

Does a better ESG score lead to better stock performance?

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Here's the scenario



We are an investment firm

As a firm we have been receiving more inquiries about buying stocks based off ESG scores.



Customer: Joel

Age: 28

About: Joel is someone who is a new investor and is highly aware of the geopolitical state that the market is in and wants to know if ESG can be an indicator of a good stock to invest in. Joel is concerned about the role of businesses in environmental degradation and social inequality.

What is ESG?

The term “ESG” was popularized in the 21st century and often comes up in the same conversation as sustainability and corporate social responsibility (CSR). However, while sustainability and CSR function more as philosophies or end goals, ESG is more tangible; it encompasses the data and metrics needed to inform decision-making for companies and investors alike.

Companies are given an ESG score which is an objective measurement or evaluation of a given company, fund, or security’s performance concerning Environmental, Social, and Governance (ESG) issues.

Recently younger Millennial and Gen Z investors have been increasingly interested in a companies ESG Grades.

[How Millennials and Gen Z Are Driving Growth Behind ESG | Nasdaq](#)





Environment

Environmental Factors:

Climate Change: Assessing a company's carbon footprint, energy efficiency, and commitment to reducing greenhouse gas emissions.

Resource Management: Evaluating how a company manages natural resources, waste, and pollution.

Biodiversity: Considering the company's impact on biodiversity conservation and ecosystem protection.





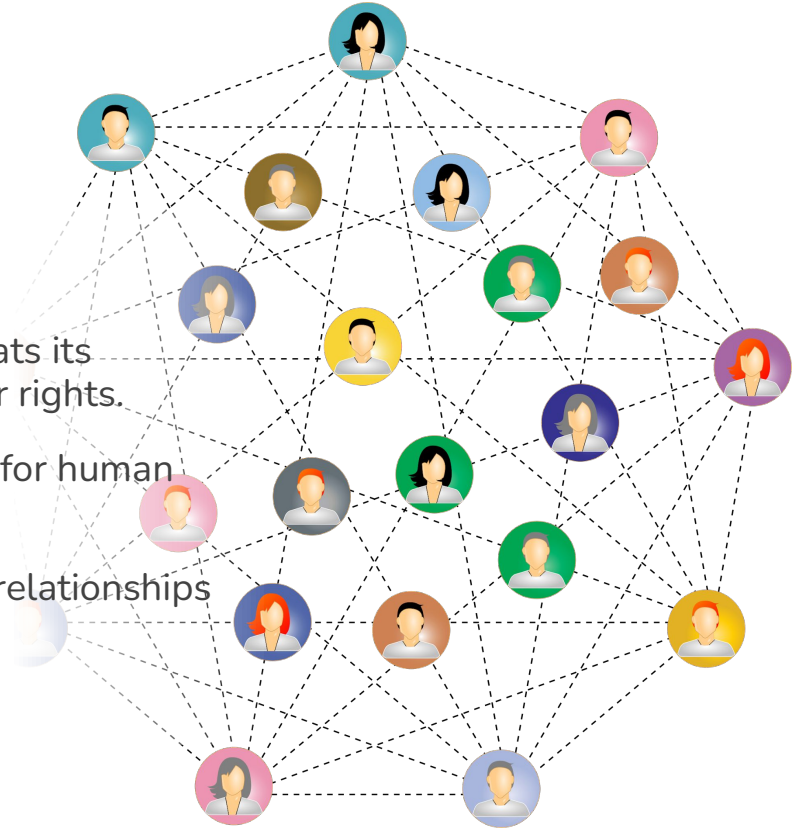
Social

Social Factors:

Labor Practices: Examining how the company treats its employees, including diversity, equality, and labor rights.

Human Rights: Assessing the company's respect for human rights in its operations and supply chain.

Community Relations: Evaluating the company's relationships with local communities and stakeholders.





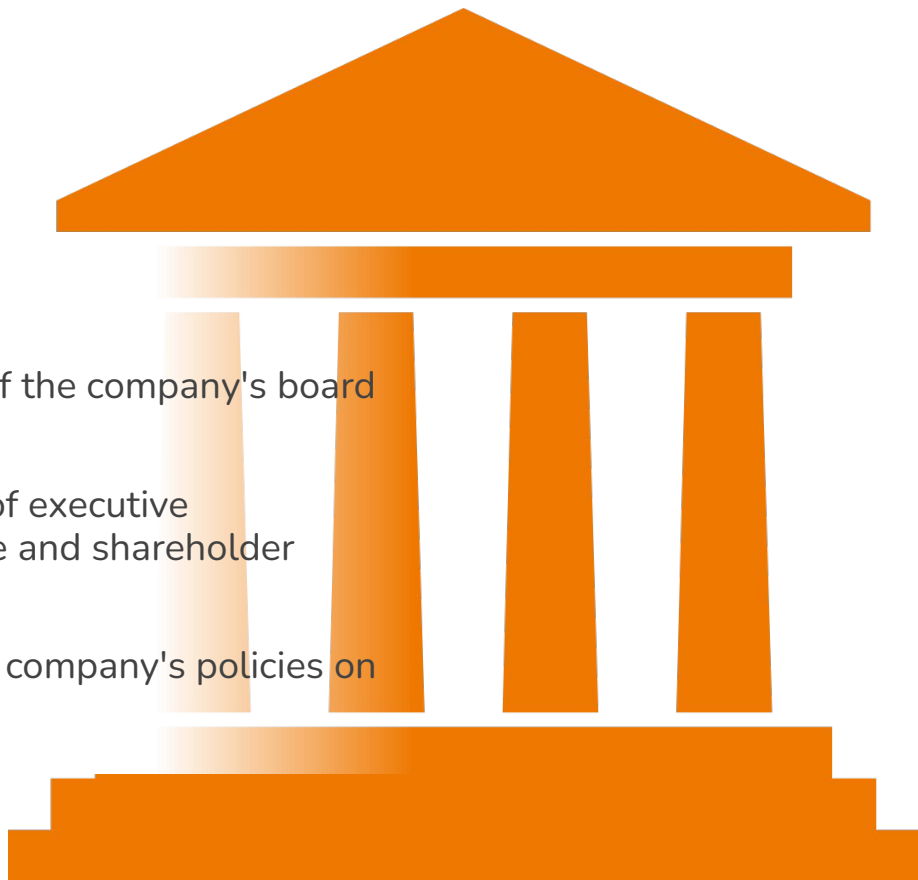
Governance

Governance Factors:

Board Diversity: Assessing the diversity of the company's board of directors and their independence.

Executive Pay: Evaluating the alignment of executive compensation with company performance and shareholder interests.

Ethical Business Practices: Examining the company's policies on corruption, bribery, and transparency.





Key Market Indicators

Earnings Per Share (EPS): Is a company's net income subtracted by preferred dividends and then divided by the average number of common shares outstanding

Annualized % Growth: The growth of the price of the stock over a 5 year period (non-split adjusted)



ESG Scoring

Within the dataset that was acquired by kaggle and it provided the following:

- Company Ticker
- Environmental score and grade (0-1000)
- Social score and grade (0-1000)
- Governance score and grade (0-1000)
- Total score and grade (0-3000)
- Companies are given letter grades
 - AAA-D



ESG Grading Scale

Companies are graded into buckets from AAA being the highest to D being the lowest.

[ESG-Enterprise-Risk-Ratings-MethodologyV3.pdf](#)
([esgenterprise.com](#))

ESG Total Score Range	Grade	Level
0 <= score < 74	D	Low
75 <= score < 149	DD	Low
150 <= score < 224	DDD	Low
225 <= score < 299	C	Low
300 <= score < 449	CC	Low
450 <= score < 599	CCC	Low
600 <= score < 749	B	Medium
750 <= score < 899	BB	Medium
900 <= score < 1199	BBB	High
1200 <= score < 1799	A	High
1800 <= score < 2699	AA	Excellent
2700 <= score <= 3000	AAA	Excellent



Exploratory Data Analysis

To start our analysis we began by asking 3 questions:

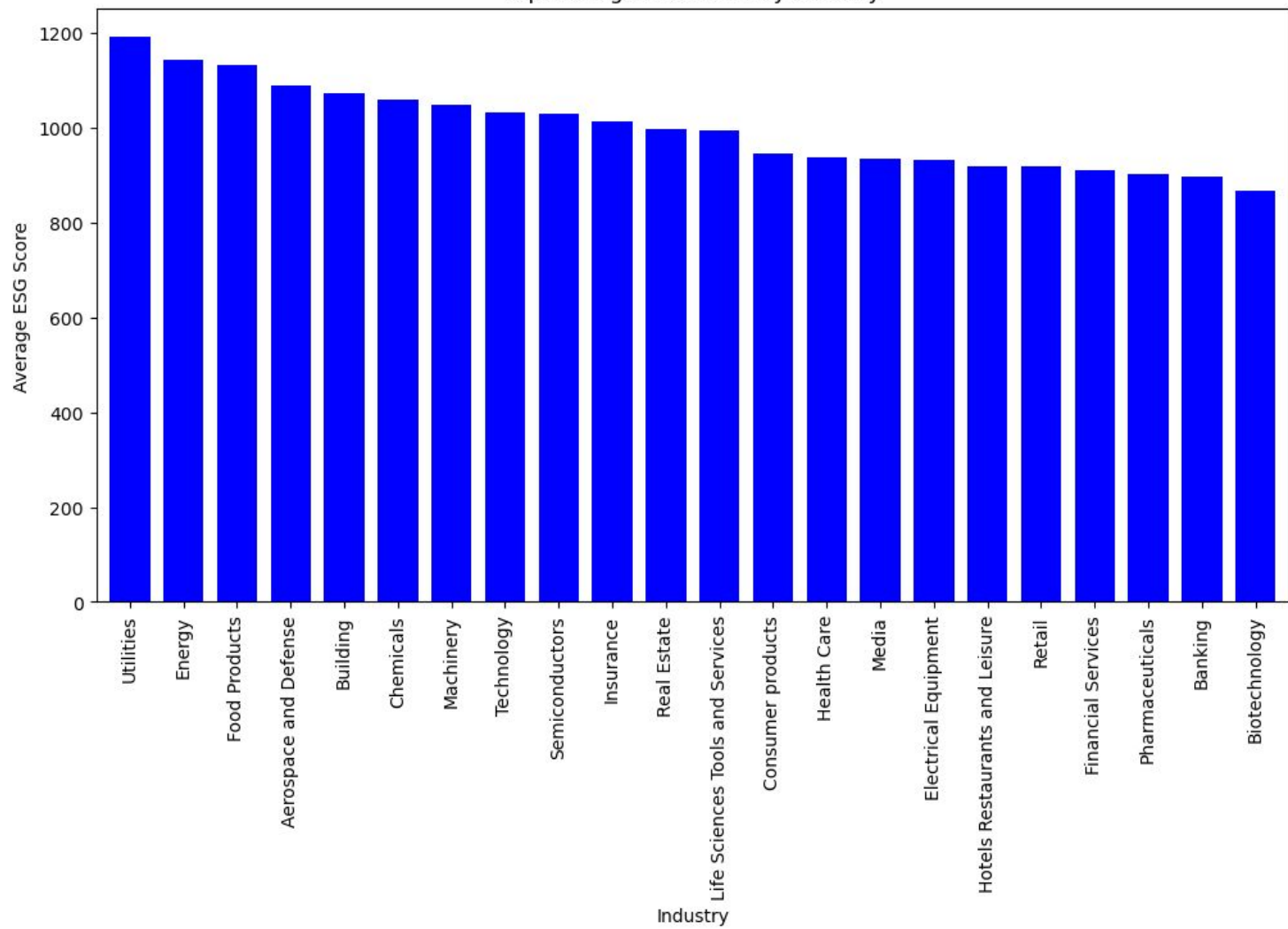
- What are the top 10 companies by ESG Total Score?
- What Industries have the highest Average ESG Score?
- What percentage of the population is accounted for by each grade bucket?



Top 10 ESG Companies

	index	ticker	name	industry	environment_score	governance_score	social_score	total_score	total_grade
0	452	cop	Conocophillips	Energy	687	305	544	1536	A
1	176	msft	Microsoft Corp	Technology	715	375	443	1533	A
2	302	eix	Edison International	Utilities	700	315	513	1528	A
3	18	abnb	Airbnb Inc	Hotels Restaurants and Leisure	505	400	570	1475	A
4	250	apd	Air Products and Chemicals Inc	Chemicals	700	300	442	1442	A
5	137	amzn	Amazon.com Inc	Retail	668	460	305	1433	A
6	487	nem	Newmont Corporation	Metals and Mining	675	355	389	1419	A
7	195	pep	PepsiCo Inc	Beverages	719	358	340	1417	A
8	494	exc	Exelon Corp	Utilities	694	316	403	1413	A
9	372	pxd	Pioneer Natural Resources Co	Energy	700	300	412	1412	A

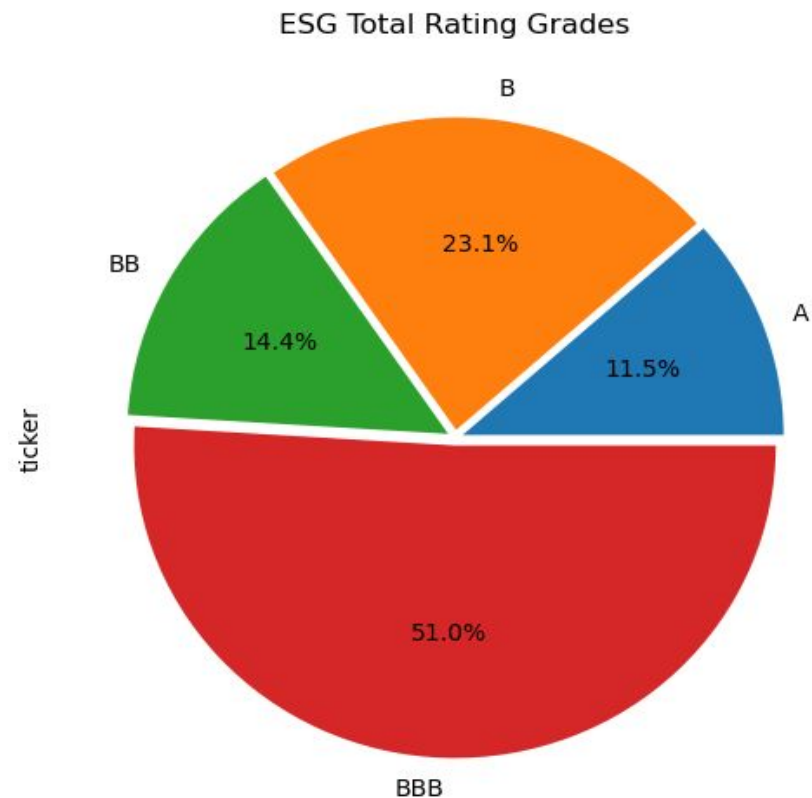
Top Average ESG Score by Industry





ESG Total Rating Grades

Pie chart representing the population amounts of each bucket from A-B





Intro to analysis

What we aimed to determine was:

- Based solely on ESG total score, is there a positive and meaningful correlation between ESG total score and 5 year annualized change in stock price?
- Based solely on ESG total score, is there a positive and meaningful correlation between ESG total score earnings per share (EPS)?

To answer this question, we needed to secure data on these key metrics for the companies in our dataset.

We utilized the AlphaVantage (<https://www.alphavantage.co/>) API and structured two separate API calls.



We used for loops to loop through each ticker symbol in our initial dataset and obtain the information we were looking for.

5 year annualized percent change: to obtain this data we used the AlphaVantage `TIME_SERIES_MONTHLY` function to pull the month end data from March 2019 and March 2024, and obtain the stock price for each. We utilized the difference between these two prices to calculate the overall percentage change for the 5 year period. This was then annualized by dividing by 5.

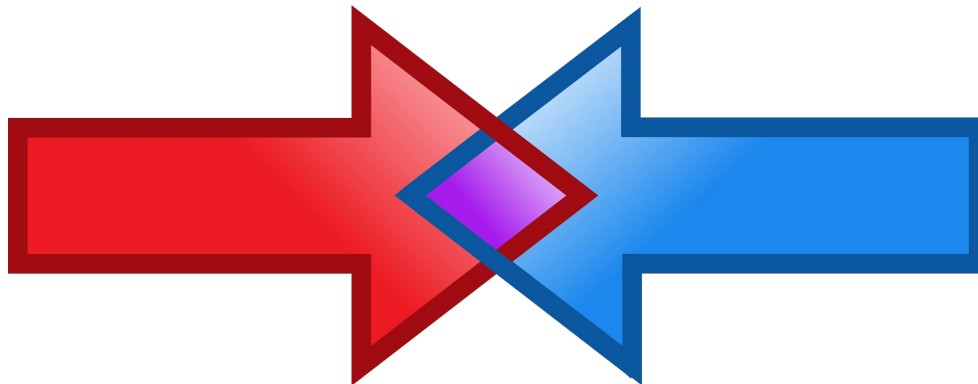
Annualized EPS: To obtain this we utilize their `EARNINGS` function to obtain the annual earnings per share from 2019-2023. These were then totalled and divided by 5 to create an annualized number (or average)



Data merging and cleaning

Once we obtained our data from AlphaVantage on our two key metrics, we converted the results into DataFrames and merged them with the DataFrame from our initial dataset and cleaned it by dropping any missing values.

We were able to obtain all of the information we wanted for 589 of the initial 722 companies.





Limitations

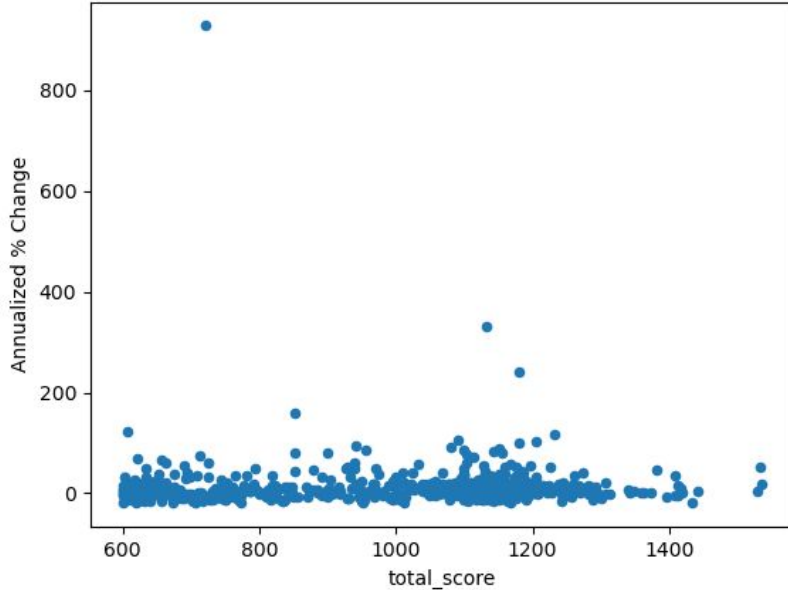
- **Static ESG Ratings:** The initial ESG dataset that we used is comprised of ESG scores and ratings from the month of April '22 and we are comparing them against the 5 year period ended march, 2024 and year end 2023, for average 5 year change and EPS, respectively.
- **5 year period limitations:** based on the results of our API pulls we are assuming that we weren't able to retrieve some data because some of the companies in question may not have been publicly listed 5 years ago
- **API limitations:** We were limited to 75 API calls per minute, and it appears some ticker symbols may have been skipped due to this limitation.
- **Stock Splits:** We were unable to isolate for "Stock Splits" in our calculations, but they were likely removed in outliers.
- **ESG data is self-reported,** thus there exists the possibility for misconduct that companies may engage in to achieve elevated scores.

Initial results

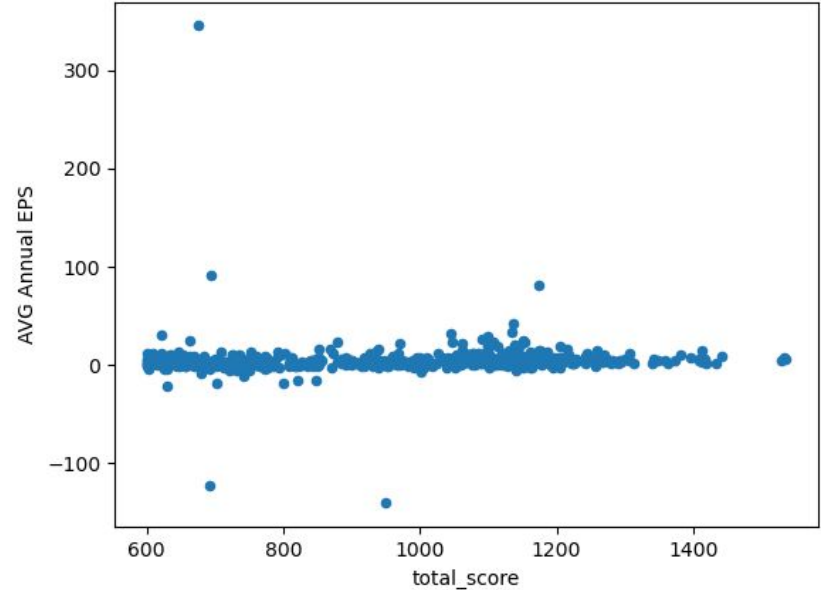


The first thing we did was took our updated dataframe and plotted each company's Total ESG score vs. the two key metrics we obtained. We can see very clearly that there are some outlier companies in our dataset for each metrics

Total ESG score vs. Annualized 5 yr % change



Total ESG score vs. AVG Annual EPS

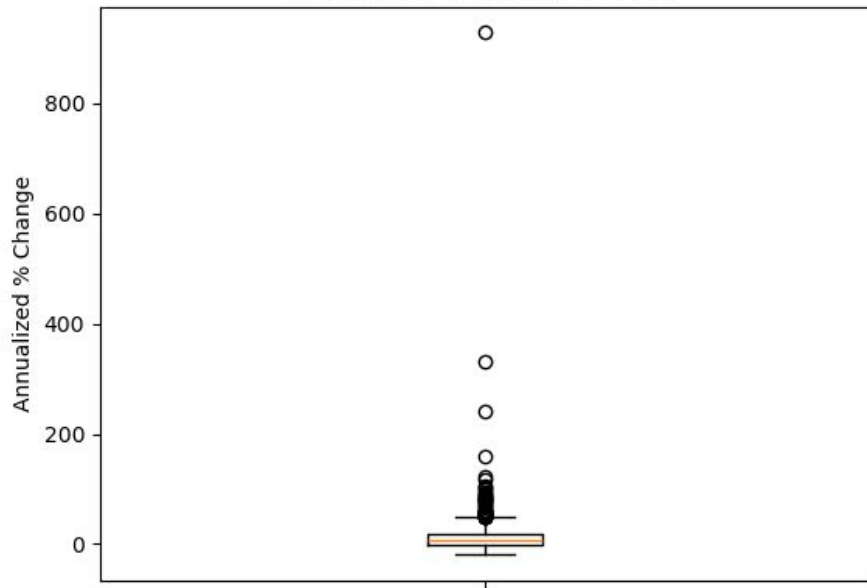




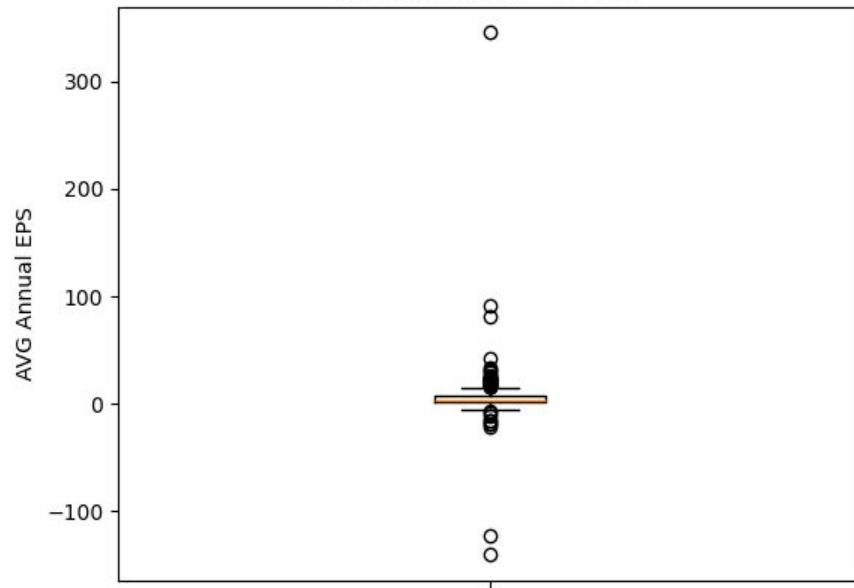
Finding Outliers

In order to identify outliers we used quantiles to identify the upper and lower bounds of each. As you can see, the outlier values clearly skew the scale of the below boxplots.

Annualized % Change Overall



AVG Annual EPS Overall

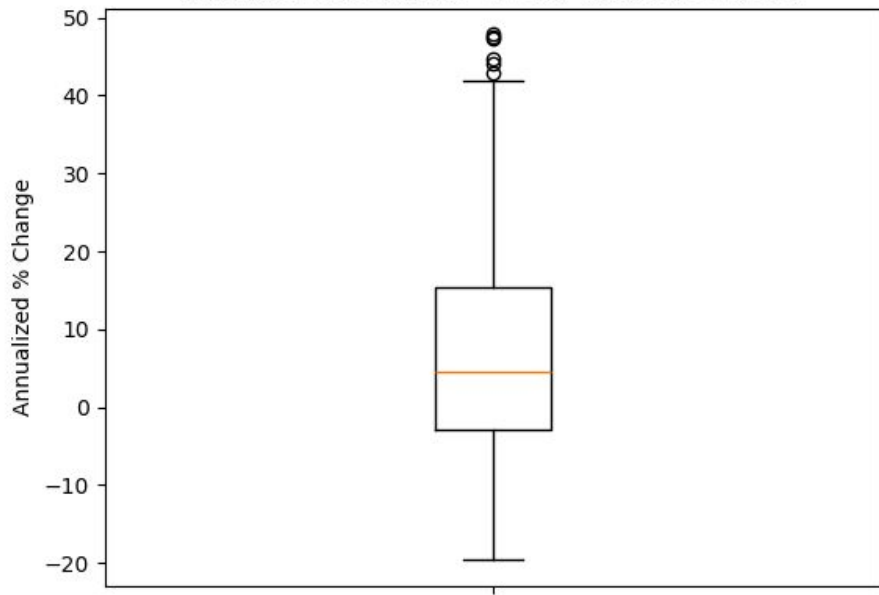




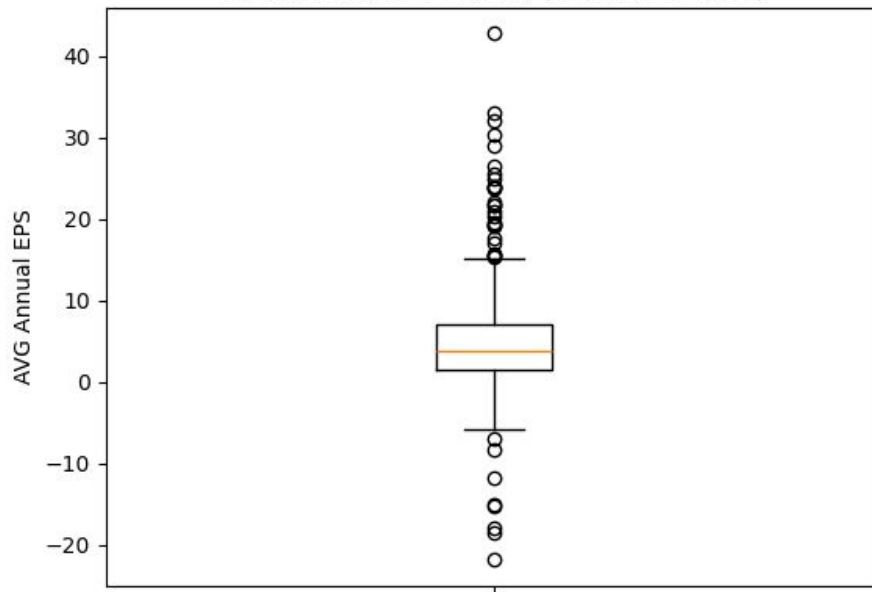
Removing outliers

After the removal of the outlier values, we were left with a much better representation of the data.

Annualized % Change Overall (without outliers)



AVG Annual EPS Overall (without outliers)



Overall Results:

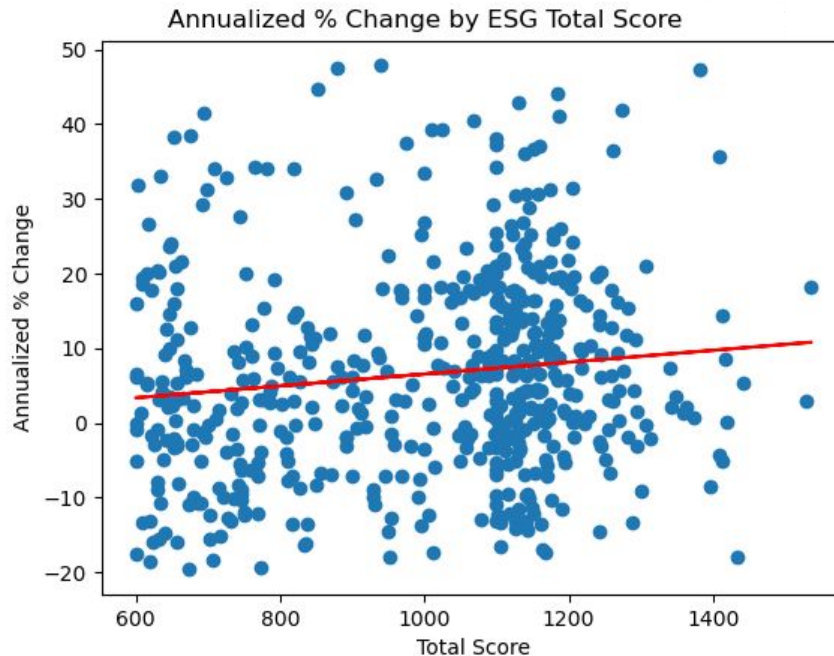
Annualized % Change

The correlation is: 0.13

The r-squared is: 0.015814301302785508

the p-value is : 0.003217712392452046

Looking at overall score and the Annualized % change we can determine that there is a **weak positive correlation** between the two. The p-value being less than .05 tells us that the relationship between the variables is statistically significant. The r^2 indicates that only 1% of the variance in the dependent variable can be explained by the independent variable(s) in the regression model, suggesting a weak relationship between the variables.



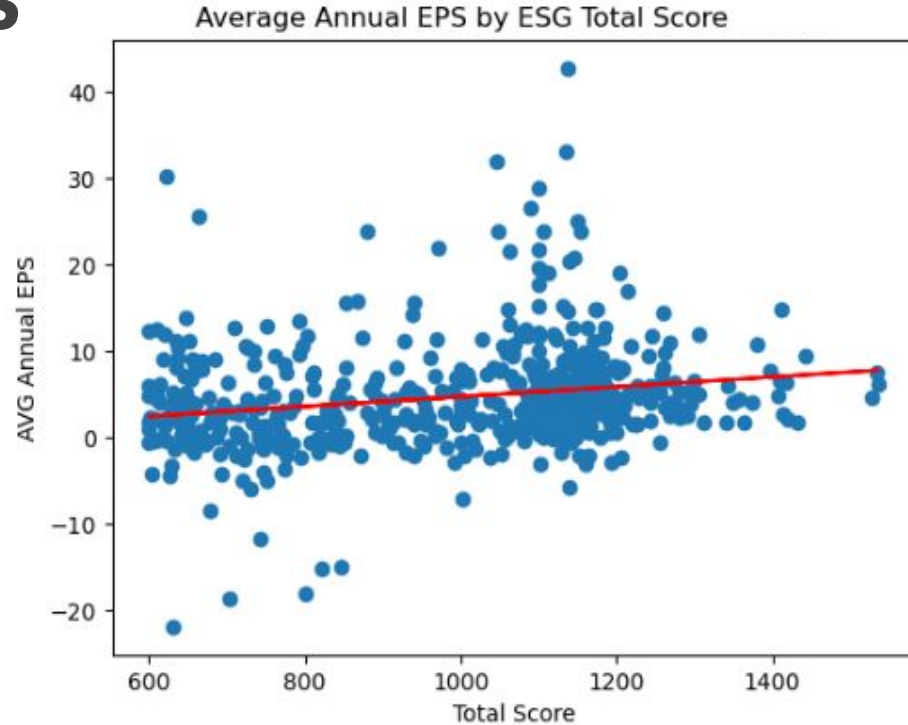
Overall results: EPS

The correlation is: 0.2

The r-squared is: 0.039783368184557244

the p-value is : 1.1816539125592155e-06

Looking at overall score and the AVG annual EPS we can determine that there is a **weak positive correlation** between the two. Despite the statistical significance due to the low p-value, the weak correlation indicated by the low R-squared and Pearson's r values suggests that while there may be a significant relationship, it is not a strong one. It is essential to interpret these statistics together. The low R-squared value and weak correlation suggest that although there is a statistically significant relationship, the explanatory power of the independent variable(s) on the dependent variable is limited.





What does this mean?

High ESG score does not equal a fair/ reasonable/ good investment

- While there does appear to be loose correlation between EPS and ESG Rating, the correlation is not strong enough for us to confidently conclude that ESG Rating indicates a good investment.



Conclusion

From our analysis we have concluded that it would not be wise for investors to solely use ESG grade as their lone indicator when deciding on their investment choices. Investors can certainly take a companies ESG rating into account when selecting an investment but factors such as Dividend Payout Ratio, Overall Investment Need, Time Horizon of the investor, Risk factor of the investor, Volatility of the stock/sector, and the overall stock market environment need to be addressed in tandem with ESG grade when determining the viability of a stock for a particular investor.