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Impact of Companies' Statements about Their Environmental Actions on Stock Prices

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Abstract

Purpose: the purpose of the study is to determine the specifics of the impact of companies' statements about their perceived environmental actions on their stock prices on the developed and developing stock exchanges. The contradictory findings on the impact of corporate environmental announcements on stock prices and the low level of green production, especially in developing countries, make this research work relevant.

Methods: the research methodology is based on event analysis and the examination of the impact of some environmental announcements on the quotations of both developed and developing stock exchanges.

Results: the environmental approach to business operations, as compared to traditional operations, often requires additional financial resources, and many companies refuse to go green. This paper examines whether the market value of a company increases after the growth of its environmental orientation and whether this can be used as additional motivation for companies to carry out environmental activities. The work has shown that greening in a developed market is primarily driven by government policy, while in an developing market – by the desire to enter international product and capital markets, and that the directions of greening reflect global rather than national priorities. In the developed market, the impact of environmental announcements is observed only in isolated cases and can be both positive and negative. In the developing market, the significance of announcements is higher, and they lead to a short-term decline in exchange prices.

Conclusions and Relevance: it is concluded that it is seen necessary to improve markets' regulatory and information space and to harmonize the interests of all participants to address environmental issues. The results will be of interest to investors, corporate managers, territorial governments, as well as specialists in green economy and behavioral finance.

Keywords: environmental announcements, greening of activity, ecological orientation, sustainable economy, company's market value, stock market, event analysis

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Научная статья

Влияние заявлений компаний об экологических действиях на котировки акций

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Аннотация

Цель исследования – определение особенностей влияния заявлений компаний о предполагаемых ими экологических действиях на котировки их акций на развитой и развивающейся фондовых биржах. Противоречивость выводов о воздействии корпоративных экологических анонсов на цены акций и низкий уровень экологизации производства, особенно в развивающихся странах, обусловливают актуальность данной работы.

Метод или методология проведения работы. Методология исследования построена на проведении событийного анализа и изучении влияния отдельных экологических заявлений на котировки как развитой, так и развивающейся бирж.

Результаты работы. Экологический подход к ведению хозяйственной деятельности, по сравнению с традиционным, зачастую требует дополнительных финансовых ресурсов, и многие компании отказываются от экологизации производства. В работе рассматривается, повышается ли рыночная стоимость фирмы после роста ее экологической ориентации, и можно ли использовать это в качестве дополнительной мотивации компаний к осуществлению экологической деятельности. В ходе работы было показано, что на развитом рынке экологизация деятельности в первую очередь обусловлена проводимой государственной политикой, на развивающемся – стремлением выйти на международные рынки товаров и капитала, а направления экологизации отражают не национальные, а глобальные приоритеты. На развитой фондовой бирже воздействие экологических анонсов наблюдается лишь в единичных случаях и может быть как положительным, так и отрицательным. На развивающейся бирже значимость заявлений выше, и они приводят к краткосрочному снижению биржевых цен.

Выводы. Сделан вывод о необходимости совершенствования нормативного и информационного пространства рынков и согласования интересов всех участников для решения экологических проблем. Результаты будут интересны инвесторам, корпоративным менеджерам, территориальным органам управления, а также специалистам в области зеленой экономики и поведенческих финансов.

Ключевые слова: экологические анонсы, экологизация деятельности, экологическая ориентация, устойчивая экономика, рыночная стоимость компании, фондовая биржа, событийный анализ

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Introduction

Companies that strive to conduct their business activities in accordance with the principles of sustainable economy and environmental safety often find it difficult to sell their products. The cost of environmental products is higher than traditional ones [1; 2; 3], and this becomes the reason why consumers refuse to buy them [4; 5; 6]. Therefore, at present, especially in developing countries, where there is no strict environmental legislation [7; 8; 9], many businesses choose the traditional way of producing goods and services, which has a significant negative impact on the environment. For example, the mission of less than 20% of the largest Russian companies contains environmental components [10]. Accordingly, additional motivation for companies to manufacture eco-goods and provide eco-services is necessary. One of the methods of motivation can be the improvement of eco-economic literacy and the distribution of information about the advantages which eco-companies can get in the market, in particular, about the increase of the investment appeal of their shares.

A number of papers show that the shares of ecologically responsible companies are more attractive to investors than the shares of traditional producers [11; 12; 13]. However, some researchers have come to the opposite conclusion: the greening of a company reduces its market value [14]. These discrepancies

testify to the insufficient study of relationship between the increase in environmental responsibility level and the dynamics of a company's exchange quotations.

The aim of the study is to determine the specifics of the influence of companies' statements about their alleged environmental actions on their stock quotes on the developed and developing stock exchange.

The objectives were to:

1) Analyze the direction, duration, and degree of change in stock prices following environmental announcements by their issuers in the developed and developing market.

2) Compare the specifics of the impact of announcements of alleged environmental actions by companies on their stock prices on the developed and developing stock exchanges, identifying similar and different effects,

3) Prepare recommendations on how to motivate companies to green their economic activities and increase the ability of green manufacturers to accumulate additional financial resources.

In this paper, we will consider both synonymous terms developed stock exchange and developed market along with developing stock exchange and developing market. As environmental announcements, we will consider messages from the company's management team in the media and on corporate websites about measures to reduce the negative impact of production and business activities on the environment. Environmental actions (greening, raising environmental awareness) include the implementation of measures to reduce the negative impact on the environment. The terms green, environmental, environmentally friendly, and eco-friendly are considered to be synonymous.

The object of the study was the environmental statements of companies about their alleged environmental actions. The subject was the role of manufacturers' environmental announcements in their stock price dynamics.

The main reason for studying environmental action announcements, rather than environmental actions themselves, is that the former are less predictable for both issuers and investors. Accordingly, behavior, as compared to reaction to happened events, may be less rational and requires a separate study.

The demonstrated need to motivate environmentally responsible manufacturers and the divergence of the conclusions of previous works on the impact of companies' environmental actions on their stock prices make this work relevant.

Research novelty is due to study methodology, in particular, taking into account investor information and regulatory space and comparing the developed and developing markets, and choosing the insufficiently explored Russian market as a developing market and the most recent environmental announcements as a study object. A literature review shows that the ratio of companies' environmental and financial performance has recently changed [13; 15], and this, taking into account the expected growth of environmental literacy, can cause new forms of investment behavior. In addition, the novelty can be attributed to the improvement of event analysis methodology: the calculation of regression equations for stock quotes was carried out on several indices, and for further modeling was chosen the one with the highest determination coefficient R2. This methodological change increases the accuracy of the conclusions drawn.

The results of the study are of interest to territorial authorities, as they will help to determine the optimal strategy for motivating manufacturers to sustainable development, as well as for the management of companies that plan the financial consequences of the environmental policy. In addition, the findings expand knowledge in green economics and behavioral finance and will be of interest to specialists in these fields.

The proposed changes are aimed at increasing the number of environmentally oriented and at the same time economically wealthy companies, which is necessary for increasing the environmental and economic security level of territories.

Literature Review

Impact of a Company's Environmental Actions on the Stock Market

Initially, companies' environmental actions were seen as additional costs, which can significantly reduce corporate profits (see, for example, [16]). Later, the ability to manage the environment came to be considered as a company's new fundamental competitive advantage [17].

It was shown that, with the right approach, environmental standards can lead to innovation and increased productivity [18]. Also, environmental management by reducing waste and increasing productivity saves a company a lot of money [19]. Preventing pollution and reducing emissions increase the profitability of companies' assets, sales and equity, and more so for those whose initial environmental performance was lower [20]. And more recently, more environmentally friendly companies improved the levels of their financial health [13; 15].

At the same time, there are opposite conclusions about the effect of greening a company's operations on its stock price dynamics. The study [14] shows that an increase in corporate environmental performance reduces stock returns, and this can be explained by

both the issuing company's acceptance of higher risks and the personal preferences of investors. However, the results of another works [11; 13] confirm that environmental disclosure leads to an increase in a company's market value. The shares of companies which environmental and social policy levels are higher have higher returns and lower volatility. At the same time, a high level of corporate environmental and social policies and large advertising expenditures increase stock returns, while the predominant focus of these policies on investors leads to less volatility [12].

The aforementioned discrepancies are also reflected in the contradictory results of previous studies on the impact of corporate environmental announcements on company stock prices.

On the one hand, a number of papers [21; 22] has shown a positive relationship between economic announcements and a company's market value. In particular, the adoption of environmental standards which imply a higher level of requirements than legislated increases a company's market value [22]. In the developed market, however, where companies' environmental actions were expected, there was little increase in stock prices [23]. There was also a short-term impact of corporate announcements on stock exchange quotations, and the stock prices of green companies operating in the financial industry were more responsive to the news than those of companies in other areas. One of the reasons for this can be seen as the predominant dependence of non-financial companies on long-term rather than short-term factors [21].

On the other hand, it has been shown that there is no significant relationship between a company's environmental announcements and market value, with a greater influence of green initiatives related to the product itself, not to its manufacturing [24]. At the same time, there is the research [25] indicating that announcements about sustainable products and services lead to a decrease in a companies' market value, but the opposite situation is observed with announcements about green information technology. Similarly, the announcements of environmental innovations made by automotive companies lead to higher stock prices, and the innovation type and the chosen market segment are important [26]. A decrease in share prices occurs after issuers' publication of pollution reports [27]. Announcements by companies of their untrue environmental commitments (greenwashing) reduce interest in their securities more than non-environmental actions [28].

Another group of studies focuses on the impact of companies' environmental ratings on their stock prices. For example, it has been shown that after the release of Newsweek's 2009 Green Rating, the stock market saw an abnormal decline in stock prices, which led to the conclusion that investors have a negative attitude towards the environmental activities of corporations [29]. Such a reaction could be explained by the consequences of the Global Financial Crisis in 2008, but a similar conclusion was obtained when examining the stock price performance of the 500 largest U.S. companies after the publication of Newsweek's 2017 Green Rating. At the same time, it was shown that the overall decline in the value of securities was due to 97 companies whose green scores in this ranking were zero. The remaining issuers cumulatively saw abnormal returns on the days examined. Thus, the rating release boosted the share prices of environmental companies and lowered those of others [30].

The positive perception of the rating and the classification of the company as green were confirmed in the study of the regional ratings in two industries – the rating of the environmental responsibility of oil and gas companies in Russia in 2014 and the rating of the environmental responsibility of mining companies in Russia in 2016 [31].

Also quite a number of studies focus on relationship between a company's market value and the issue of green bonds. The studies [32; 33] note that this relationship is positive, but it is for certified issues; the stock market reacts negatively to non-certified issues [32]. In addition, bonds with high coupon rates can lead to a negative reaction of an investor, and a large operating cash flow reduces stock price growth [33].

It has been noted that it matters whether green bond issue is primary. An analysis of 414 companies from 2013 to 2019 showed that for most of them there was a significant increase in share prices on the day the first green bond issue was announced, but their second issue was accompanied by a much smaller price increase, and there was no such an increase in subsequent issues at all. In this way, companies already perceived as environmentally friendly ones could not attract additional investors to the stock market [34].

Difference between Investor Behavior in the Developed and Developing Markets

Despite long-term relationship between developed and developing markets [35] and the similarity of the short-term returns of the stocks traded on them [36], investor behavior is more robust on the developed stock exchanges than on the developing ones during a crisis [37]. Investors in the developing markets are more reactive to major information shocks [38]. The developing stock exchanges are more volatile compared to the developed ones, and risk-averse investors are compensated for taking a higher risk [39].

Investor behavior towards green stocks has been studied in the developed (see, for example, [13; 23])

and developing markets [21], but differences in the time period and the methods used make these works not fully comparable.

At the same time, we note the comparable results demonstrated the differentiation of some forms of eco-economic behavior of residents in the developed and developing countries [40; 41].

Generalization of Theoretical Background and Study Hypothesis

Taking into account the shown difference in stock price dynamics in environmental announcements by various companies, as well as the differentiation of investor behavior in the developed and developing markets, it seems appropriate to study further the impact of environmental announcements on companies' market value and to compare the impact of environmental announcements on the developed and developing stock exchanges.

Based on our analysis of the studies, the following hypotheses are formulated:

H1: The announcements of the planned environmental actions by companies in the developed market lead to short-term and insignificant increases in their stock prices.

H2: In the developing market, the announcements of the planned environmental actions by companies lower their stock prices in the short term.

H3: The impact of companies' announcements of the planned environmental actions on stock prices in the developing market, compared to the developed market, is just a short-term one, but larger in absolute value.

Materials and Methods

The methodology relies on the reasoned action approach, which assumes that behavior is based on behavioral beliefs, and they are determined by the information available to a person [42]. Accordingly, behavior in the developed and developing markets (in different information environments, with different norms and attitudes towards them) may not coincide.

Study methodology involved the event analysis, namely fixing the changes in the stock quotes on the stock exchange upon the occurrence of a certain event – the issuer's announcement of a planned environmental action.

NASDAQ stock exchange (USA, developed market) and the Moscow Exchange (Russian Federation, developing market) were chosen for analysis (categorization of stock exchanges into the developed and developing ones was based on the results of the MSCI 2021 annual market classification review; the main criteria for classifying stock exchanges were their size, liquidity of traded securities, market access, etc.). In NASDAQ market, 12 companies and 20 statements made [1] by them were analyzed (see Table 1), while in the Moscow Exchange, 12 companies and 29 statements were analyzed (see Table 2). The discrepancy in the number of environmental statements analyzed for different companies is due to their different activities in implementing their environmental strategy: some companies made more announcements, some less. Since Yandex N.V. shares are traded on both stock exchanges, this company's statement was also considered in relation to the quotations of both stock exchanges. At present, Applied Materials, Inc. and The Goodyear Tire & Rubber Company are also listed not only on NASDAQ, but also in Moscow Exchange, but their listing occurred after the date of the considered statements, in April 2021 and May 2021, respectively. Other companies listed on both of the aforementioned stock exchanges made no material statements of any planned environmental actions during the period under review.

Table 1

List of NASDAQ Companies under Review and Their sStatements of Planned Environmental Actions

Таблица 1

Перечень исследуемых компаний биржи NASDAQ и их заявлений о планируемых экологических действиях

Company number	Company name	Issuer's industry	Country	Event code	Date of statement	Planned action type
1	Amazon. com, Inc.	Internet Retail	USA	N1	6/23/2020	D
				N2	9/25/2020	C
				N3	4/22/2021	D
2	Applied Materials, Inc.	Semiconductor Equipment & Materials	USA	N4	7/21/2020	A1
3	Apple, Inc.	Consumer Electronics	USA	N5	7/21/2020	A1
				N6	10/13/2020	B
				N7	4/15/2021	C*

[1] MSCI announces the results of the 2021 annual market classification review. (2021). Retrieved: https://www.msci.com/market-classification (access date: 10.07.2021).

Окончание таблицы 1

End of table 1

Company number	Company name	Issuer's industry	Country	Event code	Date of statement	Planned action type
4	Intel Corporation	Semiconductors	USA	N8	5/14/2020	A1
5	Netflix, Inc.	Telecommunications	USA	N9	3/30/2021	A1
6	PepsiCo, Inc	Non-Alcoholi Beverages	USA	N10	9/21/2020	A1
				N11	12/2/2020	B
				N12	1/14/2021	A1
7	Ryanair Holdings PLC	Air transportation	Ireland	N13	3/3/2021	A2
8	Starbucks Corporation	Catering	USA	N14	1/21/2020	A1
				N15	7/21/2020	A2
				N16	3/22/2021	B
9	Tesla, Inc.	Automotive	USA	N17	5/13/2021	A1
10	The Goodyear Tire & Rubber Company	Auto Parts	USA	N18	11/24/2020	B
11	The Kraft Heinz Company	Packaged Foods	USA	N19	1/13/2021	B
12	Yandex N.V.	Internet Content & Information	Netherlands	N20	5/28/2021	A1

** combined public and financial effects of the initiative noted.*

Hereinafter, the following types of planned actions are used: the achievement of the environmental parameters of the activities established independently (A1) and within the framework of environmental initiatives (A2); the release of goods with environmental characteristics, including through the greening of economic activities (B); increasing the availability of environmental goods (C); public environmental activities (D).

Complied by the author based on official company websites and the Twitter by Elon Musk, CEO of Tesla, Inc.

Составлено автором на основании официальных сайтов компаний и Твиттера генерального директора Tesla, Inc. ИлонаМаска.

Table 2

List of Moscow Exchange Companies under Review and Their Statements on Planned Environmental Actions

Таблица 2

Перечень исследуемых компаний Московской биржи и их заявлений о планируемых экологических действиях

Company number	Company name	Issuer's industry	Country	Event code	Date of statement	Planned action type
1	PJSC Utair Airline	Air transportation	Russia	M1	4/14/2021	B
2	PJSC NLMK	Steel	Russia	M2	9/21/2020	A1
				M3	10/15/2020	A1
3	PJSC Nornickel Mining and Metallurgical Company	Mining	Russia	M4	2/9/2021	A1
				M5	3/22/2021	A1
				M6	6/1/2021	A1
				M7	6/21/2021	B
4	PJSC KAMAZ	Automotive	Russia	M8	5/28/2020	B
				M9	1/31/2021	B
5	PJSC Magnit	Food retail	Russia	M10	6/23/2020	A1
				M11	10/5/2020	A2
				M12	11/13/2020	B
				M13	4/15/2021	A2
6	PJSC Rosneft Oil Company	Oil & Gas Integrated	Russia	M14	12/21/2020	A1
				M15	1/14/2020	A2

Окончание таблицы 2
End of table 2

Company number	Company name	Issuer's industry	Country	Event code	Date of statement	Planned action type
7	PJSC Polyus	Gold	Russia	M16	3/15/2021	A1
				M17	4/29/2021	B
8	PJSC SberBank	Banking	Russia	M18	10/20/2020	B
				M19	1/27/2021	A2
				M20	5/7/2021	A1
				M21	5/14/2021	A1
9	PJSC Severstal	Steel	Russia	M22	3/3/2020	A1
				M23	7/30/2020	A1
10	PJSC TGK-1	Electric	Russia	M24	12/28/2020	B
				M25	4/29/2021	B
				M26	5/25/2021	B
11	X5 Retail Group N.V.	Food retail	Netherlands	M27	5/12/2020	A2
				M28	12/2/2020	A2
12	Yandex N.V.	Internet Content & Information	Netherlands	M29	5/28/2021	A1

Compiled by the author based on the companies' official websites.
Составлено автором на основании официальных сайтов компаний.

A brief description of each environmental statement is presented in Table 3. Predominantly, the chosen environmental statements are connected with the carbon-neutral transition and the use of renewable energy sources. It should be noted that, of course, in developed countries, the choice of these areas of greening is primarily driven by government policy. In Russia, the predominant factor was the desire of large companies to enter the product and capital markets of developed countries.

Table 3

List of investigated statements of planned environmental action

Таблица 3

Перечень исследуемых заявлений о планируемых экологических действиях

Event code	A brief description of the planned action
N1	Creation of a venture capital fund, «The Climate Pledge Fund», focused on companies that contribute to the transition to a low-carbon economy
N2	Launch of the «Climate Pledge Friendly» program for sourcing and buying eco-friendly goods
N3	Joining the «LEAF Coalition» initiative to raise funds for rainforest protection
N4	Setting the course for greater sustainability; switching to renewable energy by 2030; launching a sustainable supply chain initiative
N5	Commitment to achieving full carbon neutrality by 2030
N6	The iPhone 12 models are planned to use exclusively recycled rare-earth elements, and will not come with power adapters or headphones
N7	Creation of the «Restore Fund» investment fund for reforestation projects
N8	Adoption of a strategy until 2030 to achieve clean water use, the use of exclusively renewable energy sources, zero waste, and zero carbon emissions
N9	Achieving of carbon neutrality by the end of 2022
N10	Transition to fully renewable electricity supply for our own sites by 2030 and for the ones established through franchising or outsourcing by 2040
N11	Switch to exclusively recycled plastic bottles for the Pepsi brand in nine European Union markets by 2022
N12	Reduction of greenhouse gas emissions from manufacturing by 75% and from other economic activities by 40% by 2030 compared to 2015 and reach zero emissions by 2040
N13	Joining the «Fueling Flight Initiative» to achieve zero carbon emissions

Окончание таблицы 3
End of table 3

Event code	A brief description of the planned action
N14	Planned 50% reduction in carbon dioxide emissions, as well as in water use and waste by 2030
N15	Joining the «Transform to Net Zero» initiative to accelerate the transition to a net zero emission global economy
N16	Commitment to use only carbon-neutral green coffee and reduce water used in coffee processing by 50% by 2030
N17	Refusal to accept bitcoins as payment due to the use of fossil fuels in mining them
N18	Announcement of the goal of completely replacing petroleum oils with soybean oils by 2040
N19	Developing and testing their first recyclable microwave plate
N20, M29	Defining directions for sustainable development
M1	Improving the environmental impact of flights by reducing fuel consumption
M2	Determining the amount of greenhouse gas emission reductions by 2023
M3	Launch of a waterless blast furnace slag cooling complex
M4	Announcement of priorities for sustainable development
M5	Reduction of emissions at Kola Peninsula facilities by 85% in 2021
M6	Adoption of an environmental and climate change strategy
M7	Launch of carbon-neutral nickel production
M8	Testing of Euro-5 engines and research work to reach Euro-6
M9	Planned fuel cell electric truck and fuel cell electric bus creation in 2021
M10	Defining the sustainable development strategy and goal until 2025
M11	Accession to the UN Global Compact for Sustainable Development
M12	Launch of the «Green Office» program
M13	Planned creation of the «Together for a Healthy Future» initiative with major FMCG companies
M14	Announcement of the Carbon Management Plan by 2035
M15	Signing of an Agreement on cooperation within the national project «Ecology» with the Ministry of Natural Resources and Environment of the Russian Federation
M16	Presentation of strategic priorities for climate change
M17	Securing electricity needs from renewable sources, including through the purchase of green certificates
M18	Transition to green electricity in offices
M19	Joining the UN Global Environment Program initiative for the financial sector
M20	Achieving a zero-carbon footprint by 2030
M21	Submission of the climate-neutral plan
M22	Greenhouse gas emissions are to be reduced by 3% by 2023 from 2020 levels and air pollutants by 13% by 2025 from 2017 levels
M23	Submission of the investment plan for environmental projects for 2020
M24	Green electricity generated from carbon dioxide-free hydroelectric power plants begins to be sold
M25	Sale launch of green I-REC certificates on a blockchain platform
M26	Free contracts for the supply of green energy generated by hydroelectric power plants begin to be concluded
M27	Accession to the UN Global Compact for Sustainable Development
M28	Joining the international SBTi Carbon Neutrality Initiative

Compiled by the author based on the companies' official websites.
Составлено автором на основании официальных сайтов компаний.

The analysis includes companies with different levels of environmental responsibility [2] and various industries, with some industries of the developed market companies coinciding with industries of the developing market companies (automotive – Tesla, Inc. and PJSC KAMAZ; air transportation – Ryanair Holdings PLC and PJSC Utair Airline).

[2] According to Sustainalytics, Inc. as of May 2021, estimates from https://finance.yahoo.com/

The statements made from January 1, 2020 to June 30, 2021 were considered. Note that in several statements the planned action was not directly indicated, but clearly implied (for example, based on the announcement of the release of the first unit of green goods, it was obvious that the company plans to continue its implementation).

During the study, market models were built to show the dependence of the return on certain assets on the overall market return.

To create the models, a period of 120 trading days preceding the date of the environmental statement was taken (this period is optimal for event analysis, see, for example, [23]).

The daily stock return was calculated as:

$$P_i = ln\frac{p_{ci}}{p_{oi}} \quad (1)$$

where: P_i – return on share i,

p_{ci} – closing price of share i,

p_{oi} – opening price of share i.

The choice of the long-normal distribution for yield calculation, rather than the discrete version, is due to the possibility of summing up the yields for different days.

Index return was calculated similarly:

$$P_I = ln\frac{p_{cI}}{p_{oI}} \quad (2)$$

where: P_I – index return,

p_{cI} – index value upon closing,

p_{oI} – index value upon opening.

Then coefficients in the regression equation were calculated:

$$P_i = a + b * P_I. \quad (3)$$

A research peculiarity was the construction of regression models on each stock exchange on the basis of 2 indices: in NASDAQ market – on the basis of NASDAQ Composite and NASDAQ-100 indices, in the Moscow Exchange – on the basis of MosBirzha and RTS indices. In the study, data on the index with which the regression equation had a greater coefficient of determination R2 (a measure by which one can explain the dispersion of stock quotations with the help of the index) and correspondingly significant F-statistics (shows the significance of the determination coefficient) are presented. Also, to check model quality, P-values were calculated (determining the significance of equation coefficients).

Further, to analyze the impact of an environmental statement made, an event window of 16 trading days was defined: the statement day and 15 days after it. The duration of the event window is determined by the objectives of the study, it is usually recommended to take 15 days before the event, the day of the event and 15 days after. Considering that economic statements by companies in most cases are not predictable events, in this study days before the statement date were not taken into account.

The resulting regression equation was used to determine discrepancy between the actual stock return and the expected stock return:

$$AR_i = P_i - a - b * P_I \quad (4)$$

where AR_i – the abnormal return of share i, the difference between its actual and expected returns.

For the event window under review, cumulative abnormal return is calculated:

$$CAR_i\ (t_1; t_2) = \sum_{t=t_1}^{t_2} AR_{it} \quad (5)$$

where CAR_i (t1; t2) – the cumulative abnormal return of share i during the event window,

t1 – the beginning of the event window, the date of the company's environmental statement,

t2 – the end of the event window, 15 days after the statement,

AR_{it} – the abnormal return of share i at time t.

The Kolmogorov-Smirnov test confirms that abnormal return within an event window has normal distribution.

Two hypotheses were then tested:

H_0*: CAR_i (t1; t2) = 0 (event had no effect),

H_1*:: CAR_i (t1; t2) ≠ 0 (event had an impact).

The test statistic is calculated for this purpose:

$$T = \frac{CAR_i\ (t_1; t_2)}{\sqrt{L*\sigma_i^2}} \quad (6)$$

where: T – the test statistic value,

L – the considered period of the event window (taking into account the assumption about the short-term nature of the influence of environmental announcements on exchange quotations, the test statistics was calculated for each of the days of the event window),

σ_i^2 – dispersion of the abnormal return on share i during the event window under review.

The obtained value of the test statistic was compared modulo with the critical value of Student's t-statistics for the 1% and 5% significance levels and with L-1 degrees of freedom. The null hypothesis can be considered confirmed if the calculated value of the test statistic is less than the critical value or equal to it the critical value.

By a similar procedure, based on the average value of the abnormal return on all shares for the day, test statistics of the event window per day for all events in aggregate were calculated and tested.

Descriptive statistics were used to analyze abnormal return dynamics.

Results and Discussion

Before a detailed analysis of individual events, we will compare the general trends in stock prices on developed and developing exchanges.

Considering all events in aggregate in NASDAQ market (see Table 4), we can conclude that they have no effect on the stock quotes: on none of the days within the event window abnormal return emerged. However, the situation in Moscow Exchange is somewhat different: on the first day, cumulative abnormal return is statistically significant for the 5% level, and on the second day – even for the 1% level. Thus, the events in question had an impact, and the biggest one was exactly after 2 days. Overall decrease in the stock quotes of all the selected companies traded in Moscow Exchange at the expense of the environmental statements made 0.3%.

Table 4

Dynamics of Average Daily Abnormal Returns of Companies in Markets

Таблица 4

Динамика среднедневной аномальной доходности компаний на рынках

Day number	NASDAQ exchange		Moscow Exchange		Critical value of Student's t-statistic	
	Average abnormal return	Test statistics	Average abnormal return	Test statistics	for 1% significance level	for 5% significance level
0	-0.0015	–	-0.0009	–	–	–
1	0.0002	-0.7926	-0.0008	-14.5900	63.6567	12.7062
2	0.0005	-0.4173	-0.0011	-10.8221	9.9248	4.3027
3	-0.0002	-0.5256	0.0016	-0.4462	5.8409	3.1824
4	0.0003	-0.3714	0.0011	-0.0107	4.6041	2.7764
5	0.0006	-0.0224	0.0023	0.6215	4.0321	2.5706
6	0.0000	-0.0169	0.0014	0.9764	3.7074	2.4469
7	0.0020	0.7128	0.0003	1.0755	3.4995	2.3646
8	0.0014	1.1335	-0.0010	0.7313	3.3554	2.3060
9	-0.0005	0.9303	0.0004	0.8451	3.2498	2.2622
10	-0.0003	0.8351	0.0010	1.0906	3.1693	2.2281
11	-0.0018	0.2142	-0.0017	0.5761	3.1058	2.2010
12	-0.0015	-0.1736	-0.0006	0.4388	3.0545	2.1788
13	-0.0010	-0.4062	-0.0010	0.1997	3.0123	2.1604
14	0.0021	0.0934	0.0013	0.4581	2.9768	2.1448
15	-0.0015	-0.2204	0.0011	0.6705	2.9467	2.1314

Author's calculations.

Расчеты автора.

NASDAQ market, as compared with Moscow Exchange, saw the maximum decrease in an average daily abnormal return, Moscow Exchange – a maximum growth in absolute value (see Table 5). At the same time, based on the standard deviation value, we can conclude that Moscow Exchange also had the greatest dispersion of the average cumulative abnormal return levels.

This is also confirmed by the graph of the cumulative abnormal returns of the companies on two stock exchanges (see Figure 1).

The analysis of the isolated events shows that 6 out of 49 (12.2%) had an impact, with 3 events belonging to the developed stock exchange, and 3 to the developing one (the significance of all the events is noted for the 5% level, and M11 events are also noted for the 1% level) (see Table 6). The same number of influencing environmental announcements in the markets, with a significant impact of all the events only in the developing market is explained by the multidirectional nature of the impact in the developed market: in 2 cases, cumulative abnormal returns were positive, and in 1 – negative. In addition, there is differentiation among all the environmental announcements. While in the developing stock exchange, the number of companies with negative cumulative abnormal returns for the first 2 days after the event was 25.0% greater than the number of companies with positive returns, in the developed stock exchange the excess

Table 5

Descriptive Indices of Average Daily and Cumulative Abnormal Returns of Companies in Markets

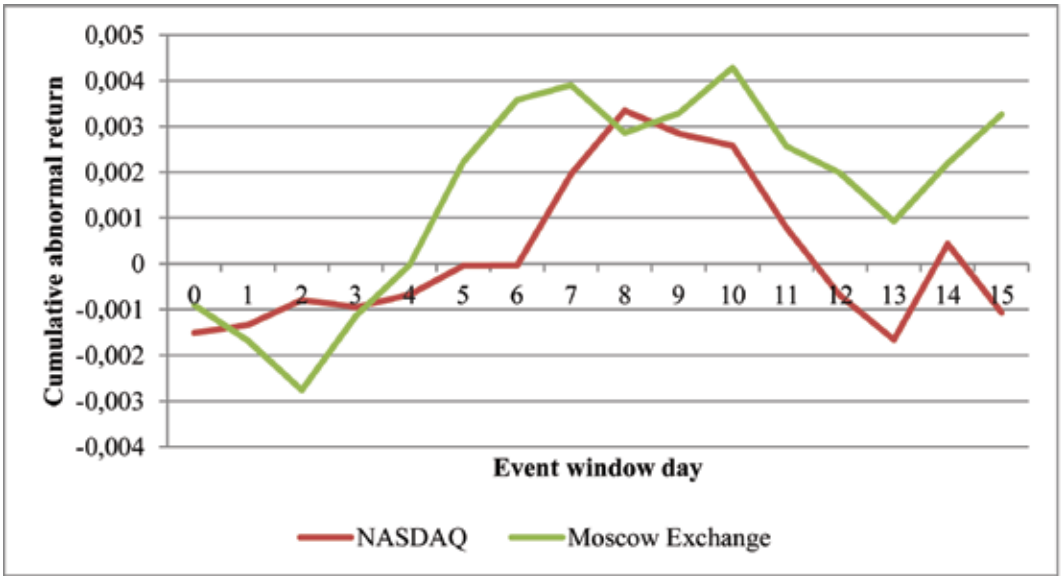
Таблица 5

Дескриптивные показатели среднедневной и накопленной аномальной доходности компаний на рынках

Index	NASDAQ exchange		Moscow Exchange	
	Abnormal return	Cumulative abnormal return	Abnormal return	Cumulative abnormal return
Minimum	-0.0018	-0.0017	-0.0017	-0.0028
Maximum	0.0021	0.0033	0.0023	0.0043
Average	-0.0001	0.0002	0.0002	0.0015
Median	-0.0001	-0.0004	0.0004	0.0022
Standard deviation	0.0012	0.0016	0.0012	0.0022

Author's calculations.

Расчеты автора.



Author's calculations.

Fig. 1. Graph of Cumulative Abnormal Returns of Companies in NASDAQ and Moscow Exchange

Расчеты автора.

Рис. 1. График накопленной аномальной доходности компаний на бирже NASDAQ и Московской бирже

of companies with positive returns over those with negative returns was only 11.1%.

Thus, based on descriptive statistics indices and the analysis of isolated influential events, we can speak of a more homogeneous perception of corporate environmental statements by investors in the developed market compared to the developing market. In the developing market, in some cases the absence of significant abnormal returns following environmental announcements can be attributed to the fact that approximately half of investors view the event as positive and half as negative. Therefore, positively minded investors tend to buy shares and negatively minded investors tend to sell, and there is no significant change in quotations.

Note that all influenced events belong to the same group – the achievement of environmental activity parameters established independently (A1) and under environmental initiatives (A2). It can be assumed that such announcements are the most significant ones for investors. Often a company adopts an environmental business strategy and then begins to release eco-products, increases their availability, implements public initiatives. However, of course, the announcement of the environmental strategy can also happen after the first steps of green production.

Table 6

Events that led to Significant Abnormal Returns

Таблица 6

События, которые привели к возникновению значимой аномальной доходности

Event code	Event type	Assessment of issuer's environmental risks	Period of significant abnormal returns, days after event	Cumulative abnormal return	Test statistics on last day of influencing period
N9	A1	0.2	8	0.018	2.805
N15	A2	3.2	5	0.035	2.654
N17	A1	3.0	2	-0.045	-4.701
M6	A1	20.0	13	-0.035	-2.405
M11	A2	9.0	4	-0.024	-5.101
M21	A1	2.2	3	-0.014	-4.066

Author's calculations; industry based on official company websites, environmental risk assessment based on Sustainalytics, Inc. as of May 2021 (estimates from https://finance.yahoo.com/).

Расчеты автора; отрасль указана по данным официальных сайтов компаний, оценка экологического риска – по данным Sustainalytics, Inc. на май 2021 г. (оценки взяты с сайта https://finance.yahoo.com/).

In this case, in contrast to event type, we cannot talk about the influence of the company's industry and the assessment of environmental risks on event significance: the companies that have made the statements have significantly different indicators. And we emphasize that for some companies, a comparable low level of environmental risks (for example, 0.3 for Apple, Inc.) and a higher one (specifically, for NASDAQ 13.3 for The Kraft Heinz Company – indeed, a significant value in the developed market) did not make corporate announcements to produce a significant impact on stock quotes.

Let us assume that environmentally responsible companies have already conducted greening of their operations and, if these issuers have a high level of financial standing today as well, their new environmental statements are perceived positively. Accordingly, investor behavior largely depends on their ability to rationally assess the consequences of their intended actions. And this is one of the reasons of the different dynamics of quotations in the developed and developing stock exchanges. The overall level of environmental risks in the developed market is lower, and even if investors pay attention to companies which have just begun their transition from conventional to organic production, they can rely on familiar experience with other similar manufacturers. In the developing market, green production is not yet as widespread, the information field of investors is narrower, and they are forced to rely more on intuition. And intuitively, any type of expense can be seen as reducing the company's profitability. In addition, developing market regulations are less inclusive of the formation and preservation of public goods, which include the environment. Thus, difference in quotation dynamics on the developed and developing stock exchanges after companies' statements about proposed environmental actions can largely be explained by difference in information and normative space of exchange investors. However, since in the developed market in some cases investors still assess environmental events negatively, both the developed and the developing markets need to improve information and regulatory fields.

Consequently, as a result of the study, H1 hypothesis is refuted. In the developed stock exchange, short-term and insignificant growth of share prices is observed only in isolated cases (in 15.0% of companies), and announcements may lead to both an increase and decrease in market prices.

H2 hypothesis is confirmed. After environmental announcements by companies in the developing stock exchange, there is a short-term decrease in the quotations of their issued shares.

H3 hypothesis is partially confirmed. Given the refutation of the first hypothesis, we are not entitled to conclude that the effect of companies' announcements of the planned environmental actions on share prices in the developing market is as short-term as in the developed market. However, looking at the average period of the isolated significant events, we can conclude that it is somewhat longer in the developing stock exchange (6.7 days after the event, 5 days in the developed one). At the same time, given the significance of all events in aggregate in the developing stock exchange, but not in the developed one, we have the right to speak of a more significant change in quotations in the developing market.

The lack of a significant impact of environmental statements on a company's market value in the developed stock exchange is confirmed by papers [23; 24]. The positive impact shown in the studies [13; 21; 22] was observed only in isolated cases and precisely in the

developed market. The conclusion about the short-term impact of both isolated events of the developed market and single events and events in aggregate of the developing market is consistent with the results of the paper [21]. Observed decline in share prices in a single event in the developed market and in the developing market confirms the conclusions [25].

As with other information shocks [38], investors in the developing market are more sensitive to environmental announcements than in the developed market. This is most likely due to the large investment risks in developing countries. However, the higher volatility observed in the developing stock exchange [39] is also observed in an event window when corporate environmental plans are announced: the spread of abnormal returns is larger in the developing market than in the developed market.

Limitations

The limitations of interpreting the results obtained include the relatively small sample of companies studied. In addition, it is worth noting that only the most significant statements of planned environmental actions were included in the study. For example, Starbucks Corporation during the time period analyzed also reported the release of strawless beverage caps for the U.S. and Canada and the return of reusable cups in its U.S. stores beginning June 22, 2021.

Beyond the scope of this paper was the effect on share prices of long-term investors who do not follow the news, but who check a company's environmental responsibility level before buying its securities.

Also an important, but unrecorded factor of the study is a change in share turnover. It is the factor that can further confirm the assumption put forward about the divergence of investors' views on environmental events. Some investors view them positively, others negatively, and there is no significant change in share prices when the first group buys shares and the second group sells them. Accordingly, it is advisable in future studies to check whether there is an abnormal increase in share turnover during the event period.

In addition, with the growing number of issuers whose shares are traded on both NASDAQ and Moscow Exchange, it looks interesting to make a separate comparison of the dynamics of the quotations of such companies after environmental announcements.

Conclusions and Relevance

For companies planning to shift from traditional to ecological business, the knowledge of the consequent growth of their share value when announcing their plans could be additional motive to adopt and implement them. In addition, an important motivating factor would be the opportunity for these companies to save on dividends and allocate a larger share of profits to further development. Environmental projects require special financing, and the opportunity to invest part of profits would reduce the need for credit resources. At the same time, as share prices rise, their investment appeal should not decrease for most investors.

However, the study has shown an extremely low impact of environmental announcements on exchange quotations. In the developed market, there is a divergence in the assessment of corporate environmental statements, while in the developing market there is a predominantly negative perception of them. This indicates a greater alignment of companies' environmental statements with the green agenda of developed countries, as well as a weakness of the regulatory area – support for environmentally responsible manufacturers, participation in public goods preservation is not a priority orientation of investors. This problem is particularly acute in the developing market. With this consideration in mind, it seems reasonable:

1. To increase environmental awareness and investors' literacy, especially in a developing market.

2. To strengthen the link between environmental risks reduction and the growth of companies' financial well-being in order to strengthen the investment appeal of shares, as well as for additional financial support of eco-friendly manufacturers (develop a green bond market, provide loans taking into account emissions and waste volume, assist in the nationwide passage of environmental certification, etc.).

3. To increase media coverage for the planned and actually committed environmental actions, establish and also cover at the federal, regional and local level awards for providing eco-friendly products/services, and familiarize potential investors with environmental rating results. The paper has shown that along with the norms guiding an investor the infosphere they are located in is of great importance.

4. To intensify media relations by company management. In the course of the study, when selecting environmental statements, it was noticed that nowadays a press release about the company's adoption of an environmental strategy (for example, about achieving carbon neutrality by a certain year) is published among other, much less significant messages: releasing a modification of an eco-product in a certain market segment, expanding eco-product sales, etc. Of course, each of these news items deserves to be delivered to consumers, but when press releases appear on the corporate website almost every day, the information field created by the most important ones is weakened.

5. For those investors who do not make daily or weekly decisions to purchase securities on the basis of corporate news, but who look for companies with

a high environmental responsibility level when buying, to sort out press releases by topic (often websites can only show financial announcements, but not environmental ones) and by significance level. It is also better to create a special section dedicated to the company's sustainable development, where you can find news and corporate documents: environmental strategy, implementation plan, implementation reports, etc. Many developing market companies, such as Russian ones, do not have such a section.

At the same time, it is important to note that in the developing market, regulatory area formation should precede information highlighting, otherwise, instead of additional benefits as the growth of the company's market value, eco-manufacturers will only make a loss.

Here we encounter a very interesting phenomenon. While the achievement of economic goals is possible with the actions of only one group of actors, environmental goals will require a common understanding of them and a combination with the personal interests of all interacting groups. It is not possible to solve environmental problems through the efforts of companies alone. Without stakeholder support, this will lead to the financial weakening of companies and, ultimately, a lack of funds for environmental program implementation. Only comprehensive and joint actions can ensure environmental and economic business sustainability and territorial safety.

Note that in March 2022, due to changes in the geopolitical and economic situation, MSCI began to consider the Moscow Exchange to be standalone rather than developing. It can be assumed that the exit of foreign issuers and investors from the Russian market and the reorientation of domestic companies' production and business activities towards the Russian market will change the environmental strategies they implement: more attention will be paid to adaptation projects rather than the Western green agenda (the taxonomy of green and adaptation projects was approved by the Government of the Russian Federation in late 2021). This may increase the loyalty of domestic investors to the environmental statements of Russian companies. Given that Russian companies have not abandoned the implementation of environmental programs, but have only changed them, the chosen topic remains relevant, and an analysis of investor reactions to adaptation projects should be the subject of a separate study.

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