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Diversification in Times of Crisis: Using Alternative Assets in Portfolio Management During Economic Downturns

Joseph Falzon[1], Owen Camilleri[2], M. Faheem Ullah[3*]

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ABSTRACT

This research determines the effectiveness of adding more assets in enhancing the resiliency of the portfolio and diversification in relation to the conventional 60/40 equity-bond allocation. The emphasis of the portfolio performance during the period when the financial crisis is witnessed is specifically geared towards the establishment of the trade-off between risk avoidance and long-term development. They were developed in four different portfolios, which consist of a classical 60/40 benchmark, a classical balanced allocation, a classical allocation that is highly balanced in the alternative assets, and an alternative allocation that incorporates Bitcoin. The methodology of using safe-haven assets, and conditional diversification; the empirical analysis consisted of descriptive statistics, risk-adjusted performance indicators, correlation tests and specification of regressions involving the crisis dummies and interaction terms to test sensitivity of the various markets in bad times. It compared the data of the Yahoo Finance, Nareit Database and LSEG Workspace in 2005-2024. The analysis shows that the 60/40 portfolio was most vulnerable to crisis and gives the highest returns in the long run. Its beta levels rose in the 2022 inflation shock, which stood at 0.64 and has risen to an approximate of 0.74. Balanced and the alternative-heavy portfolios were more resilient as reflected by lower market betas (0.50 and 0.43, respectively), reduced volatility, and reduced crisis coefficient, at the cost of somewhat reduced long-term performance. Bitcoin was the best in terms of mean returns in the shorter term, 2015-2024 and it was characterized by a high level of volatility and crisis erratics thus indicating that it was a speculative and not a defensive asset. The results indicate that diversifying a portfolio through investing in conventional alternative assets may enhance portfolio diversification and resilience compared with the 60/40 benchmark and more so, depending on market conditions. The high potential of the returns in Bitcoin is compensated through the instability which will imply that it will need to be actively risk-managed and strategically intended to be included. This paper is a long-term assessment of the integration of alternative assets into traditional portfolios, in which the performance of the alternatives it considers during a crisis is explicitly captured, as well as the evolving market sensitivities. It adds to the literature by uniting the modern portfolio theory with conditional diversification analysis and by assessing both the traditional and digital alternatives in the same empirical framework.

INTRODUCTION

The notion of diversification is the traditionally regarded pillar of the investment theory in the modern world. Markowitz coined Modern Portfolio Theory (MPT) in 1952, and since that time, the focus has never shifted; instead, the focus has always been on adding assets that have low/negative correlation. Such combinations have been sought to minimize risk and maximize efficiency of the returns per unit of risk. In practice, the concept has been applied in the portfolio construction of institutional and retail investors. It typically involves a portfolio consisting of a combination of fixed-income and stocks, typically in 60/40 proportions of 40 percent bonds and 60 percent stocks respectively (Ilmanen, 2011).

However, it has been questioned that diversification is not viable in the times when the economy is at its knees. It is during these periods that the change in market behavior has been more prone to be noticed where the correlations between stocks and bonds have sometimes led to positive values instead of negative values to the extent of positive correlation(Ang and Bekaert, 2002). Diversification advantages which are expected to mitigate risks have not been forthcoming in such situations as anticipated. This so-called diversification breakdown occurred in the past, An example is the 2008 financial crisis, the 2020 COVID-19 pandemic, and the volatility that was a result of inflation in 20222023. The post-occurrence thinking of the conventional asset allocation was the result of the occurrence of all of this resulting in the mass depreciation of the traditional portfolios. This has compelled institutions, asset managers and investors to concentrate on other commodities, cryptocurrencies, REITs, private equity and hedge funds. These assets can be used as a safe haven or as a hedge during an economic crisis since their returns will not be highly correlated with those in normal markets. However, not every one of them does so. Also, it was assumed that gold is a safe store of value, but this can be altered sooner than expected when any major crisis happens since commodities can be highly volatile when high recession times are witnessed (Conover *et al.*, 2010).

[1] Department of Banking &Finance, University of Malta, Malta
[2] Medina Asset Management, Malta
[3] Institute of Business Management Sciences, University of Agriculture Faisalabad, Pakistan
[*] Corresponding author's e-mail: joseph.falzon@um.edu.mt

Even such cryptocurrencies like Bitcoin, even though glorified by the idea of being decentralized and not reliant on central banks, are very volatile. Likewise, despite the structural difference that exists between the hedge funds and the REITs in terms of how they make returns, they are prone to equity similar risks. The idea of the private equity is investing in privately owned enterprises to provide a long-term capital growth. Its valuation is not often performed, and, therefore, it can increase the long-term returns and diminish the volatility of the portfolio, however, it also has such shortcomings as illiquidity, the slow reporting of the performance, and the lack of transparency. This article discusses the issue of whether the incorporation of such alternative assets in the portfolio is much more effective especially where the economy is in a recession. It specifically looks at how best they can minimise risk, capital protection and a better risk-adjusted performance in stressful market situations.

Research Problem

The overriding desire of investors is to build resilient portfolios in most circumstances even in a distressed market as financial markets are changing and confronting more and more complex problems. Gold, cryptocurrencies, commodities, REITs, and hedge funds are other types of assets that are constantly discussed in this regard as possible means of diversifying a portfolio. The fact that these alternative requirements are usually considered to be at variance with conventional stocks and bonds can make them attractive in making a decision that can minimize the overall risk in the portfolio, especially in periods of considerable volatility. Many studies look at the behavior of a single asset group of performance of a particular market event. Consequently, the manipulation of conventional portfolios by different alternative assets in various periods of crisis is still insufficiently understood (Amenc *et al*., 2016). There is also no standardization of the evaluation of alternative assets and most of the research works apply varying criteria, time and methodology, making it difficult to compare them (Conover *et al*., 2010). This is a problem to investors who are interested in evidencebased methods of dealing with downside risks in volatile situations. Although theory puts forward the argument that alternative assets also do not have a strong correlation with stocks and bonds, the extent to which this has been translated into a trustworthy coverage during crisis periods is still unknown (Baur and Lucey, 2010; Ilmanen, 2011). Nevertheless, this research gap in the literature is further explained by the fact that there is a bigger issue on the actual role of alternatives in risk-adjusted performance when there is a market crisis as role of alternatives are increased in portfolios with exchange-traded funds (ETFs), with individual investment, or institutional directives. The alternative assets are gaining popularity in the professional portfolio management due to their seeming diversification ability and their simplicity in application. It brings about the need to have a more elaborate and comparative perspective on their actual performance. The deficiency of evidence on the consistent assessment frameworks and at least wider testing of empirical testing across different downturns makes it still hard to establish in which cases such assets are of a great contribution to the portfolio resilience. These open ended questions are the premise on which future research on the behavior of the various classes of alternative assets to respond to conventional portfolio structures in challenging financial times can be conducted. The aim and objective of the study is to explore the existence of alternative assets in enhancing the performance of portfolios especially where the financial markets are not doing well, that is, to gain diversification and reduce the downside risk. It tries to assess these assets not independently but as a component of a comprehensive strategy to portfolio that spans across different periods of crisis.

Objectives

To carry out the critical analysis of theoretical and empirical facts of portfolio performance in a financial crisis, safe haven assets, and diversification. to select and justify appropriate assets to be incorporated as a backup according to the economic factors and the available data. to construct and test the performance in both crisis and normal times of a typical and diversified portfolio.

Research Questions

The following questions are discussed in this paper:

1. Are there better portfolio resilience and diversification with alternative assets than with the classical 60/40 portfolio, especially in the times of economic crisis?
2. What is the performance of the risk exposures and returns of portfolios of alternative allocation compared to the 60/40 standard?

LITERATURE REVIEW

The aim of this part is to critically evaluate the empirical and scholarly studies of the application of alternative assets in portfolio diversification during recessions. In spite of the fact that the background and the scope of the study were described in part 1, the main idea of this part is to determine and evaluate the theoretical frameworks, important empirical findings and discussions that corroborate the research goals. The foundation of the study in this field is what is known as the Modern Portfolio Theory (MPT) developed by Markowitz in 1952, which aims to establish the scholarly ground on which this research will be built, the gaps that persist in the existing knowledge, and the contribution that this study will bring to the current discussion in the area of financial portfolio management. With imperfectly correlated assets, in accordance with MPT, investors are able to form an efficient frontier of portfolios, which yields the highest forecasted return at a given degree of risk. To increase the risk-return profile of a portfolio, this framework advocates the use of diverse assets. Although MPT remains in common use, the assumptions

underlying its application, including constant correlation between assets, and normally distributed returns, have been subject to growing criticism, especially in the face of a financial crisis when asset class correlation is more likely to increase (Ilmanen, 2011).The Capital Asset Pricing Model (CAPM) which extended MPT, has established the relationship between systematic risk (as measured by beta) and expected return (Sharpe, 1964). CAPM only implies that higher returns should offset systematic risk but not unsystematic risk which is removed due to diversity. Just like MPT, though, CAPM is based on the assumption of a one period horizon of investment, constant risk-free rates and rational market behaviour assumptions which often fail miserably in economic crises (Fama and French, 2004). To learn more about the complexities of asset behavior during downturns, researchers have developed more dynamic risk-based frameworks, including adding some more specialised types, including diversifiers, hedges, and safe havens. A hedge is a common asset that is uncorrelated or negatively correlated to another asset, unlike a safe haven, which is uncorrelated or negatively correlated only during periods of acute instability in the market according to (Baur and Lucey.,2010). Conversely, an asset that in normal conditions may not offer the same amount of protection in case of a crisis but which is less correlated with other assets is what is referred to as a diversifier.It is these differences that are critical to understanding the theoretical role of alternative assets in modern portfolios. In one type of crisis, an asset will act as a safe haven or hedge, and in another, it will not, depending on the liquidity situation, the attitude of investors, and macroeconomic factors. As an example, gold since it is considered as a safe haven, its effectiveness differs by location and time (Baur & McDermott, 2010). On the same note, even though Bitcoin is being promoted as a digital gold, more sophisticated models have been created or are being created to study the behaviour of assets during times of stress, including significant sell-offs (Klein *et al.*, 2020). These are regime-switching models that assess changes in the relationship in different market conditions and quantile regression models (Reboredo, 2013), with the help of which the tail dependencies are measured. These models (Ang & Chen,2002) hold that the behavior of assets is not state-independent but state-based. This is what is termed as correlation asymmetry.

There is also an increased awareness of tail risk by investors, which involves the response of assets in times of sharp downward move. The assets with the negative lower-tail dependence are especially useful since they tend to move negatively with the stocks in the case of a severe downturn (Embrechts *et al.*, 2002). Because of this asymmetry, other risk measures such as the Sortino ratio, maximum drawdown and Value at risk (VaR) are being employed to determine the strength of portfolios (Sortino & Price, 1994).

Normal conditions normally depict a weak or no correlation among bonds and stocks. This negative connection is a consistent feature of conventional diversification policies where it has been observed to happen in numerous market cycles (Ilmanen, 2011). Nevertheless, the correlation between stocks and bonds has grown, often substantially, in major declines in 2008 amid the financial crisis, in 2020 during the COVID-19 crash, and in 2022-2023 following the market sell-off due to inflation. This correlation breakdown undermines the protective effect of variety is supposed to help. It is important to clarify what has been meant by an economic downturn in this study before looking at some instances of diversification breakdowns. Overall, negative economic growth, high volatility, and decreasing asset values and structural disruption, such as bear markets, recessions, or monetary shocks, are the hallmarks of downturns. These may be caused by stress on the financial system, pandemics, inflation or external shocks. As (Reinhart and Rogoff.,2009)put it these periods are systemic in nature and are often accompanied by a loss of investor confidence, asset values and credit. The assumptions of market efficiency are usually put to the test in the downturn. Fama (1991) states that the feedback mechanisms between the real economy and financial markets are prevalent during such periods.

The Global Financial Crisis that occurred in 2008 is one excellent case of failure of traditional diversification. Shares dropped in this period and panic hit the credit markets. Portfolio performance was negatively affected because of the decline of corporate and mortgage-backed bonds in addition to the decline of stocks although the U.S. Treasuries subsequently recovered. Although this was better than having all your money in stock, the 60/40 strategy was still registering huge losses (Campbell *et al.*, 2009). The assumption of a stable defense against the downside with fixed income was not quite accurate. The same situation could be observed in the March 2020 COVID-19 market crash. Investors sold almost everything, even the assets that are deemed to be safe, raising funds because the panic that was created within a few weeks was so extreme. Even U.S. Treasuries declined in the short term as liquidity evaporated (Kritzman *et al.*, 2020). Although bond markets rapidly stabilized, the first failure of the typical diversification dynamic served as a sign.

The starkest example might have been 2022, when world-wide inflation increased and major central banks rapidly increased interest rates. There was a steep decline in the shares of the equities and bonds in this case as a result of the increasing rates and the worry over the recession and the profitability strain. The 60/40 portfolio therefore had the worst calendar year gain in over 40 years (BlackRock., 2023). The failures of these breakdowns illustrate the risk of the risk management of only using traditional classes of assets (Ang & Bekaert, 2002) further assumed that the correlation of asset classes can never be similar and it may vary under different market conditions. This is the state-dependence, whereby solutions that are effective in times of stability may not provide much protection in times of downfalls. It has also been observed that the academic literature on the possible use of gold as a hedge or a

safe haven is mixed, although generally positive, which is dependent on the market environment (Chaudhuri *et al.*, 2014; Baur & Lucey., 2010) were some of the initial users who made a formal distinction between the behavior of gold under different conditions. By their definition, a safe haven is an asset that only exhibits those properties during periods of acute market stress whereas a hedge is an asset that is not typically correlated or countercyclical with another asset. The data utilized by them in the US, UK and Germany markets leads them to conclude that gold in most cases serves as a hedge against equities and a safe haven in times of extreme shock in the stock markets and thus in most of the developed markets. This was extended by (Baur & McDermott 2010), who found that though the roles of gold could not always be a safe haven in all countries and all periods, in most cases, gold served as a safe haven in most developed markets during severe market shocks. Based on their results, the safe haven attribute of gold tends to be event-specific offering safety during a crisis like the global financial crisis of 2008 but not during more mild crises.

MATERIALS AND METHODS

The first aim of the methodology is to check the effect or role of the alternative assets, such as gold, commodities, REITs, hedge funds, and Bitcoin on the risk-adjusted performance of various market recessions when specifically compared to a classic 60/40 equity-bond portfolio. The study applies the methods of performance Yardsticks and econometric modelling to determine the behaviour of such assets and their contribution to it during stressful situations.

The absolute level and relative level of performance forms the basis of the research paper because both mitigation of risk and returns influence the steps of making an investment decision. They are the rolling volatility, Sharpe and Sortino ratios, the average returns, and standard deviation. Also to establish whether i portfolio behaviour is statistically significant during periods of downturns, regression models are employed. The methodology comprises of several interesting elements that are used to obtain the role of market shocks over periods of time. Special interest is applied to the effects of including crisis dummy variables to the portfolio returns. These are the gathering and analysis of financial data and the creation of four portfolios, risk-adjusted measurements and descriptive measurements and creation and execution of regression models. Like any other step of a quantitative empirical study, all steps are designed in such a manner that they will promote consistency and reproducibility. The section makes analysis in part 4 easier because it is clear what methodological decisions were made and they are justified in terms of available academic study. It is also useful to obtain and verify the findings of other researchers, which is among the main objectives of the empirical research (Bryman, 2016; Creswell and Creswell, 2018).The empirical study relies on monthly closing price data of a sample of asset classes of conventional and alternative investments. The conventional resources are the S&P 500 Total Return Index (equities) and FTSE World Government Bond Index - USD Total Return (FTWGBIUSDT). The latter provides a wider exposure and evaluates the performance of the investment grade government bonds in the developed markets compared to the US-only benchmarks. The reason is that it is based on the performance of the international high-quality government debt that is balanced and the study i.e. the emphasizing on diversification, it has been excluded because of the data accuracy applied since January 2005-December 2024.

Computation of returns through continuously compounded (logarithmic) is done as: r_t=P_t/P_(t-1)

Where Pt -1 = the price of the close in period t and Pt-1 = the price of the close in the preceding period. Log returns are used in financial modelling because they have the following statistical properties: they are time-additive, and they are better able to model normally distributed series.

Sources of Data

Table 1:

Data Source	Index / Asset	Type	Currency
LSEG Workspace	S&P 500 Total Return Index	U.S. Equity Market Performance	US$
	FTSE World Government Bond Index – USD Total Return	Global Government Bonds	US$
	Bloomberg Commodity Index	Broad Commodity Market	US$
	Gold Spot Prices	Precious Metal (Gold)	US$
	HFRX Global Hedge Fund Index	Global Hedge Fund Performance	US$
Yahoo Finance	Bitcoin Price (BTC/USD)	Cryptocurrency Exchange Rate	US$
Nareit Database	FTSE Nareit All Equity REITs Index	U.S. Real Estate Investment Trusts (REITs)	US$

Econometric Modelling

Two regression equations are to be analysed to understand the performance under the condition of crisis and estimate the sensitivity of each portfolio to any changes in the market. The former is a basic market model and the other structure is crisis interaction.

First Regression – Baseline Market Model

The initial regression specification approximates the standard market model of each portfolio which is used as the benchmark in the assessment of performance against the market direction in general. This model analyses the correlation between the excess returns of portfolios and the excess market benchmark returns. It is expressed as:

Rp,t - Rf,t = ap + bp (Rm,t - Rf,t) + et

Where:

Rp,t its the portfolio p return at time t.

Rf,t is the risk free rate which is assumed to be the 3 months yield of the U.S Treasury Bill that is converted to a monthly yield.

Rm,tis the market benchmark returns, which is the S and p 500 total return index (spxtr).

The dependent variable is the excess on the monthly return on the portfolio, and the independent variable is the excess on the monthly market.

ap is the movement of abnormal performance that cannot be attributed to market movements.

bp is a systematical risk/market sensitivity measure.

etis the error term

Null Hypothesis (H01): The ap of the portfolio is equal to zero, which implies that there is no abnormal return, when controlling by the market exposure.

Alternative Hypothesis (H11): The apis of the portfolio is meaningfully different than zero which means that the portfolio contains abnormal returns.

Moreover, the regression evaluates the market beta of the portfolio equal to one:

Null Hypothesis (H02): The bpis of the portfolio are equal to one, that is, the portfolio is just as risky in the market as the market portfolio.

Alternative Hypothesis (H12): portfolio bpis is significantly different than one which means a variance in market risk level.

Second Regression – Crisis Interaction Model

1.1 This model is a continuation on the previous (base) specification by the inclusion of crisis-period dummy variables and their interaction with market returns to identify the presence of a change in the abnormal performance (a) and market sensitivity (b) during downturns:

1.2 Rp,t - Rf,t= ap+ bp (Rm,t- Rf,t) + gpDt + dp (Rm,t - Rf,t) x Dt) + et

1.3 Where:

1.4 Rp,tis the portfolio fund expected to run at time t.

1.5 Rf, is the risk-free rate, which is approximated by the 3 months U.S. Treasury Bill rate converted to a monthly rate.

1.6 Rm,tis the market performance of the market standard; the S&P 500 Total Return Index (spxtr).

1.7 ap shows deviant performance that cannot be explained by market forces.

1.8 Bp is a measure of systematic risk/market sensitivity.

1.9 Dt = crisis dummy (1 in crisis months, 0 in non-crisis months)

1.10 g p = Change in abnormal return in crises.

1.11 dp = The change in the market sensitivity in times of crisis.

1.12 etis the error term

1.13 The monthly excess return on the portfolio is the dependent variable; the monthly excess return on the market, the crisis dummy and interaction of the market excess return and crisis dummy is the independent variables.

1.14 Null Hypothesis (H01): ap of the portfolio is zero, which means it is not associated with an abnormal return having considered market exposure and crisis effects.

1.15 Alternative Hypothesis (H 11): Portfolio ap is not equal to zero, and there are abnormal returns even after controlling market exposure and crisis effects.

1.16 Null Hypothesis (H02): gp (crisis intercept shift) of the portfolio equals zero, or that there is no change of abnormal return in times of crisis.

1.17 Alternative Hypothesis (H12): The gpis of the portfolio are significant different than zero and so there is a change of abnormal return in the period of crisis.

1.18 Null Hypothesis (H03): dp (crisis beta shift) of the portfolio is zero, which means that the market sensitivity changed not at all in times of crisis.

1.19 Null Hypothesis (H13): dp of the portfolio is not equal to zero, which means that the market sensitivity changes in the crises situations.

1.20 Null Hypothesis (H04): bp of the portfolio = 1, which means that the market risk is the same as the market portfolio when it is not in crisis.

Null Hypothesis (H14): bp of the portfolio differs significantly as compared to one which implies a bp difference in terms of market risk during non crisis periods.

Correlation Analysis

The correlation matrices were developed as monthly log returns to assess the impact of diversification in the asset classes. It focuses on two periods, the full sample (2005 -2024), and the most recent period, which covers Bitcoin, starting in 2015.

Table 2: Correlation Matrix (2005-2024)

	S&P 500 TR	FTSE WGBI	Gold	BCOM	FNER	HFRXGL
S&P 500 TR	1.000					
FTSE WGBI	0.265	1.000				
Gold	0.099	0.503	1.000			
BCOM	0.474	0.210	0.410	1.000		
FNER	-0.003	-0.172	-0.023	0.124	1.000	

HFRXGL	0.593	0.021	0.189	0.587	0.276	1.000

Source: authors' calculation

The findings of the whole sample, with correlation of nearly 0.59, show that hedge funds (HFRXGL) are most closely related with stocks (S&P 500 TR). This is a good indication of how prone the hedge funds are to the general market risk factors, despite being known to offer diversification. By comparison, the positive relationship between the government bonds and stocks (FTSE WGBI) is less positive (0.27), which is consistent with the defensive role of fixed income in multi-asset portfolios. Although commodities (BCOM) exhibit small co-movement ([?]0.47), meaning that they are partially hedged, gold exhibits insignificant co-movement with stocks ([?]0.10), which implies that it is a strong diversifier. REITs (FNER) have nearly no correlation with stocks ([?]-0.00) although their correlation with hedge funds is slightly higher ([?]0.28), which indicates that they may be diversifying.

Table 3: Correlation Matrix with BTC included (2015-2024)

	S&P 500 TR	**FTSE WGBI**	**Gold**	**BCOM**	**FNER**	**HFRXGL**	**BTC**
S&P 500 TR	1.000						
FTSE WGBI	0.265	1.000					
Gold	0.099	0.503	1.000				
BCOM	0.474	0.210	0.410	1.000			
FNER	-0.003	-0.172	-0.023	0.124	1.000		
HFRXGL	0.593	0.021	0.189	0.587	0.276	1.000	
BTC	0.358	0.196	0.109	0.147	-0.126	0.121	1.000

Source: authors' calculation

The fact that Bitcoin was included in the 2015-2024 sample provides more insight. In general, Bitcoin shows weak correlations with conventional asset with the highest correlation of 0.36 with stocks and the lowest of 0.12 with hedge funds. This low correlation means its potential as a diversifier in mixed-asset portfolios because it aligns with research by (Baur *et al.*,2018). The autonomy of Bitcoin might be undermined in certain market conditions, however, as it is moderately correlated with stocks, giving its high reliance on it as a safe haven questionable.

RESULTS AND DISCUSSIONS

This section is a discussion of empirical findings on the basis of econometric models addressed in part 3. In the second model, the excess returns are regressed on the excess returns of the market benchmark using a traditional asset pricing model, and it is called the baseline model. It will enable the evaluation of aberrant performance (alpha) and exposure to systematic risk (beta) and, therefore, be able to provide an initial estimation of portfolio efficiency as compared to the market. The second model that will have a more advanced specification will include the crisis dummy variables and interaction with market returns to explain the changes in the behavior of portfolios in bad times. The two models have both been tested on four portfolio setups to determine whether there is a safe haven or successful hedge in the presence of poor financial situations, including Traditional 60/40, Balanced, Alternative-Heavy, and Alternative-Heavy + Bitcoin. Each specification is put through diagnostic tests to determine the quality of the model. These tests include the analysis of heteroskedasticity, autocorrelation and normality of the residues. The initial model estimation involved the use of Standard OLS but diagnostics indicated that the results were heteroskedastic and clustered volatility, such that the models have to be re-estimated with the use of HAC Newey-West robust standard errors.

Baseline Model Results

The Regression of excess returns of 60/40 portfolio

Table 4: Regression 1 Results of 60/40 Portfolio

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
EX_SPXTR	0.647452	0.014383	45.014	0.00
Constant	-0.000431	0.000564	-0.764	0.446

Source: authors' calculation

to excess market is presented in the table 4. The results show that excess market return is a robust factor of 60/40 portfolio, the beta is highly estimated to be 0.65, which is very significant at level of 1 percent. This will imply that the portfolio explains systematic risk of approximately two-thirds of the equities market. Constant following market exposure The outcome is adverse but insignificant which means that there is no aberrant performance. The model is considered compatible as nearly 93 percent of the portfolio returns are explained (R 2 = 0.93).The distribution of the residual is centered around zero with the Jarque-Bra statistic not rejecting

the normality. Arch test shows that there is a substantial amount of autoregressive conditional heteroskedasticity which supports the concept of time-varying volatility in financial returns; however, the White test shows that there is borderline heteroskedasticity. The Breusch-Godfrey test shows that there are weak autocorrelations.

Table 5: Regression1 Results of Balanced Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX_SPXTR	0.496818	0.019185	25.896	0.000
Constant	-0.000148	0.000748	-0.197	0.8436

Source: authors' calculation

Table 5 shows the regression of the excess returns of the Balanced portfolio on a market excess return. The regression indicates that the regression line has a very large loading of the market element due to a beta of about 0.50 by the balanced portfolio. This implies that the portfolio bears approximately 50 percent of systematic risk of the equity market. The return beyond market exposure is not exceptional and therefore the intercept is insignificant. The model confirms strong co-movement with the market benchmark which explains a large percentage of the variation in portfolio excess returns (R2 = 0.81). Residual diagnostics indicate a mixed picture. The Jarque-Bra test ($p < 0.01$) rejects the normality and the residuals exhibit excess kurtosis and slight skewness. However, both the ARCH test and the Breusch-Godfrey LM test do not show conditional heteroskedasticity and serial correlation. Nevertheless, the test of heteroskedasticity is commonly reported in the White test.

Alternative-Heavy Portfolio

The regression of the excess returns of the Alternative Heavy portfolio between the market excess return is reported in Table 6.

The regression shows that the beta of the Alternative

Table 6: Regression 1 Results of Alternative-Heavy Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX_SPXTR	0.425774	0.021526	19.78	0.000
Constant	0.000077	0.000948	0.081	0.935

Source: authors' calculation

Heavy portfolio is 0.43 which is positive and high meaning that the portfolio does not capture all the systematic risk of the equity market. The intercept turns out to be negligible, indicating that the market is not aberrant in returns outside the market exposure. The higher allocation in alternative assets compared to the 60/40 and balanced portfolios causes the model fit to be high (R2 = 0.62) and consequently leads to the reduced degree of co-movement with equities. The model diagnostics gives a more in-depth analysis of the model validity. The Jarque-Bra statistic shows that the normality is violated at the conventional levels however, the residual values are zero-mean and nearly symmetric. This shows that it has fat tails and extreme kurtosis as a typical financial data. The Breusch-Godfrey serial correlation tests fail to recognize autocorrelation, whereas the ARCH test fails to recognize conditional heteroskedasticity. However, the test is highly suggesting the absence of homoskedasticity as assumed by White, indicating the heteroskedasticity of the total error variance.

Alternative–Heavy with Bitcoin Portfolio

The regression of the excess returns of the Alternative-heavy + BTC portfolio on the market excess returns is given in table 7.

Table 7: Regression 1 Results of Alternative-Heavy with Bitcoin Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX_SPXTR	0.540086	0.037386	14.44606	0.00
Constant	0.0304	0.002336	1.30161	0.1956

Source: authors' calculation

The regression shows that the Alternative-heavy + BTC portfolio is exposed to systematic market risk to the tune of 0.54. This beta is a little greater than the Alternative-heavy portfolio (0.43); however, it is similar to the Balanced (0.50) portfolio. Consequently, the introduction of Bitcoin makes markets more sensitive yet is worse than the stock market compared with the other substantial allocation. The positive intercept is not statistically significant but does not imply that there are excess returns over and above market exposure. The model explains approximately 55% (R2 = 0.55) of the change in returns in the light of Bitcoin unique volatility and low correlation (alternative-heavy) to equities, compared to the Balanced (R2 = 0.81) and Alternative-heavy (R2 = 0.62) portfolios. The skewness and kurtosis of residues are acceptable values, and the Jarque-Bra ($p = 0.59$) is not significant to disclose the hypothesis of normality. Breusch-Godfrey LM test assumes that there is no serial correlation, but the

ARCH and White tests reject the null hypothesis, which demonstrates that homoskedasticity does not exist. Also, autocorrelation is weak, which is supported by the value of 1.90, which is close to 2 (Durbin-Watson).

Crisis Interaction Model

Sixty-Forty Portfolio Table 8 shows the regression of the excess returns of the 60/40 portfolio with the excess returns of the market, but with the additional variables,

Table 8: Regression 2 Results of 60/40 Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_2008	0.002941	0.002559	1.149516	0.2515
EX_SPXTR	0.636837	0.014936	42.6391	0.00
D_2022	-0.004015	0.002506	-1.602401	0.1104
D_2020	0.003423	0.001566	2.1856	0.0298
D_2020*EX_SPXTR	0.00247	0.016799	0.147015	0.8832
D_2008*EX_SPXTR	0.001282	0.040032	0.032024	0.9745
Constant	-0.000412	0.000525	-0.784395	0.4336
D_2022*EX_SPXTR	0.103708	0.020318	5.104283	0.000

Source: authors' calculation

R2 = 0.939523; Adj. R2 = 0.937698

including major periods of crisis (2008, 2020, 2022) and cross-term of crisis and the market factor.

It is not found to have an abnormal return beyond the period of crisis as the insignificance of the constant term (-0.00041, p = 0.434) indicates. It had no impact in 2008, there was a slight positive unusual return in 2020 during COVID-19 (0.00342, p = 0.030), and a small negative effect in 2022. The changes of beta are very positive in 2022, 0.1037, p < 0.001, but there are no changes in 2008 and 2020. This implies that the defensive properties of the portfolio were compromised since it grew more equity-sensitive in the process. Everything said and done, the 60/40 structure provided stability in the previous crises but failed to provide any security in the 2022 in-flation-driven shock. Having a regression fit of R2 = 0.939 and adjusted R2 = 0.938, the regression fit is very high meaning that the model can account nearly all the excess returns. This is as expected considering that the portfolio has strong ties with bonds and stocks which are highly systematic.

The distribution of the residual is not serial correlated (Breusch Godfrey p = 0.266) and it is normally distributed (Jarque Bera p = 0.524). The regression model is verified in case the returns are stationary according to Augmented Dickey-Fuller test (p < 0.001). The existence of a volatility clustering, as well as heteroskedasticity, which is characteristic of financial data, in particular, in a crisis, is highlighted in both the ARCH test (p < 0.001) and White test (p = 0.009). According to graphic evidence, fitted values are very close to realised returns and the bigger residuals are concentrated in the market turbulence events.

Balanced Portfolio

Regression of the excess returns of the Balanced portfolio on the market excess return is shown in Table 9 with additional variables to represent major crisis periods (2008, 2020, 2022) and interaction terms between the major crisis period variables and the market factor.

The abnormal return is not abnormal except in cases of

Table 9: Regression 2 Results of Balanced Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_2008*EX_SPXTR	0.009614	0.060071	0.160047	0.873
EX_SPXTR	0.482516	0.017936	26.90172	0.00
D_2022*EX_SPXTR	0.035992	0.026493	1.358538	0.1756
D_2020	−0.000062	0.005732	-0.010889	0.9913
D_2022	-0.004977	0.003055	-1.628888	0.1047
D_2008	-0.003032	0.003894	-0.778481	0.4371
D_2020*EX_SPXTR	0.014469	0.039062	0.370415	0.7114
Constant	0.000474	0.00069	0.68656	0.493

Source: authors' calculation

R2 = 0.815027; Adj. R2 = 0.809446

crisis as the insignificant intercept makes certain. The presence of alternatives is also known to significantly reduce The average percentage of systematic equity exposure is presented with a beta of 0.483, which is considerably lower than the 60/40 portfolio. The differences in the crisis intercept were always minor in 2008, 2020, and 2022, which means that the diversified portfolio did not show aberrant performance in terms of market exposure during the crisis. The computation of the beta-shift parameters of each of the three crises

has been statistically non-significant, which means that the market sensitivity of the portfolio was quite constant even during the turbulent period. Comparatively, the equity sensitivity increased markedly in 2022 in the 60/40 benchmark.

Finally, market risk and anomalous returns were minimized by diversifying into alternatives. The model explains nearly 81 percent of the volatility in excess returns, which is a good fit; however, the benefits of diversification are still apparent. Jarque-Bra test fails to accept tight normality ($p = 0.0018$), and the values of the residue have skewness and kurtosis. The distribution is centred and it has rather symmetrical shape and the histogram does not have any significant deviations. The serial correlation was not found (BreuschGodfrey test, $p = 0.145$), which means that this model is adequate. The stationarity of returns is strongly supported with the help of Augmented Dickey-Fuller test ($p < 0.001$). White test shows that there is low heteroskedasticity (5% level, $p = 0.034$), ARCH test shows that there is no autoregressive conditional heteroskedasticity ($p = 0.858$). The graphical diagnostics indicates that the residuals are centred on zero, and the volatility is skewed on the right, and the fitted values are close to the observed returns. Scatterplots confirm a linear relationship with the market but a steeper slope suggests less exposure to beta.

Alternative-Heavy Portfolio

The regression of the excess returns of the Alternative - Heavy portfolio using the market excess return, including a strategy to include the major crisis periods (2008, 2020, 2022) and interaction terms between the market factor and the major crisis periods is presented in Table 10.

Table 10: Regression 2 Results of Alt-Heavy Portfolio

Variable	Coefficient	Std. Error	t-Statistic	Prob.
EX_SPXTR	0.409898	0.02376	17.25147	0.00
D_2008*EX_SPXTR	0.015062	0.088176	0.170819	0.8645
D_2020	-0.002672	0.00862	-0.309913	0.7569
D_2022	-0.005284	0.003782	-1.39697	0.1638
D_2022*EX_SPXTR	-0.017794	0.036447	-0.488208	0.6259
D_2020*EX_SPXTR	0.022263	0.05826	0.382124	0.7027
D_2008	-0.007259	0.005951	-1.219822	0.2238
Constant	0.001098	0.000904	1.215202	0.2255

Source: authors' calculation

R2 = 0.815027; Adj. R2 = 0.809446

The constant term then becomes non-significant after the market exposure has been taken into consideration and this proves that there are no abnormal returns. As per the higher allocation to diversified assets, the estimated beta of 0.410 (p 0.001) is less than the balanced alternatives portfolio and the 60/40 benchmark. Changes in crisis intercepts (2008, 2020, 2022) are not significant, which implies that there are no high or low profits in the crisis. Even in times of extreme crises, market sensitivity remained constant as the difference in beta varied statistically insignificantly. This is a sharp contrast to the 60/40 portfolio, whose value became even more sensitive in 2022 which proves that the increased tendency to alternatives could potentially cushion the portfolio against equity-induced crises. The regression using monthly return data has a good value of R2 and adjusted R2 at 0.63 and 0.62 respectively by the standards of regression. This indicates that excess returns variance in a portfolio is explained by market changes more than 60 per cent with the rest represented by idiosyncrasies between the alternative assets.

The distribution of the residual has excess kurtosis and small skewness that is to the right side, which is not normally distributed (Jarque-Bra $p < 0.001$). The results are fitted values that are similar to realised returns, and the variances are concentrated during volatile times, whereas residues remain centred. Whereas the null is rejected at lag 4 ($p = 0.029$), the Breusch-Godfrey test indicates that there is no autocorrelation at lag 1 and 2 ($p > 0.10$) which indicate some dependence of higher order specific to this specification; the 60/40 and balanced portfolios did not show such evidence. The stationarity is well confirmed (ADF test, $p < 0.001$). Although, White ($p < 0.01$) test indicates heteroskedasticity, which is in line with the existence of volatility clustering in times of crisis, the ARCH test fails to show the presence of conditional heteroskedasticity ($p = 0.622$). According to the graphic diagnostics, the model is well-defined and has a relatively small slope of equity, which implies a lower beta exposure.

Alternative-Heavy with Bitcoin Portfolio

Table 11 shows the regression of excess returns on the Alternative - Heavy with Bitcoin portfolio on the market excess returns with the addition of dummy variables representing significant periods of the crisis (2008, 2020, 2022) and interaction terms of these dummies with the market factor.

Table 11: Regression 2 Results of Alt-Heavy Portfolio with Bitcoin

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D_2020	-0.005794	0.00751	-0.771492	0.442

EX_SPXTR	0.487591	0.040676	11.98711	0.00
D_2022*EX_SPXTR	0.073838	0.075456	0.978556	0.3299
D_2022	-0.011603	0.006541	-1.773983	0.0787
D_2020*EX_SPXTR	0.16515	0.060947	2.709731	0.0078
Constant	0.004832	0.002445	1.975796	0.0506

Source: authors' calculation

R2 = 0.568052; Adj. R2 = 0.549107

Along with Bitcoin, the beta of the equity market (0.488, $p < 0.001$) remains high, but smaller than the 60/40 standard, indicating less systematic equity. Although the change in the 2022 interaction is not statistically significant (0.201, $p < 0.05$), the crisis interaction in 2020 shows a significantly positive change (0.166, $p < 0.05$), indicating that stocks respond more to COVID-19. The constant term implies a marginal anomalous return throughout the sample and is slightly significant ($p = 0.05$). The regression has a high moderate power of explanatory with an R2 of 0.568 and a adjusted R2 of 0.542. It is smaller than the wider sample portfolios, but it is reasonable in light of the shorter period and the higher volatility of Bitcoin.

There were no indications of autocorrelation (Breusch-Godfrey $p = 0.68$) and heteroskedasticity (ARCH $p = 0.84$; White $p = 0.96$), and the distribution of the residuals is approximately normal (Jarque-Brauna $p = 0.67$). The Durbin Watson (1.92) indicates residual independence. It also fails to display any consistent misspecification in the residuals over time in the fitted vs. actual graphs. These results were confirmed by the ADF test, which identified the stationarity of the portfolio series ($p < 0.01$), thus ensuring the resilience of the time-series regression.

Comparative Discussion

The performance of the four portfolio specifications of 60/40 benchmark, Balanced, and Alternative-heavy and Alternative-heavy with Bitcoin highlight a range of trade-offs between returns generation, volatility control and resilience in times of financial stress.

Descriptive and Regression Evidence

In the case of descriptive statistics, the 60/40 portfolio had the highest overall performance, despite its volatility being fairly large. On the other hand, the Balanced allocation and Alternate-heavy allocations decreased volatility by sacrificing part of the returns. The regression analysis also confirms the diversification role of the alternatives with the 60/40 portfolio having the highest co-movement to the market (b = 0.65; R2 = 0.90) and the Alt-heavy portfolio having the lowest equity sensitivity (b [?] 0.43; R2 = 0.62). Of all extremes between these two, the balanced portfolio found a middle ground between the mitigation of risk and equity involvement. The footing of the profile is shaken by the entry of Bitcoin. The mean return of the Alt-heavy + BTC specification was highest regardless of the fact that the sample period used was the shortest (2015-2024), but its volatility was larger by a significant margin. Because of the specifics of Bitcoin and its dependence on the regime in relation to stocks, regression diagnostics have worse explanatory power (R2 = 0.55) and higher residual variability.

Resilience Relative to the 60/40 Benchmark

It has been shown that alternative portfolios are more resilient when compared to the 60/40 portfolio during stressful periods. It has been shown that alternative portfolios are more resilient when compared to the 60/40 portfolio during stressful periods. Literature documentation of alternatives as partial hedges (Ang, 2014) shows that both balanced and alternative-intensive portfolios were reduced in a downturn like the 2020 pandemic shock and the global financial crisis in 2008. Diversification benefits were not completely erased, as the correlations across the assets were higher when the system experienced sell-offs, such as that of 2022, which therefore limited its protective ability. The contribution of Bitcoin was unfair. It enhanced risk-adjusted returns in economic boom and generated huge returns in recovery hence contributing to losses in depressed days. According to recent studies (Baur *et al.*, 2018; Corbet *et al.*, 2020), Bitcoin is more of a speculative asset that results in some diversification value and is not a safe haven.

Trade-Offs and Strategic Implications

The data highlights a particular sacrifice of returns in exchange of the reduction of volatility. Balanced portfolio can be seen as providing the most appealing trade-off as the risks are eliminated, as well as the returns are competitive. The balanced portfolio offers the most attractive tradeoff since it reduces the risk and provides competitive returns. Alternative-heavy type is customized to risk-averse investors because of their focus on stability rather than growth. Bitcoin changes the portfolio to have higher risk and possible reward, and it is more effective as an investment strategy to get returns albeit not as an insurance strategy. Relative to the 60/40 model, other investments tend to enhance portfolio standing; nevertheless, the extent of this enhancement differs with the asset holdings. Bitcoin develops an asymmetrical payoff curve effectively enhancing returns in a market boom and reducing returns in a market decline. The traditional alternatives that are available are more stable but less lucrative. Such a dichotomy highlights the importance of the goals of investors and the riskiness in making the ideal allocation.

Discussion of Results, Conclusions and Recommendations

The aim of the research article was to demonstrate how

the integration of alternative assets to a portfolio and the conformity to the conventional 60/40 allocation can be enhanced in terms of enhancing the resilience and diversification of a portfolio especially in the times of financial crises. To attain this, three goals were developed. The latter was a literature review of theoretical and empirical studies on diversification, safe-haven assets and portfolio resilience. The second goal was to develop portfolios comprising both classic and non-traditional assets, as well as incorporating Bitcoin as the modern topic of research on the subject of digital assets. The third goal was to compare and contrast the performance of the successive portfolios as it would be in normal conditions, and during the time of systemic stress. All these have been done sequentially. These positive effects of diversity are situational and not absolute as indicated in the literature review and are likely to decrease during market crashes when the relationship between asset classes increases. The methodology is a clear roadmap towards building a portfolio by choosing conventional assets, such as stocks, bonds, gold, commodities, hedge funds, and REITs. Another criterion that was added was the addition of the Bitcoin to test its speculative nature. Descriptive statistics, correlation analysis, and regression model (a crisis-augmented version that incorporated dummy variables and interaction terms), were used to determine the performance of the study, with resultant proportions being rather high. The alternatives were relatively stronger than the 60/40 norm, but only partially and significantly, depending on the nature of the alternative, and the type of crisis. Although they lowered the market dependency and curtailed volatility, the traditional substitutes did not actually eradicate the risk of losses in cases of system crises. The fact that Bitcoin could only be a reliable hedge at times was constantly demonstrated by fluctuations in returns at some point and falling at other times.

Interpretation of Results in the Context of Literature

The conclusions complement the current literature. The study that Balanced and Alternative-heavy portfolios decreased market beta and were less affected by market crises supports the research in the past that commodities, gold and REITs are partial hedges (Conover *et al.*, 2010; Ang, 2014). This gains credence to the theoretical claim that although there might be no possible solutions to the drawdowns in equity, solutions can alleviate and improve the opportunity set. Moreover, the results also support the fact that diversification is susceptible to inflation shocks expressed by Ilmanen (2011). There should be more correlations in 2022, which implies reduced benefits of alternatives, and thus, systemic shocks can outweigh portfolio construction. In this perspective, the study by Baur *et al.* (2018) and Corbet *et al.* (2020) defines Bitcoin as a speculative diversifier having regime-specific correlations hence its behaviour is in line with that. Neither can be considered a safe haven because it has the capability to boost performance even in the years of expansion and downturn. Placed in the portfolio among traditional options like a magazine, this addition provides an additional contribution that is inherently different than the one of gold or REITs. Conventional options always offered little advancements to resilience at the cost of turnover, whereas Bitcoin offered the prospects of appreciation to the cost of stability. It is the duality of this that represents the trade-off of the theory of diversification: the reduction of risk at the expense of performance, and the stability at the expense of growth.

Implications for Investors and Practice

The implications of the conclusions to the practitioners are extensive. The most realistic allocation is a balanced one, as it offers a measurably better resilience-enhancing effect with no too-large aversion to returns. This distribution offers institutional investors including endowments and pension funds with a tool to facilitate stability and remain competitive in performance. Alternative-heavy ratio would suit high-risk-averse investors who prefer stability to growth in their assets and would rather be drawn to returns on asset managers, and other similarly risk-averse investors. The report shows a lot of doubt regarding the effectiveness of Bitcoin as a hedge. Rather, it can be regarded as a hypothetical component, useful in the situations when there is a need to keep the ratio 60/40, but a further scope of 20-30 needs to be added to the traditional percentages, which should not be put at the forefront by the investors whose main concern is the sustainability. To the traditional options, it can be recommended to add a smaller percentage (20-30). Trade-off between the resilience and the return seems to provide the most desirable balance but this requires to pay attention to the opportunity cost of long-term performance. Secondly, other allocations are to be increased to investors who have low risk levels. Investors who can endure volatility and are willing to earn greater returns can invest small sums in Bitcoin; however, this should not be perceived to mean that they would be strong enough to withstand the impact of a market crash. This is contrary to the stabilization properties of commodity diversification where gold, REITs and hedge funds should be considered as being speculative and opportunistic investments.

Suggestions for Future Research

The research could be further developed in several important aspects in the future. The first stage is to expand the range of options considered. Index-based choices though not liquid have also been the subject of research; however extra assets in most institutional portfolios are also private equity and venture capital, infrastructure and direct real estate. The presence of such illiquid assets would provide a more thorough view of resilience and diversification, whereas the use of credible data would make the second option. The alternative would be to expand the geographical boundary. Because of the dominance of the US markets and access to the information, this analysis dwelled on the portfolios in the

US. The next research need is to determine whether the benefits of alternative diversification could be extended to the emerging economies in Asia or Europe where the financial systems, monetary unions, and economic structures are quite different. Of great importance is the role played by real assets and commodities particularly in inflationary times within the existing economic environment. The evaluation of performance within a number of inflation cycles or interest rates regimes can give an idea of when and why an alternative will offer protection.

CONCLUSION

This study has demonstrated that conventional portfolios can be enhanced with alternative portfolios that enhance the strength of the traditional portfolios although they come with trade-offs. The traditional options offered some level of safety, at the cost of some of the returns, in reducing volatility and exposing them to crises. Bitcoin, at the same time, failed to maintain its reputation as a defensive tool due to its volatility, yet with the possibility of high upward potential. The information shows that alternatives could be used to enhance portfolios and offer more diversification as compared to the 60/40 benchmark. Substitutes increase resilience, and it is determined by the assets deployed, their levels, and the type of crisis. The Balanced portfolio provides the best trade off to the investor. The results are in support of the contingency of diversification. The guideline states that care needs to be taken in the classification of speculative assets as hedges. The analysis finally concludes that 60/40 portfolio no longer works in the existing market environment. Although the alternatives themselves do not represent a solution, they can be taken as a good improvement that will help investors to maneuver through a dynamic financial environment with both predictable and unpredictable crises.

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