

# Investment Group Project- Group 7

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## Preface: Introduction of ESG Risk ratings

Environmental, Social, and Governance (ESG) risk ratings are a set of criteria used to assess and evaluate the sustainability and ethical practices of a company or investment. Companies with low unmanaged ESG risks are often seen as more attractive investments, as they are perceived to be better positioned for long-term success in a changing and socially conscious business landscape. However, companies with high unmanaged ESG risks indicates that they may face challenges related to environmental impact, social responsibility, and corporate governance. As a result, investors and stakeholders should be cautious when engaging with companies with high unmanaged ESG risks.

The rating, from negligible to severe risk, scores the ESG performance of companies, below are the five risk categories:

Negligible	Low	Medium	High	Severe
0 - 10	10 - 20	20 - 30	30 - 40	40+

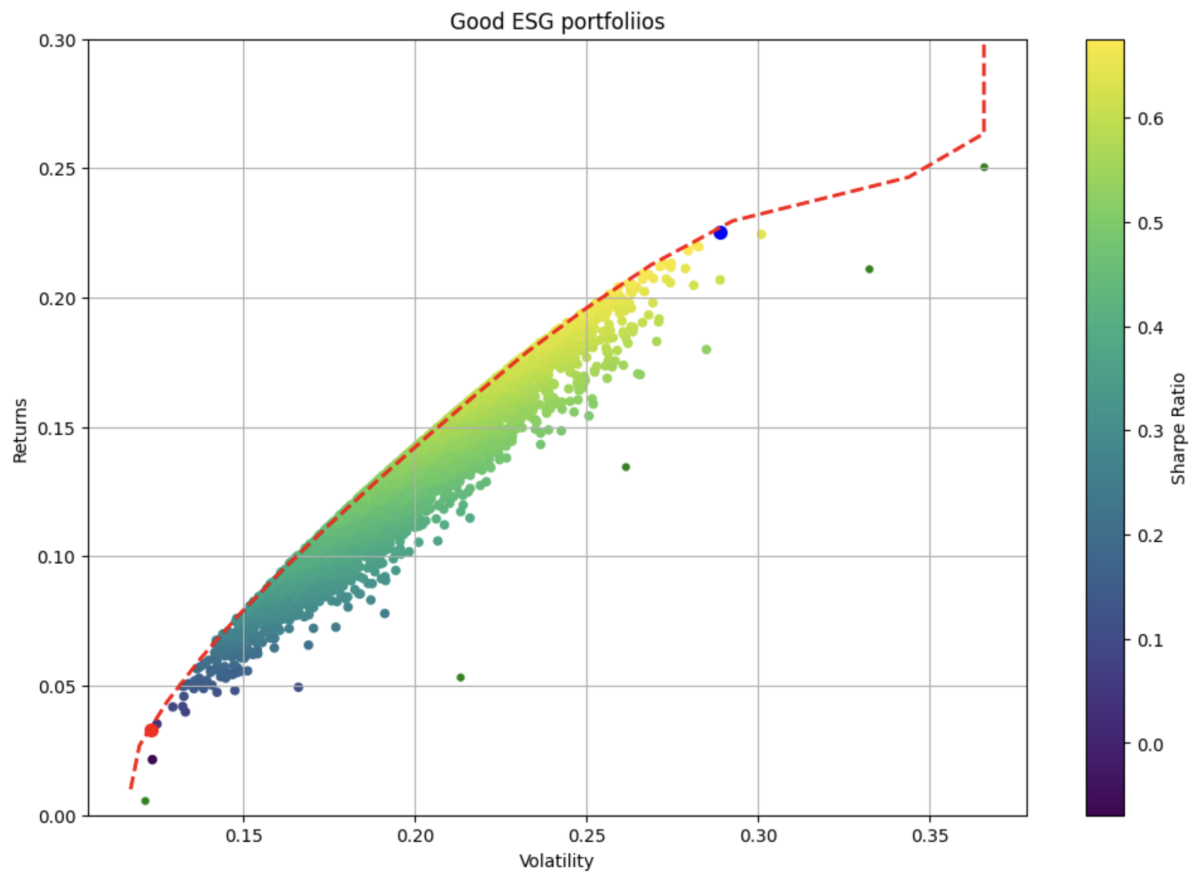
## Part I: Good ESG Companies

### 1. Good ESG Rating Companies

We chose five companies with low ESG risks and below are their names, tickers, industries and ESG ratings.

Company	Ticker	Industry	ESG Rating
Adobe	ADBE	Software & Services	14.5
Taiwan Semiconductor Manufacturing Co.	TSM	Semiconductors	14.6
PrairieSky Royalty Ltd.	PSK	Oil and Gas Producers	7.3
GSK Plc	GSK	Pharmaceuticals	16.7
National Bank of Canada	NTIOF	Banking and Financial Services	16

## 2. The expected returns and standard deviation of optimal portfolios for good ESG.



The **blue point** is the optimal risky portfolio for good ESG stocks:

-Expected Returns = 0.225140  
-Standard deviation = 0.288845

ADBE weight = 0.359047  
GSK weight = 0.016285  
NTIOF weight = 0.042639  
PSK weight = 0.012888  
TSM weight = 0.569141

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The **red point** is the global minimum variance portfolio for the good ESG stocks:

-Expected Returns = 0.032977

-Standard deviation = 0.123167

ADBE weight = 0.045416

GSK weight = 0.219827

NTIOF weight = 0.042895

PSK weight = 0.684504

TSM weight = 0.007358

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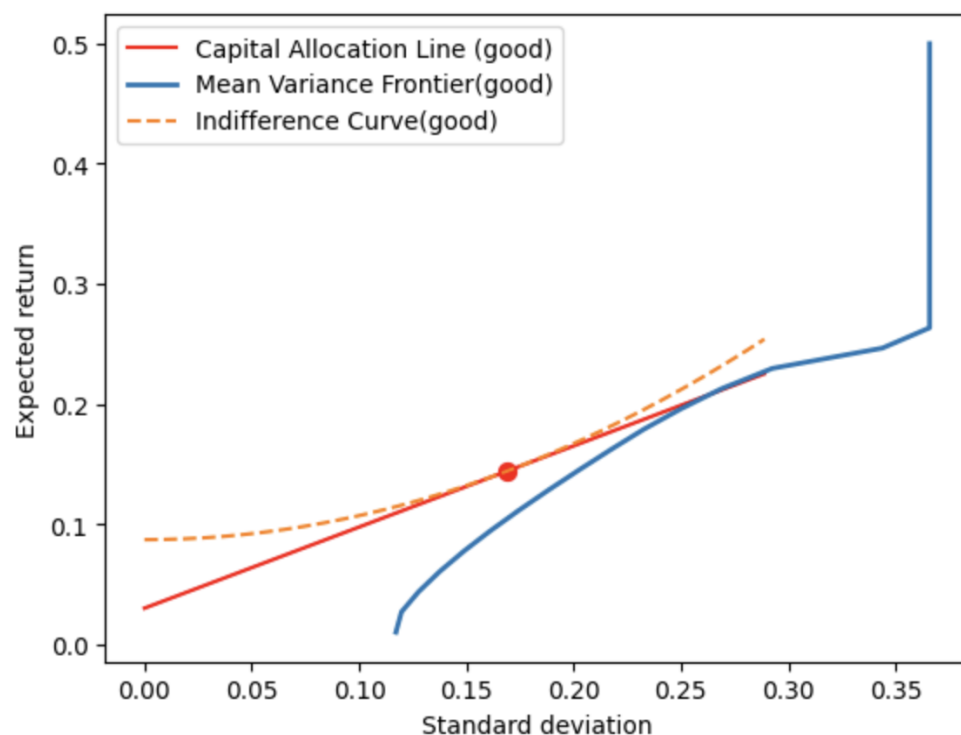
The chart illustrates that the returns range from 0.03 to 0.225, while standard deviations range from 0.12 to 0.30

### 3. The expected returns and standard deviation of complete portfolios for good ESG.

-Expected Returns = 0.17411039548910048

-Standard deviation = 0.1898093750905764

Proportion invested in risky asset (Good ESG): 0.5847350011735587



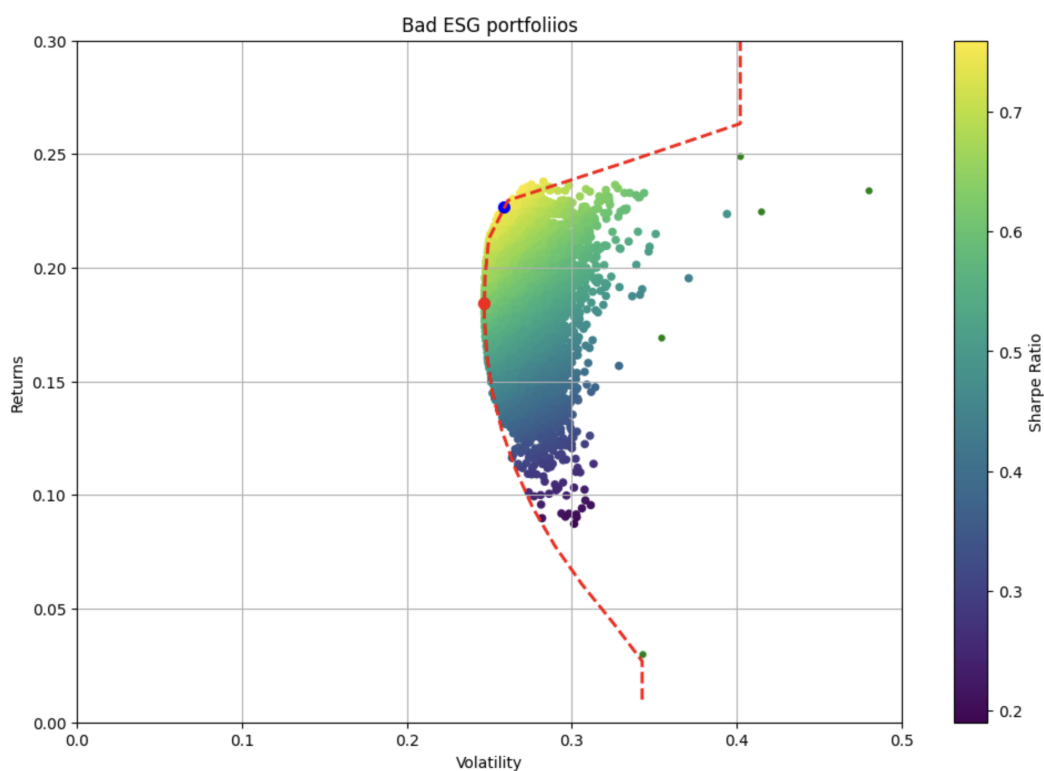
## Part II: Bad ESG Companies

### 1. Bad ESG Rating Companies

We chose five companies with high ESG risks and below are their names, tickers, industries and ESG ratings.

Company	Ticker	Industry	ESG Rating <sup>1</sup>
Meta Platforms	META	Software & Services	34.1
Microchip Technology	MCHP	Semiconductors	31.7
Exxon Mobil Corp.	XOM	Oil and Gas Producers	41.6
Legend Biotech Corp.	LEGN	Pharmaceuticals	40.7
Wells Fargo & Company	WFC	Banking and Financial Services	33

### 2. The expected returns and standard deviation of optimal portfolios for bad ESG.



<sup>1</sup> "Company ESG Risk Ratings and Scores - Sustainalytics," sustainalytics.com, 2023, <https://www.sustainalytics.com/esg-ratings>.

The **blue point** is the optimal risky portfolio for the bad ESG stocks:

Expected Returns = 0.226609

Standard Deviation = 0.258956

LEGN weight: 0.324489

MCHP weight: 0.262254

META weight: 0.285147

WFC weight: 0.004542

XOM weight: 0.123569

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The **red point** is the global minimum variance portfolio for the bad ESG stocks:

Expected Returns = 0.184372

Standard Deviation = 0.246881

LEGN weight: 0.211427

MCHP weight: 0.072734

META weight: 0.307579

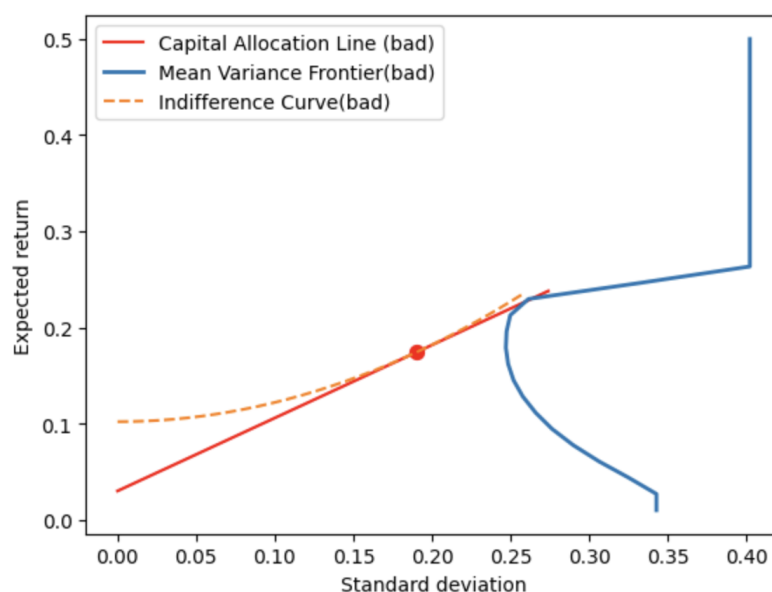
WFC weight: 0.155371

XOM weight: 0.252889

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The chart illustrates that the returns range from 0.07 to 0.24 , while standard deviations range from 0.245 to 0.355

### 3. The expected returns and standard deviation of complete portfolios for bad ESG.



Expected Returns = 0.17411039548910048

Standard deviation = 0.1898093750905764

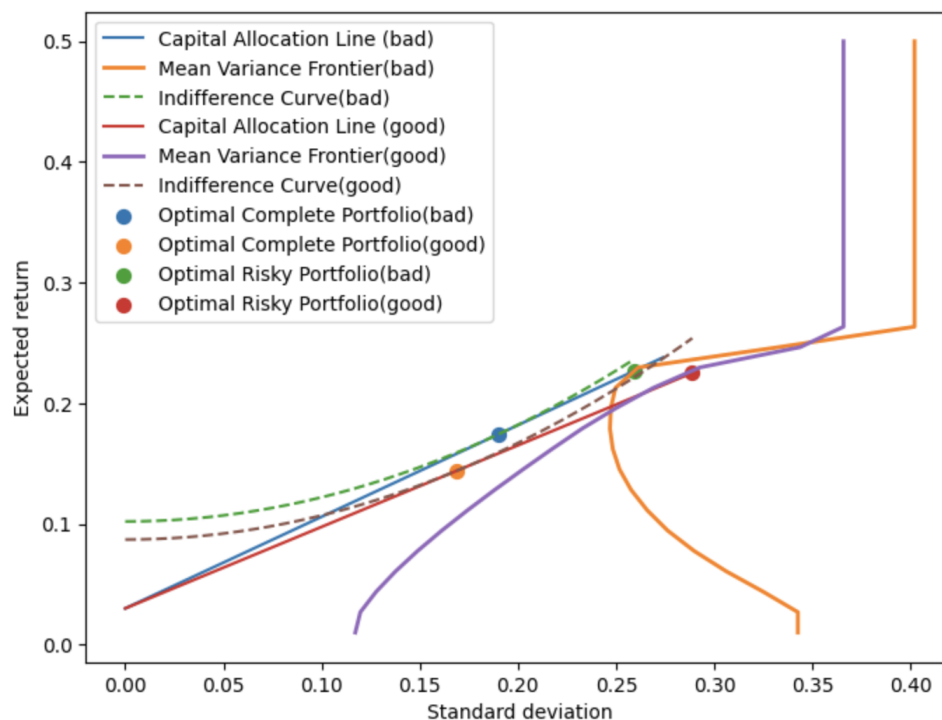
Proportion invested in risky asset(Bad ESG): 0.7329787828255465

## Part III: Comparison

For the bad ESG stocks, the optimal risky portfolio has higher expected returns, alongside lower standard deviation, as compared to the stocks of companies with better ESG. Similarly, for the global minimum variance portfolio, bad ESG stocks display significantly higher expected returns as compared to those with good ESG, though the former also takes on a higher standard deviation — twice that of the latter. In terms of the complete portfolio, the expected return for companies with bad ESG is lower than that of companies with good ESG.

On first sight, companies with higher ESG risk should also display, similarly, higher levels of risk in their stock prices — specifically, in terms of higher standard deviations. However, this is inconsistent with some of the results of our findings, in particular, the optimal risky portfolio. These discrepancies can possibly be explained by investors' preference of certain companies in spite of ESG concerns. Though the companies we chose were from a similar industry composition, certain prominent companies such as Meta could appeal to investors through short-term gains that overshadow ESG concerns. On a larger scale, the comparisons could also reflect a certain level of market inefficiency in pricing the stocks, though a larger sample size and time frame would be needed to ascertain this.

## Part V: Conclusion



### **i. Compare optimal portfolios and complete portfolios of two groups**

For the optimal portfolios, the expected return of the good ESG portfolio was less than that of the bad ESG portfolio while the standard deviation of the good ESG portfolio was greater than that of the bad ESG portfolio. For the complete portfolios, both the expected return and standard deviations of the good ESG portfolio were less than that of the bad ESG portfolio. Even without using the Sharpe Ratio in the next part, we can determine that the bad ESG portfolio has a greater level of return per unit of risk as compared to that of the good ESG portfolio. However, the next section will dive into the calculations for a clearer numerical depiction of the effectiveness of the portfolios based on the return per unit of risk metric determined by calculating the Sharpe ratio in the next section.

### **ii. Compare the Sharpe Ratio of CAL and Sharpe Ratio**

Based on the chart above, we can observe that the CAL of the bad ESG portfolio possesses a steeper slope than that of the good ESG portfolio meaning that the Sharpe Ratio for the bad ESG portfolio is greater than that of the good ESG portfolio. Aside from looking at the graph, we can also perform some very simple calculations to derive the Sharpe Ratios for the portfolios. The Sharpe Ratios for the portfolios (both optimal and complete) can be calculated as  $(0.14410545669716784 - 0.03)/0.16889749605690416 = 0.676$  for the good ESG portfolio and  $(0.17411039548910048 - 0.03)/0.1898093750905764 = 0.759$  for the bad ESG portfolio. What this shows is that the bad ESG portfolio will generate a higher expected return per unit of risk than that of the good ESG portfolio. To put it simply, for every unit of risk, the bad ESG portfolio will generate a greater expected return than the good ESG portfolio. Therefore, we can conclude that keeping the standard deviation the same, the good ESG portfolio should have a greater risk premium as compared to that of the bad ESG portfolio.

### **iii. Compare the tangent point of Indifference Curve and CAL**

We can see from the graph that the indifference curve of the good ESG portfolio stays below that of the bad ESG portfolios, which means that assuming expected return is kept equal, the good ESG portfolio would have a larger standard deviation and consequently require more risk to achieve the same expected return.

As a result of the increased risk associated with the good ESG portfolio, rational investors would invest a greater quantity of capital into risk-free assets to achieve maximum effectiveness and less on the good ESG portfolio. However, if investors were to invest in the bad ESG portfolio, they would be more inclined to invest more in the portfolio with bad ESG performance than risk-free assets compared to what would be rational when investing in the good ESG portfolio. This shows that if an investor had to choose between which of the two portfolios to invest their capital in purely based off of a risk per unit of expected return basis, they would find it more effective to invest in the bad ESG portfolio.