“ESG vs conventional indices: Comparing efficiency in the Ukrainian stock market”

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ESG VS CONVENTIONAL INDICES: COMPARING EFFICIENCY IN THE UKRAINIAN STOCK MARKET

Abstract

This paper explores market efficiency in the Ukrainian stock market to determine whether there are differences between traditional and ESG indices. Different data properties related to market efficiency are explored: persistence (R/S analysis is used for these purposes), stationarity (ADF tests), normality (Kolmogorov-Smirnoff, Anderson-Darling test, etc.), resistance to market anomalies (Day of the week effect, abnormal returns and patterns they generate are tested using parametrical and non-parametrical statistical tests), etc. Database includes daily data from 2 conventional Ukrainian stock market indices (UX and PFTS) and ESG index (WIG Ukraine) over the period 2015–2022. The following hypothesis is tested in this paper: ESG indices are more efficient than traditional ones. The findings suggest that there are no significant differences between traditional and ESG indices: they have the same persistence, stationarity, do not fit normal distribution and are not influenced by explored market anomalies. So, despite the fact that companies listed in the ESG index are more transparent and thus characterized by lower information asymmetry, they are more liquid and popular among investors, ESG index is not more efficient than traditional ones. This might be the result of unfair practices called "washing" aimed at signaling the active ESG involvement with actual absence of it. This means that many ESG companies are actually traditional. To prevent such practices, the ESG reporting regulation needs to be revised.

Keywords stock market, ESG, persistence, R/S analysis, market efficiency, market anomalies, day of the week effect

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INTRODUCTION

World investment flows have significant imbalances and disruptions that affect the efficient allocation of investment resources towards sustainable development due to systemic reasons (climate losses, social inequalities), triggered by the COVID-19 pandemic in 2019–2021. In 2022, these flows are drooped down with energy, food, inflation, cost-of-living challenges caused by political uncertainty and Russian invasion in Ukraine. The annual investment gap for Sustainable Development Goals (SDGs) was deepened with these challenges from the originally estimated $ 2,5 trillion in 2015 to $4 trillion in 2022 (UNCTAD, 2022).

Environmental, social and governance (ESG) investment as a key investment strategy for SDGs, in contrast to other investments, is on its rise despite these challenges. It is expected that by 2025, ESG assets may reach $50 trillion worldwide, accounting for one-third of total assets under management globally (Bloomberg Intelligence, 2022). ESG is considered as a basis of institutionalization of public interest companies (Velte, 2020). At the same time, there is a significant regulatory

pressure on this fast-growing market, benchmark and norm scrutiny related to possible greenwashing issues (PRI, 2022; IOSCO, 2021; Hoepner et al., 2019).

Approximately 84% of the 250 institutional investors, managing over $10 trillion in assets, believe that companies' deceptive behavior regarding their environmental credentials, commonly known as "greenwashing," is on the rise (NIKKEI, 2020).

Ukrainian post-war recovery and investment support intensions (Ukraine Recovery Plan, 2022) have a strong SDGs and ESG focus within totally estimated $750 billion of investment resources needed. Before the war, the National Bank of Ukraine has presented its Sustainable Finance Development Policy till 2025 (NBU, 2021) focused on the comprehensive re-building Ukrainian financial sector with ESG investment approach, establishing new investment ideology, promoting transparency, sustainability-aligned activities of financial institutions and creating new market benchmarks (indices, ranks and ratings). Ukrainian stock market does not have a well-known ESG-benchmark (even indices), and its stock market has slowed down.

To efficiently allocate investment support for the recovery of the Ukrainian economy, both market segments – ESG and traditional – must be stimulated, and disclosure and transparency requirements need to be enhanced for the largest companies – constituents of these market indices.

There is a strong connection between a company's corporate social responsibility (CSR) and SDGs activity, their ESG disclosure and lower information asymmetry (Durán-Santomil et al., 2019; Chen et al, 2021; Omura et al., 2021). So, it is assumed that companies included to ESG indices tend to be more transparent than traditional ones, and ESG indices are more efficient than conventional ones. Caporale et al. (2022) found that, despite a clear rationale for the potential superiority of ESG indices, there were no significant differences in the degree of persistence and dynamic behavior between ESG and traditional indices.

Existing data regarding the market efficiency of the ESG and traditional indices are mixed, partially because usually single data properties are explored. To address this, multiple properties should be explored simultaneously for the same data sets. If evidence suggests that ESG indices are more efficient, this will provide further justification for socially responsible investing. However, if these indices exhibit high persistence or are susceptible to market anomalies, it may present opportunities to generate abnormal profits through appropriately designed trading strategies.

1. LITERATURE REVIEW

ESG and CSR data of companies play a crucial role in the formation of ESG indices. It is presumed that transparent and credible ESG data show the companies' adherence to sustainability, CSR principles and ideas of creating a positive impact and value to stakeholders. So, this fact can influence directly the higher level of ESG indices compared to conventional ones. Academic background in this field is mixed. It is proved by bibliometric research on the stock market indices by Kamath et al. (2022) and Zulfikar (2022).

In contrast to these studies, the current study used Sci Val as a bibliometric analysis tool. Originally, SciVal by Elsevier queries were designed for research areas with advanced search tools. ESG, socially responsible (SRI), sustainability and conventional (traditional stock) indices were traced as searching terms in the Scopus database for 5 past years to cover possible modifications of these terms by researchers.

Search string "esg OR sustainable OR socially responsible indices AND stock OR Conventional OR traditional indices" brings more than 1,4 million studies over the 5 past years. Limitation subject areas to Business, Management and Accounting OR Economics, Econometrics and Finance gives 105,021 publications. Finally, refining this massive of publications was made with applying additional

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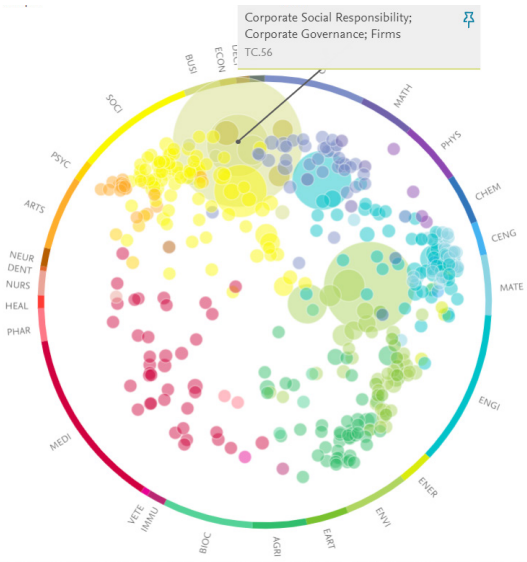

Source: authors elaboration via SciVal

Figure 1. Cluster analysis results for the research areas related to ESG, SRI, sustainability and conventional (traditional) indices in 2017–2022

journal filters. Final sample was created from the journals with a strong economic focus, excluding environmental and social-oriented journals.

8,623 publications were observed using bibliometric analysis tools for clustering, by the prominence and selection of most relevant studies with the emphasis on the indices' efficiency.

The main cluster for this set of publications is "Corporate Social Responsibility; Corporate Governance; Firms" with 97,66 prominence percentiles. This proves the importance of ESG indices as a benchmark for CSR activities of companies (Figure 1).

The next step of the bibliometric analysis is underlining the pair comparison of the searching terms. Separate research areas were constructed for "ESG and conventional indices", "ESG and traditional indices", "ESG and stock indices", as well as other sustainable and socially responsible indices and their traditional benchmarks. The most prominent areas relate to ESG indices; they are rather new (1 paper in 2019 and 2020, 5 papers in 2021 and 13 in 2022), derived mostly from Sumy State University (Ukraine) and highly intersected. They combined with the joint topics "Financial Management; Market Timing; Hedge Fund Performance", "Cause-Related Marketing; Corporate Social Responsibility; Corporate Philanthropy", and cluster "Models; Risks; Finance". This focus of the topic is supported by the main idea of the importance of ESG indices for CSR transparency and financial performance.

Joint studies in research areas were eliminated and the high ranked papers by the Field-Weighted Citation Impact were investigated.

The main question is formulated as follows: are there any differences between traditional and ESG indices in terms of their efficiency. To answer this question, very mixed academic results were investigated caused by specifics in methodologies, indices samples, periods (Junkus & Berry, 2015), however, they can be grouped into two clusters:

- Studies – opponents (ESG-indices do not outperform the conventional ones in terms of efficiency) and proponents (ESG-indices do outperform the conventional ones in terms of efficiency);
- Neutral studies (there is no significant difference between the ESG and conventional indices) and substitution-related studies (ESG and conventional indices can be treated as substitutes for each other).

In the first cluster, there is mixed evidence. On the one hand, ESG indices underperform conventional ones (Mynhardt et al., 2017). On the other hand, the studies by Statman (2000), Lopez et al. (2007),

Cortez et al. (2009), and Chen et al. (2021) proved that the ESG indices are better than conventional and can be used as benchmarks for the companies simultaneously achieving social values and better financial results. Suresha at al. (2022) underline the substantial improvement in the companies – index constituents' financial performance after they were included in the ESG indices. Greater outperformance of SRI indices was detected by Omura et al. (2021) in the US, EU and Japan during the financial crisis caused by the COVID-19 pandemic. A special case of the impact of the COVID-19 pandemic on indices in other countries is observed in Baroroh et al. (2022), Salim et al. (2022), and Bouhlal and Sedra (2022).

In the second cluster, Managi et al. (2012), Leite and Cortez (2013), Gladish et al. (2013), and Dios-Alija et al. (2021) underlined the absence of outperformance evidence in favor of either ESG or traditional indices. A special case of EU ESG and conventional indices in Kurnoga et al. (2022) proved the results above in different time series year-to-date price return, 3, 5 and 10-year price return. In the HKEX (2020), 23 pairs of blue-chip ESG and conventional equity indices at the global, regional and country markets on various investment horizons were compared. The results of such a comprehensive study prove the neutrality in both groups of indices.

Neutrality was also observed at the level of ESG vs conventional fund indices (for example, Schröder, 2004; Junkus & Berry, 2015; Rehman et al., 2016; Abidin & Gan, 2017) in 'as usual' circumstances, as well as ESG vs conventional indices returns before and after the COVID-19 pandemic (Umar et al., 2020; Chiappini et al., 2021; Caporale et al. 2022; Harabida et al., 2023).

In this so-called "neutrality" cluster, separate subcluster might be observed. Jain et al. (2019) and Rehman et al. (2021) articulate that ESG indices might be considered like substitution of conventional. Moreover, they demonstrate strong dependences in terms of volatility (Nogueira & Madaleno, 2022), causal relationship and spillover effects triggered by the recent pandemic crisis (Sharma et al., 2021a, 2021b, 2022), Eurozone Debt Crisis and Shale Oil Revolution, as well as the pandemic (Arif et al., 2021).

This fact is of great importance to investors – it doesn't matter which index (ESG or conventional) should be included in a portfolio in terms of efficiency and risk-adjusted returns if they act like substitutes. Transition of this to the companies means the absence of the difference between the CSR and sustainability-oriented companies' transparency and performance and traditional companies.

And finally, one more important group of the studies is the group with mix evidences about preferences in indices efficiency and performance. For example, the prevalence of ESG indices is quite specific and related to some period. ESG indices are more efficient than conventional ones, they are like "investor insurance" during the crisis period (Varma & Nofsinger, 2014; Becchetti et al., 2015; Cortez & Leite, 2015; Cunha et al. 2020; Vadithala & Tadoori, 2021; Rubbaniy et al. 2022).

To sum it up, mixed evidence in favor of the ESG and conventional indices comparative efficiency made these matters very prominent to investigate in the light of on-going SDGs investment gap and ESG investment raise and Ukrainian post-war recovery.

The aim of this paper is to explore and compare different data properties of ESG and conventional indices that would provide further evidence in favor or against the socially responsible investing.

Hypothesis to be tested:

H1: ESG indices are more efficient than traditional ones.

2. DATA AND METHODOLOGY

Daily data for two conventional Ukrainian stock market indices, namely UX (https://www.ux.com.ua) and PFTS (https://www.pfts.com.ua) and ESG index – WIG Ukraine (https://www.gpw.pl/), are analyzed. The sample period goes from January 14, 2015 to December 31, 2022 (the first available date for WIG Ukraine Index starts on January 14, 2015).

To compare the degree of efficiency between ESG and traditional indices, the following data properties are explored: persistence, data stationarity, data normality, resistance to market anomalies.

Descriptive statistics are examined to find preliminary evidence for differences in the analyzed data

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set. Key parameters of interest are mean, standard deviation, skewness and kurtosis.

The next step is to define whether or not analyzed data sets belong to the same general population. Parametrical tests (Student's t-tests, ANOVA analysis) and non-parametrical tests (Mann-Whitney tests) are used for these purposes. The null hypothesis is that the data comes from the same population. A rejection of the null hypothesis indicates the presence of statistically significant differences between ESG and traditional indices.

Data normality is another important evidence in favor of market efficiency. To define whether or not data are normally distributed, Kolmogorov-Smirnoff test is used in this paper, as well as a number of additional techniques (Lilliefors, Cramer-von Mises, Watson, Anderson-Darling).

Data stationarity is important property. To explore it, ADF tests are used in this paper.

To measure the degree of persistence, R/S (Rescaled Range) analysis is applied (see Caporale et al., 2022 for details). The closer the Hurst exponent is to 0.5 the more efficient the market is.

An efficient market should be resilient to market anomalies. Based on data availability, the following anomalies are explored in this paper: day of the week effect, abnormal returns and patterns they generate. To test these anomalies, the following methods are used: average analysis, parametrical tests (Student's t-tests, ANOVA analysis), and non-parametrical tests (Mann-Whitney and Kruskal-Wallis tests).

Abnormal returns are defined based on Caporale et al.'s (2018) dynamic trigger approach. Abnormal positive returns are calculated as follows:

$$R_i > \left(\overline{R_n} + k \cdot \delta_n\right). \quad (1)$$

With abnormal negative returns calculated as:

$$R_i < \left(\overline{R_n} - k \cdot \delta_n\right), \quad (2)$$

where $\overline{R_n}$ is average returns calculated for the period n, k represents the number of standard deviations used to calculate abnormal returns, and δ_n is the standard deviation of returns calculated for the period n.

This paper used a standard deviation of two and a period of 50 to calculate abnormal returns. The reasoning behind this choice is explained in Plastun et al. (2021).

3. EMPIRICAL RESULTS AND DISCUSSION

First, descriptive statistics are analyzed to examine preliminary differences between ESG and conventional indices. Descriptive statistic results are presented in Table 1.

Table 1. Descriptive statistics for ESG and conventional indices (case of returns)

Parameter	PFTS	UX	WIG
Mean	0,03%	0,05%	–0,01%
Median	0,01%	0,06%	–0,05%
Variance	0,01%	0,02%	0,07%
Standard Deviation	1,16%	1,35%	2,57%
Minimum	–6,31%	–8,45%	–38,63%
Maximum	27,68%	9,92%	17,78%
Range	33,99%	18,37%	56,40%
Skewness	11,325	–0,317	–2,135
Kurtosis	271,520	6,304	51,839

As can be seen in Table 1, there are differences between ESG and traditional indices. ESG index is much more volatile (standard deviation is 2 times higher), it has demonstrated the opposite price dynamics (ESG index mean is negative, but it is positive for traditional ones).

Next, t-tests are performed (see Table 2). t-criterion values are provided in cells. t-critical value is 1,96.

Table 2. *t*-test results for ESG and conventional indices (case of returns)

Index	PFTS	UX	WIG
PFTS	–	0,34	0,34
UX	0,34	–	0,26
WIG	0,34	0,26	–

The results indicate that there are no statistically significant differences between data sets examined. This means they all belong to the same general population. To find additional evidence, ANOVA and Kruskal-Wallis tests are used (Table 3).

Table 3. ANOVA and Kruskal-Wallis test results for ESG and conventional indices (case of returns)

Method applied	Value (*p*-value)	Difference is statistically significant
ANOVA	0.27 (0.76)	No
Kruskal-Wallis	5.01 (0.08)	No

ANOVA and Kruskal-Wallis tests confirmed the absence of statistically significant differences between analyzed data sets.

Data normality is another important evidence in favor of market efficiency. Preliminary data on data normality are provided in descriptive statistics: skewness and kurtosis values in the range [–1..1] are signs of normality. Based on Table 1, all analyzed data sets are not normally distributed (the only exception is Skewness for the case of UX). These conclusions are confirmed by the analysis of Data frequency charts (Appendix A, Figures A1-A3): fat tails are present in all cases. To define whether or not data are normally distributed, the Kolmogorov-Smirnoff test is used in this paper, as well as a number of additional techniques (Lilliefors, Cramer-von Mises, Watson, Anderson-Darling).

As can be seen, all tests reject the hypothesis that distribution is normal. This is evidence against market efficiency and in favor of absence of principal differences in data properties of ESG and traditional indices.

Another important data property is stationarity. ADF test results are presented in Table 5.

In all of the analyzed cases, original data are non-stationary, but first differences (returns) are stationary. This is additional evidence in favor of the absence of critical differences in data properties between ESG and traditional indices.

The next data property to be explored is persistence (the presence of long-memory in data). To measure the degree of persistence, R/S (Rescaled Range) analysis is applied. Table 6 reports the results of the static R/S analysis conducted on both the ESG and conventional indices. The p-values for all the calculated Hurst exponents are below 0.05, indicating their statistical significance.

Table 6. Static R/S analysis results

Index	Hurst Exponent (*p*-values and confidence intervals - CI*)
PFTS	0.63 (*p*=0.00; CI = 0.59-0.66)
UX	0.61 (*p*=0.00; CI = 0.58-0.64)
WIG Ukraine	0.54 (*p*=0.00; CI = 0.51-0.57)

Note: * The reported p-values indicate the statistical significance of the estimated Hurst exponents.

Based on the results, it can be observed that the PFTS and UX indices exhibit higher persistence compared to the WIG Ukraine index. This indicates that the former two indices are less efficient than the ESG indices. This might be evidence in favor of tested hypothesis. The rationale for these results is lower information transparency, a lack of market depth and trading volume, and smaller number of market participants typical for traditional indices compared to ESG.

Table 4. Normality tests for ESG and conventional indices (case of returns)

Index	Kolmogorov-Smirnoff test	Lilliefors	Cramer-von Mises	Watson	Anderson-Darling
	Statistic (significance)	Value (probability)	Value (probability)	Value (probability)	Value (probability)
PFST	0.208 (0.00)	0.21	20.70	20.66	108.20
UX	0.088 (0.00)	0.09	3.29	3.27	17.68
WIG	0.141 (0.00)	0.14	10.32	10.32	58.88

Table 5. Stationarity tests for the ESG and conventional indices

Data set	*t*-Statistic	Probability	Status
PFTS	–0,23	0,93	Non-stationary
PFTS (returns)	–32,10	0	Stationary
UX	–2,25	0,19	Non-stationary
UX (returns)	–34,4771	0	Stationary
WIG	–1,66	0,45	Non-stationary
WIG (returns)	–14,03	0	Stationary

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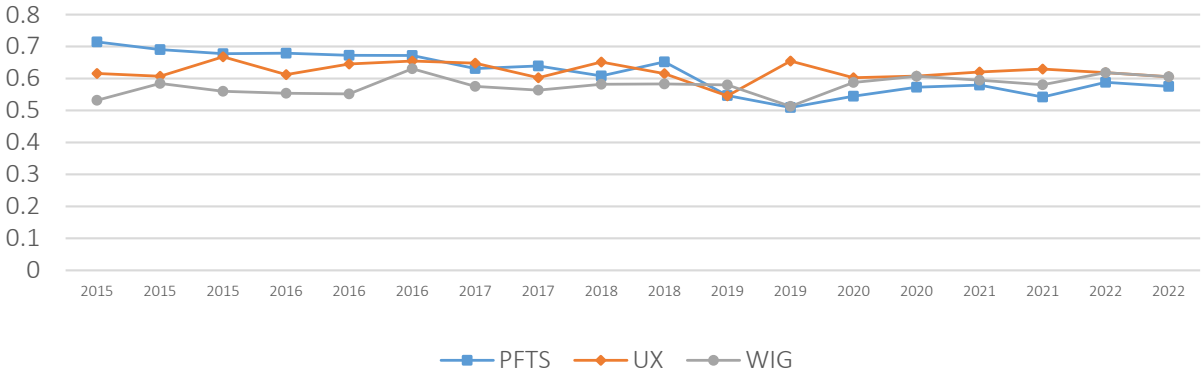

Figure 2. Dynamic R/S analysis results

The subsequent stage involves conducting dynamic R/S analysis, which sheds light on the evolution of persistence over time. The findings are presented in Figure 2.

Based on the visual inspection of the results presented in Figure 1, it appears that the persistence of both ESG and conventional indices varies over time and exhibits similar dynamic behavior. Thus it can be concluded that detected previously (during static Hurst exponent analysis) differences were typical during 2015–2016, but since 2020 the level of persistence for all of the analyzed indices is almost the same. Which is evidence against the tested hypothesis.

The last step is to analyze the resistance to anomalies. The first anomaly to explored is the day of the week effect: returns on different days of the week are not the same and tend to create price patterns (for example, price increase on Fridays and decrease on Mondays).

Visual analysis of average returns showed that returns are different for the different days of the week (see Figure 3).

But these differences are statistically insignificant (see Table 7). So, both ESG and traditional indices are immune for this type of anomaly.

Table 7. Results of yield difference tests for different days of the week

Test	Day of the Week	PFTS		UX		WIG	
		Value (*p*-value)	anomaly	Value (*p*-value)	anomaly	Value (*p*-value)	anomaly
t-test (t critical = 1.96)	Monday	0,57	Not confirmed	–0,99	Not confirmed	–0,30	Not confirmed
	Tuesday	1,14	Not confirmed	–0,15	Not confirmed	–0,84	Not confirmed
	Wednesday	–0,94	Not confirmed	1,05	Not confirmed	0,57	Not confirmed
	Thursday	–0,39	Not confirmed	–0,25	Not confirmed	0,65	Not confirmed
	Friday	–1,30	Not confirmed	0,32	Not confirmed	–0,10	Not confirmed
ANOVA	All days	0.95 (0.43)	Not confirmed	1.93 (0.10)	Not confirmed	0.26 (0.90)	Not confirmed
Kruskall-Wallis	All days	1.1 (0.89)	Not confirmed	3.63 (0.46)	Not confirmed	1.94 (0.75)	Not confirmed

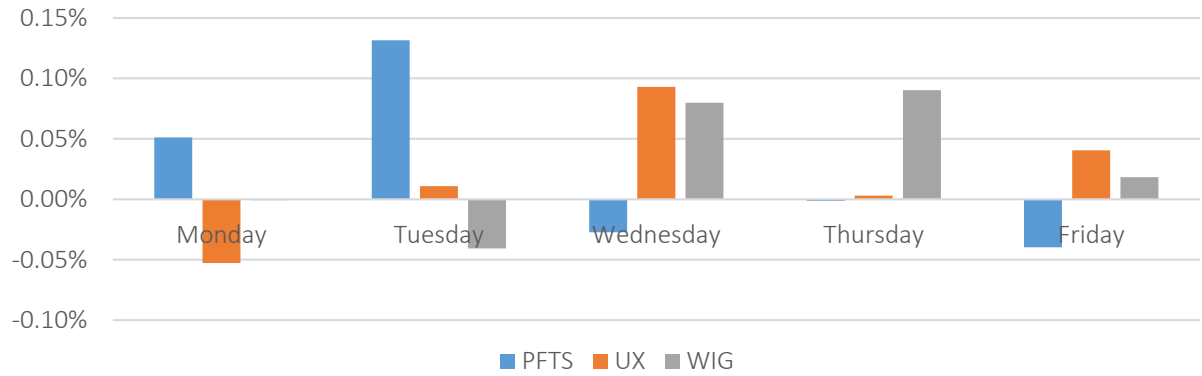

Figure 3. Average returns for the different days of the week

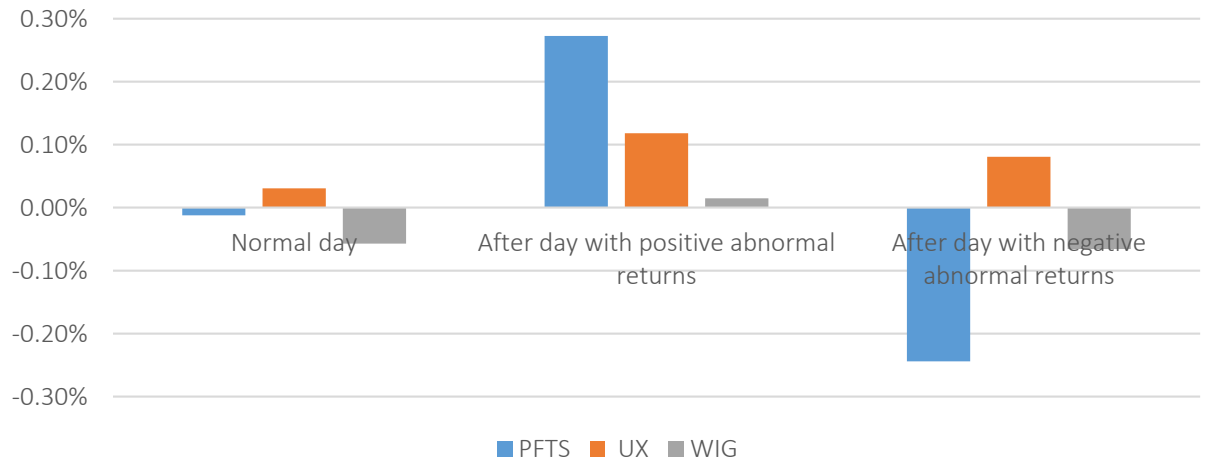

Figure 4. Average returns on usual days and on the days after the days with abnormal returns

The next anomaly to look into is abnormal returns and price patterns they create. The number of days with abnormal returns for different trigger parameters is presented in Table 8.

Table 8. Number of days with abnormal returns for ESG and conventional indices

Index	1 sigma	2 sigmas	3 sigmas
PFTS	168	62	32
UX	249	67	20
WIG	248	60	22

As can be seen, the results for UX and WIG indices are very close, but differ from those for the case of PFTS index. So, the results related to differences between ESG and traditional indices are mixed. But they are certainly against the assumption that the ESG index is more resistant to abnormal returns.

According to Caporale et al. (2018), prices tend to create patterns on the days after the days with abnormal returns. Visualization of average returns on the days after the days with abnormal returns is presented in Figure 4.

As observed, the ESG index exhibits no abnormal returns, while traditional indices tend to show significantly higher or lower returns on days following abnormal returns compared to regular days. Still in most of the cases, these differences are statistically insignificant (see Table 9) with the only exception: PFTS data for the case of days after the days with positive abnormal returns.

Based on analysis of 2 anomalies, no convincing evidence in favor of differences in indices was found.

Overall results are against Hypothesis 1. ESG index does not demonstrate any unique data properties compared to traditional analogues. Despite the fact that companies listed in ESG index are more transparent and thus characterized by lower information asymmetry, they are more liquid and popular among investors, the ESG index is not more efficient than traditional ones.

Possible explanation is derived from the practice of "washing" "camouflage" (Gray, 2006) and "bleaching" that are truly punished by regulators but without huge success. Despite the sheer number of ESG credentials and claims, the real ESG performance and scores of companies included into ESG and conventional indices should be the same due t misleading disclosure practices. Such conclusions are in line with Takaishi's (2022) conclusion about companies' behavioral bias as a reason for market inefficiency, as well as pure ESG disclosure and corporate governance regulations. Moreover, this bias can be deepened with the lack of standardization in ESG data disclosure and common approaches in ensuring the accuracy information disclosed (Yuet al., 2020).

The main concerns about the reasons of ESG and conventional indices neutrality in terms of "washing" and its regulation are as follows. First of all, there is a lack of common understanding what is washing misleading and misbehavior because of

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Table 9. Results of tests for differences in returns on days after days with abnormal returns and usual days

Index	Case	t-test		ANOVA		Mann-Whitney	
		t criterion (critical)	Anomaly status	F (p-value)	Anomaly status	Adjusted H (p-value)	Anomaly status
PFTS	Positive	3.82 (1.96)	Confirmed	28.89 (0.00)	confirmed	13.61 (0.00)	Confirmed
	Negative	1.89 (1.96)	Not confirmed	13.31 (0.00)	confirmed	1.76 (0.18)	Not confirmed
UX	Positive	0.65 (1.96)	Not confirmed	1.25 (0.26)	Not confirmed	1.58 (0.21)	Not confirmed
	Negative	0.28 (1.96)	Not confirmed	0.31 (0.57)	Not confirmed	1.07 (0.30)	Not confirmed
WIG	Positive	0.29 (1.96)	Not confirmed	0.23 (0.63)	Not confirmed	0.09 (76)	Not confirmed
	Negative	0.02 (1.96)	Not confirmed	0.00 (0.96)	Not confirmed	2.15 (0.14)	Not confirmed

plural approaches to define it and huge variety of washing types (in according with the all range of ESG criterion). Misconduct in disclosure environmental credentials ("green washing"), human or gender right ("social and pink washing"), UN compact or SDGs semi-adherence ("blue washing", "SDGs washing"), or in general promotion ascent a positive impact ("impact washing") derived from regulatory inconsistency. For example, in EU Taxonomy Regulation EU/2020/852, greenwashing was defined as "the practice of gaining an unfair competitive advantage by marketing a financial product as environmentally friendly, when in fact basic environmental standards have not been met", while in Directive (EU) 2022/2464 (CSRD), greenwashing is related to "financial products that unduly claim to be sustainable". But it is just one environment criteria covered, although social and governance criterion remain undisclosed.

In this case, the so-called "washing" taxonomy development can assist regulators, companies and index providers for higher scrutiny and focus on ESG transparency and indices influencing.

The second important reason is that companies' legal responsibilities in case of washing and CSR misspresentation allegations are not clearly defined, especially in the process of companies self-labeling as sustainable without additional assurance. So, in most cases there are no significant punishments for irrelevant ESG disclosure.

The experience of The German consumer association in promotion anti-washing actions is rather useful for consumer protection and spreading good CSR practice and code of conduct. Public claiming of unfair companies may decrease the consumer loyalty and can be treated as additional penalties for "washing" practices. There are many court proceedings relating to greenwashing (LIQID Asset Management GmbH, Tomorrow GmbH, Commerz Real Fund Management Sarl, DekaBank Deutsche Girozentrale), in addition to the well-known Volkswagen and Deutsche Creditbank AG (DWS Investment GmbH) greenwashing scandals (Verbraucherzentrale, 2022).

The third reason is related to a very comprehensive regulatory landscape, both for corporate disclosure and for ESG funds, managers, and advisors. Recent drafts and in-force regulation of ESG investment (see Table 10) show the consolidation of the regulatory efforts along with the growth of the number of types of "washing", which, however, does not have a significant impact on improving market efficiency yet. A cumulative effect of rules presented in the Table 10 may reach $ 3.6 trillion of ESG investments (8% of global assets under the management). Despite better and more transparent decision-making process, levelling washing and informational asymmetry and enhancing overall market efficiency, this can create additional pressure in terms of increasing transactional costs and possibilities of regulatory arbitrage across the different jurisdictions and disconnected regional rules.

The same issue is relevant for comprehensive disclosure standards, which is significantly different for sustainability and integrated reporting standards. The parallel systems of GRI and ISSB's (Climate Disclosure Standards Board, the International Accounting Standards Board, the Value Reporting Foundation (Integrated Reporting and SASB Standards), the TCFD, and the World Economic Forum provides different ESG disclosure requirements. Even on the EU level, there are many different initiatives: NFRD (2014), EU CSRD (2021) draft and EU Taxonomy Regulation (Sustainable finance taxonomy, 2020), Platform on Sustainable Finance's draft report on a social taxonomy (Platform on Sustainable Finance's, 2022 a), Platform on Sustainable Finance's draft report

Table 10. Emerging regulations in ESG investment landscape

Source: Authors' elaborations within MSCI (2022, 14).

Region	Country	Regulation	Year	Status
North America	Canada	Disclosure for ESG related investment funds	2022	In force
	The USA	Enhanced disclosures by investment advisers and investment companies about ESG investment practices	2022	Proposed
Europe	EU	Sustainable Finance Disclosure Regulation (SFDR)	2021	In force
		Corporate Sustainability Reporting Directive	2023	In force
	UK	Sustainability Disclosure Requirements (SDR) and investment product labels	2022	Proposed
Asia	Singapore	Disclosure and reporting guidelines for retail ESG funds	2022	In force
	Hong Kong	Circular to managers of unit trust and mutual funds – ESG funds	2022	In force
	Taiwan	Disclosure rules for ESG funds	2021	In force
	Malaysia	Guidelines on sustainable and responsible investment funds	2021	In force
	India	Disclosure norms for ESG funds	2022	Proposed
	Philippines	ASEAN Sustainable and Responsible Funds Standard	2022	Proposed
	Thailand	Regulations for Disclosure Standards of Sustainable and Responsible investment Funds	2021	Proposed
Australia	Australia	How to avoid greenwashing when promoting sustainability-related product	2022	In force
	New Zealand	Disclosure framework for integrated investment project	2020	In force

on taxonomy extension options linked to environmental objectives Platform on Sustainable Finance's, 2022 b), Draft European Sustainability Reporting Standards (EFRAG, 2022).

Otherwise, no clear requirements for ESG data providers and for index methodologies comparability are presented because of the trade secret and ESG scoring differences. For example, if the corporate disclosure landscape is becoming more complicated, but at the same time presumed greater transparency, ESG index and rating agencies like MSCI, S&P Dow Jones Indices, Nasdaq Inc., Bloomberg LP, FTSE Russell are not regulated at all. Their ESG methodology and companies' ESG scoring are unique and incomparable, which might create the background for companies' "washing" practices. The ESG index families are well recognized without being true to label because of the absence of the "true label" or universal benchmarks.

CONCLUSIONS AND IMPLICATIONS

Companies included in ESG indices tend to be more transparent, which results in less information asymmetry. Plus, they are more liquid and popular among investors compared to the companies included in traditional indices. Based on these facts, it could be expected that ESG indices are more efficient than traditional ones. This paper aims to confirm/reject this assumption by testing the following hypothesis: ESG indices are more efficient than traditional ones.

To do this, daily data from two traditional Ukrainian stock market indices (UX and PFTS) and ESG index (WIG Ukraine) over the period 2015–2022 is analyzed. Various data properties are explored, including persistence, stationarity, normality, resistance to market anomalies, in order to find differences between ESG and traditional indices. For these purposes, a number of specific methods and tests are used. Among them are static and dynamic R/S analysis, parametrical (t-test, ANOVA) and non-parametrical (Mann-Whitney and Kruskal-Wallis) statistical tests, tests for normality (Kolmogorov-Smirnoff, Anderson-Darling test, etc.) and stationarity (ADF tests), as well as a specific methodology to test market anomalies (dynamic trigger approach).

The results are mixed, but in general show no significant differences between ESG and traditional indices. In general, they have the same persistence, stationarity, do not fit normal distribution and are not influenced by explored market anomalies. So, the Hypothesis is not confirmed and ESG indices are not more efficient than traditional analogues.

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These findings can be explained by the fact that some ESG companies only pretend to be ESG oriented by using specific mimic technics like different types of "camouflage", "washing" and "bleaching". In order to fix this, stricter reporting regulations should be applied to provide real ESG compliance.

The findings suggest some policy implications for increasing the transparency of companies' ESG and therefore marketing efficiency:

- On the corporate level, it is vital to promote good governance, CSR and SDGs disclosure practice and punishments against misleading behavior.

- On the regulatory level, there needs to be clear and common understanding across jurisdictions of what ESG is, sustainable or SDGs linked investment, and a sound definition of "washing" practices. Standardization of ESG disclosure practices and mandatory comparable ESG reporting is a prerequisite for transparency and information asymmetry mitigating.

- On the ESG data providers (index) level, it is crucial to provide proper regulation of reliability and comparability ranking and index data, best benchmark, as well as lists of "washing criterions" incorporated into companies ESG scoring models across sectors, regions and markets.

Special attention should be paid to the ESG transformation of the post-war Ukrainian stock market. Despite the neutrality of Ukrainian ESG and conventional market indices, the NBU's efforts to ensure the sustainability of the financial sector and transfer the EU ESG regulation (SFRD, Taxonomy, CSRD, EFRAG SRS) into Ukrainian practice are crucial for the effective investment aid allocation.

AUTHOR CONTRIBUTIONS

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APPENDIX A. Data frequency charts

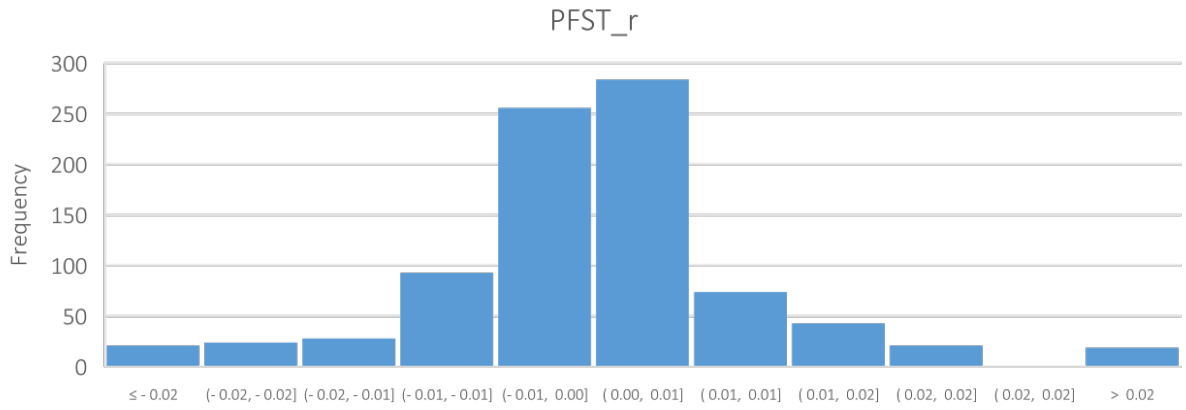

Figure A1. Frequency of returns for the case of the PFTS index

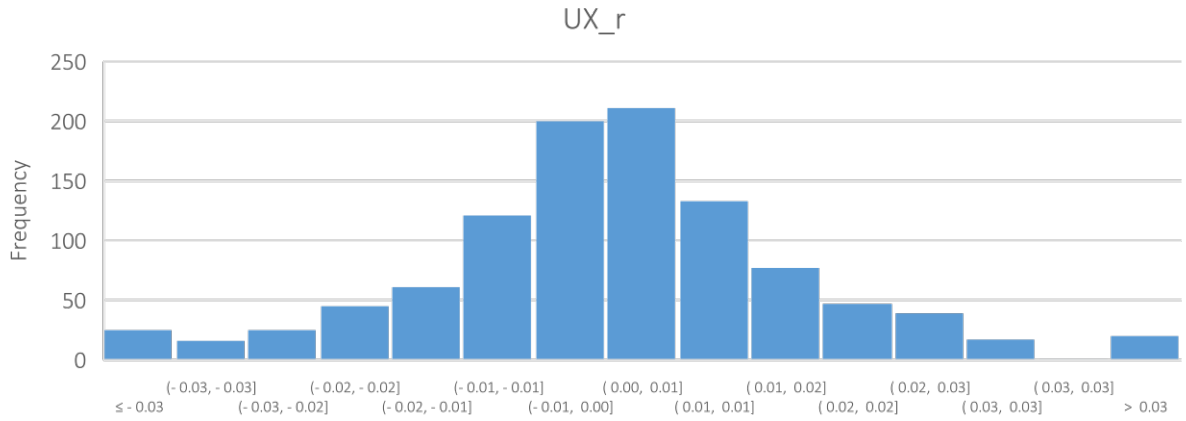

Figure A2. Frequency of returns for the case of the UX index

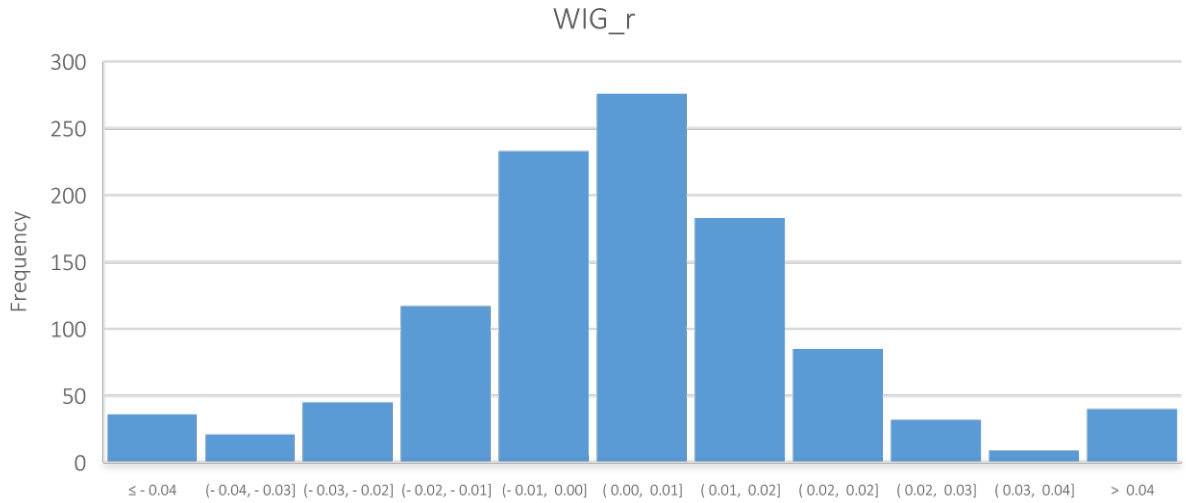

Figure A3. Frequency of returns for the case of the WIG Ukraine index