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THE IMPACT OF CRYPTOCURRENCY
RETURN ON THE STOCK MARKET
RETURN: EVIDENCE FROM OMXHPI
INDEX OF STOCK EXCHANGE IN
FINLAND

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ABSTRACT

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The relationship between virtual investment and traditional investment is a debatable topic in the context. This study investigated the impact of cryptocurrency returns on the All-Share Index - OMX Helsinki equity market (OMXHPI). The research aims to find the impact of digital currencies such as Bitcoin, Ethereum, and Tether on the returns in the Finnish market.

The study is done as a quantitative model that employs correlation analysis and time series regression models. The main independent variable is cryptocurrency returns, and the control variables are cryptocurrency volume, GDP growth, exchange rates, inflation, and interest rate. Data were collected from 2010 to 2024 using secondary sources. Findings are based on Regression analysis, Pearson correlation, and descriptive statistics, which were done by STATA 13 software.

The findings display that Bitcoin and Ethereum returns positively affect the OMXHPI, while Tether has no significant impact on OMXHPI. Interest rates showed a consistent negative effect, while GDP had a mild positive influence. The study concludes that major cryptocurrencies, particularly Bitcoin and Ethereum, are increasingly integrated into stock market dynamics, offering new considerations for investors and financial analysts in Finland.

Keywords Cryptocurrency returns, Bitcoin, Ethereum, Tether, stock market performance, OMXHPI, Finland, Interest rate, Inflation, Exchange rate, GDP growth

CONTENTS

ABSTRACT	2
1 INTRODUCTION	7
1.1 Background to the Study	7
1.2 Significance of Study	8
1.3 Research Problem/Gap	9
1.4 Objectives	9
1.5 Limitation	10
2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW	11
2.1 Studies Indicating a Significant Relationship with Stock Markets 11	
2.2 Studies Highlighting a Positive Relationship with Stock Markets 16	
2.3 Studies Reporting a Negative Significant Relationship	17
2.4 Studies Reporting Mixed Relationship	17
2.5 Studies Reporting No Significant Relationship	18
2.6 Research relating to other determinants of the stock market	19
3 DESCRIPTION OF THE DEVELOPMENT	22
3.1 Research Design	22
3.2 Regression Model	23
3.3 Conceptual Framework	24
3.4 Variable Definition	24
3.5 Hypothesis	28
3.6 Population And Sample Selection	28
3.7 Data Collection	29
3.8 Analysis Method of Data and Techniques	29
4 RESULTS	31
4.1 Introduction	31
4.2 Descriptive Statistics	31
4.3 Pearson's Correlation Analysis	32
4.4 Regression Analysis of Bitcoin	34
4.4.1 Normality	34

4.4.2	Multicollinearity	34
4.4.3	Autocorrelation	35
4.4.4	Heteroscedasticity	36
4.4.5	Regression	36
4.5	Regression Analysis of Ethereum	37
4.5.1	Normality	38
4.5.2	Multicollinearity	38
4.5.3	Autocorrelation	39
4.5.4	Heteroscedasticity	40
4.5.5	Regression	41
4.6	Regression Analysis of Tether	42
4.6.1	Normality	42
4.6.2	Multicollinearity	43
4.6.3	Autocorrelation	44
4.6.4	Heteroscedasticity	45
4.6.5	Regression	46
5	SUMMARY AND DISCUSSION	48
5.1	The Key Findings	48
5.2	Reflection	49
5.2.1	Research Process and Methodology	49
5.2.2	Reliability and Applicability	49
5.2.3	Ethical Considerations	50
5.2.4	Personal and Academic Growth	50
5.3	Suggestions for Future Research	50
5.4	Final Considerations	51
	REFERENCES	52

FIGURES

Figure 1: Conceptual Framework	24
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TABLES

Table 1: Variable explanation	27
Table 2: Descriptive Summary Table.	32
Table 3: Correlation Matrix	33
Table 4: VIF table of BTC.....	35
Table 5: Breusch-Godfrey LM test for autocorrelation	35
Table 6: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	36
Table 7: Regression analysis of Bitcoin	36
Table 8: VIF table ETH	39
Table 9: Breusch-Godfrey LM test for autocorrelation	39
Table 10: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	40
Table 11: Regression analysis of ETH	41
Table 12: VIF table of ETH.....	44
Table 13: Breusch-Godfrey LM test for autocorrelation	45
Table 14: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	45
Table 15: Regression analysis of USDT	46

ABBREVIATIONS

OMXHPI	OMX Helsinki All-Share Index (Nasdaq Helsinki)
BTC	Bitcoin Price
ETH	Ethereum Return
USDT	Tether Return
VOL	Cryptocurrency Trade Volume
INT	Interest Rate
CPI	Inflation Rate
EXR	Exchange Rate
GDP	Growth Rate of Gross Domestic Product
ECB	European Central Bank

1 INTRODUCTION

1.1 Background to the Study

Cryptocurrencies currently used in the economy and the world we live in can be defined as virtual money created by private organisations rather than monetary authorities or nations. In other words, a digital representation of value managed through distributed ledger technology (DLT) and cryptography is called a cryptocurrency (Wikipedia Contributors, 2025). Also, unlike the U.S. dollar or the euro, the value of a cryptocurrency unit is not controlled by a nation or an institution. Instead, users of a cryptocurrency unit share these responsibilities widely online. These cryptocurrencies exist in various forms, and considering market capitalisation, according to the Coin Market Value, there are reportedly more than 22,932 number of cryptocurrencies which have a market value around \$2.32 trillion (CoinMarketCap, n.d.). Bitcoin, Ethereum, USDT, and Solana are the most popular cryptocurrencies based on market capitalization (Cryptocurrency Market Capitalization, n.d.). Some popular cryptocurrencies are ZCash, EOS, and Tezos. A few have similarities to Bitcoin. Others have new features that allow them to do more than just transfer value, or they are built on different technology. In addition to well-known cryptocurrencies such as Bitcoin and Ethereum, there are many additional projects with unique uses for cryptocurrencies. And, although there are no formal guidelines or standards, some frameworks for classifying cryptocurrencies are more useful than others. Payment systems using cryptocurrencies are analogous to electronic money controlled by a distributed computer network over a public blockchain. Some focus on trying to bid beyond the money, while others are more concerned with paying for a certain feature or use case. The study seeks to investigate whether there is any relationship between traditional investments, such as the stock market, and new investments, such as cryptocurrencies. Recent analyses suggest that downturns in

the stock market may lead to increased selling pressure in crypto markets, indicating a potential correlation between these investment avenues (Choe & Lewis, 2025)

1.2 Significance of Study

This paper examines the connection among cryptocurrency returns and the equity market, as well as the impact of virtual currency returns on the equity return. This study addresses to the gap in the literature in Finland and around the world. A more widespread market phenomenon seen on several exchanges and trading platforms is the effects of the virtual currencies on the share market return is Upward relationship according to Wang et al. (2020). However, a similar association between the variables was not found in the literature. According to Kostika and Laopodis (2019), several academics discovered no connection among digital coins and the Financial market. The correlation was tested separately and collectively for different currencies, different nationalities, and different markets. With regard to the author, there is a different relationship in the literature between digital currency returns and the equity market. Cryptocurrency and the stock market can have a complicated relationship that depends on a wide range of factors. Wikipedia employees, 2025a. Understanding the connection between digital asset returns and equity market behaviour forms the core of this paper. This study is significant because it sheds light on how to generate alpha returns, comprising the actual correlation between equity market performance and digital currency returns. On the other hand, investors can minimise their risk by understanding the connection among digital currency returns and equity returns. It must be acknowledged that the association between cryptocurrencies and equity returns can fluctuate, depending on market conditions and other external variables. Moreover, as each cryptocurrency unit can have different variables that affect its price movement, the association between them and the equity market

may vary. The author intends to analyse three top-rated cryptocurrencies in this research. They are Tether USDT, Ethereum ETH, and Bitcoin BTC. These currencies are selected based on market capitalization. This allows for the diversification of these cryptocurrencies. Cryptocurrency returns and stock market returns are debatable topics among researchers. In recent years, financial experts have not yet found a unique answer to the question of whether cryptocurrency returns affect stock market returns.

1.3 Research Problem/Gap

Generally, there are two major investments in modern finance. The first is the traditional investment, and the other is the virtual investment. Luis Alana et al. (2020) revealed that cryptocurrency and stock market returns are unrelated. A correlation was discovered by other researchers, Sami and Abdullah (2020). Cryptocurrency and stock market returns show a changing relationship depending on market conditions. According to available research, most researchers have analysed the determinants of stock exchange returns, but a very small amount of research has examined cryptocurrency and equity market returns. Nevertheless, there is a relative drawback of comparative studies that analyse the impact of cryptocurrency returns on OMXHPI returns. Based on this research difference, the research problem is whether the cryptocurrency return finish affects the OMXHPI in the stock market.

1.4 Objectives

- To examine the relationship between Bitcoin's return and the stock market return
- To examine the relationship between Ethereum's return and the stock market return

- To examine the relationship between Tether's return and the stock market return
- To examine the impact of Bitcoin, return on the stock market return
- To examine the impact of Ethereum return on the stock market return
- To examine the impact of Tether return on the stock market return

1.5 Limitation

Along with emphasising the OMX Helsinki Index of the Finnish equity Exchange, three important cryptocurrencies are chosen for studies based on their market capitalisation. The analysis in this paper is predicated on secondary data spanning the years 2009 through 2025. The analysis period will be limited to the launch date of the first cryptocurrency. Due to the different ways of operating, OMXHPI and cryptocurrencies do not have the same business cultures and characteristics. The study primarily focuses on Finland, and the study's findings do not extend to equity markets in other countries. Furthermore, the invention will not exist with other cryptocurrencies. It will investigate the connection between Finland's OMXHPI and the three main cryptocurrency returns.

2 THEORETICAL FRAMEWORK AND LITERATURE REVIEW

The impact and the relationship between virtual currency markets and traditional stock markets have become an increasingly important area of research, particularly in light of the volatile nature of digital assets and their growing presence in global financial systems. This section reviews the earlier research given share market performance and the relationship between cryptocurrency returns.

2.1 Studies Indicating a Significant Relationship with Stock Markets

Wang et al. (2020) studied the connection among Bitcoin and traditional financial exchanges. They used the Cryptocurrency Historical Values Dataset, which consists of Ripple, Ethereum, Bitcoin, and Bitcoin Cash for 5 years from February of 2013. This study used daily share prices through the Yahoo Finance API. The results indicated that the S&P 500 index has a considerable impact on Bitcoin, whereas the impact of Bitcoin on the S&P 500 is substantially weaker. Additionally, their research showed that the standard deviation of the S&P 500 consistently impacts the average value as well as the volatility (standard deviation) of Bitcoin using a sliding window analysis.

The effects of Bitcoin on China, Turkey, USA, and Japan share market indexes were examined using value at risk and causality analysis by Ünvan (2019). The variables in this analysis were S&P500, BIST100, NIKKEI225, SSE380, and BITCOIN. They employed the EViews program and weekly data, spanning the period of 2016 to 2018, for analysis. The VAR (3) model was used to assess the stabilized data by the Akaike information criterion. This analysis revealed that there were two-way causation linkages between Bitcoin and BIST100 and that Bitcoin alone

had an impact on the latter. Additionally, a unidirectional causal relationship was identified from Nikkei 225 to Bitcoin, SSE 380 to Nikkei 225, and S&P 500 to Nikkei 225.

By connecting the price of Bitcoin with stock returns, Salisu et al. (2019) conducted research to improve predictability. The impact of Bitcoin pricing, or BTC for short, on the predictability of stock returns in the G7 nations is examined in this study. The BTC-based predictive model is compared both independently and in conjunction with the existing stock return prediction models, which account for both common and nation-specific factors, to guarantee comprehensiveness. The research looked at the effect of various economic and financial variables including Bitcoin's value, other commodity and oil prices, exchange rates, inflation, short-term and long-term interest rates. We further added stock indices from G7 countries including Japan, UK, France, Canada, Italy, Germany, and US. The paper presents the following results. First, while the results for interest rates are the opposite, the article finds evidence supporting Bitcoin concerning individual in-sample forecast performance. However, since the former consistently outperforms the latter in three countries, it suggests that the common characteristics do have fair competition with Bitcoin. Secondly, except for Japan, the model that is driven by Bitcoin data outperforms a model based on the macroeconomic variables of the G7 countries in forecasting stock returns for the G7 countries. Thirdly, the short-horizon forecasts from the model closely resemble the model's in-sample expectations, but its performance deteriorates over longer time horizons. This can be attributed to the behaviour of Bitcoin market participants, who typically engage in short-term trading due to the market's high volatility, similar to that of the equity market. Fourth, we explore whether the enhanced predictive performance of the BTC-based model can be partially explained by its ability to account for structural breaks that occur during the forecast horizon.

Cabarcos et al. (2021) studied Bitcoin volatility, the Stock Market, and Investor Mood. The authors aim to find whether they are related in any

way. This research extends knowledge on the subject by looking into Bitcoin behaviour and the relationship among Investor and asset emotion, the S&P 500 return, and VIX return and the volatility of Bitcoin. The VIX, S&P 500, Bitcoin, and sentiment fluctuation data were all employed in the analysis. Furthermore, information was gathered from January 4, 2016, to September 30, 2019. The S&P 500 Index, VIX Index, Bitcoin prices, and sentiment indicators associated with the S&P 500. The findings show that it is when speculation is most rampant that Bitcoin's uncertainty in volatility peaks. If market conditions are stable, Bitcoin volatility is affected by sentiment, VIX returns, and S&P 500 returns.

Gapurbaeva et al. (2023) did a study to "ascertain the impact of cryptocurrency on the investment market, focusing on the primary environmental factors that influence the variables' interrelation." The variables used were the USD price, the price fluctuated within an hour, seven days, and twenty-four hours, market capitalisation, the capacity of crypto of the market, United States dollars, and units, the dispensing amount of the coins in which the market consists of public entities. As the sample and population, Ethereum, Binance USD, Polygon, Bitcoin, Tether, BNB, Cardano, USD Coin, XRP, and Dogecoin were utilized. Finally found the low amount of worth of crypto and its changeability, depending on changes in the economy of the world and macro-economic components, in specific stipulation: as an outcome of the first component, crypto as an item of financing is highly insecure.

Bielinskyi et al. (2023) study on the multifractal cross correlation link among equity and cryptocurrency markets sought to determine the degree of correlation among the highly capitalized and developed equity markets in China and the USA, as measured by the S&P 500 and the Hang Seng, and the cryptocurrency market, which is mediated by bitcoin. The variables used were time and crash durations for every index. Standard and Poor 500 indicators, HSI stock indices, United States

of America, China stock markets, and Bitcoin were included in the sample. Utilizing the sliding windows approach, the MF-DCCA study has built measurements of cross-correlated patterns in the S&P 500, Bitcoin, and HSI. Through the sliding window approach, the researchers limited their zestful covering duration and specified a higher level of non-linearity along with powerful anti-persistency within the time durations for every indicator. The cryptocurrency market remained insignificant on a short-term basis, and there was not much association among the equity market and the cryptocurrency market. According on the report, there is more interaction between the equity and cryptocurrency markets.

Mand et al. (2020) did research titled Analysis of Bitcoin and Stock Markets. In addition to analysing the effectiveness of several trading methods for cryptocurrency portfolios, this study intends to propose a methodology for building cointegrated portfolios made up of several cryptocurrencies. The authors create a mean-reverting portfolio consisting of a linear combination of cryptocurrencies by using several statistical techniques, including the Engle-Granger test and the Johansen test. A set of performance measurements is used to construct trading systems to evaluate and compare various trading strategies with stop-loss constraints. The four cryptocurrency currencies included in the paper's cointegrated portfolios are Ethereum, Bitcoin, Litecoin, and Bitcoin Cash. The related trading methods are demonstrated to be profitable in a variety of setups.

In a study conducted during the COVID-19 period, Daho (2021) examined the link between cryptocurrency valuations and the stock prices of technology firms. This research paper's main goals are to demonstrate the Bitcoin currency's significance in international markets and to emphasize how it is related to the share prices of IT businesses. Additionally, it makes an effort to look into and pinpoint the biggest swings this industry had in the COVID-19 pandemic by employing ten top global technology businesses for a statistical study of ten technology compa-

nies from 2015 to 2021. They used daily data of the technology companies listed in the study sample over a period of time. Moreover, the COVID epidemic was shown to have a significant negative impact on the profit margins of firms operating in the information and communication technology industry.

Malladi (2022) examined the pro forma modelling of cryptocurrency return, volatility, interconnections, and portfolio properties. The contribution of this research is to provide some forecasting models for cryptocurrencies to assist the accounting modellers and financial modellers by comparing cryptocurrencies against other asset classes, including gold, equities, and bonds, are also examined using daily data from the period from 2013 to 2020 for the six most popular cryptocurrencies which make up 80% of the market. The five-factor model of Fama and French, which has been widely used in analysing stock returns, is employed to Bitcoin returns using panel data. The seven conclusions developed from this research are briefly summarised as follows. VECM is the most effective out-of-sample method for predicting bitcoin price volatility. For accounting purposes, cryptocurrencies vary from cash because their daily return standard deviations are significantly higher than those of conventional financial assets. The top asset haven cannot be substituted for by cryptocurrencies. The five key variables influencing daily cryptocurrency returns include cryptocurrency return volatility, the S&P 500 index, gold returns, daily return volatility, and the Volatility Index (VIX). The persistent volatility observed in cryptocurrency returns can be effectively modelled using the GARCH framework. From a portfolio perspective, cryptocurrencies tend to exhibit negative alpha and high beta characteristics, aligning them with the risk-return profiles of small-cap and emerging market firms. Similar to a leveraged portfolio, a cryptocurrency-based portfolio can offer investors enhanced opportunities for portfolio diversification.

2.2 Studies Highlighting a Positive Relationship with Stock Markets

Vardar and Aydođan (2019) studied return and volatility spillovers across Bitcoin and multiple equity classes in the Turkish financial market. Their state space model covered the period from June 2010 to June 2018. They encountered a one-way spillover from the bond market returns to the Bitcoin market. The study also found two-way return and volatility spillovers between Bitcoin and other markets, namely China and US equities, crude oil prices, and electronic payment values across markets indicates Bitcoin's connection with the traditional financial markets. There are bidirectional cross-market shocks from US stock prices and oil to bonds and inflation expectations and vice versa. Finally, the research reveals no shock or volatility spillovers between the US dollar exchange rate and Bitcoin.

This study intended to find the Inter-dependence of the virtual and the stock market by Kaur & Meena (2023), having the target of determining the inter-dependence of the main crypto and stock market indices, providing the entities or investors a possible way for heterogeneity. In the study, the independent variables were the five cryptocurrencies, and the dependent variable was stock market indices. The sample was taken from 1st December to 30th November 2021 the digital currencies and the equity market returns were identified in the research. In the methodology, the research involved examining the inter-dependence of several cryptocurrencies of various capital market indices. The final price values of the three main crypto extracted from the CoinMarketCap as well as CoinDesk websites were taken for stock indices the changed final price value information was taken from the Yahoo Finance website. In the final finding, a powerful correlation between crypto and the capital market was identified in the progress and adoption. The powerful correlation proves that Bitcoin is turning into an investment that has a high risk. Correlating with stock has increased beyond other assets like main currencies, gold, and investment-grade bonds, proving that the insecure

heterogeneity advantages are restricted, conflicting with the previous credence.

2.3 Studies Reporting a Negative Significant Relationship

Kostika & Laopodis (2019) performed research on the dynamic relationships between cryptocurrency, exchange rates, and global equity markets. This study explores how major global currencies, key stock indices, and selected cryptocurrencies are connected in both the short run and the long run. The analysis shows that there is no statistical significance in the short- or long-term relationships between Bitcoin prices and exchange rate or equity returns, despite some intermittent similarities in price movements. Each cryptocurrency's response to the Chinese Yuan is very erratic when compared with the other currency pairs. Cryptocurrencies appear to generally move in isolation within the global financial system, which implies cryptocurrencies can be incorporated into international investment portfolios without directly being impacted by increases or decreases in stock market exchanges or foreign exchange rate fluctuations across countries.

2.4 Studies Reporting Mixed Relationship

According to Umar et al. (2020) analysis, they aimed to find whether stock and cryptocurrency markets are related. This research examines the relationship among five cryptocurrencies which Ripple, Bitcoin, (XRP), Bitcoin Cash (BCH), Ethereum (ETH), and EOS, and several global stock markets including the NASDAQ Composite Index, the NYSE Composite Index, Nikkei 225, the Shanghai Stock Exchange, and Euronext NV. This research used data from April 15, 2019. The results show that (conditional) association is present among most cryptocurrencies and stock market indices conditional on time we have a significant but time varying conditional association. Specifically, the authors report that

larger shocks have a larger effect, in particular, negative shocks had a larger effect than equal but positive shocks. They further examine whether investors can achieve portfolio diversification by combining cryptocurrency assets with equity returns from major equity markets.

Sami and Abdallah (2020) explored the impact of the cryptocurrency market on stock market performance in the MENA region and focused on the differences in the effects in the Gulf and other countries in MENA. They used the following indicators: the index of financial markets, oil production level, an index of financial transactions, the volume of cryptocurrency trading, and cryptocurrency returns. They used daily data for both cryptocurrencies and Gulf region stock indices from 2014 to 2018. The study found a connection among cryptocurrency and equity return in the MENA region. For Gulf countries that observe Islamic Sharia law, there is a 0.15 interrelation among digital currency and equity return. And other MENA countries has a 0.13 relation among crypto return and equity return.

2.5 Studies Reporting No Significant Relationship

Luis Alanaa et al. (2020) did a investigation on the association between equity index and cryptocurrencies. Ethereum, Bitcoin, Ripple, Stellar, Litecoin, and Tether were the variables that were used. In this study, 826 trade days during the period from May 7, 2015, to October 5, 2018, were extracted from a cryptocurrency data collection. The methodology of this study assessed the linkage between 3 famous cryptos and several financial assets, inclusive of the Standard Poor's 500 composite, GSCI Gold Total Return, US NDB Index, S&P and, VIX S&P Bond Index, and S&P GSCI Commodity Total Return. Having the same aim, the study focused on working with the six biggest financial asset groups possessing the information gathered from the Data stream. In the final finding using the bivariate analysis, the study identified that there is no correlation between the six cryptocurrencies and small amounts of proof

identified for the cointegration between digital coins and the chosen stock market indicators.

2.6 Research relating to other determinants of the stock market

Aho (2024) conducted a study to examine “the effects of the OMX Helsinki Small Cap Index on the performance of Finland's macroeconomy”. Using two distributed lag models, the research used monthly data from 2007 to 2023 and analysed long-run relationships. The first conclusion shows that overall, in the long-run M1 and the Industrial Production Index (IPI) have a positive connection with the index of stocks and that CPI has a negative long-term relationship with the index of stocks. In short, the condition of the index stock has a negative relationship with the 10-year Finnish government bond yield and the Consumer Price Index (CPI), in both cases increases in either tend to coincide with poorer performance of the stock index. However, the study's interpretive caveat that the models did not fully satisfy all linear regression assumptions suggests that the proposals should be made with caution. This insight provides valuable context for understanding how local macroeconomic indicators affect the performance of small-cap stocks in Finland.

Vaihekoski (2024) retraces the historical evolution of the Finnish stock market by constructing a new, value-weighted total return index for the Helsinki Stock Exchange (HSE) for the period 1912–1981. Utilizing newly digitized primary sources, including official quotation lists and corporate capital action records, the study improves upon prior indices by incorporating accurate dividend timings and capital operations. The findings highlight an average monthly return of 1.03% (13.14% p.a.), with notable industry variations—banking underperforming, and metal/manufacturing sectors leading. This refined index offers enhanced tools for long-term risk assessment and historical financial analysis of the Finnish market.

Frod and Kengatharan (2021) examined the connection among macroeconomic variables and Sri Lankan equity market returns. The intent of the study was to identify which of these economic variables would carry some weight in terms of influencing stock market performance. The macroeconomic indicators examined were interest rate, the real exchange rate, inflation rate, and money supply. equity market performance was expressed using the All Share Price Index. Their findings showed that although money supply and the exchange rate did not have any long run effect on stock market performance, both the interest rate as well as inflation rate had a significant impact on stock market performance in a negative way. Furthermore, the study indicated that interest rates continued to exert a notable negative impact on the market in the short term.

In a different context, Nyberg and Vaihekoski (2009) created and published a new monthly, value weighted total return index for the Finnish stock market covering the period from October 1912 to March 1970. Using bid prices, dividend data, stock counts, and corporate actions (e.g., splits, bonus/cash issues), they reconstructed more accurate returns than prior indices. Their findings show an annual average return of 12.44% for the value weighted total return index, with smaller firms outperforming in equally weighted versions. This improved dataset enables long-term financial market analysis and equity risk premium studies in Finland.

Fernando et al. (2017) studied the effect of macroeconomic factors on stock market performance in Sri Lanka, paying particular attention to the All Share Price Index (ASPI) of the Colombo Stock Exchange. The data was collected from January 2006 to December 2016, sourced from the Central Bank of Sri Lanka. Results suggested that macroeconomic variables were entrenched in the ASPI. Further, the ASPI tended to respond positively to changes in the US dollar exchange rate, real GDP and growth, and negatively to increases in interest rates, falling industrial output and days of civil war. The study additionally found that the

global financial crisis was associated favorably with ASPI's performance, which differs from a majority of advanced economies. According to the study, when a country undergoes positive transformation, like Sri Lanka ending its thirty-year conflict, foreign investment tends to come into the capital market despite the uncertainty of the outside world. It also displays the rate of inflation and money supply growth.

In 2023, Ranaweera conducted research on the factors influencing Sri Lankan finance companies' share prices. The goal of this paper was to find the factors that influence the shares price of Sri Lankan finance companies. External factors included raw material prices, economic factors, inflation, investor confidence, interest rates, currency rates, etc. The research examined a variety of internal factors: antagonism over earnings per share (EPS), return on equity (ROE), interest rates, inflation, and exchange rates as the independent variables and raw material prices were the dependent variable. Information over 5 years (2017-2022) was accessed using STATA and the methods used to process the data included descriptive statistics, regression, and correlation analysis. It was discovered that both EPS and inflation had a positive relationship with raw material prices, and ROE, interest rate, and exchange rates had negative influences on raw material prices. The only statistically significant factor affecting changes in raw material prices was EPS.

3 DESCRIPTION OF THE DEVELOPMENT

A quality research analysis requires a clearly defined research strategy. In this chapter, the author extensively discussed the methodology that was used for the analysis. The chapter shows the research process, analytical tools, and procedure to establish reliability and validity of the research process and findings as a whole. Under the description of the development included the research philosophy, definitions of key variables, underlying assumptions, data collection methods, and techniques for data analysis. By establishing a structured approach, this chapter ensures that the research is replicable, scientific nature, and transparent.

3.1 Research Design

In this study, I wish to investigate the impact of cryptocurrency, the return on cryptocurrency, on the share market, and on the relationship return on cryptocurrency and the Nasdaq Helsinki Index (OMXHPI) as developed in three key models. The first model is Bitcoin and the share market, which has the highest market capitalization (\$ 2.04 trillion). The second model is Ethereum and the share market (\$ 301 billion), the second-largest traded currency. The third model is Tether USDT (\$ 148 billion), which is the third-largest market-capitalized currency. In this study, I want to consider cryptocurrency return impacts separately on the return in the stock market in the three models above. Because relationships can react differently to the different models. To the author's knowledge, there was no one examining these 3 currencies' relationships with the Nasdaq Helsinki index of Finland in one model. To find the conclusion, the author employed descriptive statistics, correlation analysis, and ran a regression model for the investigation.

3.2 Regression Model

$$\text{OMXHPI} = \beta_0 + \beta_1 \text{BTC} + \beta_2 \text{VOL} + \beta_3 \text{INT} + \beta_4 \text{INF} + \beta_5 \text{EXR} + \beta_6 \text{GDP} + u_i$$

$$\text{OMXHPI} = \beta_0 + \beta_1 \text{ETH} + \beta_2 \text{VOL} + \beta_3 \text{INT} + \beta_4 \text{INF} + \beta_5 \text{EXR} + \beta_6 \text{GDP} + u_i$$

$$\text{OMXHPI} = \beta_0 + \beta_1 \text{USDT} + \beta_2 \text{VOL} + \beta_3 \text{INT} + \beta_4 \text{INF} + \beta_5 \text{EXR} + \beta_6 \text{GDP} + u_i$$

Where:

β_0 = Intercept

OMXHPI = OMX Helsinki All-Share Index (Nasdaq Helsinki)

BTC = Bitcoin Price

ETH = Ethereum Return

USDT = Tether Return

VOL = Cryptocurrency Trade Volume

INT = Interest Rate

CPI = Inflation Rate

EXR = Exchange Rate

GDP = Growth Rate of Gross Domestic Product

3.3 Conceptual Framework

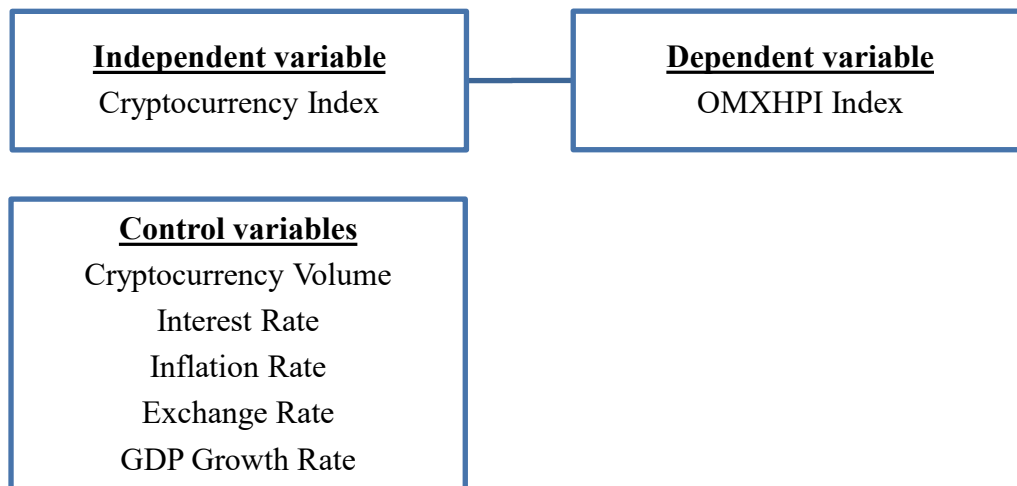


Figure 1: Conceptual Framework

3.4 Variable Definition

Cryptocurrency Return: An empirical study has been conducted by Thaker and Mand (2021), and it has relied on the Bitcoin index as a measure of Bitcoin return. In the current research, we also used the cryptocurrency index to quantify the cryptocurrency return. This study analyses three major cryptocurrencies. Each currency has an index for quantifying its return. According to this definition, Bitcoin returns will be measured by the Bitcoin index, Ethereum returns will be measured by the Ethereum index, and Tether returns will be quantified by the Tether index.

$$\begin{aligned}
 \text{Bitcoin Return} &= \text{Bitcoin Index} \\
 \text{Ethereum Return} &= \text{Ethereum Index} \\
 \text{Tether Return} &= \text{Tether Index}
 \end{aligned}$$

OMXHPI Return: This study investigates whether there is any impact of digital currency return on the equity market return. The main dependent variable of this study is the OMXHPI of Nasdaq Helsinki Index (OMXHPI). Frod & Kengatharan (2021) used the OMXHPI Index to measure the stock market return.

$$\text{Stock Market Return} = \text{OMXHPI Index}$$

Cryptocurrency Volume: Sami and Abdallah (2020) also used the Average logarithm number of cryptocurrencies traded per day as a control variable, which is present on the CoinMarketCap site. The average monthly quantity of cryptocurrencies traded in the market, as represented by the logarithm provided by coinmarketcap.com, is used in this study to calculate the volume of cryptocurrencies.

$$\text{Cryptocurrency Volume} = \text{Average number of monthly traded}$$

Interest Rate: This analysis also investigates the role of interest rates in stock market behavior, aiming to determine whether they moderate the relationship between stock market performance and cryptocurrency returns. Interest rates are incorporated as a control variable within the regression model to evaluate their influence on fluctuations in Finland's All-Share Price Index (OMXHPI). The study utilizes the European Central Bank's (ECB) main refinancing operations rate, which serves as the primary benchmark interest rate across the eurozone, including Finland. This rate represents the cost at which commercial banks borrow funds from the ECB and serves as a key policy tool influencing liquidity, investment behavior, and stock market dynamics (European Central Bank, n.d.). The monthly ECB refinancing rate was incorporated into the anal-

ysis, following the approach of previous studies that “explore the transmission of monetary policy into financial markets across the euro area” (Bruno & Shin, 2015; Kliber et al., 2022).

$$\text{Interest Rate} = \text{Monthly ECB refinancing rate}$$

Inflation Rate: Inflation is directly impacted by the OMXHPI return. Therefore, we must also consider the inflation rate while examining the effect of the virtual coin’s return on the equity return. The consumer price index (CPI) was previously employed in empirical studies to gauge the nation's rate of inflation. The author of the Ranaweera (2023) study employed the CPI. The CPI is a widely accepted indicator of price level changes over time and serves as the standard method for assessing inflation in macroeconomic research. For Finland, CPI data is sourced from Statistics Finland, which publishes monthly CPI figures aligned with Eurostat standards. By including the monthly CPI in the model, the study accounts for the broader macroeconomic environment in which asset prices including stock market indices are determined. This enhances the robustness of the analysis by controlling inflationary pressures that could influence investment behaviour and stock returns.

$$\text{Inflation Rate} = \text{Consumer Price Index}$$

Exchange Rate: Most researchers in the literature examined the influence of exchange rates in the performance of stock markets. The foreign currency value of one unit of the local currency is what is defined as an exchange rate. Fernando et al. (2017) and Ranaweera (2023) compare the rate determined dollar value to the euro. This study also looks at how the exchange rate affects the return on the OMXHPI. It is calculated by dividing the USD by the EUR.

$$\text{Exchange Rate} = \frac{\text{EUR}}{\text{USD}}$$

GDP Growth Rate: Prior research has indicated that stock market return is directly affected by GDP growth rate. Therefore, we need to consider the GDP growth rate when assessing how cryptocurrency return affects the stock market return. Previous empirical studies have used the Real GDP growth rate as the measure for GDP growth rate for the nation. The author of the Fernando et al. (2017) study employed this technique to measure the growth in the gross domestic product. However, the econometric model used in this study runs on a monthly frequency, but GDP data for Finland is released on a quarterly basis. To reconcile this mismatch, the flat allocation method was employed to convert quarterly GDP data into monthly intervals. This approach assumes that the quarterly value is uniformly distributed across the three months within the quarter, allowing for smoother integration into monthly time series analysis.

$$\text{GDP Growth} = \frac{(GDP\ 1 - GDP\ 0)}{GDP\ 0} * 100$$

Table 1: Variable explanation

Variable	Description	Abbreviation	Source
Bitcoin Return	Bitcoin Index	BTC R	Thaker and Mand (2021)
Ethereum Return	Ethereum Index	ETH R	Thaker and Mand (2021)
Tether Return	Tether Index	USDT R	Thaker and Mand (2021)
OMXHPI Index	OMX Helsinki All-Share Index Return	OMXHPI R	Frod & Kengatharan (2021)
Cryptocurrency Volume	Average logarithm number of cryptocurrencies traded per day	VOL	Sami and Abdallah (2020)
Interest Rate	ECB Refinance Rate	INT	Bruno & Shin, 2015 Kliber et al., 2022

Inflation Rate	CPI	CIP	Ranaweera (2023)
Exchange Rate	The rate determined USD value against EUR	EXR	Ranaweera (2023) Fernando et al. (2017)
GDP Growth	Real GDP growth rate	GDP G	Fernando et al. (2017)

3.5 Hypothesis

The following theories are developed in light of the research methodology to investigate experimentally how the return of cryptocurrencies affects the return of the Nasdaq Helsinki Index (OMXHPI) stock market. The formulated hypothesis is as follows,

H1: There is an impact of the Bitcoin return on the OMXHPI return of the Nasdaq Helsinki Index (OMXHPI)

H2: There is an impact of the Ethereum return on the OMXHPI return of the Nasdaq Helsinki Index (OMXHPI)

H3: There is an impact of the Tether return on the OMXHPI return of the Nasdaq Helsinki Index (OMXHPI)

3.6 Population And Sample Selection

Population of the study: There were approximately 25,000 different kinds of cryptocurrencies worldwide as of May 1, 2025, and their current market value is \$2.49 trillion. All shares which trading on the Nasdaq Helsinki Capital Market are included in the OMX Helsinki All-Share Index (OMXHPI). As of May 2025, the index includes 139 companies, representing the full breadth of publicly traded firms in Finland. with a Market

Capitalization of Rs. 4,534.65Bn. OMXHPI represents all the listed companies on Nasdaq Helsinki. This study's population comprises all cryptocurrencies in the world and the OMXHPI of the Nasdaq Helsinki Index.

Sample Selection: A sample is a group of selected populations that represents the research population. The study examines the relationship between cryptocurrency returns and OMX Helsinki All-Sher Index (OMXHPI). In this analysis, the authors selected three major cryptocurrencies for investigation based on their market capitalization. According to the data as of May 1, 2025, Bitcoin, Ethereum, and Tether coin are the three largest market-capitalized cryptocurrencies.

3.7 Data Collection

This research makes use of secondary data that was obtained between the sample period from 2009 to 2025. Monthly data for financial and cryptocurrencies variables were obtained from sources including Investing.com and CoinMarketCap. Macroeconomic indicators were collected from reputable institutions: Statistics Finland (Tilastokeskus), the European Central Bank (ECB), Eurostat, and the World Bank. Furthermore, content was complemented with information from secondary literature sources like academic journals, articles, etc.

3.8 Analysis Method of Data and Techniques

In the present study, numerous processing techniques were used. Descriptive statistics, regression analysis, and correlation analysis were the three main data analyses used. The researcher looks through the data that was gathered to provide interpretations. The following statistical tools serve as the foundation for the analysis and interpretation of data gathering.

Descriptive statistics: Using descriptive statistics, the key findings from the data gathered from annual research reports are presented. The data is analyzed using typical descriptive statistical methods. It includes mean, minimum, standard deviation, and maximum values.

Correlation analysis: Correlation coefficient analysis is used to quantify the degree of a linear correlation between two variables, as well as other aspects like cryptocurrency return and OMXHPI. In this study, the correlation among the variables is ascertained using Pearson's Correlation Analysis.

Regression analysis: The following regression model was created by the regression analysis based on the historical study to evaluate the impact of several factors on the return of the OMXHPI. A statistical technique used in statistics to determine the relationships between cryptocurrency return, OMXHPI return, and other factors influencing OMXHPI return is multiple regression analysis. The STATA 13 program will be used in this study to obtain the results.

4 RESULTS

4.1 Introduction

To analyse the effects of cryptocurrency, return to all share price index of OMX Helsinki, this study used three time series regressions. This study used quarterly data from 2010 to 2024. This model used Stata 13 software to analyse the relationship. This study mainly used descriptive analysis, correlation analysis, and regression analysis.

4.2 Descriptive Statistics

The All-share price index of OMX Helsinki comprises 173 observations and a mean of 8,823.15, based on the data produced. The lowest and largest values are 4,986.13 and 13,186.09, respectively, with a standard deviation of 1,861. The mean of 173 observations for Bitcoin is 14,234. With a minimum and maximum ranging from 0.1 to 96405.7, respectively, the standard deviation is 20968.79. Bitcoin shows a standard deviation in volume of 1.77 and a mean of 14.93741, with observation values ranging from a minimum of 11.35919 to a maximum of 24.50061. Ethereum, based on 105 observations, records an average price of 1251.48 (sd=1154.139), with recorded minimum and maximum price of 8.87 and 4287.56, respectively. Ethereum's trading volume varies from 14.47 to 23.63, average of 17.51 (sd=1.61). Tether, with 92 observations, has a relatively stable price pattern; average is 1.0011 (sd=0.0076) and varies from 0.9857 to 1.06. Tether's volume is based on the same number of observations and averages 20.68 (sd=2.18). It ranges from 15.53 at the minimum to 24.13 at the maximum.

This study includes four macroeconomic indicators: interest rate, exchange rate, gross domestic product (GDP), and consumer price index (CPI), each with a total of 173 data points. The interest rate shows an

average of 1.1780, a standard deviation of 1.37, and ranges between 0.25 and 4.75. The exchange rate fluctuates from 0.9826 to 1.4442, with a mean of 1.1847 and a standard deviation of 0.1121. GDP values fall between -6.5 and 4.9, averaging 0.1486 and showing a standard deviation of 1.29. The CPI records an average of 124.46 with a standard deviation of 9.78, and the lowest and highest values are 109.6 and 146.7, respectively.

Table 2: Descriptive Summary Table.

Variable	Obs	Mean	Std. Dev.	Min	Max
OMXHPI	173	8823.15	1861.56	4986.13	13186.09
BTC	173	14234.00	20968.79	0.10	96405.70
ETH	105	1251.48	1249.38	8	4628.9
USDT	92	4628.9	0.00761	0.9857	1.06
INT	173	1.178	1.372	0.25	4.75
EXR	173	1.185	0.112	0.983	1.444
GDP_Gr	173	0.149	1.287	-6.50	4.90
CPI	173	124.46	9.72	109.60	146.70

4.3 Pearson's Correlation Analysis

This table displays the results of the coefficient correlations between each independent variable and the OMXHPI. Based on the results, the OMXHPI and Bitcoin (BTC) price exhibit a strong positive correlation of 64.10%, suggesting that as Bitcoin prices rise, the OMXHPI also tends to increase. Closely following is the Ethereum (ETH) price, which shows an even stronger positive correlation of 67.49% with OMXHPI, highlighting the significant influence of major cryptocurrencies on the index.

The Consumer Price Index (CPI) also demonstrates a strong positive correlation of 60.32%, indicating that inflation levels tend to rise alongside OMXHPI. In contrast, the exchange rate change has a strong negative correlation of -64.81% with OMXHPI, suggesting that currency depreciation is associated with declining market performance.

Other notable relationships include Bitcoin trading volume, which is moderately correlated with OMXHPI at 42.59%, and USDT (Tether) volume, which shows a stronger positive correlation of 52.71%. However, USDT price shows a very weak negative correlation of -7.40%, indicating minimal direct influence. The interest rate has a slight negative effect at -6.33%, and GDP growth contributes a modest positive correlation of 14.79%.

Overall, the results emphasize that Bitcoin price, Ethereum price, CPI, and exchange rate changes are the most correlated factors on OMXHPI performance, with cryptocurrency trends playing an increasingly central role in shaping equity market movements.

Table 3: Correlation Matrix

Variable	OMXHPI	BTC_P	BTC_vol	Interst	Ex_rate	Gdp_Gr	CPI	ETH_P	ETH_Vol	USDT_P	USDT_Vol
OMXHPI	1.0000										
<i>(p-value)</i>											
BTC_P	0.6410	1.0000									
<i>(p-value)</i>	0.0000										
BTC_Vol	0.4259	0.1914	1.0000								
<i>(p-value)</i>	0.0000	0.0117									
Interst	-0.0633	0.5091	-0.2209	1.0000							
<i>(p-value)</i>	0.4080	0.0000	0.0035								
Ex_rate	-0.6481	-0.4278	-0.4818	-0.0486	1.0000						
<i>(p-value)</i>	0.0000	0.0000	0.0000	0.5254							
Gdp_Gr	0.1479	0.0286	-0.0364	-0.1020	0.0049	1.0000					
<i>(p-value)</i>	0.0522	0.7087	0.6345	0.1818	0.9488						
CPI	0.6032	0.7997	0.2399	0.6385	-0.6513	-0.0616	1.0000				
<i>(p-value)</i>	0.0000	0.0000	0.0015	0.0000	0.0000	0.4205					
ETH_P	0.6749	0.9237	-0.1231	0.5533	-0.1360	0.0202	0.6981	1.0000			
<i>(p-value)</i>	0.0000	0.0000	0.2109	0.0000	0.1664	0.8381	0.0000				
ETH_Vol	0.0190	-0.2101	0.6696	-0.4246	0.2540	-0.1016	-0.3402	-0.2676	1.0000		
<i>(p-value)</i>	0.8478	0.0314	0.0000	0.0000	0.0089	0.3022	0.0004	0.0058			
USDT_P	-0.0740	-0.1371	-0.0269	-0.1032	-0.0343	0.0937	-0.1470	-0.1406	-0.0435	1.0000	
<i>(p-value)</i>	0.4834	0.1924	0.7992	0.3275	0.7454	0.3745	0.1619	0.1812	0.6806		
USDT_Vol	0.5271	0.8144	-0.1888	0.5387	-0.3816	0.0178	0.7369	0.8028	-0.3339	-0.2738	1.0000
<i>(p-value)</i>	0.0000	0.0000	0.0715	0.0000	0.0002	0.8661	0.0000	0.0000	0.0011	0.0083	

4.4 Regression Analysis of Bitcoin

To analyse the impact of bitcoin price on the All-share price index, this study used a time series regression. In this model, the authors used 173 observations. This study used quarterly data from the launch date of Bitcoin in August of 2010 to December of 2024. This model used Stata 13 software to analyse the relationship.

4.4.1 Normality

To ensure the validity of our regression analysis examining the impact of Bitcoin prices on the All-Share Price Index (OMXHPI) of Finland, the author assessed the normality of the variables involved and specifically, evaluated Bitcoin Return, OMXHPI Index, Cryptocurrency Volume, Interest Rate, CIP, Exchange Rate, GDP Growth, and the residuals from our regression model. Normality was tested using skewness and kurtosis values, where skewness values within the range of -2 to +2 and kurtosis values below 5 were considered indicative of normal distribution. The results indicated that most variables adhered to these criteria, confirming their normal distribution. However, BTC price, BTC volume and GDP growth were deviated from normality. To address this, we identified and removed outliers from these datasets by 2% and 98% and subsequently ran the regression analysis. This adjustment helped ensure that our model's assumptions were met, thereby enhancing the validity of our findings.

4.4.2 Multicollinearity

Multicollinearity is a situation in which two or more explanatory variables in a multiple regression model are strongly correlated with each other. It can lower the reliability of coefficient estimates and lead to wider confidence intervals, making it harder to ascertain the individual effect of each variable. A Variance Inflation Factor (VIF) of 5 or higher is generally a good rule of thumb for identifying the presence of multicollinearity with

the variables. The model's coefficient table, which includes all explanatory and control variables, yields VIF values for each variable. The average VIF is 3.64. According to the results consumer price index (CPI) has a multicollinearity issue with 9.16. Due to this issue, the author removed the consumer price index from the regression model.

Table 4: VIF table of BTC

Variable	VIF	1/VIF
cpi	9.16	0.1092
ex_rate	3.49	0.2867
crp_price	3.32	0.3013
interst_rate	3.17	0.3154
ln_vol	1.58	0.6321
gdp_gr	1.13	0.8819
Mean VIF	3.64	

Source: Author Compiled

4.4.3 Autocorrelation

An autocorrelation is the measurement of a time series and its lagged (shifted) version's levels of relationship. While autocorrelation uses the same time series at different time ranges, it is similar to saying you are testing if two different time series were correlated. The presence of autocorrelation in the residuals of the recession model is assessed by a Breusch-Godfrey LM test. The test returns a p-value of 0.0000, which is statistically significant at the 1% level. There is very strong evidence of autocorrelation. As a result, zero hypothesis that is no serial autocorrelation it has been rejected. This suggests violating one of the fundamental estimates of traditional linear regression as it indicates that the dataset has autocorrelation.

Table 5: Breusch-Godfrey LM test for autocorrelation

Lag(p)	Chi2(χ^2)	df	Prob > χ^2
1	116.255	1	0.0000

H0: no serial correlation

Source: Author Compiled

4.4.4 Heteroscedasticity

A time series is heteroskedastic if its variance changes over time. Otherwise, the data set is homoscedastic. Heteroskedasticity affects the modelling of time series. So, it is important to detect and deal with this condition. Unconditional heteroscedasticity involves changes in volatility more generally that are not contingent upon the previous level of volatility. Conditional heteroscedasticity, on the other hand, describes volatility that will change based on the amount of volatility seen in previous periods. Unconditional heteroscedasticity is used when you can predict overall future periods of high or low volatility without relying on previous volatility. This data collection has a probability value of 0.7040. A Cook-Weisberg test probability value of more than 5% shows the presence of homoscedasticity. There is no heteroscedasticity issue.

Table 6: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant Variance
Variable: fitted value of OMXHPI

Chi2(1)	0.14
Prob > chi2	0.7040

Source: Author Compiled

4.4.5 Regression

This data set consists of an autocorrelation issue and no heteroscedasticity issue. To enhance the normality of BTC, volume and GDP, the author removed outliers by Winsorized at 2 percent to 98 percent. In addition to that, the CPI variable was removed from the model. The author used the Newey-West Regression to analyse the impact of bitcoin price on OMXHPI Finland.

Table 7: Regression analysis of Bitcoin

Dependent Variable	: OMXHPI	F (6,166)	: 45.01
Method	: Newey-West	Prob>F	: 0.0000
Sample period	: 08-2010 to 12-2024	R-squared	: 0.8109
Periods included	: 173	Root MSE	: 823.97

OMXHPI	Coefficient	Std. Err.	t-statistic	Prob.
BTC	.0428385	.0083079	5.16	0.000
BTC_VOL	44.73865	54.81299	0.82	0.416
INT_Rate	-924.4143	108.3187	-8.53	0.000
Ex_Rate	-422.68	1171.429	-0.36	0.719
GDP	340.2678	96.52582	3.53	0.001
CONSTANT	-6502.659	4538.167	-1.43	0.154

Source: Author Compile

The R2 value of the model is 0.8109. Consideration of the F-statistic's probability value reveals that the entire model is significant at the 1% and 99% confidence levels; as a result, the F-statistic's probability value is 0.0000. In other words, the price of Bitcoin significantly affects the price of all shares in Finland. According to the regression results, Bitcoin price has a significant positive influence on OMXHPI, which suggests that raising Bitcoin price enhances OMXHPI by 4.28%. This positive impact is further confirmed by the significance at 1% and T value of 5.16.

Similarly, the interest rate has a significant negative effect on Finland's OMXHPI, which implies that as the interest rate grows by 1%, the OMXHPI declines by 924. The T value of -8.53 confirms this negative impact. GDP has a significant positive influence on OMXHPI (t= -3.25). When the increase of GDP increases by 1%, OMXHPI will grow by 340.26. When the other control variables are included, Bitcoin volume and exchange rate do not have a significant influence on OMXHPI Finland, as indicated by a greater probability value than 10%.

4.5 Regression Analysis of Ethereum

To analyse the impact of the Ethereum price on the All-share price index, this study used a time series regression. In this model, the authors used 105 observations. This study used quarterly data from the launch date of Ethereum in April of 2016 to December of 2024. This model used Stata 13 software to analyse the relationship.

4.5.1 Normality

To assess the validity of regression analysis, regarding the effect of Ethereum prices on Finland's All-Share Price Index (OMXHPI), the author checked variables for normality which included Ethereum returns, OMXHPI index, cryptocurrency turnover, interest rate, CPI, exchange rate, GDP growth and model residuals. The author used measures of skewness and kurtosis for normality checks, considering skewness of between -2 and +2 and kurtosis values that are below 5, to show evidence of a normal distribution. The results indicated that most variables adhered to these criteria, confirming their normal distribution. However, the GDP growth deviated from normality. To address this, we identified and removed outliers from these datasets by 3% and 97% and subsequently ran the regression analysis. This adjustment helped ensure that our model's assumptions were met, thereby enhancing the validity of our findings.

4.5.2 Multicollinearity

Multicollinearity happens when two or more independent variables in the regression model show a strong relationship. The bad news is that this can lead to biased estimates of the standard errors of the estimated coefficients, which can lead to larger confidence intervals for estimating parameters and significance tests that are less able to demonstrate significance for the affected variables. To determine if there is evidence of multicollinearity in the regression model, I calculated the Variance Inflation Factor (VIF) for each of the explanatory variables. A commonly used threshold is that a VIF value of 5 or higher indicates a potential multicollinearity issue. The model's coefficient table, which includes all explanatory and control variables, yields VIF values for each variable. In the initial model, the Consumer Price Index (CPI) exhibited a higher VIF value, indicating a serious multicollinearity problem. As a result, the CPI variable was removed from the model to improve the reliability of the regression estimates. After this adjustment, the remaining variables

showed acceptable VIF levels, all well below the threshold of 5. Specifically, exchange rate change (VIF = 2.02), ETH price (1.49), interest rate (1.34), log of volume (1.30), and GDP growth (1.18) demonstrated low multicollinearity. The mean VIF for the revised model was 1.46, confirming the absence of multicollinearity among the remaining independent variables.

Table 8: VIF table ETH

Variable	VIF	1/VIF
ex_rate	2.02	0.495261
crp_price	1.49	0.673211
interst_rate	1.34	0.744517
ln_vol	1.30	0.772094
gdp_gr	1.18	0.846497
Mean VIF	1.46	

Source: Author Compiled

4.5.3 Autocorrelation

Autocorrelation is an association of a time series with the same time series in the past. More specifically, it indicates how the current values relate to those previous values at different time lags. While autocorrelation uses the same time series data twice - once in original form and then lagged by one or more periods it conceptually acts like the correlation of two different time series.

The Breusch-Godfrey Lagrange Multiplier (LM) test was employed to test for autocorrelation in the regression model's residuals. The results, displayed in the below table, typify a Chi-square statistic of 54.125, with a p-value of 0.0000 and degrees of freedom. Since the p-value is below the 1% level of significance, the null hypothesis can be rejected (no serial correlation). This suggests the correlation exists in the residuals, suggesting a violation to an assumption of classical linear regression.

Table 9: Breusch-Godfrey LM test for autocorrelation

Lag(p)	Chi2(χ^2)	df	Prob > χ^2
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1	54.125	1	0.0000
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H0: no serial correlation

Source: Author Compiled

4.5.4 Heteroscedasticity

Heteroskedasticity exists when the variance of the errors change over time in a time series data set. This is a violation of one of the assumptions of the classical linear regression model, which is homoscedasticity (constant residual variance). Heteroskedasticity can result in biased statistical inference and ineffective parameter estimates. Heteroskedasticity can be categorized into two forms: Heteroskedasticity can be of two kinds. First, conditional heteroskedasticity means that the current volatility is dependent on the past level of volatility. The second type of heteroskedasticity is unconditional heteroskedasticity that occurs as a result of structural shifts in volatility that is unrelated to past fluctuations.

Heteroskedasticity in the regression model was assessed using the Breusch-Pagan/Cook-Weisberg test. The test returned a Chi-square value of 2.63 with 1 degree of freedom and a p-value of 0.1047. Since the p-value is greater than 0.05 significance level, we fail to reject the null hypothesis of constancy of variance. This indicates that the residuals of model 42 do not show evidence of heteroskedasticity, which confirms homoscedasticity in this model.

Table 10: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant Variance	
Variable: fitted value of OMXHPI	
Chi2(1)	2.63
Prob > chi2	0.1047

Source: Author Compiled

4.5.5 Regression

This data set is subject to an autocorrelation issue and a heteroscedasticity issue. To enhance the normality of GDP, the author removed outliers by Winsorizing at 3 percent to 97 percent. In addition to that, the CPI variable was removed from the model. The author used the Newey-West Regression to analyse the impact of Ethereum price on OMXHPI Finland.

Table 11: Regression analysis of ETH

Dependent Variable	: OMXHPI	F (5,99)	:	32.55
Method	: Newey-West	Prob>F	:	0.000
Sample period	: 04-2010 to 12-2024	R-squared	:	0.6596
Periods included	: 105	Root MSE	:	676.18

OMXHPI	Coefficient	Std. Err.	t-statistic	Prob.
ETH	.8520198	.0723901	11.77	0.000
ETH_VOL	40.03451	51.52559	0.78	0.439
INT_Rate	-282.3495	51.7118	-5.46	0.000
Ex_Rate	2922.017	1198.728	2.44	0.017
GDP	2.320718	83.12627	0.03	0.978
CONSTANT	5313.615	1470.221	3.61	0.000

Source: Author Compile

The regression was done with Newey-West to address issues of autocorrelation and heteroskedasticity in the residuals. The model has good explanatory power with a R-squared value of 0.6596, and an adjusted R-squared value of 0.8097, meaning on average, 81% of the variation in the Finland All-Share Price Index (OMXHPI) can be explained by the chosen independent variables. The model has overall good significance with a F-statistic of 32.55, and p-value of 0.0000 at the 1% significance level. This means that the explanatory variables as a set have a relevant impact on the OMXHPI.

In the independent variables, the price of Ether (ETH) has a positive, and statistically significant effect on the OMXHPI. The coefficient on ETH is .852, and the t-statistic is 11.77 ($p < 0.01$) so the results indicate that a one unit increase in Ethereum's price, keeping everything else the same, would correspond to an increase of around 0.85 points in OMXHPI.

With a coefficient of -282.35 and a t-value of -5.46 ($p < 0.01$), on the other hand, it is determined that the interest rate significantly lowers OMXHPI. In addition, an increase in interest rates by one percentage point leads to a decline of approximately 282 points in OMXHPI. Also, exchange rate changes are known to impact OMXHPI and their relationship is (coefficient = 2922.02, $t = 2.44$, $p = 0.017$) which demonstrates that the correlation is positive and OMXHPI responds to changes in exchange rate with reasonable accuracy.

However, as indicated by their low t-statistics and high p-values (0.439 and 0.978, respectively), Ethereum trading volume (ETH_VOL) and GDP growth (GDP) do not show statistically significant associations with OMXHPI. These findings suggest that, within the parameters of our model, changes in GDP growth and trade volume have no discernible effects on the OMXHPI throughout the course of the sample period.

4.6 Regression Analysis of Tether

To analyse the impact of the Tether price on the All-share price index, this study used a time series regression. In this model, the authors used 92 observations. This study used quarterly data from the launch date of the Tether in May of 2017 to December of 2024. This model used Stata 13 software to analyse the relationship.

4.6.1 Normality

To ensure the robustness and validity of the regression analysis examining the impact of USDT prices on Finland's All-Share Price Index

(OMXHPI), the author conducted a normality assessment of the key variables. Specifically, the distributional properties of USDT returns, OMXHPI index values, cryptocurrency trading volume, interest rates, the Consumer Price Index (CPI), exchange rates, GDP growth, and the residuals from the regression model were evaluated. Skewness and kurtosis statistics were used to evaluate normality where skewness values fell between -2 and +2, while kurtosis fell below 5. The outcome demonstrated that most of the variables met these criteria and could, therefore, be considered as normally distributed. However, deviations from normality were observed in the distributions of USDT price and GDP growth. To address these deviations and uphold the assumptions of the classical linear regression model, outliers were removed by trimming the top and bottom 3% of USDT price (i.e., at the 2nd and 98th percentiles), and GDP growth trimmed the outliers with 3% -97%. The regression analysis was subsequently re-estimated using the adjusted dataset. This refinement helped to ensure compliance with model assumptions and improved the validity and reliability of the regression results.

4.6.2 Multicollinearity

Multicollinearity happens when two or more independent variables in a multivariate regression model are strongly linked. This connection can make it tough to figure out the unique effect each variable has on the outcome. Results might get confusing because the variables overlap so much. Predicting outcomes turns tricky if you can't separate their influences. Wider confidence ranges exaggerated standard errors, and inaccurate estimates of the impact of individual explanatory variables can result from this condition. Each independent variable got a VIF score to check for multicollinearity. Generally speaking, a VIF number greater than 5 indicates a possible multicollinearity issue.

As shown in Table X, all VIF values in the current model are well below the commonly accepted threshold. The highest VIF is observed for interest rate (1.65), followed closely by exchange rate change (1.64) and

log trading volume (1.62). The lowest VIF value is for cryptocurrency price change (1.18), indicating very low collinearity. The mean VIF for all explanatory variables is 1.47, confirming the absence of serious multicollinearity issues.

In an earlier specification, the Consumer Price Index (CPI) was found to have a larger VIF, indicating a high degree of collinearity with other variables. Consequently, CPI was excluded from the final regression model to improve the model's overall reliability and stability.

Table 12: VIF table of ETH

Variable	VIF	1/VIF
Ex_rate	1.65	0.606549
crp_price	1.64	0.609856
interst_rate	1.62	0.617238
ln_vol	1.27	0.789896
gdp_gr	1.18	0.849115
Mean VIF	1.47	

Source: Author Compiled

4.6.3 Autocorrelation

Autocorrelation happens when a time series links up with its own past values. This differs from regular correlation because it tracks the same thing across different times. In regression analysis, autocorrelation in the residuals is an issue. It breaks a key rule of linear regression. This can lead to biased estimates. Results could end up unreliable.

Researchers checked for autocorrelation using the Breusch-Godfrey Lagrange Multiplier test. They got a probability value of 0.0000. The Chi-squared statistic came out to 50.345 with 1 degree of freedom. You can see this info in Table 13. The result, significant at the 1% level, means the null hypothesis gets rejected. Serial association is present here. As

a result, the test verifies that the residuals contain first-order autocorrelation, indicating a breach of the traditional regression assumption of independent errors.

Table 13: Breusch-Godfrey LM test for autocorrelation

Lag(p)	Chi2(χ^2)	df	Prob > χ^2
1	50.345	1	0.0000

H0: no serial correlation

Source: Author Compiled

4.6.4 Heteroscedasticity

Heteroskedasticity occurs when error term variance shifts over time. In contrast, homoscedasticity implies constant variance throughout the series. Detecting heteroskedasticity is crucial in regression modelling, as its presence can lead to inefficient estimates and biased inference. It comes in two main types. Conditional heteroskedasticity links changes in volatility to past patterns. Unconditional heteroskedasticity signals wider changes in variance that don't hinge on time.

To spot it, the Breusch-Pagan/Cook-Weisberg test was used. Table X lays out the details. The test gave a p-value of 0.0296, with a Chi-squared value of 4.73. Since the p-value is under 0.05, there's clear evidence against constant variance. This result suggests a breach of the model's assumption of homoscedasticity since it shows the presence of heteroskedasticity in the residuals.

Table 14: Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant Variance

Variable: fitted value of OMXHPI

Chi2(1)	4.73
Prob > chi2	0.0296

Source: Author Compiled

4.6.5 Regression

This data set is subject to an autocorrelation issue and a heteroscedasticity issue. To enhance the normality of USDT and GDP, the author removed outliers of USDT by Winsorizing at 3 percent to 97 percent, and GDP growth was Winsorized by 5%-95%. In addition to that, the CPI variable was removed from the model. The author used the Newey-West Regression to analyse the impact of USDT price on OMXHPI Finland.

Table 15: Regression analysis of USDT

Dependent Variable	: OMXHPI	F (5,86)	: 21.71
Method	: Newey-West	Prob>F	: 0.0000
Sample period	: 05-2017 to 12-2024	R-squared	: 0.5789
Periods included	: 92	Root MSE	: 694.72

OMXHPI	Coefficient	Std. Err.	t-statistic	Prob.
USDT	17226.92	7747.077	2.22	0.029
USDT_VOL	429.4678	56.69134	7.58	0.000
INT_Rate	-249.1453	51.20834	-4.87	0.000
Ex_Rate	5279.736	1529.057	3.45	0.001
GDP	104.7293	114.4229	0.92	0.363
CONSTANT	-21527.38	8884.87	-2.42	0.017

Source: Author Compile

The F-statistics come in at 21.71, with a p-value of 0.0000. This points to strong statistical evidence for the Newey-West regression model in Table 15. Confidence in the results holds firm at the 1% level. The R-squared value lands at 57.89%. So, more than half of the changes in OMXHPI can be traced back to this model.

Ethereum price (USDT) leaves a mark with a coefficient of 17226.92 and a p-value of 0.029. There's clear significance at the 5% level. A rise in Ethereum price seems to lift OMXHPI in a meaningful way. Likewise, there is a highly significant positive correlation between Ethereum trading volume (USDT_VOL) and OMXHPI ($p = 0.000$, $t = 7.58$), indicating

that greater OMXHPI values are associated with larger trading activity. Higher interest rates are generally associated with worse stock market performance, as evidenced by the interest rate's considerable negative correlation with the OMXHPI (coefficient = -249.15, $p = 0.000$). Conversely, the exchange rate has a strong positive effect on the OMXHPI (coefficient = 5279.736, $p < 0.001$), suggesting that currency appreciation may help drive market growth.

The GDP growth variable has a p of 0.363, suggesting there was no statistically significant relationship with the OMXHPI in this model. Finally, with all of the explanatory variables, the constant level, representing the base figure for the OMXHPI, was statistically significant ($p = 0.017$).

5 SUMMARY AND DISCUSSION

This research project will focus on the implications of crypto returns on equity market returns. The author looked at the impact of Bitcoin, Ethereum and USDT return on the OMX Helsinki All-Share Price Index (OMXHPI). Using three multiple regression analyses and statistical techniques, including the Newey-West method, the study aimed to address the overarching research problem: Does cryptocurrency return impact the OMXHPI of the stock market in Finland?

5.1 The Key Findings

Bitcoin Returns: The analysis found that there was a statistically significant positive correlation between the returns of Bitcoin and OMXHPI. This means that increases in Bitcoin prices are associated to increases in the stock market index in Finland. This result shows the growing influence of Bitcoin as a financial asset, reflecting investor behavior that integrates digital currencies into broader investment strategies.

Ethereum Returns: ETH also exhibited a strong and statistically significant positive effect on OMXHPI, just as Bitcoin did. This finding reinforces the view that Ethereum, as a leading altcoin and a major player in decentralized finance, is increasingly perceived by investors as an asset with potential hedging or speculative value.

Tether Returns: The results concerning Tether have no significant impact on OMXHPI. This finding is unsurprising as Tether's price is stable and it is primarily used for trading and not investment. Unlike Bitcoin and Ethereum, Tether's low volatility makes it less attractive for speculative profits and thus less likely to impact the stock market.

Control Variables: Interest rate and GDP growth emerged as important macroeconomic controls. Notably, interest rates had a significant negative impact on OMXHPI, consistent with financial theory that

higher borrowing costs dampen equity performance. GDP growth, though inconsistently significant, displayed a generally positive association.

These conclusions validate the primary hypotheses of the study and suggest that the Finnish stock market, particularly the OMXHPI, is responsive to the dynamics of leading cryptocurrencies, notably Bitcoin and Ethereum. In this way, the present study adds to the increasing literature on crypto equity linkages, especially in the Nordic financial context.

5.2 Reflection

The research process adopted in this study was both challenging and enlightening. Several reflections are noteworthy:

5.2.1 Research Process and Methodology

The use of quantitative methods, specifically regression analysis and diagnostic tests (normality, multicollinearity, heteroskedasticity, and autocorrelation), proved effective in evaluating complex relationships among financial variables. The Newey-West estimator was employed to correct for heteroskedasticity and autocorrelation, enhancing the reliability of the findings.

Despite these methodological strengths, some challenges were encountered. The availability and frequency of data, particularly for Tether and Ethereum in earlier periods, posed limitations, requiring trimming and transformation techniques to maintain data consistency and normality.

5.2.2 Reliability and Applicability

The study's reliability is strengthened by the rigorous econometric modeling and the use of recognized macroeconomic control variables. However, considering the context-specific focus of the study on the Finnish stock market, the findings may not be transferable to other countries or

indices. Still, the results have practical applicability for investors and policymakers operating in markets where cryptocurrency and traditional assets coexist.

5.2.3 Ethical Considerations

This study relied exclusively on secondary data from credible sources such as Statistics Finland, the European Central Bank, and CoinMarketCap. No human participants were involved, and all data handling complied with ethical research standards, including transparency, replicability, and source acknowledgment.

5.2.4 Personal and Academic Growth

From an academic standpoint, this thesis has been instrumental in deepening the researcher's understanding of econometric modeling, financial interrelationships, and empirical data analysis. Practically, it has emphasized the importance of methodological rigor and critical thinking in addressing contemporary issues in finance.

5.3 Suggestions for Future Research

Based on the limitations and findings of the study, a number of potential directions for future research are suggested:

Inclusion of Additional Cryptocurrencies: Future research could expand the sample to include other influential cryptocurrencies such as Ripple, Litecoin, or Solana to assess whether broader crypto-market trends affect stock markets.

Cross-Country Comparative Studies: By conducting a comparative analysis between different national stock indices and cryptocurrency returns, it can be revealed whether the relationships observed in Finland are reflected in other economies with different levels of market maturity and regulatory oversight.

High-Frequency Data Analysis: This study used monthly data. Using daily or weekly data would provide a more critical understanding of the short-term interactions between cryptocurrencies and stock indices.

Behavioral Aspects and Investor Sentiment: Integrating sentiment analysis, possibly through machine learning or social media analytics, could offer a more nuanced understanding of how market psychology drives co-movements between crypto and equity markets.

Regulatory Environment: Future studies could examine how changes in cryptocurrency regulation affect investor behavior and asset price correlations in stock markets, particularly in the EU context.

5.4 Final Considerations

This study contributes to the evolving discourse on the integration of virtual and traditional financial markets. In an era marked by digital transformation and rapid innovation, understanding how emerging assets like cryptocurrencies influence conventional investment platforms is vital. By analyzing the Finnish OMXHPI in relation to Bitcoin, Ethereum, and Tether, this research offers empirical insights that are both timely and relevant. As the boundaries between digital and traditional finance continue to blur, continuous academic inquiry will be essential to navigate this complex financial landscape.

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