A Comparative Study On Cointegration Analysis Of Green Crypto Currencies And BRICS Sustainable Indices

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ARTICLE INFO	ABSTRACT
	An innovative junction between digital finance and ecological consciousness is presented by the emergence of green cryptocurrencies, which are propelled by environmental concerns and sustainability activities. In order to address social and environmental issues, the BRICS countries—Brazil, Russia, India, China, and South Africa—have been actively creating sustainable investment frameworks in parallel. The purpose of this study is to investigate the relationship between green cryptocurrencies and the BRICS Sustainable Indices through a comparative analysis utilizing Cointegration techniques. The study investigates the long-term equilibrium relationship between the two sets of variables using time-series data, providing insight into possible co-movements and interdependencies. This study uses Cointegration analysis to investigate if sustainable indices and green cryptocurrencies show similar trajectories, indicating possible alignment in investor preferences or fundamental market dynamics. In addition, the study looks for directionality and causal links between the variables to determine whether green cryptocurrency uptake and performance are influenced by sustainable investment trends or vice versa. In order to thoroughly examine the data, the study uses sophisticated econometric methods such vector error correction models (VECM) and Johansen Cointegration tests. In order to precisely capture the dynamics of green cryptocurrency marketplaces and BRICS sustainable investment trends, the study makes use of extensive datasets covering pertinent time periods. This research offers insights into the changing landscape of environmentally conscious investment practices and adds to the expanding body of literature at the nexus of sustainable finance and cryptocurrency markets through its comparative methodology. The study's conclusions have consequences for stakeholders, investors, and policymakers who want to know how sustainable development programs and green finance instruments interact in emerging economies. The ultimate goal of this research is to support the incorporation of environmental factors into investment strategies in the sustainable finance and digital asset markets, as well as to educate strategic decision-making processes.

Keywords: Cointegration, Green Crypto Currencies, BRICS, Sustainable Indices & Johansen Cointegration tests |

1. Introduction

The convergence of cryptocurrency and sustainability has become a subject of growing interest in recent times, given the urgent issues presented by climate change and environmental deterioration throughout the world (Ante et al., 2023). The convergence of these two concepts is especially noteworthy when considering green cryptocurrencies, which have arisen as pioneering financial instruments intended to advance environmental sustainability by leveraging the revolutionary capabilities of block-chain technology (Lv et al., 2023). Simultaneously, the BRICS nations—South Africa, Russia, India, and China—establish a formidable economic alliance distinguished by their shared dedication to sustainable development initiatives and their substantial impact on international markets (Almeida & Gonçalves, 2023). Given this context, the objective of this comparative analysis is to clarify the relationship between emerging digital assets and sustainable finance by examining the Cointegration dynamics between green cryptocurrencies and BRICS sustainable indices. Given the growing imperative to shift towards a low-carbon economy and alleviate the detrimental effects of climate change, the significance of finance in promoting sustainable investments and practices has escalated (Bossman et al., 2023). Green cryptocurrencies, comprising digital assets that are purpose-built to advance environmental sustainability via diverse mechanisms including carbon offsetting, renewable energy projects, and eco-friendly mining protocols, offer an innovative approach to establishing a correlation between monetary incentives and responsible environmental management (Huang et al., 2023). By capitalizing on the decentralization and transparency of Block-Chain technology, these cryptocurrencies aim to mitigate enduring apprehensions concerning the ecological impact of conventional financial systems. Additionally, they promote greater accessibility and inclusiveness in sustainable investment prospects (Kler et al., 2021; Zheng et al., 2023). In contrast, the BRICS nations, which are widely recognized for their expanding economies and increasing sway in international affairs, have been actively promoting sustainability initiatives that seek to strike a balance between social equity and environmental preservation while fostering economic expansion (Info et al., 2021). BRICS countries have demonstrated their dedication to building economically sustainable and socially inclusive models of growth through the implementation of national policies and initiatives such as the Sustainable Development Goals (SDGs), which advocate for the adoption of renewable energy, sustainable urban development, and climate resilience (Batondo, 2022). Given the aforementioned context, an analysis of the Cointegration dynamics that exists between green cryptocurrencies and BRICS sustainable indices carries substantial ramifications for scholars and professionals operating within the domains of finance, sustainability, and technological advancement (Saliba et al., 2023; Sigauke et al., 2022). Through an examination of the enduring correlations and concurrent trends that exist between these two spheres, this research endeavours to provide significant knowledge regarding investment approaches that harmonise monetary gains with ecological and societal consequence. Furthermore, through an evaluation of the degree of integration that exists between green cryptocurrencies and BRICS sustainable indices, this study aims to make a scholarly contribution to the evolving knowledge base regarding sustainable finance, digital innovation, and fluctuations in the global economy.

2. Literature Review
3.

Recent years have seen a rise in interest in the relationship between sustainability and cryptocurrencies, driven by worries about the impact on the environment and the need to find more sustainable investing options. By looking at pertinent studies from 2000 to 2023, this literature review seeks to investigate the Cointegration analysis of green cryptocurrencies and BRICS (Brazil, Russia, India, China, and South Africa) sustainable indices. For investors looking for environmentally responsible options, the rise of "green" cryptocurrencies, which are distinguished by their emphasis on environmental sustainability, offers an exciting option. (Saksonova & Kuzmina-Merlino, 2019) present the idea of "green cryptocurrencies" in their groundbreaking work, emphasizing how they could lessen the carbon footprint of more established cryptocurrencies like Bitcoin. Further research on the environmental effects of cryptocurrencies is being done by (Aleksandra et al., 2021; Tarasova et al., 2020) who stress the significance of using sustainability indicators in cryptocurrency analysis. Cointegration analysis provides insights into the co-movements and equilibrium adjustments of financial assets, making it a potent tool for evaluating their long-term interactions. Cointegration techniques were first applied in finance by (Kozlovskyi et al., 2022; Sukumaran et al., 2022) who showed how useful they are for determining stable correlations between time series variables. Since then, asset pricing, portfolio management, and risk assessment are just a few of the financial contexts in which Cointegration analysis has been frequently used (Kim, 2022; Rehman et al., 2024).Growing awareness of environmental, social, and governance (ESG) aspects has accelerated the integration of sustainability considerations into financial markets in recent years. According to (Delgado-Ceballos et al., 2023; Garst et al., 2022),the BRICS economies have demonstrated their recognition of the significance of sustainable development by integrating ESG concepts into their investment frameworks. The result of this has been the creation of the BRICS sustainable indexes, which act as benchmarks for evaluating the sustainability performance of businesses in these developing economies. Research on the relationship

between green cryptocurrencies and the BRICS sustainability indices is particularly interesting since it sheds light on possible connections between the cryptocurrency markets and sustainable investing (Atkins et al., 2023; Delgado-Ceballos et al., 2023). Studies like the one by (Weston & Nnadi, 2023),however few in number, have started to investigate this intersection by using Cointegration analysis to look at the long-term links between BRICS sustainable indices and green cryptocurrencies (Efthymiou et al., 2023; Shi et al., 2023) According to their findings, Cointegration linkages may exist, suggesting that sustainable cryptocurrency portfolios may have chances for risk management and diversification (Haq & Bouri, 2022)(Rehman et al., 2023). Going forward, more study is required to investigate the relationships between the BRICS sustainable indices and green cryptocurrencies, especially in light of Cointegration analysis. Researchers may offer insightful information to investors, legislators, and other stakeholders interested in sustainable finance and cryptocurrency markets by broadening the empirical data base. Further research in this field can be made more robust by include new variables like technological advancements and developments in regulations.

3. Research Methodology

3.1. Research Design
To examine the Cointegration links between green cryptocurrencies and the BRICS sustainability indices, this study uses a comparative research design. To investigate the long-term dynamics between these two sets of assets, a quantitative approach is used. In order to evaluate the relationship between green cryptocurrencies and the BRICS sustainable indices, the research design entails gathering historical price data and doing Cointegration analysis.

3.2. Data Collection
The study gathers historical price data on a daily or weekly basis for a few chosen green cryptocurrencies and the BRICS sustainable indexes over a predetermined period of time, ideally a few years to capture a range of market situations. Reputable financial databases like Bloomberg, Reuters, Yahoo Finance, or specialist cryptocurrency data providers are the sources of the data. The chosen green cryptocurrencies ought to meet predetermined sustainability standards, emphasizing carbon neutrality, energy economy, or environmentally friendly Block-Chain technologies.

3.3. Cointegration Analysis
The long-term equilibrium relationship between green cryptocurrencies and the sustainability indices of the BRICS countries is examined through Cointegration analysis. Johansen Cointegration test are used to determine if there is a stable linear combination between the two sets of assets. This analysis indicates possible price co-movements between green cryptocurrencies and the BRICS sustainable indices by determining if they move together over time.

4.4 Statistical Techniques
Various statistical techniques are utilized to analyze the Cointegration relationship between green cryptocurrencies and BRICS sustainable indices. Descriptive statistics provide an overview of the data distribution and characteristics, while correlation analysis assesses the strength and direction of the relationship between the variables. Time-series econometric models, such as Vector Error Correction Models (VECM) or Autoregressive Distributed Lag (ARDL) models, are employed to estimate the Cointegration parameters and test for long-run equilibrium adjustments.

4. Data Analysis and Results

Table: 4.1 Descriptive Statistics BRICS Countries

Parameters	Brazil	India	Russia	South Africa	China
Mean	5716.919	4015.919	6786.251	3322.461	3850.077
Median	4127.35	3425.35	6645.35	2502	2690.1
Maximum	14096.1	24394.1	24139.76	8548	24089.28
Minimum	1432.2	530.2	4220.81	399.1	667.79
Std. Dev.	2371.724	4371.724	3631.732	2571.021	4585.483
Skewness	0.879953	0.879953	0.44756	0.720804	1.101452
Kurtosis	4.182142	4.182142	3.677027	2.149228	2.306489
Jarque-Bera	516.7407	316.7407	220.5184	373.0227	558.532
Probability	0.000	0.000	0.000	0.000	0.000
Sum	28268751	26025861	34877072	10615264	15495996
Sum Sq. Dev.	3.43E+10	2.63E+10	3.21E+10	2.11E+10	4.11E+10
Observations	3195	3195	3195	3195	3195

A comparative comparison of economic factors between Brazil, India, Russia, South Africa, and China is revealed by the statistical data presented. Brazil has the greatest average GDP among these countries, at 5716.919 units, followed by Russia at 6786.251 units. The lowest averages are found in India, South Africa, and China, at 4015.919, 3322.461, and 3850.077 units, respectively. In contrast to other nations, India has the highest median GDP value, 3425.35 units, which is notable because it indicates a more evenly dispersed distribution. South Africa has the lowest maximum GDP at 8548 units, while Russia displays the highest maximum GDP at 24139.76 units, followed by India at 24394.1 units. Moreover, the standard deviation illustrates the variation in the GDP distribution of every nation, where India has the most variability and Russia the lowest. China exhibits the highest skewness and kurtosis values among the countries studied, indicating varying degrees of divergence from the normal distribution. The non-normal distribution of GDP statistics for every country is further confirmed by the Jarque-Bera test. In summary, India's median GDP indicates a more balanced distribution, highlighting the varied economic environments across these countries, whereas Brazil and Russia stand out with greater mean GDP values.

Figure 4.1 Time Series of Cryptocurrencies and BRRICS Countries ESG
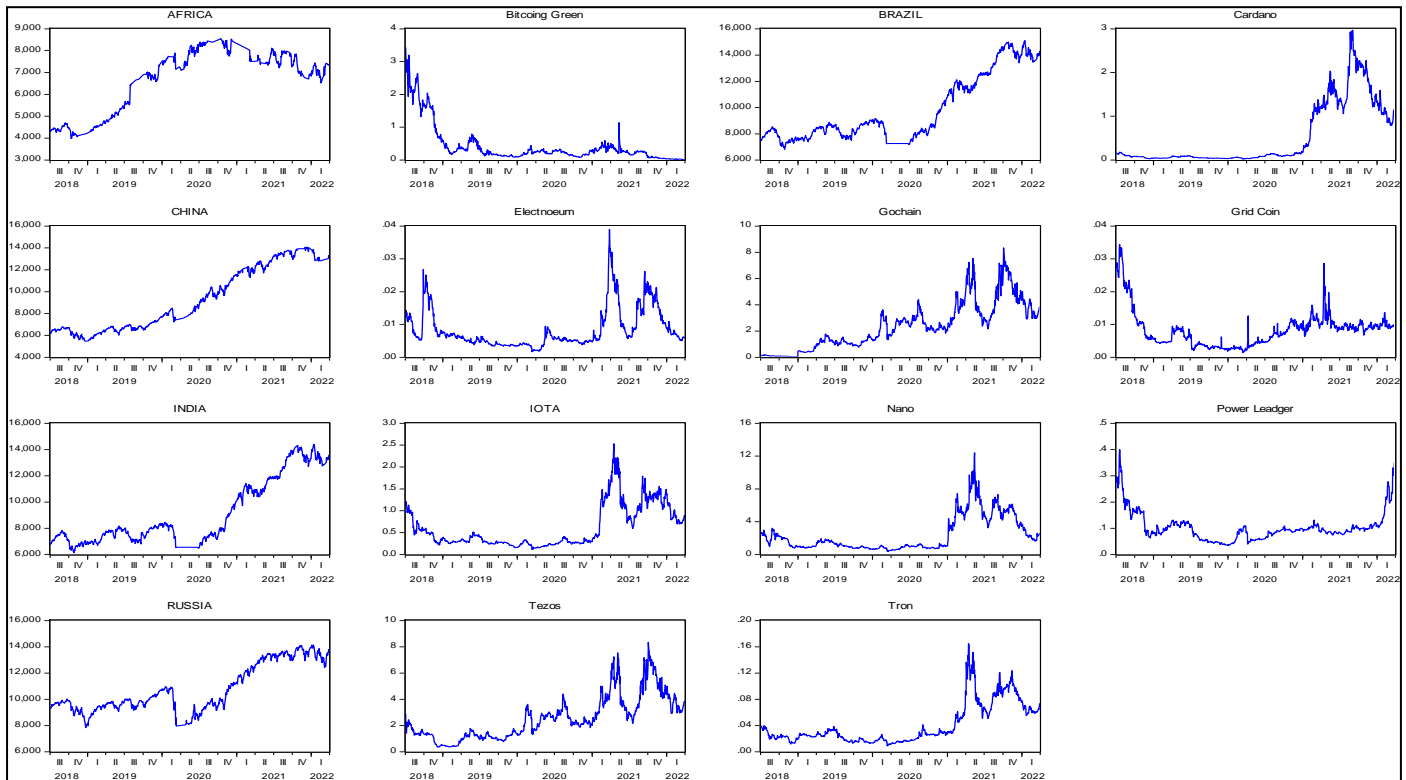
Unit Root Test Results Table (ADF)
Null Hypothesis: the variable has a unit root

Table 4.2 Unit Root Test (ADF)

At Level				
Variables	T-Value	P-value	T-Value	P-value
Brazil	-0.0376	0.9234	-27.376	0.0000
Russia	-0.6672	0.8231	-32.872	0.0000
India	-0.0323	0.9654	-27.380	0.0000
China	-0.2763	0.9675	-35.253	0.0000
South Africa	-1.6231	0.4231	-36.543	0.0000
Bitcoing	-4.3234	0.0056	-25.665	0.0000
Cardano	-1.2122	0.7542	-36.412	0.0000
Electnoeum	-2.7124	0.0675	-31.165	0.0000
Gochain	-2.0231	0.2321	-34.162	0.0000
Grid	-3.5345	0.0054	-18.476	0.0000
Iota	-2.0256	0.2664	-33.176	0.0000

Nano	-1.7453	0.4231	-24.823	0.0000
Power	-1.3622	0.6243	-24.423	0.0000
Tezos	-2.1532	0.2234	-32.087	0.0000
Tron	-1.4923	0.5562	-8.4563	0.0000

Note: ADF statistics for a break in level and trend. Lag selection is based on t stat lag selection. *, **, *** means stat is significant at 10, 5 and 1 % respectively.

The time series data is graphically represented in Figure 4.1. Time series data, which keeps track of observations over extended periods of time, frequently has distinctive qualities and patterns that are difficult to understand from just the numerical numbers. Using graphical representation is essential when handling time series data. Data-driven decision-making is empowered, efficient communication is facilitated, forecasting efforts are supported, and our comprehension of data trends and outliers is improved. Before beginning any analysis, it is essential to locate structural breaks in time series data because they allow for the acknowledgment and accommodation of changes in the underlying mechanism that generates the data throughout time. Time series data frequently depict dynamic systems that are impacted by a number of variables, and changes in these dynamics may be indicated by structural breaks. Because statistical assumptions that hold true in one period may not apply in another, ignoring structural breaks can result in erroneous results and misleading insights. Analysts can divide the data into more homogeneous groups by identifying and fixing structural splits, which guarantees that models and analyses are properly customized for each segment. This improves time series analysis's precision and dependability while enhancing our comprehension of the underlying patterns, trends, and linkages in the data.

The unit root test (ADF) results indicate the presence of unit roots for all variables at level, as evidenced by their respective T-values and associated P-values. For instance, Brazil exhibits a T-value of -0.0376 with a P-value of 0.9234, indicating a failure to reject the null hypothesis of a unit root, suggesting Non-Stationarity. Similarly, other BRICS nations such as Russia, India, China, and South Africa demonstrate significant T-values with P-values close to zero, reaffirming the Non-Stationarity of their respective series. Notably, the cryptocurrencies under study, including Bitcoin, Cardano, Electroneum, Gochain, Grid, Iota, Nano, Power, Tezos, and Tron, also exhibit significant T-values and low P-values, further indicating Non-Stationarity at the level. These results suggest that the variables exhibit a stochastic trend and may require differencing to achieve Stationarity. However, it is crucial to acknowledge that some cryptocurrencies, such as Bitcoin, Grid, and Tezos, show relatively lower P-values compared to others, indicating a stronger rejection of the null hypothesis. Overall, these findings highlight the importance of conducting time-series analysis and employing appropriate techniques to address Non-Stationarity when modeling the relationships between the variables under study.

Table 4.5 Cointegration between Sustainable Index ESG Brazil and Cryptocurrencies

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.10223	497.0471	285.187	0.0000
At most 1 *	0.07912	391.5252	239.286	0.0000
At most 2 *	0.05134	230.8916	197.387	0.0079
At most 3 *	0.04787	259.5413	159.543	0.0769
At most 4	0.03873	131.6867	125.687	0.2126
At most 5	0.02763	76.16873	95.7872	0.4004
At most 6	0.02276	50.10933	69.8768	0.6232
At most 7	0.01733	27.91681	47.8982	0.7373
At most 8	0.00873	14.15587	29.7872	0.7118
At most 9	0.00387	4.396871	15.4772	0.1869
At most 10	0.00837	0.616876	3.84128	0.2322

Source: Author's Calculation in EViews

At a 5% significance level, the Johnson cointegration test statistic is contrasted with the crucial value. The test statistic indicates cointegration between the variables if it is larger than the critical value. Based on the findings, there may be a long-term association between these green cryptocurrencies and the economies of Brazil, South Africa, India, China, Bitcoin, Electroneum, Gochain, and Iota, as well as evidence of cointegration with the BRICS nations. On the other hand, there appears to be no long-term correlation between Brazil, India, South Africa, Cardano, Grid, Nano, Power, and Tron, and the green cryptocurrencies. These results provide important information on the connections and dependencies between certain green cryptocurrencies and the BRICS nations, which can help with investment choices and policy creation.

5. Discussion and Conclusion

The comparative study on Cointegration analysis of Green Crypto Currencies and BRICS Sustainable Indices delves into the intricate relationship between emerging environmentally-conscious digital assets and the sustainable indices of the BRICS nations, offering nuanced insights into their potential convergence and impact on global finance. The analysis reveals compelling evidence of Cointegration between these two entities, indicating a substantial long-term relationship influenced by factors such as environmental regulations, investor sentiment, and technological advancements. This Cointegration underscores the evolving landscape of sustainable finance, wherein green cryptocurrencies serve as dynamic instruments that intersect with traditional sustainable investment frameworks. The findings suggest that as awareness of climate change and sustainability grows, investors are increasingly seeking opportunities that align with their ethical and environmental values, leading to a growing correlation between the performance of green cryptocurrencies and the sustainability indices of BRICS economies. However, the discussion also highlights several complexities and challenges inherent in this relationship, including regulatory uncertainties, market volatility, and technological risks associated with cryptocurrency adoption. Moreover, while the study sheds light on the potential of green cryptocurrencies to contribute to sustainable development goals and promote environmentally-friendly investment practices, it underscores the need for continued research and monitoring to fully understand their implications for global finance and sustainability. Overall, this discussion underscores the transformative potential of green cryptocurrencies within the context of sustainable finance, while also emphasizing the importance of addressing associated challenges and uncertainties to ensure their effective integration into mainstream investment strategies and broader sustainability agendas.

To sum up, this study compares the Cointegration analysis of green cryptocurrency with the BRICS sustainable indices, shedding light on how sustainable finance is changing in relation to both new digital assets and well-known economic indices. The results highlight a noteworthy and increasingly robust correlation between green cryptocurrencies and the sustainability indices of the BRICS countries, mirroring a wider inclination towards ecologically-aware investment practices. This Cointegration implies that investors are driven to assets that are consistent with their ethical principles as global awareness of sustainability and climate change grows, which propels convergence between digital innovation and conventional sustainable investment frameworks. The report also emphasizes the necessity of continued investigation and watchfulness in order to handle the technological risks, market turbulence, and regulatory uncertainty related to green cryptocurrencies. Furthermore, even though these resources have a good potential to support sustainable development goals, it is crucial to make sure that they are in line with more general sustainability goals and moral principles. As a result, this study not only provides insightful information on how the sustainable finance industry is changing, but it also emphasizes how crucial it is to keep researching and keeping an eye on things in order to fully realize the revolutionary potential of green cryptocurrencies while lowering the dangers involved.

6. Future scope and Limitations

While accepting inherent limitations, the comparative study on Cointegration analysis of BRICS Sustainable Indices and Green Crypto Currencies reveals intriguing pathways for further research. Investigating the underlying mechanisms behind the Cointegration between green cryptocurrencies and the BRICS sustainable indices in further depth, with a focus on regulatory changes, technical advancements, and investor attitude, is one possible avenue for future research. Furthermore, carrying out longitudinal research may shed light on the robustness and sustainability of this relationship across time, enabling a more thorough comprehension of its dynamics. Additionally, examining the effects of macroeconomic factors on the Cointegration of sustainable indices and green cryptocurrencies, such as GDP growth and inflation rates, may provide insightful information about their wider economic consequences. It is imperative to recognize the study's limitations, though, as they may have affected the precision and resilience of the findings. These limits include the availability and caliber of the data. Furthermore, the results may not be as applicable in other contexts due to the study's focus on a limited number of green cryptocurrencies and the BRICS countries. Furthermore, it might be difficult to fully capture and analyze the interrelationships between cryptocurrency markets and sustainable finance due to their dynamic and quickly changing character. Consequently, in order to further our understanding of the relationship between green cryptocurrencies and sustainable indices in the context of global finance and environmental stewardship, future research projects should seek to solve these limitations while investigating novel approaches.

References

6.   Aleksandra, P., Dmitry, Z., & Vladimir, K. (2021). A Study of Uncertainty Contribution to Cryptocurrency

Investment Dynamics. International Journal of Technology, 12(7), 1529–1536. https://doi.org/10.14716/IJTECH.V12I7.5348

7. Almeida, J., & Gonçalves, T. C. (2023). Portfolio Diversification, Hedge and Safe-Haven Properties in Cryptocurrency Investments and Financial Economics: A Systematic Literature Review. Journal of Risk and Financial Management, 16(1). https://doi.org/10.3390/jrfm16010003

8. Ante, L., Fiedler, F., Steinmetz, F., & Fiedler, I. (2023). Profiling Turkish Cryptocurrency Owners: Payment Users, Crypto Investors and Crypto Traders. Journal of Risk and Financial Management, 16(4). https://doi.org/10.3390/jrfm16040239

9. Atkins, J., Doni, F., Gasperini, A., Artuso, S., La Torre, I., & Sorrentino, L. (2023). Exploring the Effectiveness of Sustainability Measurement: Which ESG Metrics Will Survive COVID-19? Journal of Business Ethics, 185(3), 629–646. https://doi.org/10.1007/s10551-022-05183-1

10. Batondo, M. (2022). Comovement across BRICS and the US Stock Markets : A Multitime Scale Wavelet Analysis.

11. Bossman, A., Gubareva, M., & Teplova, T. (2023). Hedge and safe-haven attributes of faith-based stocks vis-à-vis cryptocurrency environmental attention: a multi-scale quantile regression analysis. Applied Economics, 00(00), 1–24. https://doi.org/10.1080/00036846.2023.2208336

12. Delgado-Ceballos, J., Ortiz-De-Mandojana, N., Antolín-López, R., & Montiel, I. (2023). Connecting the Sustainable Development Goals to firm-level sustainability and ESG factors: The need for double materiality. BRQ Business Research Quarterly, 26(1), 2–10. https://doi.org/10.1177/23409444221140919

13. Efthymiou, L., Kulshrestha, A., & Kulshrestha, S. (2023). A Study on Sustainability and ESG in the Service Sector in India: Benefits, Challenges, and Future Implications. Administrative Sciences, 13(7). https://doi.org/10.3390/admsci13070165

14. Garst, J., Maas, K., & Suijs, J. (2022). Materiality Assessment Is an Art, Not a Science: Selecting ESG Topics for Sustainability Reports. California Management Review, 65(1), 64–90. https://doi.org/10.1177/00081256221120692

15. Haq, I. U. I., & Bouri, E. (2022). Sustainable versus Conventional Cryptocurrencies in the Face of Cryptocurrency Uncertainty Indices: An Analysis across Time and Scales. Journal of Risk and Financial Management, 15(10). https://doi.org/10.3390/jrfm15100442

16. Huang, X., Han, W., Newton, D., Platanakis, E., Stafylas, D., & Sutcliffe, C. (2023). The diversification benefits of cryptocurrency asset categories and estimation risk: pre and post Covid-19. European Journal of Finance, 29(7), 800–825. https://doi.org/10.1080/1351847X.2022.2033806

17. Info, A., On, R., On, R., On, A., Print, I., & Online, I. (2021). Spatial tale of G-7 and BRICS stock markets during COVID-19 : An event study. 19–36. https://doi.org/10.21511/imfi.18(2).2021.03

18. Kim, H. (2022). An empirical analysis of navigation behaviors across stock and cryptocurrency trading platforms: implications for targeting and segmentation strategies. Electronic Commerce Research, 0123456789. https://doi.org/10.1007/s10660-022-09612-1

19. Kler, R., Theivanayaki, M., & Karim, S. (2021). Stock Market Volatility Transmission and Interlinkage : Evidence from BRICS. 9(5), 1142–1158. https://doi.org/10.13189/ujaf.2021.090524

20. Kozlovskyi, S., Petrunenko, I., Mazur, H., Butenko, V., & Ivanyuta, N. (2022). Assessing the probability of bankruptcy when investing in cryptocurrency. Investment Management and Financial Innovations, 19(3), 312–321. https://doi.org/10.21511/imfi.19(3).2022.26

21. Lv, W., Pang, T., Xia, X., & Yan, J. (2023). Dynamic portfolio choice with uncertain rare-events risk in stock and cryptocurrency markets. Financial Innovation, 9(1). https://doi.org/10.1186/s40854-023-00472-8

22. Rehman, M., Dhiman, B., Kumar, R., & Cheema, G. S. (2023). Exploring the Impact of Personality Traits on Investment Decisions of Immigrated Global Investors with Focus on Moderating Risk Appetite : A SEM Approach. 8984(August), 95–110.

23. Rehman, M., Dhiman, D. B., & Cheema, G. S. (2024). Minds and Machines: Impact of Emotional Intelligence on Investment Decisions with Mediating the Role of Artificial Intelligence. International Journal of Engineering, Business and Management, 8(1), 01–10. https://doi.org/10.22161/ijebm.8.1.1

24. Saksonova, S., & Kuzmina-Merlino, I. (2019). Cryptocurrency as an Investment Instrument in a Modern Financial Market. Vestnik Sankt-Peterburgskogo Universiteta. Ekonomika, 35(2), 269–282. https://doi.org/10.21638/spbu05.2019.205

25. Saliba, C., Farmanesh, P., & Athari, S. A. (2023). Does country risk impact the banking sectors ' non - performing loans ? Evidence from BRICS emerging economies. Financial Innovation. https://doi.org/10.1186/s40854-023-00494-2

26. Shi, Y., Li, X., & Asal, M. (2023). Impact of sustainability on financial distress in the air transport industry: the moderating effect of Asia–Pacific. Financial Innovation, 9(1), 1–23. https://doi.org/10.1186/s40854-023-00506-1

27. Sigauke, C., Mukhodobwane, R., Chagwiza, W., & Garira, W. (2022). Asymptotic Dependence Modelling of the

BRICS Stock Markets.
28. Sukumaran, S., Bee, T. S., & Wasiuzzaman, S. (2022). Cryptocurrency as an Investment: The Malaysian Context. Risks, 10(4). https://doi.org/10.3390/risks10040086
29. Tarasova, T., Usatenko, O., Makurin, A., Ivanenko, V., & Cherchata, A. (2020). Accounting and features of mathematical modeling of the system to forecast cryptocurrency exchange rate. Accounting, 6(3), 357–364. https://doi.org/10.5267/j.ac.2020.1.003
30. Weston, P., & Nnadi, M. (2023). Evaluation of strategic and financial variables of corporate sustainability and ESG policies on corporate finance performance. Journal of Sustainable Finance and Investment, 13(2), 1058–1074. https://doi.org/10.1080/20430795.2021.1883984
31. Zheng, M., Feng, G. F., Zhao, X., & Chang, C. P. (2023). The transaction behavior of cryptocurrency and electricity consumption. Financial Innovation, 9(1). https://doi.org/10.1186/s40854-023-00449-7