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UTILIZING MACHINE LEARNING FOR FINANCIAL RISK ANALYSIS IN THE CRYPTOCURRENCY MARKET

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ABSTRACT

One of the most well-known financial states in the world is cryptocurrency, which presents a number of hazards that affect risk auditors' intrinsic evaluation. The emergence of cryptocurrencies has always presented a significant danger to the banking industry in terms of potential money laundering. Within the financial support system, such as anti-money laundering, banks and bank secrecy, risk specialists, bank managers, and compliance officers are involved in transactions using cryptocurrencies and the concealment of illicit cash by users.This research applies unsupervised machine learning and Hierarchical Risk Parity to the Bitcoin system. The professional accounting procedure with relation to the inherent risk associated with cryptocurrencies, including the probability of occurrence and the financial impact statement. identifying the hazards associated with cryptocurrencies, which include unauthorised access to private keys and a high probability of occurrence. When compared to those with less expertise, those with professional bitcoin transaction experience have a lesser risk. When it comes to delivering the adjusted risk tail and producing superior risk management outcomes, the Hierarchical Risk Parity method performs better.The results section demonstrates how resilient the suggested model is to different rebalanced intervals and the covariance window estimate.

1. INTRODUCTION

The financial market is one of the complex systems for which academic definitions of complexity have not been accepted, leading to disagreements over how the various components of complex systems should interact. Complex system modelling is comparable to an arduous undertaking, where the system's hierarchy is constructed to gather its own subsystems. [1]_[3].These materials were taken out using hierarchical models. Regrettably, the absence of a correlation matrix in a hierarchical structure presents a significant obstacle throughout the portfolio creation process.This problem makes the matrices with high covariance worse. About 2500 different types of cryptocurrency have been traded in this market in recent decades, with a total trading value of 252.5 trillion dollars [4]_[6]. The ripple effect of cryptocurrencies occurs in an unorganised setting [7]_[10]. Even news publishers were paying greater attention to the price fluctuations and the wide range of measures to the unrestrained spike in interest.The established regulations aim to safeguard investors and prevent the diversion of funds. Stop the throng for the

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_at money in a same manner. With regard to all of the well-intentioned remarks made above, the application and theories demonstrate the committed movement of the cryptocurrency market's price. In order to get excellent outcomes on tail risk, Lahre et al. [11] present the Hierarchical Risk Parity (HRP) technique on the multi-asset multi-factor allocation. Additionally, Jain et al. [12] used the same method to align individual stocks with the NIFTY nifty indices. In Raf_not et al.'s study [13], the effectiveness of two distinct HRP variants—HERC and HCCA—is compared. The mean-variance approach is used by Brauneis et al. [14] to examine cryptocurrency portfolios that are based on Markowitz optimisation with a high ratio. Based on the greatest frequency, Walid et al. [15] hypothesised a link between cryptocurrency. The system that is being offered produces valuable marketing information and allows the agent to enhance system stability. As an alternative to the naively diversified (1/N) technique, Platanakis et al. [16] illustrate the estimate inaccuracy in terms of return estimation. Similarly, they supported the complex portfolio strategy for estimating control of the simple techniques to manage the cryptocurrency by using [17] the Black Litter Man model, which was based on variance constraints. To count the traders' and investors' diverse behaviour, Saba et al. [18] used a wavelet-based approach for the multi-scale dynamic dependency between the liquid crypto currencies. In order to separate out the variety of trading strategies, Corbet et al. [19] compare the various trading rules in terms of average-oscillator.It is advised to raise public knowledge of the inherent hazards of the ecosystem of digital assets based on studies from Chartered Professional Accountants Canada (CPAC) and associated audit concerns pertaining to cryptocurrency. The following list of unique dangers associated with cryptocurrency was released by the CPAC in 2018:

The exchange of cryptocurrency based on the entity has no control over transactions and is overbalanced for the entity's maintained account. The entity's cryptocurrency wallet has no account. Cryptocurrency cannot be accessed by losing the private key. If the private key is obtained by an unauthorised party, all of the cryptocurrency will be stolen.

The entity's private key is being misrepresented.

_ Sending the wrong address from a cryptocurrency-related company that cannot be recovered.

Due to the anonymity of the transactions in the block chain, the transactions of cryptocurrency are recorded from entities that are impossible to identify. _ The cryptocurrency includes transaction delays at the conclusion of the period.

_ Recording circumstances and occurrences for financial objectives becomes more challenging.

Certain hazards are more prevalent than others; for example, a private key is a secret number that can only be obtained by a single individual and provides access to block chain money. The biggest danger associated with losing this key is being unable to access cryptocurrency, which

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delays the process of obtaining cryptocurrency. The primary finding of this study is summed up as follows:

_ Applying Hierarchical Risk Parity to the portfolio of cryptocurrency investments using machine learning methods.

The suggested method has the capacity to assess professional accounting in light of the risk connected with cryptocurrencies and the anticipated effects on financial statements.

Identifying the inherent risk in cryptocurrency that has a negative correlation.

_ Sorting the exchange level control risk according to the assessment of probability.

Deciding which cryptocurrency has the largest probability danger.

The remainder of the procedure is broken down as follows: The quick evaluation of the literature on the framework for managing cryptocurrency risk is presented in Section 2. The suggested risk management system's systematic structure is shown in Section 3. Details about the development environment and the implementation procedure are presented in Section 4. The conclusion part is where we wrap up this paper.

2. LITERATURE REVIEW

‘‘Risk management to cryptocurrency exchange and investors guidelines to prevent potential threats,’’

C. Y. Kim and K. Lee,

Investment and interest in cryptocurrency is rapidly growing. The price of each bitcoin, in particular, has exceeded 10,000 dollars as of November 2017, so we do not know how long the uptrend will continue. Although blockchain technology is more open and security oriented than conventional currency issuing methods, it is relatively ineffective in terms of distribution and management of cryptocurrency. The most common way to get cryptocurrency is trading through exchange and mining, which novices sometimes invest in without sufficient knowledge. Therefore, this paper analyzes vulnerabilities of potential cryptocurrency exchanges and individual user wallets. Moreover, this paper will suggest policy risk management methods using international standards such as from NIST and ISO. Blockchain, weaknesses of countermeasures management system, countermeasures to deal with them, management vulnerability of investors and management plan. Server management plan and personal action tips will be provided.

‘‘Economic policy uncertainty and cryptocurrency market as a risk management avenue: A systematic review,’’

I. U. Haq, A. Maneengam, S. Chupradit, W. Suksatan, and C. Huo,

Cryptocurrency literature is increasing rapidly nowadays. Particularly, the role of the cryptocurrency market as a risk management avenue has got the attention of researchers. However, it is an immature asset class and requires gaps in current literature for future research directions. This research provides a systematic review of the vast range empirical literature based on the cryptocurrency market as a risk management avenue against economic policy uncertainty (EPU). The review discovers that cryptocurrencies have mixed connectedness

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patterns with all national EPU therefore, the risk mitigation ability varies from country to country. The review finds that heterogeneous correlation patterns are due to the dependence of EPU on the policies and decisions usually taken by regulatory authorities of a particular country. Additionally, heterogeneous EPU requires heterogeneous solutions to deal with stock market volatility and economic policy uncertainty in different economies. Likewise, the divergent protocol and administration of currencies in the crypto market consequently vicissitudes the hedging and diversification performance against each economy. Many research lines can benefit investors, policymakers, fund managers, or portfolio managers. Therefore, the authors suggested future research avenues in terms of topics, data frequency, and methodologies.

‘‘The optimization of the cryptocurrency portfolio in view of the risks,’’

V. Boiko, Y. Tymoshenko, R. Y. Kononenko, and D. Goncharov,

It was determined that the profitabilities of the cryptocurrency are not subject to normal distribution due to the presence of heavy-tailed profitability. This condition does not allow the use of the classical theory of Markowitz's portfolio for the financial asset under consideration. Based on the Cauchy distribution function, the analytical expressions were obtained for the VaR risk measure and the cryptocurrency risk estimation calculations were performed using the VaR approach. Meanwhile, the risk assessment was found as the difference between the most expected value of profitability and the boundary of the risk zone. The set of optimal cryptocurrency portfolios was built based on the modified optimization Markowitz model. The results of the author's calculations have showed that the high profitability and low risk of Bitcoin determines its dominance in the cryptocurrency portfolio. An effective tool for managing the risks of the cryptocurrency portfolio may be its integration into the structure of Amazon stocks.

‘‘Connectedness between cryptocurrency and technology sectors: International evidence,’’

Z. Umar, N. Trabelsi, and F. Alqahtani,

This paper investigates the connectedness between the technology sector and cryptocurrency markets using Diebold and Yilmaz's (2012, 2014) network connectedness measures. The data cover the period from August 1, 2014 to October 31, 2018. Despite the existence of significant interconnectedness between technology sectors worldwide, the results show that contributions from and to the cryptocurrency market are negligible. The cryptocurrency market appears to be less integrated with the technological system and structurally less exposed to systemic risk. To check robustness, application of Fernández-Macho's (2018) wavelet local multiple correlations found an almost exact linear relationship between global technology sectors for periods of quarterly and longer. Additionally, the Granger causality test confirmed the independence results except for in Japan, Turkey and the USA, where possible changes in cryptocurrency prices may be effective in predicting returns. These

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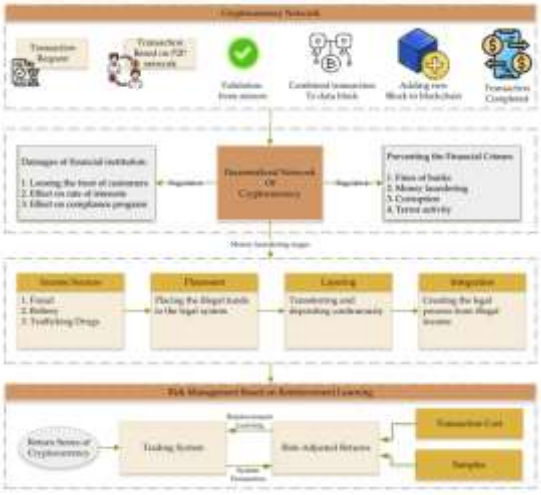
findings provide insights for cryptocurrency regulators and potential investors around the world.

3. SYSTEM ARCHITECTURE



4. EXISTING SYSTEM

Lahre *et al.* [11] propose the strategy of Hierarchical Risk Parity (HRP) on the multi-asset multi-factor allocation which achieves the good results on tail risk. Moreover, Jain *et al.* [12] applied the same strategy for the individual stocks to comport the fifty indexes of NIFTY. Raf_not *et al.* [13], compares different varients of HRP (HERC and HCCA) and evaluates the performance of them. Brauneis *et al.* [14] uses the mean-variance framework to analyze the portfolios of cryptocurrency based on the Markowitz optimization with the high ratio.

Walid *et al.* [15] proposed the relationship between cryptocurrencies based on the highest frequency. The presented system gives the output of useful marketing insights and gives the allowance to the agent to improve the system stability. Platanakis *et al.* [16], demonstrates the estimation error in term of return estimation rather than naively diversified (1/N) strategy. Similarly, they used [17] the model of Black Litterman based on the variance constraints to support the sophisticated portfolio technique for estimation control of the simple methods to manage the cryptocurrency. Saba *et al.* [18] applied the wavelet-based analysis for cryptocurrency multi-scale dynamic interdependence between the liquid cryptocurrencies to count the traders and investors heterogeneous behaviour. Corbet *et al.* [19] compare the different rules of trading in term of average-oscillator to breakout the range of trading strategies.

Disadvantages

- Choosing the exchange of cryptocurrency based on the entity contains no control on transactions and its overbalanced for the maintained account of the entity.
- Cryptocurrecy wallet which is belonging to the entity has no account.
- Its not possible to access to cryptocurrency by loosing the private key.
- If an unauthorized party get any access to the private key then all the cryptocurrency stolen.
- Misrepresentation of private key of entity.
- Sending the incorrect address from entity which is not possible of recovery from cryptocurrency.

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- The transactions of cryptocurrency get recorded from entity which has no identification possibility based on the anonymity of the transactions in blockchain.
- The cryptocurrency contains the delay of transactions in the end of period.
- It become difcult to record the conditions and events for the financial purposes.

5. PROPOSED SYSTEM

- Using the Hierarchical Risk Parity for the cryptocurrency portfolio based on the usage of machine learning techniques.
- The proposed system is able to examine the professional accounting based on the associated risk of cryptocurrency and the impact which is expected from financial statement.
- Finding the intrinsic risk which are correlated negatively in the cryptocurrency.
- Ranking the exchange level control risk based on the likelihood evaluation.
- Finding the highest likelihood risk of the determined cryptocurrency.

Advantages

- The proposed system implements a graph-based theory and using the machine learning techniques, the proposed system is processing in the following way.
- Clustering datasets.
- Recursive bisection on datasets.
- Quasi-diagonalization on datasets.

6. IMPLEMENTATION

Modules

Service Provider

In this module, the Service Provider has to login by using valid user name and password. After login successful he can do some operations such as Login, Train & Test Crypto Currency Data Sets, View Crypto Currency Trained Accuracy in Bar Chart, View Crypto Currency Trained Accuracy Results, View Crypto Currency Financial Risk Type, Find Financial Risk Type Ratio, Download Predicted Datasets, View Crypto Currency Financial Risk Type Ratio Results, View All Remote Users.

View and Authorize Users

In this module, the admin can view the list of users who all registered. In this, the admin can view the user's details such as, user name, email, address and admin authorizes the users.

Remote User

In this module, there are n numbers of users are present. User should register before doing any operations. Once user registers, their details will be stored to the database. After registration successful, he has to login by using authorized user name and password. Once Login is successful user will do some operations like REGISTER AND LOGIN, PREDICT CRYPTO CURRENCY FINANCIAL RISK TYPE, VIEW YOUR PROFILE.

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7. CONCLUSION AND FUTURE ENHANCEMENT

The asset allocation strategy known as Hierarchical Risk Parity (HRP), which is used in cryptocurrency portfolios, and the Reinforcement Learning (RL) technology were used in this research to assess the risk management of the cryptocurrency network. In comparison to other machine learning algorithms employed in this field, reinforcement learning yields good performance assessment results. The primary motivation for using reinforcement learning (RL) in this process is its learning-based nature, which provides the system structure with the ability to achieve high accuracy in providing the system with the correct information. Additionally, the HRP offers the best qualities and the most desired diversification. The findings were rebalanced throughout the chosen time and analysed using several estimating windows and approaches. The transitional asset allocations are given a relevant alternative by the used HRP, which also enhances the risk management procedure.

The suggested method will be expanded in subsequent studies by applying out-of-sample testing performance to other assets and classes and by using optimisation approaches to achieve higher risk management performance.

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