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Risk and efficiency of Goldman Sachs investment funds listed on the Warsaw Stock Exchange.

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Contents

Introduction

Recently, stock exchanges in all countries have been going through difficult times, and the Warsaw Stock Exchange has not been spared from these turmoils. First, there was the outbreak of the COVID-19 pandemic in 2020 when the world economy faced mass lockdowns, and then the war broke out in our eastern neighbor in 2022, which had global consequences. All these crisis situations were reflected in stock market indicators. This work was devoted to the analysis of six funds of the Goldman Sachs investment bank. The study includes three funds related to the Polish market, i.e. the Goldman Sachs Equity fund, the Goldman Sachs European Distribution Companies fund, and the Goldman Sachs Polish Responsible Investment fund. The remaining three funds concern foreign markets, i.e. the Goldman Sachs USA Distribution Companies fund, the Goldman Sachs Global Distribution Companies fund, and the Goldman Sachs Global Responsible Investment fund. All of the above funds are listed on the Warsaw Stock Exchange.

The study was conducted from October 25, 2015 to October 25, 2023. The study distinguished two sub-periods concerning the peace period from October 25, 2015 to December 31, 2019 and the crisis period from January 1, 2020 to October 25, 2023. The analysis was conducted on weekly data. During the individual analysis of funds in the assumed period, statistical analysis methods were used. Programs such as the GRETL and Excel packages were used for the study.

The first part of the work was devoted to presenting the profile of the examined funds. The second part of the work analyzed the price formation of individual funds and the analysis of return rates. The study was conducted both in the entire period and in sub-periods. In the third part of this work, absolute risk measures were determined, which were then compared in the two examined sub-periods. The next part was devoted to the analysis of the effectiveness of the funds in the examined sub-periods, both in the context of the market to which the fund relates and the Polish market represented by the WIG index. In this part, classic efficiency measures were also determined. In the fourth chapter, the funds were examined in terms of the compliance of the distribution of return rates with the normal distribution to check whether the fund meets the CAMP assumptions. The last part of the work was devoted to alternative risk measures.

I. Basic information about funds.

1. Goldman Sachs Shares.

The first fund analyzed is the open-end investment fund (FIO) of the investment bank Goldman Sachs. This fund is listed on the Warsaw Stock Exchange, and its total assets amount to PLN 1.48 billion. In turn, 100% of its capital is invested in Polish companies, the capital of which makes up the WIG index. The assets of this fund are mainly invested in Polish companies with large capitalization. The current price of participation units is PLN 432.47. The fund structure is as follows: Risky assets 95.48% (Domestic shares 82.41%, Foreign shares 13.06%), Safe assets 1.58% (Deposits 1.58%), Cash 2.70%, Others 0.24%. The risk measures that were made available by the fund indicate that the total risk is 5.51, and the Sharpe ratio is 0.12.

Figure 1. Descriptive statistics of the Goldman Sachs Share price (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'FIO_P_PL' (418 prawidłowych obserwacji)

Średnia	319,53
Mediana	314,03
Minimalna	216,97
Maksymalna	423,07
Odchylenie standardowe	40,727
Wsp. zmienności	0,12746
Skośność	0,30358
Kurtoza	-0,46848
Percentyl 5%	258,10
Percentyl 95%	393,95
Zakres Q3-Q1	55,470
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 319.53, and the minimum and maximum prices were PLN 314.03 and PLN 423.97, respectively. On the other hand, deviations from the average price were around PLN 41. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 55.5.

Figure 2. Descriptive statistics of the logarithmic rate of return of Goldman Sachs Equities (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'FIO_Rl_PL' (418 prawidłowych obserwacji)

Średnia	0,063867
Mediana	0,29267
Minimalna	-22,762
Maksymalna	10,055
Odchylenie standardowe	2,5114
Wsp. zmienności	39,322
Skośność	-2,2163
Kurtoza	17,877
Percentyl 5%	-3,7179
Percentyl 95%	3,6522
Zakres Q3-Q1	2,5634
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the

average rate of return from the fund in the period from 2015 to 2023 was 0.064, and the minimum and maximum rates of return were -22.762 and 10.055, respectively. At the worst moment, one could expect to lose about 22.8% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.5. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 2.7%.

2. Goldman Sachs European Dividend Companies.

Due to the lack of a Polish specialist investment fund of this company on the Polish market, a European fund will be presented. The second analyzed fund is a specialist open-end investment fund (SFIO) of the investment bank Goldman Sachs. This fund is listed on the Warsaw Stock Exchange, and its total assets amount to PLN 142.92 million. On the other hand, 100% of its capital is invested in a European fund called Goldman Sachs Europe Equity Income and is listed on the Luxembourg Stock Exchange. The assets of the analyzed fund are invested in the parent fund EEI, which then invests in them in European companies with high capitalization. The current value of participation units is PLN 233.98. The fund structure is as follows: Risky assets 97.28% (Participation Titles in Equity Funds 97.28%), Cash 1.71%, Other 1.01%. The risk measures provided by the fund indicate that the total risk is 3.62 and the Sharpe ratio is 0.17.

Figure 3. Descriptive statistics of the Goldman Sachs European Distribution Companies price (18/10/2015-15/10/2023)

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Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SFIO_P_PL' (418 prawidłowych obserwacji)

  Średnia                          175,73
  Mediana                          169,41
  Minimalna                        128,51
  Maksymalna                       230,88
  Odchylenie standardowe           24,254
  Wsp. zmienności                 0,13802
  Skośność                        0,56147
  Kurtoza                        -0,55369
  Percentyl 5%                     142,92
  Percentyl 95%                    224,01
  Zakres Q3-Q1                     34,215
  Brakujące obs.                        0
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Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 175.73, and the minimum and maximum prices were PLN 169.41 and PLN 128.51, respectively. On the other hand, deviations from the average price were around PLN 24. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 34.2.

Figure 4. Descriptive statistics of the logarithmic rate of return of Goldman Sachs European Distribution Companies (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SFIO_Rl_PL' (418 prawidłowych obserwacji)

Średnia	0,084581
Mediana	0,21840
Minimalna	-20,406
Maksymalna	6,5460
Odchylenie standardowe	2,3152
Wsp. zmienności	27,373
Skośność	-2,2953
Kurtoza	16,845
Percentyl 5%	-3,4486
Percentyl 95%	3,1502
Zakres Q3-Q1	2,1600
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the average rate of return from the fund in the period from 2015 to 2023 was 0.085, and the minimum and maximum rates of return were -20.406 and 6.5460, respectively. At the worst moment, one could expect to lose about 20.4% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.3. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 2.2%.

3. Goldman Sachs Polish Responsible Investment

The third fund analyzed is a specialized Socially Responsible Investment (SRI) fund of the Goldman Sachs investment bank. This fund is listed on the Warsaw Stock Exchange, and its total assets amount to PLN 266.18 million. In turn, 100% of its capital is invested in Polish companies, whose capital makes up the WIG index. The assets of this fund are mainly invested in Polish companies that implement sustainable development goals. The current value of participation units is PLN 220.64. The fund structure is as follows: Risky assets 93.01% (Domestic shares 77.2%, Foreign shares 15.29%), Safe assets 5.07% (Deposits 5.07%), Cash 1.65%, Other 0.27%. The risk measures that were made available by the fund indicate that the total risk is 5.42, and the Sharpe ratio is 0.13.

Figure 5. Descriptive statistics of the Goldman Sachs Polish Responsible Investment price (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SRI_P_PL' (418 prawidłowych obserwacji)

Średnia	161,71
Mediana	156,20
Minimalna	107,86
Maksymalna	211,30
Odchylenie standardowe	20,204
Wsp. zmienności	0,12494
Skośność	0,36096
Kurtoza	-0,58598
Percentyl 5%	135,07
Percentyl 95%	197,44
Zakres Q3-Q1	30,643
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 161.71, and the minimum and maximum prices were PLN 107.86 and PLN 211.30, respectively. On the other hand, deviations from the average price were around PLN 20. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 30.6.

Figure 6. Descriptive statistics of the logarithmic rate of return of Goldman Sachs Polish Responsible Investing (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SRI_Rl_PL' (418 prawidłowych obserwacji)

Średnia	0,050248
Mediana	0,26848
Minimalna	-20,921
Maksymalna	8,7349
Odchylenie standardowe	2,5759
Wsp. zmienności	51,264
Skośność	-1,9413
Kurtoza	11,978
Percentyl 5%	-4,0019
Percentyl 95%	3,6168
Zakres Q3-Q1	2,4637
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the average rate of return from the fund in the period from 2015 to 2023 was 0.05, and the minimum and maximum rates of return were -20.921 and 8.7349, respectively. At the worst moment, one could expect to lose about 21% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.6. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 2.46%.

4. Goldman Sachs Dividend Companies USA

The fourth analyzed fund is the open-end investment fund (FIO) of the investment bank Goldman Sachs. This fund is listed on the Warsaw Stock Exchange, and its total assets amount

to PLN 201.32 million. In turn, 100% of its capital is invested in American companies, whose capital makes up the S&P 500 index. The assets of this fund are mainly invested in American companies with large capitalization. The current value of participation units is PLN 314.21. The fund structure is as follows: Risky assets 96.48% (Participation Titles in Equity Funds 96.48%), Cash 3.22%, Other 0.29%. The risk measures that were made available by the fund indicate that the total risk is 4.06, and the Sharpe ratio is 0.17.

Figure 7. Descriptive statistics of the price of Goldman Sachs US Dividend Companies (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'FIO_P_Z' (418 prawidłowych obserwacji)

Średnia	218,89
Mediana	210,59
Minimalna	145,83
Maksymalna	297,57
Odchylenie standardowe	36,830
Wsp. zmienności	0,16826
Skośność	0,24013
Kurtoza	-0,90314
Percentyl 5%	162,67
Percentyl 95%	277,13
Zakres Q3-Q1	63,028
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 218.89, and the minimum and maximum prices were PLN 145.83 and PLN 297.57, respectively. On the other hand, deviations from the average price were at the level of approximately PLN 36.83. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 63.

Figure 8. Descriptive statistics of the logarithmic rate of return of Goldman Sachs Polish Responsible Investing (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'FIO_Rl_Z' (418 prawidłowych obserwacji)

Średnia	0,13966
Mediana	0,22646
Minimalna	-15,109
Maksymalna	10,627
Odchylenie standardowe	2,2262
Wsp. zmienności	15,941
Skośność	-1,2052
Kurtoza	9,0850
Percentyl 5%	-3,4810
Percentyl 95%	3,2349
Zakres Q3-Q1	1,9874
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the average rate of return from the fund in the period from 2015 to 2023 was 0.14, and the minimum and maximum rates of return were -15.109 and 10.627, respectively. At the worst moment, one

could expect to lose about 15% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.23. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 1.99%.

5. Goldman Sachs Global Dividend Companies

The fifth fund analyzed is a specialist open-end investment fund (SFIO) of the investment bank Goldman Sachs. This fund is listed on the Warsaw Stock Exchange, and its total assets amount to PLN 798.42 million. In turn, 100% of its capital is invested in a global fund called Goldman Sachs Global Equity Income and is listed on the Luxembourg Stock Exchange. The assets of the analyzed fund are invested in the parent fund GEI, which then invests them in global companies with high capitalization. Current value of participation units PLN 355.09. The fund structure is as follows: Risky assets 97.58% (Participation Titles in Equity Funds 97.58%), Cash 2.28%, Other 0.14%. The risk measures that were made available by the fund indicate that the total risk is 3.29, and the Sharpe ratio is 0.25.

Figure 9. Descriptive statistics of the Goldman Sachs Global Dividend-Growing Companies price (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SFIO_P_Z' (418 prawidłowych obserwacji)

Średnia	248,39
Mediana	229,26
Minimalna	169,95
Maksymalna	344,13
Odchylenie standardowe	44,210
Wsp. zmienności	0,17798
Skośność	0,60830
Kurtoza	-0,84146
Percentyl 5%	190,88
Percentyl 95%	330,88
Zakres Q3-Q1	67,302
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 248.39, and the minimum and maximum prices were PLN 169.95 and PLN 344.13, respectively. On the other hand, deviations from the average price were at the level of approximately PLN 44.21. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 67.

Figure 10. Descriptive statistics of the logarithmic rate of return of Goldman Sachs Global Dividend Companies (18/10/2015-15/10/2023)

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Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SFIO_Rl_Z' (418 prawidłowych obserwacji)

  Średnia                          0,13110
  Mediana                          0,20508
  Minimalna                       -13,430
  Maksymalna                       7,9876
  Odchylenie standardowe           2,1088
  Wsp. zmienności                  16,085
  Skośność                        -1,2671
  Kurtoza                          7,3499
  Percentyl 5%                    -3,1875
  Percentyl 95%                    3,1399
  Zakres Q3-Q1                     2,0909
  Brakujące obs.                        0
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Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the average rate of return from the fund in the period from 2015 to 2023 was 0.13, and the minimum and maximum rates of return were -13.43 and 7.9876, respectively. At the worst moment, one could expect to lose about 13.5% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.1. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 2.09%.

6. Goldman Sachs Global Responsible Investing

The last fund analyzed is a specialist Socially Responsible Investment fund (SRI) of the investment bank Goldman Sachs. This fund is listed on the Warsaw Stock Exchange, and its total assets amount to PLN 161.37 million. In turn, 100% of its capital is invested in a global fund called Goldman Sachs Global Equity Impact Opportunities and is listed on the Luxembourg Stock Exchange. The assets of the analyzed fund are invested in the parent fund GEIO, which then invests them in global companies that implement sustainable development goals. Current value of participation units PLN 83.04. The fund structure is as follows: Risky assets 97.46% (Participation Titles in Equity Funds 9.46%), Cash 2.41%, Other 0.13%. The risk measures provided by the fund indicate a total risk of 5.33 and a Sharpe ratio of 0.00.

Figure 11. Descriptive statistics of the Goldman Sachs Global Responsible Investment Price (18/10/2015-15/10/2023)

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Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SRI_P_Z' (418 prawidłowych obserwacji)

  Średnia                          72,288
  Mediana                          71,015
  Minimalna                        42,760
  Maksymalna                       102,35
  Odchylenie standardowe           12,714
  Wsp. zmienności                 0,17587
  Skośność                        0,14251
  Kurtoza                        -0,60320
  Percentyl 5%                     52,901
  Percentyl 95%                    95,403
  Zakres Q3-Q1                     19,840
  Brakujące obs.                        0
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Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

Based on the above descriptive statistics, it can be seen that the average price of the fund in the period from 2015 to 2023 was PLN 72.29, and the minimum and maximum prices were PLN 42.76 and PLN 102.35, respectively. On the other hand, deviations from the average price were at the level of approximately PLN 12.71. In the case of the interquartile range, it can be seen that most of the price fluctuations did not exceed PLN 19.8.

Figure 12. Descriptive statistics of the Goldman Sachs Global Responsible Investing log return (18/10/2015-15/10/2023)

Statystyki opisowe, wykorzystane obserwacje 1 - 418
dla zmiennej 'SRI_Rl_Z' (418 prawidłowych obserwacji)

Średnia	0,091567
Mediana	0,13546
Minimalna	-12,118
Maksymalna	11,375
Odchylenie standardowe	2,6584
Wsp. zmienności	29,032
Skośność	-0,21791
Kurtoza	2,3822
Percentyl 5%	-4,0660
Percentyl 95%	4,1844
Zakres Q3-Q1	2,9743
Brakujące obs.	0

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

For the purposes of this study, the logarithmic rate of return (Rl) was chosen due to the non-stationarity of the process. Based on the above descriptive statistics, it can be seen that the average rate of return from the fund in the period from 2015 to 2023 was 0.09, and the minimum and maximum rates of return were -12.118 and 11.375, respectively. At the worst moment, one could expect a loss of about 12% of the invested capital. On the other hand, deviations from the average rate of return were at the level of about 2.65. In the case of the interquartile range, it can be seen that most of the fluctuations in the rate of return did not exceed 2.97%.

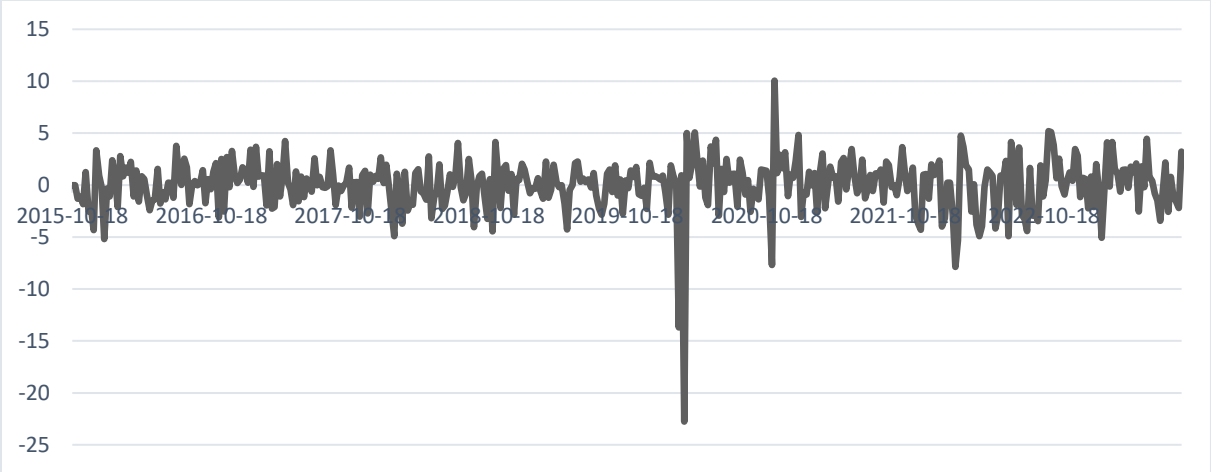
II. Analysis of rates of return and index formation.

1. Goldman Sachs Shares

Chart 1. Goldman Sachs Share Price in the period 18/10/2015–15/10/2023.

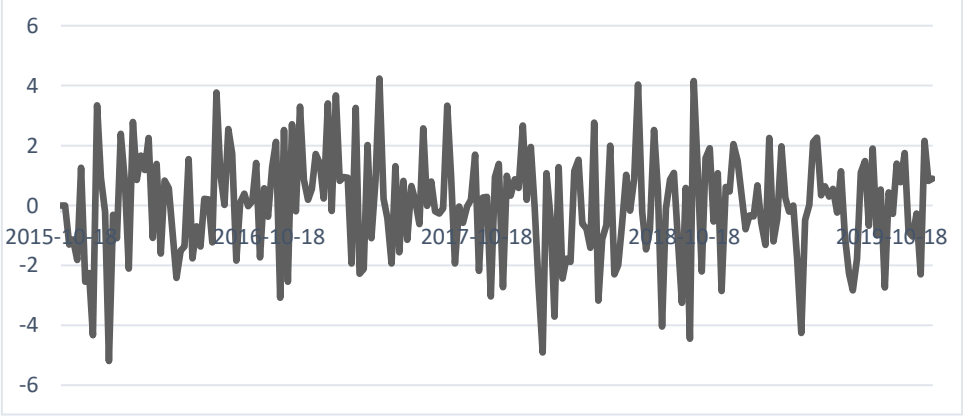
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 2. Rate of return of Goldman Sachs Shares in the period 18/10/2015-15/10/2023.



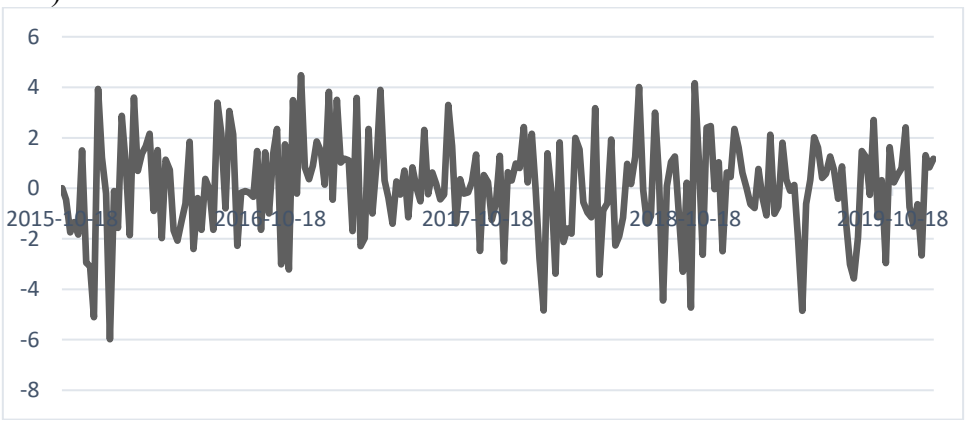
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 3. Goldman Sachs Shares Return Rate in the Period 18/10/2015-31/12/2019 (Peacetime)



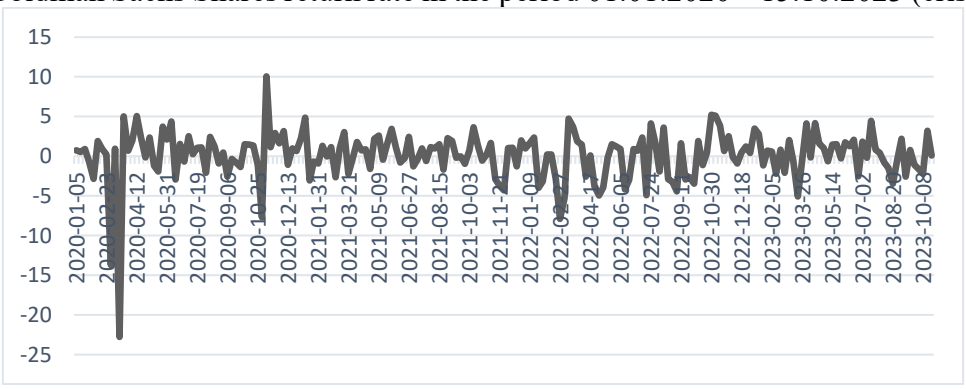
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares

Chart 4. Market rate of return for Goldman Sachs Shares in the period 18/10/2015-31/12/2019 (peace period)



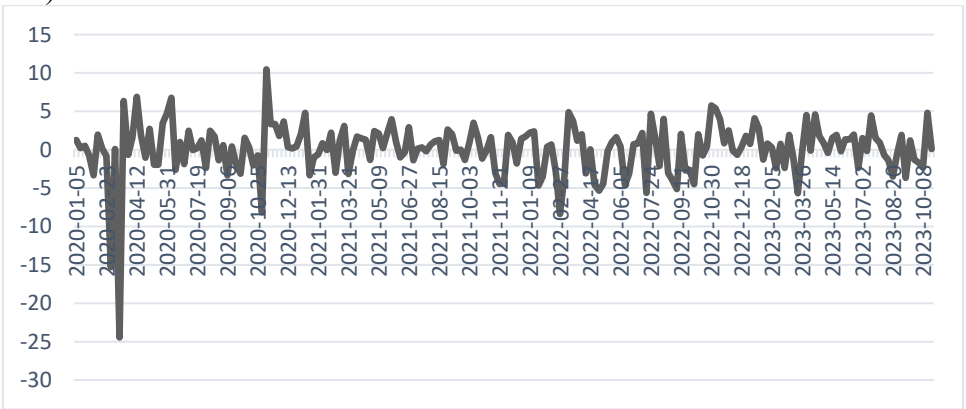
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares and www.stooq.pl WIG Index

Chart 5. Goldman Sachs Shares return rate in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares

Chart 6. Market rate of return for Goldman Sachs Shares in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares and www.stooq.pl WIG Index

Chart 1 shows not very serious price fluctuations throughout the period and the final increase in the fund's value compared to the beginning of the period under review. The second chart shows stable fluctuations in the rate of return throughout the period, with the exceptions being two moments in the second half of the period, probably caused by the pandemic. In the first

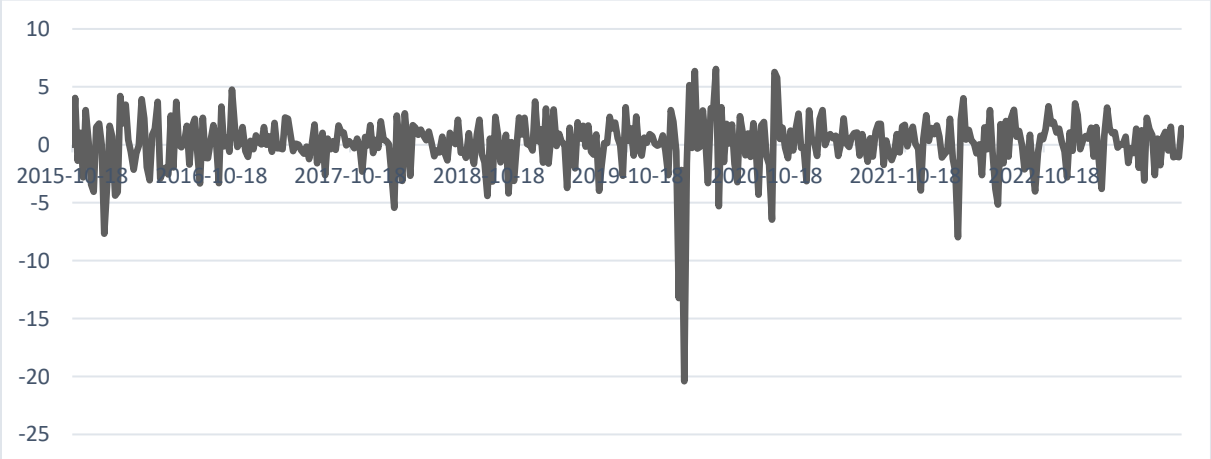
case, there is a noticeable strong decline in the rate of return caused by the pandemic. On the other hand, the second case shows a strong decline and a strong rebound in the rate of return. A comparison of Charts 3 and 4 shows that the fund reacted more strongly to the economic environment than the market in peacetime. However, during the crisis, a comparison of Charts 5 and 6 shows that the market reacted more strongly to the economic environment than the fund, which is particularly visible in the case of the outbreak of the pandemic, where the market recorded greater losses than the fund. On this basis, it can be concluded that this is a fund with moderate risk. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

2. Goldman Sachs European Dividend Companies.

Chart 7. Price of Goldman Sachs European Distribution Companies in the period 18/10/2015-15/10/2023.

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies

Chart 8. Rate of return of Goldman Sachs European Distribution Companies in the period 18/10/2015-15/10/2023.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies

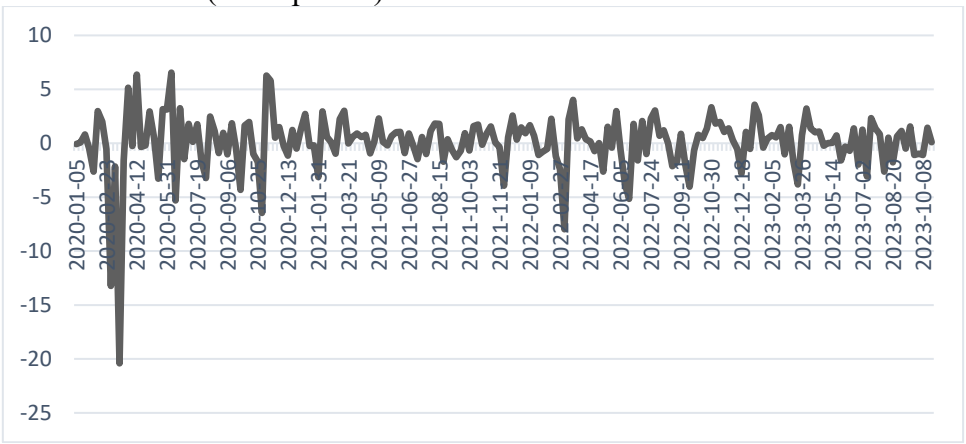
Chart 9. Rate of return of Goldman Sachs European Distribution Companies in the period 18/10/2015-31/12/2019 (peace period)

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies

Chart 10. Market rate of return for Goldman Sachs European Distribution Companies in the period 18/10/2015-31/12/2019 (peace period)

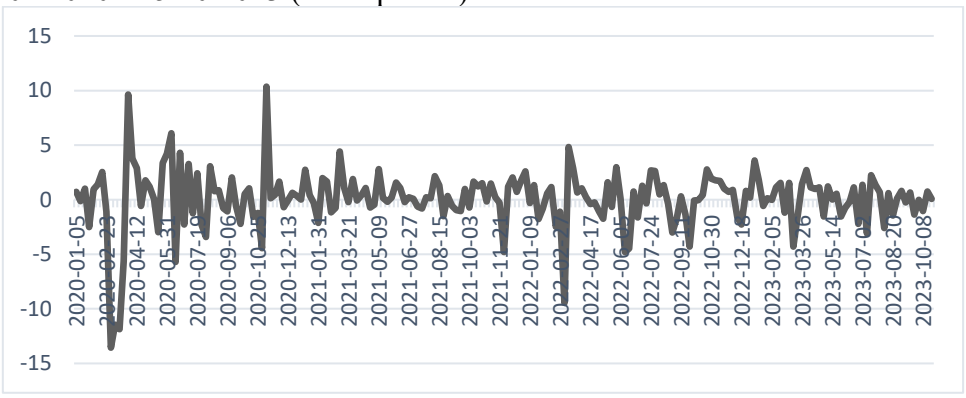
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies and www.fundsquare.net EEI Index

Chart 11. Rate of return of Goldman Sachs European Distribution Companies in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies

Chart 12. Market rate of return for Goldman Sachs European Distribution Companies in the period 01.01.2020 - 15.10.2023 (crisis period)

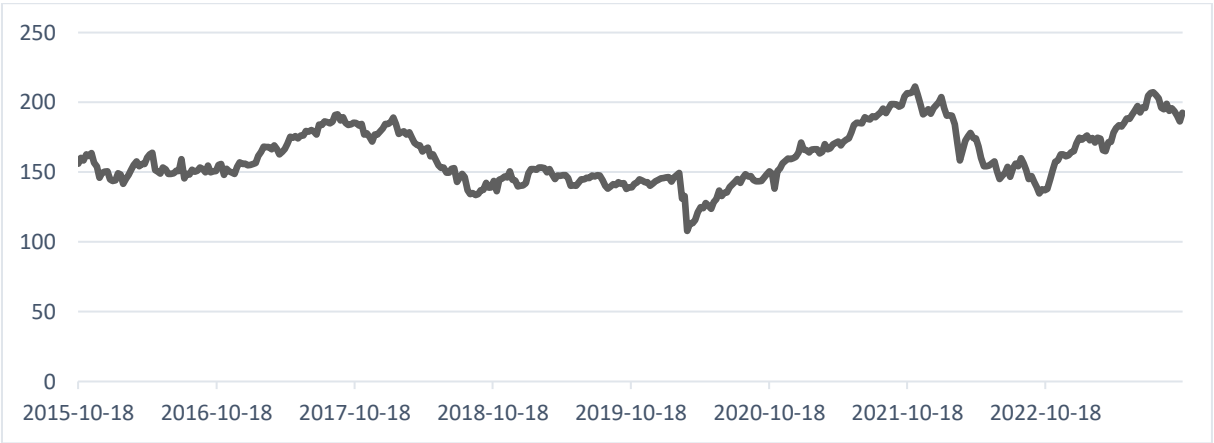


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies and www.fundsquare.net EEI Index

Chart 7 shows a stable increase in the fund's value throughout the period under review, except for the beginning of the pandemic. Chart 8 also shows stable fluctuations in the rate of return excluding the pandemic. A comparison of Charts 9 and 10 shows that the market reacted more strongly to the environment than the fund, which may show the stability and confidence of this fund in peacetime. On the other hand, a comparison of Charts 11 and 12 shows the poor diversification of the fund's structure because it is not very resistant to crisis situations and reacts more strongly than the market. These charts also show that the fund's situation quickly stabilized after the crisis and brought a safer return on investment than the market. On this basis, it can be concluded that this is an attractive fund with moderate risk. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

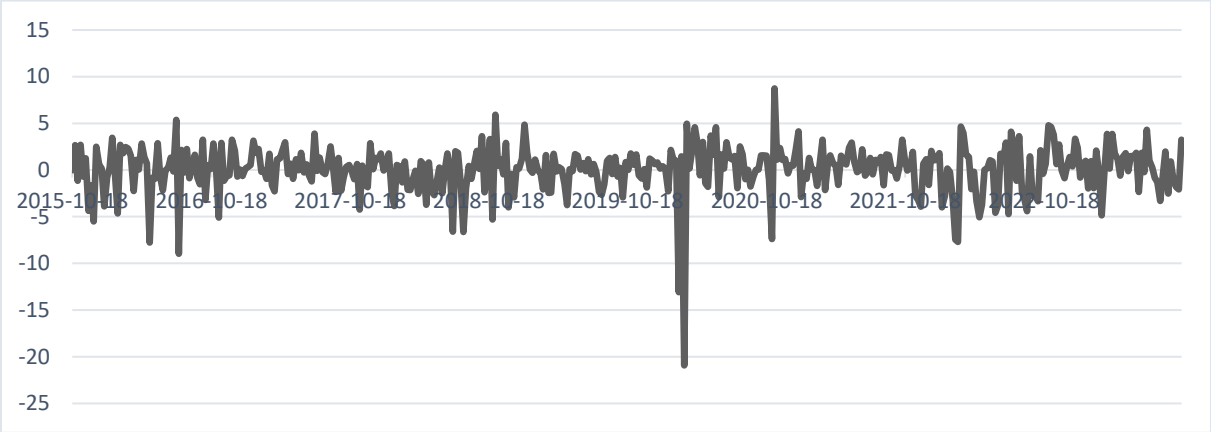
3. Goldman Sachs Polish Responsible Investment

Chart 13. Price of Goldman Sachs Polish Responsible Investment in the period 18/10/2015-15/10/2023.



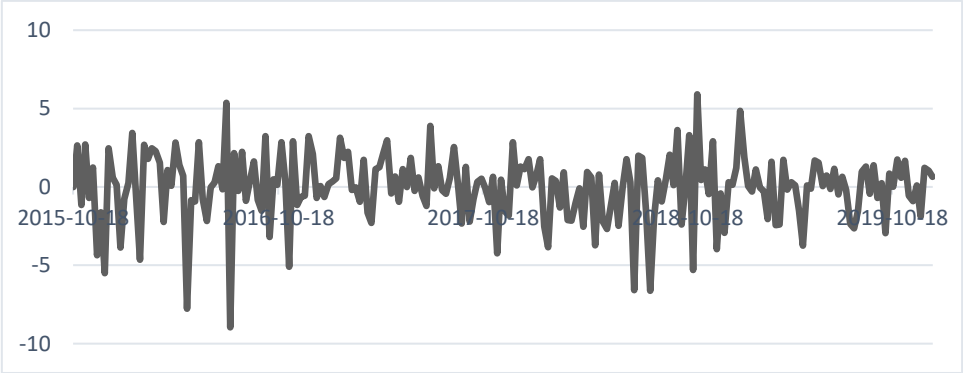
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

Chart 14. Rate of return of Goldman Sachs Polish Responsible Investing in the period 18/10/2015-15/10/2023.



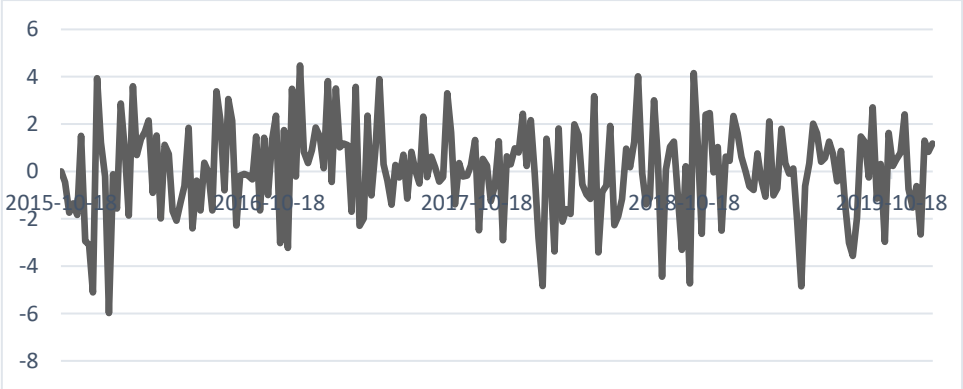
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

Chart 15. Rate of return of Goldman Sachs Polish Responsible Investment in the period 18/10/2015-31/12/2019 (peace period)



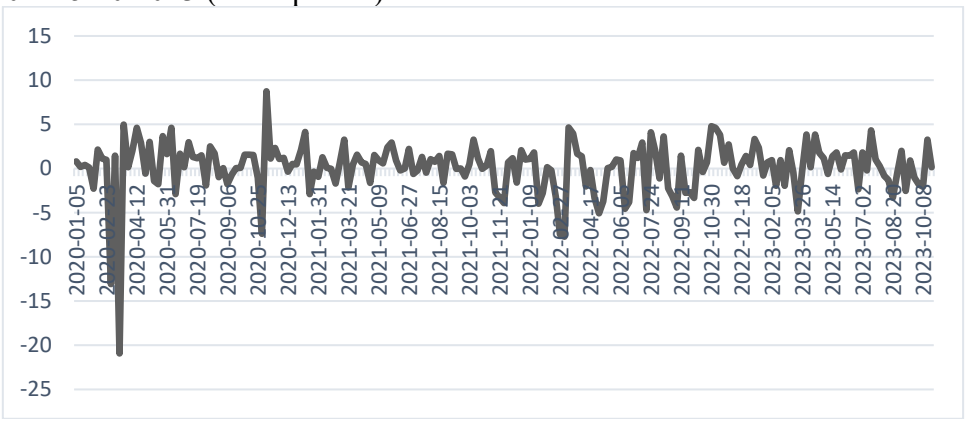
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

Chart 16. Market rate of return for Goldman Sachs Polish Responsible Investment in the period 18/10/2015-31/12/2019 (peace period)



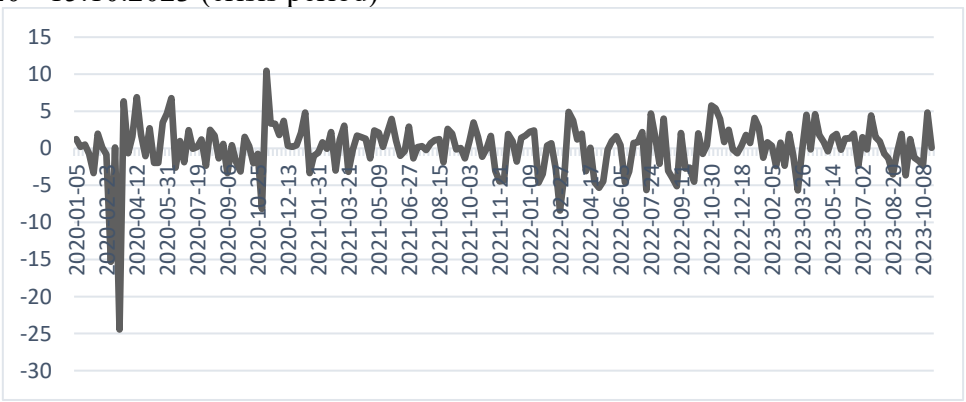
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment and www.stooq.pl WIG Index

Chart 17. Rate of return of Goldman Sachs Polish Responsible Investment in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment

Chart 18. Market rate of return for Goldman Sachs Polish Responsible Investment in the period 01.01.2020 - 15.10.2023 (crisis period)

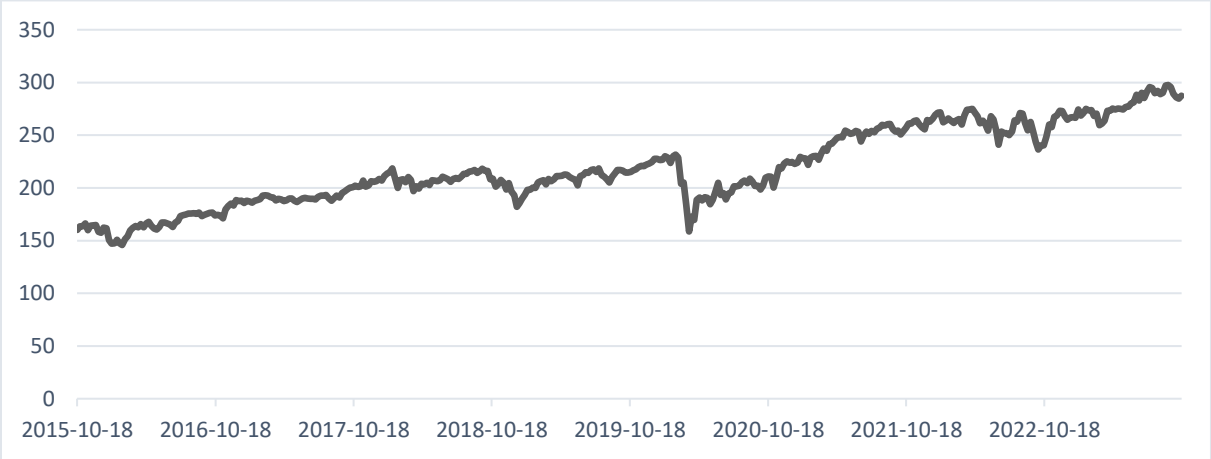


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment and www.stooq.pl WIG Index

Chart 13 shows frequent fluctuations throughout the period under review, but the final value of the funds increased relative to the beginning of the period. Chart 14 shows strong fluctuations in the rate of return throughout the period. A comparison of charts 15 and 16 clearly shows that the fund reacted very aggressively in peacetime compared to the market. A comparison of charts 17 and 18 also shows stronger reactions of the fund value to changes in the economic environment, but they are weaker than in the case of the market. On this basis, it can be concluded that this is a fairly risky fund. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

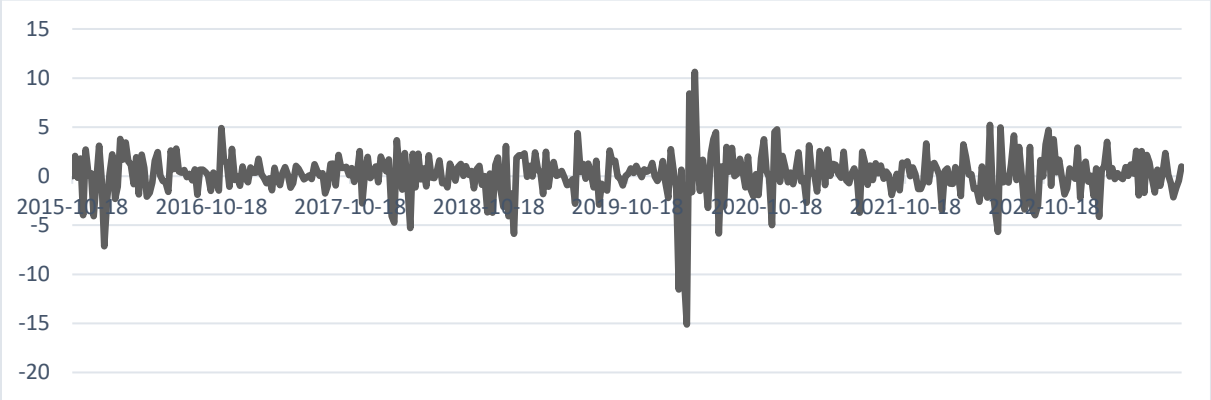
4. Goldman Sachs Dividend Companies USA

Chart 19. Price of Goldman Sachs US Dividend Companies in the period 18/10/2015-15/10/2023.



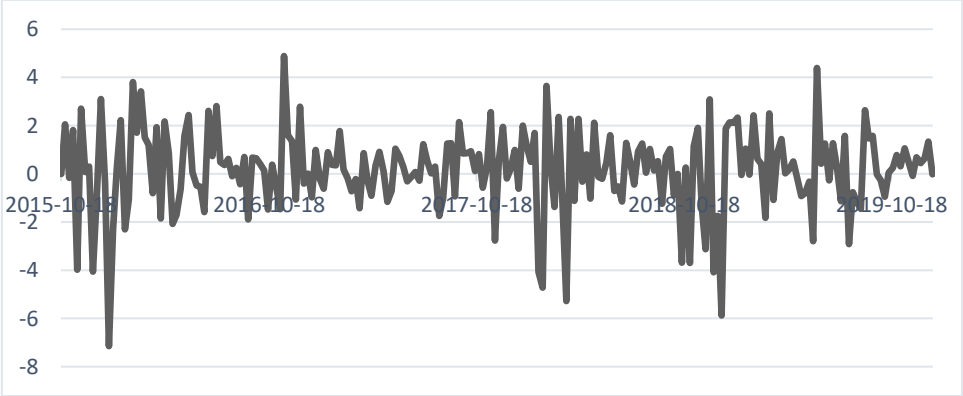
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 20. Rate of return of Goldman Sachs US Dividend Companies in the period 18/10/2015-15/10/2023.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 21. Rate of return of Goldman Sachs US Dividend Companies in the period 18/10/2015-31/12/2019 (peace period)

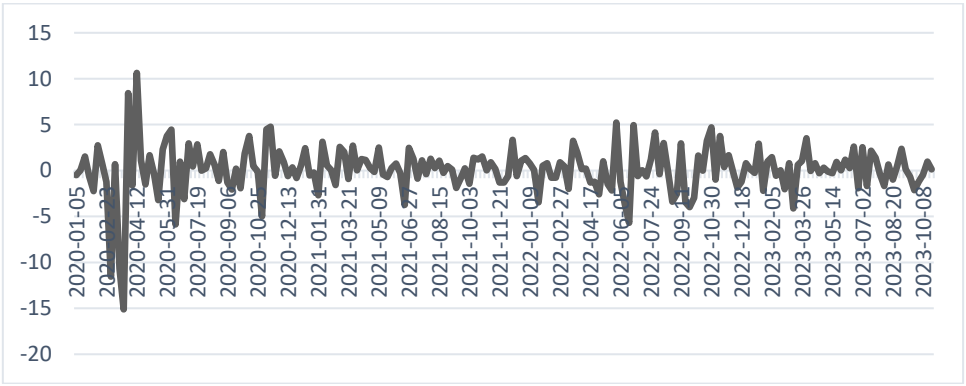


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 22. Market rate of return for Goldman Sachs US Dividend Companies in the period 18/10/2015-31/12/2019 (peace period)

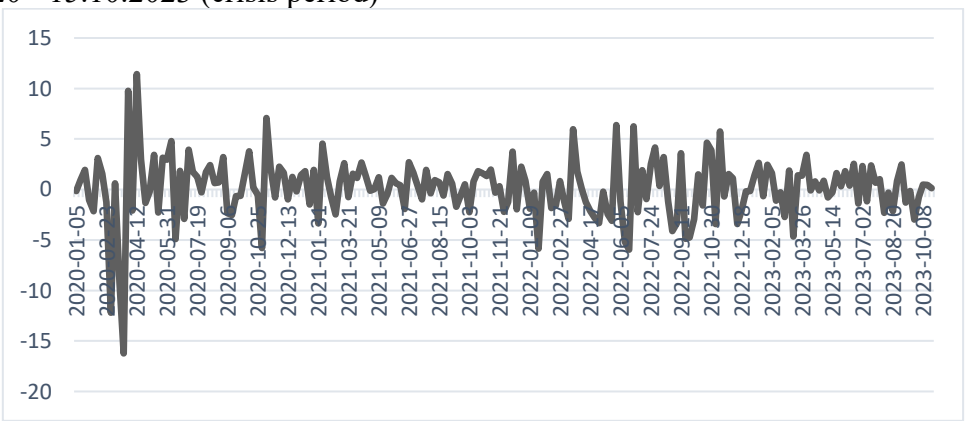
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies and www.stooq.pl S&P500 Index

Chart 23. Goldman Sachs US Dividend Rate of Return from 01.01.2020 to 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA

Chart 24. Market rate of return for Goldman Sachs US Dividend Companies in the period 01.01.2020 - 15.10.2023 (crisis period)

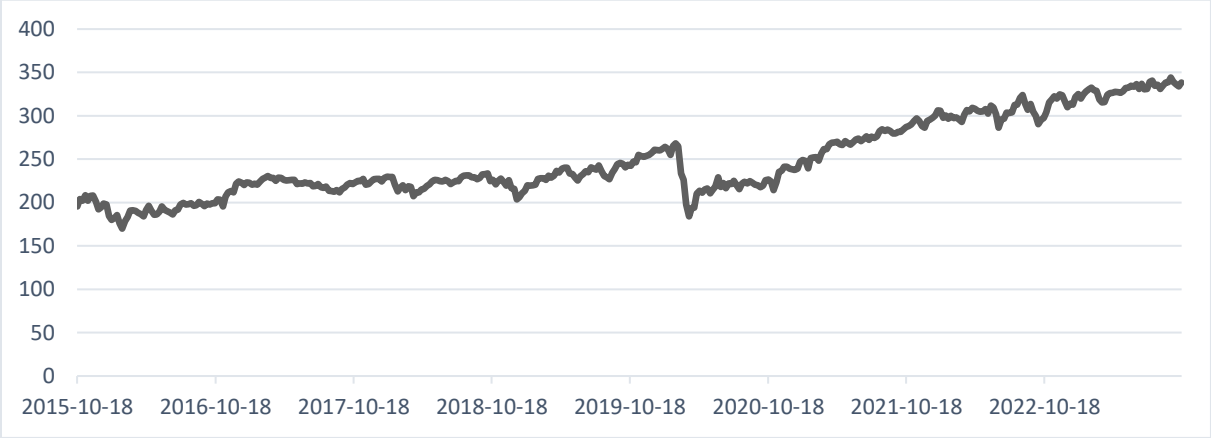


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies and www.stooq.pl S&P500 Index

Chart 19 shows a stable increase in the fund's value throughout the period under review. However, in the case of the rate of return, low fluctuations are noticeable, of course excluding the period starting the pandemic. A comparison of charts 21 and 22 shows very similar behavior to the market in peacetime. On the other hand, a comparison of charts 23 and 24 shows that during the crisis the fund was more stable than the market. On this basis, it can be concluded that this is a very attractive fund in terms of long-term investments and stability of the rate of return. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

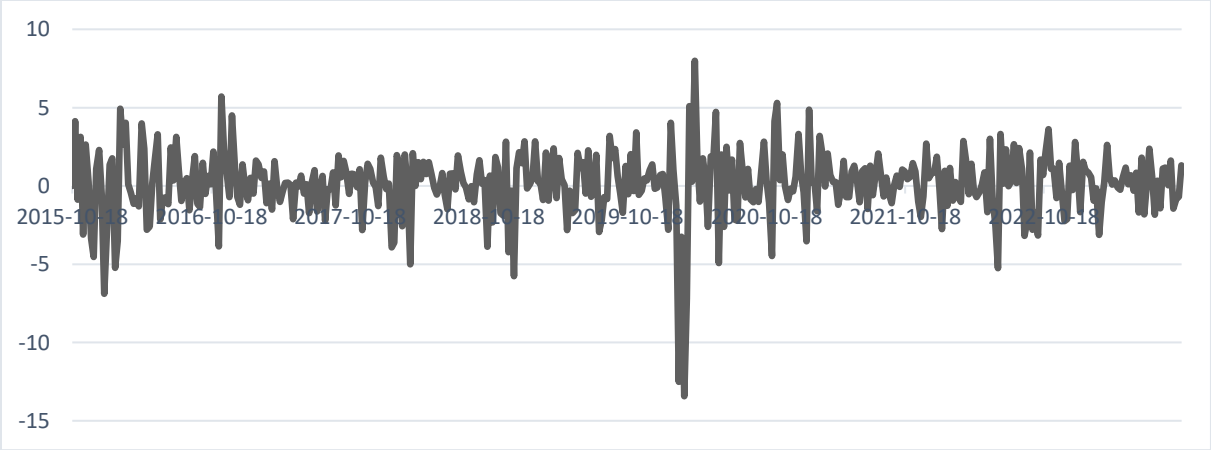
5. Goldman Sachs Global Dividend Companies

Chart 25. Goldman Sachs Global Dividend Share Price in the period 18/10/2015-15/10/2023.



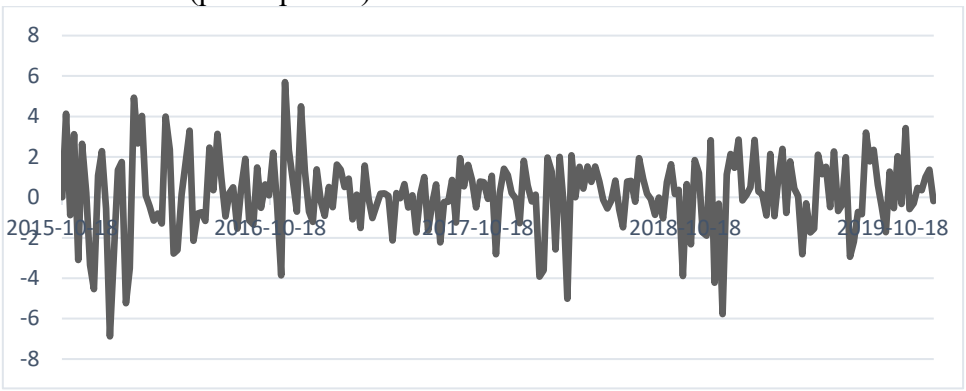
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

Chart 26. Rate of return of Goldman Sachs Global Dividend Companies in the period 18/10/2015–15/10/2023.



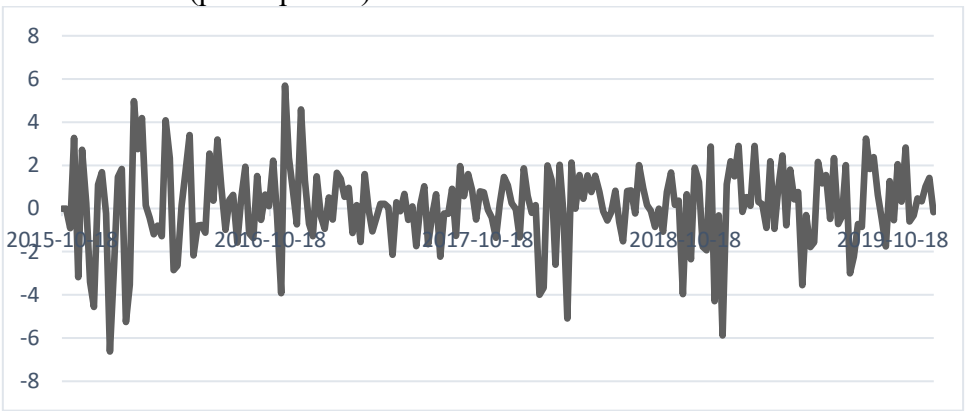
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

Chart 27. Rate of return of Goldman Sachs Global Dividend Companies in the period 18/10/2015-31/12/2019 (peace period)



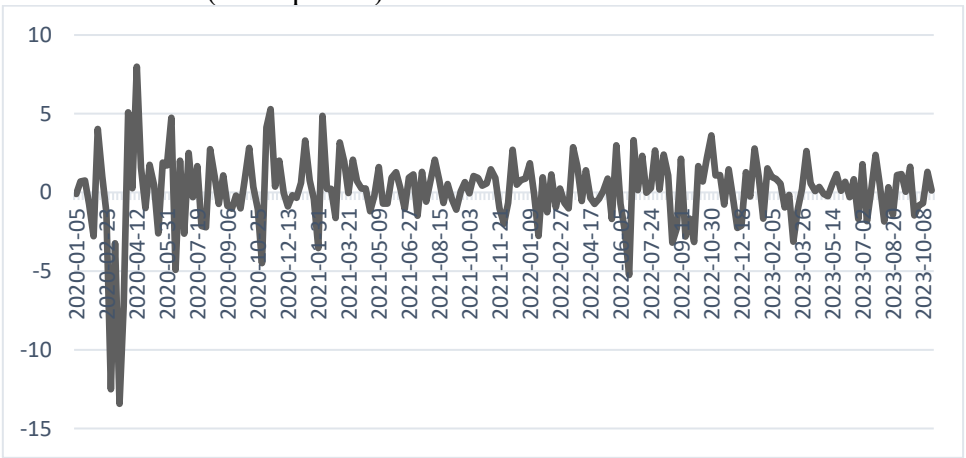
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

Chart 28. Market rate of return for Goldman Sachs Global Dividend Companies in the period 18/10/2015-31/12/2019 (peace period)



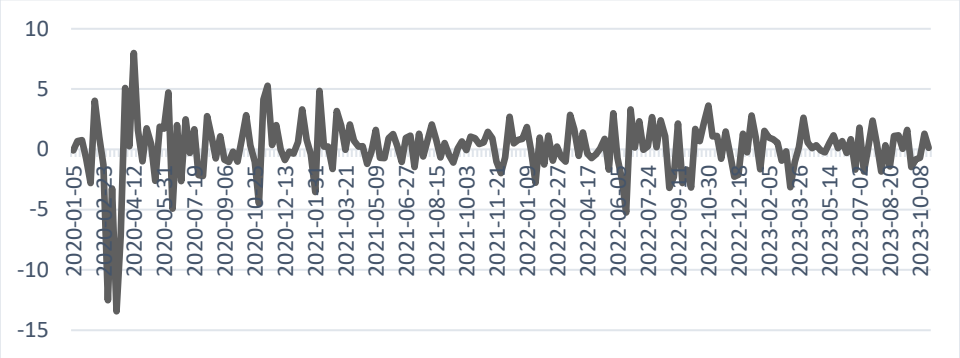
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies and www.investing.com GEI Index

Chart 29. Rate of return of Goldman Sachs Global Dividend Companies in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies

Chart 30. Market rate of return for Goldman Sachs Global Dividend Companies in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies and www.investing.com GEI Index

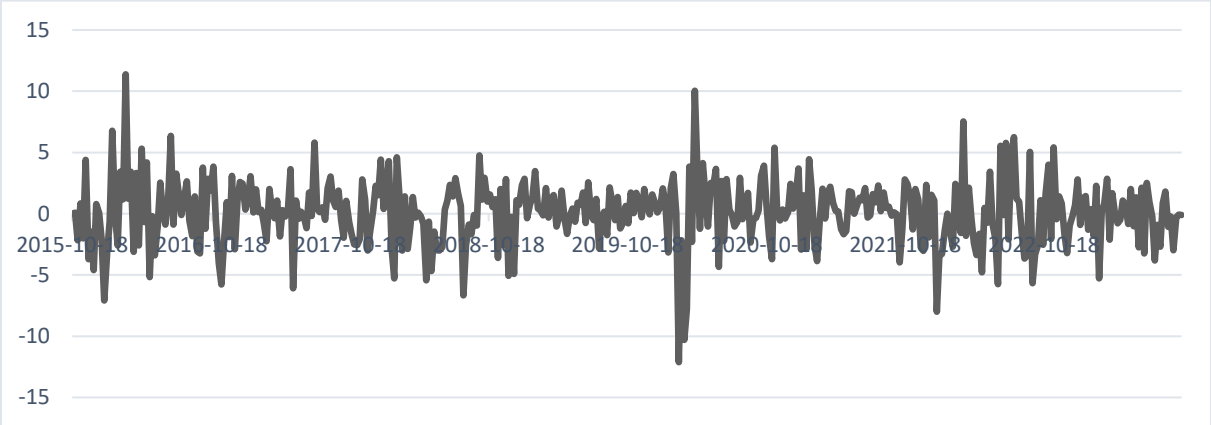
Based on Chart 25, one can see a moderate growth of the fund throughout the period under review. On the other hand, the fund's rate of return reveals large fluctuations, increasing the riskiness of the investment. In peacetime, the fund's rate of return was similar to the market rate of return. The rate of return during the crisis also behaved similarly. On this basis, one can assume that this is a stable fund with a moderate rate of return and the same risk. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

6. Goldman Sachs Global Responsible Investing

Chart 31. Goldman Sachs Global Responsible Investing price in the period 18/10/2015-15/10/2023.

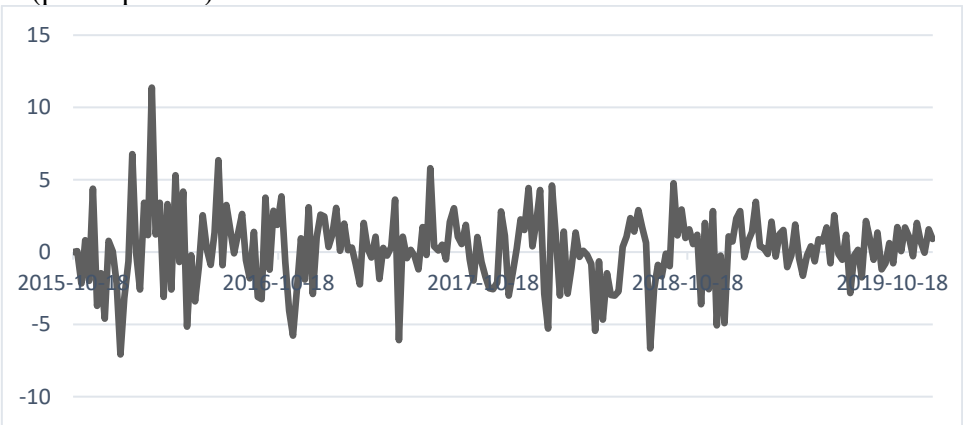
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

Chart 32. Goldman Sachs Global Responsible Investing rate of return in the period 18/10/2015–15/10/2023.



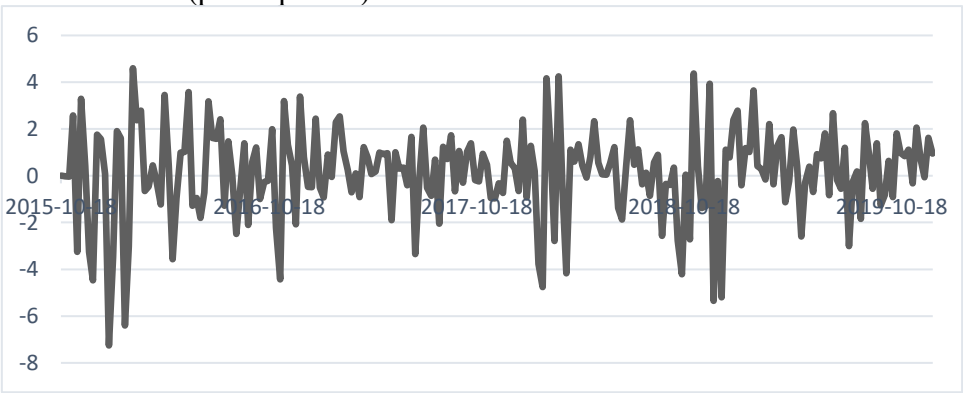
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

Chart 33. Goldman Sachs Global Responsible Investment return in the period 18/10/2015-31/12/2019 (peace period)



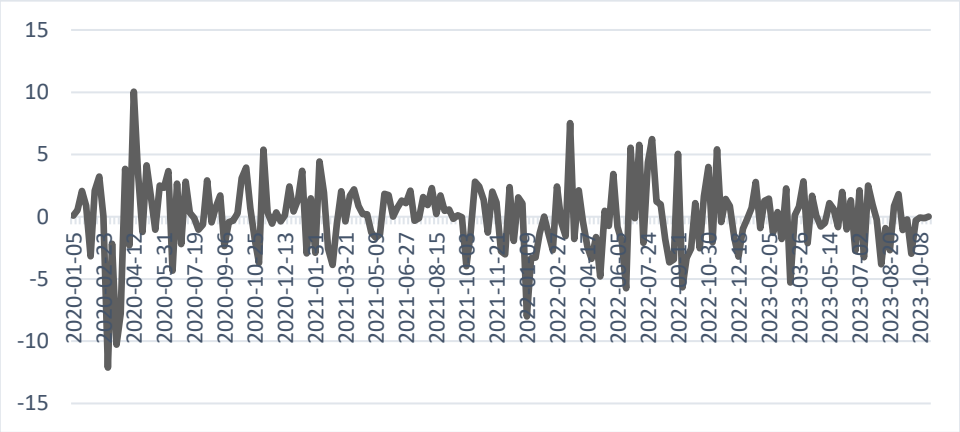
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

Chart 34. Market rate of return for Goldman Sachs Global Responsible Investing in the period 18/10/2015-31/12/2019 (peace period)



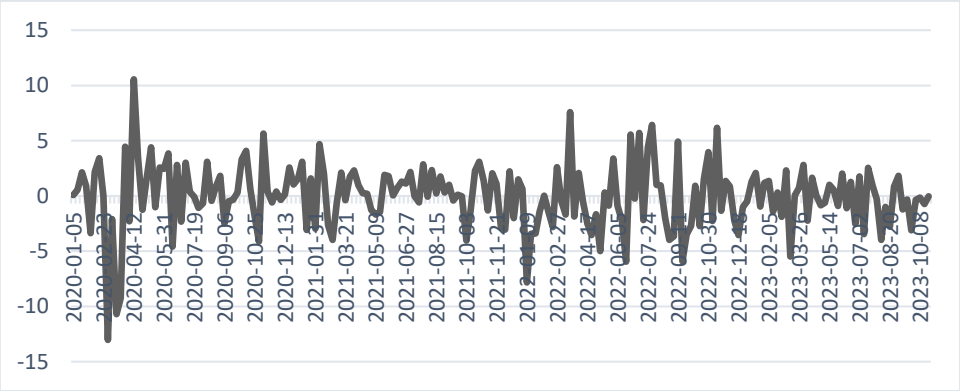
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing and www.investing.com GEIO Index

Chart 35. Goldman Sachs Global Responsible Investment return in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing

Chart 36. Market rate of return for Goldman Sachs Global Responsible Investing in the period 01.01.2020 – 15.10.2023 (crisis period)



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing and www.investing.com GEIO Index

Based on Chart 31, one can see large fluctuations in the fund's price throughout the entire period under review. Analysis of the rate of return based on Chart 32 confirms strong fluctuations in the fund's value. Comparison of Charts 33 and 34 also indicates strong fluctuations in the rate of return in the context of the market. However, during the crisis, this fund behaved similarly to the market. On this basis, one can conclude that this is a fund with high risk and a moderate rate of return. The above-mentioned charts prove that the price process is non-stationary and a logarithmic rate of return should be used.

7. Analysis of rates of return

Table 1. Rates of return

Return rates	Whole per	Peace period	Crisis period
FIO_PL	0,063866914	0,021731801	0,110683706
SFIO_PL	0,084581159	0,069178438	0,101695292
SRI_PL	0,050247779	-0,035616604	0,145652649
FIO_Z	0,139656826	0,159289238	0,117843035
SFIO_Z	0,131104567	0,130270517	0,13203129
SRI_Z	0,091567147	0,157686459	0,018101244
FIO_PL_Rm	0,063669944	0,054026526	0,074384853
SFIO_PL_Rm	0,066927374	0,055536072	0,079584376
SRI_PL_Rm	0,063669944	0,054026526	0,074384853
FIO_Z_Rm	0,180738772	0,211824028	0,146199599
SFIO_Z_Rm	0,122744351	0,120137686	0,125640645
SRI_Z_Rm	0,054847016	0,129464852	-0,02806169
BONDS_Rf	0,580515808	0,595329031	0,564056671

Source: Own study based on historical data, www.sooq.pl, www.investing.com, www.fpumdsquer.com, www.analizy.pl.

1. Goldman Sachs Shares (FIO_PL)

Based on the above table, it can be seen that the fund had the highest rate of return during the crisis and it was almost twice as high as the rate during the entire period. The fund's rate of return compared to the market rate during the entire period were very similar. However, during the peace period, the fund's rate of return was much lower than the market rate. However, during the crisis, the fund's rate of return was almost twice as high as the market rate. However, in none of the periods examined did the fund's rate of return approach the risk-free rate. Which may mean that it is a low-profit and low-risk fund.

2. Goldman Sachs European Dividend Companies (SFIO_PL)

Also in the case of this fund it obtained in the peacetime which was at the level of 0.1 and it was higher than the market rate in the same period by 0.3. However, in the case of the entire period under review the rate of return from the fund was higher than the market rate, which may mean that it is a fund with high risk and high rate of return. Also in the peacetime the rate of return from the fund was higher than the market rate. This is also indicated by the difference between the rate of return and the risk-free rate.

3. Goldman Sachs Polish Responsible Investment (SRI_PL)

In the case of this fund, we should start by considering the rate of return during peacetime. During this period, the fund's rate of return was negative, and the market rate was positive, which means that the fund was generating losses for the investor. However, during the crisis, the rate of return was more than twice as high as the market rate. For the entire period, the fund's rate was 0.01 lower than the market rate. Based on the differences described, it can be said that this fund is characterized by very high risk. This is also indicated by the high difference between the rate of return and the risk-free rate.

4. Goldman Sachs Dividend Companies USA (FIO_Z)

This fund has the highest rate of return among all the funds discussed. The fund had the highest rate of return during the peace period. Also, a comparison of the fund's and the market's rates of return shows that they behaved in a similar way. A comparison of the fund's rate of return

and the risk-free rate shows that they were the most similar of all the funds examined. On this basis, it can be concluded that this is a fund that includes a large part of the market, it is a fund with moderate risk and it has a high rate of return in the context of other offers of this type.

5. Goldman Sachs Global Dividend Companies (SFIO_Z)

In the case of this fund, it should be noted that both the fund's rate of return for the entire period and for sub-periods were at a similar level. This is also the second fund examined whose rate of return approached the risk-free rate. Also in the context of the market, the rate of return was higher and similar in all periods. On this basis, it can be concluded that this is a stable fund with moderate risk and a high rate of return.

6. Goldman Sachs Global Responsible Investing (SRI_Z)

In the case of this fund, the rate of return over the entire period under review was almost twice as high as the market rate. The fund achieved its highest values in peacetime. However, in the case of crisis, it should be noted that the fund achieved a satisfactory rate of return and the market achieved a negative one. However, in the context of the risk-free rate, this fund is more risky than the two previous funds. On this basis, it can be concluded that this is a fund with a lower risk than the market and has a higher rate of return.

III. Risk analysis.

Table 2. Risk

Specification	Systematic risk	Total risk	Negative risk
Funds	Beta	Sigma_p	Sigma_(-)p
FIO_PL_P	0,910168	1,781961	1,898422976
SFIO_PL_P	0,734057	1,881262	2,024797078
SRI_PL_P	0,683617	2,155972	2,506714216
FIO_Z_P	0,907593	1,716082	1,941439514
SFIO_Z_P	0,986976	1,889396	2,024797078
SRI_Z_P	0,628429	2,499069	2,527447178
FIO_PL_K	0,894421	3,133047	3,828731942
SFIO_PL_K	0,857262	2,722344	3,409732719
SRI_PL_K	0,835321	2,976626	3,850027336
FIO_Z_K	0,828227	2,686255	3,036285222
SFIO_Z_K	0,965334	2,333501	2,755601159
SRI_Z_K	0,949115	2,829498	3,014088447
WIG_P	1	1,9079	1,984387729
EEI_P	1	2,0862	2,417221796
SP500_P	1	1,7839	2,10168064
GEI_P	1	1,8848	2,015498152
GEIO_P	1	1,9231	2,167603732
WIG_K	1	3,447	4,247068311
EEI_K	1	2,7138	3,243936255
SP500_K	1	3,0463	3,262693026
GEI_K	1	2,3906	2,741363947
GEIO_K	1	2,9683	3,173442554

Source: Own study based on historical data, www.sooq.pl, www.investing.com, www.fpumdsquer.com, www.analizy.pl.

1. Goldman Sachs Shares (FIO_PL)

Based on the beta coefficient, it can be seen that in the case of this fund there is a lower systematic risk than the market risk (WIG), which means that it is a very desirable fund. In peacetime, total and negative risk were low. However, in peacetime, both total and negative risk increased almost twice. It should also be noted that in peacetime, total and negative risk were the lowest in the studied group. However, in the crisis period, both coefficients were among the highest. However, in the context of the market, its total and negative risk were not higher.

2. Goldman Sachs European Dividend Companies (SFIO_PL)

Based on the beta coefficient, it can be seen that in the case of this fund there is a lower systematic risk than the market risk (EEI), which means that it is a very desirable fund. In the case of total risk, it was similar to the case of most funds in the studied group. On the other hand, negative risk in peacetime was almost the highest in the entire studied group. In the case of the crisis period, both total and negative risk increased to a similar level as in the entire group. In the context of the market, negative and total risk were at a lower level, except for negative risk in the crisis period.

3. Goldman Sachs Polish Responsible Investment (SRI_PL)

Based on the beta coefficient in the table above, it can be seen that in the case of this fund there is a lower systematic risk than the market risk (WIG), which means that it is a very desirable fund. Both in peacetime and in crisis, the total risk and negative risk were high in the context of the entire group studied. In the case of this fund, in peacetime and crisis, its total risk and negative risk were higher than the market risk. This means that this is a fund with a higher risk than the others, but it is still attractive to investors.

4. Goldman Sachs Dividend Companies USA (FIO_Z)

Based on the beta coefficient, it can be seen that in the case of this fund there is a lower systematic risk than the market risk (S&P 500), which means that it is a very desirable fund. In the case of total risk, both in peacetime and in crisis, they remained at a low level in the context of the entire group studied. On the other hand, the negative risk in the case of peacetime was moderate but increased significantly in the crisis. On the other hand, in the context of the market, the negative and total risk were at a lower level. This is a very attractive fund for peacetime.

5. Goldman Sachs Global Dividend Companies (SFIO_Z)

Based on the beta coefficient in the table above, it can be seen that in the case of this fund there is a lower systematic risk than market risk (GEI), which means that it is a very desirable fund. In the case of total risk, both in peacetime and in crisis, they remained at a low level in the context of the entire group studied. Also, in the case of negative risk in peacetime and crisis, it was low in the context of the group studied. In the context of the market, total and negative risk were at a similar level. Which means that it is an attractive fund for long-term investments.

6. Goldman Sachs Global Responsible Investing (SRI_Z)

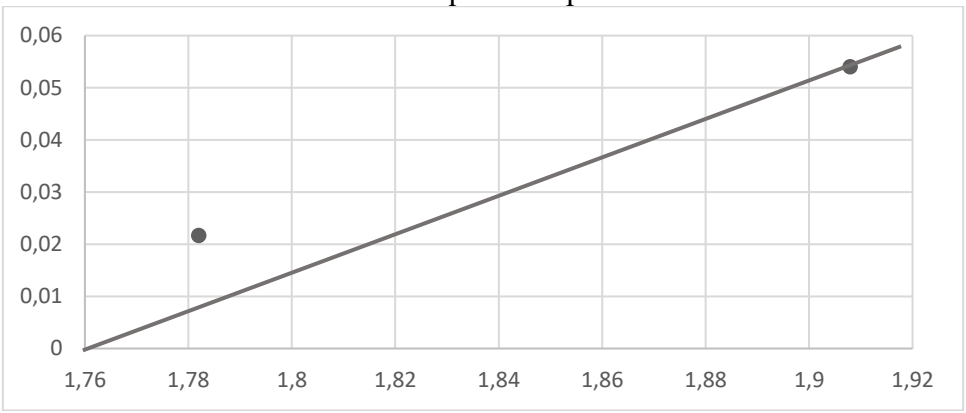
Based on the beta coefficient, it can be seen that in the case of this fund there is a lower systematic risk than the market risk (GEIO), which means that it is a very desirable fund. In the case of total risk, both in peacetime and in the crisis period, they remained at a low level in the context of the entire group studied. On the other hand, the negative risk in the peacetime period was moderate but increased significantly in the crisis period. In the context of the market, in peacetime, the total risk and the negative risk of the fund were higher. However, in the case of the crisis period, they were similar. This means that investing in this fund is burdened with moderate risk.

IV. Efficiency of funds.

1. Analysis of effectiveness in relation to the market.

1. Goldman Sachs Shares (FIO_PL)

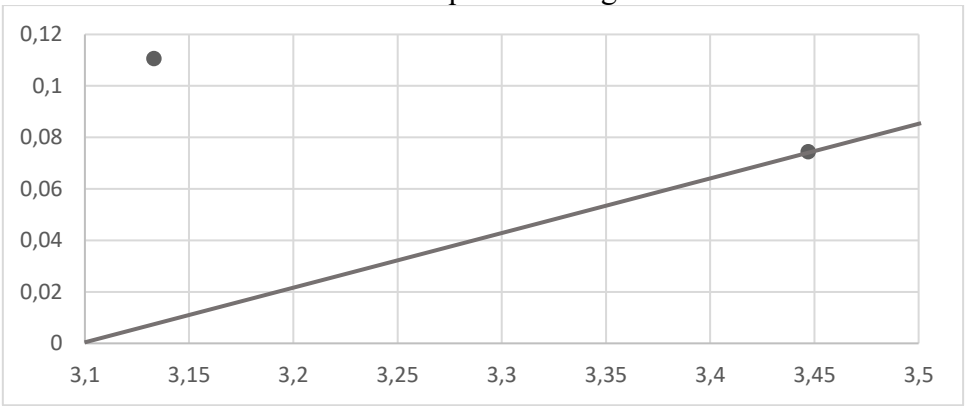
Chart 37. Performance of Goldman Sachs Equities in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and low risk in peacetime.

Chart 38. Performance of Goldman Sachs Equities during the crisis.

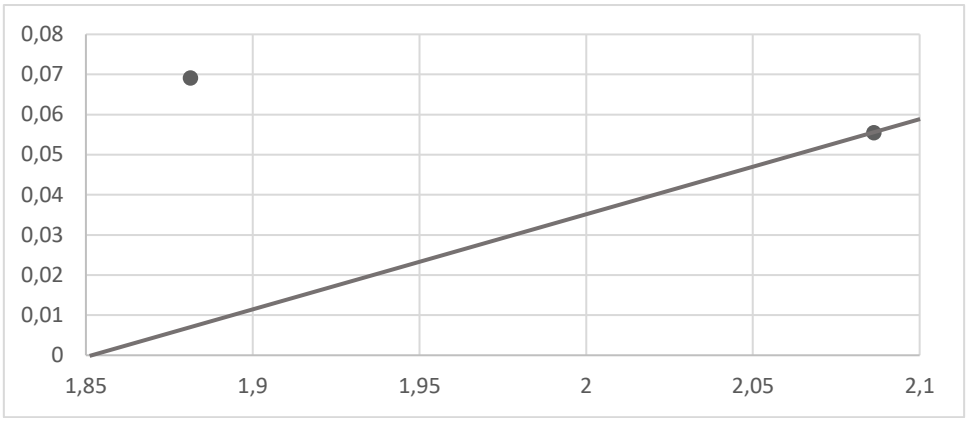


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk during the crisis.

2. Goldman Sachs European Dividend Companies (SFIO_PL)

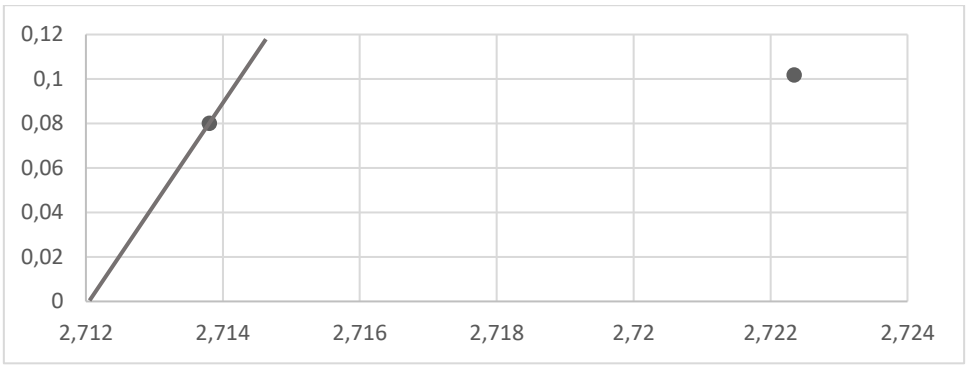
Chart 39. Performance of Goldman Sachs European Distribution Companies in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies, www.fundsquare.net EEI Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in peacetime.

Chart 40. Efficiency of Goldman Sachs European Dividend Companies during the crisis.

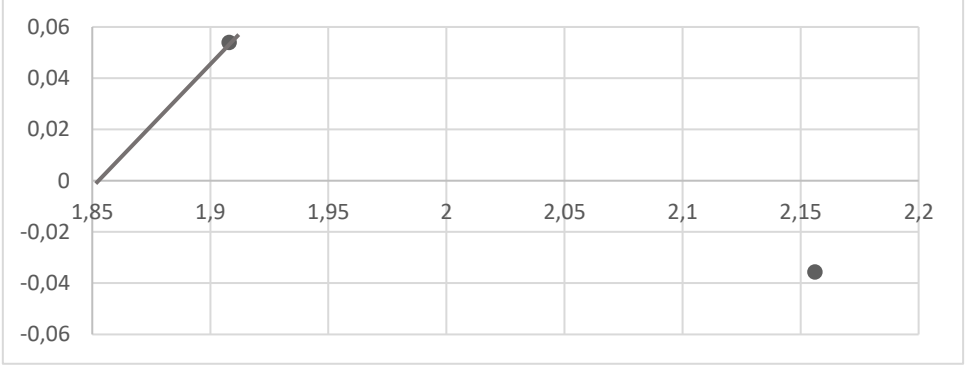


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies, www.fundsquare.net EEI Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and high risk during the crisis.

3. Goldman Sachs Polish Responsible Investment (SRI_PL)

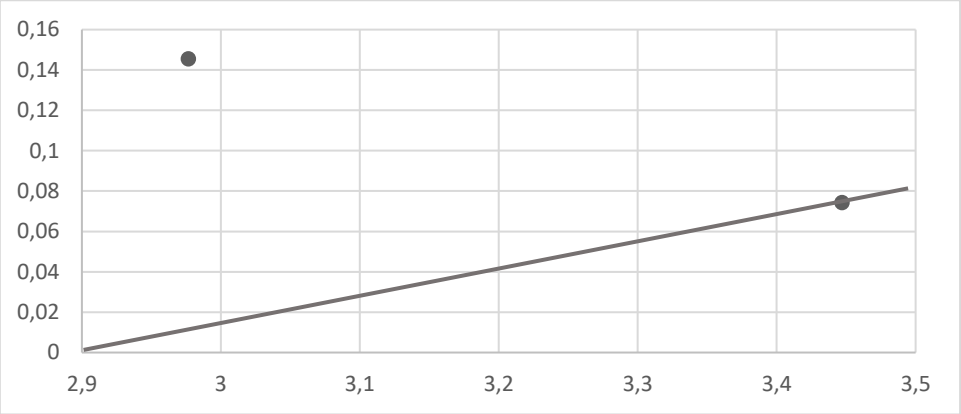
Chart 41. Effectiveness of Goldman Sachs Polish Responsible Investment in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and high risk in peacetime.

Chart 42. Effectiveness of Goldman Sachs Polish Responsible Investment during the crisis.

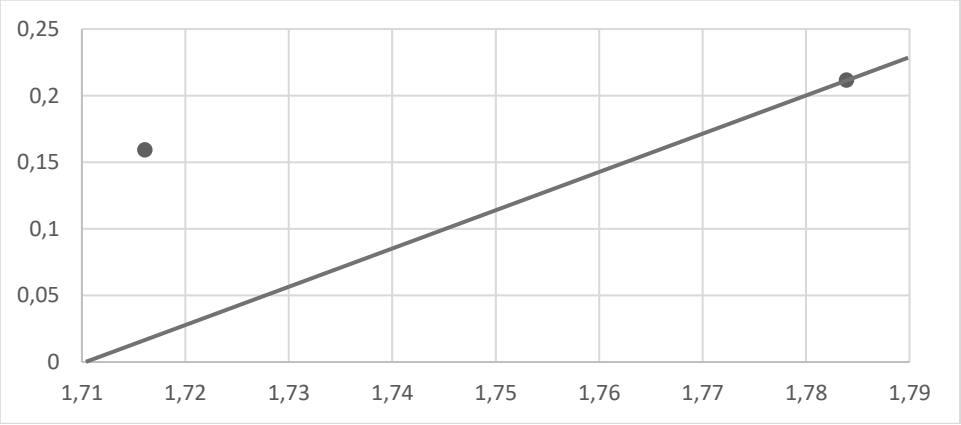


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk during the crisis.

4. Goldman Sachs Dividend Companies USA (FIO_Z)

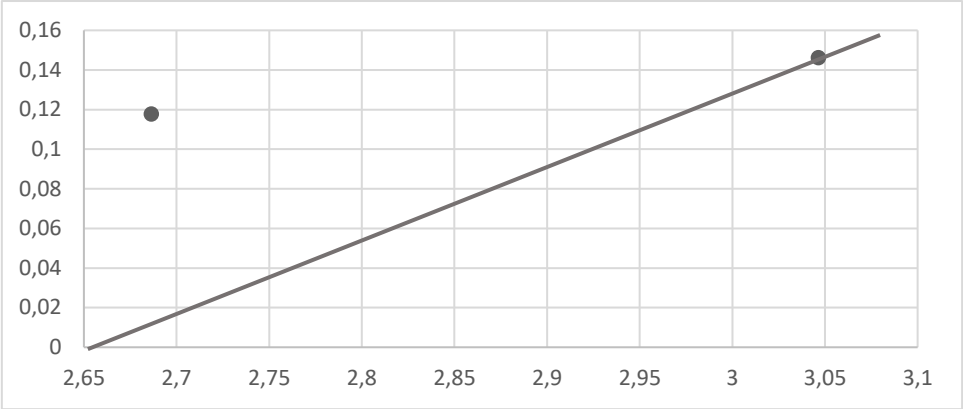
Chart 43. Performance of Goldman Sachs Distribution Companies in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA, www.stooq.pl S&P500 Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and low risk in peacetime.

Chart 44. Efficiency of Goldman Sachs Dividend Companies during the crisis.

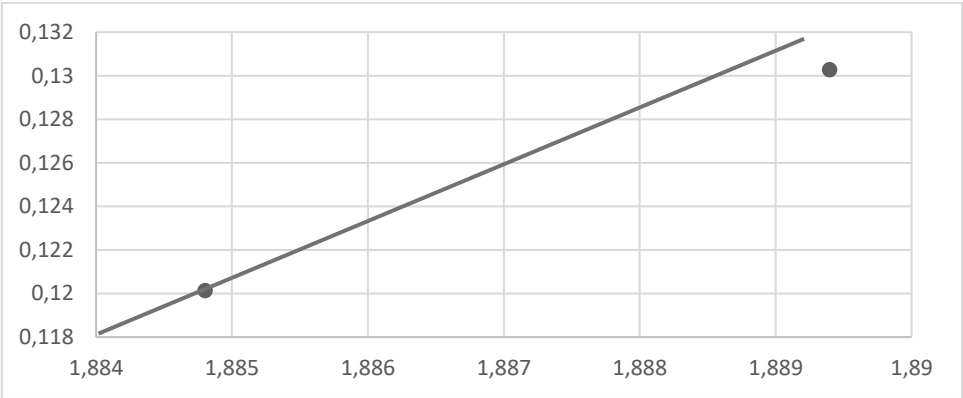


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA, www.stooq.pl S&P500 Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and low risk during the crisis.

5. Goldman Sachs Global Dividend Companies (SFIO_Z)

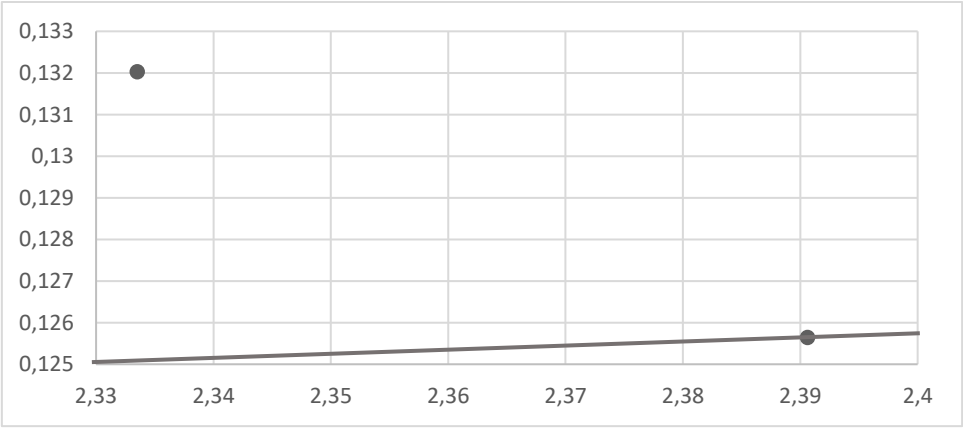
Chart 45. Efficiency of Goldman Sachs Global Dividend Companies in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.investing.com GEI Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and low risk in peacetime.

Chart 46. Efficiency of Goldman Sachs Global Dividend Companies in peacetime.

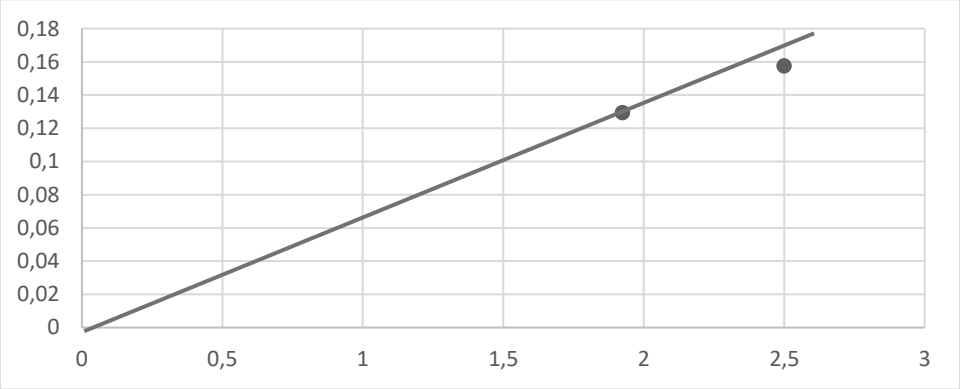


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.investing.com GEI Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk during the crisis.

6. Goldman Sachs Global Responsible Investing (SRI_Z)

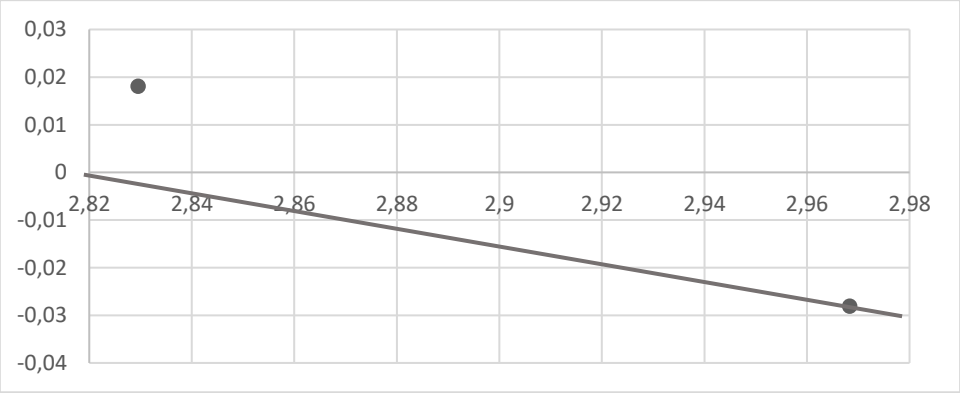
Chart 47. Effectiveness of Goldman Sachs Global Responsible Investing in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.investing.com GEIO Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and high risk during the crisis.

Chart 48. Effectiveness of Goldman Sachs Global Responsible Investing in peacetime.



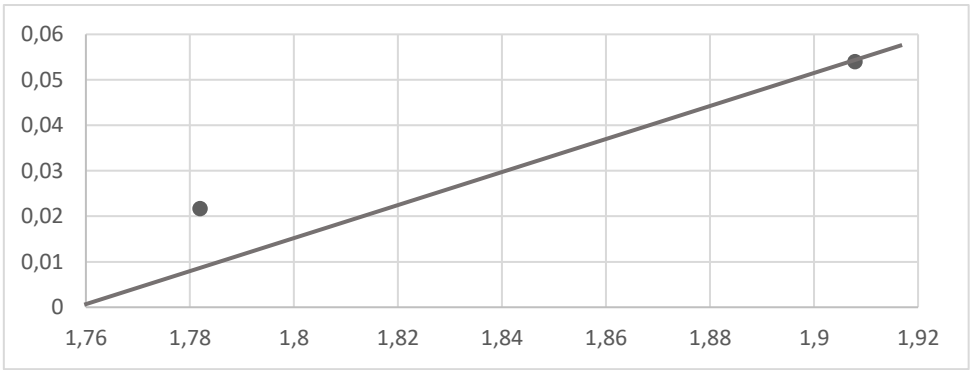
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.investing.com GEIO Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk during the crisis.

2. Analysis of efficiency against WIG.

1. Goldman Sachs Shares (FIO_PL)

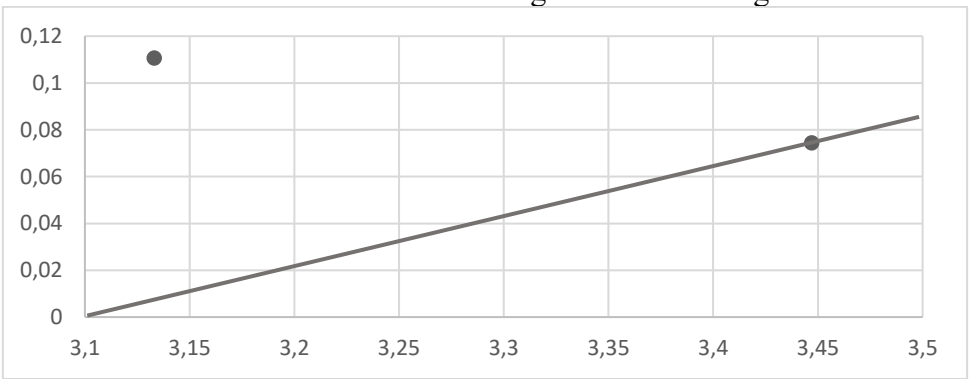
Chart 49. Performance of Goldman Sachs Shares against WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and low risk in relation to the Polish WIG index in peacetime.

Chart 50. Performance of Goldman Sachs Shares against WIG during the crisis.

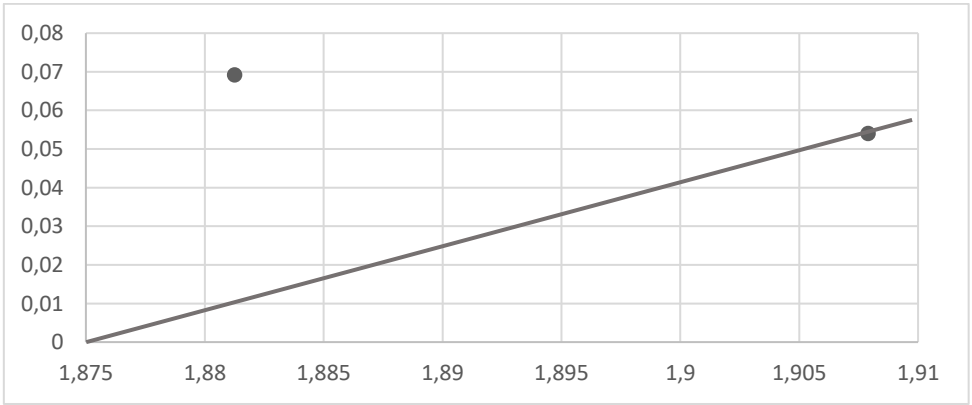


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index during the crisis.

1. Goldman Sachs European Dividend Companies (SFIO_PL)

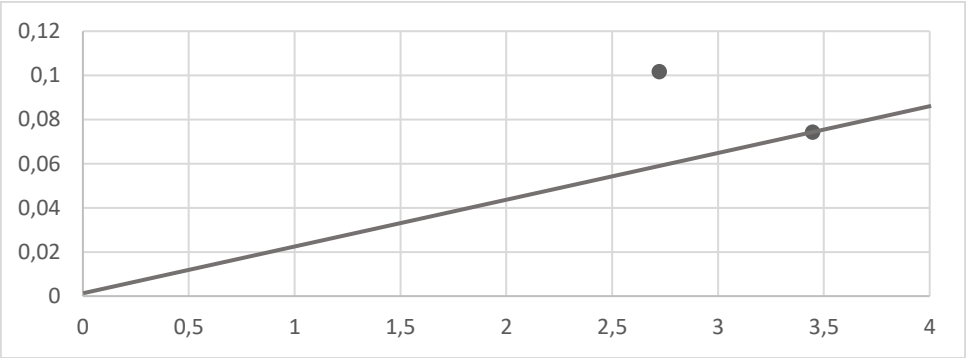
Chart 51. Performance of Goldman Sachs European Dividend Companies relative to WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index in peacetime.

Chart 52. Performance of Goldman Sachs European Dividend Companies relative to WIG during the crisis.

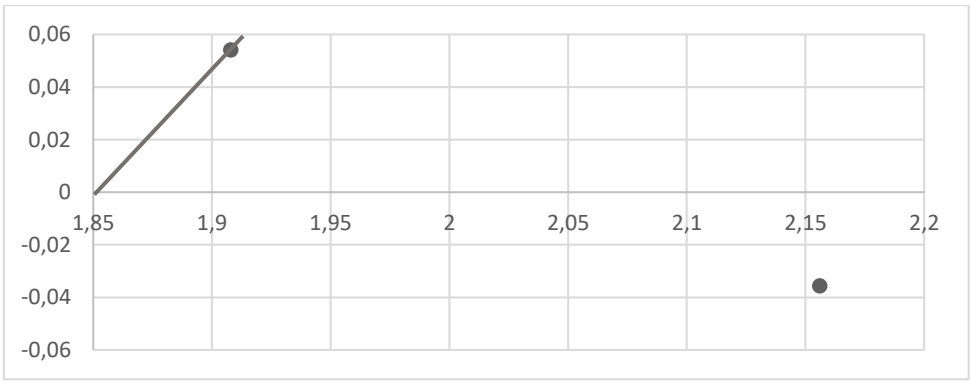


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Dividend Companies, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index during the crisis.

2. Goldman Sachs Polish Responsible Investment (SRI_PL)

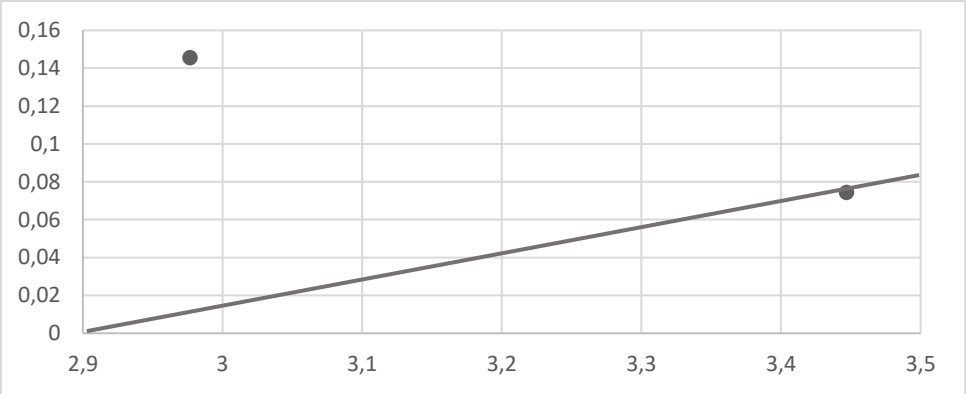
Chart 53. Performance of Goldman Sachs Polish Responsible Investment against WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by low efficiency and high risk in relation to the Polish WIG index in peacetime.

Chart 54. Effectiveness of Goldman Sachs Polish Responsible Investment against WIG during the crisis.

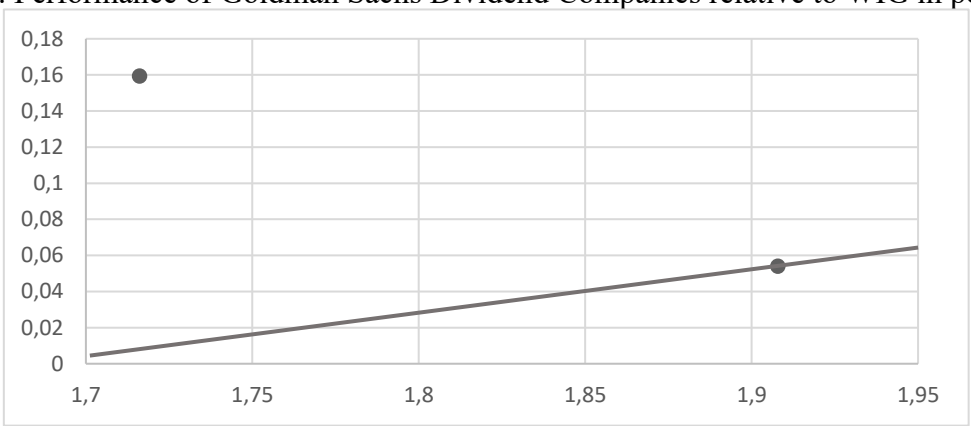


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investment, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index during the crisis.

3. Goldman Sachs Dividend Companies USA (FIO_Z)

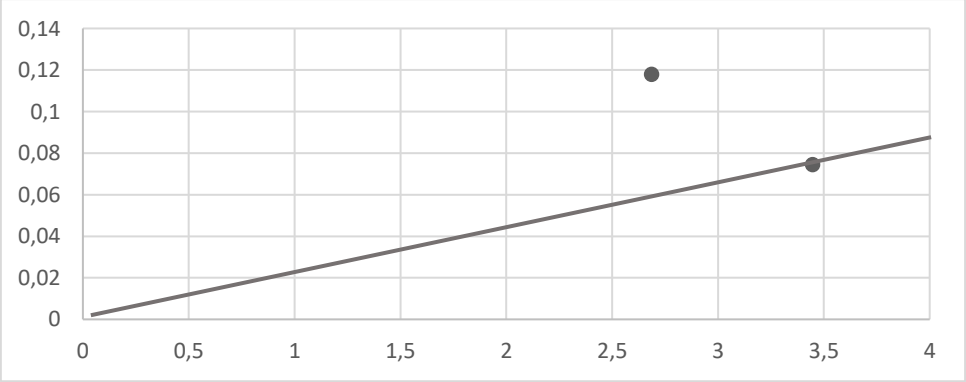
Chart 55. Performance of Goldman Sachs Dividend Companies relative to WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index in peacetime.

Chart 56. Performance of Goldman Sachs Dividend Companies relative to WIG during the crisis.

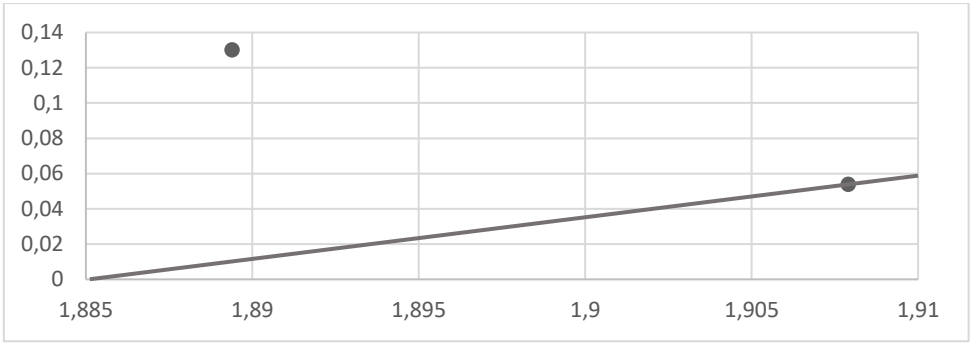


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Dividend Companies USA, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index during the crisis.

4. Goldman Sachs Global Dividend Companies (SFIO_Z)

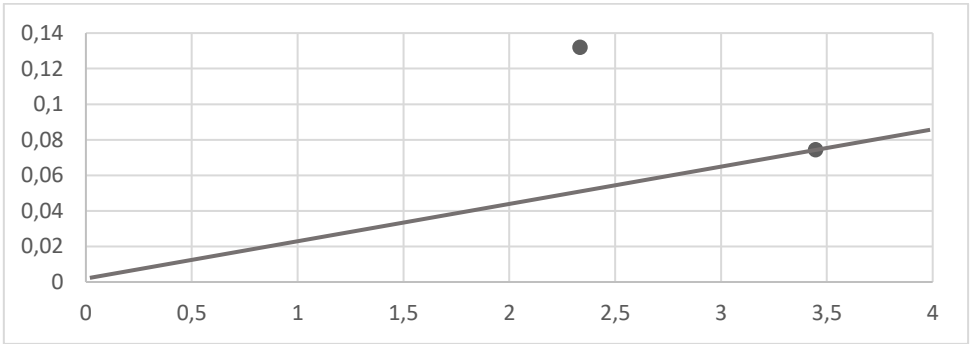
Chart 57. Performance of Goldman Sachs Global Dividend Companies relative to WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index in peacetime.

Chart 58. Performance of Goldman Sachs Global Dividend Companies relative to WIG during the crisis.

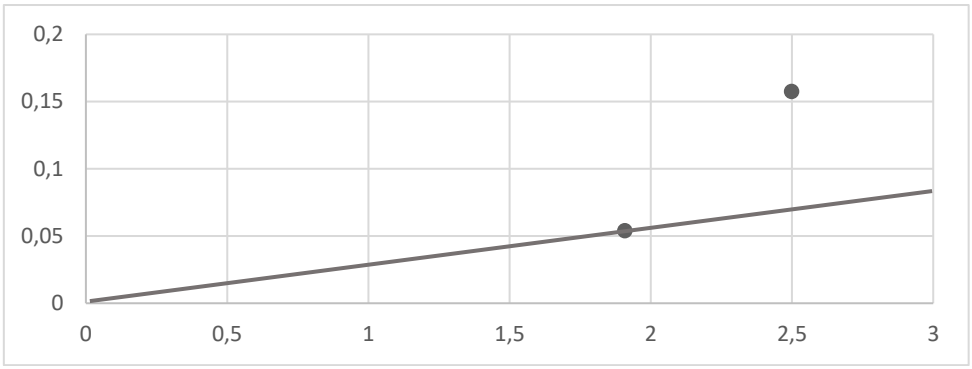


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and low risk in relation to the Polish WIG index during the crisis.

5. Goldman Sachs Global Responsible Investing (SRI_Z)

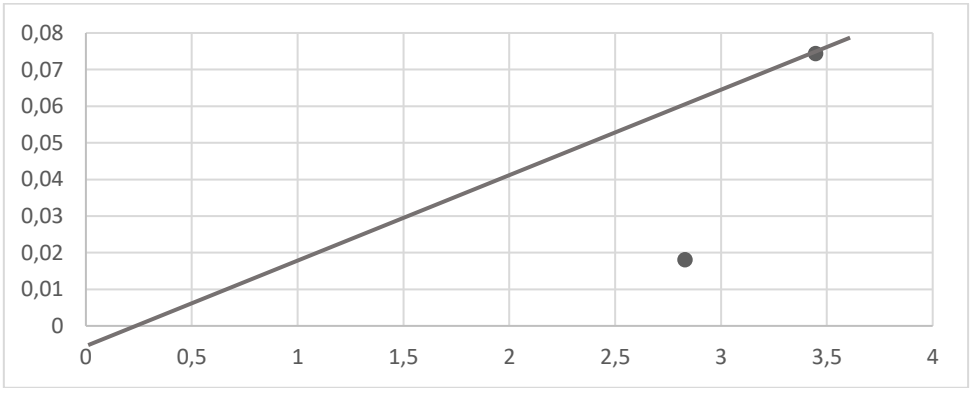
Chart 59. Performance of Goldman Sachs Global Responsible Investing relative to WIG in peacetime.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterized by high efficiency and high risk in relation to the Polish WIG index in peacetime.

Chart 59. Performance of Goldman Sachs Global Responsible Investing against WIG during the crisis.



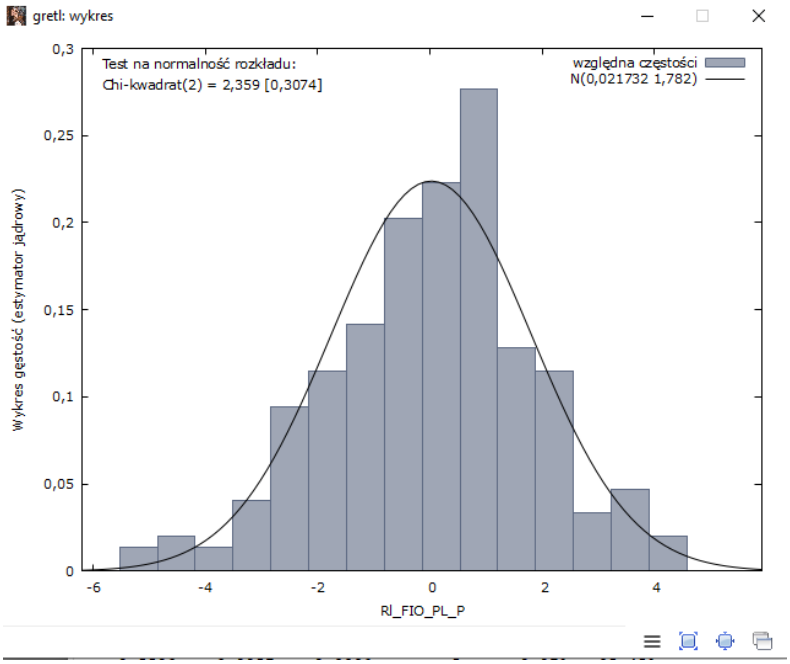
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.stooq.pl WIG Index

Based on the above chart, it can be observed that the examined fund was characterised by low efficiency and high risk in relation to the Polish WIG index during the crisis.

3. Classical risk measures and compliance of processes with the normal distribution.

1. Goldman Sachs Shares (FIO_PL)

Figure 7. Normal distribution test for Goldman Sachs Stocks during peacetime.

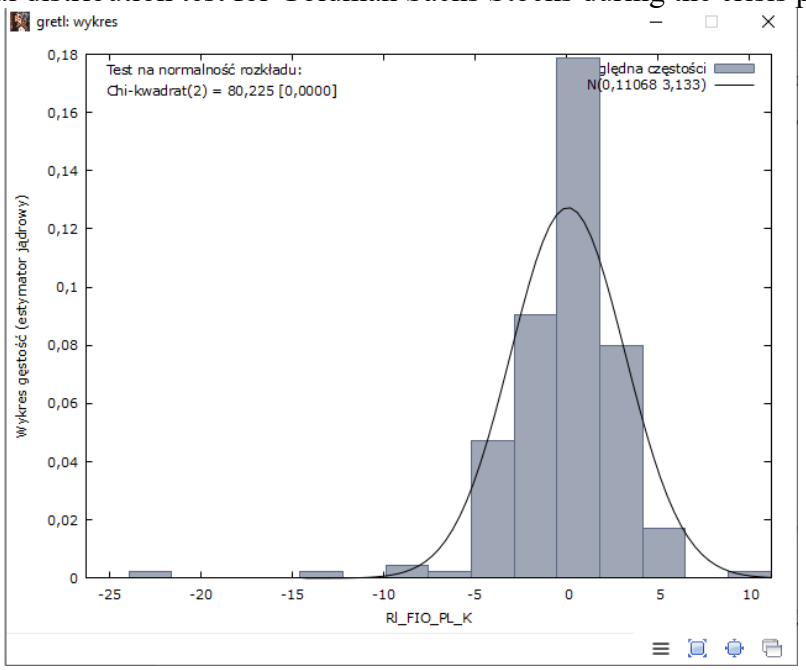


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test result shows (p value > 0.05) compliance with the normal distribution, therefore the null hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -0.24833 indicates low left-side skewness. On the other hand, kurtosis at the level of 0.091190 indicates the concentration of data in the normal distribution.

Figure 8. Normal distribution test for Goldman Sachs Stocks during the crisis period.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -2.3990 indicates high left-side skewness. On the other hand, kurtosis at the level of 15.071 indicates a large amount of outlier data.

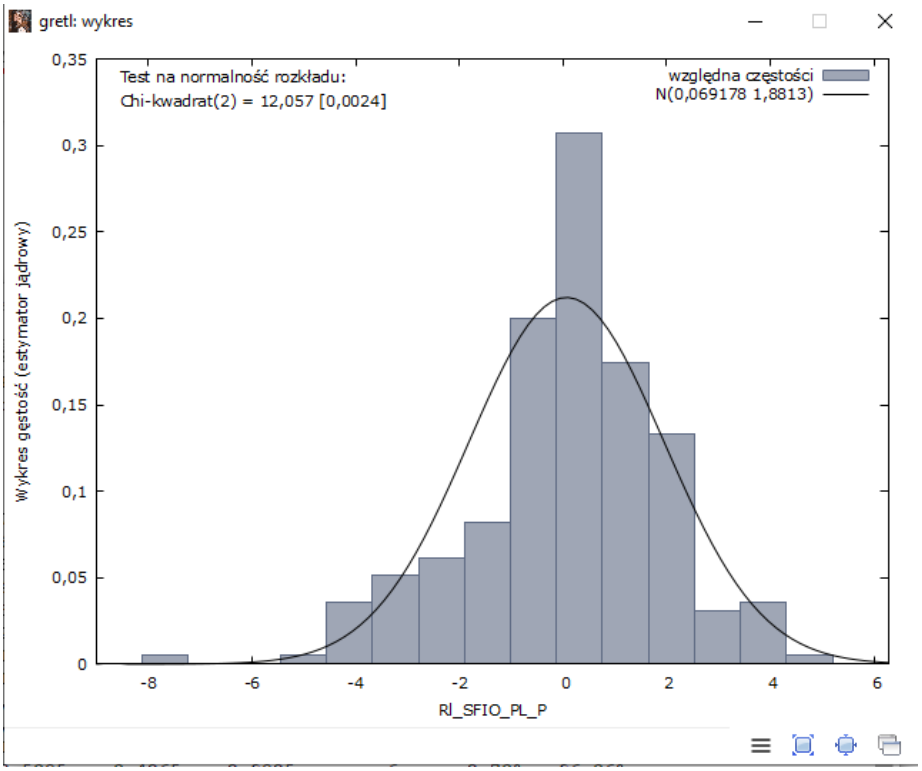
Table 3. Classic Goldman Sachs Equity Risk Measures

Specification	Peace period	Crisis period
FIO_PL		
Rl	0,021731801	0,110683706
Rf	0,595329031	0,564056671
Rm	0,054026526	0,074384853
Systematic risk (beta)	0,910168	0,894421
Fund Risk (deviation)	1,781961	3,133047
Market risk (deviation)	1,9079	3,447
Classic risk measures		
Treynor	-0,63021028	-0,506889893
Sharpe	-0,321891012	-0,144706723
alpha-Sharpe	-0,567431562	-0,437649527
alpha-Jensen	-1,079168777	-0,898445439
Modified Alpha-Jensen	-1,18568086	-1,004499491

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index and www.stooq.pl Bond Index.

2. Goldman Sachs European Dividend Companies (SFIO_PL)

Figure 9. Normal distribution test for Goldman Sachs European Distribution Companies in peacetime.

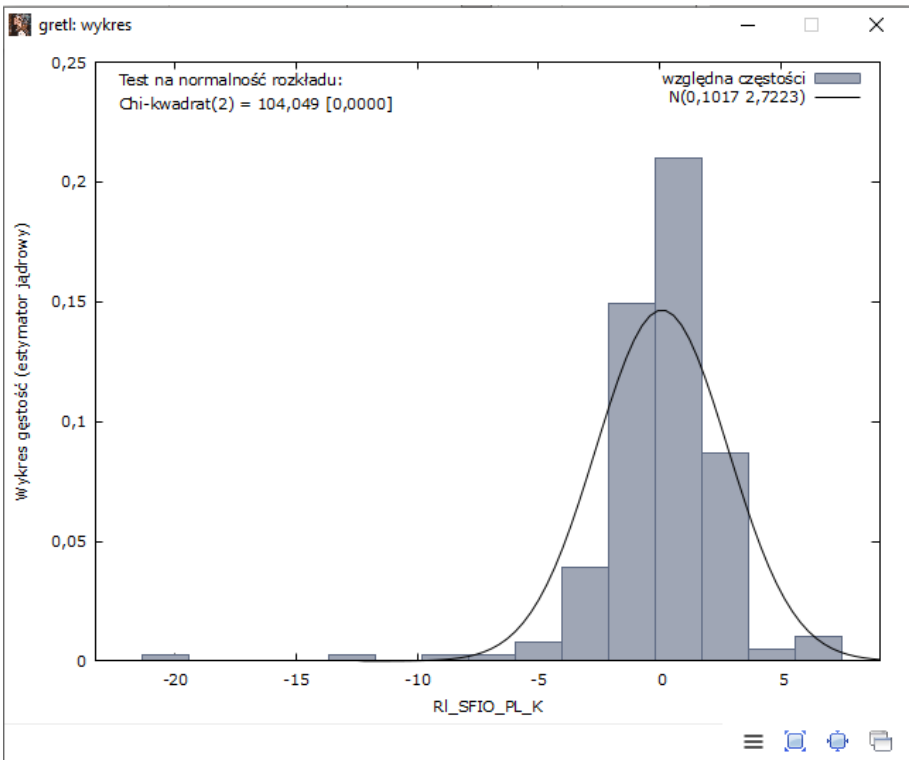


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -0.54869 indicates left-sided skewness. On the other hand, kurtosis at the level of 1.1438 indicates a large amount of outlier data.

Figure 10. Normal distribution test for Goldman Sachs European Dividend Companies during the crisis period.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -2.8010 indicates high left-sided skewness. On the other hand, kurtosis at the level of 18.047 indicates a large amount of outlier data.

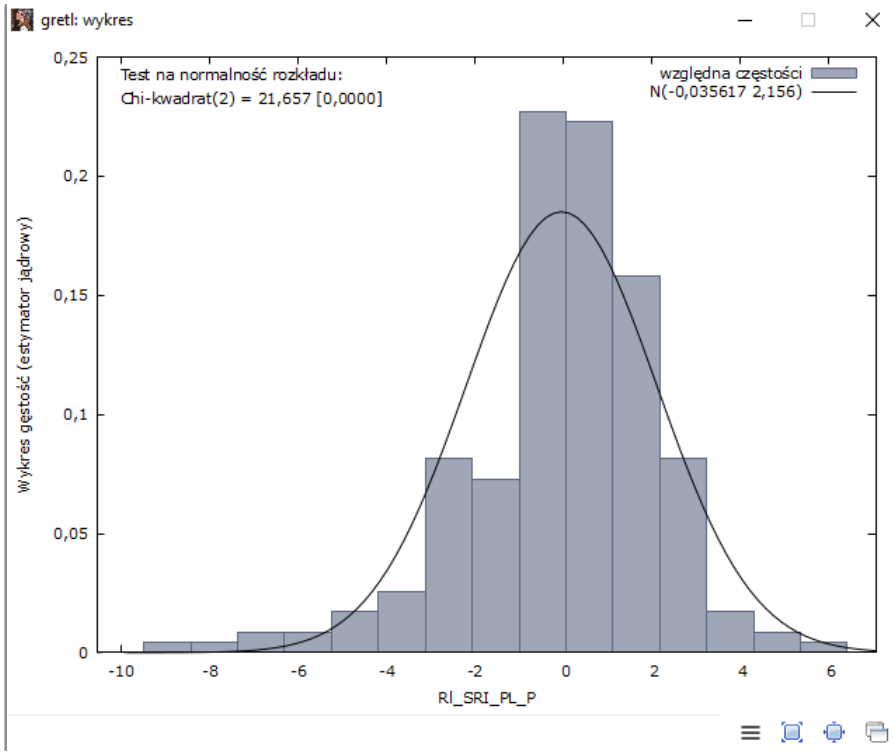
Table 4. Classic risk measures of Goldman Sachs European Distribution Companies

Specification	Peace period	Crisis period
SFIO_PL		
Rl	0,069178438	0,101695292
Rf	0,595329031	0,564056671
Rm	0,055536072	0,079584376
Systematic risk (beta)	0,734057	0,857262
Fund Risk (deviation)	1,881262	2,722344
Market risk (deviation)	2,0862	2,7138
Classic risk measures		
Treynor	-0,716770759	-0,539346639
Sharpe	-0,279679594	-0,169839439
alpha-Sharpe	-0,508251046	-0,444206558
alpha-Jensen	-1,012916954	-0,948358963
Modified Alpha-Jensen	-1,379888692	-1,10626502

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies, www.fundsquare.net EEI Index and Bond Index.

3. Goldman Sachs Polish Responsible Investment (SRI_PL)

Figure 11. Normal distribution test for Goldman Sachs Polish Responsible Investment in peacetime.



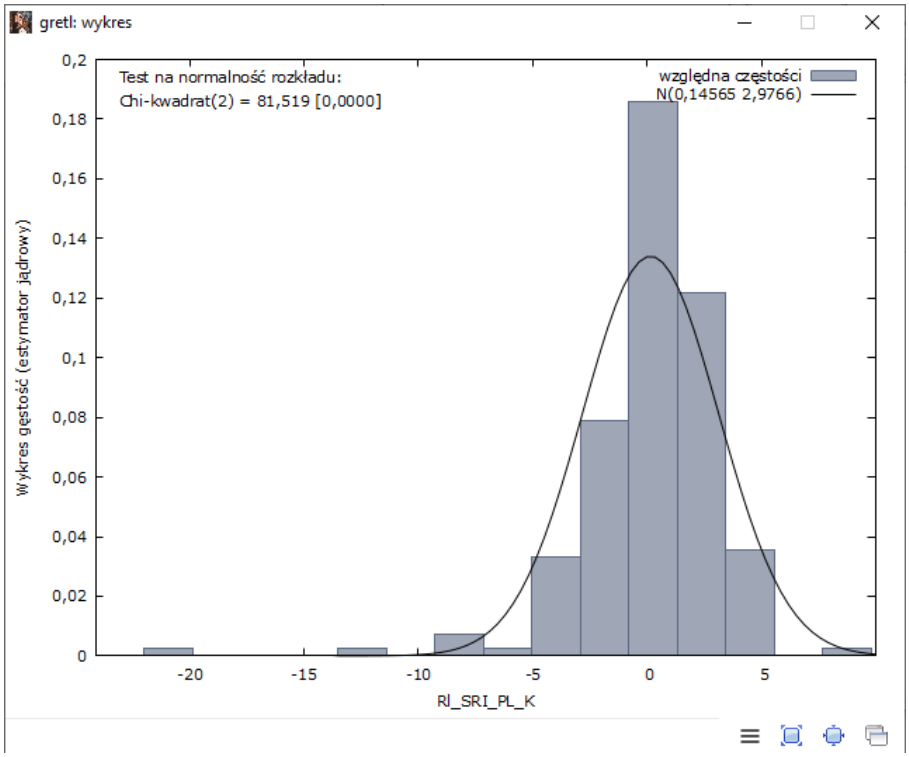
Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investing.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at

the level of -0.81812 indicates left-sided skewness. On the other hand, kurtosis at the level of 2.0645 indicates a large amount of outlier data.

Figure 12. Normal distribution test for Goldman Sachs Polish Responsible Investing during the crisis.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investing.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -2.3667 indicates high left-side skewness. On the other hand, kurtosis at the level of 13.532 indicates a large amount of outlier data.

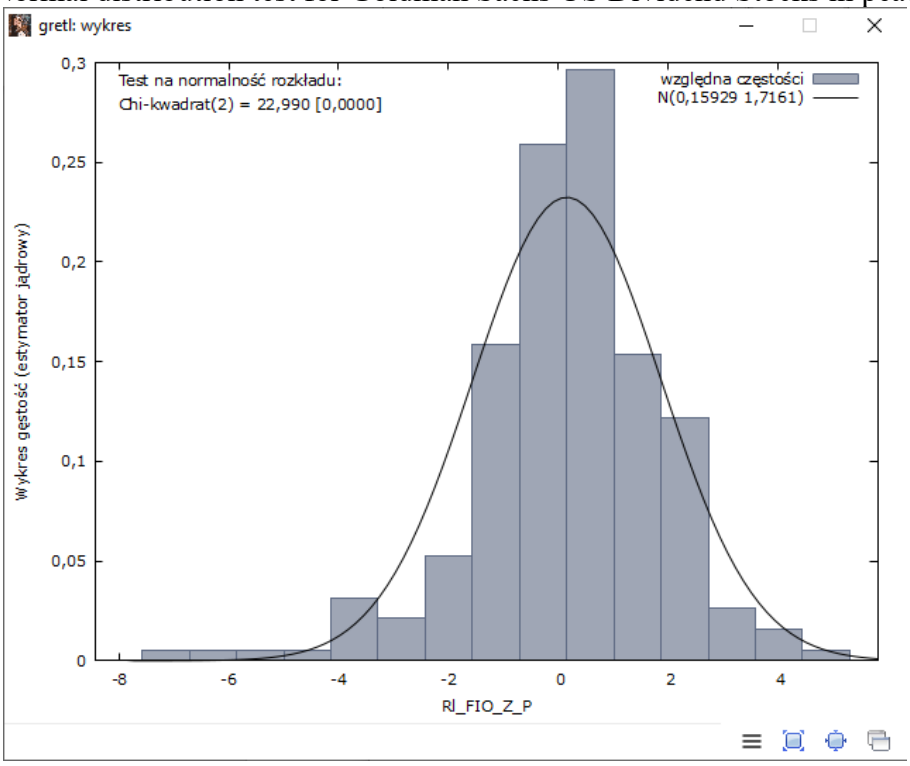
Table 5. Classic risk measures of Goldman Sachs Polish Responsible Investment

Specification	Peace period	Crisis period
SRI_PL		
RI	-0,035616604	0,145652649
Rf	0,595329031	0,564056671
Rm	0,054026526	0,074384853
Systematic risk (beta)	0,683617	0,835321
Fund Risk (deviation)	2,155972	2,976626
Market risk (deviation)	1,9079	3,447
Classic risk measures		
Treynor	-0,922951938	-0,500890103
Sharpe	-0,292650199	-0,140563182
alpha-Sharpe	-0,64105065	-0,397712987
alpha-Jensen	-1,242630234	-0,841255738
Modified Alpha-Jensen	-1,81772869	-1,007104739

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investing, www.stooq.pl WIG index and bond index.

4. Goldman Sachs Dividend Companies USA (FIO_Z)

Figure 13. Normal distribution test for Goldman Sachs US Dividend Stocks in peacetime.

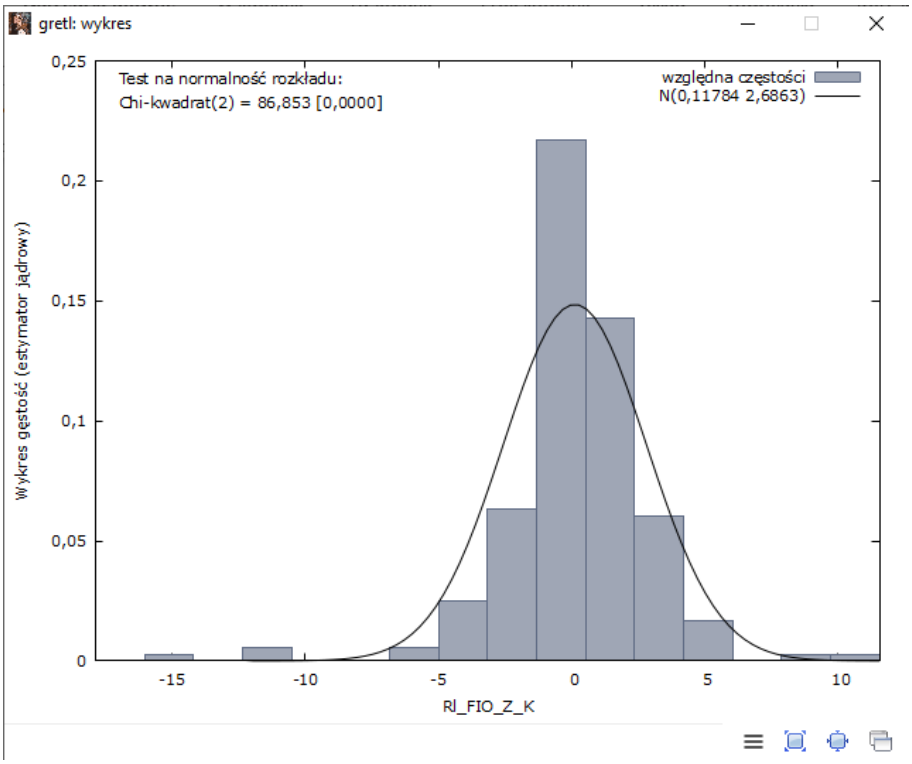


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -0.80978 indicates left-sided skewness. On the other hand, kurtosis at the level of 2.2914 indicates a large amount of outlier data.

Figure 14. Normal distribution test for Goldman Sachs US Dividend Companies during the crisis period.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -1.2048 indicates a high left-sided skewness. On the other hand, kurtosis at the level of 8.0860 indicates a high concentration of outlier data.

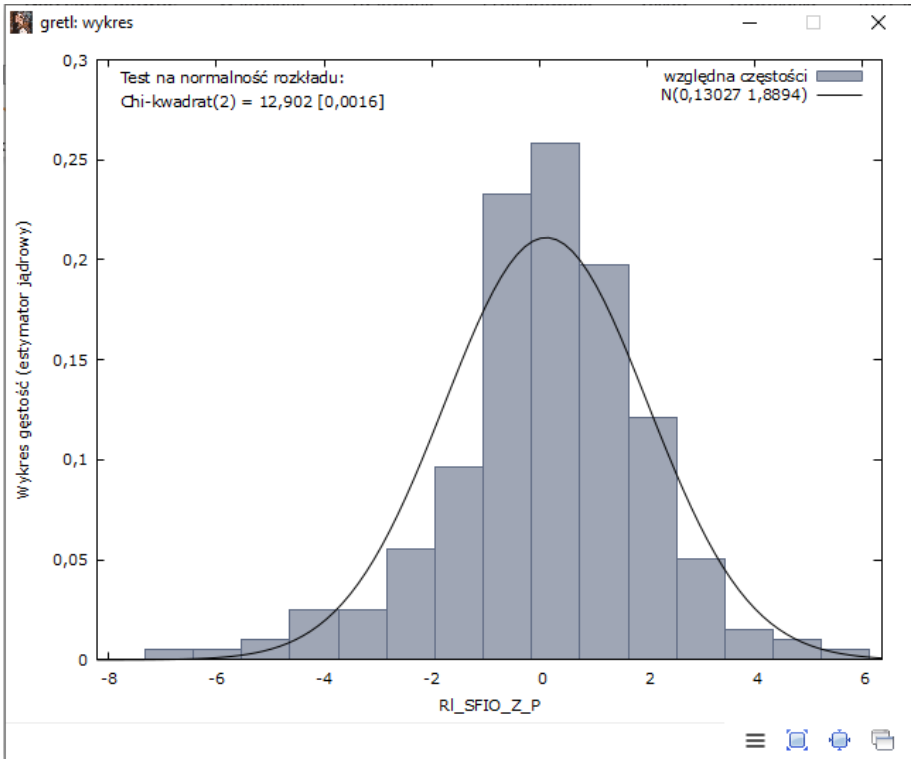
Table 6. Goldman Sachs Classic Risk Measures for US Dividend Companies

Specification	Peace period	Crisis period
FIO_Z		
RI	0,159289238	0,117843035
Rf	0,595329031	0,564056671
Rm	0,211824028	0,146199599
Systematic risk (beta)	0,907593	0,828227
Fund Risk (deviation)	1,716082	2,686255
Market risk (deviation)	1,7839	3,0463
Classic risk measures		
Treynor	-0,480435386	-0,538757654
Sharpe	-0,254090302	-0,166109932
alpha-Sharpe	-0,401795598	-0,430049258
alpha-Jensen	-0,8049652	-0,814683796
Modified Alpha-Jensen	-0,886923103	-0,983647956

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies, www.stooq.pl S&P500 Index and Bond Index.

5. Goldman Sachs Global Dividend Companies (SFIO_Z)

Figure 15. Normal distribution test for Goldman Sachs Global Dividend-Paying Companies in peacetime.

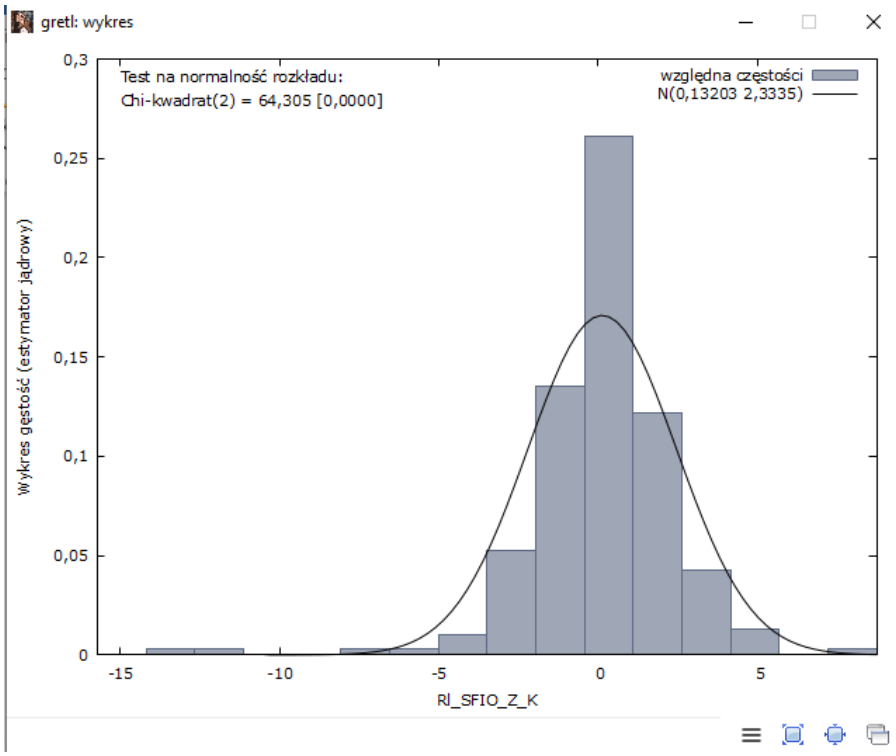


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -0.47089 indicates left-sided skewness. On the other hand, kurtosis at the level of 1.2857 indicates a concentration of outlier data.

Figure 16. Normal distribution test for Goldman Sachs Global Dividend-Paying Companies during the crisis period.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -1.7048 indicates high left-side skewness. On the other hand, kurtosis at the level of 9.6061 indicates a high concentration of outlier data.

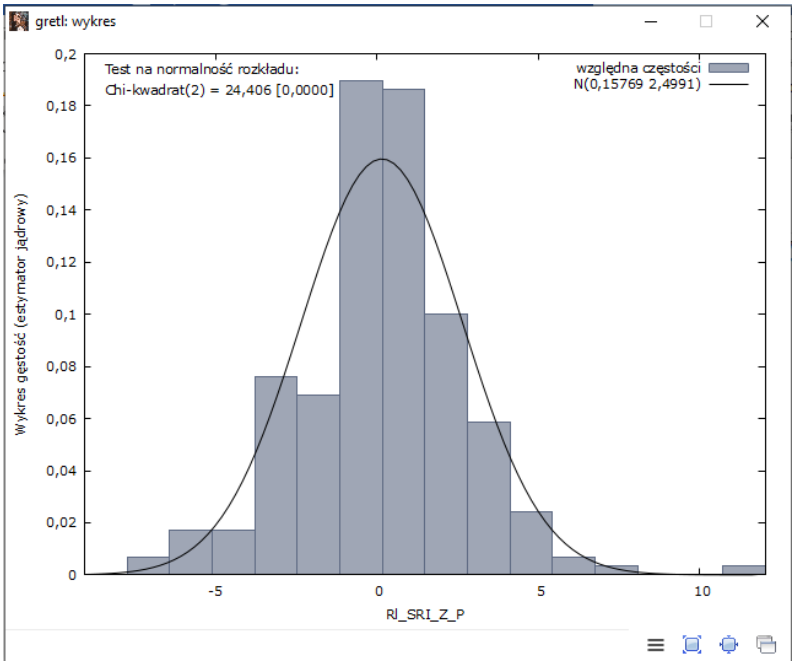
Table 7. Classic risk measures of Goldman Sachs Global Dividend Companies

Specification	Peace period	Crisis period
SFIO_Z		
Rl	0,130270517	0,13203129
Rf	0,595329031	0,564056671
Rm	0,120137686	0,125640645
Systematic risk (beta)	0,986976	0,965334
Fund Risk (deviation)	1,889396	2,333501
Market risk (deviation)	1,8848	2,3906
Classic risk measures		
Treynor	-0,471195363	-0,447539796
Sharpe	-0,246141367	-0,185140431
alpha-Sharpe	-0,432215018	-0,407811948
alpha-Jensen	-0,941408593	-0,859969929
Modified Alpha-Jensen	-0,953831291	-0,890852211

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.investing.com GEI Index and Bond Index.

6. Goldman Sachs Global Responsible Investing (SRI_Z)

Figure 17. Normal distribution test for Goldman Sachs Global Responsible Investing in peacetime.

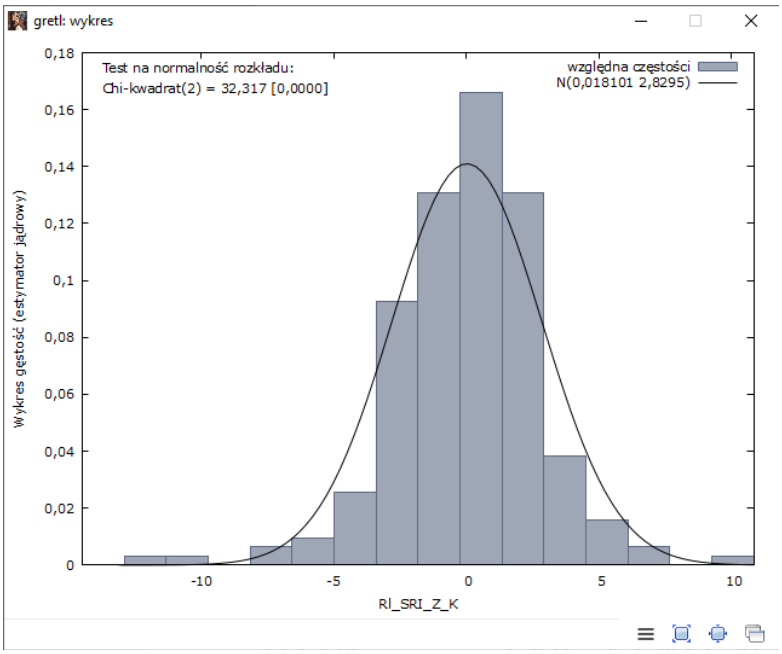


Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of 0.11823 indicates right-sided skewness. On the other hand, kurtosis at the level of 1.7854 indicates a concentration of outlier data.

Figure 18. Normal distribution test for Goldman Sachs Global Responsible Investing during peacetime crisis.



Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing.

H_0: The distribution of returns is normally distributed
H_1: The distribution of returns is not normally distributed

The test excludes the existence of a normal distribution (p value < 0.05), therefore the first hypothesis should be accepted. This result is confirmed by descriptive statistics. Skewness at the level of -0.45648 indicates left-sided skewness. On the other hand, kurtosis at the level of 2.5988 indicates a large amount of outlier data.

Table 8. Classic risk measures Goldman Sachs Global Responsible Investment

Specification	Peace period	Crisis period
SRI_Z		
RI	0,157686459	0,018101244
Rf	0,595329031	0,564056671
Rm	0,129464852	-0,02806169
Systematic risk (beta)	0,628429	0,949115
Fund Risk (deviation)	2,499069	2,829498
Market risk (deviation)	1,9231	2,9683
Classic risk measures		
Treynor	-0,696407346	-0,575225791
Sharpe	-0,175122244	-0,192951339
alpha-Sharpe	-0,399443585	-0,542344579
alpha-Jensen	-1,043033206	-1,110385477
Modified Alpha-Jensen	-1,659747094	-1,169916688

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.investing.com GEIO Index and Bond Index.

All indicators indicate a negative value, which means that investing in bonds would be a better decision, and investing in funds is undesirable for investors. In the case of the Treynor indicator, it would be best to invest in a global fund of dividend companies. The situation for this fund is

the best among all the funds examined both in peacetime and during the crisis. On the other hand, in the case of the Sharp indicator, the best investment in peacetime was the global fund of responsible investment. However, in the crisis period, it would be best to invest in a Polish fund of responsible investment. In the case of the alpha-Sharp indicator, the best investment in peacetime would be the global fund of responsible investment, and in the crisis period in the Polish fund of responsible investment. And in the case of the alpha-Jensen indicator, the best investment would be the American fund of dividend companies both in the crisis and in the peacetime. On the other hand, the modified alpha-Jensen indicator in peacetime indicated that the best investment would be the American fund of dividend companies, and in the crisis period the global fund of dividend companies. However, the above data are not reliable because of the single fund of the normal distribution, which is necessary for modeling CAMP.

V. Alternative measures of risk.

1. Goldman Sachs Shares (FIO_PL)

Table 9. Alternative risk measures for the Goldman Sachs Equity fund.

Specification	Peace period	Crisis period
FIO_PL		
RI	0,021731801	0,110683706
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,054026526	0,074384853
Rt+	1,356931167	1,92258125
Rt-	-1,483000862	-2,429042317
Sum Rt+	156,0470842	221,0968438
Sum Rt-	-151,2660879	-199,18147
Systematic risk (beta)	0,910168	0,894421
Fund Risk (deviation)	1,781961	3,133047
Market risk (deviation)	1,9079	3,447
Semi-deviation	1,898422976	3,828731942
minRt	-5,192286866	-22,76226052
minRtj	-3,947624663	-8,094615575
sum minRtj	-43,4238713	-80,94615575
Z(MVaR)	2,170636637	53481790949
Alternative risk measures		
Group I		
Sortino	0,011447292	0,028908711
UPR	0,714767565	0,502145692
Omega	-1,031606531	-1,110027172
Group II		
Calmar	0,110471021	0,019917748
Sterling	0,145301866	0,056009203
Burkego	-0,013209261	-0,00560092
Group III		
VaR	2,77985916	4,88755332
MVaR	-3,867989833	-1,67561E+11
conditional Sharpe ratio	0,256431481	-0,115618748
Modified Sharpe ratio	-0,128513612	-2,70572E-12

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Shares, www.stooq.pl WIG Index and www.stooq.pl Bond Index.

Based on the above table, it can be seen that in the first group, in the case of the Sortino and Omega indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators examined. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency

in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

2. Goldman Sachs European Dividend Companies (SFIO_PL)

Table 10. Alternative risk measures for the Goldman Sachs European Distribution Fund.

Specification	Peace period	Crisis period
SFIO_PL		
RI	0,069178438	0,101695292
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,055536072	0,079584376
Rt+	1,336754089	1,585884125
Rt-	-1,496816848	-1,91256098
Sum Rt+	160,4104907	180,7907902
Sum Rt-	-145,1912343	-160,6551223
Systematic risk (beta)	0,734057	0,857262
Fund Risk (deviation)	1,881262	2,722344
Market risk (deviation)	2,0862	2,7138
Semi-deviation	2,024797078	3,409732719
minRt	-7,672676322	-20,40623669
minRtj	-4,433146942	-7,461347044
sum minRtj	-48,76461636	-74,61347044
Z(MVaR)	2355,889829	4,15675E+11
Alternative risk measures		
Group I		
Sortino	0,034165616	0,029825004
UPR	0,660191633	0,465105114
Omega	-1,104822144	-1,12533474
Group II		
Calmar	0,068574585	0,022657846
Sterling	0,118685575	0,061967548
Burkego	-0,010789598	-0,006196755
Group III		
VaR	2,93476872	4,24685664
MVaR	-4432,046012	-1,13161E+12
conditional Sharpe ratio	-0,066568263	2,587888209
Modified Sharpe ratio	-0,000118699	-4,08587E-13

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs European Distribution Companies, www.fundsquare.net EEI Index and Bond Index.

Based on the above table, it can be seen that in the first group, in the case of the Sortino and Omega indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators examined. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

3. Goldman Sachs Polish Responsible Investment (SRI_PL)

Table 11. Alternative risk measures of the Goldman Sachs Polish Responsible Investment Fund.

Specification	Peace period	Crisis period
SRI_PL		
RI	-0,035616604	0,145652649
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,054026526	0,074384853
Rt+	1,406077038	2,001791466
Rt-	-1,764898434	-2,381177545
Sum Rt+	166,8892921	212,1898954
Sum Rt-	-174,724945	-183,350671
Systematic risk (beta)	0,683617	0,835321
Fund Risk (deviation)	2,155972	2,976626
Market risk (deviation)	1,9079	3,447
Semi-deviation	2,506714216	3,850027336
minRt	-7,760353334	-20,92142412
minRtj	-5,732753548	-8,012420245
sum minRtj	-63,06028903	-80,12420245
Z(MVaR)	326130,157	51446778594
Alternative risk measures		
Group I		
Sortino	-0,014208482	0,037831588
UPR	0,560924348	0,519942144
Omega	-0,955154355	-1,157289986
Group II		
Calmar	0,081303725	0,019998831
Sterling	0,110059787	0,05221943
Burkego	-0,010005435	-0,005221943
Group III		
VaR	3,36331632	4,64353656
MVaR	-703127,4868	-1,53138E+11
conditional Sharpe ratio	-0,361359321	-0,151513042
Modified Sharpe ratio	-8,97341E-07	-2,73221E-12

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Polish Responsible Investing, www.stooq.pl WIG index and bond index.

Based on the above table, it can be seen that in the first group, in the case of the UPR and Omega indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators examined. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

4. Goldman Sachs Dividend Companies USA (FIO_Z)

Table 12. Alternative risk measures for the Goldman Sachs US Distribution Companies fund.

Specification	Peace period	Crisis period
FIO_Z		
RI	0,159289238	0,117843035
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,211824028	0,146199599
Rt+	1,201721842	1,662551366
Rt-	-1,33309428	-1,852991732
Sum Rt+	155,0221176	184,5432016
Sum Rt-	-119,9784852	-161,2102807
Systematic risk (beta)	0,907593	0,828227
Fund Risk (deviation)	1,716082	2,686255
Market risk (deviation)	1,7839	3,0463
Semi-deviation	1,941439514	3,036285222
minRt	-7,147500341	-15,10915386
minRtj	-4,519601707	-6,94009462
sum minRtj	-49,71561878	-69,4009462
Z(MVaR)	508174,3148	11653921608
Alternative risk measures		
Group I		
Sortino	0,082046974	0,038811583
UPR	0,618984951	0,547560998
Omega	-1,292082637	-1,144735936
Group II		
Calmar	0,061005914	0,029532669
Sterling	0,096477482	0,064295036
Burkego	-0,00877068	-0,006429504
Group III		
VaR	2,67708792	4,1905578
MVaR	-872068,7945	-31305405189
conditional Sharpe ratio	0,774643755	0,078758389
Modified Sharpe ratio	-5,00006E-07	-1,42536E-11

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs USA Dividend Companies, www.stooq.pl S&P500 Index and Bond Index.

Based on the above table, it can be seen that in the first group, for all indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators studied. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

5. Goldman Sachs Global Dividend Companies (SFIO_Z)

Table 13. Alternative risk measures for the Goldman Sachs Global Distribution Fund.

Specification	Peace period	Crisis period
SFIO_Z		
RI	0,130270517	0,13203129
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,120137686	0,125640645
Rt+	1,38206582	1,462035886
Rt-	-1,442809447	-1,672974948
Sum Rt+	168,61203	184,5432016
Sum Rt-	-139,9525163	-140,5298956
Systematic risk (beta)	0,986976	0,965334
Fund Risk (deviation)	1,889396	2,333501
Market risk (deviation)	1,8848	2,3906
Semi-deviation	2,024797078	2,755601159
minRt	-6,877611631	-13,42960322
minRtj	-4,587334404	-6,093185757
sum minRtj	-50,46067844	-60,93185757
Z(MVaR)	2944,113001	4563528274
Alternative risk measures		
Group I		
Sortino	0,064337567	0,047913788
UPR	0,682570039	0,530568759
Omega	-1,204780267	-1,313195322
Group II		
Calmar	0,067619188	0,032169631
Sterling	0,101378813	0,070903038
Burkego	-0,009216256	-0,007090304
Group III		
VaR	2,94745776	3,64026156
MVaR	-5562,595327	-10648997790
conditional Sharpe ratio	2,204706461	-0,111922188
Modified Sharpe ratio	-8,35956E-05	-4,05696E-11

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Dividend Companies, www.investing.com GEI Index and Bond Index.

Based on the above table, it can be seen that in the first group, for all indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators studied. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

6. Goldman Sachs Global Responsible Investing (SRI_Z)

Table 14. Alternative risk measures for the Goldman Sachs Global Responsible Investment Fund.

Specification	Peace period	Crisis period
SRI_Z		
RI	0,157686459	0,018101244
Rw	0	0
Rf	0,595329031	0,564056671
Rm	0,129464852	-0,02806169
Rt+	1,852127957	1,993469634
Rt-	-1,89458923	-2,16741272
Sum Rt+	222,2553548	207,320842
Sum Rt-	-187,5643338	-203,7367956
Systematic risk (beta)	0,628429	0,949115
Fund Risk (deviation)	2,499069	2,829498
Market risk (deviation)	1,9231	2,9683
Semi-deviation	2,527447178	3,014088447
minRt	-7,080681536	-10,28634735
minRtj	-5,522795275	-6,800961349
sum minRtj	-60,75074803	-68,00961349
Z(MVaR)	12132,83602	1420411,957
Alternative risk measures		
Group I		
Sortino	0,062389616	0,006005545
UPR	0,732805802	0,661383921
Omega	-1,184955318	-1,017591551
Group II		
Calmar	0,061807973	0,053075733
Sterling	0,079242947	0,080276214
Burkego	-0,007203904	-0,008027621
Group III		
VaR	3,89854764	4,41401688
MVaR	-30320,79438	-4019052,791
conditional Sharpe ratio	0,048998482	-0,33258119
Modified Sharpe ratio	-1,44335E-05	-1,35842E-07

Source: Own study based on: Historical data www.stooq.pl Goldman Sachs Global Responsible Investing, www.investing.com GEIO Index and Bond Index.

Based on the above table, it can be seen that in the first group, in the case of the Sortino and UPR indicators, there was an increase in risk between the peace period and the crisis period. In the case of the second group, there is a visible increase in risk in all the indicators examined. In the case of the third group, there is also a visible increase in risk and a decrease in efficiency in all cases. It should also be noted that the study of the third group was conducted on a volume equal to 1. On the other hand, the variance-covinition approach was used to estimate the VaR indicator.

Ending

The above results show that the crisis has significantly affected the formation of indices. Open-end investment funds and specialist investment funds are less risky than responsible investment funds. The share capital of the former funds is also much higher. Based on the graphs from Chapter 2, significant price and return rate fluctuations can be observed during the crisis. On the other hand, the comparison of the return rate and absolute risk analysis indicates that higher risk funds generate higher profits, but the level at which this relationship is balanced remains to be assessed by the investor. The risk analysis itself also jumps into very violent market reactions, because in many cases the risk increased more than twice. The efficiency analysis also indicates higher efficiency of foreign markets. It is recommended to continue research in order to determine the differences in the efficiency of domestic and foreign markets.