BT4016 Risk Analytics for Financial Services

AY 2023/2024, SEMESTER 2

Analysis of Corporate Bonds in Healthcare Sector

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1. Introduction to the Companies and their Industries

The companies we chose are Amgen Inc., Pfizer and Merck & Co. All three companies are from the overarching pharmaceutical industry. The pharmaceutical industry stands strong as a cornerstone of modern healthcare, driving innovation, advancing medical science, and shaping how mankind approaches the treatment and prevention of diseases, playing a pivotal role in improving the quality of life for millions worldwide.

Amgen Inc. (AMGN) is an American multinational biotechnology company, established in 1980. Their primary business aims to apply cutting-edge biotechnology to the discovery, development and manufacturing of innovative pharmaceutical drugs. They invest heavily and research to drive innovation and develop novel biologic drugs, and have success in various areas, such as oncology, inflammation and weight loss (Beasley, 2024).

Pfizer (PPE) is the largest pharmaceutical company globally and was established in 1849. They are known for their blockbuster drugs like Viagra, Lipitor and Prevnar. With a strong presence in both developed and emerging markets, Pfizer is known to be actively involved in the research and development of various medical conditions, ranging from cardiology to mRNA vaccines. Alongside their extensive research efforts, Pfizer also maintains a diverse portfolio of high-quality products through strategic market acquisitions, with the latest one being Seagen in 2023 (Pfizer, 2023).

Merck & Co., (MRK) is an American multinational pharmaceutical company, established in 1891 (Merck & Co., n.d.). They strive to deliver innovative health solutions through their medicines, vaccines, biological therapies and animal health products (Merck & Co., n.d.). The organisation innovates, manufactures, markets and sometimes distributes its products. They are also well known for their novel therapies, including immuno-oncology treatments (Merck Group, 2021).

2. Data Collection and Calculation of Financial Ratios

Our financial ratios for the three companies are taken from Morningstar's valuation of the company. We have also separately conducted our own calculations of the financial ratios using their 10-Ks and formulas that we have researched and compared the ratios with those of Morningstar's. There are some discrepancies between the values of certain metrics (Quick Ratio, Return on Assets, and Return on Equity), which we will further elaborate on in the respective sections. As a quick summary, here are the differences and the possible reasons for them.

Financial Metric	Comments
Quick Ratio	Our calculated quick ratios were consistently about 20 - 40 percent higher than that of Morningstar. Morningstar might have used (Cash + Marketable Securities + Account Receivables) / (Current Liabilities). However, we used another well defined formula (Current Assets - Inventory) / Current (Liabilities). This may have resulted in the discrepancy.
Return on Assets (ROA)	Our calculated ROAs fluctuated above and below Morningstar's ratios, between +- 20 percent of that on Morningstar. Morningstar might have used (Net Income) / (Average Assets), while we used (Net Income) / (Total Assets), which are 2 common variations of ROA. This may have resulted in the discrepancy.
Return on Equity (ROE)	Our calculated ROEs fluctuate randomly above and below Morningstar's ratios, sometimes being very similar, and other times being up to 40 percent different from Morningstar. We used (Net Income) / (Total Shareholder's Equity). However, it is possible that Morningstar used (Net Income) / (Average Shareholder's Equity) or (Net Income) / (Total Equities)

Fig 2.1 Summarised Differences between Morningstar and Calculated Metric

The summarised table of Morningstar's financial ratio as well as our calculated ratios can be found in the Appendix. The tables are captioned A1. Additionally, we have included a step-by-step calculation of the individual values obtained from the 10-K in the same section of the appendix. We have chosen to use Morningstar's financial ratios in the cases of discrepancies.

3. Detailed Analysis of the Calculated Financial Ratios

3.1. Financial Ratios

In addition to computing the financial ratios of the three companies we are focused on (AMGN, PPE and MRK), we have also computed the financial ratios of the pharmaceutical industry average. In this case, we have selected two other companies (Johnson & Johnson and Novartis) within the industry and averaged the values over the five companies.

3.1.1. Debt-to-Equity Ratio

The Debt-to-Equity Ratio measures the company's financial risk by comparing the company's total debt against the value of its shareholders' equity (Wall Street Prep, 2024). It's calculated by dividing total debt by shareholders' equity.

$$Debt—to—Equity\ Ratio = \frac{Total\ Debt}{Shareholder's\ Equity}$$

A lower debt-to-equity ratio is preferred as it indicates that the company has lower debt. A general guideline for the ratio would be **lower than 2.0,** although this would vary depending on the industry (The Investopedia Team, 2023). For credit risk assessment, companies with lower debt-to-equity ratios are preferred, as they are considered less risky and more capable of servicing their debt.

3.1.2. Interest Coverage Ratio

The Interest Coverage Ratio is used to determine the ability of a company to pay interest on its outstanding debt (Hayes, 2024). The ratio is calculated by dividing the earnings before interest and taxes (EBIT), composed of the net income, interest and taxes, over the interest expense.

$$Interest\ Coverage\ Ratio = \frac{EBIT}{Interest\ Expense} = \frac{Net\ Income + Interest + Taxes}{Interest\ Expense}$$

Unlike the debt-to-equity ratio, a higher interest coverage ratio is preferred as it indicates that the company is more able to pay off debt, stipulating lower credit risk. Conversely, a low-interest rate suggests that it may be challenging for the company to cover its interest payments, thereby leading to higher credit risk. A consensus is that a ratio of **more than 1.5** is preferred, however it can vary across industries (Hayes, 2024).

3.1.3. Current Ratio

The current ratio, a liquidity ratio, measures the company's ability to pay short-term obligations, typically those due within a year (Fernando, 2024). It is calculated by dividing the current assets by the current liabilities.

$$Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

A higher current ratio suggests that the company has more current assets than current liabilities, and hence, has higher liquidity and lower credit risk in the short term. A higher current ratio also means the company has sufficient current assets to meet its short-term financial obligations. A current ratio of **more than 1.00** is preferred (Fernando, 2024).

3.1.4. Quick Ratio

Similar to the current ratio, the quick ratio measures the company's ability to meet its short-term obligations, but with a more stringent limitation of only its most liquid assets (Seth, 2023). The difference with the current ratio is that on the numerator of the fraction, the inventory is subtracted from its current assets (Gillingham, 2022).

$$Quick\ Ratio = \frac{Current\ Assets - Inventory}{Current\ Liabilities}$$

A higher quick ratio suggests higher short-term liquidity and low credit risk and further shows the company's ability to meet its short-term financial obligations without relying on selling its inventory. A quick ratio of **more than 1.2** is preferred (Gillingham, 2022).

There are some discrepancies observed between our calculated financial ratios, using data obtained from the companies' 10-K and Morningstar's. This is likely due to the different variations of the formula used to compute the quick ratio. We have likely selected a formula that differs from the one that Morningstar has used in their valuation. For example, another well-used interpretation would be:

$$Quick\ Ratio = \frac{Cash + Marketable\ Securities + Accounts\ Receivable}{Current\ Liabilities}$$

It is likely due to the different formulas that led to the discrepancy observed.

3.1.5. Net Profit Margin

Net profit margin measures the ratio of net income generated over the revenue (Murphy, 2024). It is calculated as the net income generated by the company over its revenue. In this case, we are representing it as a ratio.

$$Net\ Profit\ Margin(\%) = \frac{Net\ Income}{Revenue}$$

A higher net profit margin indicates greater profitability as well as efficiency in operations, which in turn, reduces credit risk. High-profit margins are viewed more favourably, with a 10% margin being considered average, 20% high and 5% low (Vipond, n.d.).

3.1.6. Return on Assets (ROA)

Return on Assets, a profitability ratio, that measures the profit a company can generate from its assets (Boyte-White, 2022). It is an indicator of the efficiency of the company's management in earning a profit from their economic resources and assets (Boyte-White, 2022). It is calculated by taking the net income divided by their total assets.

$$Return\ on\ Assets\ (ROA)\ (\%) = \frac{Net\ Income}{Total\ Assets}$$

Companies with higher ROA indicate greater efficiency in utilising their assets to generate profits, reducing credit risk. This further implies better asset management and profitability increasing investor's confidence in the company. Conversely, lower ROA indicates greater inefficiency in utilising its assets to generate profits, leading to higher credit risk, and lower investor confidence in the company. Generally, a ROA of 5% or lower would be considered low, whereas a ROA of over 20% is considered high (Boyte-White, 2022).

The discrepancy in our calculation of ROA from the 10-K and Morningstar's ratio is minor. Similar to the reason behind quick ratio differences, it is likely due to the variation in the formula used to calculate the ROA. One possible difference is that total assets may not have been used in Morningstar's ratio, but instead average assets. This is another common variation of ROA.

$$Return\ on\ Assets\ (ROA)\ (\%) = \frac{Net\ Income}{Average\ Assets}$$

3.1.7. Return on Equity (ROE)

Return on Equity measures the financial performance of the company, by gauging the company's profitability and its efficiency in generating profits (Fernando, 2024). It is computed by dividing the net income by the shareholders' equity (CFI Team, n.d.).

$$Return\ on\ Equity\ (ROE)\ (\%) = \frac{Net\ Income}{Shareholders'\ Equity}$$

A higher ROE indicates higher profitability and efficiency in utilising shareholders' equity in generating profits, thereby leading to lower credit risk. This in turn leads to being viewed as more creditworthy by investors. Conversely, lower ROE suggests lower profitability and efficiency in utilising shareholders' equity, hence resulting in higher credit risk. The rule of thumb for ROE is no less than 10%, but it can vary depending on the industry (Fernando, 2024).

There are also differences between our calculation of ROE and Morningstar's financial ratio. This is likely due to the variation in the formula used to calculate ROE. One variation of the formula includes using total equity rather than shareholders' equity.

$$Return\ on\ Equity\ (ROE)\ (\%) = \frac{Net\ Income}{Total\ Equity}$$

Another included using the average shareholders' equity instead of simply shareholders' equity.

$$Return\ on\ Equity\ (ROE)\ (\%) = \frac{Net\ Income}{Average\ Shareholders'\ Equity}$$

Hence, the reasoning behind the discrepancy is likely due to a different set of formulas used by Morningstar than the one we have used to calculate from the 10-K. Nonetheless, the ratios remain comparable and still allow for insightful analysis.

3.1.8. Inventory Turnover Ratio

The inventory turnover ratio is a financial ratio that illustrates the number of times a company turned over its inventory relative to its cost of goods sold (Fernando, 2023). It is also an efficiency ratio that measures how effectively a company uses its assets (Fernando, 2023). It is calculated by dividing the cost of goods sold by the average inventory over the past two years.

$$Inventory\ Turnover\ Ratio = \frac{Cost\ of\ Goods\ Sold}{Average\ Inventory}$$

We have chosen the inventory turnover ratio to consider when evaluating the credit situation of the company, as we believe that it is relevant for the credit risk analysis in terms of evaluating the efficiency of the company. The inventory turnover ratio provides insights into a company's operational efficiency and inventory management practices. A higher inventory turnover ratio indicates that the company sells its inventory quickly, implying a strong demand for the company's products and efficient inventory management. Consequently, this suggests that the company has lower inventory holding costs and is less likely to face liquidity issues, leading to lower credit risk. Unfortunately, it has the potential to also mean inadequate stocking (Fernando, 2023). A lower ratio, on the other hand, could be a sign of weak sales or excess inventory (Fernando, 2023). Hence, the inventory turnover ratio is relevant for credit risk analysis.

Additionally, whether an inventory turnover ratio is good would have to be compared against the industrial average. In our calculations, that would be somewhere between 2.0 and 2.7 depending on the financial outlook of the particular year. This can be observed in the Appendix, table A1.4.1.

3.1.9. Revenue Growth

Revenue Growth measures the percentage change in the company's total revenue over 1 year. In this case, we are computing the year-on-year revenue growth. This is calculated by computing the change in revenue over 1 year, divided by the previous year's revenue.

$$Revenue\ Growth\ (\%) = \frac{Current\ Year's\ Revenue - Previous\ Year's\ Revenue}{Previous\ Year's\ Revenue}$$

We have chosen revenue growth as our second metric relevant to our credit risk analysis as it indicates the company's ability to expand its business and generate higher income over time. Consistent or increasing revenue growth indicates that the company remains successful in capturing market demand for its products, further translating into higher cash flows. Positive and high revenue growth enhances the company's ability to generate sufficient cash flow to service its debts. Increased cash flow similarly reduces credit risk by providing greater confidence that the company can meet its financial commitments. It also signals overall positive financial health, further mitigating credit risk for investors.

4. Quantitative Analysis / Fundamental Analysis

4.1. Introduction and Overview

As part of the traditional 4Cs in Credit Analysis, we aim to address the Capacity and Collateral factors. Capacity refers to the ability of the firm to repay debts, while collateral refers to the quality and value of assets the firm has pledged as collateral against debt.

To further conduct a quantitative analysis of the firms, we will use the ratios to evaluate certain metrics about the firm. We will also compare the trends of these ratios across time and industry averages, generated from a pool of similar pharmaceutical firms. The metrics we will be analysing are as follows:

A. Ability to access Liquidity

Liquidity is important as it determines the firm's ability to meet short-term obligations without raising additional capital. We will use current and quick ratios as financial ratios to evaluate this metric, focusing on the firm's ability to convert assets into cash quickly and efficiently. A higher ratio indicates better liquidity, which suggests a lower credit risk.

B. Solvency of Firm

Solvency assesses the firm’s long-term stability and its capacity to cover all liabilities with its assets. We will utilise the Debt-to-Equity Ratio and the Interest Coverage Ratio to measure the firm's financial leverage and its ability to pay interest on outstanding debt, respectively. These indicators help in evaluating whether the firm can sustain operations in the long term without undue financial risk.

C. Profitability of Firm

Profitability is crucial as it measures how effectively a firm can generate income relative to its revenue, assets, equity, and expenses. We will examine Net Profit Margin, Return on Assets (ROA), and Return on Equity (ROE) to evaluate the firm's capacity to generate profits from its operations. Higher profitability ratios often indicate better performance and lower credit risk.

D. Efficiency of Firm

Efficiency relates to how well a firm uses its assets and liabilities to generate sales and maximise profits. We will use the Inventory Turnover Ratio to gauge the effectiveness of the firm in managing inventory and utilising its assets to produce revenue.

E. Growth and Outlook of Firm

This metric examines the firm's potential for growth and expansion, which is vital for long-term sustainability. We will analyse trends in revenue growth. A positive trend in this area suggests a promising outlook and potentially lower credit risk.

The following is a quick overview of our findings before we delve deeper into the detailed analysis.

	Liquidity	Solvency	Profitability	Efficiency	Future Growth
Amgen	Good	Poor	Moderate	Poor	Good
Pfizer	Poor	Moderate	Poor	Good	Moderate
Merck	Poor	Moderate	Moderate	Good	Good

Fig 4.1.1 Summary of Quantitative Evaluation of the 3 firms

4.2. Amgen Inc. (AMGN)

4.2.1. Ability to access Liquidity

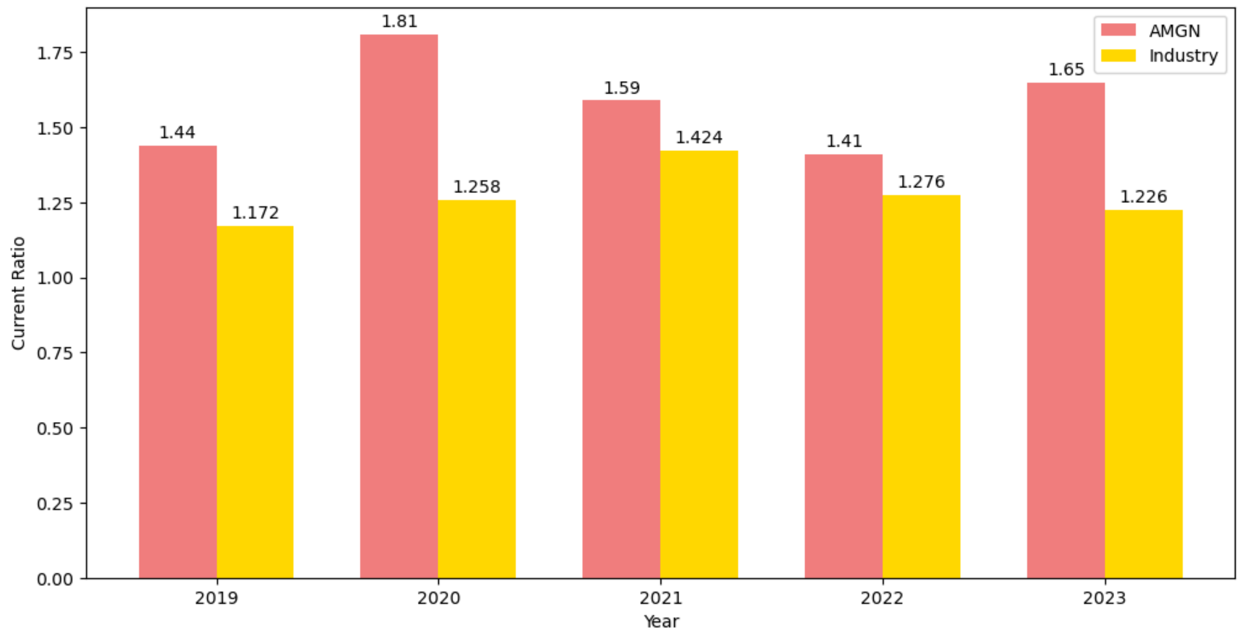

Fig 4.2.1.1 Barchart of Amgen's Current Ratio against the Industry Average

The **Current Ratio** of Amgen ranges from about 1.4 to 1.8 across the five years, with the lowest of 1.41 in 2022 and the highest of 1.81 in 2020. Throughout the past 5 years, Amgen's current ratio has consistently outperformed the industry average, by at least 0.20 yearly. The current ratio is also consistently higher than the generally recommended 1.00 figure. Therefore, this suggests that Amgen has sufficient assets to meet its short-term financial obligations, and highlights its ability to access liquidity in a short-term time period.

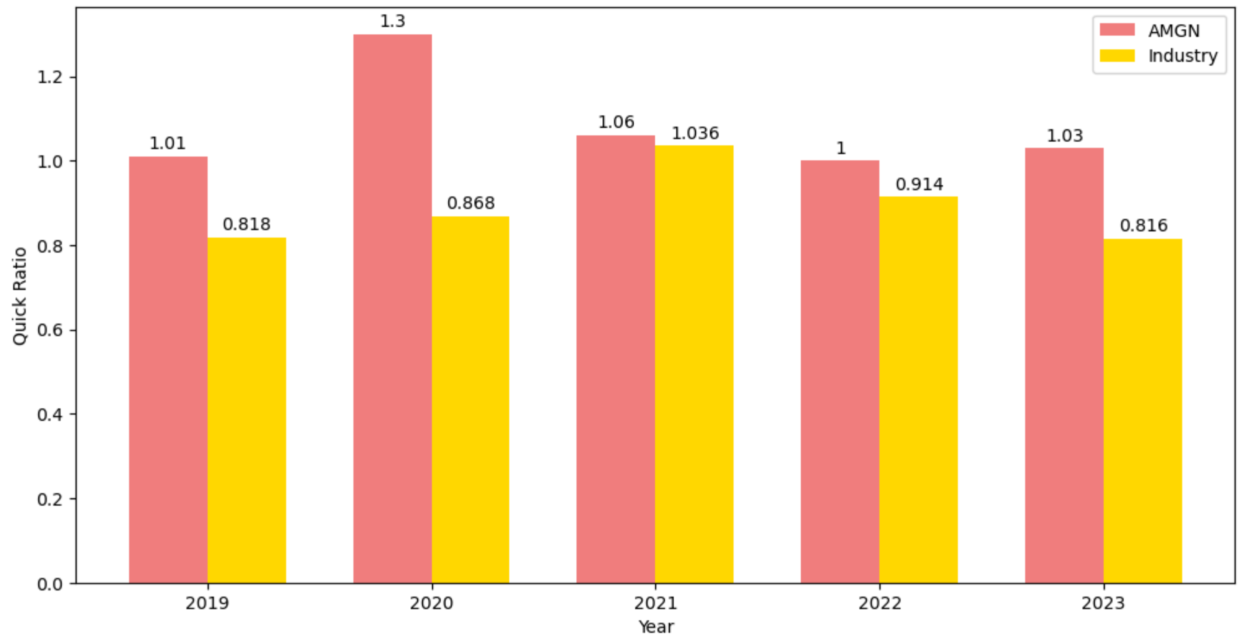

Fig 4.2.1.2 Barchart of Amgen's Quick Ratio against the Industry Average

The **Quick Ratio** of Amgen ranges from 1 to about 1.3 throughout the past 5 years, with a low of about 1 in 2021 and a high of 1.3 in 2020. It has a consistent average of about 1.02, with 2020 being the only outlier year where it achieved a 1.3 quick ratio, possibly due to the COVID-19 pandemic. Their quick ratio consistently outperforms their competitors but remains under the general guideline of 1.2 as mentioned beforehand. This may be an indication that the company may face challenges paying off its short-term debt without its inventory. However, as Amgen still outperforms their sector averages, it may be attributed to the fact that pharmaceutical companies tend to have a larger inventory due to their nature of business. Hence, it is not an overly worrying factor in this context.

In conclusion, Amgen’s Quick and Current ratio consistently outperforms their industry averages and is also above / not too far from the general guideline. This suggests that Amgen has a relatively stable balance sheet in this aspect, and has sufficient short-term assets to cover its short-term liabilities. Therefore, we conclude that Amgen’s liquidity situation is considered quite safe, and we give Amgen a **good** rating.

4.2.2. Solvency of Firm

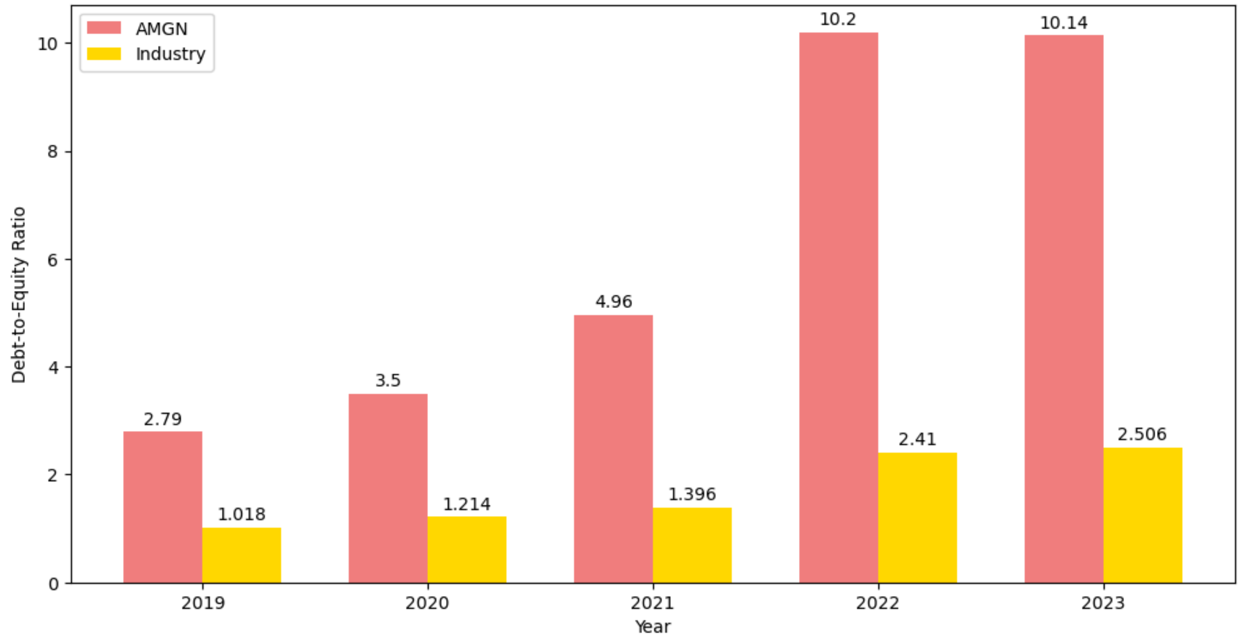

Fig 4.2.2.1 Barchart of Amgen's Debt-to-Equity Ratio against the Industry Average

Amgen has a high **Debt-to-Equity Ratio**, ranging from 2.79 in 2019 to about 10.14 in 2023. Their Debt-to-Equity ratio has been consistently increasing in the past few years and rose sharply from 2021-2022. Their figures have been consistently way higher than the recommended 2.0, and are also much higher than their industry averages that range from 1.01 to 2.50. As seen from the ratios, it is evident that Amgen relies heavily on debt financing, which can be advantageous in some cases, but is particularly financially more risky if they fail to meet their debt obligations. The recent sharp increase in the ratio has also shown that Amgen may be facing a higher financial strain than before, especially when compared to its industry peers. This is a poor and worrisome figure reflecting Amgen’s financial health.

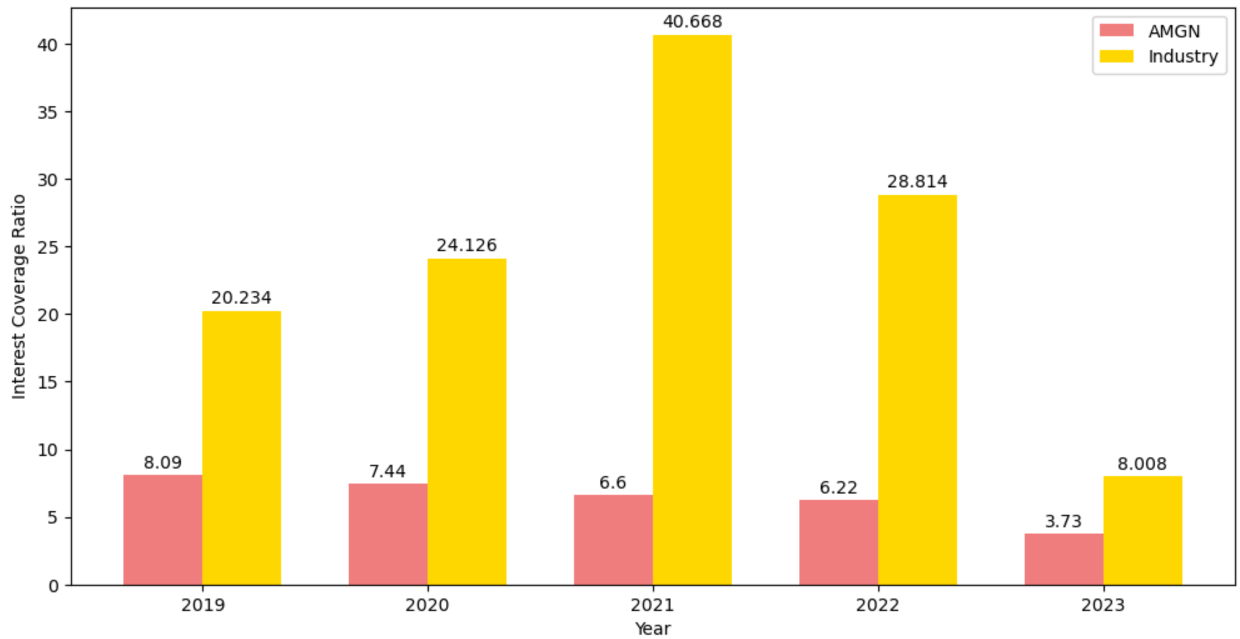

Fig 4.2.2.2 Barchart of Amgen's Interest Coverage Ratio against the Industry Average

Amgen's **Interest Coverage Ratio** ranges from about 3.73 to 8.09 in the past few years. They are consistently above the recommended 1.5 value but are underperforming greatly as compared to their industry averages, which range from about 8.008 to 40.668. This suggests that Amgen's operating income may not be as robust in meeting its interest payments, especially as compared to its sector peers. Their Interest coverage ratios have also been consistently declining, from 8.09 to 3.73, which signals a deteriorating financial health and poorer financial ability to service its debt obligations.

From the two ratios, we can conclude that Amgen has a poor solvency state. It has an increasing debt-to-equity ratio and a decreasing interest coverage ratio, both of which consistently underperform greatly when compared to the sector averages. This raises many concerns about their financial health and their ability to service their long-term loans. Consequently, we evaluate their solvency to a **poor** rating.

4.2.3. Profitability of Firm

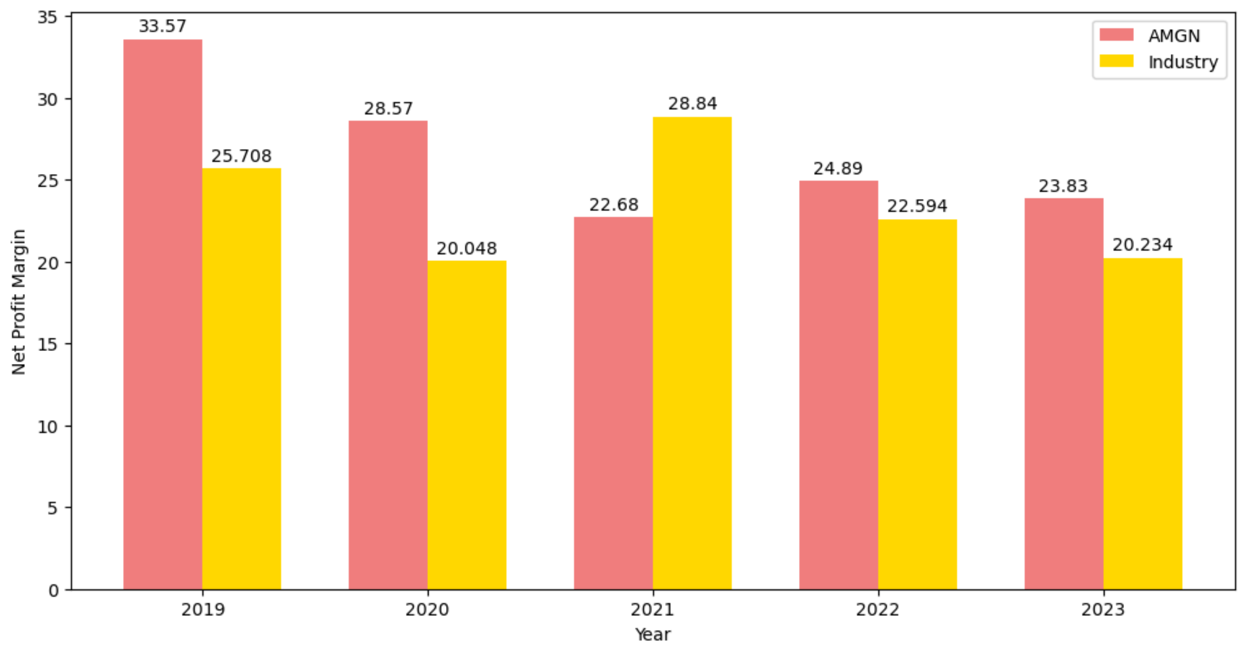

Fig 4.2.3.1 Barchart of Amgen's Net Profit Margin (%) against the Industry Average

Amgen's **Net Profit Margin (%)** over the last five years range from 22.68 to 33.57. Amgen has consistently outperformed the industry average and has enjoyed higher margins than its peers every year except in 2021. However, there is an obvious downtrend in the profit margins of Amgen from 2019 to 2023, with a slide from 33.57 to 23.83. This may suggest that there are potential challenges or increasing competition in the market, which may still negatively impact Amgen's margins in the upcoming years.

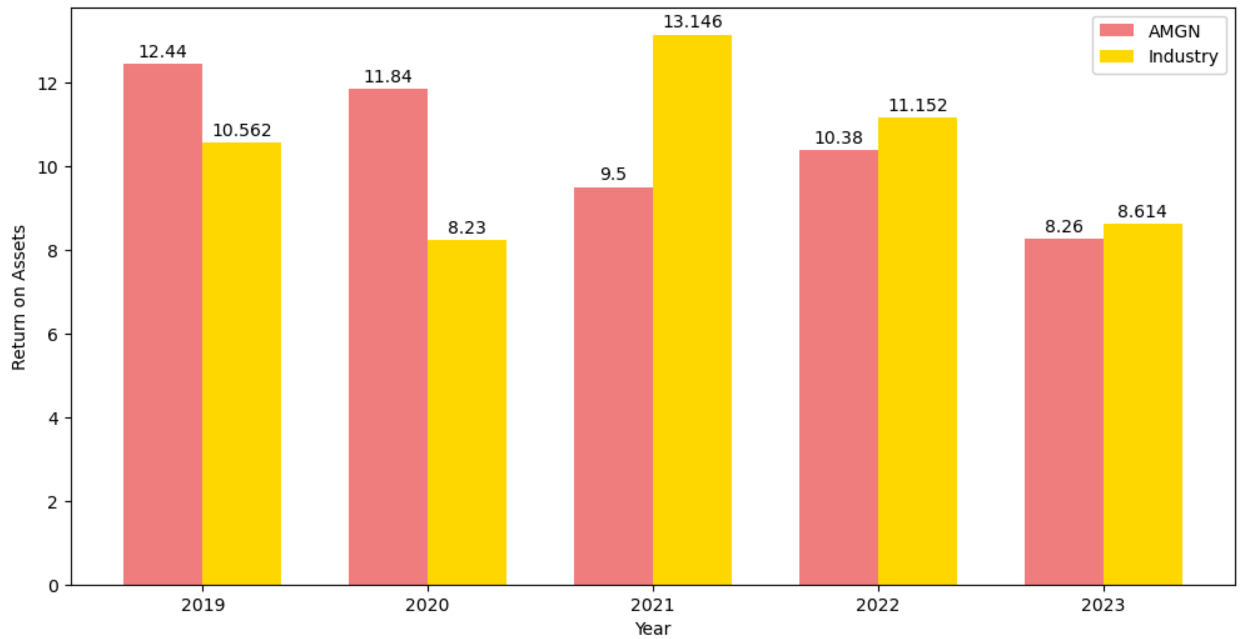

Fig 4.2.3.2 Barchart of Amgen's Return on Assets (%) against the Industry Average

Amgen's **Return on Assets (%)** ranges from 8.26 to 12.44 in the past few years. They outperformed industry averages in 2019 and 2020 but have since seen a downtrend and underperformed. The downtrend is in line with the sector averages, suggesting that Amgen is also facing headwinds in utilising assets efficiently as with their peers. However, Amgen has also consistently underperformed in this aspect, indicating that Amgen may have weaker operational strategies or investment decisions, which directly results in a lower ROA and profitability for the company.

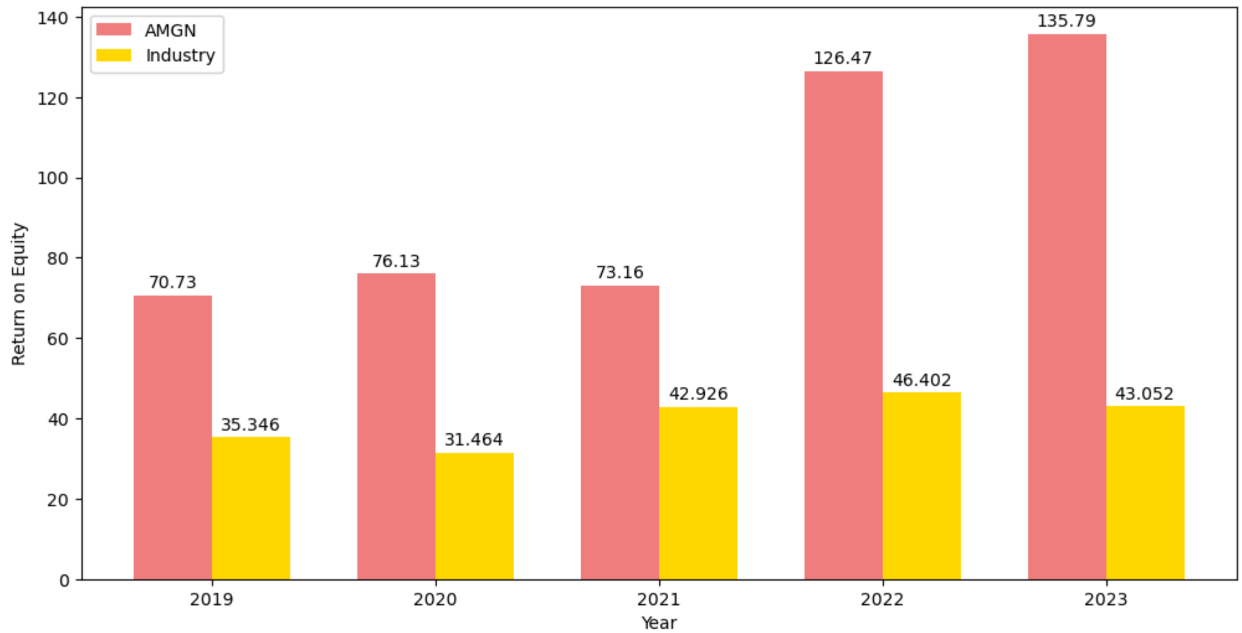

Fig 4.2.3.3 Barchart of Amgen's Return on Equity (%) against the Industry Average

Amgen's **Return on Equity (%)** ranges from 70.73 to 135.79 over the past few years, which is consistently higher than the industry average. There has also been an increasing trend, especially from the year 2021 to 2022, where Amgen's ROE sharply increased from 73.16 to 126.47. On the surface, this seems like Amgen is greatly outperforming its peers when utilising equity for profit margins.

However, this could be attributed to the high debt financing that Amgen has. It is evident that Amgen heavily relies on debt financing for its business operations, as per the high Debt-to-Equity ratio and relevant analysis above. Hence, this abnormally high ROE is not entirely attributed to Amgen's efficiency.

To conclude, Amgen's ROE and Profit Margins have consistently outperformed the industry, while ROA has been slightly below the industry norm. However, the ROE value is likely inflated, and the ROA and Profit Margins are all experiencing a downtrend concerning the last 3 years. Therefore, we evaluate Amgen's profitability to be **moderate**.

4.2.4. Efficiency of Firm

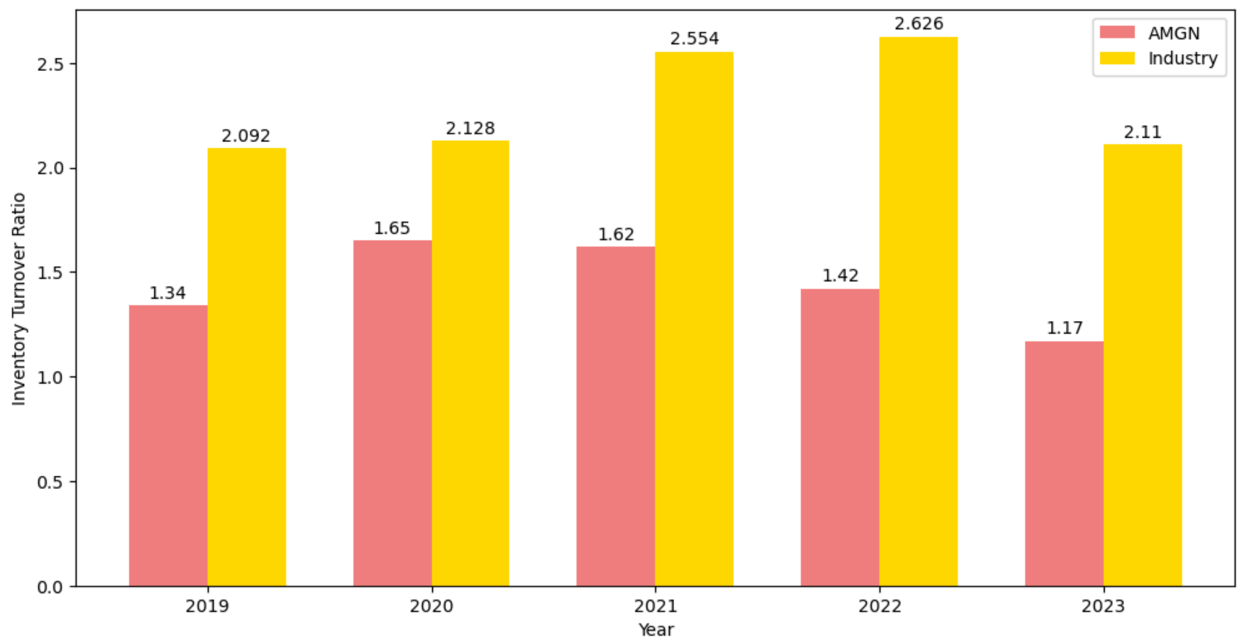

Fig 4.2.4.1 Barchart of Amgen's Inventory Turnover Ratio against the Industry Average

Amgen's **Inventory Turnover Ratio** ranges from about 1.17 to 1.65. Across the past 5 years, Amgen's Inventory Turnover Ratio has consistently lagged the industry average by a large margin. This means that Amgen is not selling its inventory as fast as its peers are. There is also a strong downward trend from 2020 to 2023, indicating that the Inventory Turnover ratio is unlikely to improve to the sector average in the near future. This implies that Amgen potentially has weaker sales than its counterparts, or has a weak and ineffective business management/strategy. Therefore, we rate Amgen's efficiency to be **poor.**

4.2.5. Growth and Outlook of Firm

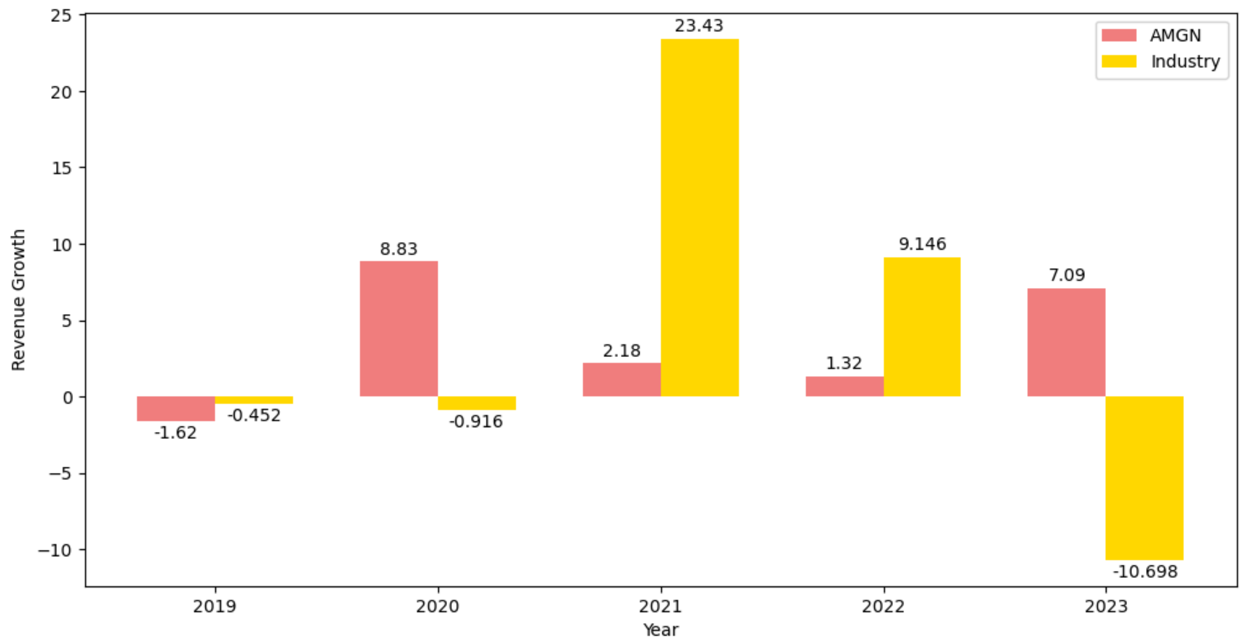

Fig 4.2.5.1 Barchart of Amgen's Revenue Growth (%) against the Industry Average

The **Revenue Growth (%)** of Amgen ranges from -1.62% to about 8.83%. It is erratic and independent of industry averages, as Amgen focuses more on biologic drugs, and has negligible efforts against the Covid-19 disease, which many pharmaceutical firms benefited from in 2021 and 2022. Their revenue growth is likely attributed to the organic growth of their drugs that resolve other illnesses. As we can observe, their revenues only increased marginally in 2021 and 2022, possibly due to the pandemic's disruption. However, the years right outside the pandemic, 2020 and 2023, both show Amgen experiencing a high period of growth, which outperforms the market greatly.

This trend of outperforming the market outside the COVID-19 hit years shows that Amgen is a strong growing company. Even when the pharmaceutical sector took a hit in 2023, Amgen still grew strongly at about 7.09%. Therefore, we evaluate Amgen's growth and outlook to be positive and give it a **good** rating.

4.3. Pfizer (PPE)

4.3.1. Ability to access Liquidity

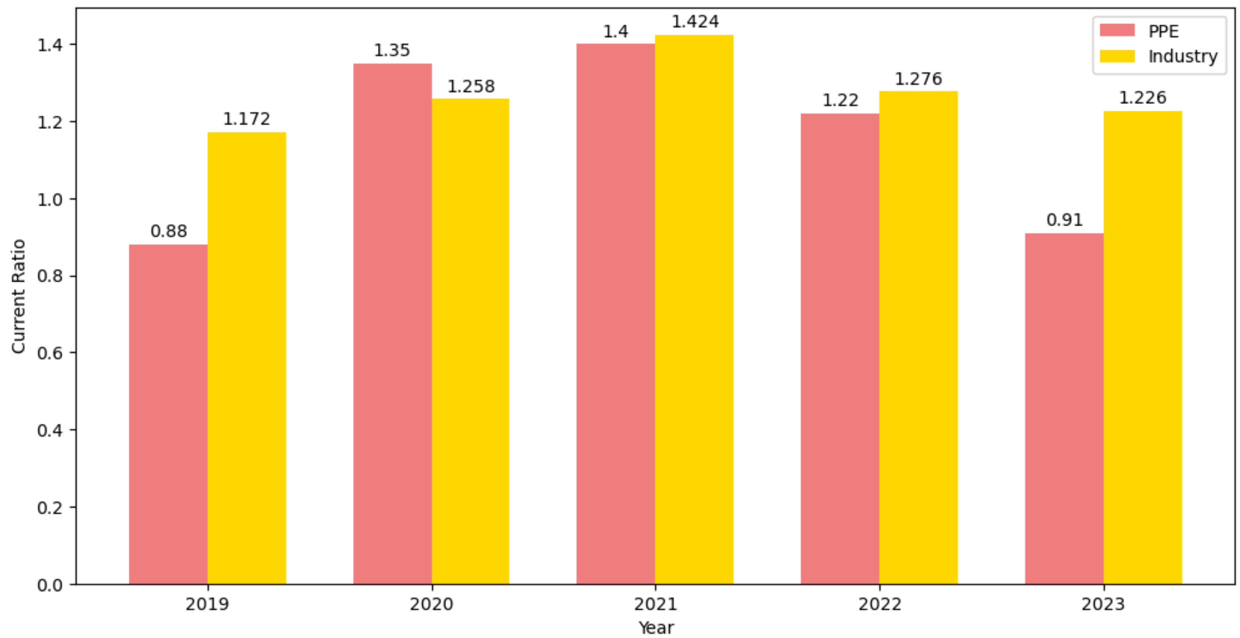

Fig 4.3.1.1 Barchart of Pfizer's Current Ratio against the Industry Average

The **Current Ratio** of Pfizer ranges from 0.8 to 1.4 across the five years, with a lowest of 0.88 in 2019 and a highest of 1.4 in 2021. The current ratio of Pfizer consistently underperforms the industry averages, with the only exception in 2020 where it outperformed the sector average marginally. Ever since 2021, there has been an obvious stark decrease in the year-on-year current ratios, from 1.4 to 0.91, which is lower than the general guideline of 1.00. This is likely due to the Covid-19 boom, where Pfizer vaccines were sold globally to curb the pandemic. However, since the waning of the pandemic, Pfizer has yet to show improvement on its balance sheet, with a worsening current ratio. This suggests that the company may have some difficulty with using assets to meet its short-term financial obligations, even with accounting for its inventory value.

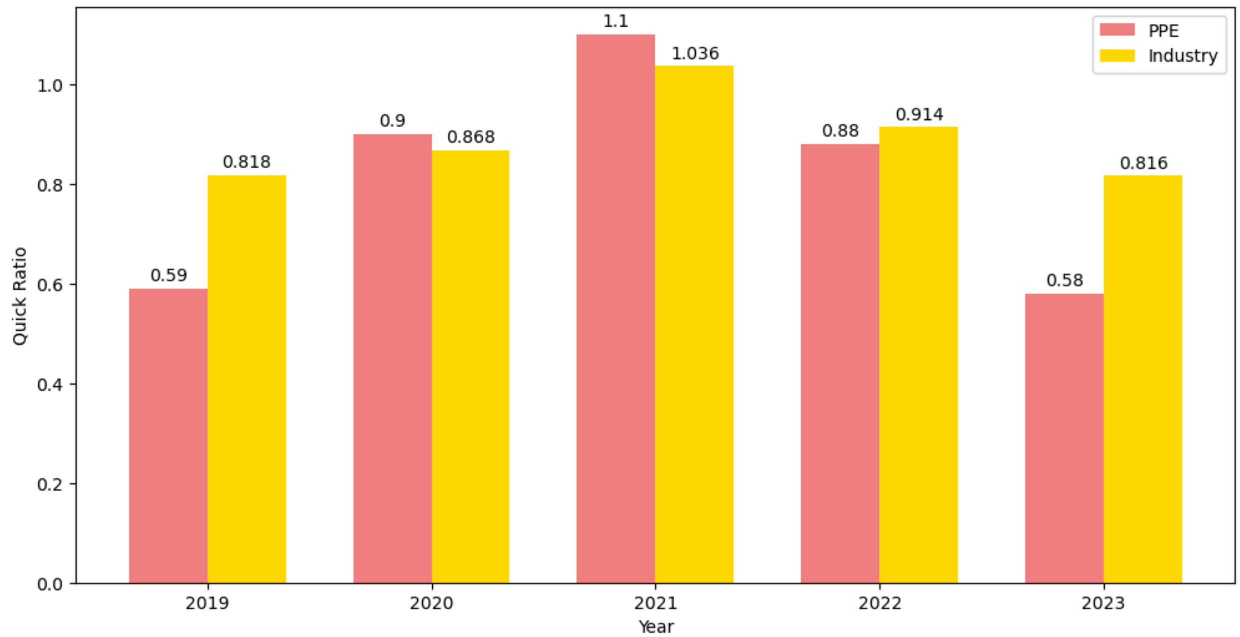

Fig 4.3.1.2 Barchart of Pfizer's Quick Ratio against the Industry Average

The **Quick Ratio** of Pfizer ranges from 0.58 to 1.1 across the past five years, with the lowest of 0.58 in 2023 and the highest in 2021. Similar to the current ratio, Pfizer's quick ratio peaked in 2021, possibly due to the COVID-19 pandemic. Ever since then, it has steadily declined to about 0.58 recently. This is under the general guideline of 1.2. Moreover, Pfizer's quick ratios are also worse than their sector averages, with the most stark one being 0.58 in 2023 as compared to the industry average of 0.816. This indicates that the firm will face some difficulties in paying its short-term liabilities today

In conclusion, Pfizer's Quick and Current Ratio consistently performs either equal or worse than the sector averages. It is also particularly worrying that there has been a stark drop in both their current and quick ratios in recent times, ever since the COVID-19 outbreak. Their averages are also below the general guideline of 1.00 and 1.20. Therefore, we conclude that Pfizer may have some difficulty with its liquidity issues, and we give them a **poor** rating.

4.3.2. Solvency of Firm

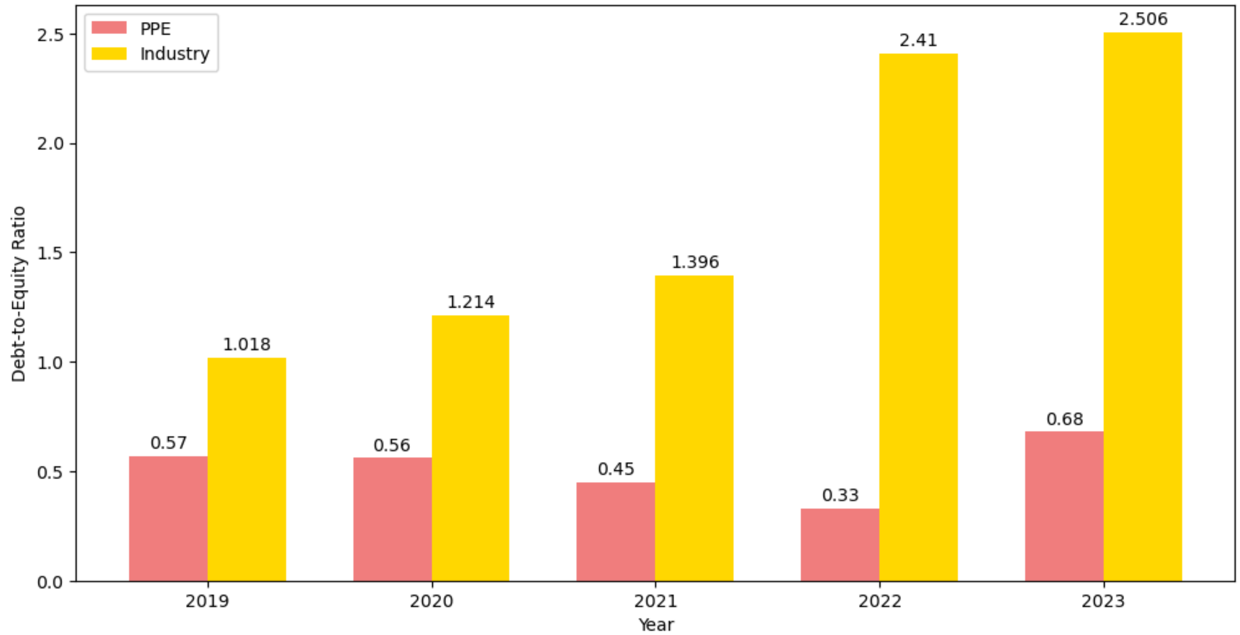

Fig 4.3.2.1 Barchart of Pfizer's Debt-to-Equity Ratio against the Industry Average

Pfizer has a low **Debt-to-Equity Ratio**, ranging from 0.33 to 0.68. Their Debt-to-Equity ratio has been consistent around the past 5 years, bouncing around the 0.50 figure. Their ratio is also consistently lower than the recommended 2.0, and they outperform the sector averages greatly. This shows that Pfizer does not rely as much on debt financing, which is a more financially stable business approach. They have sufficient equity to cover their debt obligations and are not overly financially leveraged.

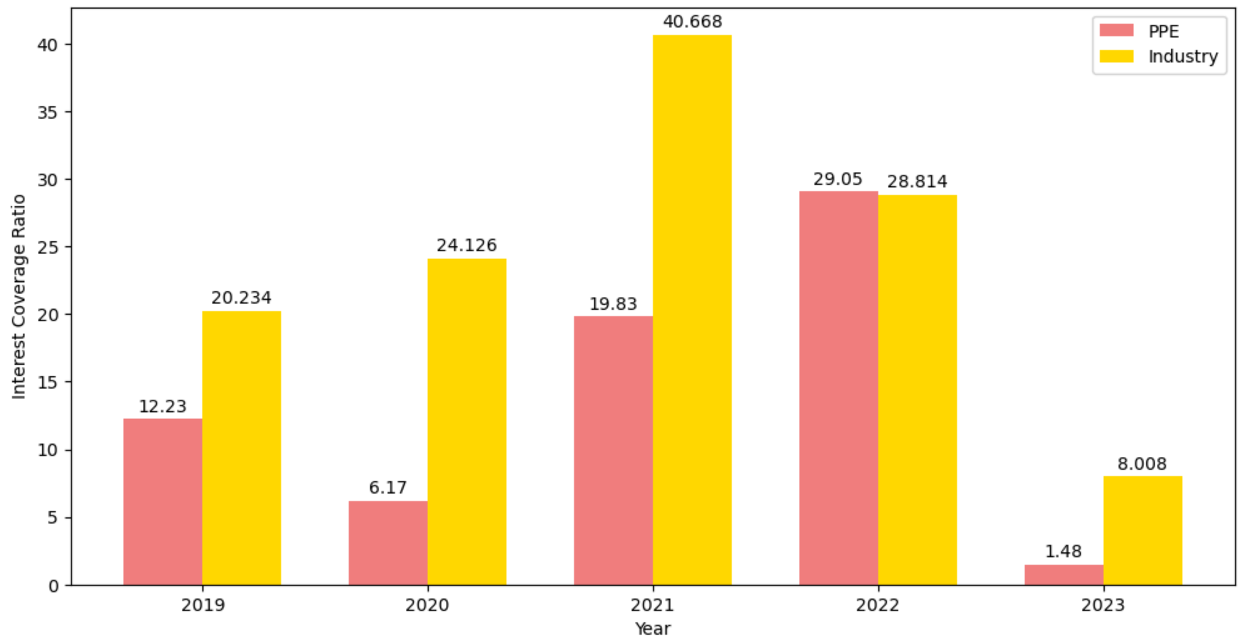

Fig 4.3.2.2 Barchart of Pfizer's Interest Coverage Ratio against the Industry Average

Pfizer's **Interest Coverage Ratio** has ranged from 1.4 to about 29.05 over the last few years. They are consistently above the recommended 1.5 value but underperform as compared to their peers. Their Interest coverage ratio fluctuates greatly, from 29.05 in 2022 to 1.48 in 2023. As interest expenses remained relatively constant, it could be due to a decline in their operating income. In this aspect, Pfizer may face some difficulties if it were to pay off its interest coverage using operating income alone.

Overall, Pfizer's solvency is considered stable, especially when compared to its industry peers. Although Pfizer has below-average Interest coverage, they do have a very healthy Debt-to-Equity ratio, meaning that the firm is more than capable of paying off its debt using its equities. It is a relatively safe position to operate from, and Pfizer is considered solvent with its well-performing Debt to Equity ratio. Therefore, we rate the solvency of Pfizer to be **good.**

4.3.3. Profitability of Firm

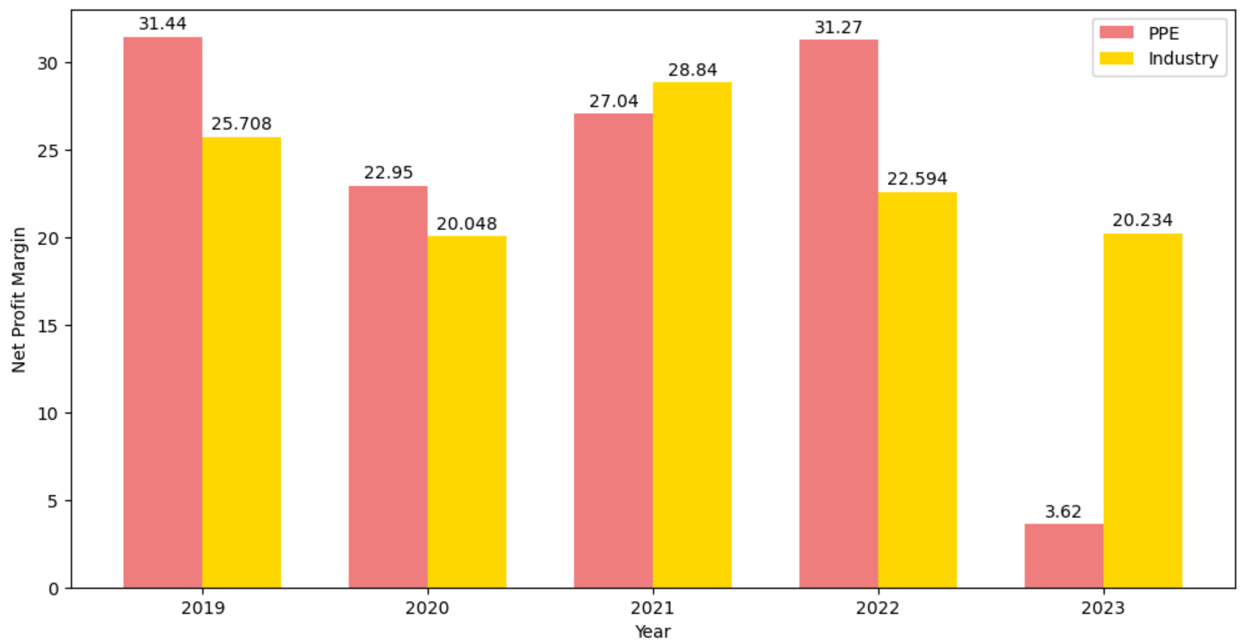

Fig 4.3.3.1 Barchart of Pfizer's Net Profit Margin (%) against the Industry Average

Pfizer's **Net Profit Margin (%)** ranges from 3.62 to 31.44. Over the past 5 years, Pfizer managed to outperform/maintain close to the sector average, except for 2023. From 2022 to 2023, there is a sharp decline in the profit margin from 31.27 to 3.62. From our research, this can be attributed to the downturn from Pfizer's COVID-19 vaccine, as well as the lacklustre clinical trials, which we will cover in the qualitative assessment. These factors caused a sharp drop in Pfizer's total revenue, which led to a low-profit margin for the year 2023. As such, the recent drop in Net Profit Margin signals that Pfizer may have some difficulties with its profitability, despite its good track record.

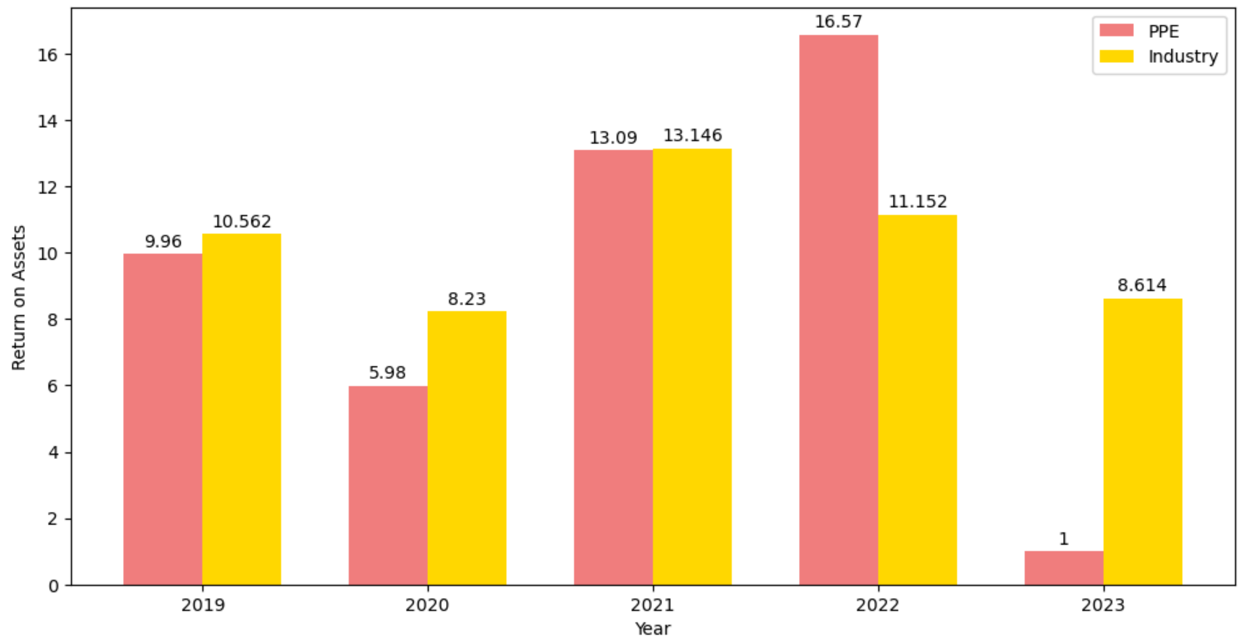

Fig 4.3.3.2 Barchart of Pfizer's Return on Assets (%) against the Industry Average

Pfizer's **Return on Assets (%)** ranges from 1.00 to 16.57. Over the past 5 years, Pfizer has consistently outperformed/maintained close to the sector average. However, similar to the Net Profit Margin, the ROA has dropped significantly from 16.57 in 2022 to 1.00 in 2023. Pfizer is likely facing new challenges in their field and currently, resulting in a lower return per asset.

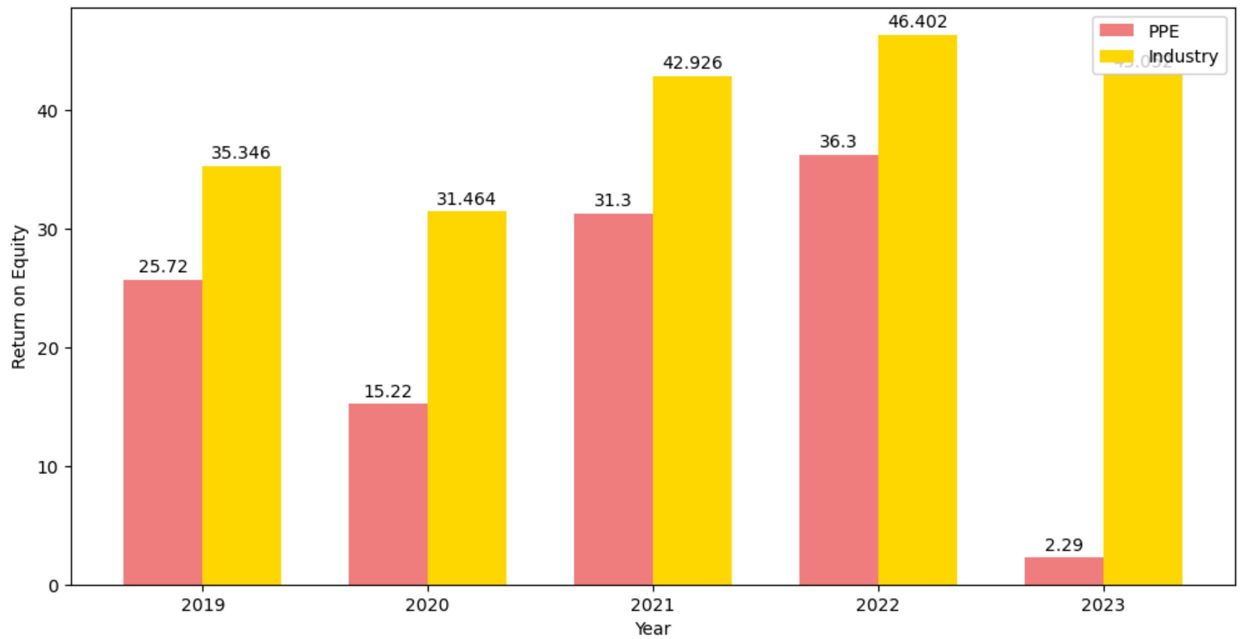

Fig 4.3.3.3 Barchart of Amgen's Return on Equity (%) against the Industry Average

Pfizer’s **Return on Equity (%)** ranges from 2.29 to 36.3 over the past 5 years. Their ROE has consistently underperformed the market, with the most recent ROE being the worst at 2.29 against the industry norm of about 45. This signals that Pfizer’s business is not running an optimal strategy to maximise returns for the equity they have on hand.

For Pfizer, although their ROA and Net Profit Margin have seen historic success against the sector averages, they have all collapsed recently alongside ROE. Their profit measured against returns and equities they have on hand is simply underperforming other competitors greatly. This indicates that they are not very good at generating income with their business practices, as such, we evaluate their profitability rating to be **poor.**

4.3.4. Efficiency of Firm

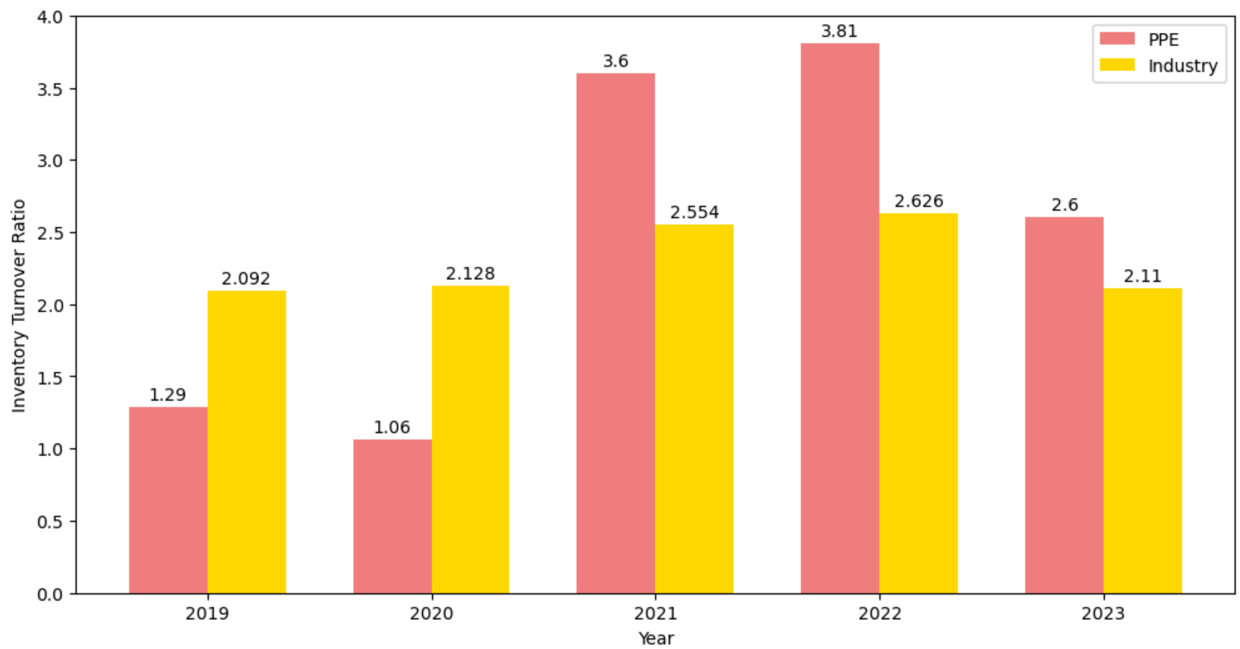

Fig 4.3.4.1 Barchart of Pfizer's Inventory Turnover Ratio against the Industry Average

Pfizer’s **Inventory Turnover Ratio** ranges from 1.06 to 3.81 over the past 5 years and has consistently outperformed the industry average. It follows the same trend as the industry, rising steadily till dropping slightly in 2023. A higher inventory ratio means that Pfizer is selling its inventory relatively quickly, which often signifies a strong sales performance and efficient business management strategies. This suggests that Pfizer has a more logical and efficient business process in this industry, which is often a positive sign. Hence, we rate the efficiency of Pfizer to be **good.**

4.3.5. Growth and Outlook of Firm

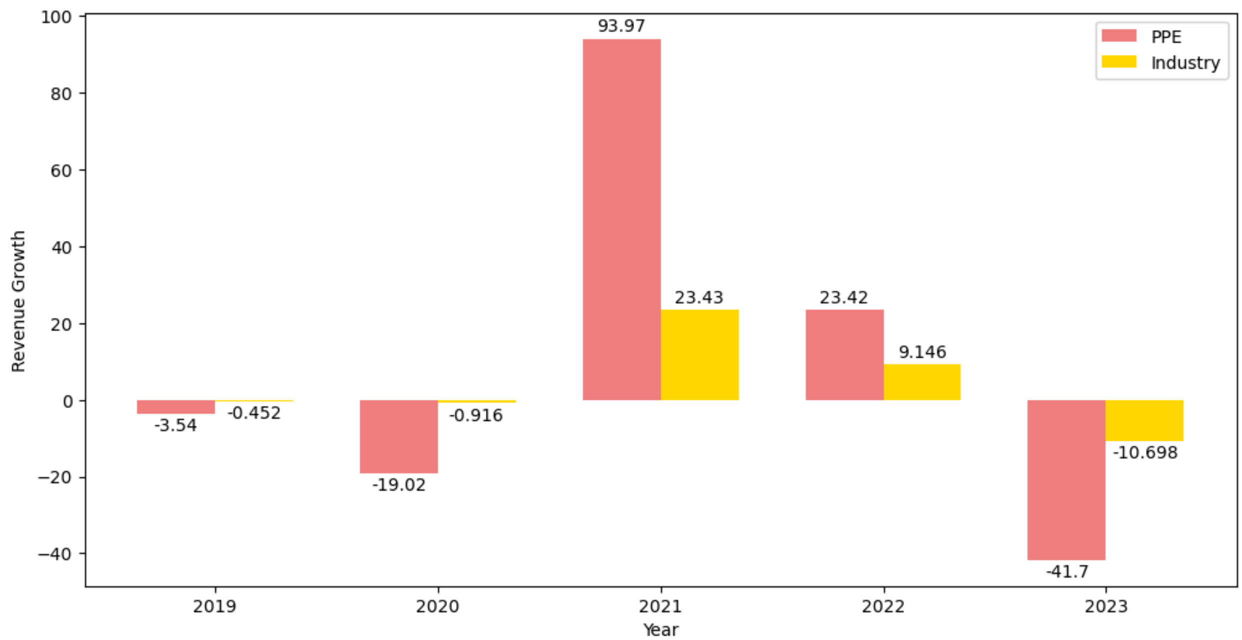

Fig 4.3.5.1 Barchart of Pfizer's Revenue Growth (%) against the Industry Average

The **revenue growth (%)** of Pfizer ranges from -41.7% to 93.97% in the past 5 years. This large discrepancy is attributed to the COVID-19 pandemic, where Pfizer's vaccine was incorporated internationally as a form of prevention against the deadly virus. As a result, their revenues almost doubled in 2021 and improved steadily in 2022. However, as the world moves on from this pandemic, Pfizer's vaccines are no longer in demand, resulting in a large drop in revenue of about -41.7%.

However, if we take into account the abnormal growth experienced in 2021 due to the pandemic, we can see that Pfizer's revenue has grown about 40% since 2021, as compared to about 20% for the industry average. This preliminary calculation shows that Pfizer has likely experienced some sort of organic revenue growth, independent of its Covid-19 vaccines. Therefore, we evaluate Pfizer's revenue growth to be of a **moderate** rating.

4.4. Merck & Co. (MRK)

4.4.1. Ability to access Liquidity

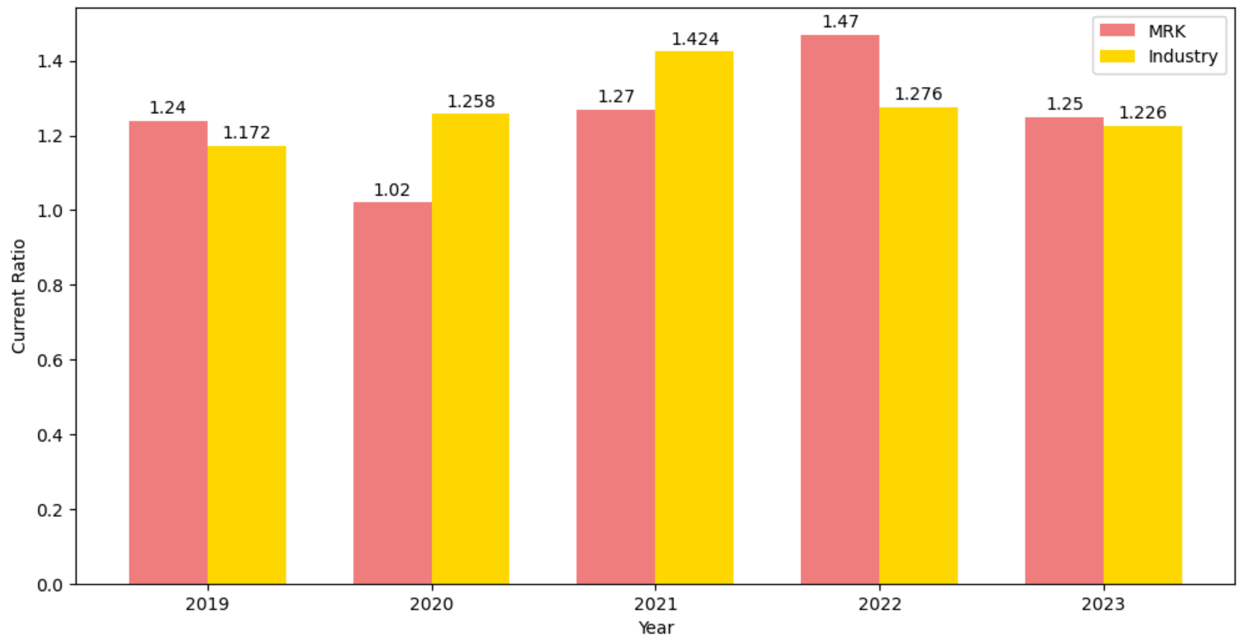

Fig 4.4.1.1 Barchart of Merck's Current Ratio against the Industry Average

The **Current Ratio** of MRK ranges from 1.0 to 1.5 across the five years, with a lowest of 1.02 in 2020 and a highest of 1.47 in 2022. The remaining years average a current ratio of around 1.25. Its current ratio is approximately around that of the industry average's current ratio. In the years 2019 and 2021, it underperforms slightly as compared to the industry average, whereas it outperforms marginally in the remaining three years. Throughout all five years, it maintained a current ratio of more than 1.00, which suggests that the company has sufficient assets to meet its short-term financial obligations. This indicates that the company's assets have higher liquidity and thus lower credit risk in the short term.

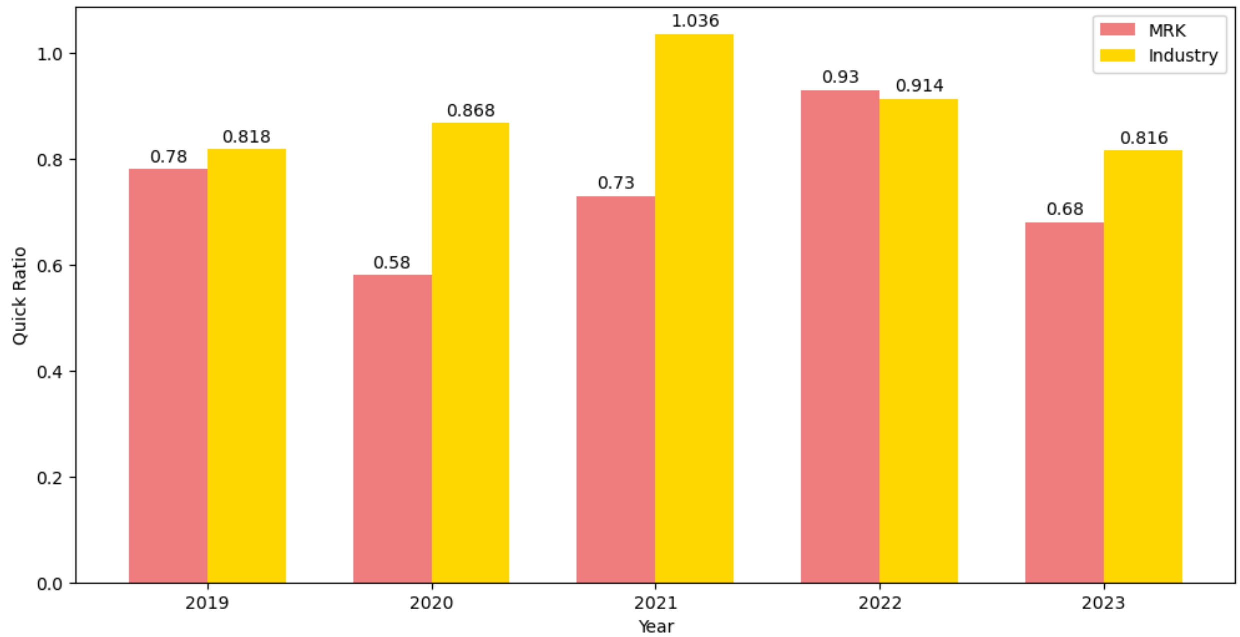

Fig 4.4.1.2 Barchart of Merck's Quick Ratio against the Industry Average

The **Quick Ratio** of MRK ranges from 0.58 to 0.93 between 2019 and 2023, with a low of 0.58 in 2020 and a high of 0.93 in 2022. The remaining years averaged out to be 0.73. Its quick ratio is below that of the industry average for all years, except 2022. This indicates that the company struggles to meet its short-term financial obligations without relying on selling its inventory compared to its competitors. Moreover, its ratio remained under the general guideline of 1.2 throughout all five years, indicating that the company faces challenges in meeting its short-term obligations, even more so with the restriction of only its most liquid assets. Hence, this suggests that the company has a higher credit risk when concerning its quick ratio.

Overall, the company can meet its short-term obligations well, but not when the inventory is removed. Hence, its stricter definitions of liquid assets would mean that the company would have inadequate liquid assets to meet its short-term obligations, which is a cause of concern for the company. This causes lower investor confidence, higher credit risk and poorer financial health. Thus we will assign Merck’s ability to access liquidity as **poor**.

4.4.2. Solvency of Firm

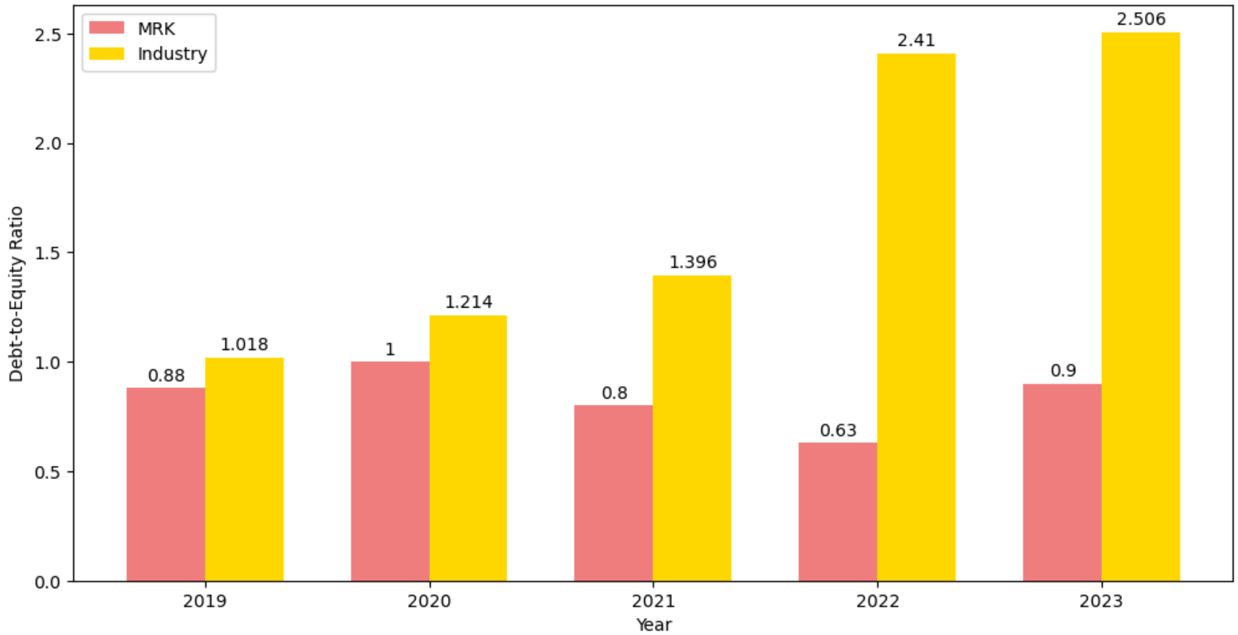

Fig 4.4.2.1 Barchart of Merck's Debt-to-Equity Ratio against the Industry Average

The **Debt-to-Equity Ratio** fluctuates between the values of 0.63 and 1.0 through the five years of 2019 to 2023. The debt-to-equity ratio is the highest in the year 2020, with a ratio of 1.0, and lowest in 2022 with a ratio of 0.63. Its highest debt-to-equity ratio of 1.0 indicates $1.00 of total debt for every $1.00 of shareholders' equity. Across the five years, its ratio remains below the industry average, and is increasingly below the industry average, indicating a positive financial health for the company.

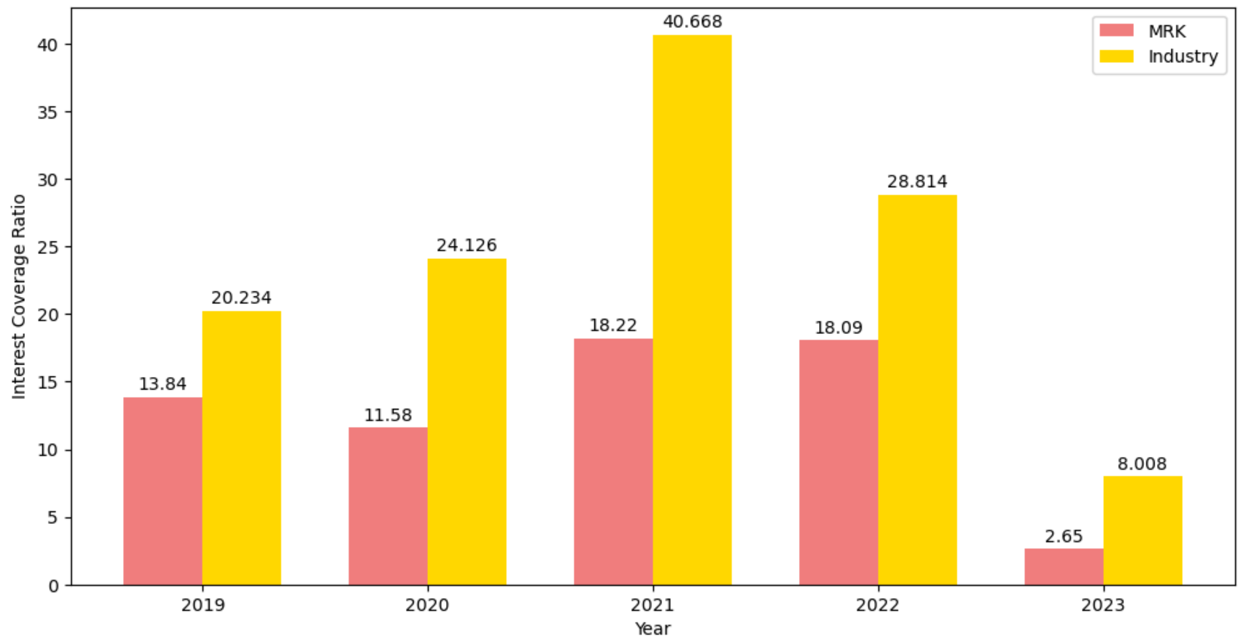

Fig 4.4.2.2 Barchart of Merck's Interest Coverage Ratio against the Industry Average

The **Interest Coverage Ratio** ranges between 2.65 and 18.22 over the five years. From the years 2019 to 2022, MRK maintained an interest coverage ratio of > 11, higher than the consensus of 1.5 as indicated in **2.1.2 Interest Coverage Ratio**. An interest coverage ratio of > 11 indicates that it can easily pay interest on its outstanding debt. However, the interest coverage ratio of MRK remains below our calculated industry average across all five years. Nonetheless, there is a general increase over the four-year period, illustrating an improvement in the companies' financial health. However, there was a significant drop in the ratio in the year 2023, falling to a value of 2.65. This is likely due to the recovery of the financial market from the COVID-19 pandemic. An article by FiercePharma has reported that the fall in sales between 2022 and 2023 was drastic, from 866 million to 271 million, and Merck's official statement has cited the decline in on-demand COVID-19-related products as the reason (Dunleavy, 2024). Regardless, Merck's CEO remains confident in returning to growth in the 2024 fiscal year (Pharmaceutical Technology, 2024).

Hence, in terms of the solvency of the firm, Merck outperforms our calculated industry average of the five years in terms of debt-to-equity ratio, while underperforming for interest coverage ratio. Overall, while its interest coverage ratio does not outperform our industry average, it still retains a rather high value over the years, indicating that the company still maintains positive financial health. The company maintains a long-term viability and ability to meet its long-term financial obligations. Thus, we will assign Merck's solvency a **moderate** rating.

4.4.3. Profitability of Firm

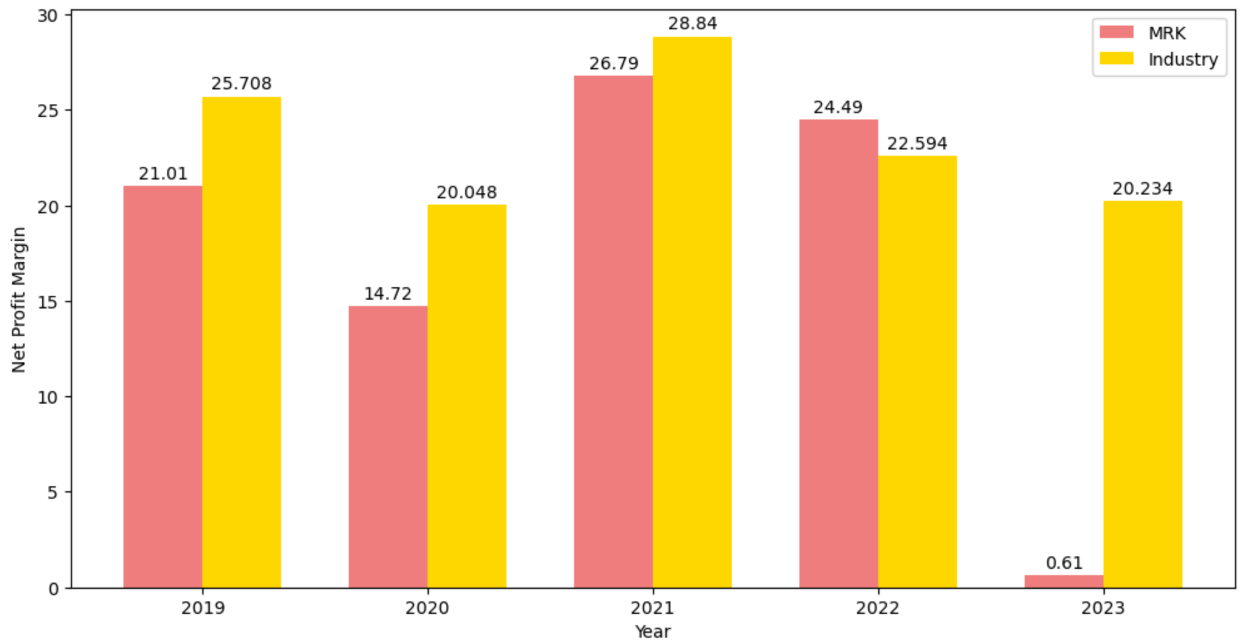

Fig 4.4.3.3 Barchart of Merck's Net Profit Margin (%) against the Industry Average

The **Net Profit Margin (%)** of MRK has a wide range of 0.61% to 26.79%, with a low of 0.61% in 2023 and a high of 26.79% in 2021. From 2019 to 2020, the net profit margin fell from 21.01% to 14.72%, but quickly spiked to 26.79% in 2021, fell slightly to 24.49% in 2022 and decreased sharply to 0.61% in 2023. The sharp spike observed between 2020 and 2021 could be attributed to the COVID-19 pandemic. During this period, vaccines and related products were being researched and manufactured rapidly to combat the pandemic, especially for pharmaceutical companies like MRK. As such, it can be explained that the rise in profit could be attributed to the pandemic. As explained in the fundamental analysis of the interest coverage ratio in **2.2.4.2 Solvency of Firm**, there was a sharp drop in sales and thus profit of Merck as a result of the decline in demand for COVID-19-related products. In the year leading up to the pandemic, Merck performed well, with a net profit margin of 21.01%, considered high by consensus, indicating great profitability and low credit risk. The fall between 2019 and 2020 was likely due to the impact of the COVID-19 pandemic. In 2020, when COVID-19 became a pandemic, the net profit margin suffered a little, but was considered to have performed an average of > 10%. In the years 2021 and 2022, production, manufacturing and distribution of COVID-19-related products spiked, causing a high net profit margin of > 24% in both years. The year 2023 has a very low-profit margin of 0.61%. The net profit margin largely remained lower than the industrial average, except for the year 2022. Nonetheless, with an exception to the year 2023, MRK had high net profit margins, indicating high profitability and thus reducing credit risks.

Fig 4.4.3.2 Barchart of Merck's Return on Assets (%) against the Industry Average

The **Return on Assets (%)** of MRK varies between 0.34% and 13.52%, with a low of 0.34% in 2023 and a high of 13.52% in 2022. The ROA of Merck follows a similar trend as that of the net profit margin. Pre-COVID-19, it started at 11.79% in 2019, dropping to 8.03% in 2020, before rising to 13.23% in 2021, hitting 13.52% in 2022 before falling to 0.34% in 2023. The explanation for the trend would be similar to the net profit margin, the initial drop between 2019 and 2020 was due to the unexpected impact of the COVID-19 pandemic, the sudden increase from 2020 to 2021 was likely due to the COVID-19-related products being researched, and manufactured, whereas the sharp decline was due to the net income generated as a result of the decline in demand for COVID-19-related products. Hence, before the year 2023, Merck was generally slightly above the industrial average ROA, indicating that its ROA was on par with the industrial average. As such, this further indicates that MRK has sufficient asset management and profitability, able to generate an adequate amount of income from its assets, hence reducing credit risks and bolstering the investors' confidence in the company.

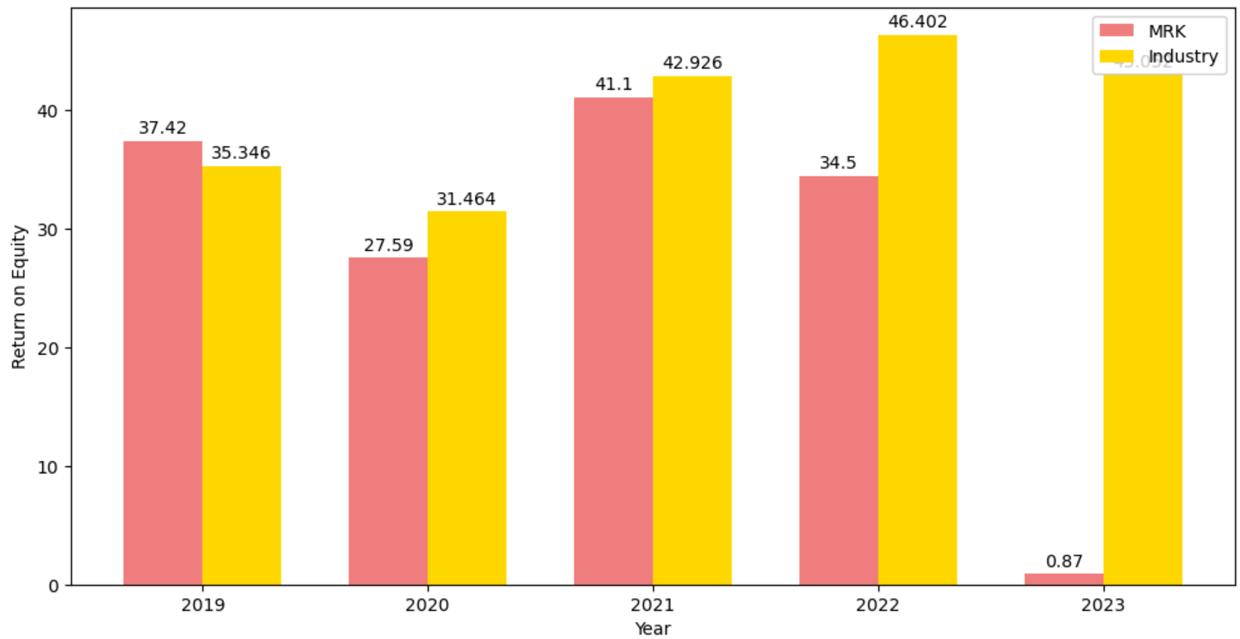

Fig 4.4.3.3 Barchart of Merck's Return on Equity (%) against the Industry Average

The **Return on Equities (%)** of MRK ranged from 0.87% to 41.1%, with a low of 0.87% in 2023 and a high of 41.1% in 2022. The ROE, like the other two metrics under the profitability of the firm, follows a similar trend, starting at 473742% in 2019, and dropping to 27.59% in 2020, before rising sharply to 41.1% in 2021, falling again to 34.5% in 2022 and sharply declining to 0.87% in 2023. As the formulae for ROE are similar to that of ROA and net profit margin, all dependent on the net income generated by the firm, the explanation for the trends observed follows the above. The drop between 2019 and 2020 is attributable to the unexpected impact of the COVID-19 pandemic, and the increase in ROE from 2020 to 2021 due to the research, manufacturing and production of COVID-19-related products, the drop between 2022 and 2023 is attributable to the decline in demand for COVID-19-related products. Hence, prior to the year 2023, Merck performed consistently greater than 27% in ROE, indicating high profitability and efficiency in utilising shareholders' equity in generating profits. However, it is worth noting that it fluctuates around the industrial average ROE, with some years being below and others being above. Nonetheless, before 2023, Merck does have high profitability and displays efficiency in generating profits from shareholders' equity, suggesting a lower credit risk.

Overall, the profitability ratios of Merck indicate that Merck can generate profits in relation to its revenue, assets, and equity. Except for the year 2023, Merck's profitability ratio indicates low credit risk, boosting investors' confidence in the firm. With consideration of the year 2023, Merck is likely capable of recovering from the aftereffects of the COVID-19 pandemic, returning to profitability similar to the year 2019 before the pandemic hit. Hence, we can conclude that even with the sudden drop across the three profitability ratios in the year 2023, Merck has a standard credit risk in this aspect. Thus we will assign Merck a rating of **moderate** for its profitability.

4.4.4. Efficiency of Firm

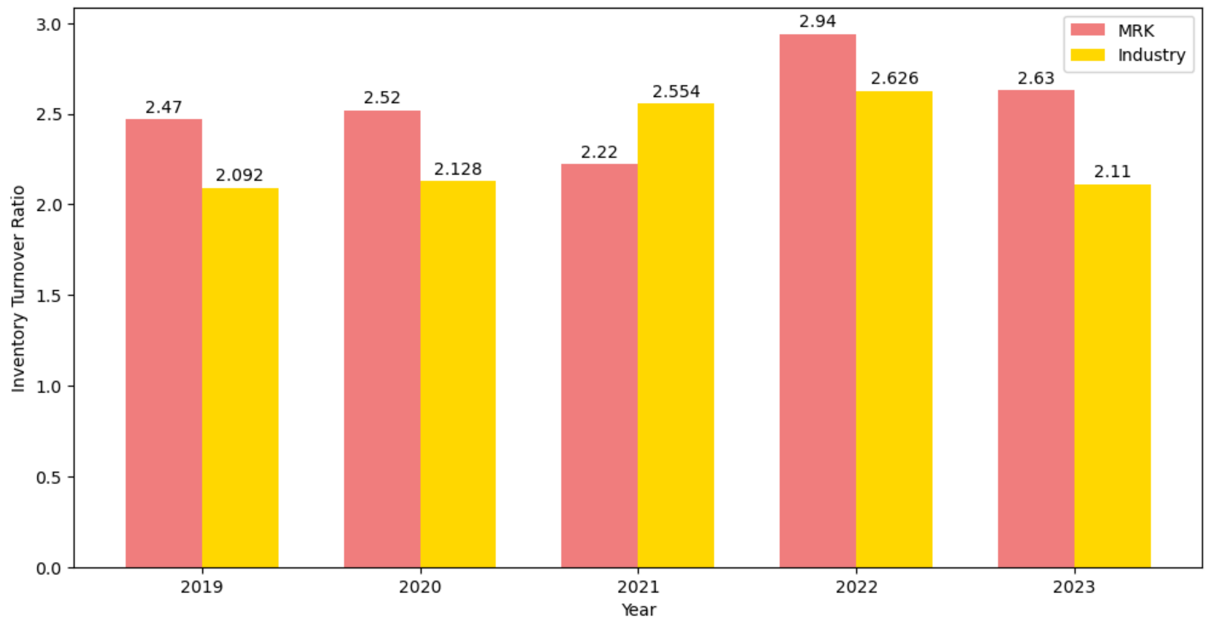

Fig 4.4.4.1 Barchart of Merck's Inventory Turnover Ratio against the Industry Average

The **Inventory Turnover Ratio** of MRK ranged from 2.22 to 2.94, with a low inventory turnover ratio of 2.22 in 2021 and a high of 2.94 in 2022. In 2019, it had an inventory turnover ratio of 2.47, increasing marginally to 2.52 in 2020, before dropping to 2.22 in 2021 and spiking in 2022 to 2.94 before falling to 2.63 in 2023. It has remained above the industrial average in all years except 2021, where it is slightly lower. As the inventory turnover ratio does not fluctuate greatly and remains around the industrial average, it indicates that the firm can effectively use its assets, showing moderate operational efficiency and inventory management practices. It can sell its inventory quickly, showing a demand for the company's products before, during and after the COVID-19 pandemic. This further suggests that it has a low inventory holding cost and is thus less likely to face liquidity issues, indicating a lower credit risk.

Hence, Merck's efficiency is on par with the industry in its inventory turnover ratio, showing that it is slightly more efficient than its competitors, thereby reducing its credit risk. Thus, we will assign Merck's efficiency a **good** rating.

4.4.5. Growth and Outlook of Firm

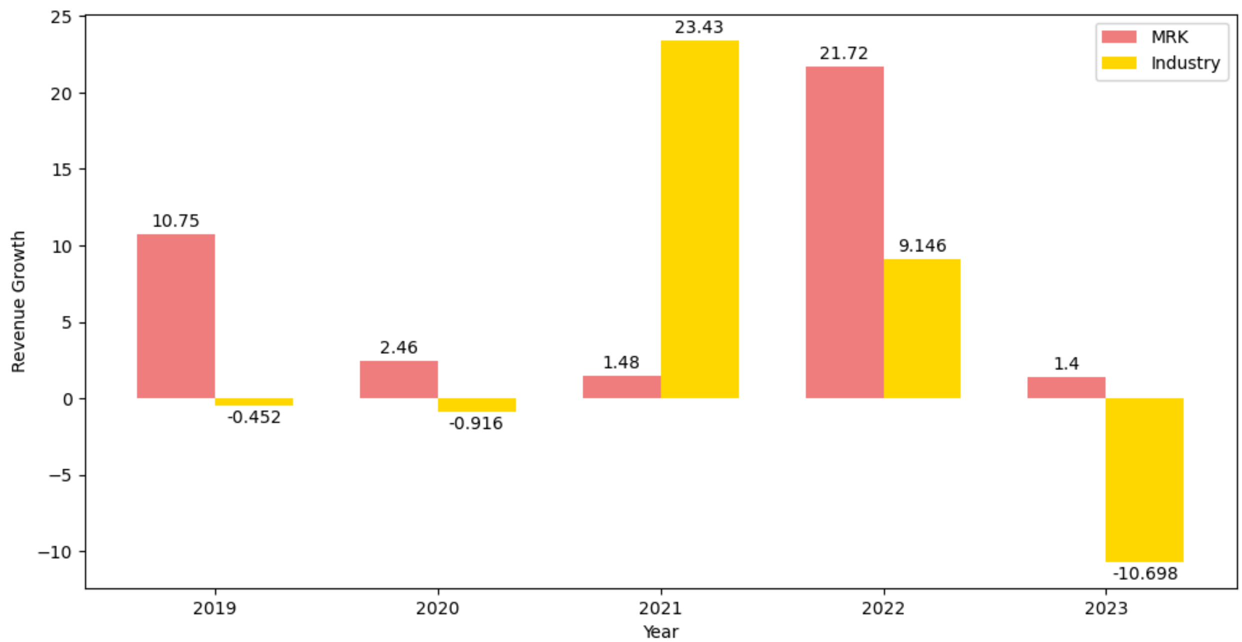

Fig 4.4.5.1 Barchart of Merck's Revenue Growth (%) against the Industry Average

The **Revenue Growth (%)** of MRK ranged from 1.4% to 21.72%, with the lowest revenue at 1.4% in 2023 and the highest at 21.7% in 2022. In 2019, it had a 10.75% revenue growth, before the growth fell to 2.46% in 202, and even further to 1.48% in 2021, before spiking to 21.72% in 2022 and down to 1.4% in 2023. Its revenue growth is higher than the industrial average in all years except 2023. This indicates that the company can expand its business and generate higher income over time. Its positive revenue growth suggests that the company remains successful in capturing market demand for its products, further translating into higher cash flows. Hence, it suggests low credit risks and positive financial health.

Hence, the growth and outlook of Merck, represented by the revenue growth, indicates that the company generates more revenue than its competitors, thereby lowering credit risk. Hence we will assign its growth and outlook a **good** rating.

5. Qualitative Assessment

5.1. Introduction and Overview

Building upon the 4C framework mentioned in the Quantitative Assessment, we will focus more on the Character factor. The character factor broadly encompasses the quality of the management, competitive strategy and track record of the company. This factor complements the Quantitative Assessment by offering a differing perspective, thereby ensuring a holistic credit risk assessment of the firms.

As shown in the Quantitative Assessment, all firms are safe and large multinational companies with a healthy balance sheet. As such, there is a lesser focus on the Covenant factor, which refers to a provision in a bond indenture, as it is only more applicable to high-yield, riskier bonds.

To conduct a thorough and robust assessment, we will be evaluating the following categories.

A. Industry Outlook

The pharmaceutical industry outlook provides a context for the potential growth and risks associated with operating in this sector. It has a strong influence on the firm's profitability and stability. Firms operating in sunset industries often face declining demand, talent losses and lack of innovation, which eventually leads to decreasing profitability. This increases the credit risk of firms as they are more likely to default on debts and negatively affects their abilities to meet financial obligations in the future (Jayachandran, 2024).

As all the firms in this study operate in the pharmaceutical industry, we will evaluate the industry outlook in **5.2 Pharmaceutical Sector Outlook Analysis**.

B. Firm Fundamental Background and Competitive Strategy

This includes the firm's history, core business activities and business model. Understanding what drives the firm can help to assess the inherent stability and soundness of its business practices. For example, firms with a robust and sustainable business model are likely to generate healthy margins, leading to better financial health. Under the Fundamental Background, we will also evaluate the competitive strategy of a firm. This outlines how the firm will position itself in the market relative to its competitors and how it plans to sustain/grow its market share. We will evaluate the effectiveness and results of its various strategies, such as cost leadership or differentiation. A strong and effective competitive strategy can enhance a firm's profitability and market standing, resulting in lower credit risk.

C. Company Prospect of Generating Cash Flows

Cash flow generation is the process by which a firm produces cash from its operating, investing, and financing activities. This is a crucial metric as it indicates the financial health and operational efficiency of a business. This measures the firm's capacity to generate sustained and predictable cash flows can provide a buffer against financial distress, thereby impacting its credit risk rating. A higher prospect of generating cash flow in short, medium and long terms would improve the financial resilience of the firm, resulting in lower credit risk

D. Character of Firm and Track Record

This refers to the firm's reputation, management quality and corporate practices. Firms with strong leadership, fair and ethical business practices and transparent governance are likely to engage in less risky and sustainable practices, which leads to financial and overall stability. This is a vital factor to evaluate if the firms are in a position to navigate sudden challenges in the future. A more resilient firm would naturally result in a lower credit risk.

Track Record refers to the historical performance of the firm. Aside from quantitative metrics, we should evaluate the past behaviours and practices of the firm. This includes their past bonds, lawsuits, layoffs and labour disputes. By evaluating their track record, we can garner insights into how the firm has operated in the past few years. Generally, firms that have a better track record, with little outstanding negative news and consistent positive news, tend to indicate a proven competence and mitigate the potential risk. This reflects lower volatility and increases predictability in financial performance, decreasing the credit risk of the firm.

The following is a quick overview of our findings before we delve deeper into the detailed analysis.

Firm	Industry Outlook	Business Background	Cash Flow Potential (Short-term)	Cash Flow Potential (Long-term)	Character and Track Record
Amgen	Stable	Stable but Riskier	Moderate	Good	Poor
Pfizer	Stable	Stable and Strong	Moderate	Good	Good

Merck	Stable	Stable and Strong	Good	Good	Good

Table 5.1.1 Summarised Table of overall credit risk rating on Qualitative Assessment

5.2. Pharmaceutical Sector Outlook Analysis

The global pharmaceutical market has been on a consistent growth trajectory. It is primarily driven by an ageing population (World Health Organization, 2022), increasing prevalence of chronic diseases (Stuckler, 2008, 273-326), and rising healthcare expenditures particularly in emerging economies (Speyside, 2023). According to Evaluate, worldwide pharmaceutical revenues are forecasted to grow at a compounded annual rate of 5.9% and are on track to reach 1.6 trillion by 2028 (Evaluate, 2023).

Moreover, the branded drug industry is also significantly consolidated, led by about 20 Big Pharma Companies, including Amgen, Pfizer and Merck & Co. (Dunleavy, 2023). Together, the top players in this industry accounted for about $700 billion in revenue in 2023, which is more than half the approximately $1.1 trillion global market (S&P, 2024). With these trends, it shows a steadily positive growing sector for our 3 firms.

However, there are also expectations of headwinds in this sector. For example, recent legislative efforts were set by the Inflation Reduction Act (IRA) to address the increasing drug pricing and Medicare expenditure. 15 Selected drugs will be added to the Medicare program by 2026, restricting its cost, thereby lowering its profit margins. This includes Januvia, a diabetes drug produced by Merck, and Enbrel, an autoimmune drug by Amgen. It was also announced that 20 new drugs would thereafter be added yearly. Therefore, it is not an over-assumption that Pfizer, a leading drug producer in the US, would likely be affected in future years.

The White House has also recently introduced proposed frameworks to curb the prices of drugs. The Biden-Harris administration has proposed that government agencies consider high prices as a factor in exercising “march-in” rights under the Bayh-Dole Act. This seeks to lower the prices of drugs by promoting competition in the industry, threatening the market share of the Top 20 Big Pharma Companies.

Lastly, the Lowering Drug Costs for American Families Act of 2023 was also recently passed, which will expand the number of products subject to price negotiation and extend the negotiated prices and 'inflation-related rebates' in the IRA to the private/commercial insurance market. The effect of such negotiation is likely to reduce the profitability of the sector, dimming the previously positive outlook.

To conclude, there is a superficially exciting buzz of growth in this sector, with an ageing and increasingly sickly global population. However, growth and profiteering in the pharmaceutical industry are set to be limited by the slew of US government regulations. As our firms mainly operate in the US, such policies serve to negatively affect the outlook of the sector. Given this mix of healthy projections and trends but negative governmental measures, we find that a fair conclusion is that the overall pharmaceutical industry is set to a **stable** outlook. Even as regulations may slow down the industry, it is undeniable that there exists significant growth potential in the upcoming years.

5.3. Amgen Inc.

5.3.1. Firm Fundamental Background and Competitive Strategy

Amgen Inc. was founded in 1980 and headquartered in Thousand Oaks, California, and is one of the world's leading biotechnology firms. The company specialises in developing novel human therapeutics, with a focus on cardiovascular disease, oncology, bone health, neuroscience, nephrology, and inflammation. They are most well known for their drugs like Enbrel and Prolia, which are key solutions to autoimmune diseases like arthritis and osteoporosis.

Amgen operates globally, with products marketed in approximately 100 countries. They are actively seeking international expansion to reach a wider patient base and leverage global market opportunities. With this goal in mind, they have also made multiple strategic acquisitions, including Onyx Pharmaceuticals, a firm focused on oncology treatments, and Otezla, a firm with adaptive biotechnologies on COVID-19.

As with many other big pharma companies, Amgem seeks a differentiation strategy through high efforts in research and development. Compared to traditional pharmaceutical firms, Amgen has a notably high focus on biologics instead of synthetic drugs. This focus provides a defence against traditional generic competition due to its high barriers to entry. Production is often complex, and new firms would have to seek multiple strict regulatory approvals. This places Amgen at the forefront of advanced therapeutic modalities, such as biosimilars.

However, this is a double-edged sword. Biologics, as compared to traditional synthetic drugs, tends to be a more complicated sector to explore due to its higher research costs and inherent risks of failure. Biologics aim to engineer living cells for medicine, which significantly increases the R&D costs. Due to this very nature, it is also subject to very heavy regulations, and many firms are known to have missed it. Examples would be Alimera, Orexigen and Alexza, which are all smaller biotech firms that almost collapsed due to rejections and failures in their R&D process.

Amgen is a relatively larger firm in this sector, with a greater free cash pool to withstand such failures. However, their entire focus and dependency on biologics still means that the firm would be more volatile compared to traditional pharmaceutical firms like Pfizer and Merck. Therefore, we can conclude that Amgen has a **stable but slightly riskier** fundamental business model.

5.3.2. Company Prospect of Generating Cash Flows

Amgen is a big pharmaceutical company with many established drugs sold worldwide. Their primary form of revenue is through distribution and patents for blockbuster drugs. This includes Enbrel for rheumatoid arthritis, Prolia for bone cancer and Otezla for psoriasis. Such drugs are known for their effectiveness and have few alternatives (Drugs.com, n.d.). In 2023, Enbrel and Prolia both brought in about 4 billion in revenue for Amgen each, while Otzela brought in about 2 billion (Mikulic, 2024). With high research costs and the advancement of biologic treatments, it is likely that there will not be competitive drugs on the market in the short term.

However, in January 2024, the US Food and Drugs Administration (FDA) issued a warning that Prolia increases the risk of severe hypocalcemia, causing a very low blood calcium level in patients with advanced chronic kidney disease. Consequently, a ‘boxed warning’, which is the highest safety-related warning that medications can get from the FDA was issued for this drug. Undoubtedly, this will affect the revenue of Prolia, especially as kidney disease patients turn away from it. As a result, we expect a short-term revenue stagnation or decline in Amgen, as they seek to potentially rectify this matter. Therefore, we conclude Amgen’s prospect of generating cash flow in the short term to be moderate.

In the medium term, Amgen has a list of exciting drugs which have seen success in its clinical stages. An example would be the MariTide weight-loss drug. Recent tests in Feb 2024 have shown that it produces better and longer-lasting effects than the current drugs like Wegovy and Zepbound (Goodwin, 2024). In other fields like oncology, Amgen has also had breakthroughs, with the new drug Tarlatamab achieving FDA approval. These areas of research have shown remarkable breakthroughs and highlight Amgen's potential to gain revenue in the medium term. Therefore, we conclude that Amgen's prospect of generating cash flow in the medium term is good.

In the long term, Amgen's focus on biologics is an exciting prospect to venture towards. As Artificial Intelligence is to Computer Science, Biologics is to modern medicine. Biologics, often termed as 'medicine of the future', is a specialised field which seeks to revolutionise the pharmaceutical industry. Engineering living cells can serve to combat significantly hard-to-treat diseases, such as cancer, and autoimmune and inheritable diseases (Ngo & Garneau-Tsodikova, 2018, 757-758). In the long run, with a respectable standing in the pharmaceutical industry and strategic acquisitions, we expect Amgen to still be at the forefront of this growing industry. It has a capable Research and Development process which is proven. Therefore, we conclude that Amgen's prospect of generating cash flow in the long term is good.

To quickly summarise the overall cash flow prospect of Amgen, we conclude that Amgen has a **moderate rating** for short-term cash flow, but a **good rating** for medium and long-term cash flow. The moderate rating is due to the recent boxed warning of the FDA on Prolia, one of Amgen's leading drugs. However, the excess of other drugs like Otzela and Enbrel remains as strong blockbuster drug in the industry. Therefore, a moderate and not low rating is sufficient in this case. As for medium and long-term cash flow, Amgen has seen success in its recent clinical trials and has a great focus on biologics, which indicates a likely high prospect of increased revenue and cash flow in the future.

5.3.3. Character of Firm and Track Record

Amgen has made efforts in the conventional ESG pillars. For example, they have promised aims to reach net zero emissions by 2027 (Wikipedia, n.d.), and have consistently reduced their emissions from 354 kilo tons in 2014 to 243 kilo tons in 2020. They have also provided up to $2.2 billion of Amgen medicines at no cost or to eligible uninsured patients through the Amgen Safety Net Foundation. Lastly, they have also donated up to $4 million USD to Khan Academy, and the Amgen Foundation has reached out to more than 23 million learners and educators worldwide through its four core science programs. Their efforts have led them to winning multiple awards, such as the Leadership in Energy and Environmental Design (LEED) Gold Certification and the Supplier Diversity Award.

However, despite such efforts, there has been an onslaught of negative news regarding Amgen's work in the past years. Most recently, Amgen and its CEO Robert Bradway were sued by investors for failing to disclose a $10.7 billion tax bill from investors (Tremayne-Pengelly, 2023). Towards its Merger and Acquisitions side, Amgen was also sued in 2023 by the Federal Trade Commission for its $27.8 billion acquisition of Horizon Therapeutics, as part of an illegal monopolistic move (Federal Trade Commission, 2023). On its business side, Amgen was also seen to pay a total of about US$125 million dollars to resolve allegations that they violated the False Claims Act by illegally paying the Medicare copays for their own products (Office of Public Affairs, 2019). In 2012, Amgen also pleaded guilty to misbranding its drug, Aranesp, by marketing it in ways to mislead users about its uses and effectiveness (Pollack & Secret, 2012). This intentional profiteering act increased the likelihood of deaths from victims due to the wrongful consumption of the drug. Lastly, Amgen has also lost patent disputes regarding its cholesterol drug, Repatha in recent times (Wolfe & Walker, 2023).

This plethora of adverse news suggests a pertinent problem in the leadership of the firm. Most of its adverse news stems from unethical and dishonest practices, even at the expense of human lives. Adding insult to injury, Amgen's current CEO is Robert A. Bradway, who happens to sit on the Boeing And Norfolk Southern Corporation board of directors. These 2 firms are also shredded in adversity, with the recent upheaval of Boeing's manufacturing practices and the infamous 2023 Norfolk Ohio derailment, which was very poorly and unethically handled by the firm. Despite the efforts of Amgen in ESG and education, the sheer level of turmoil and lawsuits they face is inexcusable. There lies a key issue in the firm, which possibly originates from its central leadership. Regardless of the cause, this pushes the character of Amgen and its track record to a **poor rating.**

5.4. Pfizer

5.4.1. Firm Fundamental Background and Competitive Strategy

Pfizer's fundamental background and competitive strategy are anchored in its long-standing reputation as a pioneer in the pharmaceutical industry, with a history that dates back to its founding in 1849. This legacy provides a solid base from which the firm has continued to evolve, adapting to new challenges and opportunities in healthcare.

Pfizer operates on a global scale in over 125 companies. It is by far the largest pharmaceutical company among the 3 we are studying. As per the industry norm, Pfizer spends a large amount of its cash flow on Research and Development and is well-known for their drugs like Humira and Lipitor. Given its large scale of business, Pfizer has also explored areas like biologics and therapy.

On top of spending heavy resources on Research and Development, Pfizer pursues an aggressive acquisition strategy to incorporate new capabilities and expand its market presence, with the most recent one being Seagen to explore opportunities in the cancer treatment field (Pfizer, 2023). Over the years, Pfizer has also acquired firms like Array BioPharma for their oncology pipeline with targeted therapies and Allergan to broaden its portfolio in aesthetics and dermatology.

This business strategy is one of the main distinctions that Pfizer has compared to its peers. By focusing on acquisitions, Pfizer lowers the potential risk of wasting unnecessary resources on Research and Development. They can easily select and acquire semi-established pharmaceutical firms with high potential and quickly incorporate new technologies into their product line. This allows Pfizer to remain fast-forward in their R&D process and stay competitive in the market.

Moreover, Pfizer has also explored the field of biologics and vaccines, such as their worldwide renowned COVID-19 vaccine, which helped curb the COVID-19 global pandemic. Such technologies are generally more expensive and harder for smaller pharmaceutical firms to follow. With respect to the COVID-19 vaccine, there have only been 4 firms that have ventured successfully into this market. This has allowed Pfizer to stand out in the pharmaceutical world with its extensive R&D.

To conclude, Pfizer is one of the largest pharmaceutical firms worldwide. In such an R & D-focused heavy industry, Pfizer has sufficient capital and economies of scale to continuously innovate and acquire its competitors, and they have shown to do so effectively. While sticking to staple blockbuster drugs, Pfizer has also ventured successfully into specialised fields, such as biologics and vaccines. This further enhances their product differentiation in the market. As such, we conclude that Pfizer has a **stable and strong** business model

5.4.2. Company Prospect of Generating Cash Flows

In the short term, Pfizer's cash flow is expected to remain poor to moderate, even with its COVID-19 vaccine, Comirnaty. As the pandemic is largely over, the main focus on COVID-19 vaccines is on the less frequent booster shots. Given this, revenues from the vaccine have declined sharply since 2022. Additionally, Pfizer's established products like Ibrance and Xeljanz continue to face competitive pressure in the market, as revenues have declined year-on-year. The drugs are also expected to lose market exclusivity by 2027, further adding to Pfizer's woes. Lastly, Pfizer's latest releases are also not as optimal, with an underwhelming launch of the new RSV shot, a daily weight loss pill that fell short during clinical trials. To mediate this fall in revenues, Pfizer has conducted a cost-cutting program, which has saved about $4 billion from its operational expenses. Therefore, our final evaluation of Pfizer's short-term cash flow prospect is **moderate.**

Looking at the medium term, Pfizer's prospects are shaped by the progression of its pipeline products towards market approval and commercialization. They have many new drugs with positive testing results, such as Adcetris, which is said to extend survival in patients with late-stage lymphoma, and danuglipron, a new type of weight loss pill. These products do have strong promises, and serve to resolve unique medical illnesses in the market. Therefore, we expect Pfizer to recover from the recent downturn in the medium term. As such, we evaluate their medium short-term cash flow to be **good.**

In the long term, Pfizer has mentioned that they will be pivoting more towards biologics. As mentioned in Amgen's analysis, this is considered to be a smart move that allows Pfizer's R&D to be less replicable by other smaller pharmaceutical companies. Biologics have also been shown to outperform traditional drugs in various fields. Moreover, Pfizer has also acquired large firms like Seagen to explore the field of oncology. With the oncology market set to double in the next 10 years, we can expect Pfizer to enjoy recurring revenues from its R&D today (Wehrwein, 2023). Lastly, the acquisition of mRNA technology for their COVID-19 vaccine has also unlocked this field for Pfizer. mRNA is a revolutionary technology that has the potential to fight traditionally difficult diseases. With this in their belt, we are confident that Pfizer will walk out of the storm and thrive as a pharmaceutical powerhouse in the long term. Therefore, we conclude their long-term cash flow to be rated **good**.

Overall, we will evaluate the cash flows of Pfizer to be a **moderate** rating.

5.4.3. Character of Firm and Track Record

Pfizer is a dominant player in the pharmaceutical industry and has many strong ESG practices. They ranked 52 out of 915 pharmaceutical firms in the latest ESG report. Recently, they have also passed the industry's first Sustainability Bond addressing capital investments in both environmental and social initiatives and revised their carbon footprint target to 95% by 2040 (Pfizer, n.d.). They have also launched "An Accord for a Healthier World", which offers pharmaceutical products to 1.2 billion people in 45 lower-income countries non-profit patented medicines and vaccines. From their ESG report, Pfizer has almost no income disparity between its minority and non-minority workers and has about 40% female representation of Vice Presidents globally. Such ESG strong practices lead the industry and show Pfizer's commitment to ethical and sustainable business practices.

Over the recent years, Pfizer has also done its fair share of good internationally, namely for its efforts during the devastating COVID-19 pandemic. Refusing to accept public funding, Pfizer invested more than 2 billion dollars in risk to develop a safe and effective vaccine in 8 months. This vaccine made it safe for populations and put a halt to the deadly coronavirus outbreak, which has claimed millions of lives. This event highlighted Pfizer's highly efficient and ethical management, as well as its professionalism when facing a critical crisis.

Analysing the recent lawsuits and negative news of Pfizer, there are some articles like the Lipitor antitrust lawsuit. However, it is important to note that the lawsuit ended with a settlement, with Pfizer not admitting liability, but choosing to settle as a fair and reasonable way to resolve the litigation. Other than that, major negative news goes back more than 10 years ago, such as the 2009 $2.3 billion fraudulent marketing fraud case (Office of Public Affairs, 2009). However, the management and CEO have changed since then, which indicates that they are not indicators to evaluate the character of the firm.

It is also worth mentioning that the CEO, Dr Albert Bourla, is a well-respected and established individual. He has won many awards, including the Golden Cross Order of the Redeemer by the President of Greece, the Order of Boyaca from the President of Columbia and the 2022 Genesis Prize Laureate for his efforts and leadership during the Covid-19 pandemic. He was also named CEO of the Year by CNN Business in 2022, and inducted into Crain's New York Business 2021 Hall of Fame (Pfizer, n.d.). With its good recent track record and impressive leadership, we are rating Pfizer's character to be **good.**

5.5. Merck & Co.

5.5.1. Firm Fundamental Background and Competitive Strategy

Merck & Co. has a long and successful history dating back to 1981 (Merck & Co., n.d.). Since its establishment, they have evolved to become a multinational corporation and positioned itself at the forefront of the pharmaceutical industry with a proven track record of innovation (Merck & Co., n.d.). At the core of its business, Merck focuses on researching, developing, manufacturing and marketing prescription medications, vaccines, and animal health products to meet the global market needs. Its business model revolves around generating revenue through the sale of their pharmaceutical products to healthcare providers, distributors and governments. Their business model heavily relies on research & development to innovate a steady pipeline of new drugs to maintain market share.

As illustrated, Merck has a long and successful history, where their business practices have undoubtedly evolved with the changing market demands. Its strong performance during the COVID-19 pandemic further exemplifies its ability to adapt, and the soundness as well as inherent stability at the core of its business. This indicates that Merck has a robust and sustainable business model, and is thus likely to continue to generate healthy margins, leading to improvement in financial health.

Taking into consideration the competitive strategy of Merck, Merck uses a combination of strategies to remain competitive. This includes a high focus on researching and developing innovative drugs and vaccines that can address unmet medical needs. As aforementioned, its long establishment in the market has created a strong brand for the corporation. Merck strategically leverages their strong brand reputation to command premium pricing for their products. Additionally, Merck has long since expanded its geographical outreach to become the multinational corporation it is today, operating in over 140 countries worldwide. We believe that its strong and effective competitive strategies further enhance the firm's profitability and market standing, and thereby result in lower credit risk.

Hence, we can safely conclude that Merck has a **stable and strong fundamental background**, with a long history, robust business model and competitive strategy that boosts investors' confidence, leading to lower credit risk.

5.5.2. Company Prospect of Generating Cash Flows

Like Amgen, Merck is a global pharmaceutical company with a diverse portfolio of prescription medicines, vaccines, biologic therapies and animal health products. Their primary form of revenue involves the sales of their pharmaceutical products across the various sources. As such, their operational cash flows would be primarily based on their sales revenue.

Taking into consideration the short-term outlook, we believe at this point in time, the sales of their current top two revenue generating drugs, Keytruda and Gardasil will have a significant impact on their short-term cash flows (Mikulic, 2024). Keytruda, the top selling product at Merck, is also one of the best-selling drugs worldwide (Mikulic, 2024), treating a total of 16 types of cancer, including certain early-stage and advanced cancers (Merck & Co., n.d.). Keytruda alone generated over 25 billion worth of revenue in USD in 2023 (Mikulic, 2024). Given the long process of clinical trials and obtaining FDA approval, it is unlikely a new competitor drug will emerge in the short-term, and Keytruda will continue to dominate the market. Gardasil, which targets the prevention of certain human papillomavirus (HPV) cancer types (Merck & Co., n.d.), was the second highest revenue generating product earned close to 9 billion USD in 2023 (Mikulic, 2024). However, Gardasil has a competitor drug in Cervarix, the other competitor in the market in the HPV vaccine market. Gardasil 9, an improved version of the original Gardasil is able to protect against more types of infections as compared to Cervarix, thus it is likely that Gardasil 9 would retain its position in its market (National Cancer Institute, 2021). Therefore, with two strong revenue generating blockbuster drugs at the forefront of their respective markets, we conclude Merck's prospect of generating cash flow in the short term to be **good**.

In the medium term, Merck has a list of exciting drugs that have seen success in its clinical trials. One such example would be Winrevair, which treats adults with pulmonary arterial hypertension (Merck & Co., 2024). It gained FDA approval earlier this year, becoming the first FDA-approved activin signalling inhibitor therapy(Merck & Co., 2024). Another example would be MK-1084, which treats certain patients with metastatic non-small cell lung cancer, who just entered the third phase of clinical trials earlier this month, with promising results (Merck & Co., 2024). It is evident that Merck has shown promising breakthroughs, highlighting Merck's potential to generate revenue in the medium term outlook. Hence, we can conclude that Merck's prospect of generating cash flow in the medium term to be **good**.

Considering the long term outlook, Merck's heavy focus on the field of oncology for their research is likely to continue to generate revenue for the firm. This decision is strategic as the number of cancer cases around the world is expected to continue to rise (Freeborn, 2024). Targeting this field would in the long-run, maintain Merck's respectable standing in the pharmaceutical industry. Its diversification into other fields such as animal health shows Merck's desire to expand into other markets. Merck has also executed strategic acquisitions to further diversify their pipelines. Their most recent acquisition is of Harpoon Therapeutics, Inc., diversifying their oncology pipeline (Merck & Co., 2024). Its R&D have been proven to be capable of generating innovative solutions to health problems around the world, and will likely continue to do so in the long-run. Hence, we can conclude that Merck's prospect of generating cash flow in the long term is **good**.

To conclude, the overall cash flow prospect of Merck is **good** for the short, medium and long-term cash flow. Merck's current blockbuster drugs are likely to continue their rein on their respective niche markets, its continuous success in clinical trials is promising and will highly likely generate cash flows in the medium term. Lastly, Merck's business model and a focus on oncology as well as the execution of numerous acquisitions only further strengthen the long-term cash flow outlook for Merck.

5.5.3. Character of Firm and Track Record

Merck boasts a long history and a generally positive reputation within the pharmaceutical industry. Their commitment to innovation has resulted in blockbusters like Keytruda and Gardasil. However, their reputation isn't without blemishes. High drug prices remain a concern of the U.S. government and the public, who are dissatisfied with the high barrier required to access life-saving drugs (Constantino, 2024). These ongoing controversies regularly tarnished the reputation of Merck. However, Merck has responded with patient assistance programs, offering certain medicines and adult vaccines for free to those who are unable to afford them, however, public perception remains mixed (Merck & Co., n.d.).

The leadership team at Merck is experienced, with Robert M. Davis, as their current chairman and chief executive officer. Davis has an extensive leadership portfolio under his belt, even serving as Merck's President before stepping into the role of chairman of the board and CEO (Business Roundtable, 2024). His experience as president of Merck would have prepared him well for his stepping up, being familiar with the companies' business practices, sustainability practices and more. Merck's leadership team remains largely free of controversy unlike some of its competitors, such as Amgen.

Additionally, access to health, employees, environmental sustainability and ethics & values, remain Merck's core sustainability focus area. Their 2024 Annual Meeting Notice have re-established ambitious goals around the four key focus areas to further create value for their stakeholders (Merck & Co., 2024). This likely continues to build trust within the community, improving public perception and demonstrating their commitment to an ethical and sustainable future.

Given the knowledge of the firm's strong character and positive track record, we can conclude that Merck holds a largely positive reputation, with their commitment to innovation and environmental sustainability. The leadership team at Merck remains largely free of controversies and the company has few recent lawsuits against them, leaving a positive impact on the company. As such, we would conclude that Merck has a **good rating** for their character and track record.

6. Credit Risk Assessment

From our Quantitative and Qualitative Assessments above, the table below shows a quick summary of how each firm fares in each aspect. We will further dissect the points to give the overall credit risk rating of each company, as well as rank them against each other, with 1 being the safest firm with the best credit risk rating and 3 being the firm with the worst credit risk rating.

Firm	Liquidity	Solvency	Profitability	Efficiency	Future Growth
Amgen	Good	Poor	Moderate	Poor	Good
Pfizer	Poor	Good	Poor	Good	Moderate
Merck	Poor	Moderate	Moderate	Good	Good

Table 6.0.1 Summarised Table of overall credit risk rating on Quantitative Assessment

Firm	Industry Outlook	Business Background	Cash Flow Potential (Short-term)	Cash Flow Potential (Long-term)	Character and Track Record
Amgen	Stable	Stable but Riskier	Moderate	Good	Poor
Pfizer	Stable	Stable and Strong	Moderate	Good	Good
Merck	Stable	Stable and Strong	Good	Good	Good

Table 6.0.2 Summarised Table of overall credit risk rating on Qualitative Assessment

6.1. Amgen Inc.

6.1.1. Liquidity Concerns

From Amgen's financial ratios, we can see that they do not have many liquidity issues in the short term, with their Current Ratio consistently outperforming the industry average, with the most recent one being 1.65 compared to 1.226 sector average. Their Quick Ratio also outperforms the industry average, of about

1.03 in 2023 compared to 0.816 sector average. Therefore, from a quantitative standpoint, Amgen looks healthy with regard to its short-term Liquidity concerns.

However, recent news has suggested that their short-term revenue is likely to face a decline. As explained in the qualitative evaluation, there has been a recent FDA ‘boxed warning’ on Prolia, their best-selling drug in the market, due to a new finding of its side effects (Mandowara et al., 2024). This can and will majorly affect the revenue of Amgen in the short term, as it struggles to navigate this issue with other replacement drugs. As this ‘warning’ was only issued in Jan 2024, it has not shown up in the balance sheets of Amgen yet. Therefore, it is not reflected in the quantitative evaluation. Regardless, this ‘warning’ would put a dent in Amgen’s short-term revenue, which might bring about liquidity issues, depending on how the firm handles the situation. Hence, after considering the qualitative standpoint, we have to downgrade their Liquidity rating to Moderate.

6.1.2. Debt Analysis

From our analysis, Amgen is a more risky firm from a quantitative point of view. Although they have good liquidity ratios in the short term, they are startlingly insolvent, with increasingly abnormally high debt-to-equity ratios of about 10.1 in recent years. This means that Amgen has a lot of long-term debt and financial obligations, which outweigh its current assets. As compared to their peers, they are also very lacking concerning their Interest Coverage ratio, which consistently lags behind industry averages by 2-3 times. As such, Amgen is in a riskier position and is considered over-leveraged in this industry, which will affect its eventual credit rating negatively.

6.1.3. Asset Utilisation Efficiency

With regards to their Asset Utilisation, their ratios may seem appealing at first glance, with Net Profit Margins and ROA being just above / similar to the industry average, and ROE being more than double the sector average. However, upon closer inspection, this is just another accounting trick, which does not paint the full picture. Amgen is heavily leveraged - hence, it has little equities and assets. Therefore, the ROA and ROE would naturally spike in these circumstances. As such, we are unable to make any meaningful conclusion from the abovementioned factors.

However, what we can utilise is the Inventory Turnover Ratio, which has consistently lagged the industry average by about half, with the most recent one being 1.17 against the sector average of 2.11. This highlights that Amgen is not very efficient with selling its inventory as compared to its peers. The only redeeming factor is Net Profit Margin, which is marginally higher than the industry average, by about 1 to 2 percentage points. However, this is not enough to justify the lackadaisical Inventory Turnover Ratio. Hence, we can conclude that Amgen has a moderate Asset Utilisation Efficiency

6.1.4. Company Character

From our research, Amgen has also been in the negative spotlight on more occasions than expected. Providing a quick summary of the extensive examples in our qualitative review, the company has been involved in a variety of lawsuits, from untruthful tax claims amounting to billions to misleading consumers about their products, and even unintended side effects surfacing from their blockbuster drugs. This plethora of adverse news across various departments - business, marketing and research - suggests that there may be an issue with the core leadership of the company, which is a concerning indicator of potential systematic challenges within the organisation.

6.1.5. Future Outlook

The beacon of light for Amgen is their exceptional growth, which is measured from their Revenue Growth metric, which has outperformed the market during non-COVID-19 affected years. In 2020 and 2023, just right before and after the pandemic, Amgen recorded revenue growth rates of about 7 - 8 percentage points, which is much higher than the negative revenue growth rates of the industry. Therefore, from this quantitative perspective, Amgen's future looks promising.

From a qualitative standpoint, Amgen's business background and full focus on biologics also seem to be slightly risky, but it comes with a huge potential upside. Biologics is often termed to be the future of medicine, just like how Artificial Intelligence is to Computer Science. With a strong foothold in biologics, Amgen can look forward to an exclusive industry with high barriers to entry. Their drugs are unlikely to be replicated, and they can foresee lucrative earnings at good margins from their future patents. They have proved that they have what it takes, from their current blockbuster drugs like Otezela and Enbrel which dominate the market. As such, the future of Amgen's technology is very promising.

6.1.6. Final Conclusion

To conclude, the short-term prospect of Amgen's performance does not look very optimal, especially with the FDA warnings on Prolia and the slew of lawsuits. However, what investors can bet on is the exciting and lucrative biologics field in which Amgen already has a strong foothold. Despite that, it remains unclear whether their management and company character is strong enough to navigate these murky waters, alongside their heavy long-term financial obligations. Therefore, we rate Amgen's credit rating to be **good**.

Relative to other firms in this paper, we give **Amgen a score of 3**, which indicates that it has the lowest and worst credit rating amongst the 3 firms in this paper.

6.2. Pfizer

6.2.1. Liquidity Concerns

From a quantitative standpoint, Pfizer also does not have the best liquidity. Their liquidity woes have shown up on their balance sheets - with quick and current ratios constantly underperforming sector averages. Their quick and current ratios have also declined at an increasing rate since 2021, from 1.4 to 0.91 and 1.1 to 0..58 respectively. This is partially attributed to the shift in the world's attention away from Comirnaty, their flagship COVID-19 vaccine that curbed the deadly pandemic. Moreover, they have also underperformed in the clinical aspect, such as their well-known RSV shot missing result estimates. As such, in recent years, it is evident they have yet to achieve much success as compared to the industry.

Moreover, they also face declining revenues from their blockbuster drugs, Ibrance and Xeljanz, which are facing strong competition in the market. Therefore, there are some concerns about the liquidity of Pfizer in the short term.

6.2.2. Debt Analysis

As compared to the less ideal Liquidity issues, Pfizer has an above average Debt sheet. They have a consistently low Debt-to-Equity Ratio as compared to the sector average, with their most recent one being 0.68 compared to 2.506 sector average. This indicates that they are very under-leveraged - which is an ideal situation when measuring a company's credit risk.

On the other hand, their Interest Coverage Ratio is not performing very well, with the most recent one being 1.48 against the industry average of 8.008. However, this can be attributed to their lower Operating Income due to their short-term revenue issues as explained previously. Therefore, due to their very healthy Debt-to-Equity Ratio, they are still considered a very solvent firm.

6.2.3. Asset Utilisation Efficiency

With regards to their Net Profit Margin, ROE and ROA, all metrics have fallen sharply in the recent year, with Net Profit Margin falling from 31.27 to 3.62, ROA falling from 16.57 to 1, and ROE falling from 36.3 to 2.29. Consequently, these metrics perform way below the industry average. However, all these are also due to their recent pivot away from their COVID-19 vaccines and other short-term issues, which have caused their revenue to drop greatly. Outside of this abnormal year, their Profit Margins, ROE and ROA all perform around the industry average. Hence, this metric is not very conclusive on how efficiently Pfizer is utilising their Assets.

Another financial metric we analysed is the Inventory Turnover Ratio, which Pfizer performs well in, as seen from their recent 2.6 figure against the industry average of 2.11. This means that Pfizer is still running a very efficient business and that demands for their products still remain high. Therefore, we would evaluate their Asset Utilisation to still be moderate, as we expect them to recover from this anomalous year in the future.

6.2.4. Company Character

Pfizer has also passed the character test with flying colours. Ever since their new CEO, Dr Albert Bourla, took over, they have been in the spotlight for much positive news. One of which is their rejection of public funding to research for the COVID-19 vaccine in 2020. As elaborated in the qualitative analysis, Dr Albert has also won multiple international awards from various organisations and pushed Pfizer towards operating an evidently greener and fairer business with their lowered carbon emissions and highly gender/race-equal workforce.

6.2.5. Future Outlook

As compared to the sector, Pfizer has experienced a more negative revenue growth in 2023 of about 41.7% against 10.69%, which is largely expected as demand for the vaccine drops. But a quick mathematical calculation which accounts for the abnormal revenue growth during COVID-19 years would find that they are still experiencing some sort of organic growth. As such, despite their falling profitability and liquidity, we find that Pfizer is still considered moderately safe in the future with its low long-term financial obligations and stable growth rate. Future business outlook to venture more towards biologics is also a very positive point as it helps Pfizer differentiate itself from the competitive pharmaceutical industry. They have also made timely acquisitions, such as the latest leading oncology firm, Seagen. With their strong track record and sensible business strategy, we find Pfizer’s future outlook to be good.

6.2.6. Final Conclusion

In conclusion, the combination of quantitative and qualitative analyses presents a cohesive overview of Pfizer's status - as recent revenue struggles are evident, the overall outlook still remains optimistic, with strong indications of resilience and potential for growth. Although current struggles may bring pessimism, we must be reminded that it is also partially caused by the gradual pivot away from their COVID-19 vaccine, which has been their focus for the past 3 years. Pfizer has a proven track record, as well as a sustainable and viable business process. With strong and proven leadership, as well as a bright future outlook and low debt obligations, we have sufficient evidence to believe that Pfizer will undoubtedly overcome the recent challenges and continue their position as a stable leading force in this sector. Therefore, we rate Pfizer’s credit rating to be **high quality.**

Relative to other firms in this paper, we give **Pfizer a score of 2**, which indicates that it has the 2nd highest credit rating amongst the 3 firms in this paper.

6.3. Merck & Co.

6.3.1. Liquidity Concerns

Based on our previous fundamental analysis of the firm’s liquidity accessibility, we admit that Merck does not perform well in this aspect. Their struggles with liquidity were visible in their balance sheet, with their Current Ratio and Quick Ratio struggling to keep up with industry averages. While the company’s Current Ratio remains above 1.00, indicating that it has sufficient assets to meet its short-term averages, the firm’s low Quick Ratio (0.68 in 2023 against industry’s 0.816) illustrates that a stricter definition of liquidity leaves Merck struggling to meet its short-term obligations. This was why we had assigned its accessibility to liquidity to be a **poor** rating as summarised in Table 6.0.1.

Qualitatively, Merck’s blockbuster drugs continue to generate revenue in their respective markets. However, concerns about the prices of their drugs remain present and inaccessible to the larger majority of the population. Hence, there are some concerns about the liquidity of Merck in the short term.

6.3.2. Debt Analysis

Considering our prior quantitative analysis of the firm's solvency, we have assigned Merck a **moderate** rating as indicated in the summary Table 6.0.1. As previously discussed, our solvency rating considers the Debt-to-Equity Ratio and Interest Coverage Ratio of the company, which ties in closely with the firm's debt. Merck has an above-average debt sheet, with a consistently low Debt-to-Equity Ratio as compared to the industry average. In the most recent year, 2023, Merck had a debt-to-equity ratio of 0.9, compared to the sector average of 2.506. This indicates that the firm remains underleveraged, which we consider ideal when measuring the firm's credit risk.

However, their Interest Coverage Ratio does not fair well either. Its latest ratio measures 2.65 against the industry average of 8.008. This indicates that while it is able to pay off its outstanding debt with relative ease, it is not on par with the industry standards. However, we can attribute the low ratio to the firm's slow recovery of the firm in a post-pandemic world, as they struggle with low sales following the decline in on-demand COVID-19-related products, as previously mentioned.

Hence, with a low Debt-to-Equity Ratio and low-Interest Coverage Ratio, we remain firm in the moderate rating of the firm's solvency, that the firm is able to meet its short-term obligation and its debt level remains manageable.

6.3.3. Asset Utilisation Efficiency

Quantitatively, we have previously assigned Merck a **moderate** rating for its profitability as seen in Table 6.0.1. Notably, like Pfizer, Merck's Net Profit Margin, ROE and ROA have all fallen sharply in the recent year. Its Net Profit Margin (%) had fallen from 24.49 in 2022 to 0.61 in 2023, ROA from 13.52 to 0.34 and ROE from 34.5 to 0.87. One of the core reasons behind their less-than-ideal recent profitability would be the decline in demand for COVID-19-related products. However, as we have established, Merck's profits were outperforming the industrial average before COVID-19 struck, and will likely continue to do so in the post-COVID-19 world. Hence, we do not believe that this metric is accurate in determining Merck's utilisation of its assets.

The efficiency of Merck is quantified by its Inventory Turnover Ratio. Merck has performed well in recent years in terms of this particular ratio, with a recent 2.63 against the sector average of 2.11. This would mean that in recent years, Merck's efficiency is on par, if not more efficient than its competitors, with operational efficiency and a high demand for its products.

6.3.4. Company Character

Merck's company character continues to hold a generally positive reputation. From our prior qualitative analysis, we have highlighted their tremendous contribution to the pharmaceutical industry through their innovative health solutions. Additionally, as the world shifts towards accessibility and environmental sustainability, Merck easily adapts, integrating these values into their core key focus areas that continue to build trust towards the community. This demonstrates Merck's commitment to an ethical and sustainable future.

6.3.5. Future Outlook

In our fundamental analysis, we have quantified the growth and outlook of the firm with the Revenue Growth (%) of the company. Our rating in Table 6.0.1 indicates that Merck holds a **good** rating in this aspect. While the industry struggled with tremendous loss in the post-COVID-19 world, with a revenue growth of -10.698%, Merck emerged with a positive growth of 1.4%. This indicates that the company is more than capable of continuing the business expenditure in difficult times.

Additionally, our qualitative analysis has further bolstered the fundamental analysis. With strong business fundamentals at its core and a competitive strategy to differentiate itself as a leader within the pharmaceutical industry, Merck has a strong future business outlook. With blockbuster drugs like Keytruda and Gardasil under its belt, both of which hold its position as the top drugs in their respective niche market, it has a good potential cash flow in the short term. Its focus on the field of oncology for its research and innovation will likely continue to generate cash flow for the firm in the long-term.

6.3.6. Final Conclusion

To conclude, the combination of quantitative and qualitative analyses presents a cohesive overview of Merck's status. While Merck's recent struggles with their sales are seen in the profitability ratios, affecting their asset utilisation, we are optimistic that Merck will recover with ease, with their strong indications of resilience and potential for growth. Liquidity still remains a concern for Merck, but similar to its profitability, Merck's overall outlook still remains optimistic. We must be reminded that the COVID-19 pandemic has deeply affected the economy, and the pharmaceutical industry is no exception to this. Through the past 3 years, Merck has not only maintained a strong business but has continued to expand and grow. With strong leadership and a good track record overall, we believe that Merck will continue to be a stable and safe business with low credit risk. Therefore, we rate Merck's credit rating to be **high quality**.

Relative to other firms in this paper, we give **Merck a score of 1,** which indicates that it has the highest credit rating amongst the 3 firms in this paper.

7. Corporate Bond and Yield Analysis

7.1. Introduction of Selected Bonds

We have selected the following bonds and listed their basic information in the table below. The following information was obtained from Bondsupermart. (Bondsupermart, n.d.).

Bond Issuer	Amgen	Pfizer	Merck
Accessed Information Date	11 April 2024	11 April 2024	11 April 2024
Bond Issue Date	02 Mach 2023	19 May 2023	17 May 2023
Bond Maturity Date	02 Mach 2053	19 May 2053	17 May 2053
Bond Seniority	Senior Unsecured	Senior Unsecured	Senior Unsecured
Coupon Frequency	Semi-annual	Semi-annual	Semi-Annual
Annual Coupon Rate	5.650%	5.300%	5.000%
Bid YTM	5.791%	5.613%	5.429%
Ask YTM	5.737%	5.586%	5.375%
Bid Price	98.027	95.531	93.750

Ask Price	98.768	95.900	94.515
Bond Credit Rating	BBB+	A	A+

Table 7.1.1 Bond Selection Details

7.2. Yield Comparison

From the bonds we have selected, we have also obtained the yield comparison as shown in the table below. We have obtained the information from the website Bondsupermart (Bondsupermart, n.d.).

Bond Issuer	Date Recorded	Ask YTM	Bid YTM
Amgen	11 April 2023	5.737	5.791
Pfizer	11 April 2023	5.586	5.613
Merck	11 April 2023	5.375	5.429

Table 7.2.1 Selected Bond Yield Comparison

We will be using the Ask YTM for our analysis as we are looking to purchase the bonds as an investor. From the above figure, we can see that Amgen has the highest YTM of above 5.737%, followed by Pfizer at 5.586% and Merck at 5.375%.

7.3. Ratio and Yield Comparisons

7.3.1. Amgen Inc.

Out of the 3 bonds we collected, Amgen has the highest YTM, which signifies that it should have the worst financial ratios as well. This is true to a large extent.

Firstly, Amgen has very poor solvency and a large long-term debt compared to Pfizer and Merck, as measured by their Debt-to-Equity Ratios and Interest Coverage ratios. Amgen also suffers from poor efficiency due to its low Inventory Turnover ratio. Finally, Amgen also has moderate profitability, with an average Net Profit Margin.

On the other hand, Amgen's ROE and ROA do outperform the sector very well. However, as explained above, this is likely due to an accounting trick, as much of its finances is tied up in long-term debt. Amgne's Current and Quick ratios are also consistently maintained slightly above the industry average. However, this is likely to change with the recent FDA 'boxed warning' on its main blockbuster drug, Prolia.

The only conclusive metric that Amgen also outperforms the market is in its year-on-year revenue growth, which has been a net positive as compared to its peers.

Therefore, across all quantitative fields measured - Liquidity, Solvency, Profitability, Efficiency and Future Growth - Amgen underperforms in 2, is moderate in 2, and only outperforms 1. This indicates that Amgen is considered a **relatively more risky firm** than Pfizer and Merck. As such, the higher YTM of 5.737% is also **justified.**

7.3.2. Pfizer

Pfizer has the middle YTM value amongst the three bonds we compared, and this is somewhat supported by its financial ratios as well.

Pfizer has very low debt obligations, as measured by their above-average Debt-to-Equity ratio. They are also still very efficient with a good Inventory Turnover Ratio.

However, in recent times, they suffer from poor Liquidity - with poor Current and Quick Ratio, as well as poor profitability - with their lacking Net Profit Margins, ROE and ROA. This is attributed to a steep decline in revenue during the latest Financial Year. Throughout the other years, they have shown to be marginally below/on par with sector averages. Lastly, Pfizer also only has a moderate future growth rate, that adjusts to about sector average.

Therefore, across all quantitative fields measured - Liquidity, Solvency, Profitability, Efficiency and Future Growth - Pfizer underperforms in 2, is moderate in 1, and only outperforms 2. They have less long-term debt, as well as a stronger track record and leadership (elaborated in qualitative analysis), which makes them a relatively **less risky company** as compared to Amgen. Hence, this **justifies** their slightly lower YTM of 5.586%.

7.3.3. Merck & Co.

Merck has the lowest YTM value amongst the three bonds we compared, but this is not supported by the financial ratios solely.

Merck's liquidity remains a concern. As assessed in 6.3.1, Merck struggles to keep up with industry averages in their Current Ratio and Quick Ratio. With a stricter definition of what could be considered as liquidity, Merck's Quick Ratio performs worse than the industry averages. Additionally, their profitability ratios in the most recent year (Net Profit Margin, ROA, ROE), suffered a sharp decline and do not compare well against the industry averages.

However, Merck's efficiency has been performing well, with an Inventory Turnover Ratio that regularly outperforms the industry. Its Revenue Growth (%) has remained positive in all years, even when the industry average yielded negative growth, indicating positive future growth, resilience and adaptability in the firm.

Therefore, across all quantitative fields measured, Merck underperforms in 1 (Liquidity), is moderate in 2 (Solvency, Profitability) and outperforms 2 (Efficiency, Future Growth). However, this is very similar to that of Pfizer. Despite that, there is still a **divergence** in YTM, which we evaluate to be due to the **qualitative factors** that have yet to show up on the financial sheets.

For example, unlike Pfizer, Merck's blockbuster drugs like Keytruda and Gardisal still remain a traditional powerhouse for the company. They do not have many competitors in the market and are still dominating their respective fields. On the other hand, Pfizer's covid vaccine Cominarity, and their blockbuster drugs like Ibrance and Xeljanz have experienced declining revenues in the past years. Hence, this makes Merck comparatively less risky due to its stable and continued revenue in the short term as the pharmaceutical market transitions away from COVID-19. As such, with their strong company character, their lowest YTM of about 5.375% is **justified.**

7.4. Risk Assessment

Based on our findings, we believe that the bond yields are justified given the credit risk ratios as well as the industry benchmark. As previously mentioned in the above section **7.3 Ratio and Yield Comparisons**, we have noticed a largely inverse relationship between the YTM and our credit risk assessment findings, meaning that higher credit-rated firms have a lower YTM. This indicates that the bond yields are largely justified by their respective credit risk.

The only exception from our own analysis was regarding **Merck**, which had about the same financial health as Pfizer, but is rated much safer, resulting in a low YTM. We have attributed this to qualitative reasons for the recent clinical and drug performances of the 2 companies.

The market's perception of credit risk also largely aligns with our analysis of financial statements. A stronger financial statement in our analysis is generally related to a higher credit rating. This can be observed from S&P credit ratings we have found on Bondsupermart. (Bondsupermart, n.d.).

Bond Issuer	Issuer Credit Rating	Bond Credit Rating	Credit Rating from our Analysis
Amgen	BBB+	BBB+	3
Pfizer	A	A	2
Merck	A+	A+	1 (Safest)

Table 7.4.1 Issuer and Bond Credit Ratings

However, this is just the analysis of past financial metrics. As investors, we should also look out for the future outlook of the companies when analysing credit risk, especially when the bond maturity date is very far away (2053 in this case). Therefore, we will analyse the future outlook of the bond yields below.

7.4.1. Amgen Inc

For Amgen, they are currently rated BBB+ by S&P 500. The future bond yields are dependent on the following factors:

Business Focus: Amgen's future business focus on biologics is a good step in the right direction. Biologics has been touted to be the future of pharmaceutical science and has shown to be more effective than traditional medicine in some cases. This pivot would also differentiate their product, making the company relatively more financially stable, and lowering the bond yield.

Long-Term Debt: Amgen has a high amount of relative long-term debt, which is considered financially unsafe. Even with growing revenues, it is still an unanswered question if Amgen would be able to finance its debt. This would make the company more risky, and decrease the bond yield.

Company Character: Amgen has been involved in a slew of lawsuits. This reflects poorly on the company's character. If the status quo remains, it is likely that the financial metrics of Amgen would decline from the poor leadership, leading to a higher bond yield due to increased perception of risk

Government Policies: There is a recent trend by the US Government to curb profiteering in the pharmaceutical industry. This has been put into action with policies like the Medicare Subsidy Program. Aggressive governmental policies would definitely decrease Amgen's revenue in the long run, making the company less financially sound and increasing bond yield.

Government Macroeconomic Policies: Bond yields are also dependent on the general economic landscape, such as the interest rate environment, which can affect Amgen's Bond yield.

In conclusion, it is **difficult** to accurately estimate Amgen's bond yield in the long run. It is indeed a company with good potential and decent growth rates, but the high debt makes it difficult to come to a consensus. However, in the short to medium term (1-5 years time), we expect the bond yield to **increase** due to the impact of the lawsuits and the newly discovered side effects of Prolia, their blockbuster drug, which will negatively affect the company's reputation and financial statements, thereby increasing their perceived credit risk. Therefore, the market is likely to expect a **higher** bond yield given this increased risk.

7.4.2. Pfizer

For Pfizer, they are currently rated A by S&P 500. The future bond yields are dependent on the following factors:

Business Focus: Similar to Amgen, Pfizer also has a renewed business focus on biologics, which is a step in the right direction. Their bond yield is also dependent on the effectiveness of their strategic acquisition, which will directly impact the financial health of the company.

Ability to recover: Pfizer has had a downtrend in revenue ever since the pandemic, due to the pivot in demand away from their vaccines. This has also shown up on the balance sheet in terms of declining ratios. Pfizer's ability to innovate new drugs and navigate the complex pharmaceutical market is the key to its financial stability, which would affect its bond yield.

Company Character: Pfizer is being led by a sound and respected CEO, and has made many efforts to pivot towards a greener and fairer workforce. In this aspect, we would expect good leadership to bring the company forward positively, leading to a drop in bond yield.

Government Policies: As mentioned, there has been an increase in policies that restrict the prices of medical drugs. Such policies will directly affect Pfizer's revenue and its bond yield.

Government Macroeconomic Policies: Bond yields are also dependent on the general economic landscape, such as the interest rate environment, which can affect Amgen's bond yield.

In conclusion, we expect Pfizer's bond yield to **increase** in the next 1 - 2 years but decrease in the longer run. This is because Pfizer is currently in a 'slump', and is experiencing declining revenues after the COVID-10 shift, which is showing up on their balance sheet. The poorer financial ratios signify to investors a higher credit risk, which will cause the bond yield to rise in the short term. However, in the long term, with the low debt, high efficiency, good leadership and sound business strategy, we expect their financial situation to improve, and therefore their bond yield would likely **drop** to reflect the respective risk.

7.4.3. Merck & Co.

Merck is currently rated A+ by S&P 500. The future bond yields are dependent on the following factors:

Business Focus: Merck's focus on oncology is considered to be more niche as compared to both Amgen and Pfizer. Nonetheless, we believe that oncology still remains a step in the right direction. Their bond yield remains dependent on the success of their future clinical trials, as well as their strategic acquisitions, both of which will directly impact the financial health of the company.

Ability to recover: Similar to Pfizer, Merck has seen a fall in their revenue in the past year, as a result of the decline in on-demand COVID-19 related products. Nonetheless, we believe that Merck is more than able to recover as they shift their resources towards innovating health solutions and ensuring success in their clinical trials.

Company Character: While Merck's CEO is new to the table, he has a history as the firm's previous President. With experience and familiarity with the firm, we can expect good leadership, alongside Merck's shift towards sustainability and accessibility, to bring the company forward positively. This is likely to lead to a fall in bond yield.

Government Policies: As mentioned, there has been an increase in policies that restrict the prices of medical drugs. Such policies, like Pfizer and Amgen, are likely going to affect Merck's revenue and thus, their bond yield.

Government Macroeconomic Policies: As bond yields are dependent on the general economic landscape, such as the interest rate environment, we believe the government macroeconomic policies could affect Merck's bond yield.

To conclude, we would expect Merck's bond yield to **increase** in the short-run while decreasing in the longer term. This is because, like Pfizer, Merck's revenue is experiencing a "slump", which likely signifies to investors a higher credit risk, causing an increase in the short-term. However, given the strong business outlook and potential for future growth, we can expect their financial health to recover and improve, and therefore its bond yield will likely fall again, to reflect the respective changes in credit risk.

7.5. Investment Recommendation of Bonds

The two bonds that we have chosen as investment recommendations would be from the relatively safer companies with a stronger credit rating: **Pfizer** and **Merck**. We would recommend a **60% investment in Pfizer** and **40% investment in Merck** bonds which will mature in 2053.

The reason for Amgen's exclusion would be its poor leadership and high financial debt. These are all crucial issues which have plagued Amgen over the past 5 years, and we have not seen much evidence that suggests its improvement anytime soon. In the short run, this would not be a significant issue - lawsuits and settlements can drag inconclusive for a few years and long-term debt would not be due yet. Alongside their promising revenue growth and business prospects, the firm is still rated quite safe. However, given the longer time frame of the bonds, Amgen will be forced to resolve these issues. With the current situation, we are not very confident that they would be able to do so and do not find that the yield is very attractive to its potential risk.

We also recommend a larger stake in Pfizer as we feel that its credit rating is underrated in the market. As such, its bond yield is considered very attractive with respect to the credit risk. On the market, Pfizer's credit rating is considered strong but not the best - due to its declining revenues on the balance sheet and the recent underwhelming clinical trials. However, we feel that this is just an unavoidable temporary situation. As we move on from the COVID-19 pandemic, Pfizer's revenue will undoubtedly decline from the lowered vaccine demands. Throughout the lifecycle of a pharmaceutical company, there will also inevitably be underwhelming clinical trials - and that is exactly the point of a clinical trial. It is just an unlucky coincidence that both factors are coming into play at the same time, which portrays Pfizer as a declining company in the industry.

However, if we zoom out into a macro view, Pfizer has a strong balance sheet with very few debt obligations. If we take away the abnormally high revenue growth during the COVID-19 period, we can also observe that Pfizer has had an organic growth of about 40% since 2021. Pfizer also has a strong leadership team, which has won many awards, and has transformed the company culture towards a more sustainable and equitable workplace. Lastly, Pfizer's business goals of focusing on biologics and its strategic acquisitions are also a step in the right direction. Therefore, we are fairly confident that Pfizer is poised to grow and recover robustly from its current position, continuing as a stable powerhouse in the pharmaceutical industry.

As such, Pfizer’s credit risk rating is likely to improve once the company overcomes the temporary obstacle, which will cause its bond yield to drop. As an investor looking to hold the bond to maturity, we are confident that Pfizer will continue to be a leading firm in 30 years, and should take this opportunity to invest at a higher YTM.

At the same time, we are still recommending a sizable investment in Merck, as it is a traditionally safer company across all aspects. Compared to Pfizer, Merck was not as affected by the pandemic, and it also isn't failing recent clinical trials as much. Therefore, alongside our qualitative and quantitative analysis, we find Merck’s credit risk to be fairly rated as Strong and expect it to still be a leading pharmaceutical firm in 30 years. Hence, as more risk-averse investors, we would still recommend a good portion to be spent on Merck bonds.

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9. Appendix

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	2.79	3.5	4.96	10.2	10.14
Interest Coverage Ratio	8.09	7.44	6.6	6.22	3.73
Current Ratio	1.44	1.81	1.59	1.41	1.65
Quick Ratio	1.01	1.3	1.06	1	1.03
Net Profit Margin (%)	33.57	28.57	22.68	24.89	23.83
Return on Assets (%)	12.44	11.84	9.5	10.83	8.26
Return on Equity (%)	70.73	76.13	73.16	126.47	135.79
Inventory Turnover Ratio	1.34	1.65	1.62	1.42	1.17
Revenue Growth (%)	-1.62	8.83	2.18	1.32	7.09

Table A1.1.1 Summarised Financial Ratios on Amgen from Morningstar

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	2.78611	3.49612	4.95851	10.20322	10.13639
Interest Coverage Ratio	8.08922	7.44453	6.59816	6.22475	3.73217
Current Ratio	1.43670	1.81447	1.59102	1.41429	1.64920
Quick Ratio	1.15746	1.48039	1.25566	1.10002	1.13169
Net Profit Margin (%)	33.56733	28.57143	22.68371	24.89078	23.82760

Return on Assets (%)	13.13414	11.53968	9.63459	10.06127	6.91377
Return on Equity (%)	81.07102	77.20268	87.95522	178.96750	107.78241
Inventory Turnover Ratio	2.59074	1.64745	1.61775	1.42103	1.16985
Revenue Growth (%)	-1.62126	8.82630	2.18298	1.32415	7.09266

Table A1.1.2 Summarised Financial Ratios on Amgen Calculated from its 10-K

2019

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 26950 / 9673 = 2.786105655
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (9138 + 1289) / 1289 = 8.089216447
- **Current Ratio** = Current Assets / Current Liabilities = 18440 / 12835 = 1.436696533
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (18440 - 3584) / 12835 = 1.15746007
- **Net Profit Margin** = Net Income / Revenue = 7842 / 23362 * 100 = 33.56733156
- **Return on Assets (ROA)** = Net Income / Total Assets = 7842 / 59707 * 100 = 13.13413838
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 7842 / 9673 = 81.07102243
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 4356 / ((3584 + 2940) / 2) = 2.590741876
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (23362 - 23747) / 23747 * 100 = -1.621257422

2020

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 32895 / 9409 = 3.496120735
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (8133 + 1262) / 1262 = 7.444532488
- **Current Ratio** = Current Assets / Current Liabilities = 21144 / 11653 = 1.814468377
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (21144 - 3893) / 11653 = 1.480391316
- **Net Profit Margin** = Net Income / Revenue = 7264 / 25424 * 100 = 28.57142857
- **Return on Assets (ROA)** = Net Income / Total Assets = 7264 / 62948 * 100 = 11.53968355
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 7264 / 9409 = 77.20267829
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 6159 / ((3893 + 3584) / 2) = 1.647452187

- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (25424 - 23362) / 23362 * 100 = 8.826299118

2021

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 33222 / 6700 = 4.958507463
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (6701 + 1197) / 1197 = 6.598162072
- **Current Ratio** = Current Assets / Current Liabilities = 19385 / 12184 = 1.591021011
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (19385 - 4086) / 12184 = 1.255663165
- **Net Profit Margin** = Net Income / Revenue = 5893 / 25979 * 100 = 22.68370607
- **Return on Assets (ROA)** = Net Income / Total Assets = 5893 / 61165 * 100 = 9.634594948
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 5893 / 6700 = 87.95522388
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 6454 / ((4086 + 3893) / 2) = 1.617746585
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (25979 - 25424) / 25424 * 100 = 2.182976715

2022

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 37354 / 3661 = 10.20322316
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (7346 + 1406) / 1406 = 6.224751067
- **Current Ratio** = Current Assets / Current Liabilities = 22186 / 15687 = 1.414292089
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (22186 - 4930) / 15687 = 1.100019124
- **Net Profit Margin** = Net Income / Revenue = 6552 / 26323 * 100 = 24.89077993
- **Return on Assets (ROA)** = Net Income / Total Assets = 6552 / 65121 * 100 = 10.06127056
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 6552 / 3661 = 178.9674952
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 6406 / ((4930 + 4086) / 2) = 1.421029281
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (26323 - 25979) / 25979 * 100 = 1.324146426

2023

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 63170 / 6232 = 10.13639281
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (7855 + 2875) / 2875 = 3.732173913
- **Current Ratio** = Current Assets / Current Liabilities = 30332 / 18392 = 1.649195302
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (30332 - 9518) / 18392 = 1.13168769
- **Net Profit Margin** = Net Income / Revenue = 6717 / 28190 * 100 = 23.82759844

• **Return on Assets (ROA)** = Net Income / Total Assets = 6717 / 97154 * 100 = 6.913765774 • **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 6717 / 6232 = 107.7824134 • **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 8451 / ((9518 + 4930) / 2) = 1.169850498 • **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (28190 - 26323) / 26323 * 100 = 7.092656612

Table A1.1.3 Calculations of Financial Ratios on Amgen using its 10-K

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	0.57	0.56	0.45	0.33	0.68
Interest Coverage Ratio	12.23	6.17	19.83	29.05	1.48
Current Ratio	0.88	1.35	1.40	1.22	0.91
Quick Ratio	0.59	0.90	1.10	0.88	0.58
Net Profit Margin (%)	31.44	22.95	27.04	31.27	3.62
Return on Assets (%)	9.96	5.98	13.09	16.57	1.00
Return on Equity (%)	25.72	15.22	31.30	36.30	2.29
Inventory Turnover Ratio	1.29	1.06	3.60	3.81	2.60
Revenue Growth (%)	-3.54	-19.02	93.97	23.42	-41.70

Table A1.2.1 Summarised Financial Ratios on Pfizer from Morningstar

	2019	2020	2021	2022	2023
Debt-to-Equity	0.5666934607	0.5604115136	0.4486974258	0.3328433212	0.6775714542

Ratio					
Interest Coverage Ratio	12.23379924	6.173913043	19.83113865	29.05250404	1.478949751
Current Ratio	0.8793426978	1.352893519	1.39891261	1.216455456	0.9066619241
Quick Ratio	0.657302166	1.042476852	1.18661386	1.003322417	0.6934761686
Net Profit Margin (%)	31.44347826	22.94549967	27.03843126	31.26881292	3.622469912
Return on Assets (%)	9.715264883	6.23488449	12.11124336	15.90831875	0.9355367084
Return on Equity (%)	25.77007744	15.206047	28.46983847	32.79497392	2.380524412
Inventory Turnover Ratio	1.295922896	1.065914526	3.603741596	3.807538803	2.603442879
Revenue Growth (%)	-3.536078439	-19.01835749	93.96773886	23.42535184	-41.69640187

Table A1.2.2 Summarised Financial Ratios on Pfizer Calculated from its 10-K

2019 ● **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 35955 / 63447 = 0.5666934607 ● **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (17682 + 1574) / 1574 = 12.23379924 ● **Current Ratio** = Current Assets / Current Liabilities = 32803 / 37304 = 0.8793426978 ● **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (32803 - 8283) / 37304 = 0.657302166 ● **Net Profit Margin** = Net Income / Revenue = 1627.2 / 5175 = 0.3144347826 ● **Return on Assets (ROA)** = Net Income / Total Assets = 16272 / 167489 = 0.09715264883 ● **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 16272 / 63143 = 0.2577007744 ● **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 10219 / ((8263 + 7508)/2) = 1.295922896 ● **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (51750 - 53647) / 53647 = -0.03536078439
2020 ● **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 35571 / 63473 = 0.5604115136

- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (7497 + 1449) / 1449 = 6.173913043
- **Current Ratio** = Current Assets / Current Liabilities = 3506.7 / 2592 = 1.352893519
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (3506.7 - 804.6) / 2592 = 1.042476852
- **Net Profit Margin** = Net Income / Revenue = 9616 / 41908 = 0.2294549967
- **Return on Assets (ROA)** = Net Income / Total Assets = 9616 / 154229 = 0.062348849
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 9616 / 63238 = 0.15206047
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 8692 / ((8046+8263)/2) = 1.065914526
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (41908 - 51750) / 51750 = -0.1901835749

2021

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 34757 / 77462 = 0.4486974258
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (24311 + 1291) / 1291 = 19.83113865
- **Current Ratio** = Current Assets / Current Liabilities = 59693 / 42671 = 1.39891261
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (59693 - 9059) / 42671 = 1.18661386
- **Net Profit Margin** = Net Income / Revenue = 21979 / 81288 = 0.2703843126
- **Return on Assets (ROA)** = Net Income / Total Assets = 21979 / 181476 = 0.1211124336
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 21979 / 77201 = 0.2846983847
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 30821 / ((9059 + 8046)/2) = 3.603741596
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (81288 - 41908) / 41908 = 0.9396773886

2022

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 31925 / 95916 = 0.3328433212
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (34729 + 1238) / 1238 = 29.05250404
- **Current Ratio** = Current Assets / Current Liabilities = 51259 / 42138 = 1.216455456
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (51259 - 8981) / 42138 = 1.003322417
- **Net Profit Margin** = Net Income / Revenue = 3137.2 / 10033 = 0.3126881292
- **Return on Assets (ROA)** = Net Income / Total Assets = 31372 / 197205 = 0.1590831875
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 31372 / 95661 = 0.3279497392
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 34344 / ((8981+9059)/2) = 3.807538803
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (100330 - 81288) / 81288 = 0.2342535184

<u>2023</u> ● **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 60499 / 89288 = 0.6775714542 ● **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (1058 + +2209) / 2209 = 1.478949751 ● **Current Ratio** = Current Assets / Current Liabilities = 43333 / 47794 = 0.9066619241 ● **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (43333 - 10189) / 47794 = 0.6934761686 ● **Net Profit Margin** = Net Income / Revenue = 2119 / 58496 = 0.03622469912 ● **Return on Assets (ROA)** = Net Income / Total Assets = 2119 / 226501 = 0.009355367084 ● **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 2119 / 89014 = 0.02380524412 ● **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 24954 / ((10189+8981)/2) = 2.603442879 ● **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (58496 - 100330) / 100330 = -0.4169640187

Table A1.2.3 Calculations of Financial Ratios on Pfizer using its 10-K

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	0.88	1	0.8	0.63	0.9
Interest Coverage Ratio	13.84	11.58	18.22	18.09	2.65
Current Ratio	1.24	1.02	1.27	1.47	1.25
Quick Ratio	0.78	0.58	0.73	0.93	0.68
Net Profit Margin (%)	21.01	14.72	26.79	24.49	0.61
Return on Assets (%)	11.79	8.03	13.23	13.52	0.34
Return on Equity (%)	37.42	27.59	41.1	34.5	0.87
Inventory Turnover Ratio	2.47	2.52	2.22	2.94	2.63
Revenue Growth (%)	10.75	2.46	1.48	21.72	1.4

Table A1.3.1 Summarised Financial Ratios on Merck from Morningstar

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	0.87760	1.00170	0.80374	0.62501	0.89628
Interest Coverage Ratio	13.83763	11.57882	18.21960	18.09356	2.64834
Current Ratio	1.23686	1.01599	1.26785	1.47374	1.25197
Quick Ratio	0.96782	0.78508	1.01847	1.22988	1.00451
Net Profit Margin (%)	21.01409	14.72476	26.79246	24.49100	0.60717
Return on Assets (%)	11.66274	7.71608	12.34602	13.30066	0.34216
Return on Equity (%)	37.99359	27.91405	34.17400	31.56922	0.97124
Inventory Turnover Ratio	2.47189	2.52035	2.22229	2.93510	2.62874
Revenue Growth (%)	10.74857	2.46371	1.47935	21.72101	1.40344

Table A1.3.2 Summarised Financial Ratios on Merck Calculated from its 10-K

2019

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 22736 / 25907 = 0.8776006485
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (11464 + 893) / 893 = 13.83762598
- **Current Ratio** = Current Assets / Current Liabilities = 27483 / 22220 = 1.236858686
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (27483 - 5978) / 22220 = 0.9678217822
- **Net Profit Margin** = Net Income / Revenue = 9843 / 46840 * 100 = 21.01409052
- **Return on Assets (ROA)** = Net Income / Total Assets = 9843 / 84397 * 100 = 11.66273683
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 9843 / 25907 = 37.99359247

- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 14112 / ((5978 + 5440) / 2) = 2.471886495
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (46840 - 42294) / 42294 * 100 = 10.74856954

2020

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 25360 / 25317 = 1.001698463
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (8791 + 831) / 831 = 11.5788207
- **Current Ratio** = Current Assets / Current Liabilities = 27764 / 27327 = 1.01599151
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (27764 - 6310) / 27327 = 0.7850843488
- **Net Profit Margin** = Net Income / Revenue = 7067 / 47994 * 100 = 14.72475726
- **Return on Assets (ROA)** = Net Income / Total Assets = 7067 / 91588 * 100 = 7.716076342
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 7067 / 25317 = 27.91404985
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 15485 / ((6310 + 5978) / 2) = 2.520345052
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (47994 - 46840) / 46840 * 100 = 2.463706234

2021

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 30690 / 38184 = 0.8037397863
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (13879 + 806) / 806 = 18.21960298
- **Current Ratio** = Current Assets / Current Liabilities = 30266 / 23872 = 1.267845174
- **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (30266 - 5953) / 23872 = 1.018473525
- **Net Profit Margin** = Net Income / Revenue = 13049 / 48704 * 100 = 26.79246058
- **Return on Assets (ROA)** = Net Income / Total Assets = 13049 / 105694 * 100 = 12.34601775
- **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 13049 / 38184 = 34.17399958
- **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 13626 / ((5953 + 6310) / 2) = 2.222294708
- **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (48704 - 47994) / 47994 * 100 = 1.479351586

2022

- **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 28745 / 45991 = 0.6250135896
- **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (16444 + 962) / 962 = 18.09355509
- **Current Ratio** = Current Assets / Current Liabilities = 35722 / 24239 = 1.473740666

• **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (35722 - 5911) / 24239 = 1.22987747 • **Net Profit Margin** = Net Income / Revenue = 14519 / 59283 * 100 = 24.49100079 • **Return on Assets (ROA)** = Net Income / Total Assets = 14519 / 109160 * 100 = 13.30065958 • **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 14519 / 45991 = 31.56922006 • **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 17411 / ((5911 + 5953) / 2) = 2.935097775 • **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (59283 - 48704) / 48704 * 100 = 21.72100854
2023 • **Debt-to-Equity Ratio** = Total Debt / Shareholders' Equity = 33683 / 37581 = 0.8962773742 • **Interest Coverage Ratio** = EBIT / Interest Expense = (Net Income + Interest + Taxes) / Interest Expense = (1889 + 1146) / 1146 = 2.648342059 • **Current Ratio** = Current Assets / Current Liabilities = 32168 / 25694 = 1.251965439 • **Quick Ratio** = (Current Assets - Inventory) / Current Liabilities = (32168 - 6358) / 25694 = 1.004514673 • **Net Profit Margin** = Net Income / Revenue = 365 / 60115 * 100 = 0.6071695916 • **Return on Assets (ROA)** = Net Income / Total Assets = 365 / 106675 * 100 = 0.3421607687 • **Return on Equity (ROE)** = Net Income / Shareholders' Equity = 365 / 37581 = 0.9712354647 • **Inventory Turnover Ratio** = Cost of Goods Sold / Average Inventory = 16126 / ((6358 + 5911) / 2) = 2.628739099 • **Revenue Growth** = (Revenue Current Year - Revenue Past Year) / Revenue Past Year * 100 = (60115 - 59283) / 59283 * 100 = 1.403437748

Table A1.3.3 Calculations of Financial Ratios on Merck using its 10-K

	2019	2020	2021	2022	2023
Debt-to-Equity Ratio	1.018	1.214	1.396	2.41	2.506
Interest Coverage Ratio	20.234	24.126	40.668	28.814	8.008
Current Ratio	1.172	1.258	1.424	1.276	1.226
Quick Ratio	0.818	0.868	1.036	0.914	0.816
Net Profit Margin (%)	25.708	20.048	28.84	22.594	20.234

Return on Assets (%)	10.562	8.23	13.146	11.152	8.614
Return on Equity (%)	35.346	31.464	42.926	46.402	43.052
Inventory Turnover Ratio	2.0.92	2.128	2.554	2.626	2.11
Revenue Growth (%)	-0.452	-0.916	23.42	9.146	-10.698

Table A1.3.1 Calculated Industrial Average Financial Ratios from Morningstar