded securities is known as the market return (Gitman et al., 2015: 330-332).

Equation 2: Beta coefficient formula (Brigham and Ehrhardt, 2019: 40).

$$\text{Beta coefficient}(\beta) = \frac{\text{covariance}(R_e, R_m)}{\text{Variance}(R_m)}$$

R_e = the return on an individual stock

R_m = the return on the overall market

Covariance = how changes in a stock's returns are related to changes in the market's returns

Variance = how far the market's data points spread out from their average value

Betas of a portfolio by using the individual asset betas and taking the weight into consideration, it may quickly determine the beta of a portfolio, the interpretation of portfolio betas is the same as that of individual asset betas, they demonstrate how sensitive the portfolio's return is to variations in market return (Gitman et al., 2015: 332).

Unsystematic risk can be diversified away by efficient portfolio formation and diversification into investments that have low correlation with each other. Examples include product problems, labor problems, etc. that plague individual companies or sectors.

Unsystematic risk is defined as a risk that is controllable, i.e., a risk that can be lessened by applying risk management strategies or by enforcing regulations that prohibit risky business operations (Haneef et al., 2012, 309). Unsystematic risk is described as a risk that only impacts a certain firm or industry and is unrelated to overall economic activity (Berk et al., 2018, 355). Because this risk is special to businesses or tools, it is frequently referred to as unique risk or asset specific risk. These phrases are used interchangeably. It can impact a single tool or a small group of tools (Jordan & Miller 2009, 383).

Different models have been created to describe how risk and return relate to one another (Günay, 2014: 1152). The Capital Assets Pricing Model explains how risk and anticipated returns are related (Bilal et al., 2013: 242). Additionally, there are systemic

risks and unsystematic risks connected with investment (Mehrra et al., 2014: 375). The only model in the financial literature that has quantified the trade-off between risk and expected return is the capital asset pricing model created by Sharpe in 1964 (Günay, 2014: 1152).

The only factor in return, according to proponents of the capital asset pricing model, is the beta, which is a gauge of systemic risk in comparison to a market portfolio. The capital asset pricing model is largely accepted as the best model for describing stock prices and projected returns. It states that the primary determinant of projected return is systemic risk (Zaragoza and Mouton, 2013: 1). To put it another way, the expected return from assets is influenced by the amount of systemic risk (beta) and unsystematic risk as well as by the unique features of each stock. Business risk and financial risk are the two components that make up both systemic and unsystematic risk (Jones, 1996: 427).

The first, known as systemic risk, results from common causes that are connected to broad political and economic situations as well as changes throughout the whole economic system. The second risk, un systemic, is brought on by variables unique to a certain institution. It stands apart from other places in a distinct way (Mehrra et al., 2014: 375). There are other names for this risk. both the diversified risk and the avoidable risk.

Knowing the change in rate of return can help determine the risk associated with a particular investment because the greater the volatility in these rates, the greater the risk. The variance is one of the best traditional measures of risk because the greater the variance in the expected returns of a variable, this indicates its dispersion and heterogeneity. It is either the weighted total of the squared deviations from the expected return or the statistical measure of the dispersion of the expected returns (Brealey et al., 2010: 164). Calculating the expected value of an investment is how the variance for that particular investment is determined (Cecchetti and Schoenholtz, 2014: 110) and according to the following equation 3 (Brigham and Ehrhardt, 2011: 225):

$$Variance = \sigma^2 = \sum_{i=1}^n (r_i - \hat{r})^2 P_i$$

Where

$r_i = \text{expected return}$

$\hat{r}$ = expected rate of return

P_i = probability that outcome i occurs

$r_i - \hat{r}$ = deviation

Standard Deviation: The standard deviation, σ , measures the dispersion of an investment's return around the expected return. The expected return, is the average return that an investment is expected to produce over time. For an investment that has j different possible returns, the expected return is calculated as follows (Gitman et al., 2015: 316):

$$\bar{r} = \sum_{j=1}^n r_j \times Pr_j$$

Where

r_j = return for the j th outcome

Pr_j = probability of occurrence of the j th outcome

n = number of outcomes considered

The coefficient of variation, CV , is a measure of relative dispersion that is useful in comparing the risks of assets with differing expected returns. Equation 5 gives the expression for the coefficient of variation (Gitman et al., 2015: 319):

$$CV = \frac{\sigma_r}{\bar{r}}$$

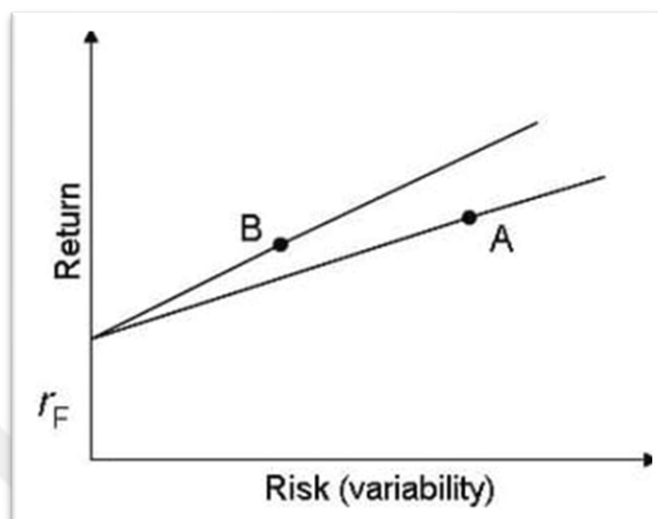
Higher coefficient of variation means that an investment has more volatility relative to its expected return. Intuitively, one could anticipate investors to favor assets with a low coefficient of variation since they desire larger returns and lower risk.

2.5. SHARP RATIO

The Sharpe ratio, which compares an investment's excess expected return to its return volatility or standard deviation, is one of the most often used statistics in financial research as show in figure (2.1). The Sharpe ratio was first inspired by mean-variance analysis and the Sharpe-Lintner Capital Asset Pricing Model, but it is currently applied

in a wide range of situations, including performance attribution, market efficiency testing, and risk management (Lo, 2002: 36).

Figure 2.1. Sharp Ratio



Source: Bacon, C. R. (2004). Practical Portfolio Performance Measurement and Attribution. p66

Many professionals still use the traditional Sharpe ratios to evaluate the performance of assets (Bhargava et al., 2001: 377-395; Scholz and Wilkens 2005: 3671-3691; Elyasiani and Jia, 2011: 381-408; Ho et al. 2011: 247-267). Basically, portfolio managers utilize such risk adjusted performance measures a lot since they are straightforward and simple to execute. The Capital Asset Pricing Model's assumptions are used to calculate the performance metric known as the Sharpe ratio (CAPM), the CAPM is a fundamental and constrained setting-derived equilibrium connection between security returns (Gatfaoui, 2009: 1-2). Performance is specifically calculated as the excess return over the risk-free rate, and risk adjustment is given by the asset return volatility, or alternatively, the return's standard deviation as a denominator (Sharpe 1964: 425-442).

“For a zero investment plan, the Sharpe Ratio is used to calculate the expected return per unit of risk. The outcome of such a strategy may be seen in the difference in the returns on two investment assets. The Sharpe Ratio does not apply to situations when there is just one investment return. It is obvious that any measure that makes an attempt to capture even a fair estimate of performance in a single number requires a significant set of underlying assumptions in order to be justified. Such presumptions are, at most, only roughly likely to hold in actual life. Undoubtedly, there are substantial concerns about using historical (ex post) unadjusted Sharpe ratios as substitutes for objectively predicting ex ante ratios. Despite these

warnings, there are several arguments in favor of a measure over a substitute that simply considers expected return over one that at least considers risk. *Ex ante Sharpe Ratios can offer significant inputs for a variety of investing decisions. It makes sense to favor the fund with the highest anticipated Sharpe Ratio when selecting one from a group of funds to give representation in a certain market sector, provided that the correlations between the funds and other pertinent asset classes are roughly similar. It makes sense to distribute assets across multiple of these funds in a way that the selection (residual) risk levels are inversely correlated with the expected Sharpe Ratios for the selection (residual) returns. The decision rules must be changed if some of the indicated net positions are impractical or require high transaction costs. Sharpe Ratios, however, may still offer helpful advice (Sharpe, 1994: 49-58). Whatever the use, it's critical to keep in mind that correlations are ignored by the Sharpe Ratio. Such data should be utilized to augment comparisons based on Sharpe Ratios when a decision may have a significant impact on correlations with other assets in an investor's portfolio. Nevertheless, any strategy involving the difference between a fund's return and that of a pertinent benchmark may be conveniently summarized by the ratio of predicted increased return to unit of added risk. Such a measurement is offered by the Sharpe Ratio. It can enhance the process of managing investments when applied properly” (Sharpe, 1994: 49-58).*

Sharp ratio is calculated as follows (Taivainen, 2018: 22):

$$\text{sharpe ratio} = \frac{R_p - R_f}{\sigma_p}$$

R_p = return of portfolio

R_f = risk-free rate

σ_p = standard deviation of the portfolio's excess return.

CHAPTER THREE: METHODS AND FINDINGS

The following paragraphs provide an overview of the financial analysis, standard model analysis and statistical analysis of the study's variables and the extrapolation of what was found in the financial, standard and statistical indicator results for each independent and dependent variable:

3.1. AIM AND SCOPE OF THE RESEARCH

The purpose of this study is to formulate investment decisions pertaining to the creation of investment portfolios according to a scientific methodology that is founded on standard mathematical procedures. The overarching goal of the study is to maximize returns while simultaneously minimizing risks. This study was conducted as part of an effort to identify the best model for predicting the performance of investment portfolios; doing so would help investors make more informed choices in the US financial market, which would have a beneficial effect on the market as a whole and, by extension, the economy of the country. The study seeks to determine if an investment portfolio that includes both traditional and digital financial tools (or diversification portfolio) is an optimal portfolio with lower risk and higher return than a portfolio that includes only one or the other. The natural question that inspired this study arose from its underlying problem as follows:

Does combining traditional financial tools and digital tools into an investment portfolio have an impact on reducing risks and improving investment returns?

3.2. IMPORTANCE OF THE RESEARCH

Among the many reasons this research is crucial is that it contributes to a vital area of study: the business administration with the profit motive in focus. All financial decisions (such as those involving investments, financing, and the distribution of profits) hinge on two of the most vital variables in financial theory: return and risk. The importance of the research is increased when one considers the significance of the research sample and of society as a whole. This is because economics is one of the most important fields and aspects of society, as well as the single most important contributor to achieving both economic and social development. The financial sector is the most

essential component of any nation. The adopted measurements and indicators that contributed to the research of the relationships between the study variables, as well as the underlying intellectual frameworks and theoretical and applied ideas that the study addressed, provide the study a unique and substantial degree of value.

3.3. DATA SET AND LIMITATION OF THE RESEARCH

The sample was drawn from the US financial market with the intention of attaining the research objectives and spans the years 2015 through 2021. Daily secondary data was collected and processed using statistical analysis methods, developing models, and testing assumptions linked to model dependability using software packages. This data becomes information with obvious logical relevance and easy to interpret. This will be done by selecting a sample of financial tools to make portfolios: an investment portfolio for traditional tools (Oil, Gold, S&P stock, Dollar currency), a digital tool investment portfolio (Bitcoin, Ripple, Ethereum), and a diversification portfolio that includes the two portfolios above. And putting them through their paces so they may learn about the portfolio's results, and finally calculating the return and risk of each portfolio using the Sharpe ratio. In addition, the E-Views program was used to test the normal distribution and stationarity of the data, as well as a series of standard tests to determine the existence of the necessary conditions to test the working model. In order to determine the relationship between variables and the effect of independent variables on dependent variables, various statistical tests were applied using the SPSS program.

3.3.1. Financial Analysis of the Independent Variables

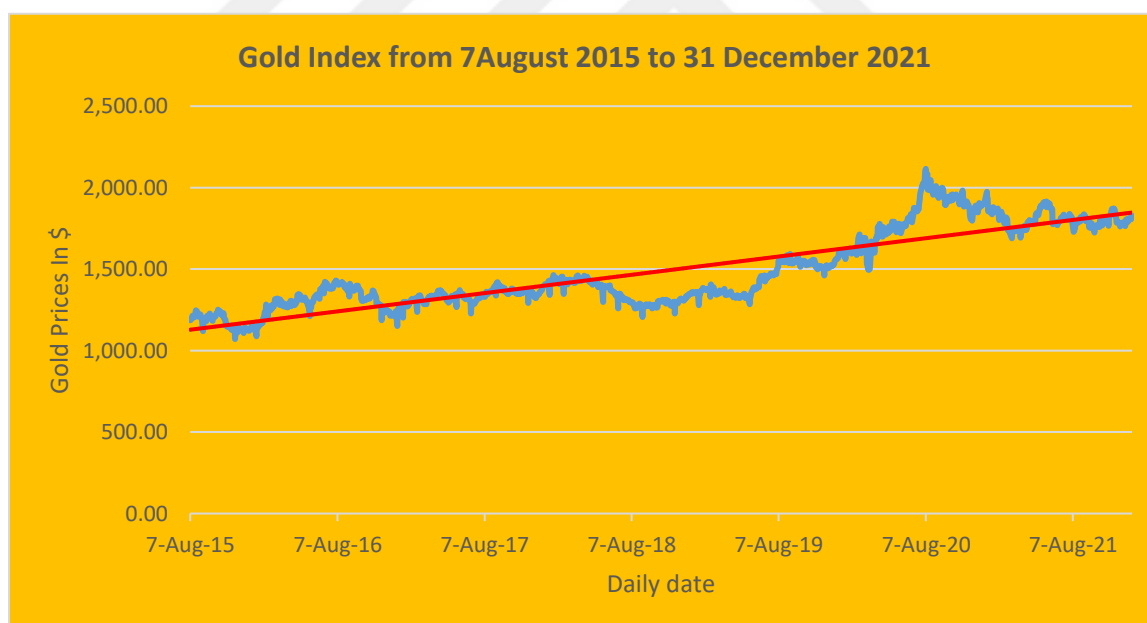
Traditional and digital financial tools were used in our study as an independent variable, which is discussed in the next paragraph:

3.3.1.1. Gold Index

From August 2015 to December 2021, the daily data for dealing with gold metal can be seen in the time series figure (3.1) during the time period under consideration, the price of gold fluctuated from (1185.8) US dollars on 7 August 2015 to (1828.6) dollars on 31 December 2021. This shows how volatile this investment tool's value was, with price swings of (642.8) dollars over a period of seven years, with the ounce price fluctuating from (1185.8) dollars to (1828.6) dollars. There was a (54.46 %) increase in

gold's prices during the study period amounted to (642.8) dollars, which suggests that the price has been steadily rising over the course of the seven-year period studied in this study. We can conclude from the high levels of this tool that it is one of the investment tools that enjoy high confidence among investors as it is a safe haven for their investments, in addition to, the historical data confirming that the general predictive trend indicates that there will be an increase in the levels of gold prices in the short and long term, which is what it is confirmed by the general trend line for gold prices in the aforementioned figure (3.1), meaning that there are high levels of optimistic expectations among investors in this precious metal that its prices will not decline. Gold prices fell to their lowest position on November 21, 2015, at (1088.5) dollars, while gold prices rose to their peak point on August 6, 2021, at (2115.2) dollars, indicating a high and progressive fluctuation in the price levels of this tool. Because of this, it's possible that investing in this instrument carries some risk, but the potential rewards outweigh it.

Figure 3.1. Gold Prices Index for the period 2015-2021 (Daily Bases)



It is also clear from the annual change ranges in the table (3.1) between the opening price at the start of the year and the closing price at the end of the year that the price of gold closed with large losses in the years 2015, 2018, and 2021, with the annual change percentage reaching its highest drop levels in the year 2021 with a decrease of (-7.022%), indicating that the overall performance of gold in those years tended to decline.

While the price of gold closed in the years 2016, 2017, 2019, 2020, to reach substantial gains, the highest percentage of profits was in the years 2017 and 2020, with an increase percentage of more than (20.924%), (21.748%) respectively indicating that the overall performance of gold in those years tended to grow. The annual average of gold prices during the study years also witnessed their highest value in the years 2020 and 2021, which amounted to (1806.82), (1806.36) dollars respectively, although the year 2021 was the general performance of gold in a decline unlike the year 2020, which witnessed an upward performance. Gold prices may continue to rise, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.1. Annual Trend for Gold Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	1,185.80	1,121.00	-0.055	-5.465%	Decrease	1179.70	107
2016	1,135.50	1,234.50	0.087	8.719%	Increase	1302.81	258
2017	1,151.05	1,391.90	0.209	20.924%	Increase	1334.55	258
2018	1,400.10	1,347.10	-0.038	-3.785%	Decrease	1355.82	258
2019	1,349.50	1,567.60	0.162	16.162%	Increase	1442.22	258
2020	1,572.10	1,914.00	0.217	21.748%	Increase	1806.82	258
2021	1,966.70	1,828.60	-0.070	-7.022%	Decrease	1806.36	258
Total							1655

** Change Percentage = [(Close price -Open Price)/Open price] * 100%

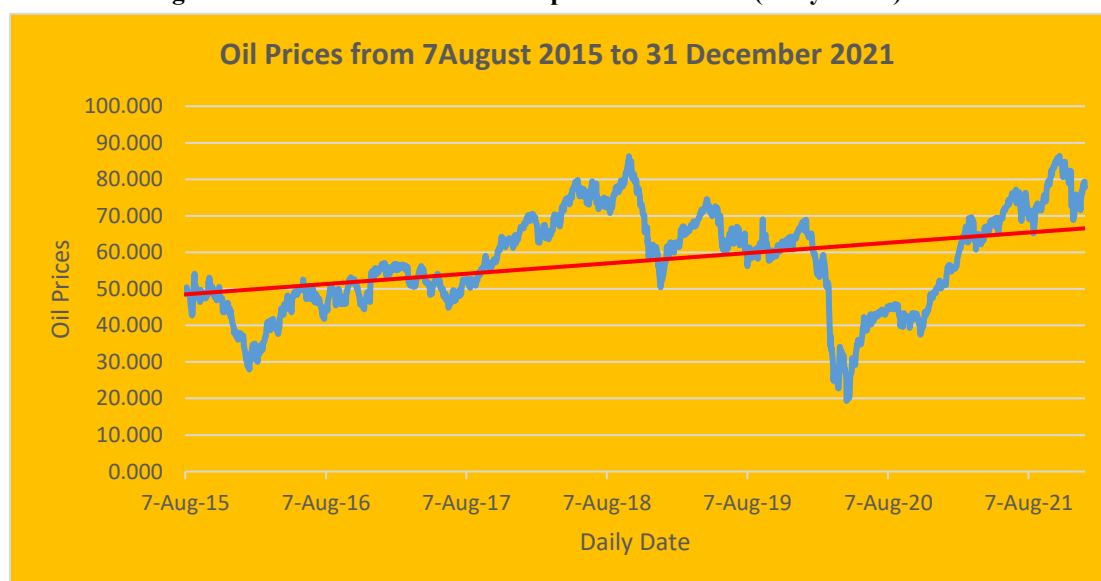
Based on the above, we can explain the performance or overall trend in gold prices as being influenced by a variety of factors. In reality, central banks' interest rate and inflation policies affect the price of precious metals, as low interest rates and high inflation make these metals more expensive. The same is true for exchange rates, which means that a weak dollar leads to an increase in the price of gold. Other factors influencing the price of gold include supply and demand for the metal itself, with the increasing difficulty of gold mining through time being one of the causes for the long-term rise in pricing.

3.3.1.2. Oil Index

The time series of oil index represents the daily data for dealing with this tool for the period from August 2015 to December 2021, as it is noted from figure (3.2) the instability of the prices of this investment tool in the global market during the study

period, as the price of oil reached at the beginning of the study period and on 7 August 2015 amounted to (48.61) dollars per barrel, then the price increased at the end of the study period on December 31, 2021 to (77.78) dollars per barrel, which indicates the high fluctuation in the value of this investment tool, which amounted to (29.17) dollars during seven years, with a fluctuation rate of (60.01%), which indicates that there is a steady increase in the prices of oil during the study period. We can conclude from the historical data that the general predictive trend indicates that there will be an increase in the levels of oil prices in the short and long term, which is what it is confirmed by the general trend line for oil prices in the aforementioned figure (3.2), meaning that there are high levels of optimistic expectations among the investors in this commodity that its prices will not decline at least in the foreseeable future. It was also found that the lowest point in the oil prices curve was recorded on April 21, 2020, which was (19.33) dollars and this is due to the closures that the countries of the world witnessed in the wake of the exacerbation of the Covid-19 crisis, while it reached the highest point in the gold price curve on October 26, 2021, which was (86.4) dollars, which indicates the high and gradual fluctuation in the price levels of this tool. This in turn, may indicate the existence of a type of risk that accompanies investing in this instrument in exchange for the gains that can be achieved from that investment.

Figure 3.2. Oil Prices Index for the period 2015-2021 (Daily Bases)



It is also noted from the ranges of annual change in the table (3.2) between the opening price at the beginning of the year and the closing price at the end of the year that the price of oil closed in the years 2015, 2018, 2021 with large losses, which according to the annual change percentage had reached its highest drop levels in the year 2015 with a decrease of (-23.308%), which indicates that the overall performance of oil in those years tended to decline. While the price of oil closed in the years 2016, 2017, 2019, 2021, to achieve high gains and that the highest percentage of profits was in the years 2016 and 2021, with an increase percentage of more than (52%) for each of them, which indicates that the overall performance of oil in those years tended to rise. From these results, we can conclude that gold and oil prices have taken the same structure of rise and fall in price and in the same years during the study period, which indicates the existence of a relationship between them, that is, a decrease in gold prices will be offset by a decrease in oil prices and vice versa.

The annual average of oil prices during the study years also witnessed their highest value in the years 2018 and 2021, which amounted to (71.52), (70.79) dollars respectively, although the year 2018 was the general performance of oil in a decline unlike the year 2021, which witnessed an upward performance. Oil prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.2. Annual Trend for Oil Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	48.61	37.28	-0.233	-23.308%	Decrease	46.11	107
2016	37.22	56.82	0.527	52.660%	Increase	45.04	258
2017	56.82	66.87	0.177	17.687%	Increase	54.83	258
2018	66.57	53.80	-0.192	-19.183%	Decrease	71.52	258
2019	54.91	66.00	0.202	20.197%	Increase	64.18	258
2020	66.25	51.80	-0.218	-21.811%	Decrease	43.21	258
2021	51.09	77.78	0.522	52.241%	Increase	70.79	258
Total							1655

$$** \text{ Change Percentage} = [(\text{Close price} - \text{Open Price}) / \text{Open price}] * 100\%$$

Based on the foregoing, we can explain how the performance or general trend in oil prices fluctuated up and down during the study period 2015-2021, due to a variety of factors such as the Covid-19 crisis, political and military crises in Middle Eastern and

Gulf states, which are among the world's largest producers, as well as the crisis between America and Iran, all of which had an impact on the volatility of oil prices. However, market sentiment remained bullish, with analysts expecting oil prices to reach \$100 per barrel as a recovery in demand combined with low inventories and supply disruptions are seen to push prices higher after starting a rally of (52.241%) so far in the year 2021, and prices are expected to continue to rise in the coming years, given the lack of radical solutions to the crises that are causing this, in addition to the conservative supply policy adopted by the Organization of Petroleum Exporting Countries.

3.3.1.3. S&P Index

Standard & Poor's is a financial services company headquartered in the United States, it is a subsidiary of McGraw-Hill Companies that publishes financial research and analysis on stocks and bonds. it is well-acquainted with its indices in the US S&P 500, Australian S&P/ASX 200, Canadian S&P/TSX, Italian S&P/MIB and Indian S&P CNX Nifty. It is also one of the big three credit rating agencies,

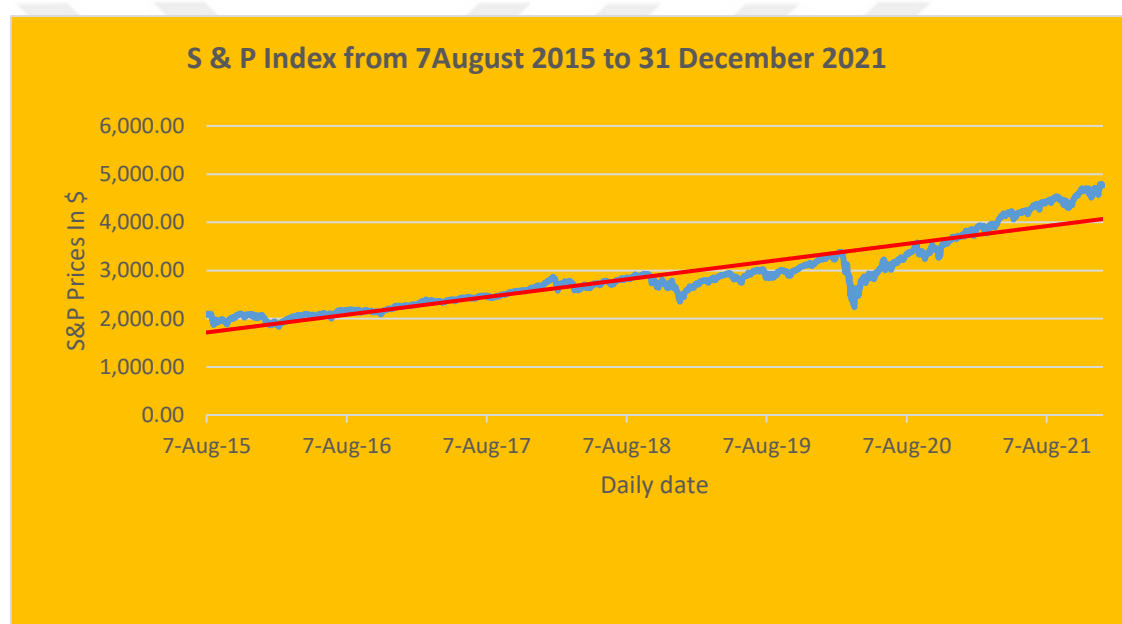
The time series of S&P index represents the daily data for dealing with this tool for the period from August 2015 to December 2021, It is noted from the figure (3.3) that there is a fluctuation in the prices of this indicator, but the prices were of a regular upward feature, punctuated by two sharp decline periods in the years 2015 and 2018, where its price at the beginning of the study period amounted to (2077.57) dollars, i.e. on August 7, 2015 and the price of this indicator reached On December 31, 2021 a value of (4,766.14) dollars, which indicates the gradual rise in the share prices of this company, which indicates the high fluctuation in the value of this investment tool, which amounted to (2688.61) dollars during the seven years, with a fluctuation rate of (129.4%), which indicates that there is a high level and steady increase in the prices of S&P stock during the study period.

We can conclude from the historical data that the general predictive trend indicates that there will be an increase in the levels of S&P prices in the short and long term, which is what it is confirmed by the general trend line for S&P prices in the aforementioned figure (3.3), meaning that there are high levels of optimistic expectations among the investors in this financial tool that its prices will not decline at least in the foreseeable future. It also notes that there are strong increases in the prices of this index in 2021 and

at levels that exceeded previous years, as it led the "Standard & Poor's 500" index to approach achieving the best annual performance ever during the study period.

It was also found that the lowest point in the S&P prices curve was recorded on February 11, 2016, which was (1829.08) dollars, while it reached the highest point according to the historical data curve on December 29, 2021, which was (4793.06) dollars, which indicates the high and gradual fluctuation in the price levels of this tool. This, in turn, may indicate the high gains that can be achieved by investing in this financial instrument according to the trend curve of its trading prices.

Figure 3.3. S&P Prices Index for the period 2015-2021 (Daily Bases)



It is also noted from the ranges of annual change in the table (3.3) between the opening price at the beginning of the year and the closing price at the end of the year that the price of S&P closed in the years 2015, 2018 with large losses, which indicates that the overall performance of S&P in those years tended to decline, and also the annual change percentage had reached its highest drop levels in the year 2018 with a decrease of (-7.009%), While the prices of S&P closed in the years 2016, 2017, 2019, 2020, 2021 to achieve high gains and that the highest percentage of profits was in the years 2019 and 2021, with an increase percentage of more than (28%) for each of them, which indicates that the overall performance of S&P index in those years tended to rise.

The annual average of S&P prices during the study years also witnessed their highest value in the years 2020 and 2021, which amounted to (3219.43), (4297.49) dollar, as these years witnessed an unprecedented rise compared to previous years, which confirms the general upward trend in the prices of this indicator. From these results, we can be predicted that S&P prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.3. Annual Trend for S&P Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	2,077.57	2,043.94	-0.016	-1.619%	Decrease	2026.52	107
2016	2,012.66	2,238.83	0.112	11.237%	Increase	2092.33	258
2017	2,256.83	2,673.61	0.185	18.467%	Increase	2448.11	258
2018	2,695.81	2,506.85	-0.070	-7.009%	Decrease	2743.60	258
2019	2,510.03	3,230.78	0.287	28.715%	Increase	2912.30	258
2020	3,257.85	3,756.07	0.153	15.293%	Increase	3219.43	258
2021	3,700.65	4,766.18	0.288	28.793%	Increase	4267.49	258
Total							1655

** Change Percentage = $[(\text{Close price} - \text{Open Price}) / \text{Open price}] * 100\%$

It is possible to explain how S&P prices changed between 2015 and 2021 based on this information, which includes issues such as the Covid-19 crisis and the broader collapse in global market indicators due to that crisis, which included the index of S&P. In spite of this, the price of this index continues to rise, and it is hoped that the recovery from the Covid-19 issue will lead to the continuation of this index's rise in the following years, based on the overall trend of the S&P Index prices for 2019-2021.

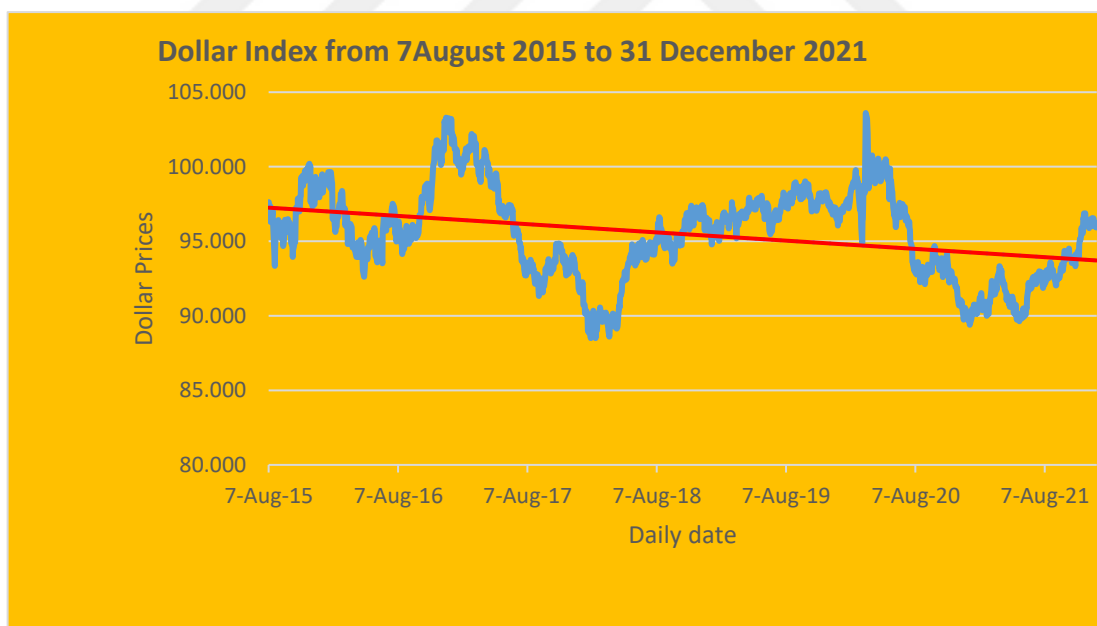
3.3.1.4. Dollar Index

Based on the data series for dollar currency prices shown in Figure (3.4), it can be concluded that this indicator was characterized by large and severe movements and fluctuations throughout the study period, and that there was no period of stability for this indicator. The daily data for dealing with this tool from August 2015 to December 2021 is represented by the Dollar Index time series. A rise in the value of this currency may have begun in the fourth quarter of 2016, continued through the first quarter of 2017, followed by a decline through the first quarter of 2018, and then a gradual increase through the first quarter of 2019. This currency's price went up and down a great deal in

2020, but in the beginning of 2021, the price began to rise again, indicating the significant volatility of this indicator during the years of research. In addition, it should be highlighted that the times of collapse occurred at levels far higher than the global currency market's price escalation.

It was also observed that the lowest point in the dollar prices curve was recorded on February 1, 2018, which was (88.505) dollars, and the highest point according to the historical data curve was on March 19, 2020, which was (103.605) dollars, indicating the tool's price levels fluctuating rapidly and gradually. This, in turn, may signal the significant risk associated with investing in this financial instrument based on the trading price trend curve. The general trend curve of this indicator during the study period indicates that there is a downward trend in the price of the US dollar, indicating that there are signs that this indicator is difficult to predict in the long term, but that there is a decrease in the price of this currency in the short term.

Figure 3.4. Dollar Prices Index for the period 2015-2021 (Daily Bases)



Additionally it is noted from the ranges of annual change in the table (3.4) between the opening price at the beginning of the year and the closing price at the end of the year that the price of Dollar closed in the years 2017, 2019, 2020 with large losses, which indicates that the overall performance of the Dollar prices in that years tended to decline, and also the annual change percentage had reached its highest drop levels in the year 2017

with a decrease of (-10.252%), While the prices of Dollar closed in the years 2015, 2016, 2018, 2021 to achieve high gains and that the highest percentage of profits was in the year 2021, with an increase percentage of more than (7%), which indicates that the overall performance of Dollar index in these years tended to rise.

The annual average of Dollar prices during the study years also witnessed their highest value in the year 2019, which amounted to (97.15) dollars, as this year witnessed an unprecedented rise compared to other years, which confirms the general upward trend in the prices of this indicator. From these results, there is difficulty in predicting the price of this index but we can conclude that Dollar prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.4. Annual Trend for Dollar Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	97.619	98.745	0.012	1.153%	Increase	97.05	107
2016	98.968	102.286	0.034	3.353%	Increase	96.91	258
2017	102.315	91.826	-0.103	-10.252%	Decrease	96.51	258
2018	91.573	95.735	0.045	4.545%	Increase	93.37	258
2019	96.423	96.058	-0.004	-0.379%	Decrease	97.15	258
2020	96.525	89.918	-0.068	-6.845%	Decrease	95.90	258
2021	89.649	95.964	0.070	7.044%	Increase	92.42	258
Total							1655

$$** \text{ Change Percentage} = [(\text{Close price} - \text{Open Price}) / \text{Open price}] * 100\%$$

Based on the foregoing, we can explain the performance or general trend in the Dollar prices fluctuated up and down during the study period 2015-2021, due to many factors, including the Covid-19 crisis, economic and related financial market events, such as a change in a country's interest rate or a fall in commodity prices, are often the source of the Dollar currency volatility, and the degree of volatility arises from various aspects of a currency relation with a specific to the economy of the USA. Also, the nature of the sharp economic volatility as a result of financial, economic, political, and other crises is one of the motives that make the currency tends to be more volatile and the price difference between the buying and selling price is greater. Other causes of volatility include inflation, government debt, and current account deficits. The USA's political and economic stability also affects the extent of the volatility of that Dollar's prices. In

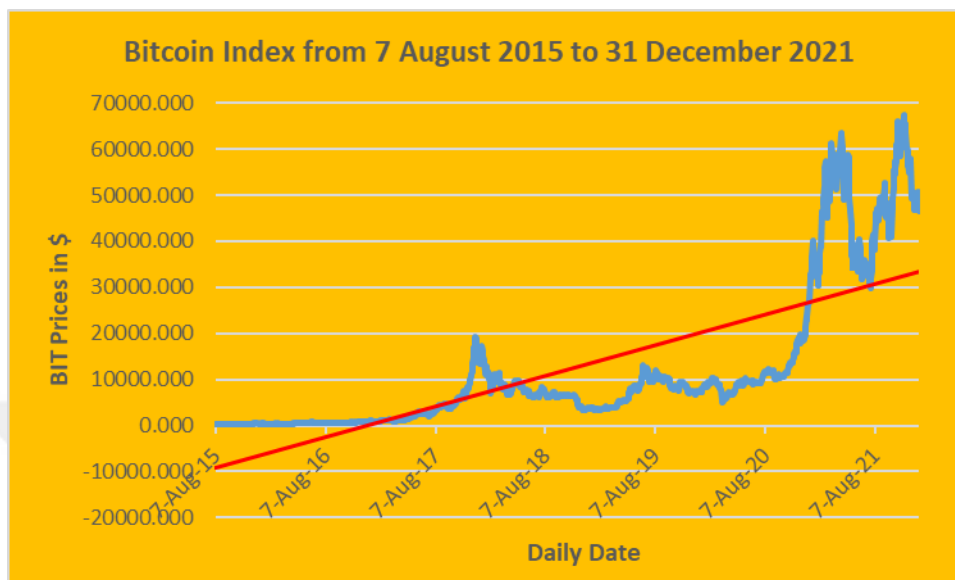
general, currencies that are not regulated by a central bank like Bitcoin and other digital currencies are more volatile since they are by nature speculative instruments.

3.3.1.5. Bitcoin Index

The time series of Bitcoin index represents the daily data for dealing with this tool for the period from August 2015 to December 2021, it is noted from the figure (3.5) that there is a difference in the pattern of fluctuation in the prices of this currency, as it is possible to note the presence of 3 time periods that characterized this time series and during the study period. The first period was limited between 2015 and 2016 and was characterized by rising relative stability, with price limits ranging between 200 dollars and not exceeding 1,000 dollars, and the second period starts from 2017, which fluctuated between rise and fall, as prices crossed the barrier of 1,000 dollars to reach 4,000 dollars and then began to decline from this price in 2018, while the third period, which started in 2019 and continue in 2020, 2021 was characterized by the nature of the crazy and uncontrolled escalation, as it rose at record levels from 4,000 dollars to touch the 70,000 dollars barrier. This, in turn, indicates the expansion in the demand for investing in this currency due to the high profits that investors derive from trading this currency.

It was also found that the lowest point in the Bitcoin prices curve was recorded on August 24, 2015, which was (211.4) dollars, while it reached the highest point according to the historical data curve on November 10, 2021, which was (67527.9) dollars, which indicates the high and gradual fluctuation in the price levels of this tool. This, in turn, may indicate the high gains that can be achieved by investing in this financial instrument according to the trend curve of its trading prices.

Figure 3.5. Bitcoin Prices Index for the period 2015-2021 (Daily Bases)



It is also noted from the ranges of annual change in the table (3.5) between the opening price at the beginning of the year and the closing price at the end of the year that the price of Bitcoin closed in the year 2018 with large losses, which indicates that the overall performance of Bitcoin in that year tended to decline, and also the annual change percentage had reached its highest drop levels in the year 2018 with a decrease of (-73.237%), While the prices of Bitcoin closed in the years 2015, 2016, 2017, 2019, 2020, 2021 to achieve high gains and that the highest percentage of profits was in the year 2017, with an increase percentage of more than (1500%), which indicates that the overall performance of Bitcoin index in this year tended to rise.

The annual average of Bitcoin prices during the study years also witnessed their highest value in the year 2021, which amounted to (47285.72) dollars, as this year witnessed an unprecedented rise compared to previous years, which confirms the general upward trend in the prices of this indicator. From these results, we can be predicted that Bitcoin prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.5. Annual Trend for Bitcoin Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	277.9	430.0	0.547	54.732%	Increase	302.38	107
2016	433.3	972.2	1.244	124.371%	Increase	563.23	258
2017	963.4	15416.6	15.002	1500.228%	Increase	3900.27	258
2018	13850.4	3706.8	-0.732	-73.237%	Decrease	7614.97	258
2019	3709.4	7321.5	0.974	97.377%	Increase	7341.16	258
2020	7397.5	27376.0	2.701	270.071%	Increase	10994.76	258
2021	32193.3	46461.7	0.443	44.321%	Increase	47285.72	258
Total							1655

** Change Percentage = [(Close price -Open Price)/Open price] * 100%

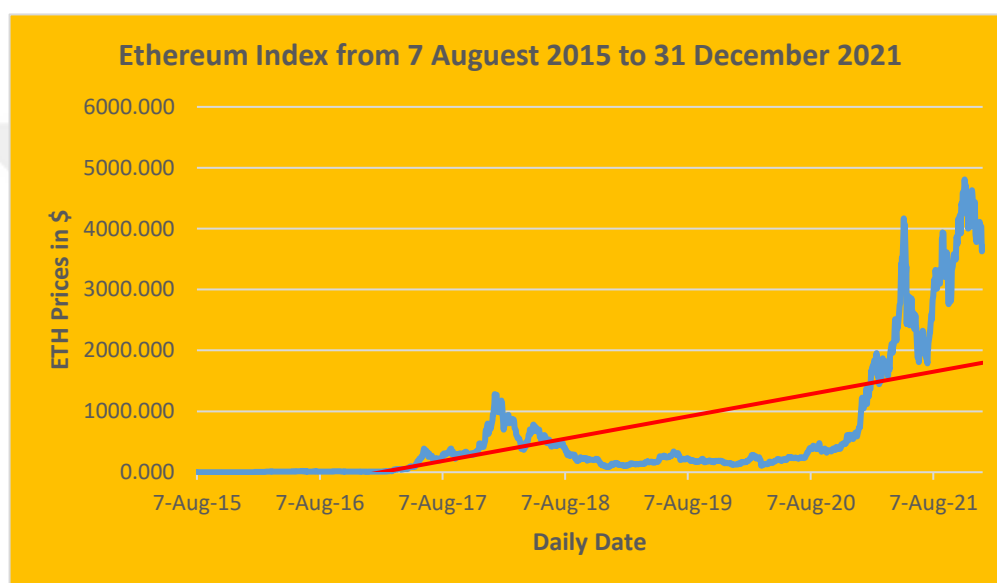
Based on the foregoing, we can explain the performance or general trend in the Bitcoin prices fluctuated up and down during the study period 2015-2021, due to many factors, including the Covid-19 crisis. From a second point of view, the price levels of this currency are affected by many factors, including the high demand for this currency that comes from illegal operations such as money laundering and drug dealing funds and others. However, despite that, Bitcoin prices will continue to rise, based on the general trend of the prices of the Bitcoin Index for the study years 2019, 2020 and 2021.

3.3.1.6. Ethereum Index

The time series of Ethereum index represents the daily data for dealing with this tool for the period from August 2015 to December 2021, it is noted from the figure (3.6) that the price of the Ethereum currency during the study period has a similar behavior to the behavior of the Bitcoin currency in terms of the general framework of the volatility of this indicator. Where the price path of Ethereum took an upward behavior at slight levels in the transactions of the first quarter of 2015 and within the range of 1 to 2 dollars, and then returned to decline below the level of one dollar by the end of the year, then it took a gradual upward trend in the years 2016 and 2017, and at the beginning of 2018 it reached a price level of 1,250 dollars, however, it declined this year from the level of \$1,000 to reach its lowest level at the \$100 barrier, and then re-escalated gradually in the following years to witness its highest levels in 2021 and to reach a barrier of just under \$5,000. This, in turn, indicates the expansion in the demand for investing in this currency due to the high profits that investors derive from trading this currency.

It was also found that the lowest point in the Ethereum prices curve was recorded on October 19, 2015, which was (0.433) dollars, while it reached the highest point according to the historical data curve on November 8, 2021, which was (4808.48) dollars, which indicates the high and gradual fluctuation in the price levels of this tool. This, in turn, may indicate the high gains that can be achieved by investing in this financial instrument according to the trend curve of its trading prices.

Figure 3.6. Ethereum Prices Index for the period 2015-2021 (Daily Bases)



It is also noted from the ranges of annual change in the table (3.6) between the opening price at the beginning of the year and the closing price at the end of the year that the price of Ethereum closed in the years 2015, 2018, and 2019 with large losses, which indicates that the overall performance of Ethereum in that years tended to decline, and also the annual change percentage had reached its highest drop levels in the year 2018 with a decrease of (-84.641%), While the prices of Ethereum closed in the years 2016, 2017, 2020, 2021 to achieve high gains and that the highest percentage of profits was in the year 2017, with an increase percentage of more than (8939%), which indicates that the overall performance of Ethereum index in these years tended to rise.

The annual average of Ethereum prices during the study years also witnessed their highest value in the year 2021, which amounted to (2777.12) dollars, as this year witnessed an unprecedented rise compared to previous years, which confirms the general

upward trend in the prices of this indicator. From these results, we can be predicted that Ethereum prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.6. Annual Trend for Ethereum Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	2.832	0.946	-0.666	-66.596%	Decrease	0.98	107
2016	0.953	8.160	7.562	756.243%	Increase	9.78	258
2017	8.370	731.520	86.398	8639.785%	Increase	219.46	258
2018	858.780	131.900	-0.846	-84.641%	Decrease	481.35	258
2019	152.950	129.210	-0.155	-15.521%	Decrease	180.68	258
2020	127.190	735.940	4.786	478.615%	Increase	307.61	258
2021	1042.400	3677.850	2.528	252.825%	Increase	2777.12	258
Total							1655

** Change Percentage = [(Close price -Open Price)/Open price] * 100%

Based on the foregoing, we can explain the performance or general trend in the Ethereum prices fluctuated up and down during the study period 2015-2021, due to many factors, including the Covid-19 crisis. We can also note the growth of trading in the Ethereum currency, especially in the year 2021, which indicates the tendency of investors to achieve high profits as a result of speculation in this currency, which is the second virtual currency in terms of trading levels among investors. However, despite that, Ethereum prices will continue to rise, based on the general trend of the prices of the Ethereum Index for the study years 2020 and 2021.

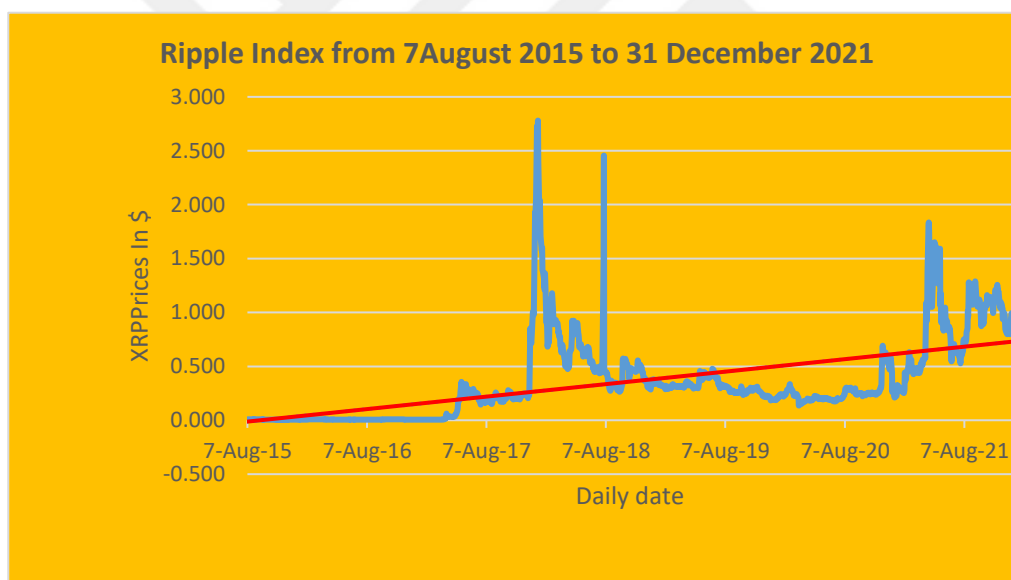
3.3.1.7. Ripple Index

The time series of Ripple index represents the daily data for dealing with this tool for the period from August 2015 to December 2021, it is noted from the figure (3.7) that the price of the Ripple currency during the study period has a different behavior to the behavior of the Bitcoin and Ethereum currencies in terms of the general framework of the volatility of this indicator. Where generally noted on the Bitcoin data series that it was characterized by three sharp rise periods during the study period, when the behavior of the Ripple currency prices took a linear trend below one dollar from 2015 to 2017, then it began in mid-December 2017 to exceed the one-dollar barrier to reach the peak of its first rise in January 2018, and it crossed the \$2 barrier, then deteriorated again in the same month, but it recover and began to rise to reach its second peak in February of the same

year, and continued to gradually decline in the years 2019 and 2020 to reach low levels and then started to rise in the middle of 2020, and to reach its third peak in the last quarter of the year 2021, and then to decline again after that and in a downward trend.

It was also found that the lowest point in the Ethereum prices curve was recorded on October 22, 2015, which was (0.004) dollars, while it reached the highest point according to the historical data curve on January 11, 2018, which was (2.780) dollars, which indicates the high and gradual fluctuation in the price levels of this tool. From these results, we can infer that investing in this currency does not achieve high levels of profits for investors due to its low-price levels and below one dollar. However, in general, it is possible to infer the general upward trend of the price of this currency based on the general trend curve.

Figure 3.7. Ripple Prices Index for the period 2015-2021 (Daily Bases)



It is also noted from the ranges of annual change in the table (3.7) between the opening price at the beginning of the year and the closing price at the end of the year that the price of Ripple closed in the years 2015, 2018, and 2019 with large losses, which indicates that the overall performance of Ripple in that years tended to decline, and also the annual change percentage had reached its highest drop levels in the year 2018 with a decrease of (-80.363%), While the prices of Ripple closed in the years 2016, 2017, 2020, 2021 to achieve high gains and that the highest percentage of profits was in the year 2017,

with an increase percentage of more than (16250%), which indicates that the overall performance of Ripple index in these years tended to rise.

The annual average of Ripple prices during the study years also witnessed their highest value in the year 2021, which amounted to (0.86) dollars, as this year witnessed an unprecedented rise compared to other years, which confirms the general upward trend in the prices of this indicator. From these results, we can be predicted that Ripple prices may continue to rise in the year 2022, but history shows that it is not possible to anticipate the periods during which its decline can be determined.

Table 3.7. Annual Trend for Ripple Prices

Year	Annual Price		Change Value	** Change Percentage	Overall Performance	Annual Average	N
	Open	Close					
2015	0.008	0.005	-0.375	-37.500%	Decrease	0.01	107
2016	0.005	0.006	0.200	20.000%	Increase	0.01	258
2017	0.006	0.981	162.500	16250.0%	Increase	0.17	258
2018	1.930	0.379	-0.804	-80.363%	Decrease	0.69	258
2019	0.337	0.189	-0.439	-43.917%	Decrease	0.31	258
2020	0.190	0.318	0.674	67.368%	Increase	0.26	258
2021	0.222	0.925	3.167	316.667%	Increase	0.86	258
Total							1655

$$** \text{ Change Percentage} = [(\text{Close price} - \text{Open Price}) / \text{Open price}] * 100\%$$

Based on the foregoing, we can explain the performance or general trend in the Ripple prices fluctuated up and down during the study period 2015-2021, due to many factors, including the Covid-19 crisis. We can also note the growth of trading in the Ripple currency, especially in the year 2018, which indicates the tendency of investors to achieve high profits as a result of speculation in this currency, which is the third virtual currency in terms of trading levels among investors. However, despite that, Ripple prices will continue to rise, based on the general trend of the prices of the Ripple Index for the study year 2021.

3.3.2. Financial Analysis of the Dependent Variables

In the current paragraph, we address the financial analysis of the performance of the investment portfolio if it is built according to traditional financial tools and then on the basis of digital or virtual financial tools. Finally, the financial analysis of the performance of the investment portfolio is done on the basis of diversification between traditional and digital tools as follows:

3.3.2.1. Traditional Tools Portfolio

To get acquainted with the performance of the investment portfolio for traditional tools (Oil, Gold, S&P stock, Dollar currency) the researcher calculated the returns and risks of the portfolio using the Sharpe ratio to reach the performance results and according to the data of the study for the period from 2015 to 2021 and on a daily basis. The results shown in the table (3.8) indicate the following:

1. The Sharpe ratio describes how much excess return the investor can receive for the extra volatility he endures for holding a riskier asset. The Sharpe equation was applied using the Solver, which is one of the sub-programs within the Excel program. The equation formula was formed according to the following model:

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

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 .

2. The risk-free rate was set to (0.05%) as a minimum return that the investors expect and as a starting point for a best available rate of return on the portfolio tools or assets. The risk-free rate represents the rate of return of an investment with zero risk. Also, represents the interest an investor would expect from an absolutely risk-free investment over a specified period of time.

3. It is noted that the expected return from the traditional tools of this portfolio amounted to (0.04%) for Oil, (1.19%) for Gold, (1.19%) for the stock of (S&P) company and (0.33%) for the Dollar currency during the study period.

4. The results of the analysis, after calculating the variance - covariance matrix, revealed that the optimal solution for investing in the portfolio of the four traditional tools came with weights (0.0) for Oil, (0.52) for Gold, (0.40) for the stock of S&P company, and

(0.08) for the Dollar currency, which indicates that the optimal investment composition for this portfolio is to consist of metal Gold with a percentage of (52%), then investing in the stock of S&P company with a percentage of (40%), and the investment in the Dollar currency with a percentage of (8%), While this portfolio includes a percentage (0%) of Oil. Where it is noticed that the best return for the portfolio and for this combination of traditional tools will be according to the Sharpe ratio equal to (0.719), This indicates the best case for investment returns in the portfolio, but it is not necessarily the best case for risk.

5. The expected return of a portfolio is the anticipated amount of returns that a portfolio may generate from the four tools or assets which indicate (0.6%) on a daily basis. In other words, the portfolio of the four traditional tools, represented by Oil, Gold, stock of S&P company, and the Dollar currency, generates a daily return of (0.6%).

Table 3.8. 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

Source: EXCEL- Solver results.

From these results, we can conclude that the formation of an investment portfolio with the three traditional tools, namely the Gold, the stock of S&P company, as well as the Dollar currency, gives positive results and the best returns and the lowest possible risks than would be the case if the portfolio included the presence of oil, due to the wide fluctuations in the prices of this asset during the period of study.

Also, it can be concluded that the decline in the percentage of investment in the dollar currency in this investment portfolio of traditional tools came due to the wide fluctuation in the prices of this currency during the study period, which is the opposite of

the trend for both gold and the stock of S&P company, whose prices during the study period were characterized by relative stability, which was characterized by a gradual escalation.

3.3.2.2. Digital Tools Portfolio

To get acquainted with the performance of the investment portfolio for digital tools or currencies (Bitcoin, Ripple, Ethereum) the researcher calculated the returns and risks of the portfolio using the Sharpe ratio to reach the performance results and according to the data of the study for the period from 2015 to 2021 and on a daily basis. The results shown in the table (3.9) indicate the following:

1. The Sharpe ratio describes how much excess return the investor can receive for the extra volatility he endures for holding a riskier asset. The Sharpe equation was applied using the Solver, which is one of the sub-programs within the Excel program.
2. The risk-free rate was set to (0.05%) as a minimum return that the investors expect and as a starting point for a best available rate of return on the portfolio tools or assets. The risk-free rate represents the rate of return of an investment with zero risk. Also, represents the interest an investor would expect from an absolutely risk-free investment over a specified period of time.
3. It is noted that the expected return from the digital tools of this portfolio amounted to (8.9%) for Bitcoin, (6.58%) for Ripple, (7.74%) for Ethereum during the study period.
4. The results of the analysis, after calculating the variance - covariance matrix, revealed that the optimal solution for investing in the portfolio of the three digital tools came with weights (0.50) for Bitcoin currency, (0.20) for Ripple and (0.30) for Ethereum currencies, which indicates that the optimal investment composition for this portfolio is to consist of Bitcoin currency with a percentage of (50%), While this portfolio includes a percentage (20%) of Ripple currency and (30%) for Ethereum currency. Where it is noticed that the optimal return for the portfolio and for this combination of digital tools will be according to the Sharpe ratio equal to (0.832), This indicates the optimal case for investment returns in the portfolio, but it is not necessarily the best case for risk.
5. The expected return of a portfolio is the anticipated amount of returns that a portfolio may generate from the three tools or assets which indicate (8.3%) on a daily basis. In

other words, the portfolio of the three digital tools, represented by Bitcoin, Ripple, and Ethereum currencies, generates a daily return of (8.3%).

Table 3.9. 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

Source: EXCEL- Solver results.

From these results, we can conclude that the formation of an investment portfolio with the three digital tools adopted by the current study contributed to giving positive results with high levels of return and the lowest possible risks, which came as a result of the escalation of the price index for these digital currencies.

It can also be concluded that the investment in the digital tools portfolio came at higher levels than the returns achieved from investing in the traditional tools, and in light of the high Sharpe ratio index for the digital portfolio, which amounted to (0.832) with a daily return amounted to (8.3%), while the same percentage was for the portfolio of traditional financial tools is equal to (0.719), with daily returns of (0.06%).

3.3.2.3. Diversification Portfolio

To get acquainted with the performance of the diversification portfolio for traditional tools (Oil, Gold, S&P stock, Dollar currency) and digital tools (Bitcoin, Ripple, Ethereum) the researcher calculated the returns and risks of the portfolio using the Sharpe ratio to reach the performance results and according to the data of the study for the period from 2015 to 2021 and on a daily basis. The results shown in the table (3.10) indicate the following:

1. The Sharpe ratio describes how much excess return the investor can receive for the extra volatility he endures for holding a riskier asset. The Sharpe equation was applied using the Solver, which is one of the sub-programs within the Excel program.
2. The risk-free rate was set to (0.05%) as a minimum return that the investors expect and as a starting point for a best available rate of return on the portfolio tools or assets. The risk-free rate represents the rate of return of an investment with zero risk. Also, represents the interest an investor would expect from an absolutely risk-free investment over a specified period of time.
3. It is noted that the expected return from the Traditional and digital tools of the diversification portfolio amounted to (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 during the study period.
4. The results of the analysis, after calculating the variance - covariance matrix, revealed that the optimal solution for investing in the portfolio of the traditional and digital tools came with weights (0.04) for Oil, (0.21) for Gold, (0.18) for S&P stock, (0.09) for Dollar currency, (0.34) for Bitcoin, (0.03) for Ripple and (0.11) for Ethereum digital currencies, which indicates that the optimal investment composition for this portfolio is to consist of Oil with percentage of (4%), Gold with percentage (21%), S&P stock with percentage of (18%), Dollar currency with percentage of (9%), Bitcoin with a percentage of (34%), Ripple with percentage of (3%), and Ethereum with percentage of (11%). Where it is noticed that the optimal return for the portfolio and for this combination of traditional and digital tools will be according to the Sharpe ratio equal to (0.897), This indicates the optimal case for investment returns in the portfolio, but it is not necessarily the best case for risk.
5. The expected return of a portfolio is the anticipated amount of returns that a portfolio may generate from the traditional and digital tools or assets which indicate (9.5%) on a daily basis. In other words, the Diversification portfolio of the traditional and digital tools, represented by Oil, Gold, S&P Stock, Dollar Currency, Bitcoin, Ripple, and Ethereum currencies, generates a daily return of (9.5%).

Table 3.10. 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

Source: EXCEL- Solver results.

Based on the previous results, we can conclude that the performance of the investment portfolio comprised of traditional and digital financial tools was significantly superior than the performance of the traditional and digital financial tools portfolios separately.

Also, the results of the Sharpe ratio proved that diversifying the investment portfolio's tools between traditional and digital contributes significantly to improving the portfolio's return with the lowest possible risk levels.

It can also be concluded that the investment in the traditional and digital tools portfolio came at higher levels than the returns achieved from investing either with the traditional tools or with digital tools, like the Sharpe ratio index for this diversification portfolio, which amounted to (0.897) with a daily return amounted to (9.5%).

From the financial results for this study we can prove the first hypotheses that refer 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)**. Therefore, according to the financial analysis in this chapter that we will accept this hypothesis.

3.3.3. Limitation of the Research

Despite the study's useful findings, its limitations and potential sources should be taken into account when trying to build an optimal portfolio for the US financial market:

- Data availability, the availability of data and its quality during Covid19 period.
- Since the first online trades of Ethereum occurred on August 7, 2015, no historical data was accessible prior to that date.
- Sample size is only covering USA financial market.
- A limited number of studies on digital financial tools portfolio.
- Time constraints.

3.4. STANDARD MODEL ANALYSIS

The standard model analysis of the study data and the selection of the standard model tests for the study variables are covered in this part of the study. To evaluate the study data, the researcher used a variety of tools and standard tests with the goal of identifying the normal distribution of data, stationarity tests, and identifying the availability of the necessary conditions in the study data to test its model. In addition, the (E-Views V.12) program was used to test these requirements and estimate the standard model using the following approaches:

3.4.1. Stationary Approach

The time series is stationary (stable) when its levels change over time without changing its average during a specific period of time, whereas the time series is nonstationary (unstable) when its average changes over time by increase or decrease, making the impact test on this type of series false and with dummy statistical parameters, i.e. the results obtained from regression analysis (t, R², etc.) will not be a valid estimate. It should be noted here that testing the stationarity of time series and identifying the locations of fluctuations that have a negative impact on the analysis of regression, variance, and covariance may yield results of the series being stationary at the level or when taking differences, which could be of the first or second type, and so on. The following are the time series stationary tests:

3.4.1.1. Autocorrelation Test

This test is concerned with determining the significance of the autocorrelation coefficients between the time series of the independent variables, because the presence of a high correlation between the independent variables contributes to an exaggerated rise in the parameters of the model and thus the regression results will not be correct, because it is assumed that the correlation coefficients between the independent variables are null of this condition, which is also known as the null condition (Breusch - Godfrey). As the independent variable, this test was conducted to traditional and digital tools, which included seven tools:

The results of the autocorrelation analysis of the residuals that can be seen in table (3.11) showed that the Durbin - Watson value was equal to (1.9474), which does not fall within the rejection region since it is close to the standard value (2), revealing that there is no autocorrelation between the time series of the independent variables in the current study. This result was supported by the P-value for this test, which was (0.42951), which was greater than the value of the study's default level of significance (0.05), Furthermore, the estimated (F) value (1.3117) is less than the critical value (2.015), and with degrees of freedom (7, 1646).

Table 3.11. Residuals Autocorrelation by Breusch – Godfrey

Model	Durbin-Watson Estimate Value	Durbin-Watson Critical Value	P-Value
Autocorrelation	1.947409	± 2	0.429512
Estimated F Value	1.311715		
Degree of Freedom	7, 1646		
Critical F Value	2.015		

From the previous analysis, it was found that there is no autocorrelation between the independent variables in the current study model, based on the results of the residual test according to Breusch - Godfrey criterion.

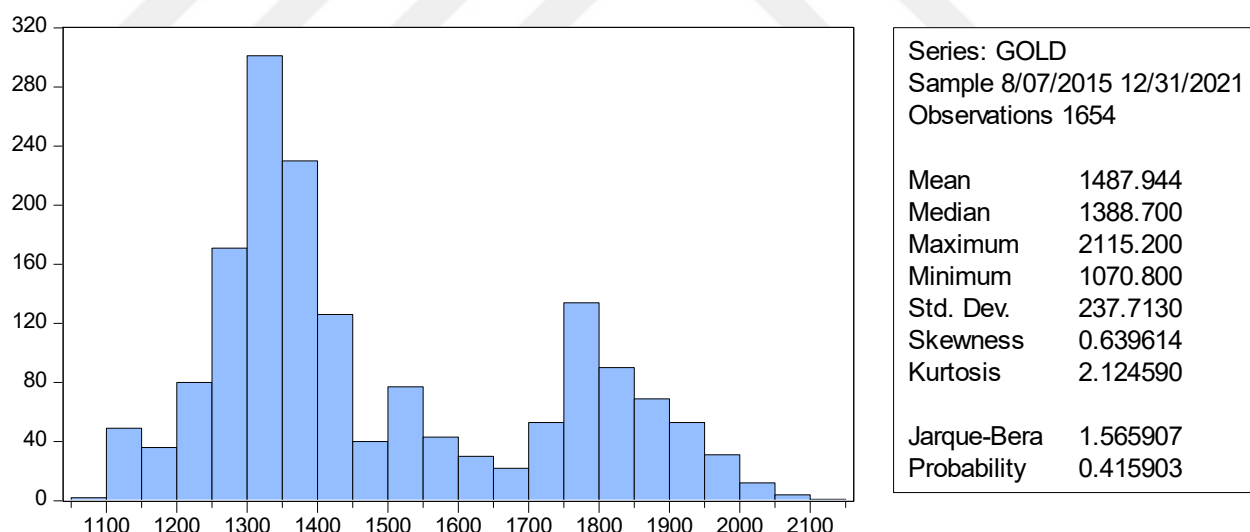
3.4.1.2. Normal Distribution Test:

This test is related to identifying the type of distribution of the study data, as the standard model for regression analysis requires that the data follow a normal distribution,

and the most important of these tests are the Skewness test, the Kurtosis test, as well as the Jargue-Bera test, which combines the two previous tests. Among the analyzing results of the (E-Views V.12) program for the normal distribution of the time series for the independent and dependent variables data, the following shows:

1. Time series Data for Gold: It is noted from the results of the figure (3.8) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of gold has reached (0.415) and this value is greater than the default level of significance of the study (0.05). This indicates that the gold data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.565), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.6396) was less than the standard value (± 1) and the Kurtosis index value of (2.124) was less than the standard value (± 3). From these results, we can conclude that the data of the gold time series have passed this condition.

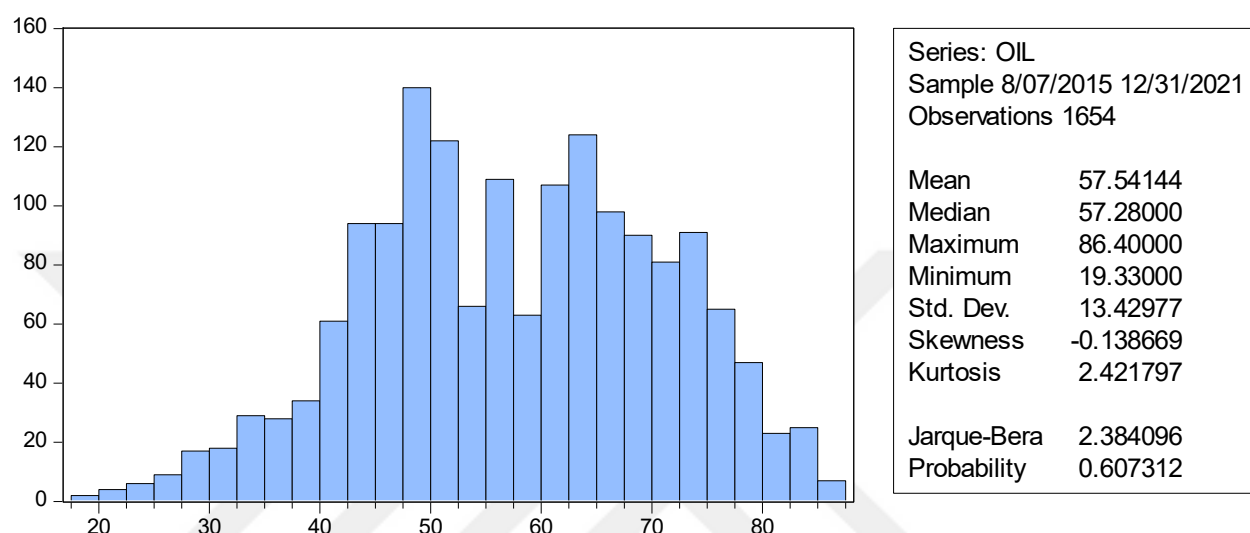
Figure 3.8. Normal Distribution for Gold Data



2. Time series Data for Oil: It is noted from the results of the figure (3.9) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of oil has reached (0.607) and this value is greater than the default level of significance of the study (0.05). This indicates that the oil data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (2.384), which is less than the critical chi-square value of (3.841), with a degree of

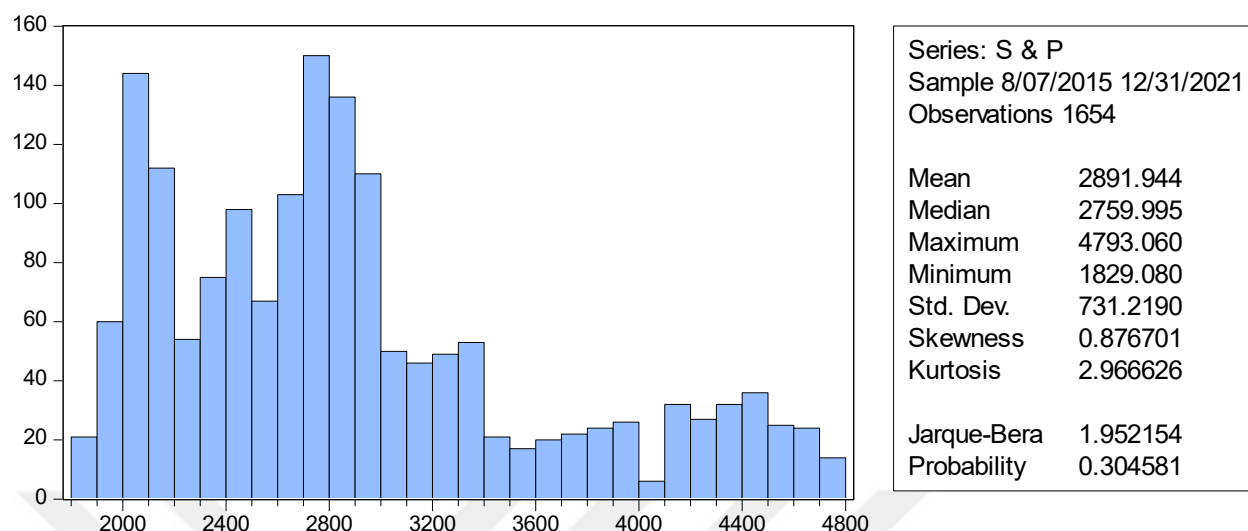
freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.1386) was less than the standard value (± 1) and the Kurtosis index value of (2.421) was less than the standard value (± 3). From these results, we can conclude that the data of the oil time series have passed this condition.

Figure 3.9. Normal Distribution for Oil Data



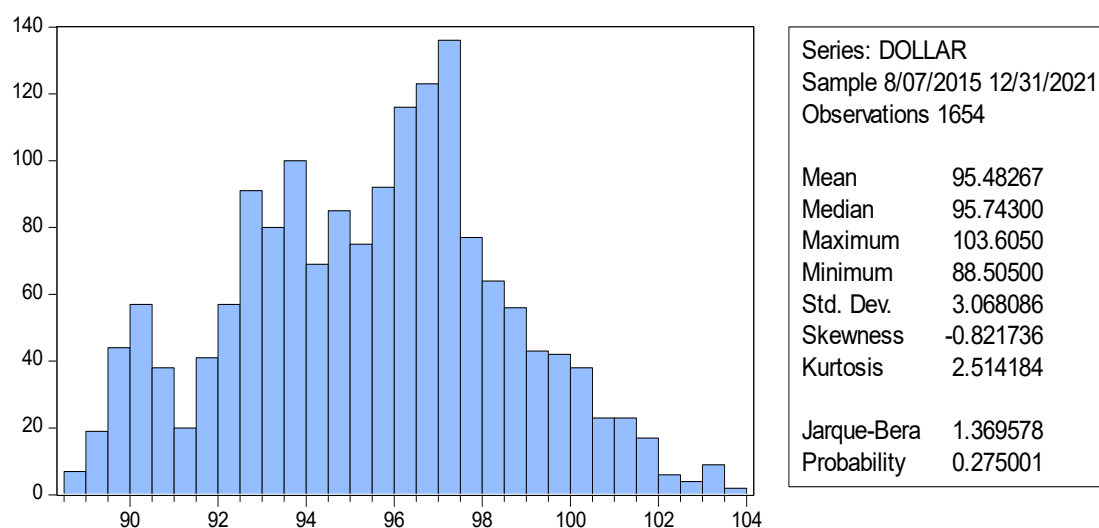
3. Time Series Data for S&P: It is noted from the results of the figure (3.10) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of S&P has reached (0.304) and this value is greater than the default level of significance of the study (0.05). This indicates that the S&P data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.952), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.8767) was less than the standard value (± 1) and the Kurtosis index value of (2.966) was less than the standard value (± 3). From these results, we can conclude that the data of the S&P time series have passed this condition.

Figure 3.10. Normal Distribution for S&P Data



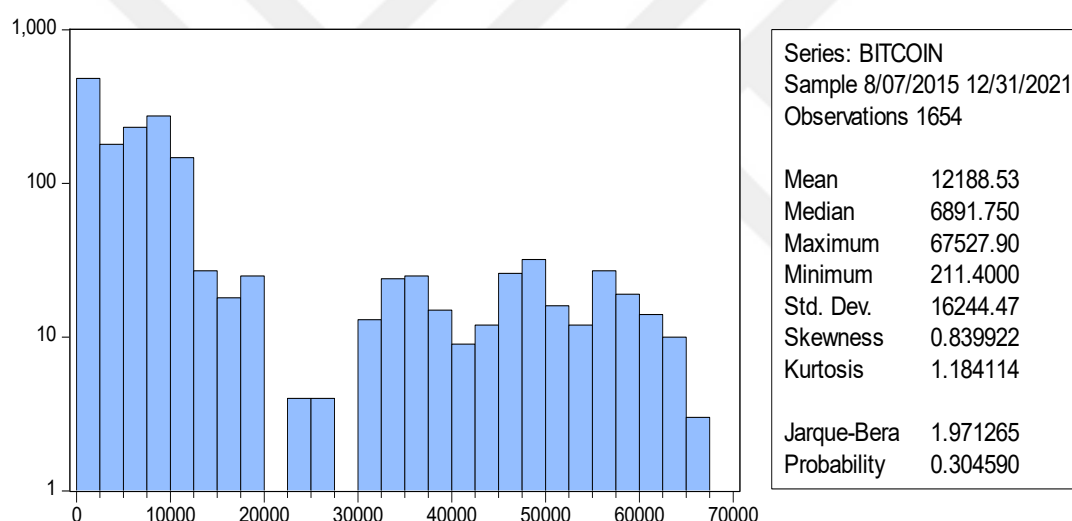
4. Time Series Data for Dollar: It is noted from the results of the figure (3.11) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of dollar has reached (0.275) and this value is greater than the default level of significance of the study (0.05). This indicates that the dollar data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.369), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.8217) was less than the standard value (± 1) and the Kurtosis index value of (2.514) was less than the standard value (± 3). From these results, we can conclude that the data of the dollar time series have passed this condition.

Figure 3.11. Normal Distribution for Dollar Data



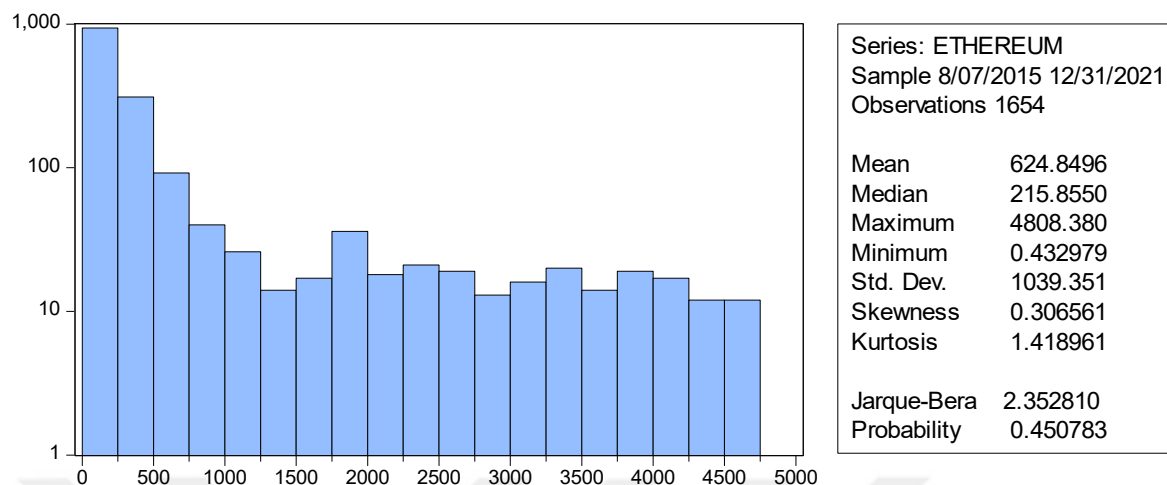
5. Time Series Data for Bitcoin: It is noted from the results of the figure (3.12) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of bitcoin has reached (0.304) and this value is greater than the default level of significance of the study (0.05). This indicates that the bitcoin data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.971), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.8399) was less than the standard value (± 1) and the Kurtosis index value of (1.1841) was less than the standard value (± 3). From these results, we can conclude that the data of the bitcoin time series have passed this condition.

Figure 3.12. Normal Distribution for Bitcoin Data



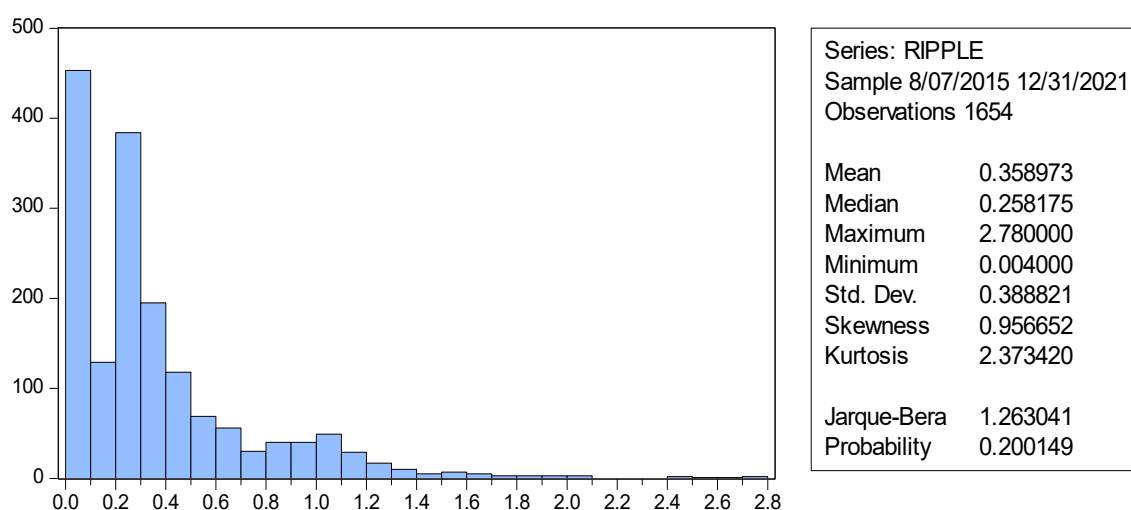
6. Time Series Data for Ethereum: It is noted from the results of the figure (3.13) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of ethereum has reached (0.450) and this value is greater than the default level of significance of the study (0.05). This indicates that the ethereum data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (2.352), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.3065) was less than the standard value (± 1) and the Kurtosis index value of (1.418) was less than the standard value (± 3). From these results, we can conclude that the data of the ethereum time series have passed this condition.

Figure 3.13. Normal Distribution for Ethereum Data



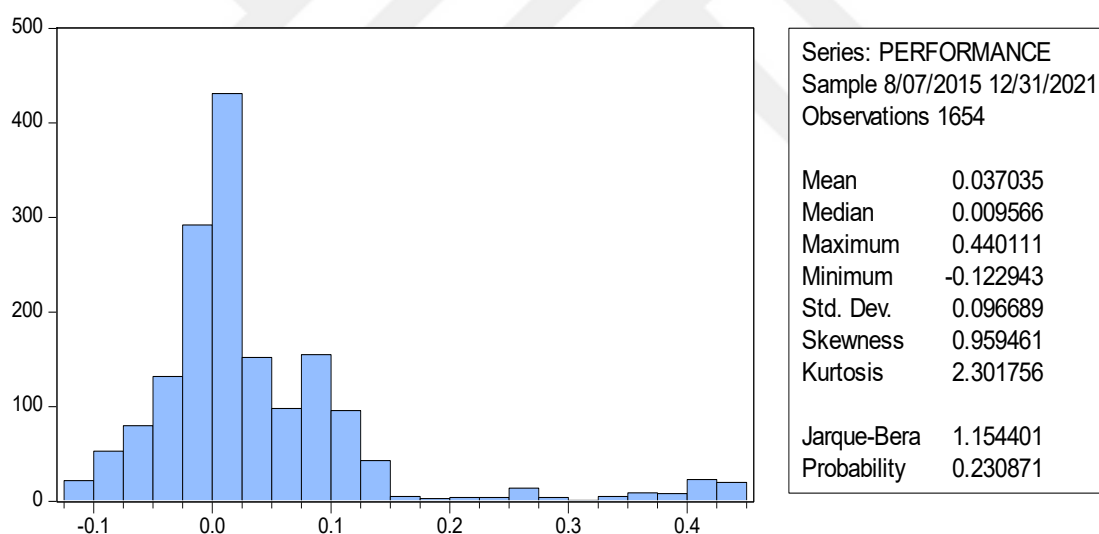
6. Time Series Data for Ripple: It is noted from the results of the figure (3.14) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of ripple has reached (0.200) and this value is greater than the default level of significance of the study (0.05). This indicates that the ripple data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.263), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.9566) was less than the standard value (± 1) and the Kurtosis index value of (2.373) was less than the standard value (± 3). From these results, we can conclude that the data of the ripple time series have passed this condition.

Figure 3.14. Normal Distribution for Ripple Data



7. Time Series Data for Portfolio Performance: It is noted from the results of the figure (3.15) and the attached table that the probability value (P-value) for the Jargue-Bera test and for the data of portfolio performance (Return & Risk) has reached (0.230) and this value is greater than the default level of significance of the study (0.05). This indicates that the portfolio performance data follow a normal distribution, and this confirms by the value of Jargue - Bera, which amounted to (1.154), which is less than the critical chi-square value of (3.841), with a degree of freedom (1) and at a confidence level (95%), on the other hand, the Skewness index value of (0.9594) was less than the standard value (± 1) and the Kurtosis index value of (2.301) was less than the standard value (± 3). From these results, we can conclude that the data of the portfolio performance time series have passed this condition.

Figure 3.15. Normal Distribution for Portfolio Performance Data



From the results of the normal distribution analysis of the data for the study variables, it can be concluded that we can be applying the parametric tests as they are more accurate and reliable than nonparametric tests.

3.4.1.3. Unit Root Test

This type of standard test is used in time series analysis applications, where stationarity (stability) is obtained in the time series when it is free of unit roots, but it is a nonstationary series when it has unit roots. Rather, it aids in determining the best method

for making the series stationary, hence it must distinguish between two sorts of unstable models:

- Trend Stationarity (Model 1), is one of the nonstationary models that show deterministic in the general trend equation.
- Differences Stationarity (Model 2), is one of the nonstationary models that show stochastic instability in the general trend equation.

Unit root test is used to test the stationarity of the time series variables and to determine whether there is the existence of any unit root, and the variable may be stationary at a weak level, or else it may be stationary after taking into account a certain degree of differences, as the alternative hypothesis is accepted when the estimated value (t) of the parameter is statistically significant and greater than the tabular (critical) value at a sample size (n) and a level of significance (1%, 5%, 10%), for this, it is said that the time series of the variable under study does not have a unit root, so it is integrated of order zero $I(0)$, that is stationary in level which requires no need for differencing, while the series is integrated of order one $I(1)$ when it settles at its first difference, then integrated of order two $I(2)$ when it settles at its second difference, also series are integrated in different orders when it having a combination of the three orders. And it is worth to be noted here that most of the variables of time series are stationary beyond taking their first or second difference. To deploy unit root test there is many methods or criterion can be used, one of the most important of these methods is the Augmented Dickey-Fuller test (ADF). The results of the unit root test gained from (E-Views V.12) program by using the Augmented Dickey-Fuller method for the variables of the study, shows the following:

1. Unit Root test for Gold: From the results in the table (3.12) we noticed that the gold variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the gold time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-18.29050) which is greater than its critical values of (-3.434118), (-2.863091), (-2.567643) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference

was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the gold data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

According to the results in table (3.12), the time series for gold is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), which means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test, the time series for gold is stationary and do not contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of gold variable has not a unit root.

Table 3.12. Unit Root Test for the Gold Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.7971	-0.872857	-3.434118	-2.863091	-2.567643
	Trend & Intercept	0.5231	-2.138871	-3.963628	-3.412542	-3.128228
At First Differences	Intercept	0.0000	-18.29050	-3.434118	-2.863091	-2.567643
	Trend & Intercept	-	-	-	-	-

N = 1655

2. Unit Root test for Oil: From the results in the table (3.13) we noticed that the oil variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the oil time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-41.39660) which is greater than its critical values of (-3.434104), (-2.863085), (-2.567640) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference

was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the oil data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.13) the time series for oil is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of oil variable has not a unit root.

Table 3.13. Unit Root Test for the Oil Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.4412	-1.680309	-3.434102	-2.863084	-2.567640
	Trend & Intercept	0.6093	-1.983618	-3.963604	-3.412530	-3.128221
At First Differences	Intercept	0.0000	-41.39660	-3.434104	-2.863085	-2.567640
	Trend & Intercept	-	-	-	-	-

N = 1655

3. Unit Root test for S&P: From the results in the table (3.14) we noticed that the S&P variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the S&P time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-12.50815) which is greater than its critical values of (-3.434123), (-2.863093), (-2.567645) and at significant levels (1%),

(5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the s&p data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.14) the time series for S&P is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of S&P variable has not a unit root.

Table 3.14. Unit Root Test for the S&P Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.9924	0.711526	-3.434123	-2.863093	-2.567645
	Trend & Intercept	0.7388	-1.727557	-3.963635	-3.412545	-3.128230
At First Differences	Intercept	0.0000	-12.50815	-3.434123	-2.863093	-2.567645
	Trend & Intercept	-	-	-	-	-

N = 1655

4. Unit Root test for Dollar: From the results in the table (3.15) we noticed that the dollar variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the dollar time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-40.02780) which is greater than

its critical values of (-3.434104), (-2.863085), (-2.567640) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the dollar data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.15) the time series for dollar is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of dollar variable has not a unit root.

Table 3.15. Unit Root Test for the Dollar Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.0833	-2.649329	-3.434102	-2.863084	-2.567640
	Trend & Intercept	0.2328	-2.709519	-3.963604	-3.412530	-3.128221
At First Differences	Intercept	0.0000	-40.02780	-3.434104	-2.863085	-2.567640
	Trend & Intercept	-	-	-	-	-

N = 1655

5. Unit Root test for Bitcoin: From the results in the table (3.16) we noticed that the bitcoin variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the bitcoin time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-39.82183) which is greater than

its critical values of (-3.434104), (-2.863085), (-2.567640) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the bitcoin data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.16) the time series for bitcoin is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of bitcoin variable has not a unit root.

Table 3.16. Unit Root Test for the Bitcoin Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.9115	-0.371317	-3.434102	-2.863084	-2.567640
	Trend & Intercept	0.7361	-1.733339	-3.963604	-3.412530	-3.128221
At First Differences	Intercept	0.0000	-39.82183	-3.434104	-2.863085	-2.567640
	Trend & Intercept	-	-	-	-	-

N = 1655

6. Unit Root test for Ethereum: From the results in the table (3.17) we noticed that the Ethereum variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the Ethereum time series is stationary at the degree of order one I(1), and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-28.72804) which is greater than

its critical values of (-3.434106), (-2.863086), (-2.567641) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the Ethereum data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.17) the time series for Ethereum is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for Ethereum is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of Ethereum variable has not a unit root.

Table 3.17. Unit Root Test for the Ethereum Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.9749	0.237527	-3.434106	-2.863086	-2.567641
	Trend & Intercept	0.9424	-0.999261	-3.963611	-3.412533	-3.128223
At First Differences	Intercept	0.0000	-28.72804	-3.434106	-2.863086	-2.567641
	Trend & Intercept	-	-	-	-	-

N = 1655

7. Unit Root test for Ripple: From the results in the table (3.18) we noticed that the ripple variable series was stationary at the level in the presence of the intercept only at significant levels of (5%), (10%), according to statistical estimated value of the (t) test for the ADF criterion, that equal to (-3.173684) which is greater than its critical values of (-2.863086), (-2.567641) and at significant levels (5%), (10%) respectively, while it is nonstationary at significant level (1%) because the estimated value of the (t) test for the

(ADF) criterion was (-3.173684) which is less than its critical value of (-3.434106). Also, the same situation at the level in the presence of the trend and intercept that it is nonstationary at significant level of (1%) for the same reason, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the ripple time series is stationary at the degree of order one $I(1)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the (ADF) criterion, that equal to (-36.21848) which is greater than its critical values of (-3.434106), (-2.863086), (-2.567641) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the ripple data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well. Based on the results in the table (3.18) the time series for ripple is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of ripple variable has not a unit root.

Table 3.18. Unit Root Test for the Ripple Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.0218	-3.1736284	-3.434106	-2.863086	-2.567641
	Trend & Intercept	0.0114	-3.923378	-3.963611	-3.412533	-3.128223
At First Differences	Intercept	0.0000	-36.21848	-3.434106	-2.863086	-2.567641
	Trend & Intercept	-	-	-	-	-

N = 1655

8. Unit Root test for Diversification Portfolio: From the results in the table (3.19) we noticed that the diversification portfolio variable series was nonstationary at the level in the presence of the intercept or the intercept and the trend, but it was stationary when we take the first difference at the intercept, where the lag length adopted was 24 periods, this means that the diversification portfolio time series is stationary at the degree of order one $1(I)$, and therefore there is no need to conduct stationary in the second difference, based on the statistical estimated value of the (t) test for the Augmented Dicky Fuller criterion, that equal to (-41.44956) which is greater than its critical values of (-3.434104), (-2.863085), (-2.567640) and at significant levels (1%), (5%), (10%), respectively. Also, the value of probability (P-Value) at the first difference was (0.0000), which is less than the default level of significance of our study (0.05), which confirms that the diversification portfolio data is stable and does not have a unit root. The significance of stationary also can be inferred by the absolute value of (ADF) and without negative signs, by comparing it with the absolute critical values as well.

Based on the results in the table (3.19) the time series for diversification portfolio is nonstationary and contain a unit root at the level (neither in intercept nor in trend and intercept), this means we can't reject the null hypothesis because the p-value for this test is greater than (0.05) the statistical significance level of the study, but at the first difference with an intercept according to (ADF) test the time series for oil is stationary and don't contain a unit root, so we can reject the null hypothesis and accept the alternative hypothesis that refers to that the data of diversification portfolio variable has not a unit root.

Table 3.19. Unit Root Test for the Diversification Portfolio Variable

Unit Root Test						
Augmented Dicky Fuller Method		P -Value	Estimated t Value	Critical t Value		
				1%	5%	10%
At Level	Intercept	0.0795	-2.670157	-3.434102	-2.863084	-2.567640
	Trend & Intercept	0.2143	-2.755634	-3.963604	-3.412530	-3.128221
At First Differences	Intercept	0.0000	-41.44956	-3.434104	-2.863085	-2.567640
	Trend & Intercept	-	-	-	-	-

N = 1655

Based on the results of the unit root analysis and the stability of the time series for the study variables, it can be concluded that the stationarity tests of the series for the independent and dependent variables of this study was stationary at the first difference and in the presence of the intercept (constant).

3.4.2. Cointegration Approach

As the results of stationarity tests for all variables of this study have stationarity at the first difference that is, they are series integrated of order one, so this need to performing the following tests:

1. Lag Selection: This procedure is to select the optimal lag length for the time series data, there are many criteria to achieve this goal, an Akaike Information Criterion (AIC) is employed to determine the optimal lag length in our study. The most commonly used ones are the Akaike IC, Hannan-Quinn criterion and Schwarz criterion.

The results in the table (3.20) shows many criteria such as LR, FPE, AIC, SC, and HQ, also every star in any criterion refer to the case of the optimal lag selection depending on the lowest values in every criteria column, as we can see from the LR criterion that the star refers to the number (136.6300) in the line of the lag number 4, which means that we should select four lags to conduct cointegration test, and the same interpret on for the rest of criteria, also, we can see the criteria FPE and AIC that refer to select lag four as an optimal solution for this study. According to these results, we will depend on LR, FBE,

and AIC criterion with four lags as an optimum solution in performing the Johansen cointegration test and in VECM test also.

Table 3.20. The Lag Selection Test for the study Time series

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-60055.27	NA	5.74e+21	72.80397	72.83019	72.81369
1	-34999.25	49838.71	4.00e+08	42.51060	42.74661	42.59811
2	-34818.28	358.2027	3.47e+08	42.36883	42.81462	42.53411
3	-34462.45	700.8929	2.44e+08	42.01509	42.67066*	42.25815*
4	-34392.74	136.6300*	2.42e+08*	42.00816*	42.87353	42.32901
* indicates lag order selected by the criterion LR: sequential modified LR test statistic (each test at 5% level) FPE: Final prediction error AIC: Akaike information criterion SC: Schwarz information criterion HQ: Hannan-Quinn information criterion						

2. Cointegration Test: which is necessary to identify the long-term relationships, the aim of this test is to modify the imbalances in those series in the short term as well as to explain the non-linear cointegration relationships that traditional linear tests could not explain or transcend, as the series containing a unit root (nonstationary) will make it difficult to predict the series because it contains random changes, which calls to address this problem. Also, cointegration is one of the tools of importance in studying the long-term relationships between the variables of the study, which helps to predict the future through time series, and since the series stationary test is concerned with the relationships between variables in the short term, so it is necessary to apply the cointegration approach to improve the model's ability to predict in long-term. The most important cointegration tests are the Engel-Granger test, the Johansson test, as well as the ARDL test, each with its own conditions. The Engel-Granger test and the Johansson are appropriate for applying to the time series that integrated according to order one $I(1)$ but the first method is appropriate for the situation that has two variables only while the other method is appropriate for the cases with two variables and more, and in this case, we will depend on the Johansson test to conduct the cointegration for our study.

Also, the cointegration test should be done only on the level form of the variables and not on the first or second differences, and to overcome this obstacle we should take a log transformation of all variables data, so we have done this procedure on the study of all variables data.

By adopting the Johansson cointegration analysis, the results are shown in the following:

1. To interpret the test results in this method of cointegration, the Trace test and the Maximum Eigenvalues test are used to determine the number of cointegration vectors, which are two statistical tests based on the function of greatest possibility.
2. It is noticed from the results in the table (3.21) for the trace test that there are eight cointegration vectors, including seven insignificant vectors and only one significant vector, because the estimated values of the trace test for this vector amounted to (200.1418), which is greater than the critical values for the same test, which was (159.5297), where this value came with estimated significant level of (0.0000), which is less than the statistical default level of the study (0.05). As for the seven vectors, they are not significant, because the estimated values for the trace test were less than the critical values for them in the mentioned table, and their levels of significance were greater than the statistical default level of the study. It is also noted that four periods of time lag were used, as they are the optimal time lag for the current study sample according to the AKAIKE criterion.
3. From the results of trace test, we denote rejection of the null hypothesis which state that there is no cointegration between time series of the study if the trace value is less than its critical value, and accept the alternative hypothesis which state that there is cointegration between time series of the study if the trace value is greater than its critical value at the 0.05 level.

Table 3.21. The Trace Test for the Log Time Series of the Study

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.045805	200.1418	159.5297	0.0000
At most 1	0.024362	122.8253	125.6154	0.0731
At most 2	0.019490	82.15431	95.75366	0.2963
At most 3	0.013975	49.69740	69.81889	0.6509
At most 4	0.007266	26.49027	47.85613	0.8728
At most 5	0.005093	14.46492	29.79707	0.8135
At most 6	0.003555	6.044417	15.49471	0.6903
At most 7	0.000104	0.171155	3.841466	0.6791
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.				

4. It is noticed from the results in the table (3.22) for the maximum eigenvalue test that also there are eight cointegration vectors, including seven insignificant vectors and only one significant vector, because the estimated values of the maximum eigenvalue test for this vector amounted to (77.31643), which is greater than the critical values for the same test, which was (52.36261), where this value came with estimated significant level of (0.0000), which is less than the statistical default level of the study (0.05). As for the seven vectors, they are not significant, because the estimated values for the maximum eigenvalue test were less than the critical values for them in the mentioned table, and their levels of significance were greater than the statistical default level of the study.

5. From the results of maximum eigenvalue test, we denote rejection of the null hypothesis which state that there is no cointegration between time series of the study if the Max-Eigen value is less than its critical value, and accept the alternative hypothesis which state that there is cointegration between time series of the study if the Max-Eigen value is greater than its critical value at the 0.05 level.

Table 3.22. The Maximum Eigenvalue Test for the Log Time Series of the Study

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.045805	77.31643	52.36261	0.0000
At most 1	0.024362	40.67101	46.23142	0.1747
At most 2	0.019490	32.45691	40.07757	0.2786
At most 3	0.013975	23.20713	33.87687	0.5147
At most 4	0.007266	12.02535	27.58434	0.9317
At most 5	0.005093	8.420504	21.13162	0.8762
At most 6	0.003555	5.873263	14.26460	0.6295
At most 7	0.000104	0.171155	3.841466	0.6791
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level. * denotes rejection of the hypothesis at the 0.05 level. **MacKinnon-Haug-Michelis (1999) p-values.				

From the trace test and maximum eigenvalue test for Johansen cointegration results, we can conclude that the variables of our study are cointegrated or have a long-run association, which means they move together in the long run, then we can run restricted VAR which means VECM test.

3. VECM Test: This test is designed for using with nonstationary series at level but it used when the series is integrating at differences. The vector error correction model (VECM) has cointegration relations built into the specification so that it restricts the long-

run behavior of the endogenous variables to converge to their cointegrating relationships while allowing for short-run adjustment dynamics. The cointegration term is known as the error correction term since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments.

As our variables, nonstationary at level and they integrated in the same order at first differenced so, we can run the VECM test. The table (3.23) shows the results of VECM, the C's represent the coefficients of the integrating equation when the portfolio represent the dependent variable. Were:

C(1) = The long run coefficient.

C(2) = The Portfolio coefficient.

C(3) = The Gold coefficient.

C(4) = The Oil coefficient.

C(5) = The S&P coefficient.

C(6) = The Dollar coefficient.

C(7) = The Bitcoin coefficient.

C(8) = The Ethereum coefficient.

C(9) = The Ripple coefficient.

C(10) = The Constant or Intercept coefficient.

As coefficient C(1) is negative and significant this means that there is a long-run causality between diversification portfolio variable and between all the independent variables of the study (gold, oil, S&P, dollar, bitcoin, ethereum, ripple). From this, we conclude that the existence of a long-term causal relationship between the variables of the study indicates the possibility of predicting changes that occur in the diversification portfolio due to changes that occur in the independent variables represented by traditional and digital financial tools. It should also be noted that the negative causation coefficient indicates that the ability to bounce back to equilibrium, while the positive sign indicates movement away from equilibrium.

The coefficient C(2) is a percentage of the independent variable in the general equation of the study which represents the short-run coefficient, while The coefficient C(3) is a percentage of the first dependent variable in the general equation of the study which represents the gold variable which means that any increase in the gold variable (C3=1.934706) will lead to an increase in diversification portfolio by (1.934706), and so on we can interpret the other coefficients, but we must note that if the coefficient of any dependent variable is negative this means that any increase (or decrease) will lead to decrease (or an increase) in the independent variable by the same percentage of this coefficient.

Table 3.23. The VECM test

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.022243	0.000526	3.462676	0.0037
C(2)	0.017941	0.025025	2.716933	0.0135
C(3)	1.934706	0.655205	4.566566	0.0019
C(4)	0.000230	0.000258	4.893735	0.0016
C(5)	1.883706	0.718905	3.679355	0.0033
C(6)	0.000800	0.010798	2.403153	0.0141
C(7)	0.038307	0.080507	4.315004	0.0018
C(8)	0.060007	0.194606	2.049183	0.0147
C(9)	1.002387	0.003811	1.626223	0.0089
C(10)	-0.202006	0.000309	-0.003886	0.9969
Integrating Equation	$D(\text{PORTFOLIO}) = C(1)*[\text{PORTFOLIO}(-1) + 1.934706*\text{GOLD}(-1) + 0.0002230*\text{OIL}(-1) + 1.883706*\text{S\&P}(-1) + 0.000800*\text{DOLLAR}(-1) + 0.038307*\text{BITCOIN}(-1) + 0.060007*\text{ETHEREUM}(-1) + 1.002387*\text{RIPPLE}(-1) + 0.202006].$			

3.4.3. Causality Approach

This approach is used to determine the direction of causality between the variables of the study, in other words between the independent and dependent variables. One of the best test of causality is Granger's Causality which is a statistical test that is based on prediction. According to Granger causality, if a signal X_1 causes a signal to X_2 , then the past values of X_1 should contain information that helps to predict X_2 future values. After conducting this test in our study, the results were as shown in the table (3.24), which refer to the following:

1. There is one direct causal relationship of the all the dependent variable in the study (gold, oil, S&P, dollar, bitcoin, ethereum, and ripple) towards the diversification

portfolio, that is, the past changes in this variables explain the current changes in the diversification portfolio, this conclusion depend on the probability values for them (0.0002), (0.0369), (0.0241), (0.0057), (0.0001), (0.0059), (0.0002) respectively which are less than the significant value (0.05), and to confirm this causal relationship we can rely on the estimated statistical values for F test (8.611), (4.615), (4.394), (6.185), (9.510), (5.407), (8.499) respectively which was greater than its critical value (3.847) at degrees of freedom (1, 1651).

2. While there is no direct causal relationship from the diversification portfolio towards the dependent variable in the study (gold, oil, S&P, dollar, bitcoin, ethereum, and ripple), because the probability values for them are (0.5568), (0.6187), (0.7749), (0.2776), (0.6294), (0.7144), (0.3923) respectively, which are greater than the significant value (0.05), and to confirm this, we can rely on the estimated statistical values for F test (0.586), (0.480), (0.255), (1.283), (0.463), (0.336), (0.936) respectively which was less than its critical value (3.847) at degrees of freedom (1, 1651).

Table 3.24. The Causality Test for the Study Variables

Causality Direction	F – Statistics Value	P-Value	Results
From Gold to Portfolio	8.61076	0.0002	Predictor
From Portfolio to Gold	0.58578	0.5568	Not Predictor
From Oil to Portfolio	4.51621	0.0369	Predictor
From Portfolio to Oil	0.48035	0.6187	Not Predictor
From S&P to Portfolio	5.39444	0.0241	Predictor
From Portfolio to S&P	0.25505	0.7749	Not Predictor
From Doller to Portfolio	6.18450	0.0057	Predictor
From Portfolio to Dollar	1.28248	0.2776	Not Predictor
From Bitcoin to Portfolio	9.51030	0.0001	Predictor
From Portfolio to Bitcoin	0.46304	0.6294	Not Predictor
From Ethereum to Portfolio	5.40667	0.0059	Predictor
From Portfolio to Ethereum	0.33634	0.7144	Not Predictor
From Ripple to Portfolio	8.49902	0.0002	Predictor
From Portfolio to Ripple	0.93626	0.3923	Not Predictor
Observations = 1652			
F critical Value = 3.847	Degree of Freedom (1, 1651)		

The findings of the standard analysis of the study variables and their data in this chapter show that the time series of these variables have passed the standard tests and are thus valid for conducting statistical tests in the inferential statistics paradigms using the parametric technique.

3.5. STATISTICAL ANALYSIS

This section is concerned with the statistical analysis of the study data as well as the identification of the standard model tests for the variables under consideration in the research. Before starting to conduct tests for hypotheses, it must be recalled that the adoption of parametric tests requires the availability of three conditions in the data subject to analysis, which are as follows:

1. Availability of the condition for a normal distribution in the data.
2. Availability of the independence condition between the independent variables.
3. The availability of homogeneity of variance condition for the study variables.

3.5.1. Homogeneity Test

Since in the previous section we verified the first and second conditions and within the standard analysis, we must verify the condition of homogeneity of variance if we want to adopt parametric tests, which are more accurate and reliable than nonparametric tests. So, the Levene's test was applied to determine the extent to which the homogeneity of variance condition was met. As the condition of homogeneity is considered fulfilled if the value of (Levene's Test Sig. > 0.05), which gives an indication that the groups have homogeneous or equal variance, and vice versa if the value of (Levene's Test Sig. ≤ 0.05), this indicates the heterogeneity of variance.

After conducting a (Levene) analysis, the results mentioned in the table (3.25), showed that all values of the calculated level of significance (Levene's Test Sig.) and for all variables of the study were greater than the value of the hypothetical level of significance of the study, which amounted to (0.05), this indicates the fulfillment of the condition heterogeneity of the study data and we should accept the null hypothesis of homogeneity that refer to equal variances of the study variables.

Table 3.25. Homogeneity Test

Variable	ANOVA Test	Estimate Levene Statistic	Sig.
Gold	Based on Mean	1.731	.086
Oil	Based on Mean	0.980	.167
S & P	Based on Mean	1.837	.051
Dollar	Based on Mean	1.645	.080
Bitcoin	Based on Mean	0.723	.146
Ethereum	Based on Mean	1.778	.073
Ripple	Based on Mean	0.751	.131
Degree of Freedom = 6, 1647		N = 1655	

Since the conditions for applying the three parametric tests have been fulfilled in the study data, therefore it is possible to adopt the parametric tests in testing the study hypotheses.

3.5.2. Statistical Hypotheses Test

In order to examine the data, the researcher used a number of parametric statistical tests, which are described below. The Statistical Packages for Social Science (SPSS) V.26 program has also been used to verify these tests and obtain their results, and the following guidelines have been followed in this regard:

3.5.2.1. Correlation Test

The researcher uses the multi-correlation test, which is based on the Pearson method, to determine the relationship between the variables in the study; the results of this test are displayed in SPSS V. 26 and include the following information:

3.5.2.1.1. Correlation between Traditional Tools and Diversification

Portfolio

The results of correlation matrix between traditional financial tools and the diversification portfolio in the table (3.26) shows the following:

1. The gold variable is correlated positively with the variables of oil, S&P stock, and diversification portfolio according to the correlation coefficients (0.570), (0.829), (0.750) respectively with statistically significant levels of (0.004), (0.000), (0.000) respectively which are less than the statistical level (0.05) for the study. From these results, we concluded that whenever the performance of the gold variable improves (or decline), that leads to an improvement (or decline) in the performance of each of the oil, S&P stock, and the diversification portfolio variables.
2. The oil variable is correlated positively with the variables of S&P stock, and diversification portfolio according to the correlation coefficients (0.515), (0.362) respectively with statistically significant levels of (0.000), (0.000) respectively which are less than the statistical level (0.05) for the study. From these results, we concluded that whenever the performance of the oil variable improves (or decline), that leads to an improvement (or decline) in the performance of each of the S&P stock, and the diversification portfolio variables.
3. The S&P variable is correlated positively with the diversification portfolio variable according to the correlation coefficient (0.673) with statistically significant levels of (0.000) which is less than the statistical level (0.05) for the study. From this results, we concluded that whenever the performance of the S&P variable improves (or decline), that leads to an improvement (or decline) in the performance of the diversification portfolio variable.
4. The dollar variable is correlated negatively with the variables of gold, oil, and S&P stock according to the correlation coefficients (-0.412), (-0.368), (-0.442) respectively with statistically significant levels of (0.000), (0.000), (0.000) respectively which are less than the statistical level (0.05) for the study. From these results, we concluded that whenever the performance of the dollar variable improves (or decline), that leads to decline (or improvement) in the performance of each of the gold, oil, and S&P stock variables.
5. The dollar variable is correlated positively with the diversification portfolio variable according to the correlation coefficient (0.434), with statistically significant levels of (0.000), which is less than the statistical level (0.05) for the study. From this results, we concluded that whenever the performance of the dollar variable improves (or decline),

that leads to improvement (or decline) in the performance of the diversification portfolio variable.

Table 3.26. The Correlation between Traditional Tools and Diversification Portfolio

Variables		Gold	Oil	S & P	Dollar	Diversification
Gold	Pearson Correl.	1				
	P-value	-				
Oil	Pearson Correl.	0.570**	1			
	P-value	0.004	-			
S & P	Pearson Correl.	0.829**	0.515**	1		
	P-value	0.000	0.000	-		
Dollar	Pearson Correl.	-0.412**	-0.368**	-0.442**	1	
	P-value	0.000	0.000	0.000	-	
Diversification	Pearson Correl.	0.750**	0.362**	0.673**	0.434**	1
	P-value	0.000	0.000	0.000	0.000	-

N = 1655

Based on the findings of the correlations, we will accept the second correlation hypothesis of the study, which comprises the following: (There is a positive significant correlation between variables of the traditional financial tools and the diversification portfolio variable at a statistically significant level of 0.05).

3.5.2.1.2. Correlation between Digital Tools and Diversification Portfolio

The results of correlation matrix between digital financial tools and the diversification portfolio in the table (3.27) shows the following:

1. The bitcoin variable is correlated positively with the variables of ethereum, ripple, and diversification portfolio according to the correlation coefficients (0.932), (0.676), (0.768) respectively with statistically significant levels of (0.000), (0.000), (0.000) respectively which are less than the statistical level (0.05) for the study. From these results, we concluded that whenever the performance of the bitcoin variable improves, that leads to an improvement in the performance of each of the ethereum, ripple, and diversification portfolio variables.
2. The ethereum variable is correlated positively with the variables of ripple, and diversification portfolio according to the correlation coefficients (0.484), (0.729)

respectively with statistically significant levels of (0.000), (0.000) respectively which are less than the statistical level (0.05) for the study. From these results, we concluded that whenever the performance of the ethereum variable improves (or decline), that leads to an improvement (or decline) in the performance of each of the ripple, and the diversification portfolio variables.

3. The ripple variable is correlated positively with the diversification portfolio variable according to the correlation coefficient (0.411) with statistically significant levels of (0.000) which is less than the statistical level (0.05) for the study. From this results, we concluded that whenever the performance of the ripple variable improves (or decline), that leads to an improvement (or decline) in the performance of the diversification portfolio variable.

Table 3.27. The Correlation between Digital Tools and Diversification Portfolio

Variables		Bitcoin	Ethereum	Ripple	Diversification
Bitcoin	Pearson Correl.	1			
	P-value	-			
Ethereum	Pearson Correl.	0.932**	1		
	P-value	0.000	-		
Ripple	Pearson Correl.	0.676**	0.484**	1	
	P-value	0.000	0.000	-	
Diversification	Pearson Correl.	0.768**	0.729**	0.411**	1
	P-value	0.000	0.000	0.000	-

N = 1655

The third hypothesis of the study that pertains to that (There is a positive significant correlation between variables of the digital financial tools and the diversification portfolio variable at a statistically significant level of 0.05) will be accepted based on the outcomes of the previous interpretation.

3.5.2.1.3. Correlation at the level of Portfolios

The correlation on the macro level of the study variables was carried out between traditional and digital financial tools, both together with portfolio, and the findings are shown in table (3.28):

1. The traditional variable is correlated positively with the diversification portfolio variable according to the correlation coefficients (0.651), with statistically significant levels of (0.000), which is less than the statistical level (0.05) for the study. From this result, we concluded that whenever the performance of the traditional tools variable improves, that leads to an improvement in the performance of the diversification portfolio variable.

2. The digital variable is correlated positively with the diversification portfolio variable according to the correlation coefficients (0.770), with statistically significant levels of (0.000), which is less than the statistical level (0.05) for the study. From this result, we concluded that whenever the performance of the digital tools variable improves, that leads to an improvement in the performance of the diversification portfolio variable.

3. The traditional and digital variables both together are correlated positively with the diversification portfolio variable according to the correlation coefficients (0.849), with statistically significant levels of (0.000), which is less than the statistical level (0.05) for the study. From this result, we concluded that whenever the performance of the traditional and digital variables both together improves, that leads to an improvement in the performance of the diversification portfolio variable.

Table 3.28. The Correlation at the level of Portfolios

Portfolios		Traditional	Digital	TRA&DIG	Diversification
Traditional	Pearson Correl.	1			
	P-value	-			
Digital	Pearson Correl.	0.877**	1		
	P-value	0.000	-		
TRA&DIG	Pearson Correl.	0.886**	0.870**	1	
	P-value	0.000	0.000	-	
Diversification	Pearson Correl.	0.651**	0.770**	0.849**	1
	P-value	0.000	0.000	0.000	-

N = 1655

Based on the results of the previous correlations, we may accept the fourth correlation hypothesis of the study, which contains the following statements: (There is a positive significant correlation between traditional financial tools and digital financial tools with diversification portfolio variable at a statistically significant level of (0.05).

3.5.2.2. Impact Test

In order to achieve the study's goal of exploring the impact of the independent variables on the dependent variable, daily data covering the study period 2015-2021 was used. The independent variables are represented by each of the traditional financial instruments (gold, oil, S&P, and dollar) as well as digital currencies (bitcoin, ethereum, and ripple), and the diversification portfolio (or investment portfolio) represents the dependent variable. The following will be the equations for the estimation of three multiple regression models:

1. The first model: Initially, this model was designed to handle the impact of gold, oil, S&P, and dollar variables on the diversification portfolio, and it was based on the equation below:

$$Y_1 = B_0 + B_1 * X_1 + B_2 * X_2 + B_3 * X_3 + B_4 * X_4 + e_i \dots\dots\dots (1)$$

2. The second model: Initially, this model was designed to handle the impact of bitcoin, ethereum, and ripple variables on the diversification portfolio variable, and it was based on the equation below: `

$$Y_2 = B_0 + B_5 * X_5 + B_6 * X_6 + B_7 * X_7 + e_i \dots\dots\dots (2)$$

3. The third model: Initially, this model was designed to handle the impact of gold, oil, S&P, dollar, bitcoin, ripple, and ethereum variables on the diversification portfolio variable, and it was based on the equation below:

$$Y_3 = B_0 + B_1 * X_1 + B_2 * X_2 + B_3 * X_3 + B_4 * X_4 + B_5 * X_5 + B_6 * X_6 + B_7 * X_7 + e_i \dots\dots\dots (3)$$

4. The fourth model: Initially, this model was designed to handle the impact of traditional financial tools and digital financial tools variables on the diversification portfolio variable, and it was based on the equation below:

$$Y_4 = B_0 + B_8 * X_8 + B_9 * X_9 + e_i \dots\dots\dots (4)$$

5. The fifth model: Initially, this model was designed to handle the impact of financial tools variable both together on the diversification portfolio variable, and it was based on the equation below:

$$Y_5 = B_0 + B_{10} * X_{10} + e_i \dots\dots\dots (5)$$

were:

Y_1, Y_2, Y_3, Y_4, Y_5 = the diversification portfolio as the dependent variable in the five models.

X_1, X_2, X_3, X_4 = the independent variables gold, oil, S&P, and dollar respectively.

X_5, X_6, X_7 = the independent variables bitcoin, ethereum, and ripple respectively.

X_8, X_9 = the independent variables traditional tools and digital tools respectively.

X_{10} = the traditional tools and the digital tools both together as an independent variable.

$B_1, B_2, B_3, B_4, B_5, B_6, B_7, B_8, B_9, B_{10}$ = The estimation parameters or coefficients of the five regression models.

B_0 = the constant or the intercept.

e_i = the standard error for the models.

1. Testing Equation One: The researcher adopts the stepwise method for the regression test using SPSS V.26 program to investigate equation one and the analysis revealed three models for impact analysis only that are shown in the table (3.29):

- The first Model:** Based on the (t) value (19.561) of this model, which was greater than the critical value (1.646) with a degree of freedom (1652), it was discovered that there is one variable that affects the diversification portfolio, represented by the gold variable, while the oil, S&P stock, and dollar variables were excluded from this model. Additionally, the calculated value of significance (0.000) confirms that, which was lower than the study's default level of significance (0.05). Based on the explanatory coefficient (R^2) (0.118), we can conclude that changes in the gold explain the changes that occur in the diversification portfolio with a percentage of (11.8%), and that the remaining percentage (88.2%) is due to other variables of traditional financial tools or to other factors that were not included in the first regression equation. Due to the high returns and low risks associated with gold, we can conclude that it is one of the best traditional financial tools in which to place one's investments.

- **The Second Model:** The results of this model shows that the entering of the S&P stock variable alongside the gold variable in the first regression equation, which indicates that the S&P stock variable comes with an effective value in the diversification portfolio less than the impact value of gold and S&P stock that the two variables together have a significant effect on the diversification portfolio based on the (t) estimated values for gold and S&P variables (15.019), (10.124) respectively which were greater than its critical value (1.646) with a degree of freedom (1651), also it was found that the explanatory value of this model (R^2) was equal to (0.236), which means that the gold and S&P variables explain the percentage (23.6%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (76.4%) is due to the variables of other traditional tools or other factors not included in the first regression equation. As a result, we believe that investing in gold and S&P stock together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variables of dollar and oil.
- **The Third Model:** The results of this model show that the entering of the dollar variable alongside the gold and S&P variables in the first regression equation, which indicates that the dollar variable comes with an effective value in the diversification portfolio less than the impact value of gold and S&P. The three variables together have a significant effect on the diversification portfolio based on the (t) estimated values for gold, S&P, and dollar variables (16.237), (11.734), (5.838) respectively which were greater than its critical value (1.646) with a degree of freedom (1650), also it was found that the explanatory value of this model (R^2) was equal to (0.251), which means that the gold, S&P, and dollar variables explain the percentage (25.1%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (74.9%) is due to the variables of other factors not included in the first regression equation. As a result, we believe that investing in gold, S&P stock, and dollar together will yield and improve the diversification portfolio's returns while lowering its risk. In this model, the oil variable was excluded as it is one of the traditional tools that does not affect the diversification portfolio, and the reason for this can be attributed to

the large fluctuations in oil prices during the study period, which means an increase in the levels of risks achieved from investing in it.

Table 3.29. Regression Test for the Equation One

Models	Dependent Variables	B ₀	B ₁	R ²	Estimated t value	Critical t value	Degree of Freedom	P-vale
First	Gold	1.268	0.014	0.188	19.561	1.646	1652	0.000
Second	Gold	1.112	0.011	0.236	15.019	1.646	1651	0.000
	S&P		0.002		10.124			0.000
Third	Gold	1.079	0.012	0.251	16.237	1.646	1650	0.000
	S&P		0.002		11.734			0.000
	Dollar		0.024		5.838			0.000
Significant Value ≤ 0.05					N = 1655			

From the previous discussion of the results of the analysis of the first regression equation, we reject the fifth hypothesis for the study, which states that there is an impact of traditional financial tools variables in the diversification portfolio variable at a statistically significant level of (0.05). And accept the alternative hypothesis, which states that there is an impact of a number of variables of traditional financial tools in the diversification portfolio variable at a statistically significant level of (0.05).

2. Testing Equation Two: The researcher adopts the stepwise method for the regression test using SPSS V.26 program to investigate equation two and the analysis revealed three models for impact analysis only that are shown in the table (3.30):

- **The first Model:** Based on the (t) value (18.340) of this model, which was greater than the critical value (1.646) with a degree of freedom (1652), it was discovered that there is one variable that affects the diversification portfolio, represented by the bitcoin variable, while the ripple, and ethereum variables were excluded from this model. Additionally, the calculated value of significance (0.000) confirms that, which was less than the study's default level of significance (0.05). Based on the explanatory coefficient (R²) (0.373), we can conclude that changes in the bitcoin variable explain the changes that occur in the diversification portfolio with a percentage of (37.3%), and that the remaining percentage (62.7%) is due to other

variables of digital financial tools or to other factors that were not included in the second regression equation. Due to the high returns and low risks associated with bitcoin, we can conclude that it is one of the best digital financial tools in which to place one's investments.

- **The Second Model:** The results of this model shows that the entering of the ethereum variable alongside the bitcoin variable in the second regression equation, which indicates that the ethereum variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin and ethereum that the two variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin and ethereum variables (16.348), (7.646) respectively which were greater than its critical value (1.646) with a degree of freedom (1651), also it was found that the explanatory value of this model (R^2) was equal to (0.416), which means that the bitcoin and ethereum variables explain the percentage (41.6%) of the change that occurs in the diversification portfolio variable, so that the remaining percentage (58.4%) is due to the variables of other digital tools or other factors not included in the second regression equation. As a result, we believe that investing in bitcoin and ethereum together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variable of ethereum only.
- **The Third Model:** The results of this model shows that the entering of the ripple variable alongside the bitcoin and ethereum variables in the second regression equation, which indicates that the ripple variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin and ethereum together. The three variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, ethereum, and ripple variables (15.404), (11.917), (5.551) respectively which were greater than its critical value (1.646) with a degree of freedom (1650), also it was found that the explanatory value of this model (R^2) was equal to (0.590), which means that the bitcoin, ethereum, and ripple variables explain the percentage (59%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (41%) is due to the variables of other factors not included in the second regression equation. As a result, we believe that investing in bitcoin, ethereum,

and ripple together will yield and improve the diversification portfolio's returns while lowering its risk. In this model, all variables of the digital tools were included and no one of them is excluded.

Table 3.30. Regression Test for the Equation Two

Models	Dependent Variables	B ₀	B ₁	R ²	Estimated t value	Critical t value	Degree of Freedom	P-vale
First	Bitcoin	2.290	0.102	0.373	18.340	1.646	1652	0.000
Second	Bitcoin	1.875	0.147	0.416	16.348	1.646	1651	0.000
	Ethereum		0.374		7.646			0.000
Third	Bitcoin	1.054	0.302	0.590	15.404	1.646	1650	0.000
	Ethereum		0.447		11.917			0.000
	Ripple		0.775		5.551			0.000
Significant Value ≤ 0.05					N = 1655			

From the previous discussion of the results of the analysis of the second regression equation, the sixth hypothesis for the study is accepted, which states that there is an impact of digital financial tools variables in the diversification portfolio variable at a statistically significant level of (0.05).

3. Testing Equation Three: The researcher adopts the stepwise method for the regression test using SPSS V.26 program to investigate equation three and the analysis revealed seven models for impact analysis only that are shown in the table (3.31):

- The first Model:** Based on the (t) value (19.561) of this model, which was greater than the critical value (1.646) with a degree of freedom (1652), it was discovered that there is one variable that affects the diversification portfolio, represented by the bitcoin variable, while the gold, S&P, oil, dollar, ripple, and ethereum variables were excluded from this model. Additionally, the calculated value of significance (0.000) confirms that, which was lower than the study's default level of significance (0.05). Based on the explanatory coefficient (R²) (0.402), we can conclude that changes in the bitcoin variable explain the changes that occur in the diversification portfolio with a percentage of (40.2%), and that the remaining percentage (59.8%) is due to other variables of traditional and digital financial

tools together or to other factors that were not included in the third regression equation. Due to the high returns and low risks associated with bitcoin, we can conclude that it is one of the best traditional and digital financial tools together in which to place one's investments.

- ***The Second Model:*** The results of this model shows that the entering of the gold variable alongside the bitcoin variable in the third regression equation, which indicates that the S&P, oil, dollar, ripple, and ethereum variables comes with an effective value in the diversification portfolio less than the impact value of bitcoin and gold that the two variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin and gold variables (15.019), (10.124) respectively which were greater than its critical value (1.646) with a degree of freedom (1651), also it was found that the explanatory value of this model (R^2) was equal to (0.425), which means that the bitcoin and gold variables explain the percentage (42.5%) of the change that occurs in the diversification portfolio variable, so that the remaining percentage (57.5%) is due to the variables of other traditional and digital tools or other factors not included in the third regression equation. As a result, we believe that investing in bitcoin and gold together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variable of S&P, oil, dollar, ripple, and ethereum.
- ***The Third Model:*** The results of this model show that the entering of the S&P variable alongside the bitcoin and gold variables in the third regression equation, which indicates that the S&P variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin and gold together. The three variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, gold, and S&P variables (16.409), (11.815), (6.215) respectively which were greater than its critical value (1.646) with a degree of freedom (1650), also it was found that the explanatory value of this model (R^2) was equal to (0.494), which means that the bitcoin, gold, and S&P variables explain the percentage (49.4%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (50.6%) is due to the variables of other factors not included in the third regression equation. As a

result, we believe that investing in bitcoin, gold, and S&P together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variable of oil, dollar, ripple, and ethereum.

- **The Fourth Model:** The results of this model show that the entering of the ethereum variable alongside the bitcoin, gold and s&p variables in the third regression equation, which indicates that the ethereum variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin, gold and S&P together. The four variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, gold, S&P, and ethereum variables (12.921), (7.113), (9.716), (8.806) respectively which were greater than its critical value (1.646) with a degree of freedom (1649), also it was found that the explanatory value of this model (R^2) was equal to (0.540), which means that the bitcoin, gold, S&P, and ethereum variables explain the percentage (54%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (46%) is due to the variables of other factors not included in the third regression equation. As a result, we believe that investing in bitcoin, gold, S&P, and ethereum together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variables of oil, dollar, and ripple.
- **The Fifth Model:** The results of this model show that the entering of the dollar variable alongside the bitcoin, gold, S&P, and ethereum variables in the third regression equation, which indicates that the dollar variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin, gold, S&P, and ethereum together. The five variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, gold, S&P, ethereum, and dollar variables (13.112), (5.565), (5.980), (8.885), (2.213) respectively which were greater than its critical value (1.646) with a degree of freedom (1649), also it was found that the explanatory value of this model (R^2) was equal to (0.543), which means that the bitcoin, gold, s&p, ethereum, and dollar variables explain the percentage (54.3%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (45.7%) is due to the variables of other factors not included in the third regression

equation. As a result, we believe that investing in bitcoin, gold, S&P, ethereum and dollar together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variables of oil and ripple.

- **The Sixth Model:** The results of this model show that the entering of the ethereum variable alongside the bitcoin, gold, S&P, ripple, and dollar variables in the third regression equation, which indicates that the ethereum variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin, gold, S&P, ripple, and dollar together. The six variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, gold, S&P, ripple, dollar, and ethereum variables (12.599), (5.648), (1.861), (9.253), (2.609), (2.605) respectively which were greater than its critical value (1.646) with a degree of freedom (1647), also it was found that the explanatory value of this model (R^2) was equal to (0.706), which means that the bitcoin, gold, S&P, ripple, dollar and ethereum variables explain the percentage (70.6%) of the change that occurs in the diversification portfolio variable, so that remaining percentage (29.4%) is due to the variables of other factors not included in the third regression equation. As a result, we believe that investing in bitcoin, gold, S&P, ripple, dollar and ethereum together will yield and improve the diversification portfolio's returns while lowering its risk. This model excludes the variables of oil only.
- **The Seventh Model:** The results of this model show that the entering of the oil variable alongside the bitcoin, gold, S&P, ripple, dollar, and ethereum variables in the third regression equation, which indicates that the oil variable comes with an effective value in the diversification portfolio less than the impact value of bitcoin, gold, S&P, ripple, dollar, and ethereum together. The seven variables together have a significant effect on the diversification portfolio based on the (t) estimated values for bitcoin, gold, S&P, ripple, dollar, ethereum and oil variables (12.546), (5.533), (9.445), (3.644), (6.428), (2.605), (1.905) respectively which were greater than its critical value (1.646) with a degree of freedom (1646), also it was found that the explanatory value of this model (R^2) was equal to (0.787), which means that the bitcoin, gold, S&P, ripple, dollar, ethereum and oil variables explain the percentage (78.7%) of the change that occurs in the diversification

portfolio variable, so that remaining percentage (21.3%) is due to the variables of other factors not included in the third regression equation. As a result, we believe that investing in bitcoin, gold, S&P, ripple, dollar, ethereum and oil together will yield and improve the diversification portfolio's returns while lowering its risk. This model didn't exclude any variables.

Table 3.31. Regression Test for the Equation Three

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			

From the previous discussion of the results of the analysis of the third regression equation, the seventh hypothesis for the study is accepted, which states 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).

4. Testing Equation Four: The researcher adopts the stepwise method for the regression test using SPSS V.26 program to investigate equation four and the analysis revealed two models for impact analysis only that are shown in the table (3.32):

- The first Model:*** Based on the (t) value (10.010) of this model, which was greater than the critical value (1.646) with a degree of freedom (1652), it was discovered that there is one variable that affects the diversification portfolio, represented by the digital tools variable, while the traditional tools variable was excluded from this model. Additionally, the calculated value of significance (0.000) confirms that, which was lower than the study's default level of significance (0.05). Based on the explanatory coefficient (R^2) (0.593), we can conclude that changes in the digital tools variable explain the changes that occur in the diversification portfolio with a percentage of (59.3%), and that the remaining percentage (41.7%) is due to traditional tools or to other factors that were not included in the fourth regression equation. Due to the high returns and low risks associated with digital tools, we can conclude that it is one of the best digital financial tools in which to place one's investments.
- The Second Model:*** The results of this model shows that the entering of the traditional variable alongside the digital variable in the fourth regression equation, which indicates that the traditional variable comes with an effective value in the diversification portfolio less than the impact value of digital variable, those variables together have a significant effect on the diversification portfolio based on the (t) estimated values for digital and traditional variables (7.010), (6.821) respectively which were greater than its critical value (1.646) with a degree of freedom (1651), also it was found that the explanatory value of this model (R^2) was equal to (0.803), which means that the traditional and digital tools variables explain the percentage (80.3%) of the change that occurs in the diversification portfolio variable, so that the remaining percentage (19.7%) is due to the variables other factors not included in the fourth regression equation. As a result, we believe

that investing in digital and traditional financial tools together will yield and improve the diversification portfolio's returns while lowering its risk.

Table 3.32. Regression Test for the Equation Four

Models	Dependent Variables	B ₀	B ₁	R ²	Estimated t value	Critical t value	Degree of Freedom	P-vale
First	Digital	2.864	0.049	0.593	10.010	1.646	1652	0.000
Second	Digital	2.002	0.027	0.803	7.010	1.646	1651	0.000
	Traditional		0.101		6.821			0.000
Significant Value ≤ 0.05					N = 1655			

From the previous discussion of the results of the analysis of the fourth regression equation, the eighth hypothesis for the study is accepted, which states that there is an impact of traditional and digital financial tools variable both together in the diversification portfolio at statistically significant level of (0.05).

5. Testing Equation Five: The researcher adopts the enter method for the regression test using SPSS V.26 program to investigate equation five and the analysis revealed the following results as shown in the table (3.33):

1. Based on the (F) value (49.167) for this analysis, which was greater than the critical value (3.847) with a degree of freedom (1, 1652), it was discovered that there is an impact for the variable of traditional and digital both together in the diversification portfolio variable on the macro level of the study. Additionally, the calculated value of significance (0.000) confirms that, which was lower than the study's default level of significance (0.05).

2. As the explanatory coefficient (R²) reached (0.721), we can conclude that changes in the traditional and digital tools as an independent variable explain the changes that occur in the diversification portfolio as dependent variable with a percentage of (72.1%), and that the remaining percentage (27.9%) is due to other factors that were not included in the fourth regression equation. Due to the high returns and low risks associated with digital tools, we can conclude that it is one of the best digital financial tools in which to place one's investments.

Table 3.33. Regression Test for the Equation Five

Dependent Variables	B ₀	B ₁	R ²	Estimated F value	Critical F value	Degree of Freedom	P-value
TRA & DIG	1.528	0.003	0.721	49.167	3.847	1, 1652	0.000
Significant Value ≤ 0.05				N = 1655			

From the previous discussion of the fifth regression equation, the eighth hypothesis for the study is accepted, which states that there is an impact of traditional and digital financial tools variable both together in the diversification portfolio at statistically significant level of (0.05).

3.5.2.3. Analysis Of Variance

The one-way analysis of variance (ANOVA) is used to check if the means of two or more independent variables differ statistically or not. It's also vital to remember that the one-way ANOVA is an omnibus test statistic that can't tell you which specific variables were statistically significantly different from each other; it can only say that at least two of them were equal. To overcome this obstacle a Post-Hoc test can be used to fix this problem. So, to test the hypotheses of variance for our study we deploy this test as the following paragraphs:

3.5.2.3.1. Testing Hypothesis nine:

To test the variance between the traditional portfolio tools, the results mentioned in the table (3.34) disclosed the following:

1. It is noticed that there is a variance between the tools of the traditional portfolio, which means that there are differences between those variables regarding the returns and risks of this portfolio, this conclusion rely on the estimated values of (F) for the gold, oil, S&P, and dollar variables which were equal to (1951.234), (921.921), (3343.156), (121.333) respectively, which is greater than its critical value (2.104) with a degrees of freedom (3, 1650), and these results are confirmed with the calculated significant values (0.000), (0.000), (0.000), (0.000) respectively, which were less than the hypothetical level of significance (0.05).

Table 3.34. The Variance between the Traditional Portfolio Variables

Traditional Variables	Estimated F Value	Critical F Value	Degree of Freedom	P-Value
Gold	1951.234	2.104	3, 1650	0.000
Oil	921.921			0.000
S & P	3343.156			0.000
Dollar	121.333			0.000

In order to identify the variable or variables that were the cause of this variance, the Post-Hoc tests were used according to the Least Significant Differences method (LSD), and the results for this analysis are mentioned in the table (3.35), which assure the following:

1. The gold variable represents the first source of the differences in the return and risk of the traditional portfolio, this conclusion depends on the Post-Hoc test and the value of (LSD) for this variable that is equal to (0.000) which is less than the values other variables for this test.
2. The S&P and dollar variables represent the second and the third sources of the differences in the return and risk of the traditional portfolio, this conclusion depends on the Post-Hoc test and the value of (LSD) for these variables that equal to (0.006), (0.022) which are less than the values other variables for this test.
3. The oil variable did not represent any source of differences according to the results of the Post-Hoc test, where the value of (LSD) was equal to (0.116), which is greater than the value of the hypothetical level of significance (0.05). This indicates that the oil variable does not represent or contribute to making any differences in the traditional portfolio.

Table 3.35. The Post-Hoc Test for the Traditional Variables

Variables	Gold	Oil	S & P	Dollar
LSD	0.000*	0.116	0.006*	0.022*
* The mean difference is significant at the 0.05 level				

From the previous discussion of the variance test, the ninth hypothesis for the study is rejected, which states that (the returns and risks of a traditional financial portfolio vary with the differences of its tool or variables at a statistically significant level of 0.05). So, we must accept the alternative hypothesis that refer to (the returns and risks of a traditional financial portfolio vary with the differences of its some tool or variables at a statistically significant level of 0.05).

3.5.2.3.2. Testing Hypothesis Ten

To test the variance between the digital portfolio variables or tools, the results mentioned in the table (3.36) disclosed the following:

1. It is noticed that there is a variance between the tools of the digital portfolio, which means that there are differences between those variables regarding the returns and risks of this portfolio, this conclusion rely on the estimated values of (F) for the bitcoin, ripple, and ethereum variables which were equal to (2385.413), (490.612), (1591.343) respectively, which is greater than its critical value (3.001) with a degrees of freedom (2, 1651), and these results are confirmed with the calculated significant values (0.000), (0.000), (0.000) respectively, which were less than the hypothetical level of significance (0.05).

Table 3.36. The Variance between the Digital Portfolio Variables

Digital Variables	Estimated F Value	Critical F Value	Degree of Freedom	P-Value
Bitcoin	2385.413	3.001	2, 1651	0.000
Ripple	490.612			0.000
Ethereum	1591.343			0.000

In order to identify the variable or variables that were the cause of this variance, the Post-Hoc tests were used according to the Least Significant Differences method (LSD), and the results for this analysis are mentioned in the table (3.37), which assure the following:

1. The bitcoin variable represents the first source of the differences in the return and risk of the digital portfolio, this conclusion depends on the Post-Hoc test and the value of

(LSD) for this variable that is equal to (0.000) which is less than the values other variables for this test.

2. The ethereum and ripple variables represent the second and the third sources of the differences in the return and risk of the digital portfolio, this conclusion depends on the Post-Hoc test and the value of (LSD) for these variables that equal to (0.006), (0.030).

Table 3.37. The Post-Hoc Test for the Digital Variables

Variables	Bitcoin	Ripple	Ethereum
LSD	0.000*	0.030*	0.006*
* The mean difference is significant at the 0.05 level			

From the previous discussion of the variance test, the tenth hypothesis for the study is accepted, which states that (The returns and risks of a digital financial portfolio vary with the differences of its tool or variables at a statistically significant level of 0.05).

3.5.2.3.3. Testing Hypothesis Eleven:

To test the variance between the diversification portfolio variables or tools, the results mentioned in the table (3.38) disclosed the following:

1. It is noticed that there is a variance between the variables or tools of the diversification portfolio, which means that there are differences between those variables regarding the returns and risks of this portfolio, this conclusion rely on the estimated values of (F) for the gold, oil, s&p, dollar, bitcoin, ripple, and ethereum variables which were equal to (626.144), (843.349), (207.967), (718.274), (379.064), (326.223), (546.665) respectively, which is greater than its critical value (2.104) with a degrees of freedom (6, 1647), and these results are confirmed with the calculated significant values (0.000), (0.000), (0.000), (0.000), (0.000), (0.000) respectively, which were less than the hypothetical level of significance (0.05).

Table 3.38. The Variance between the Diversification Portfolio Variables

Digital Variables	Estimated F Value	Critical F Value	Degree of Freedom	P-Value
Gold	626.144	2.104	6, 1647	0.000
Oil	843.349			0.000
S & P	207.967			0.000
Dollar	718.274			0.000
Bitcoin	379.064			0.000
Ripple	326.223			0.000
Ethereum	546.665			0.000

In order to identify the variable or variables that were the cause of this variance, the Post-Hoc tests were used according to the Least Significant Differences method (LSD), and the results for this analysis are mentioned in the table (3.39), which assure the following:

1. The bitcoin variable represents the first source of the differences in the return and risk of the diversification portfolio, this conclusion depends on the Post-Hoc test and the value of (LSD) for this variable that is equal to (0.000) which is less than the values other variables for this test.
2. The gold, S&P, ethereum, dollar, ripple, and oil variables represent the second to the seventh sources of the differences in the return and risk of the diversification portfolio, this conclusion depends on the Post-Hoc test and the value of (LSD) for these variables that equal to (0.001), (0.007), (0.014), (0.033), (0.043), (0.047).

Table 3.39. The Post-Hoc Test for the Diversification Portfolio Variables

Variables	LSD
Gold	.001*
Oil	.047*
S & P	.007*
Dollar	.033*
Bitcoin	.000*
Ripple	.043*
Ethereum	.014*
* The mean difference is significant at the 0.05 level	

From the previous discussion of the variance test, the eleventh hypothesis for the study is accepted, which states that (The returns and risks of a diversification portfolio vary with the differences of its tool or variables at a statistically significant level of 0.05).



CONCLUSIONS AND SUGGESTIONS

In this section, we review the conclusions of the study and the suggestions that address with the weaknesses in the relations between the variables of the study and to enhance the strength aspect between those variables, according to the following paragraphs:

CONCLUSIONS

1. The high levels of gold performance during the study period prove that it is one of the investment tools that enjoy high confidence among investors as it is a safe haven for their investments as a traditional tool for trading off.
2. The high levels of bitcoin performance during the study period prove that it is one of the investment tools that enjoy high confidence among investors as it is a safe haven for their investments as a digital tool for trading off.
3. As the gold and bitcoin have a best performance between the traditional and digital tools we expect that their prices may continue to rise in the future, although the history shows that it is not possible to anticipate the periods during which its decline can be determined.
4. It was found that the best performance of the diversification portfolio in terms of achieving the highest returns and reducing the risks of investing in both traditional and digital tools is achieved through diversification between these tools and by relying on the tools of bitcoin, gold, S&P stock and ethereum because of their high weight according to their results of the Sharpe test.
5. It appeared that the most volatile traditional tools during the study period were the oil prices, which witnessed a wide fluctuation in their price ranges, this indicates the high risks resulting from investing in this tool.
6. We conclude that the most volatile digital tools during the study period were the ripple prices, which witnessed a wide fluctuation in their price ranges, this indicates the high risks resulting from investing in this tool.
7. It was found that the general trend of the dollar prices movement as a traditional financial tool was gradually declining during the study period, which gives an impression

on the high fluctuation in profitability levels and the risks associated with trading with this tool.

8. It can be concluded that ethereum is among the best digital currencies that come after the bitcoin digital currency in terms of performance, which has proven its worth and strength in the virtual markets, through the gradual rise in its prices.

9. The investment in the digital tools portfolio came at higher levels than the returns achieved from investing in the traditional tools, and in light of the high Sharpe ratio index for the digital portfolio, which amounted to (0.832) with a daily return amounted to (8.3%), while the same percentage was for the portfolio of traditional financial tools is equal to (0.719), with daily returns of (0.06%).

10. The optimal investment composition for the diversification portfolio is to consist the percentage of Oil (4%), Gold (21%), S&P stock (18%), Dollar (9%), Bitcoin (34%), Ripple (3%), and Ethereum (11%).

11. The optimal return for the portfolio and for this combination of traditional and digital tools will be according to the Sharpe ratio equal to (0.897), This indicates the optimal case for investment returns in the portfolio, but it is not necessarily the best case for risk.

12. It is noted that the time series of data for all the study variables were not stable at the level, whether in the presence of the intercept or in the presence of the trend and intercept together, which indicates that these series include random changes, but after conducting the unit root test by the Augmented Dickey Fuller criterion, its stationarity was found at the first difference and in the presence of the intercept.

13. Depending on the autocorrelation analysis, it was found that there is no autocorrelation between the independent variables in the current study model, based on the results of the residual test according to Breusch - Godfrey criterion.

14. From the results of the normal distribution analysis of the data for the study variables, it can be concluded that we can be applying the parametric tests as they are more accurate and reliable than nonparametric tests.

15. It was found that the time series data for the study variables passed the normal distribution test, according to the Jarque-Bera criterion, which means that the second condition of the parametric tests is available in the study data.

16. From the trace test and maximum eigenvalue test for Johansen cointegration results, we can conclude that the variables of this study are cointegrated or have a long-run association, which means they move together in the long run.

17. The correlation test prove that there is a positive correlation between traditional variables represented by gold, oil, S&P stock, and dollar with the performance of diversification portfolio.

18. The correlation test prove that there is a positive correlation between digital variables represented by bitcoin, ethereum, and ripple with the performance of diversification portfolio.

20. There is an impact of gold, S&P, and dollar variables of the traditional financial tools in the diversification portfolio variable, while there is no impact for the oil variable in the diversification portfolio variable.

21. There is an impact of bitcoin, ethereum, and ripple variables of the digital financial tools in the diversification portfolio variable.

22. The gold and the bitcoin variables represent the optimal sources of the differences in the return and risk of the diversification portfolio, so, this means that they yield some high returns with the lower risk from other financial tools in this study.

SUGGESTIONS

1. We suggest that the best diversification portfolio that can be build up to achieve the highest returns and reduce investment risks consists of traditional tools represented by gold and the S&P stock, combine with the digital tools represented by bitcoin and ethereum together.

2. When forming diversified portfolios, the weights of financial tools represented by oil, the dollar, and ripple should be avoided or reduced, because they are characterized by poor performance, in addition to the sharp fluctuations in their prices.

3. We see that the best financial tool that can be traded in the financial markets is the digital bitcoin currency, which has proven its worth in performance, and it may be the currency on which it is based in digital monetary dealings in the future as an alternative to global cash currencies.
4. Based on historical extrapolation of the data from the present study for this ripple digital currency, the researcher advises against investing in this currency because its prices are unlikely to rise in the near future.
5. We suggest that both oil and ripple instruments be dealt wisely when including them together in the components of any investment portfolio adopted by the investors.
6. The need for there to be control and oversight by central banks and global regulators on investing in virtual currencies in order to avoid financing terrorism.
7. The governments must work to tighten their control over the websites that deal in cryptocurrencies, due to the high risks of dealing with them, and try to ban those sites that do not comply with the regulatory instructions, whether from the government or from the competent international organizations.
8. The continuation of cryptocurrencies operating in virtual markets without controls will encourage higher levels of money laundering, so it is necessary to tighten the regulations that reduce penetration of those markets.
9. The necessity for investors and portfolio managers to concentrate on laying the proper foundations and regulations for balancing and investing in cryptocurrency and traditional financial assets.
10. Commercial banks should include cryptocurrencies in their investment portfolios, particularly ones that have demonstrated their market presence, because the returns they generate can boost the banks' status and competitiveness, which in turn boosts client confidence in those currencies.
11. The importance of academic institutions around the world adopting research approaches to address the issue of cryptocurrencies and related challenges in their circulation in order to generate future visions for a better understanding of digital currencies.

12. The ability and efficiency of investors in creating a balance between the traditional tools and between the risks of investing in digital tools is related to mitigating the price rate risks of digital tools.

13. The need to evaluate the quality of the performance of both traditional financial tools and digital financial tools before forming and building a diversification portfolio in order to mitigate the risks of investing in it.

14. As a future studies the researcher suggests the following scientific title:

- Explore the market efficiency impact on the returns and risks of the cryptocurrency.
- Using financial derivatives to hedge against the losses in trading virtual currencies.
- The impact of employing the surplus of bank liquidity in the digital currencies on the profitability of the commercial banks.
- Diversification effect on the mitigating the levels of the financial contagion of the financial and economic crises.
- Building a model for the differentiation between investing in a number of virtual currencies.

REFERENCE

- Adavelli ,Sagar Reddy., and Rathipelli, Raju., (2014). Return and Risk Analysis, Asia Pacific Journal of Applied Finance, Vol. 3, No. 5,
- Addin, M. M., Nayebzadeh, S., & Yosefi, Z. (2013). Measuring the Financial Literacy of Real Investors of the Iran StockExchange and the Relationship of Financial Literacy with the Portfolio Diversification and their Investment Decisions. Life Science Journal, 10(2), 925-933.
- Adrianto, Y., & Diputra, Y. (2017). The Effect of Cryptocurrency on Investment Portofolio Effectiveness. Journal of Finance and Accounting, 5(6), 229–238.
- Aljohani, A. (2017). Bitcoin: Technology, Economics and Business Ethics (Doctoral dissertation, Université d'Ottawa/University of Ottawa).
- Anas, A. Q., & Laham, M. (2013). The Effect of Financial Leverage & Systematic Risk on Stock Returns in the Amman Stock Exchange (Analytical Study–Industrial Sector). Exchange, 4(6).
- Antonopoulos, A. M. (2017). *Mastering Bitcoin: Programming the open blockchain*. " O'Reilly Media, Inc."
- Aroni, J., Namusonge, G., & Sakwa, M. (2014). Influence of dividend payout on investment in shares-A Survey of Retail Investors in Kenya. International Journal of Business and Social Science, 5(5).
- Atack, J., & Neal, L. (2009). *The origins and development of financial markets and institutions*. Cambridge University Press.
- Aw, E. N., Jiang, J. Q., Sivin, G. Y., & Soe, A. M. (2018). Oasis or Mirage: Assessing Low-Risk Investing from a Global Perspective. The Journal of Investing, 27(2), 90-104.
- Azar, J. (2017). Portfolio diversification, market power, and the theory of the firm. Market Power, and the Theory of the Firm.
- Bakry, W., Rashid, A., Al-Mohamad, S., & El-Kanj, N. (2021). Bitcoin and portfolio diversification: A portfolio optimization approach. *Journal of Risk and Financial Management*, 14(7), 282.
- Bärsch, S. E. (2012). *Taxation of hybrid financial instruments and the remuneration derived therefrom in an international and cross-border context: issues and options for reform*. Springer Science & Business Media.
- Bauen, M. (2007). *Swiss company limited by shares: company law, merger law, stock exchange law, tax law*. Bruylant.
- Baumöhl, E., & Shahzad, S. J. H. (2019). Quantile coherency networks of international stock markets. Finance Research Letters, 31, 119-129.

- Baz, J., Davis, J., Sapra, J., Tsai, J., & Gillmann, N. (2019). A Theoretical Framework for Equity-Defensive Strategies. *PIMCO Quantitative Research*.
- Beck, R., Avital, M., Rossi, M., & Thatcher, J. B. (2017). Blockchain technology in business and information systems research. *Business & Information Systems Engineering*, 59(6), 381–384.
- Bergin, P. R., & Pyun, J. H. (2016). International portfolio diversification and multilateral effects of correlations. *Journal of International Money and Finance*, 62, 52-71.
- Berk, J., DeMarzo, P., Harford, J., Ford, G., & Mollica, V. (2018). *Fundamentals of corporate finance*. 4th Ed., Prentice Hall
- Bhargava, R., Gallo, J. G., & Swanson, P. E. (2001). The performance, asset allocation, and investment style of international equity managers. *Review of Quantitative Finance and Accounting*, 17(4), 377-395.
- Bholane, K. P. (2021). Pros and Cons of Cryptocurrency: A Brief Overview. *National Journal of Research in Marketing, Finance & HRM*, 6(3), 71-78.
- Block, Stanley B. And Hirt, Geoffrey A., (2005), *foundations of financial management*, 11th edition, Statndard & Poor's and McGraw-Hill Irwin.
- Boiko, Viktor, Yelizaveta Tymoshenko, Anna Kononenko, and Dmitrii Goncharov. 2021. The optimization of the cryptocurrency portfolio in view of the risks. *Journal of Management Information and Decision Sciences* 24: 1–9.
- Bouri, E., Jalkh, N., Molnár, P., & Roubaud, D. (2017). Bitcoin for energy commodities before and after the December 2013 crash: diversifier, hedge or safe haven?. *Applied Economics*, 49(50), 5063-5073.
- Brauneis, A., & Mestel, R. (2018). Price Discovery of Cryptocurrencies: Bitcoin and Beyond *Economic Letters*, 165, 58–61.
- Brealey, Richard, Myers, Stewar & Allen, Franklin. (2010). *Principles of Corporate Finance*, 10th Ed., McGraw-Hill Education.
- Bremo, J. (2016). International portfolio diversification: analyzing efficient portfolios with various risk measures from a Dutch perspective.
- Brigham, E. F., & Ehrhardt, M. C. (2019). *Financial Management: Theory & Practice*. Cengage Learning.
- Brigham, E. F., & Houston, J. F. (2006). *Fundamentals of Financial Management. Instructor*.
- Brown, R., & Lee, N. (2018). The theory and practice of financial instruments for small and medium-sized enterprises. In *EC-OECD Seminar Series on Designing better economic development policies for regions and cities*. Paris: Organisation for Economic Co-operation and Development (OECD).

Buongiorno, J., Zhou, M., & Johnston, C. (2017). Risk aversion and risk seeking in multicriteria forest management: a Markov decision process approach. *Canadian Journal of Forest Research*, 47(6), 800-807.

C. Paramasivan and T. Subramanian, *Financial Management*, 2009, New age international (P) Limited, Publishers, Publishing for one world.

Carrick, J. (2016). Bitcoin as a Complement to Emerging Market Currencies. *Emerging Markets Finance & Trade*, 52(10), 2321–2334.

Cecchetti, Stephen, Schoenholtz, Kermit. (2014), *Money, Banking and Financial Markets*. 4th Ed., McGraw-Hill/Irwin.

CFA Montreal., (2016). *INVESTMENT PRINCIPLES - Information Sheet for CFA Professionals*.

Chambers, N., Sezgin, F. H., & Karaaslan, B. (2013). An analysis of the effects of capital structure and the beta coefficient on stock returns: A case study of the Istanbul Stock Exchange (ISE)-Manufacturing Industry. *International Journal of Business and Social Science*, 4(7).

Chaum, D. L. (1981). Untraceable electronic mail, return addresses, and digital pseudonyms. *Communications of the ACM*, 24(2), 84-90.

Chkir, I. E., & Cosset, J. C. (2001). Diversification strategy and capital structure of multinational corporations. *Journal of Multinational Financial Management*, 11(1), 17-37.

Choudhry, M. (2006). *Bonds: a concise guide for investors*. Springer.

Chui, M. (2012). Derivatives markets, products and participants: an overview. *Ifc Bulletin*, 35, 3-12.

Clare, A., & Thomas, S. (2015). Financial market indices: Facilitating innovations, monitoring markets. *The Journal of Finance Journal of Finance XIX*, 7(4), 77-91.

Corbet, S., Meegan, A., Larkin, C., Lucey, B., & Yarovaya, L. (2018). Exploring the dynamic relationships between cryptocurrencies and other financial assets. *Economics Letters*, 165, 28-34.

D. A. H. Abdulaziz., (2018). Diversification and its effect on Investment Portfolio's Performance in Palestine. *Al-Najah National University, Faculty of Graduate studies*.

Dave Reymond. (2020). *Stock Market Investing for Beginners: 6 Books in 1: Best Strategies and Tactics for Building Income by Trading Stocks, Bonds, Options, Forex, Cryptocurrencies, and more*. Charlie Creative Lab Ltd.

De Vries, M. M. G. (1987). *Balance of payments adjustment, 1945 to 1986: The IMF experience*. International Monetary Fund.

Draho,J. Falconio, L., Sutedja, R., Waring, J. (2018). *Yield-Focused Portfolios: Efficiently Generating Income and Returns*. UBS Financial Services Inc.

- Drake, P. P., & Fabozzi, F. J. (2010). *The basics of finance: An introduction to financial markets, business finance, and portfolio management* (Vol. 192). John Wiley & Sons.
- Droms, W. G. (1987). Investment asset allocation for PFP clients. *Journal of Accountancy*, 163, p. 114–118.
- Dyhrberg, A. H., Foley, S., & Svec, J. (2018). How investible is Bitcoin? Analyzing the liquidity and transaction costs of Bitcoin markets. *Economics Letters*, 171, 140-143.
- Eisl, A., Gasser, S. M., & Weinmayer, K. (2015). Caveat emptor: Does Bitcoin improve portfolio diversification? Available at SSRN 2408997.
- Elyasiani, E., & Jia, J. (2011). Performance persistence of closed-end funds. *Review of Quantitative Finance and Accounting*, 37(3), 381-408.
- Ertz, M., & Boily, É. (2019). The rise of the digital economy: Thoughts on blockchain technology and cryptocurrencies for the collaborative economy. *International Journal of Innovation Studies*, 3(4), 84-93.
- Gatfaoui, H. (2009). Sharpe ratios and their fundamental components: An empirical study. Available at SSRN 1486073.
- Ghilal, A., & Nach, H. (2019). La technologie de la chaîne de blocs: Fondements et applications. In M. Ertz, D. Hallegatte, & J. Bousquet (Eds.), *La reconfiguration de l'échange marchand. Tour d'horizon, enjeux et perspectives* (p 113-131).
- Gitman, L. J., Juchau, R., & Flanagan, J. (2015). *Principles of managerial finance*. Pearson Higher Education AU.
- Giudici, G., Milne, A., & Vinogradov, D. (2020). Cryptocurrencies: market analysis and perspectives. *Journal of Industrial and Business Economics*, 47, 1-18.
- Chu, Q. C., & Kayali, M. M. (2006). Standard & Poor's Depositary Receipts and the Market Quality of S&P 500 Index Futures. *Applied Econometrics and International Development*, 6(3).
- Giulia Lori, (2008) *financial derivatives*.
- Goudarzi, S., Jafari, M. J., & Afsar, A. (2017). A hybrid model for portfolio optimization based on stock clustering and different investment strategies. *International Journal of Economics and Financial Issues*, 7(3), 602-608.
- Guesmi, K., Saadi, S., Abid, I., & Ftiti, Z. (2019). Portfolio diversification with virtual currency: Evidence from bitcoin. *International Review of Financial Analysis*, 63, 431-437.
- Günay ,Samet. (2014). Total Risk Composition, *Journal of Emerging Issues in Economics, Finance and Banking (JEIEFB)*, vol.3, No.4.
- Gupte, R., Venkataramani, B., & Gupta, D. (2012). Computation of financial inclusion index for India. *Procedia-Social and Behavioral Sciences*, 37, 133-149.

Gurrib, I., & Alshahrani, S. (2012). Diversification in portfolio risk management: The case of the UAE financial market. *International Journal of Trade, Economics and Finance*, 3(6).

H., A., H., Alfayyadh AL-Ganimy. (2015). The Effect of earnings retention on common stock returns: An applied Study in the Iraq Stock Exchange. College of Administration & Economics at University of Karbala.

Hamzaee, R. G., & Hughs, B. (2006). Modern Banking And Strategic Portfolio Management. *Journal of Business & Economics Research (JBER)*, 4(11).

Haneef, S., Riaz, T., Ramzan, M., Rana, M. A., Ishaq, H. M., & Karim, Y. (2012). Impact of risk management on non-performing loans and profitability of banking sector of Pakistan. *International Journal of Business and Social Science*, 3(7), 307-315.

Härdle, W. K., Harvey, C. R., & Reule, R. C. (2020). Understanding cryptocurrencies. *Journal of Financial Econometrics*, 18(2), 181-208.

Harwood, A. (2002, March). Building corporate bond markets in emerging market countries. In *presentation to OECD/World Bank workshop on bond markets, March*.

Ho, L.-C., Cadle, J., & Theobald, M. (2011). An analysis of risk-based asset allocation and portfolio insurance strategies. *Review of Quantitative Finance and Accounting*, 36(2), 247-267.

Houben, R., & Snyers, A. (2018). Cryptocurrencies and blockchain: Legal context and implications for financial crime, money laundering and tax evasion. European Parliament study. PE 619.024.

Huberman, Gur (2005): Arbitrage pricing theory, Staff Report, No. 216, Federal Reserve Bank of New York, New York, NY

Investment industry association of Canada. (2008). *BONDS: AN INTRODUCTION TO BOND BASICS*.

Jacobs, B. I., & Levy, K. N. (1996), Residual risk: how much is too much? *Journal of Portfolio Management*, 22, p. 10–16.

Jones, C. P. (1996). *Investment Analysis and Management*, Ed.

Jordan, Bradford D., Miller, Thomas W., (2009). *Fundamentals of Hill/Irwin. Investments: Valuation and Management*, 5th Ed., McGraw Hill/Irwin.

Jordan, Bradford D., Miller, Thomas W., (2009). *Fundamentals of Hill/Irwin. Investments: Valuation and Management*, 5th Ed., McGraw Hill/Irwin.

Judmayer, A., Stifter, N., Krombholz, K., & Weippl, E. (2017). Blocks and chains: introduction to bitcoin, cryptocurrencies, and their consensus mechanisms. *Synthesis Lectures on Information Security, Privacy, & Trust*, 9(1), 1-123. Rosati, P., & Čuk, T. (2019). Blockchain beyond cryptocurrencies. *Disrupting finance*, 149.

- Kajtazi, A., & Moro, A. (2019). The role of bitcoin in well diversified portfolios: A comparative global study. *International Review of Financial Analysis*, 61, 143-157.
- Kamwaro, E. K. (2013). The impact of investment portfolio choice on financial performance of investment companies in Kenya (Doctoral dissertation, University of Nairobi).
- Kapoor, N. (2014). Financial portfolio management: Overview and decision making in investment process. *International Journal of Research (IJR)*, 1(10), 1362-1369
- Karmazin, V. A., & Bondar, A. O. (2013). The advantages and disadvantages of financing with preferred and common stock. *Економічний вісник Національного технічного університету України "Київський політехнічний інститут"*, (10), 241-244.
- Katsiampa, P. (2017). Volatility estimation for Bitcoin: A comparison of GARCH models. *Economics letters*, 158, 3-6.
- Kirk, R. (2008). *IFRS: a quick reference guide*. Elsevier.
- Konovalova, M. Y., Kuzmina, O. Y., Mikhaylov, A. M., Levchenko, L. V., & Salomatina, S. Y. (2019). The Management of Investment Portfolios. *TEM Journal*, 8(3), 928.
- Labatt, S., & White, R. R. (2002). *Environmental finance: a guide to environmental risk assessment and financial products* (Vol. 98). John Wiley & Sons.
- Latvian branch of Luminor Bank AS. (2019). *Types of financial instruments and their attributes description of risks*.
- Lee, D. (2015). *Handbook of digital currency*. San Diego, USA: Elsevier.
- Leonard, B. (Ed.). (1999). *Risk Management of Financial Derivatives: Comptroller's Handbook*. DIANE Publishing.
- Levišauskait, K. (2010). Investment analysis and portfolio management. *Leonardo da Vinci programme project*, 7.
- Levišauskait, K. (2010). Investment analysis and portfolio management. *Leonardo da Vinci programme project*, 7.
- Liu, J., Cheng, Y., Li, X., & Sriboonchitta, S. (2022). The role of risk forecast and risk tolerance in portfolio management: A case study of the Chinese financial sector. *Axioms*, 11(3), 134.
- Lo, A. W. (2002). The statistics of Sharpe ratios. *Financial analysts journal*, 58(4), 36-52.
- Lu, Y., & Neftci, S. N. (2008). Financial instruments to hedge commodity price risk for developing countries.
- Lyandres, E., Marchica, M. T., Michaely, R., & Mura, R. (2018). Owners' Portfolio Diversification and Firm Investment: Theory and Evidence from Private and Public Firms. *Johnson School Research Paper Series*, (18-2013), 19-12.

- M Ramesh, (2018) lecture notes on financial derivatives. Department of master of business administration institute of aeronautical engineering. (Ramesh,2018:)
- M., O., Mensah. (2022). Speculation and Investment: An Empirical Analysis. University of Port Harcourt Journal of Accounting And Business.
- Ma, Yechi, Ferhana Ahmad, Miao Liu, and Zilong Wang. (2020). Portfolio optimization in the era of digital financialization using cryptocurrencies. *Technological Forecasting and Social Change* 161: 1–11.
- Maese, V. A., Avery, A. W., Naftalis, B. A., Wink, S. P., & Valdez, Y. D. (2016). Cryptocurrency: A primer. *The Banking Law Journal*, 133(8)
- Mangram, M. E. (2013). A simplified perspective of the Markowitz portfolio theory. *Global journal of business research*, 7(1), 59-70.
- Mantha PK, Srinivasa Rao M (2015) Portfolio Management. *J Account Mark* 4: 130.
- Markowitz, H. (1952): "Portfolio Selection," *The Journal of Finance*, 7 (1), 77-91.
- Massol, Y., & Molines, A. (2015). Determinants of risk tolerance and investment behavior: A study of French and Swedish Business School students.)
- Mayo, H. B. (2013). *Investments: An Introduction*. Cengage Learning.
- McLaney, E.J., (2000). "Business Finance: Theory and Practice", 5th.ed., England: Prentice Hall, Inc.
- Megginson, W. (1996). A historical overview of research in finance. *Journal of Finance*, 39(2), 323-346.
- Mehrara, M., Falahati, Z., & Zahiri, N. H. (2014). The Relationship between systematic risk and stock returns in Tehran Stock Exchange using the capital asset pricing model (CAPM). *International Letters of Social and Humanistic Sciences*, 21, 26-35.
- Mishkin, F. S. (2012). *The Economics of Money, Banking and Financial Markets* (The Pearson Series in Economics)
- Moodi, R., & Hajiha, Z. (2013). The Investigation of The Effect of Accruals on Stock Returns after Financing Activities of Listed Companies in Tehran Stock Exchange.
- Moodi, Raziye., and Hajiha, Zohreh., (2013) *The Investigation of the Effect Of Accruals On Stock Returns After Financial Activities*, **International Research Journal of Applied and Basic Sciences**. Vol.4.
- Morck, R., Shleifer, A., Vishny, R. W., Shapiro, M., & Poterba, J. M. (1990). The stock market and investment: is the market a sideshow? *Brookings papers on economic Activity*, 1990(2), 157-215.
- Morningstar Investment Profiles. (2022). Aggressive Profile Portfolio. *City of Los Angeles, Deferred compensation plan*. Morningstar | Empowering Investor Success
- Mosselaar, J. S. (2018). A Concise Financial History of Europe. *Robeco, Rotterdam*.

Muendler, M. A. (2005). Risk Neutral Investors Do Not Acquire Information. Department of Economics, UC San Diego

Mulwa, J. M., & Kosgei, D. (2016). Commercial bank diversification and financial performance: The moderating role of risk. 31-52

Nakamoto, S. (2008). Bitcoin: A peer-to-peer electronic Cash system. Satoshi Nakamoto Institute.

Núñez Ferrer, J., Rinaldi, D., Thomadakis, A., Musmeci, R., Nesbit, M., Paquel, K., ... & Ehrhart, K. (2017). Financial Instruments: defining the rationale for triggering their use. CEPS Special Report, October 2017.

Osewe, L. A. (2020). *Effect of Portfolio Diversification on Financial Performance of Investment Firms Listed at the Nairobi Securities Exchange, Kenya* (Doctoral dissertation, University of Nairobi).

Osewe, L. A. (2020). *Effect of Portfolio Diversification on Financial Performance of Investment Firms Listed at the Nairobi Securities Exchange, Kenya* (Doctoral dissertation, University of Nairobi).

Paduszyńska, M. (2020). The Essence and Significance of Financial Instruments for Enterprises in Poland in 2010-2018. *Finanse i Prawo Finansowe*, 3(27), 109-124.

Parameswaran, S. K. (2022). *Fundamentals of Financial Instruments: An Introduction to Stocks, Bonds, Foreign Exchange, and Derivatives*. John Wiley & Sons.

Phillip, A., Chan, J., & Peiris, S. (2019). On long memory effects in the volatility measure of cryptocurrencies. *Finance Research Letters*, 28, 95-100.

Purkayastha, S., Manolova, T. S., & Edelman, L. F. (2012). Diversification and performance in developed and emerging market contexts: A review of the literature. *International journal of management reviews*, 14(1), 18-38.

Ranjan, P. (2017). Financial derivative: a study material. *University of Calicut, school of distance education*.

Robertson, K. (2001). The Sharpe Ratio. Panel Publishers 401(k) Advisor – Investment CORNER, May 3.

Rosati, P., & Paulsson, V. (2017). Development of accounting information systems over time. In M. Quinn & E. Strauss (Eds.), *The Routledge companion to accounting information systems* (pp. 13–23). Abingdon: Routledge.

Ross, P., Peters, & Milton H., Marquis. (2008). *Money and Capital Markets*, 10th ed, McGraw-Hill, 2008.

Ryan, S. G. (2007). *Financial instruments and institutions: Accounting and disclosure rules*. John Wiley & Sons.

Salimov, Ramin. (2019). Portfolio investment management and risk analysis in electronics stock markets, Bachelor's Thesis, Azerbaijan state economic university.

- Schirripa, F. and Tecotzky, N. D. (2000). An optimal frontier. *The journal of portfolio management*, Summer 2000, Vol. 26, No. 4,. p. 29-40.
- Scholer, A. A., Zou, X., Fujita, K., Stroessner, S. J., & Higgins, E. T. (2010). When risk seeking becomes a motivational necessity. *Journal of personality and social psychology*, 99(2), 215.
- Scholz, H., & Wilkens, M. (2005). An investor-specific performance measurement: A justification of Sharpe ratio and Treynor ratio. *International Journal of Finance*, 17(4), 3671-3691.
- Sharpe, W. (1963). A Simplified Model for Portfolio Analysis. *Management Science*, 9(2), 277–293.
- Sharpe, W. F. (1964). Capital asset prices: A theory of market equilibrium under conditions of risk. *Journal of Finance*, 19(3), 425-442.
- Sharpe, W. F. (1994). The Sharpe Ratio. *The Journal of Portfolio Management*, 21(1), 49-58.
- Simister, J., & Whittle, R. (2013). Ethical investment and portfolio theory: Using factor analysis to select a portfolio.
- Sun, J., Yan, J., & Zhang, K. Z. (2016). Blockchain-based sharing services: What blockchain technology can contribute to smart cities. *Financial Innovation*, 2(1), 2–26.
- Sundaram, R. K. (2012). Derivatives in financial market development. *London: International Growth Centre*, 39.
- Swiss Bankers Association. (2019). *Risks Involved in Trading Financial Instruments*.
- Taivainen, M. (2018). Performance comparison between green and conventional mutual funds: the US Evidence.
- The Committee for Economic Development. (2019). A Report on the Financial Index Industry.
- The USAA Educational Foundation. (2010). *Investing stock and bonds*.
- Tobin, J. (1958). Liquidity preference as behavior toward risk. *Review of Economic Studies*, 65-85.
- Van der Wei, D.(2021). Ethereum investment thesis.
- Van Horne, J. C., & Wachowicz Jr, J. M. (2005). Fundamentals of *Financial Management*.
- Victor.O.A. (2017). Introducing cryptocurrency. *Researchgate*.
- Viney, C., & Phillips, P. (2019). *Financial institutions, instruments and markets*. McGraw-Hill Australia.

Wang, Jinghua, and Geoffrey Ngene. (2020). Does Bitcoin still own the dominant power? An intraday analysis. *International Review of Financial Analysis* 71: 1–12.

Website ([A Basic Understanding of Financial Instruments | Abdulaziz Al Ghannami](#))

White, J. (2016). *Investing in Stocks and Shares: A step-by-step guide to making money on the stock market*. Robinson.

Wu, C. Y., & Pandey, V. K. (2014). The Value of Bitcoin in Enhancing the Efficiency of an Investor's Portfolio. *Journal of Financial Planning*, 27(9), 44–52.

Zaragoza, James., and Mouton ,Jaime . (2013). Capital Asset Pricing Model (Capm) and Stock Returns, *European Journal of Banking and Finance*, Vol.11.

