Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Elsevier hereby grants permission to make all its COVID-19-related research that is available on the COVID-19 resource centre - including this research content - immediately available in PubMed Central and other publicly funded repositories, such as the WHO COVID database with rights for unrestricted research re-use and analyses in any form or by any means with acknowledgement of the original source. These permissions are granted for free by Elsevier for as long as the COVID-19 resource centre remains active.
The emergence of the COVID 19 virus had a huge impact on various aspects of life. The stock exchange was not indifferent to the pandemic. This resulted in significant drops on the Warsaw Stock Exchange. WIG20 showed the lowest values since May 2020. In the period from October 2020, the index of the largest companies has an open path to further declines (stockwatch.pl: The second wave of the pandemic hits the stock exchanges). Despite the difficult situation, many companies have become involved in fighting the pandemic through financial support or by providing protective measures. RESPECT Index companies deserve special attention in this respect. Engaging in pro-social, ecological and ethical activities is extremely important, because especially now investors often take them into account when building an investment portfolio. The aim of the article is to assess the effectiveness of investing in selected listed companies using CSR during the COVID-19 pandemic. The conducted research allowed to answer the questions whether investing in companies involved in the fight against the world can bring benefits.

© 2021 The Authors. Published by Elsevier B.V.
This is an open access article under the CC BY-NC-ND license (https://creativecommons.org/licenses/by-nc-nd/4.0)
Peer-review under responsibility of the scientific committee of KES International.

Keywords: financing efficiency; CSR; COVID 19;
in the Index. Many leading brands were involved in the mask making campaign, such as: John Cotton Europe, Motive & More, Krosno Len Men, KGHM, 4F and Regioszulki. They produced masks for their clients and also supplied hospitals. Additionally, Grupa Lotos sewed masks for its employees, and the Reserved brand financed the purchase of protective masks for infectious wards. A total of over 250,000 masks for forty hospitals and medical facilities [2]. Another campaign that companies got involved in was the # stay at home initiative, promoting staying home during a pandemic and encouraging people to spend time at home. Many well-known brands were involved in the campaign, such as MediaMrkt, Santander, Lotto, Poczta Polska, Pekao SA, PZU, PGE Group, 4F, Ikea, and Kazar. [3].

A new reality through the eyes of a friendly brand Schulz. The companies chose to manufacture the products needed to fight COVID-19, including disinfectants that they gave to hospitals, medical facilities and government departments. Another important activity was the provision of free meals by catering companies for doctors and services fighting on the fronts with the pandemic. Local restaurants provided lunches for doctors, paramedics working in closed wards. Fuel stations organized an action to distribute coffee to all public services. Moreover, cheaper fuel could be bought by public and uniformed services as well as medical services. Oil companies have provided clinics with thousands of liters of disinfectant fluid and organized the transport of medical equipment. As you can see, companies offered various forms of assistance. The donated products could be financed from funds allocated by organizations to fight the coronavirus, but often these were additional activities [4].

Many of the above-mentioned companies involved in the fight against the pandemic are listed on the WSE. Investors, when making investment decisions, strive for maximum profit with simultaneous risk diversification. When building a portfolio, in addition to analyzing financial results, they look at non-economic aspects. They are looking for trustworthy companies that adhere to high ethical and sustainable standards. The aim of the study is to assess the effectiveness of investing in socially responsible companies included in the RESPECT Index, which are involved in the fight against the COVID-19 pandemic in relation to companies from the WIG20 index leaders. The essence of the considerations is to assess whether creating a good image by participating in activities supporting the fight against the COVID-19 pandemic translates into stock exchange quotations, or whether investing in the shares of RESPECT Index companies is more beneficial than in the leader's shares. The article consists of an introduction containing preliminary information on the problem under consideration, chapter 1 discusses the issues related to the functioning of the capital market during a pandemic, chapter 2 discusses the research methodology. The next chapter is the efficiency assessment. This study clearly highlights the role of socially responsible companies in investing during periods of high risk. The period of the COVID-19 pandemic should be considered such a period.

1. The capital market in Poland during the COVID-19 pandemic

The COVID 19 pandemic has changed our private and economic lives and caused changes in the stock market. Due to the high uncertainty, many stock quotes dropped drastically. Despite making up for losses, many companies are still struggling to survive, but there will also be those that achieved record profits during the pandemic. The investment interest of technology companies producing computer games increased, as well as the share quotations of companies that took part in social campaigns, such as sewing masks or the production of gloves and disinfectants included in the RESPECT Index, which was confirmed by the survey. The companies most affected by the pandemic come from the energy, real estate and luxury goods industries. Profit declines in these industries decreased by 102%, 98% and 78%, respectively. This means that economic activity is declining, and thus the demand for energy and non-necessity expenses are postponed. The smallest drop in profits was recorded in the health sector by 4%.

Looking at the data on the Polish stock exchange indices WIG and WIG20, a decline can be noticed during the COVID-19 pandemic. The WIG fell by -37% and the WIG20 by -30%. Falling stock indices may indicate the country's weak resistance to the current situation. A significant decline in the WIG index may turn out to be the result of a large share of the financial sector, which is very susceptible to negative phenomena in the economy [5].
Based on the chart, we can see that the value of the index started to decline in September, and the largest decline was noticeable on October 30, where the index was at 1,496.76. The exchange rate fluctuations during the year amounted to 491 or 29.94%. For comparison, the exchange rate fluctuation a year before the pandemic was -3.46%. Turnover during the pandemic was 255,410,093 million.

Chart 1.2. WIG index in the period from May 2020 to May 2021

The above chart shows the behavior of the WIG index at the turn of the whole year. The value of the index began to decline in September, and the largest decline was recorded on October 30, when the index was 43,679.41. The maximum value in this period was recorded on May 18, 2021 and was 63,727.55. The exchange rate fluctuations during the year amounted to 17,312.44, or 37.68%. For comparison, fluctuations in the exchange rate a year before the pandemic amounted to -7.81%. Turnover during the pandemic was 325,654,170 million.

As can be seen in both charts, 2021 started more optimistically. Both the WIG 20 index and the WIG index increase the value of their quotations. The driving force behind the growth will be WIG 20 companies. The Warsaw Stock Exchange successfully entered in 2021, giving investors hope for a lasting improvement in market sentiment, which was spoiled by last year’s Covid-19 pandemic. Despite the December rebound, the WIG ended last year with 1.4% below the level and the WIG20 lost 7.7% [6].

The Monetary Policy Council made a decision on a record interest rate cut. Interest rates on deposits and deposits dropped drastically, which resulted in an outflow of funds in the amount of PLN 85 billion, which decreased by 22% [7].

The Ministry of Finance, meeting the needs of people who want to protect themselves against inflation and earn at the same time, proposed Treasury Savings Bonds as a safe option for investing funds or purchasing Treasury securities on the interbank market in tenders organized by the Ministry of Finance [8].

Warsaw Stock Exchange bears an average level of operational and financial risk related to the COVID-19 pandemic. The Stock Exchange Management Board has taken a number of measures to mitigate this risk. In order to maintain the continuity of the GPW Group’s operations, protective procedures have been introduced in the event of various possible pandemic events. A Crisis Management Team was also established to monitor possible current threats [9].

Investing in times of a pandemic brings with it many new opportunities, but also many new types of risk. When planning investments in uncertain times, you should be guided by the diversification of your investment portfolio, bearing in mind financial security.
The above chart shows the behavior of the WIG index at the turn of the whole year. The value of the index began to decline in September, and the largest decline was recorded on October 30, when the index was 43,679.41. The maximum value in this period was recorded on May 18, 2021 and was 63,727.55. The exchange rate fluctuations during the year amounted to 17,312.44, or 37.68%. For comparison, fluctuations in the exchange rate a year before the pandemic amounted to -7.81%. Turnover during the pandemic was 325,654,170 million. As can be seen in both charts, 2021 started more optimistically. Both the WIG 20 index and the WIG index increase the value of their quotations. The driving force behind the growth will be WIG 20 companies. The Warsaw Stock Exchange successfully entered in 2021, giving investors hope for a lasting improvement in market sentiment, which was spoiled by last year's Covid-19 pandemic. Despite the December rebound, the WIG ended last year with 1.4% below the level and the WIG20 lost 7.7% [6].

The Monetary Policy Council made a decision on a record interest rate cut. Interest rates on deposits and deposits dropped drastically, which resulted in an outflow of funds in the amount of PLN 85 billion, which decreased by 22% [7].

The Ministry of Finance, meeting the needs of people who want to protect themselves against inflation and earn at the same time, proposed Treasury Savings Bonds as a safe option for investing funds or purchasing Treasury securities on the interbank market in tenders organized by the Ministry of Finance [8].

Warsaw Stock Exchange bears an average level of operational and financial risk related to the COVID 19 pandemic. The Stock Exchange Management Board has taken a number of measures to mitigate this risk. In order to maintain the continuity of the GPW Group's operations, protective procedures have been introduced in the event of various possible pandemic events. A Crisis Management Team was also established to monitor possible current threats [9].

Investing in times of a pandemic brings with it many new opportunities, but also many new types of risk. When planning investments in uncertain times, you should be guided by the diversification of your investment portfolio, bearing in mind financial security.
Making investment decisions on the stock exchange is complex and multi-stage. When deciding to make a long-term investment, portfolio theory and risk diversification considerations are of particular importance when making investment decisions. When selecting components for the investment portfolio, investors pay attention to many factors of a quantitative nature (e.g., rate of return on shares, investment risk, level of liquidity) and qualitative (e.g., industry from which the company comes, market position), companies in the context of building a securities portfolio. Investors focus on selecting the most profitable companies and reducing risk. In the literature on the subject, the issue of diversification and risk management is well-established ([10], [11], [12], [13], [14], [15], [16]). In this regard, the classical approach, the precursors of which are Markowitz [14] and Sharpe [15], or non-classical approaches, for example, using fundamental analysis in the portfolio building process ([17], [18], [19], [20], [21], [22]). Especially during a pandemic, investors are looking for solutions to more effectively manage risk in uncertain times. One of them may be building a portfolio of companies that attach great importance to corporate social responsibility (CSR) in their strategy. Focusing investors' attention on this type of companies may: constitute an alternative in the process of selecting companies for the portfolio, and thus support the process of horizontal risk diversification and making investment decisions. The growing importance of corporate social responsibility in making investment decisions is a fairly new trend on the capital market in the context of risk diversification. When selecting companies for their portfolio, many investors take into account not only financial but also non-economic aspects. Nowadays, ecological, pro-social and ethical activities are important. Such companies inspire investors' trust [23]. To achieve the goal of the study, a portfolio was built using classical methods using CSR information during the COVID 19 pandemic, and then its effectiveness was assessed.

Building an investment portfolio takes place using various methods. Diversification of investment risk is made on the basis of fundamental analysis. The purpose of diversification is to build a portfolio to be the most effective. This means minimizing the portfolio risk at a given level of return or maximizing the return for a specific level of risk. This method of diversification uses information from fundamental analysis and quantitative methods to reduce risk. Horizontal diversification is important for CSR, as it takes into account qualitative aspects for the assessment of the enterprise. Companies selected for long-term investment should be fundamentally strong. Such companies not only want to survive on the market, but also strive for the best financial results and act to gain the trust of stakeholders. This is where corporate social responsibility is reflected, which is why in the diversification of risk, a good way may be to include companies guided by CSR in the construction of the portfolio. Such companies are positively perceived by investors and this is important from the point of view of investment risk assessment.

A study was conducted to determine the effectiveness of investments in socially responsible enterprises. Two investment portfolios were built. For this purpose, the Markowitz model was used, the aim of which is to minimize the risk at a predetermined level of profit that the investor wants to achieve. One portfolio was built classically, and the construction of the second investment portfolio, apart from economic aspects, also took into account non-economic aspects. The first investment portfolio was built from WIG 20 companies in 2020 and 2021, and the second one included socially responsible companies, which during the pandemic showed the greatest commitment to socially responsible activities. Based on the data on rates for 2020 and 2021 collected from the portal www.infostrefa.pl, weekly rates of return were calculated for the surveyed companies. The Solver tool was used for the parameters of the portfolios. The effective portfolio line has been established for both categories of portfolios. The structure uses the portfolio effect of the rate of return, which allowed to determine the variability range for the expected rate of return:

1. WIG20 portfolios - R0 ∈ (0.0004; 0.011)
2. RESPECT Index portfolios - R0 ∈ (0.0004; 0.0169).

### 3. Assessment of investments in socially responsible companies and WIG20 companies

The tables (Table 1 and Table 2) present: the expected value (Rp) and risk (Sp) of the built portfolios, the shares of individual companies (xi), the number of shares (ni) that were included in the portfolios and the random
variability coefficient (Vs). The Vs coefficient was used as a criterion for selecting the optimal portfolio. The optimal portfolio was used to test the investment efficiency and comparisons in accordance with the assumed research objective. Portfolios are marked with:
1. WIG20 - WIG20_nr (consecutive number of the portfolio variant).
2. CRS portfolios - CSR_nr (sequential number of the portfolio variant).

Table 3.1. Estimated WIG portfolios 20

| Portfolio number | Rp  | Sp  | Vs   | the number of companies |
|------------------|-----|-----|------|-------------------------|
| WIG20_1          | 0.0004 | 0.0208 | 52.00 | 8                       |
| WIG20_2          | 0.0016 | 0.0221 | 13.81 | 8                       |
| WIG20_3          | 0.0028 | 0.0238 | 8.50  | 8                       |
| WIG20_4          | 0.004  | 0.0258 | 6.45  | 6                       |
| WIG20_5          | 0.0052 | 0.0281 | 5.40  | 5                       |
| WIG20_6          | 0.0064 | 0.0309 | 4.83  | 5                       |
| WIG20_7          | 0.0076 | 0.034  | 4.47  | 4                       |
| WIG20_8          | 0.0088 | 0.0374 | 4.25  | 3                       |
| **WIG20_9**      | **0.01** | **0.0418** | **4.18** | **2**                   |
| WIG20_10         | 0.011  | 0.0706 | 6.42  | 2                       |

Table 3.2. Estimated CSR portfolios

| Portfolio number | Rp  | Sp  | Vs   | the number of companies |
|------------------|-----|-----|------|-------------------------|
| CSR_1            | 0.0004 | 0.0240 | 60.08 | 8                       |
| CSR_2            | 0.0024 | 0.0262 | 10.92 | 9                       |
| CSR_3            | 0.0044 | 0.0292 | 6.64  | 7                       |
| CSR_4            | 0.0064 | 0.0331 | 5.17  | 6                       |
| **CSR_5**        | **0.0084** | **0.0381** | **4.54** | **4**                   |
| CSR_6            | 0.0104 | 0.0489 | 4.70  | 2                       |
| CSR_7            | 0.0124 | 0.1030 | 8.31  | 2                       |
| CSR_8            | 0.0144 | 0.1686 | 11.71 | 2                       |
| CSR_9            | 0.0164 | 0.2364 | 14.41 | 2                       |
| CSR_10           | 0.0169 | 0.2535 | 15.00 | 1                       |

For further analyzes, portfolios with the lowest Vs. In the case of the WIG20_9 portfolio, two companies were taken into account, for which the percentage share in the portfolio was: PGNiG (28%) and LOTOS (72%). In the case of the RES_5 portfolio, there were 3 companies: PGNiG (27%), LOTOS (65%), PKN ORLEN (5%), and PEKAO (3%).
To assess the effectiveness of the portfolios, they were purchased and sold. The portfolios were purchased on 02/01/2020. The portfolios were sold in three randomly selected periods: after half a year (30/06/2020), after a year (31/12/2020) and (21/05/2021). Hypothetical investment capital of PLN 100,000 divided equally into two
categories of portfolios of PLN 50,000 each. The results of the simulation of purchase and sale are presented in 
the tables (Tab. 3 and Tab. 4).

Table 3.3. Simulations of the portfolio profitability WIG20

| CSR_5 portfolio composition | Share in the portfolio | Purchase of a portfolio | Portfolio sale |
|-----------------------------|------------------------|-------------------------|---------------|
|                             |                        | 02.01.2020               | 28.06.2020r.  | 30.12.2019 r. | 21.05.2021r. |
| PGNIG                       | 32%                    | 15893,6                 | 12056,4       | 9831,3        | 10330,8       |
| LOTOS                       | 68%                    | 34106,4                 | 32879,7       | 32445,0       | 23291,4       |
| amount                      | 100%                   | 50000                   | 44936,2       | 42276,3       | 33622,3       |

Table 3.4. Simulations of the portfolio profitability CSR

| CSR_5 portfolio composition | Share in the portfolio | Purchase of a portfolio | Portfolio sale |
|-----------------------------|------------------------|-------------------------|---------------|
|                             |                        | 02.01.2020               | 28.06.2020r.  | 30.12.2019 r. | 21.05.2021r. |
| PGNIG                       | 16%                    | 6664                    | 5055,12       | 4122,16       | 4331,6        |
| LOTOS                       | 79%                    | 15682,5                 | 7331,25       | 10238,25      | 13285,5       |
| PKN ORLEN                   | 2%                     | 4900,5                  | 3196,26       | 4757,94       | 5580,9        |
| PEKAO                       | 3%                     | 22750                   | 20138,3       | 30030         | 37264,5       |
| amount                      | 100%                   | 50000                   | 35720,93      | 49148,35      | 60462,5       |

From the presented data it can be seen that there is a loss in the WIG 20 portfolio in each sales period, but in the portfolio of socially responsible companies there is a profit in the last sale. We would lose the least on sales six months after the purchase, in the case of WIG 20, and in the case of CSR companies, the profit would be 20.92% higher. In the light of the presented analyzes, we can say that building an investment portfolio with information on social responsibility is a good direction, because we would make a profit on such a portfolio.

Due to the difficult situation related to the pandemic, 2020 turned out to be a favorable year for companies that were socially responsible. They allocated funds to help fight the pandemic, but their rates increased significantly in the first quarter of 2021.

**Summary**

The aim of the article was to build a securities portfolio using CSR companies and to present its effectiveness against the background of the WIG 20 portfolio during the COVID 19 pandemic. The simulation results show that making investment decisions taking into account the proposed approach was profitable. The portfolio, taking into account CSR aspects, turned out to be more effective than the classic one. The simulation results show that making investment decisions with the use of CSR is much more beneficial. Including companies that operate in a socially responsible manner takes into account differentiation, that is, diversification of the investment portfolio. The analysis showed that it is worth acting socially, engaging in social and charity activities, because this translates into investment attractiveness. It is worth noting that the companies included in the CSR portfolio come from various industries, including two from the fuel sector. These companies have been largely committed...
to helping combat the pandemic by cutting fuel prices for services or helping transport medical equipment. Bank PEKO and PGNiG also largely supported the fight against the pandemic, mainly through advertising spots encouraging distance or stay at home. The main goal according to which making investment decisions taking into account CSR information is beneficial has been confirmed. When making investments, risk and rate of return will always be important, but as the research results show, CSR aspects are also a profitable criterion for selecting companies for the portfolio. The proposed concept of building a securities portfolio may be an alternative to making investment decisions as part of the diversification of investment risk. It is worth noting that nowadays a lot of attention is paid to pro-social and pro-ecological activities, which is why many investors, apart from purely economic criteria, also follow non-economic criteria when making investment decisions. A company's good reputation often translates into an increase in the price of its shares. The analysis of the effectiveness and risk of responsible investment funds does not provide clear evidence that the adoption of such a strategy has a negative impact on the investment portfolio of participants. Many companies pursue a corporate social responsibility policy as it may contribute to an increase in financial results and a competitive advantage. The behavioral model of making investment decisions is an alternative or complement to the neoclassical approach. Interest in the behavioral decision-making model that takes into account CSR may result from difficulties in assessing the results achieved by companies. This study clearly highlights the role of socially responsible companies in the investment process during periods of high-risk investment such as the COVID 19 pandemic.

References

[1] Kiepas, Marcin. (2020) “Second wave of pandemic hits stock markets”. Retrieved October 15, 2020, from https://www.stockwatch.pl/wiadomosci/druga-fala-pandemii-uderza-w-gieldy-mocna-przecena-ccc-i-lpp,akcje,278682 2020-10-15.
[2] Czajkowska, Angelika. (2020) “Impact of the COVID-19 pandemic on CSR activities undertaken by enterprises”, Scientific Journal UEK, 3 (987):45–62.
[3] Brysza, Anna. (2020) “# Stay at home with art. Activities of cultural institutions in the time of the plague” (in : Marek in the time of the pandemic. A new visit through the eyes of Schulz, brand-friendly. Retrieved April 8, 2020, from https://www.schulz.com.pl/Marka w czasach pandemii_Schulz.pdf.
[4] Gugniewicz, Julia. (2020), "GastroPomaga and #Meet for a doctor - Restaurants from all over Poland support doctors in the fight against coronavirus." Retrieved March 22, 2020, from https://nowymarketing.pl/a/25492,gastropomaga- i-posilekdlalekarza- restauracje-z-calej-polski-wspieraja-lekarzy-w-walce-z-koronawirusem.
[5] Kowalczyk, Patrycja. (2020) “Impact of the pandemic on stock market valuations”. Retrieved September 14, 2020, from https://home.kpmg/pl/pl/home/media/press-releases/2020/09/media-press-wplyw-pandemii-na-wyceny-gieldowe.html.
[6] Trochała, Adam. (2020) „WIG20 spada. Sztandarowy indeks warszawskiej giełdy na najniższych poziomach w tym roku”. Retrieved August 8, 2020, from https://www.bankier.pl/wiadomosc/Gwaltowne-spadki-na-GPW-WIG20-przebil-pazdziernikowe-minima-7722588.html.
[7] Lon, Eryk. (2020) “Money and Bond. Monetary Policy of Central Banks in the Age of the Corona Virus”, No. 1 (86), pp. 69-76.
[8] Dziadkowiak, Marcin. (2021) Treasury savings bonds are falling like hot cakes”. Retrieved May 21, 2021 from https://www.bankier.pl/wiadomosc/To-byl-dzien-Najwazniejsze-wiadomosci-z-21-maja-2021-r-8118077.html.
[9] Dietl, Marek. (2020) “COVID 19 pandemic”. Retrieved November 13, 2020 from https://www.gpw.pl/covid19.
[10] Browne, Eleanor C. (2007) "A little book about investing in value" MT Biznes, Warsaw.
[11] Cassidy, Jude. (2000) "When to Sell Stock". ABC Publishing House, Warsaw.
[12] Graham, Benjamin, and David Le Fevre Dodd. (2005) „Security Analysis. Fifth edition. Mc Grow-Hill”, New York, Toronto, London
[13] Łuniewska, Małgorzata. (2007) “The Construction and Evaluation of Sectorial Portfolio, Polish Journal of Environmental Studies”, Vol. 16, No. 4A, 2007, pp. 161-164.
[14] Markowitz, Harry. (1952) „Portfolio selection. “Journal of Finance” 7, pp. 77-91.
[15] Sharpe, Richard. (1963). „A Simplified Model for Portfolio Analysis. Management Science”, 1, 277-293.
[16] Tarczyńska-Luniewska, Małgorzata (2010). "Strategy of investing in foundations - theoretical foundations in Finance, Financial Markets” Insurance No. 25, Scientific Papers No. 586, University of Szczecin, Szczecin, pp. 147–154.
[17] Abarbanell, Lina. (1998) "Abnormal Returns to a Fundamental Analysis Strategy”. The Accounting Review, 73, 19-45.
[18] Łuniewska, Małgorzata. (2007) "The Construction and Evaluation of Sectoral Portfolio, Polish Journal of Environmental Studies”, Vol. 87, No. 2, Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association, pp. 184-188.
[19] Edrissinhe, Mohan, and Guohua Zhang. (2007) “Generalized DEA model of fundamental analysis and its application to portfolio optimization”, pp. 3311-3335.
[23] Kłobukowska, Justyna. (2018) “Socially responsible investing as an innovation on the financial market in Poland in the era of financialization - current state and prospects”, Acta Universitatis Lawodsis. Folia Economica, vol. 6, vol. 339, pp. 111-124.