



Caterpillar Inc. Equity Research Report

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ABSTRACT

Title: Caterpillar Inc. Equity Research Report

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Key Words: Share Price, Equity Valuation, Discounted Cash Flow, Caterpillar Inc.

The following paper will perform an equity valuation analysis of the company Caterpillar Inc. contextualized in its main operating sectors. The analysis will be carried out using a DCF model to reach a final equity value per share with the objective of comparing this obtained value with the present market price of the company's shares. The paper will so develop: the Introduction will address the importance of valuation and then present the company being valued. To follow, a literature review will be presented, showing the fundamentals and the theoretical bases sustaining the soundness of a valuation methodology like the DCF model.

The Valuation section applies the elements presented in the literature review section in order to reach a fair value for Caterpillar. The Conclusions and General Discussions section closes the analysis. Here a comparison with the equity report from Morningstar and a recommendation with regard to Caterpillar Inc. will be made. The report and the collection of data has been concluded on the day of the issue of Caterpillar's annual report, February the 16th 2024.

RESUMO

Título: Relatório de pesquisa de ações da Caterpillar Inc.

Autor: Alfani Leonardo

Palavras-chave: Preço das Ações, Avaliação Patrimonial, Fluxo de Caixa Descontado, Caterpillar Inc.

A presente tese de mestrado realizará uma análise de avaliação patrimonial da empresa Caterpillar Inc., contextualizada nos seus principais setores de operação. A análise será efetuada utilizando um modelo de Fluxo de Caixa Descontado (DCF) para alcançar um valor final de equidade por ação, com o objetivo de comparar este valor obtido com o preço de mercado atual das ações da empresa. O artigo será desenvolvido da seguinte forma: a Introdução abordará a importância da avaliação e, em seguida, apresentará a empresa a ser avaliada. A seguir, uma revisão da literatura será apresentada, mostrando os fundamentos e as bases teóricas que sustentam a solidez de uma metodologia de avaliação como o modelo de Fluxo de Caixa Descontado.

A seção de Avaliação aplica os elementos apresentados na seção de revisão de literatura de modo a alcançar um valor justo para a Caterpillar. A seção de Conclusões e Discussões Gerais encerra a análise. Aqui, será feita uma comparação com o relatório de equidade da Morningstar e uma recomendação em relação à Caterpillar Inc. O relatório e a coleta de dados foram concluídos no dia da emissão do relatório anual da empresa Caterpillar Inc em 16 de fevereiro de 2024.

LIST OF ABBREVIATIONS

DCF	Discounted Cash Flow
CAT	Caterpillar Inc.
ME&T	Mining Energy & Transportation
EBITDA	Earnings Before Interest and Taxes Depreciation and Amortization
ROE	Return on Equity
ROIC	Return on Invested Capital
EV	Electric Vehicles
FCFF	Free Cash Flow to the Firm
NOPAT	Net Operating Profit After Tax
EBIT	Earnings Before Interest and Taxes
WACC	Weighted Average Cost of Capital
CAPM	Capital Asset Pricing Model
TV	Terminal Value
R&D	Research & Development
D&A	Depreciation & Amortization

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INTRODUCTION

1.1. Why Valuation

In today's environment, where changes and information flow faster than ever, the challenge of equity valuation has become a more and more stringent issue. Equity Valuation tries to address several challenges, that in the always evolving and interconnected world we live in, are today of more than ever of utmost importance. Just to mention some of the most important aspects that equity valuation tries to address, we can think of Investment Decisions, Mergers and Acquisitions, Corporate Finance decisions, Risk Management, Economic Analysis, Regulatory Compliance, Portfolio Management, and Wealth Management and Retirement Planning.

It goes by itself that in each and every of these multiple aspects, the capability of making sound decisions through a proper analysis is of utmost importance. In this brief but detailed dissertation we are going to address just the first aspect, Investment Decisions, even if all the others can be somehow reconducted to this main one. To do so we are going to perform a valuation of the company Caterpillar Inc, in the heavy equipment and mining sector.

The methodology chosen to perform the analysis is the Discounted Cash Flow methodology because given the company under analysis and the strengths and weaknesses of the DCF method, it appeared to be the best possible choice for this task. The general characteristics, strengths and weaknesses of a DCF method will be further discussed in the General Discussion section of the analysis.

1.2. Caterpillar Inc.

Rooting its origins into a tractor manufacturing company at the beginning of the 1900s, today Caterpillar Inc. (CAT), with a 2023 revenue of \$67.1 billion remains the world leading company in heavy equipment manufacturing. (About Caterpillar, 2024). At the present date CAT conducts operations on every continent in the areas of Construction Industries (Infrastructures), Resources (Mining), and Energy & Transportation. The values on which the company is built can be summarized in Integrity, Excellence, Teamwork, Commitment, and Sustainability.

The company uses an information-driven approach when making operational decisions, it goes by the name of Operating & Execution Model. It builds itself around profitable growth as the

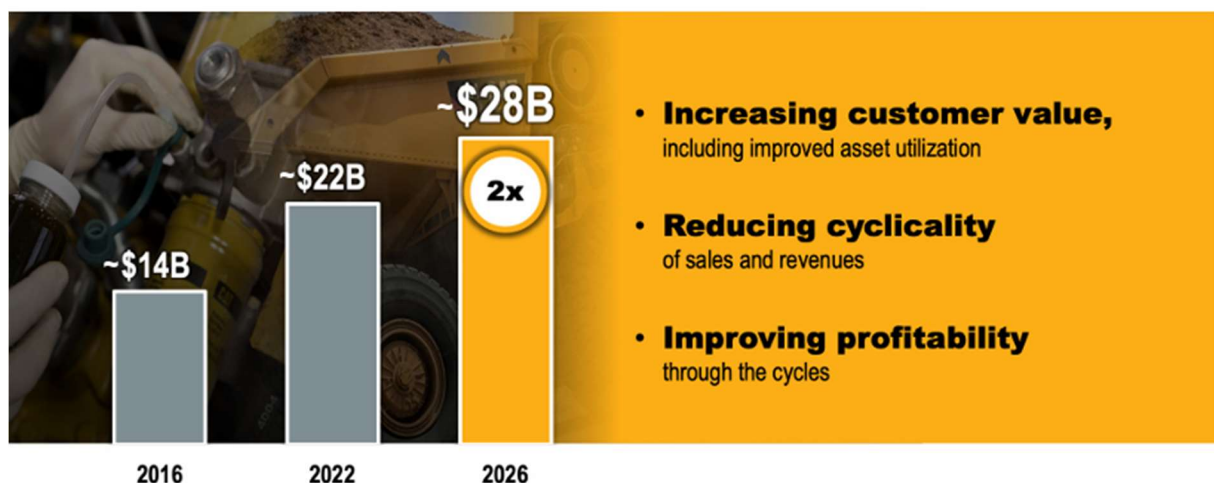
central goal for the company. Then CAT implements its strategy into the model to reach this final goal. Caterpillar articulates its strategy into four main areas respectively: operational excellence, expanded offerings, growing services, and sustainability that, as the company stated, has recently been introduced. (Caterpillar Investor Presentation, 2022)

Moving on to examine the competitive advantages stated by the company, the Caterpillar Dealers Network, with 156 and 2,800 facilities in 192 countries, seems to be the fundamental resource that allows CAT always have support present for its customers. Among the benefits provided by this extensive dealers' network, the company highlights their sense of entrepreneurship due to the fact that they are independently owned, the presence of local personnel, the deep customer insights due to the long-term relationship, and the possibility to offer capital and financing assistance thanks to their partnership with Cat Financial. (Caterpillar Investor Presentation, 2022)

Concerning the prospects for the future of the company, Caterpillar started declaring that the sales and revenues for the full year of 2024 are expected to be very close to the level of 2023. (Caterpillar Fourth Quarter and Full Year Financial Review, 2023). That said the company has experienced and expect to continue experience in the foreseeable future healthy demand across multiple end markets. This could be due to multiple factors such as the energy transition, that is expected to increase the demand for mined materials, and the substantial investment of the companies in the development of new generation machinery, digitalization, and connectivity. Caterpillar remains confident in the possibility of achieving the objective of doubling its ME&T

Figure 1 ME&T Cash Flow Targets

Strong Momentum to Achieve Services Target



cash flow from \$14 billion in 2016 to \$28 billion in 2026. The company expects to be able to reach this objective through a combination of three main steps, these being: increasing customer value, reducing the effect of cyclicalities, and improving its profitability. Moreover, CAT is aiming to further enhance its digitalization through an improved connectivity among its main products and plants. These goals, if properly carried out, could enable Caterpillar to seize the profitable growth opportunities that the energy transition is bringing in in terms of accelerating mining commodities demand and growing global energy demand.

Figure 2 Future Opportunities & Goals



To address these new possibilities Caterpillar is investing further to increase its infrastructure, expand its services, and the development of new products and technologies. Clear examples are the development of new lithium-ion batteries developed for demanding working conditions, and the new fully electric mining trucks. Thanks to this line of action CAT remains confident in its capability of continuing to return to shareholders the totality of the cash flow derived from

ME&T through dividends and stock repurchases. Looking at the past trend in CAT's dividends the objective appears to be in line with the possibilities of the company.

Figure 3 CAT's Dividends Trend

Dividends Per Share Paid by Year²



Caterpillar has been constantly increasing its dividends to shareholders for the past thirty years and this trend is believable to continue in the foreseeable future.

1.3. Industry and peer

To better understand how Caterpillar is performing in working towards the stated objectives, a

Figure 4 Key Figures and Ratios Comparison 2023

	CAT	Komatsu	Industry Average
Profitability			
Gross Margin	36.4%	29.3%	37.1%
EBITDA Margin	25.2%	18.2%	17.0%
Operating Margin	19.3%	13.8%	12.8%
Net Margin	15.3%	9.6%	8.3%
Earning Power			
Asset Turnover	0.79	0.77	0.77
ROE	58.5%	13.7%	12.2%
Earning Retention	0.75	0.60	0.79
Reinvestment Rate	44.0%	8.2%	11.4%
Leverage			
Debt/Equity	1.86	0.41	0.54
Liquidity			
Quick ratio	0.87	1.17	1.26
Current Ratio	1.35	2.07	2.16
Operating			
ROIC	19.9%	10.9%	-
Revenue per Employee	\$ 603,328.80	\$ 367,588.46	-

brief comparison with Komatsu and industry standard averages will be presented. Even if the difference in market capitalization between the two companies is of relevant magnitude, the

fact that they both operate in the exact same sector and with very similar lines of products, offers a nice opportunity for comparison.

Moreover, in order to address possible differences given by the relevant size difference among the two companies, a comparison will be performed against market averages as well, in order to confront CAT's performance against what should be the aggregate performance of all the possible peers.

First a series of profitability measures will be addressed, starting with the company gross margin. Caterpillar presents a gross margin of 36.4% in 2023. This performance is closely aligned with the industry average (37.1%), while Komatsu slightly lags behind with a gross margin of 29.3%. CAT outperforms both Komatsu and the Industry Averages in all other profitability parameters, namely EBITDA Margin 25.2% (Komatsu 18.2%, Industry Average 17%), Operating margin 19.3% against 13.8% for Komatsu and 12.8% for the industry, and last the Net Margin where CAT shows an impressive 15.3% compared with Komatsu 9.6% and industry average of 8.3%.

Shifting the attention to the company's earning power it is possible to see how CAT's asset turnover (0.79) is perfectly in line with the average from the industry (0.77) as well as Komatsu (0.77). While, instead, comparing the levels of the different reinvestment rates, it is possible to see how Caterpillar massively deviates both from the industry average and the reinvestment rate of Komatsu. CAT reinvests an impressive 44% of its resources, this compared with an 8.2% from Komatsu and 11.4% as an industry average. Such a reinvestment level could testify to the effort that the company stated to be pursuing during the presentation to shareholders of constant research into innovation and service expansion. The development of new generation electric equipment coupled with the strategy to increase the reach and quality of services to customers could be reflected in an above average level of reinvestment.

When looking at Return on Equity, a different approach has to be considered. Caterpillar shows an astonishing 58.5% as ROE level, that is absolutely out of scale both compared to Komatsu performance of 13.7% and the industry average of about 12.2%. The ROE decomposition suggests that such an incredible performance could be due to the combination of spread and leverage showcased by Caterpillar. If the debt-to-equity ratio is investigated, it is easily noticeable how compared to the industry average of 0.54 and Komatsu's ratio of 0.41, CAT exhibits a quite more relevant 1.86 debt to equity ratio. This could be the leading cause explaining such a higher-than-expected ROE. This in turn exposes the company to a higher degree of interest rate risk than its direct competitor, Komatsu.

The high levels of debt showcased by the company demand its liquidity to be investigated. In order to do so the quick ratio and the current ratio of the companies can be compared. It is visible how both ratios are, for CAT, below both Komatsu's levels and the industry average. Nevertheless, being the quick ratio close to 1 (0.89) and the current ratio above 1 (1.35), the company should not incur any substantial risk of not being able to meet on time its financial obligations.

The potential negative factor of an "inflated" ROE thanks to the excessive use of financial leverage could be mitigated by the level of return on invested capital (ROIC) showcased by Caterpillar. If the RIOCs of the two companies are put to comparison, it appears clearly visible the superior capacity of CAT of obtaining more satisfying results from its investments, Caterpillar's ROIC stands at a satisfactory 19.9% compared with the 10.9% of Komatsu.

Among its strengths Caterpillar can first of all count on its size, a factor that gives the company several advantages to exploit like economies of scale and a wider reach. Together with it, it is possible to recognize Caterpillar's diverse product range so that it can address different demands and customers' needs, a very wide and spread global network, and its sound financial position. These elements together concur in putting CAT in a solid and competitive position that gives the investors the reassurance that the company would be able to face even unforeseen difficulties or challenges without incurring too great risks.

Its weaknesses instead mostly depend on the price sensitivity, the interest risk, and the high dependency on end markets that Caterpillar is called to face. As stated in the company financial report, the greater risks that CAT expects to face are to see their margins reduced due to shifts in prices and their exposure to interest risk through their financial activities.

Nevertheless, these elements are matched with a potential range of great opportunities presented to Caterpillar in the upcoming years. The two main ones that stand out are surely the increasing attention to the energy transition towards a greener economy and the speeding up of the development of infrastructures and emerging markets economies.

The raising concerns about the green transition, especially paired with the electrification and the switch to fossil and gas free energy sources, not only present a great opportunity for CAT for the development of innovative products to satisfy the increasing market demand, but the transition is expected to increase the demand for raw materials and rare materials. This aspect could in turn increase the demand for new mining equipment and machinery, bringing potential benefits to Caterpillar.

On the other hand, opportunities do not come without potential threats. CAT has three main ones to be concerned about that are: a potential economic slowdown, an increasing competition, and the energy transition itself. Let's look at each one of them in more detail.

The economic slowdown could arise from a potential crisis that is still so feared to arrive. Long-Term bonds still present an inverted yield curve and if the eventuality of a crisis should materialize, then the increased expected revenues derived from an increase in demand could be delayed by several years, keeping the income of CAT stable or even decreasing over the close foreseeable future.

For what instead concerns the potential competition, in case of an increase in demand in the markets where Caterpillar operates, it could attract external competition (especially from China and Japan) drawn by the idea of increasing profits. This could in turn lead to a decrease in the margins of the company. Finally, the energy transition presents threats as well as opportunities. It could be more costly than expected for the company to implement the new green economy requirements and the development of new generation machinery and equipment could turn out to be too expensive, if compared with the actual demand for these new pieces of equipment. This as well, could in turn reduce the revenues and the margin of the company.

Turning the attention to the outlook of the sectors Caterpillar operates in, it is possible to identify several elements that could contribute to possible future scenarios. Referring to the 2023 Global Energy Perspective report from McKinsey & Company it is possible to see that fossil fuel demand (oil and gas) is projected to peak in the next years and then embrace a diminishing trend. While on the other side, renewables should make up the bulk of the power mix by 2050. To reach this goal, major investments in the energy sector will be needed.¹ The major areas that led in these years, and that are expected to continue to do so are respectively: EV sales, Heat Pump sales, Solar capacity, and Wind capacity.

As clearly visible in the graphs from Figure 5, the resources invested in low-carbon technologies has been constantly increasing in the past years and, given the new politics introduced for the de-carbonization process, are likely to keep increasing in the foreseeable future in order to sustain the energy transition. This has important implications for CAT as it is likely that, if on one side the reducing demand of oil, gas, and coal could negatively affect the company, on the opposite side of the spectrum a steep increase in the demand of materials to

manufacture EV, solar panes, and wind turbines could potentially be reflected in an increase in demand for the products offered by CAT, like heavy equipment for the mining of these resources.

Given the cyclical nature of the sector and sectors that the company operates in, it is of great help to look into sector indexes in order to collect additional information with regard to which position of a cycle the present economy is in. The first index chosen is the Dow Jones Global

Figure 6 Dow Jones Global Basic Material Index

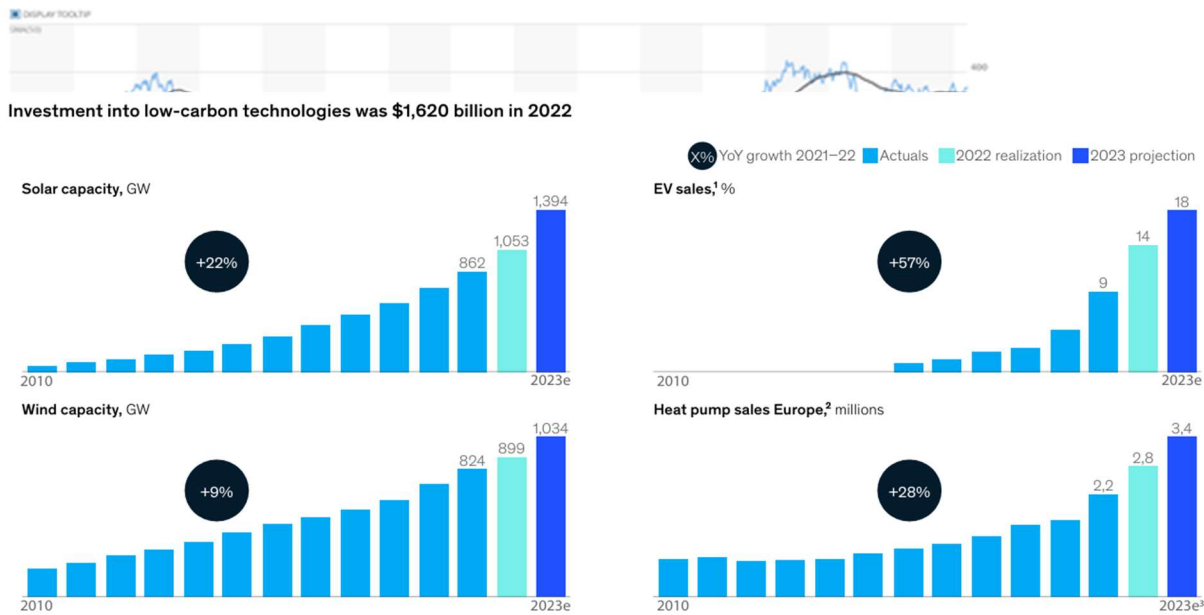
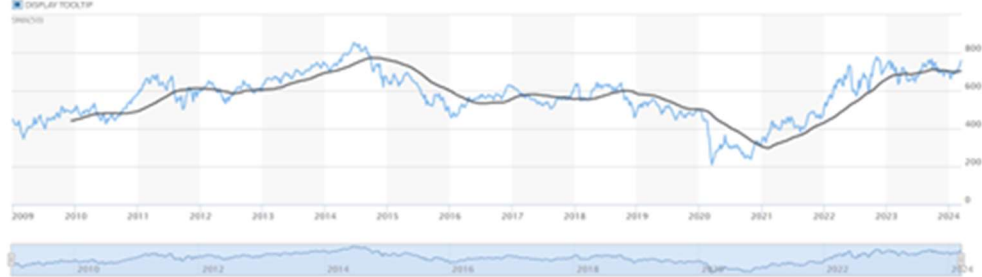


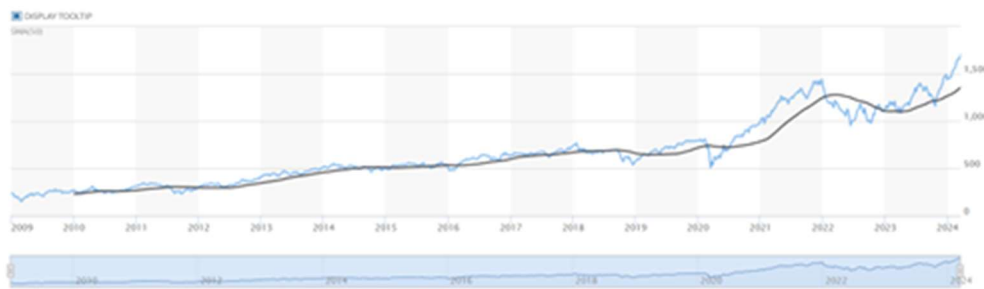
Figure 7 Dow Jones US Construction and Material Index



Basic Material Index. From the Figure 6 it is clearly visible how the index is almost back at the 2011 high, this could mean that we are at a high point of the cycle and that a future decrease could happen. On the other hand, it is possible that the renewed and increasing demand for materials due to the energy transition could be a sufficient element to further sustain this growth and push the index further to new highs, before the eventuality of a correction. Moving on to

the industrial sector, the index chosen was the Dow Jones Global Industrial Index. Again, it is clearly visible from Figure 7 how the index is back and has already surpassed the its previous

Figure 9 Dow Jones US Oil & Gas Index



highest point, reached back in 2021, before the slump due to the crisis and the raise of interest rates. Even if this could suggest that we are a high point of the cycle and that a correction could be likely to happen, looking at past performances it is possible to see how drawbacks happened further in the future, after a new high had been broken through. This could imply that, even if a correction could happen, it is not yet an immediate event. Together with the industrial index, the Dow Jones US Construction and Material Index shows a behavior very similar. It is possible

Figure 8 Dow Jones Global Industrial Index



to see how the index, after a slump in 2022 and a brief setback at the end of 2023, it is already above the maximum levels reached back in 2021. Even if the levels are at new highs, a cyclicity is not clearly visible in this case, therefore is hard to draw a possible clear expectation for the upcoming future. An element that could favor further growth could be the possibility of interest rate cuts during this year. If the even should not happen, than a correction is as likely. Finally, to have a clear vision of the nery sector the Dow Jones US Oil & Gas Index is visible in Figure 9. A clear cyclicity here is visible and it is possible to observe how the index is returned to the high level reached back in 2014, bringing us close to the peak of the cycle. As already stated in the McKinsey report, demand for Oil and Gas are expected to enter a decreasing trend in the close future. This, combined with the high level reached by the index, could suggest that a correction could be likely to happen in the close future, driving back the index to lower than present levels. This eventality could in turn put additional pressure on the materials sector, because even if the demand for fossil fuels is predicted to decrease, the demand

for energy is instead forecasted to increase in the future. The additional energy needed to replace the one produced from fossils has to come from renewable sources, and this implies that an even greater amount of materials will be needed to satisfy this increasing demand.

Overall the position of the company looks like in the middle of a cycle. Materials could keep rising due to the energy transition, but this increase could be compensated by a general decrease of the fossil fuels energy sector. Industrial and construction sectors do not show heavy traits of cyclicalities, but both are close or above the maximum historical levels. They both are heavily influenced by the interest rates' level. An eventual easing policy as the FED seems likely to begin later this year could push these sectors to even higher new maximums before the eventuality of a correction.

On the other hand, the main risk is that the expected correction could come before than anticipated putting a downward pressure on both sectors. Given all the elements considered, the estimates done by CAT about the 2024 revenues expected to be very close to the 2023 levels appears very likely and accurate.

2. LITERATURE REVIEW

We are now about to present the main elements that represent the building blocks of the methodology used to determine what should be the intrinsic value of Caterpillar. Together with these building blocks a possible alternative will be presented, the Dividend Discount Model, and the necessary assumptions on which the theory builds up.

2.1. Market Efficiency

As stated by Damodaran, an efficient market is one where the price of a stock is a reflection of its true value, and this reflection is unbiased (Damodaran, 2012). What does this specifically mean and what kind of implications an efficient market would have for an investor? An efficient market is one where price deviations from the true value of a stock are at random and uncorrelated with all the observable variables. This would imply that all the information available is already incorporated and reflected in the stock's price.

The consequences are straightforward, if that is to be the case any kind of valuation activity is useless. No investor could consistently beat the market, and equally allocating "X" amount of resources over "N" number of stocks at random, would be as effective (if not more) than

actually performing any form of analysis in order to actively choosing a stock over another. Nonetheless, there seems to be a caveat that allows inefficiencies to arise and some investors to profit from them. This caveat is the speed at which the market inefficiency is corrected, and so how long it takes for it to disappear. The dominant idea is that there are three forms of market efficiency: Weak, Semi-Strong, and Strong. (Chung, Hrazdil, 2010). The Weak form of efficiency assumes that just past information are incorporated and reflected in market prices, so allowing room for present inefficiencies to appear and be exploited by who can access and correctly interpret the most recent information.

The Semi-Strong hypothesis states instead that the market price reflects all the publicly available information, past and present. This condition would allow those individuals that have access to private information or public information in advance with respect to the majority of other players could exploit momentary inefficiencies, that would self-correct as soon as the new information are made available for everyone else.

The last form of efficiency theorized is the Strong Form of market efficiency. It simply takes what the other two say and adds the fact that market prices not only reflect past and present publicly available information, but even private and insider information, so not allowing the possibility for inefficiencies to arise at all.

Recent studies seem to suggest that higher liquidity of both information and capital favor a higher degree of efficiency. If we think of how fast information flows today with respect to the last century, this possibility seems very likely to be true. Information are readily available for everyone almost instantaneously today, while just 60 years ago this was not the case.

The logic would suggest that today's fast flow of information allows the market to correct inefficiencies very quickly, bringing it more and more toward a condition of strong efficiency, while in the past these "errors" were slower to correct, potentially allowing a greater number of people to profit from them. In conclusion, the most plausible hypothesis for today's time seems to be the Semi-Strong Efficient Market Hypothesis.

2.2. Dividend Discount Model

The first and probably the best-known valuation method worth mentioning is the Dividend Discount Model (Damodaran, 2012). Despite its simplicity it has been and still is widely used. The main assumption of this model is that the value of a company can be represented as the future cash flows to the investors in the form of dividends, discounted by a discounting factor back to present value.

Equation 1 Dividend Discount Model

$$\text{Value per share of stock} = \sum_{t=1}^{t=\infty} \frac{E(DPS_t)}{(1 + k_e)^t}$$

where DPS_t = Expected dividends per share
 k_e = Cost of equity

As it is possible to see the Dividend Discount Model, also known as Gordon Growth Model, requires two main inputs: the future expected dividends and the cost of equity. The model represents the value of a single stock as the expected dividend amount for the next period, divided by the difference between the cost of equity and the long-term growth rate. Even if the model has the advantage of its great simplicity, it can reliably be applied to companies that ideally are in a stable-growth or maturity phase and this for three main limitations presented by the model.

The first one being, obviously, not every company pays dividends, implying that for those that don't the model is rendered completely useless. Second, the Dividend Discount Model is sensible to the assumption made about the long-term growth rate, meaning that even slight variations in this factor can produce extremely different results in terms of final value. Last but not least, if the long-term growth rate approaches the cost of equity, the per-share value of the company approaches infinity (Damodaran, 2012). These limitations lead to a less and less frequent use of the Gordon Growth Model over time.

2.3. Discounted Cash Flow (DCF)

The DCF model addresses at least one of the problems mentioned with the Dividend Discount Model, the case in which the company wouldn't be to pay any dividend to its investors. We can consider the Free Cash Flow as the amount of cash indeed that the firm could potentially distribute to its investors. If we consider an investment in a company as an asset generating a return then, following Damodaran's definition of asset's value, it is possible to see how the DCF model allow us to estimate what the intrinsic value of a company could be, "the value of any asset is the present value of expected future cash flows that the asset generates" (Damodaran, 2012).

Equation 2 DCF Model

$$Present\ Value = \sum_{t=1}^{t=n} \frac{CF_t}{(1+r)^t}$$

- n = life of the asset
- CF_t = Cash Flow of period t
- r = discount rate

The DCF Model presents several benefits but several weaknesses as well. As positive aspects we can highlight its fundamentals-based approach (it focuses on the intrinsic value of a business and this is in direct contrast with market-based valuation, as these estimates can be influenced by investors' sentiment), its being detail-oriented (it provides a throughout understanding of a company operations and potential), its flexibility (it is very well suited for sensitivity analysis, given that the DFC Model can be modeled on various assumptions), and the long-term perspective.

On the other hand, the DCF Model is sensible to assumptions (speculative assumptions will produce speculative results), it is sensible to the discount rate used and to the accuracy of the forecasts made (forecasted future cash flow can be highly uncertain and subjective and small variations in the discount rate can produce significantly different results), and it's definitely more complex (higher complexity usually translates in higher time requirements and, as a consequence, higher costs) than a model like the Dividend Discount can be (Steiger, 2008).

In order for us to be able to determine the intrinsic value of a company through the use of the DCF Model, a list of sub-components is necessary. In the following pages each one of these sub-components will be briefly presented and explained.

FREE CASH FLOW TO THE FIRM (FCFF)

The Free Cash Flow to the Firm (FCFF) "is the sum of the cash flows to all claim holders in the firm, including common stockholders, bondholders, and preferred stockholders" (Damodaran, 2009). It can be referred to as *unlevered free cash flow*, and it would represent the surplus cash flow available to a business if it was debt free (Corporate Finance Institute, 2024). Usually, it is obtained starting from the NOPAT (Net Operating Profit After-Tax), that can be derived just by the EBIT multiplied by (1-Tax Rate) of the company. From here depreciation and amortization are going to be added back (because they are not cash expenses) and the

CapEx and the change in the Net Working Capital are going to be subtracted, leaving us with the FCFF for the year under analysis.

Equation 3 Free Cash Flow to the Firm (FCFF)

$$FCFF = NOPAT + Depreciation/Amortization - CapEx - \Delta Net Working Capital$$

Being the FCFF the element that should represent the expected future cash flows generated by the company; this makes it of primary importance in the determination of the enterprise value.

WEIGHTED AVERAGE COST OF CAPITAL (WACC)

The Weighted Average Cost of Capital represents our discounting factor for the calculation of the terminal value of the company and the discounting factor to determine the present value of the FCFF. It takes into consideration both the Cost of Equity and the Cost of Capital and scales their respective influences based on the weight they have on the capital structure of the company.

Equation 4 Weighted Average Cost of Capital

$$WACC = cost\ of\ equity * E/V + cost\ of\ debt * D/V * (1 - TaxRate)$$

Relying on past data, WACC presents some limitations in the accuracy that can be expected when forecasting the future. Different assumptions can lead to significantly different results and even just the implicit assumption that the capital structure of a company will remain fixed in time cannot completely reflect the reality of facts.

COST OF EQUITY

In our case calculated through the Capital Assets Pricing Model or CAPM, the cost of equity represents the rate or return that investors expect to get from a company as compensation for bearing the risk when investing their resources into it. CAPM is composed by multiple factors: the risk-free rate, the *beta* of the company, and the equity risk premium.

Equation 5 Cost of Equity

$$Cost\ of\ Equity = Risk-Free\ Rate + \beta * Equity-Risk\ Premium$$

Again, as already mentioned for the WACC, the CAPM relies on past data and makes the implicit assumption that these data will be accurate in forecasting the future.

COST OF DEBT

The Cost of Debt represents the effective interest rate that a company pays to its debtholders. It is usually calculated after tax when used to compute the WACC because this practice makes it possible to account for the shield benefits deriving from debt financing (Wallstreet Prep, 2024).

Equation 6 & 7 Cost of Debt

Pre-Tax Cost of Debt = Risk-Free Rate + Country's Default Spread + Firm's Default Spread

*After-Tax Cost of Debt = Pre-Tax Cost of Debt * (1-TaxRate)*

The Cost of Debt, computed as a sum of the risk-free rate, the country's default spread, and the firm's default spread (Damodaran, 2009), can be affected by many factors. To list a few more important ones, we can quote the level of the interest rates, that directly affect the interest rates requested by banks, and the reliability of the company or its credit rating. The distinction between pre- and after-tax cost of debt derives from the fact that debt provides for firms what is known as a tax-shield, making it necessary to compute the actual economic impact of the debt on the firm.

This last element works in reverse too, because looking at the credit rating of a company can help us understand how solid and reliable it is considered, providing insights to make our investment decisions.

RISK-FREE RATE

The term Risk-Free Rate refers to any kind of investment that one decides to make and where a return can be expected bearing virtually no risk at all. Usually, it is associated with the interest rate of the 10-year US treasury notes, and this is exactly what we are going to be using as Risk-Free rate during the valuation of Caterpillar. It is important to understand that no instrument is actually risk-free. The risk is considered virtually zero because a failure to repay such an instrument would signify the default of the US, given the statistical unlikelihood of this event to actually verify, the interest rate is considered risk-free.

The risk-free rate is a fundamental element for valuation, given that it is essential for deriving both the cost of equity and so compute the WACC.

An additional caveat is that, generally, the adoption of the 10-year US treasury notes can be made only if we are valuing a US company, otherwise a better practice would be of using the interest rate of the government bonds of the country where the company is located.

BETA

The *beta* of a company represents a factor that allows us to understand how sensitive the price of the company's stock to market movements is. In general, a beta greater than 1 indicates that, in response to a movement of the market both positive and negative, the company's stock will "answer" with a movement that is magnified. In theory the size of the change in value should be possible to compute by multiplying the market movement by the beta of the company.

This means that beta is a measure of the volatility of the stock in relation to the market as a whole.

Equation 8 Company's Beta

$$\beta = \text{Covariance}(\text{Return of the security}, \text{Return of the market}) / \text{Variance}(\text{Return of the market})$$

Given the complexity and the amount of data necessary to correctly estimate the beta of a company we'll be relying on the data available on Refinitiv to get the beta for Caterpillar.

TERMINAL VALUE

The terminal value is the final element of our computation and will allow us to determine the total enterprise value when added to the forecasted expected FCFFs. It will be computed using the perpetuity method. The assumption made in this calculation implies that the company, once reached the last forecasted year, will be able to keep a constant growth rate for the foreseeable future.

Equation 9 Terminal Value

$$TV = FCFF * (1+g) / WACC - g$$

Where *g* is the long-term growth rate. This growth rate has to comply with some logical limitations and be consistent with what the company can expect to achieve as future growth. For example, it is recommended to not assume a growth rate that is higher than the growth rate of the economy as a whole. This because, given that the calculation is based on the assumption of a constant future growth, a higher growth rate than the economy's ones, would imply that at a certain point in time in the future the value of the company alone would be greater than the value of the economy as a whole, and this is clearly impossible.

Another suggestion is to use a growth rate that is in line with the sustainable growth rate of the company. Given that in order to grow a company has to reinvest part of the profits into the business, this level of reinvestment determines how fast a company can expect to grow in the foreseeable future, all other conditions equal. A long-term growth rate greater than the sustainable growth rate would require, in the long run, a level of reinvestment that the company (at the present time) cannot afford to sustain forever.

With all the necessary elements now laid out and clarified, we'll be moving on to the section where the valuation of Caterpillar Inc. will be performed. To perform the valuation of the company the DCF Model will be used, and the choice has been made as consequence of the advantages stated when presenting it at the beginning of this section (fundamentals-based, detail oriented, flexible, and long-term focused). These positive aspects have been considered to outweigh the drawbacks present, such as the model's sensitivity to assumptions and discount rates used, that are conditions that can be mitigated through a deep and attentive analysis.

3. VALUATION

3.1. Free Cash Flow to the Firm (FCFF)

As has already been discussed, in order to perform a valuation using the DFC method, two main components are needed: the expected FCFF for the numbers of years forecasted and then the estimation of the terminal value of the enterprise. This first section will be focused in forecasting the expected FCFF and its sub-components for the upcoming 10 years.

For this purpose, wherever possible and reliable to do so, we'll assume the average past performance, calculated excluding the years from the Great Financial Crisis (2009-2011) to be the best indicator possible of expected future performances given the fact that more complex and sophisticated models better predict future expected returns with a greater accuracy than past average performances often by a negligible margin, and in an inconsistent way (Campbell, 2015), (Welch, 2007). First let's look at the revenues presented by Caterpillar. The choice of such a long sample period has been made in order to reduce possible noise in the data deriving from the recent Covid-19 crisis.

Figure 10 CAT's Revenues Overview (in millions of \$)

Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Revenue Sales of Goods & Services	\$ 29,540.00	\$ 39,867.00	\$ 57,392.00	\$ 63,068.00	\$ 52,694.00	\$ 52,142.00	\$ 44,147.00	\$ 35,773.00	\$ 42,676.00	\$ 51,822.00	\$ 50,755.00	\$ 39,022.00	\$ 48,188.00	\$ 56,574.00	\$ 63,869.00
Revenues of Financial Products	\$ 2,856.00	\$ 2,721.00	\$ 2,746.00	\$ 2,807.00	\$ 2,962.00	\$ 3,042.00	\$ 2,864.00	\$ 2,764.00	\$ 2,786.00	\$ 2,900.00	\$ 3,045.00	\$ 2,726.00	\$ 2,783.00	\$ 2,853.00	\$ 3,191.00
Total Revenue	\$ 32,396.00	\$ 42,588.00	\$ 60,138.00	\$ 65,875.00	\$ 55,656.00	\$ 55,184.00	\$ 47,011.00	\$ 38,537.00	\$ 45,462.00	\$ 54,722.00	\$ 53,800.00	\$ 41,748.00	\$ 50,971.00	\$ 59,427.00	\$ 67,060.00

Revenues Growth	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Arith. Average
Revenue Sales of Goods & Services	34.96%	43.96%	9.89%	-16.45%	-1.05%	-15.33%	-18.97%	19.30%	21.43%	-2.06%	-23.12%	23.49%	17.40%	12.89%	2.29%
Revenues of Financial Products	-4.73%	0.92%	2.22%	5.52%	2.70%	-5.85%	-3.49%	0.80%	4.09%	5.00%	-10.48%	2.09%	2.52%	11.85%	1.41%
Total Revenue	31.46%	41.21%	9.54%	-15.51%	-0.85%	-14.81%	-18.03%	17.97%	20.37%	-1.68%	-22.40%	22.09%	16.59%	12.84%	2.18%

We can see in Figure 10 that Revenues and their growths oscillated greatly during the past years, while the revenues coming from financial products has been exceptionally stable. This led to an average growth rate for the total revenues of 2.29%.

Using the averages as future performance reference and keeping into account the expectations expressed by the company and clarified in the Introduction section for the upcoming future, in Figure 11 are the expected revenues for the period 2024-2033.

Figure 11 CAT's Revenues Projection (in millions of \$)

Income Projections	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
Revenue Sales of Goods & Services	\$ 64,507.69	\$ 65,475.31	\$ 67,439.56	\$ 70,811.54	\$ 76,193.22	\$ 81,983.90	\$ 86,984.92	\$ 91,247.18	\$ 94,349.59	\$ 96,142.23
Revenues of Financial Products	\$ 3,219.72	\$ 3,248.70	\$ 3,277.93	\$ 3,307.44	\$ 3,337.20	\$ 3,367.24	\$ 3,397.54	\$ 3,428.12	\$ 3,458.97	\$ 3,490.10
Total Revenue	\$ 67,727.41	\$ 68,724.00	\$ 70,717.50	\$ 74,118.98	\$ 79,530.42	\$ 85,351.14	\$ 90,382.47	\$ 94,675.31	\$ 97,808.56	\$ 99,632.34

Income Growth Projections	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
Revenue Sales of Goods & Services	1.00%	1.50%	3.00%	5.00%	7.60%	7.60%	6.10%	4.90%	3.40%	1.90%
Revenues of Financial Products	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%	0.90%
Total Revenue	1.00%	1.47%	2.90%	4.81%	7.30%	7.32%	5.89%	4.75%	3.31%	1.86%

The company is expected to have a performance for the year 2024 very close to the one presented in 2023. Given this widespread expectation, it seems unlikely that Caterpillar will be able to immediately grow at a pace greater than the past average. But that, the possible higher-than-average growth due to the future potential opportunities expected by the company will require some time in order to be fully exploited.

A scenario that seems more likely to happen is one where Caterpillar will slowly increase its revenue growth across the upcoming years, until when the company will be fully able to take advantage of the potential development scenarios previously discussed. Its capability to reach such a growth comes from the expected opportunities brought by the energy transition that is happening and will happen in the forthcoming years. From that point forward, due to increasing competition and stricter environmental obligations, revenues' growth rate will most likely decrease again to finally stabilize at a lower than the historical average level.

The forecasted total revenue growth rate is instead derived from the forecasted total revenue, that is a sum of the forecasted revenues from sales of goods & services and the revenues from financial products. Now that we have a glance at the past and future expected revenues, we will focus our attention on the operating expenses necessary to reach an estimation of the future FCFF.

Figure 12 CAT's Operating Expenses (in millions of \$)

Operating Expenses	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Total Revenue	\$ 32,396.00	\$ 42,588.00	\$ 60,138.00	\$ 65,875.00	\$ 55,656.00	\$ 55,184.00	\$ 47,011.00	\$ 38,537.00	\$ 45,462.00	\$ 54,722.00	\$ 53,800.00	\$ 41,748.00	\$ 50,971.00	\$ 59,427.00	\$ 67,060.00
Cost of Good Sold	\$ 23,886.00	\$ 30,367.00	\$ 43,578.00	\$ 47,055.00	\$ 40,727.00	\$ 40,718.00	\$ 33,284.00	\$ 27,782.00	\$ 31,087.00	\$ 36,815.00	\$ 36,508.00	\$ 29,039.00	\$ 35,454.00	\$ 41,135.00	\$ 42,657.00
Selling, General & Administrative	\$ 3,645.00	\$ 4,248.00	\$ 5,203.00	\$ 5,919.00	\$ 5,547.00	\$ 6,529.00	\$ 4,951.00	\$ 4,383.00	\$ 4,999.00	\$ 5,478.00	\$ 5,162.00	\$ 4,642.00	\$ 5,365.00	\$ 5,651.00	\$ 6,371.00
R&D	\$ 1,421.00	\$ 1,905.00	\$ 2,297.00	\$ 2,466.00	\$ 2,046.00	\$ 2,380.00	\$ 2,119.00	\$ 1,853.00	\$ 1,842.00	\$ 1,850.00	\$ 1,693.00	\$ 1,415.00	\$ 1,686.00	\$ 1,814.00	\$ 2,108.00
Interest Expense of Financial Products	\$ 1,045.00	\$ 914.00	\$ 824.00	\$ 796.00	\$ 728.00	\$ 624.00	\$ 587.00	\$ 596.00	\$ 646.00	\$ 722.00	\$ 754.00	\$ 589.00	\$ 455.00	\$ 565.00	\$ 1,030.00
Other Operating (income) expense	\$ 1,341.00	\$ 1,158.00	\$ 1,081.00	\$ 391.00	\$ 740.00	\$ 1,189.00	\$ 734.00	\$ 1,147.00	\$ 1,172.00	\$ 1,178.00	\$ 1,127.00	\$ 1,156.00	\$ 1,043.00	\$ 1,134.00	\$ 1,148.00

Expenses as Percentage of Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Arith. Average
Cost of Good Sold	73.73%	71.30%	72.46%	71.43%	73.18%	73.79%	70.80%	72.09%	68.38%	67.28%	67.86%	69.56%	69.56%	69.22%	63.61%	69.73%
Selling, General & Administrative	11.25%	9.97%	8.65%	8.99%	9.97%	11.83%	10.53%	11.37%	11.00%	10.01%	9.59%	11.12%	10.53%	9.51%	9.50%	10.33%
R&D	4.39%	4.47%	3.82%	3.74%	3.68%	4.31%	4.51%	4.81%	4.05%	3.38%	3.15%	3.39%	3.31%	3.05%	3.14%	3.71%
Interest Expense of Financial Products	3.23%	2.15%	1.37%	1.21%	1.31%	1.13%	1.25%	1.55%	1.42%	1.32%	1.40%	1.41%	0.89%	0.95%	1.54%	1.28%
Other Operating (income) expense	4.14%	2.72%	1.80%	0.59%	1.33%	2.15%	1.56%	2.98%	2.58%	2.15%	2.09%	2.77%	2.05%	1.91%	1.71%	1.99%

As visible in Figure 12, all the main components have kept a relatively stable level as a percentage of the total revenues of the Company throughout the years. It is clearly visible how the Cost of Goods Sold has never exceeded a range, going from 67% to 73% of the total revenues of the company for all the 14 years of historical data available. The same can be stated for Selling, General & Administrative expenses, that have always remained in a range comprised between 9% and 11%. R&D expenses present an even more stable pattern, showing a variability of less than 1.5% from year to year.

Slightly different has been the behavior for the voices: Interest Expense of Financial Products and Other Operating Expenses. It is visible how both of them presented a slightly higher level in relation to revenues for the earliest years, but in the following periods they decreased too and remained very stable throughout the final years of data available. Because of this, the assumption about the future that these averages will remain sufficiently constant has been made. Based on this assumption the future expected operating costs have been forecasted (Figure 13) in order to reach the expected future operating income for the forecasting window 2024-2033.

Figure 13 CAT's Operating Expenses Projection (in millions of \$)

Operating Expenses Projections	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
Cost of Good Sold	\$ 47,225.48	\$ 47,920.39	\$ 49,310.43	\$ 51,682.24	\$ 55,455.57	\$ 59,514.29	\$ 63,022.57	\$ 66,015.91	\$ 68,200.69	\$ 69,472.39
Selling, General & Administrative	\$ 6,995.33	\$ 7,098.26	\$ 7,304.17	\$ 7,655.49	\$ 8,214.42	\$ 8,815.62	\$ 9,335.29	\$ 9,778.68	\$ 10,102.31	\$ 10,290.68
R&D	\$ 2,512.72	\$ 2,549.70	\$ 2,623.66	\$ 2,749.85	\$ 2,950.62	\$ 3,166.57	\$ 3,353.24	\$ 3,512.51	\$ 3,628.75	\$ 3,696.41
Interest Expense of Financial Products	\$ 867.72	\$ 880.49	\$ 906.03	\$ 949.61	\$ 1,018.94	\$ 1,093.52	\$ 1,157.98	\$ 1,212.98	\$ 1,253.12	\$ 1,276.49
Other Operating (income) expense	\$ 1,347.57	\$ 1,367.40	\$ 1,407.06	\$ 1,474.74	\$ 1,582.41	\$ 1,698.22	\$ 1,798.33	\$ 1,883.75	\$ 1,946.09	\$ 1,982.38
Total Operating Expenses	\$ 58,948.82	\$ 59,816.24	\$ 61,551.35	\$ 64,511.94	\$ 69,221.97	\$ 74,288.23	\$ 78,667.41	\$ 82,403.83	\$ 85,130.96	\$ 86,718.35
Operating Income	\$ 8,778.59	\$ 8,907.76	\$ 9,166.15	\$ 9,607.04	\$ 10,308.45	\$ 11,062.91	\$ 11,715.05	\$ 12,271.48	\$ 12,677.60	\$ 12,913.99

Now that we have the expected future operating income, some elements are still missing. In order to reach the FCFF, it is still necessary to estimate the future levels of depreciation and amortization, capital expenditures (or CapEx), and the working capital. To do so, we started with the historical figures and represented them as a percentage of the total revenues of the company (Figure 14), exception made for the figure of depreciation and amortization that has been represented as percentage of property, plant, and equipment. The historical average, being

very stable throughout all the past years, has then been used as a figure to forecast the future expected levels of D&A. The Net Working capital has been computed as *current assets (minus cash) – current liabilities (minus debt)* instead.

Figure 14 CapEX, Depreciation and NWC (in millions of \$)

CapEx, D&A, and Net Working Capital	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
CapEx	\$ (2,472.00)	\$ (2,586.00)	\$ (3,924.00)	\$ (5,076.00)	\$ (4,446.00)	\$ (3,379.00)	\$ (3,261.00)	\$ (2,928.00)	\$ (2,336.00)	\$ (2,916.00)	\$ (2,669.00)	\$ (2,115.00)	\$ (2,472.00)	\$ (2,599.00)	\$ (3,092.00)
D&A	\$ 2,336.00	\$ 2,296.00	\$ 2,527.00	\$ 2,813.00	\$ 3,087.00	\$ 3,163.00	\$ 3,046.00	\$ 3,034.00	\$ 2,877.00	\$ 2,766.00	\$ 2,577.00	\$ 2,432.00	\$ 2,352.00	\$ 2,219.00	\$ 2,144.00
Net Working Capital	\$ 9,207.00	\$ 9,832.00	\$ 11,681.00	\$ 13,860.00	\$ 11,565.00	\$ 9,941.00	\$ 6,175.00	\$ 5,031.00	\$ 7,241.00	\$ 8,348.00	\$ 10,487.00	\$ 12,134.00	\$ 10,670.00	\$ 10,455.00	\$ 12,962.00

CapEx and Net Working Capital Revenues %	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Arith. Average
CapEx	7.63%	6.07%	6.52%	7.71%	7.99%	6.12%	6.94%	7.60%	5.14%	5.33%	4.96%	5.07%	4.85%	4.37%	4.61%	5.94%
Net Working Capital	28.42%	23.09%	19.42%	21.04%	20.78%	18.01%	13.14%	13.05%	15.93%	15.26%	19.49%	29.06%	20.93%	17.59%	19.33%	18.70%

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Arith. Average
PPE	\$ 23,187.00	\$ 23,714.00	\$ 25,330.00	\$ 27,668.00	\$ 17,075.00	\$ 30,351.00	\$ 29,300.00	\$ 29,528.00	\$ 29,105.00	\$ 27,396.00	\$ 26,869.00	\$ 26,853.00	\$ 26,362.00	\$ 25,488.00	\$ 25,757.00	
D&A	\$ 2,336.00	\$ 2,296.00	\$ 2,527.00	\$ 2,813.00	\$ 3,087.00	\$ 3,163.00	\$ 3,046.00	\$ 3,034.00	\$ 2,877.00	\$ 2,766.00	\$ 2,577.00	\$ 2,432.00	\$ 2,352.00	\$ 2,219.00	\$ 2,144.00	
D&A as % of PPE	10.07%	9.68%	9.98%	10.17%	18.08%	10.42%	10.40%	10.27%	9.88%	10.10%	9.59%	9.06%	8.92%	8.71%	8.32%	10.24%

Again, given the relative stability throughout the years of each of the three voices, the average of the past performances has been used to forecast the future levels of CapEx, D&A, and Net Working Capital. CapEx presented a higher level with respect to sales in the beginning of the observable period (2009 – 2016), to then decrease to an average of around 5%. Still, if compared the average for the whole period and the last 5 years average a surprisingly close to each other. For this reason, the decision to consider the historical average as a reliable future indicator. The same reasoning applies to the Net Working Capital even if it presents a slightly higher degree of variability throughout the years. The result of such a decision can be observed in Figure 15.

Figure 15 CapEX, Depreciation and NWC Projections (in millions of \$)

Average PPE Growth 2009 - 2023	2.98%										
	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	
PPE	\$ 26,524.59	\$ 27,315.06	\$ 28,129.08	\$ 28,967.37	\$ 29,830.63	\$ 30,719.63	\$ 31,635.11	\$ 32,577.88	\$ 33,548.74	\$ 34,548.54	
Projections CapEx, D&A, and Net Working Capital	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E	
CapEx	\$ 4,022.22	\$ 4,081.40	\$ 4,199.79	\$ 4,401.80	\$ 4,723.18	\$ 5,068.86	\$ 5,367.66	\$ 5,622.61	\$ 5,808.69	\$ 5,917.00	
D&A	\$ 2,717.04	\$ 2,798.01	\$ 2,881.40	\$ 2,967.27	\$ 3,055.70	\$ 3,146.76	\$ 3,240.54	\$ 3,337.11	\$ 3,436.56	\$ 3,538.97	
Net Working Capital	\$ 12,662.07	\$ 12,848.38	\$ 13,221.08	\$ 13,857.01	\$ 14,868.71	\$ 15,956.93	\$ 16,897.57	\$ 17,700.14	\$ 18,285.93	\$ 18,626.89	

At this point just the unlevered taxes are missing, that are going to be subtracted from the future expected operating income in order to reach the NOPAT, that is going to be our starting element to determine the FCFF. The unlevered taxes can easily be computed as the EBIT (unlevered pre-tax income) multiplied by the tax rate. The tax rate used is the average of the past tax rates incurred by caterpillar from 2009 to the present date in 2023, and it amounts to 27.47%.

EBIT has been derived subtracting from the forecasted revenues the expected operating expenses (Figure 16), and the results are presented below.

Figure 16 CAT's Profitability Indicators (in millions of \$)

Profitability Indicators as Percentage of Revenues	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Arith. Average
EBIT	1.74%	9.30%	11.89%	13.01%	10.11%	6.01%	8.05%	3.02%	10.00%	15.15%	15.41%	10.91%	13.49%	13.30%	19.33%	11.48%
EBITDA	8.95%	14.69%	16.09%	17.28%	15.66%	11.74%	14.53%	10.89%	16.33%	20.21%	20.20%	16.73%	18.11%	17.03%	22.53%	16.77%
Net Profit	2.76%	6.34%	8.19%	8.62%	6.81%	4.44%	5.34%	-0.17%	1.66%	11.23%	11.33%	7.18%	12.73%	11.28%	15.41%	7.99%

Projections Profitability Indicators	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
EBIT	\$ 8,778.59	\$ 8,907.76	\$ 9,166.15	\$ 9,607.04	\$ 10,308.45	\$ 11,062.91	\$ 11,715.05	\$ 12,271.48	\$ 12,677.60	\$ 12,913.99
EBITDA	\$ 11,495.63	\$ 11,705.77	\$ 12,047.55	\$ 12,574.31	\$ 13,364.15	\$ 14,209.67	\$ 14,955.59	\$ 15,608.59	\$ 16,114.16	\$ 16,452.96
Net Profit	\$ 5,410.74	\$ 5,490.36	\$ 5,649.62	\$ 5,921.36	\$ 6,353.68	\$ 6,818.70	\$ 7,220.65	\$ 7,563.60	\$ 7,813.92	\$ 7,959.62

Now that all the necessary elements are present, it is possible to compute the expected FCFF for the forecasting window 2024-2033 and the results are shown in Figure 17. The final average for the explicit period has been computed and will be the figure used in the calculation of the terminal value of the company. This is due to the fact that, as explained during the company's presentation, Caterpillar operates in a cyclical sector, and its operations and revenues are affected by this characteristic. In order to account for the directionality to which the future is exposed depending on where exactly the company could be through the current cycle, the average level of the expected free cash flows is the most reliable figure to take into consideration when computing the terminal value of the company.

Figure 17 CAT's Expected FCFF (in millions of \$)

Forecasted Free Cash Flow to the Firm (FCFF)	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
Operating Income	\$ 8,778.59	\$ 8,907.76	\$ 9,166.15	\$ 9,607.04	\$ 10,308.45	\$ 11,062.91	\$ 11,715.05	\$ 12,271.48	\$ 12,677.60	\$ 12,913.99
Less: Unlevered Taxes	\$ 2,411.77	\$ 2,447.26	\$ 2,518.25	\$ 2,639.37	\$ 2,832.07	\$ 3,039.35	\$ 3,218.52	\$ 3,371.38	\$ 3,482.96	\$ 3,547.90
Net Operating Profit After Tax (NOPAT)	\$ 6,366.82	\$ 6,460.50	\$ 6,647.90	\$ 6,967.66	\$ 7,476.38	\$ 8,023.56	\$ 8,496.54	\$ 8,900.09	\$ 9,194.64	\$ 9,366.09
Plus: D&A	\$ 2,717.04	\$ 2,798.01	\$ 2,881.40	\$ 2,967.27	\$ 3,055.70	\$ 3,146.76	\$ 3,240.54	\$ 3,337.11	\$ 3,436.56	\$ 3,538.97
Less: CapEx	\$ 4,022.22	\$ 4,081.40	\$ 4,199.79	\$ 4,401.80	\$ 4,723.18	\$ 5,068.86	\$ 5,367.66	\$ 5,622.61	\$ 5,808.69	\$ 5,917.00
Less: Change in Working Capital	\$ (299.93)	\$ 186.32	\$ 372.70	\$ 635.93	\$ 1,011.70	\$ 1,088.22	\$ 940.64	\$ 802.57	\$ 585.78	\$ 340.97
Free Cash Flow to the Firm (FCFF)	\$ 5,361.58	\$ 4,990.79	\$ 4,956.81	\$ 4,897.20	\$ 4,797.19	\$ 5,013.24	\$ 5,428.77	\$ 5,812.02	\$ 6,236.73	\$ 6,647.10
								Average	\$ 5,414.14	

3.2. Weighted Average Cost of Capital (WACC)

As the name itself suggests, the weighted average cost of capital is the combined required return, composed of the cost of equity and the cost of debt. The WACC is going to be the required return employed to compute the terminal value of Caterpillar, using the perpetuity method. In order to determine the WACC a series of sub-components are necessary, namely: the cost of equity, (that computed using the CAPM model will require the *beta* of the company, the risk free rate, and the equity risk premium), the cost of debt (obtained from the pre-tax cost of debt and the tax rate), and the debt-to-capital ratio and the equity-to-capital ratio.

Cost of Equity

Using the CAPM model, in order to compute Caterpillar's cost of equity we found a leveraged *beta* of 1.16 (Refinitiv) and as risk free rate it has been decided to use the yield of the 10 years

US Treasury bond, that at the present date is found to be 4.21%. Refinitiv *beta* is “computed using monthly Price Close change values with a minimum of 40 monthly Price Close change values required within the 5-year trading period” (Refinitiv). In order to determine the equity risk premium instead, I relied on the data present on the official Damodaran website, showing all the equity risk premiums by year. The resulting value turns out to be 4.61%. With these elements the cost of equity for Caterpillar turns out to be 9.56%.

Figure 18 CAT's Cost of Equity

Levered Beta (Refinitiv)	1.16
Equity Risk Premium (Damodaran)	4.61%
Risk Free 10Y US Bond	4.21%
Cost of Equity	9.56%

Cost of Debt

The cost of debt is computed as the sum of the risk-free rate, the country’s default spread (0% for US), and the firm’s default spread (Damodaran, 2009). In order to determine the firm’s default spread, it has been relied on the data provided by Damodaran, after checking the corresponding ratings for the level of interest-coverage ratios. The choice to use an academic source instead of an official rating is due to the fact that many ratings differ from each other for very negligible amounts (0.9% to 1.1%) and choosing one over the other would have been a purely arbitrary choice. Moreover, the value indicated by Damodaran falls almost perfectly as an average of the various ratings. With an interest-coverage ratio slightly below 5, Caterpillar obtains a rating of A and a spread of 1%, bringing the pre-tax cost of debt to a total of 5.21%. After accounting for taxes, the costs of debt’s final value turn out to be 3.78%.

Figure 19 CAT's Cost of Debt (in millions of \$ excl. percentage fig.)

Interest Coverage Ratio	4.90
Tax Rate	27.47%
Pre-Tax Cost of Debt	5.21%
Cost of Debt	3.78%

Unlevered Beta

In order to understand how sensitive Caterpillar to market movements is, its unlevered beta has been computed and it turned out to be 0.49, meaning that the magnitude with which CAT swings

is demagnified with respect to the market. In order to calculate the unlevered beta, the following factors have been employed: CAT's levered beta from Refinitiv, the debt, Caterpillar's equity, and its debt-to-equity ratio (computed as the debt over equity).

Figure 20 Unlevered Beta (in millions of \$ excl. percentage fig.)

Levered Beta (Refinitiv)	1.16
Debt	\$ 36,289.00
Equity	\$ 19,494.00
Debt/Equity	186%
Unlevered Beta	0.49

WACC – Weighted Average Cost of Capital

After reaching this point, we have all the elements necessary to compute Caterpillar's WACC. With a cost of equity equal to 9.56% and a cost of debt of 3.78% the resulting amounts indicate that the weighted average cost of capital for CAT amounts to 5.80%.

Figure 21 Weighted Average Cost of Capital (in millions of \$ excl. percentage fig.)

Equity	\$ 19,494.00
Debt	\$ 36,289.00
Debt + Equity	\$ 55,783.00
Cost of Equity	9.56%
Cost of Debt	3.78%
Equity/Debt+Equity	34.95%
Debt/Debt+Equity	65.05%
WACC	5.80%

Enterprise Value

Now that we have all the necessary elements determined we can finally proceed to determine the intrinsic value of Caterpillar. In order to do so we first discounted back to the present date the expected future FCFF and the terminal value, calculated as a perpetuity. As growth rate for the perpetuity, several scenarios have been implemented. The best-case scenario is a growth rate to infinity of 3.6 %, this being equal to the average overall economy growth rate (Macabacus Valuation, 2024).

This upper threshold has been determined through the reasoning that a higher growth is not sustainable indefinitely for the simple reason that, if a company could grow at a faster pace than the whole economy for an indefinite amount of time, eventually, the company will grow bigger than the economy itself, and this is clearly impossible.

From this best-case scenario, all the others follow by decreasing the long-term growth rate by 0.5% each time, until the reaching of the worst possible case: no growth at all. This allowed us to have a more comprehensive view of what CAT value could be based on their expected future performances.

Figure 22 CAT's Enterprise Value (in millions of \$)

	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	2033E
Free Cash Flow to the Firm (FCFF)	\$ 5,361.58	\$ 4,990.79	\$ 4,956.81	\$ 4,897.20	\$ 4,797.19	\$ 5,013.24	\$ 5,428.77	\$ 5,812.02	\$ 6,236.73	\$ 6,647.10
Discounting Factors	0.945196	0.893395479	0.844433833	0.798155482	0.754413369	0.713068499	0.673989493	0.637052173	0.602139166	0.569139531
PV of FCFF	\$ 5,067.74	\$ 4,458.75	\$ 4,185.70	\$ 3,908.73	\$ 3,619.06	\$ 3,574.78	\$ 3,658.94	\$ 3,702.56	\$ 3,755.38	\$ 3,783.13
									Average	\$ 5,414.14

Long Term growth rate	3.60%	3.00%	2.50%	2.00%	1.50%	1.00%	0.50%	0.00%
Terminal Value	\$ 255,170.07	\$ 199,293.93	\$ 168,260.27	\$ 145,397.32	\$ 127,853.61	\$ 113,966.23	\$ 102,700.03	\$ 93,376.89
PV of Terminal Value	\$ 145,227.37	\$ 113,426.05	\$ 95,763.57	\$ 82,751.36	\$ 72,766.54	\$ 64,862.69	\$ 58,450.65	\$ 53,144.48
PV of FCFF	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77	\$ 39,714.77
Shares Outstanding (mil)	499.38	499.38	499.38	499.38	499.38	499.38	499.38	499.38
Enterprise Value	\$ 184,942.14	\$ 153,140.82	\$ 135,478.34	\$ 122,466.13	\$ 112,481.31	\$ 104,577.46	\$ 98,165.42	\$ 92,859.25
Net Debt	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00	\$ 29,311.00
Equity Value	\$ 155,631.14	\$ 123,829.82	\$ 106,167.34	\$ 93,155.13	\$ 83,170.31	\$ 75,266.46	\$ 68,854.42	\$ 63,548.25
Price per Share	\$ 311.65	\$ 247.97	\$ 212.60	\$ 186.54	\$ 166.55	\$ 150.72	\$ 137.88	\$ 127.25

Once computed the enterprise value, to get the equity value per share, the net debt has been deducted from the figure (being it equal to *debt – cash*). The results are presented for different scenarios, each considering a different level for the long-term growth. In the next and final section, a discussion of what in my opinion will be the most likely scenario is going to be presented, together with a comparison of my results with an equity report issued by Morningstar.

4. GENERAL DISCUSSION AND CONCLUSIONS

Before reaching stating what the most likely scenario could be, some clarifications are needed. Looking at the general picture, it is clear that Caterpillar still enjoys a position as leader in the market for heavy equipment, and this factor constitutes a great advantage for the company. Caterpillar showed a strong price realization in the past period and the absence of goodwill impairment charges have increased its margins. To take into consideration are the statements made by the management on the release of the 2023 annual report. The company expects its sales level for 2024 to come very close to the ones reported in 2023. These expectations are led and confirmed by the general stability in demand and pricing for the products offered by the company.

My personal expectation is that the company will experience a slower than average growth in the immediate years after 2024, in order to return to its historical growth average, while

Morningstar forecast an immediate higher growth rate already from 2025 onward. My opinion is derived from the fact that, even if the future seems like reserving major growth opportunities for the company, a great degree of uncertainty has been recently introduced due to the worsening geo-political situations that are developing. If from one side Caterpillar would profit from a further increase in the demand and prices of commodities, it is as well true that the possibility of a stagnating situation with higher-than-usual interest rates could cause a slowing in the demand for the company's products and erosion of margins.

Since the beginning of the year commodities 'prices have been increasing due to the geo-political situation that is currently developing. This has to be considered on top of the already forecasted future increase in the price of commodities due to the more and more stringent environmental requirements, and energy transition. On the other side, a potential steep increase in the sector profitability could attract new competition and incentivize the already existing one to scale its operations in order to capture a greater market share, challenging the leading position of Caterpillar.

The position and reputation of Caterpillar has been built around its operational excellence (always providing top quality, durable, and reliable products), the aim to expand its customer offer (this can be seen with the constant investments made in R&D for the development of new products and the modernization of existing ones, aiming for higher levels of efficiency), and last but not least, the wide range of value-added services for its customers, such as the huge net of distributors and assistance centers. Caterpillar has recently implemented a strategy for cost management together with actions aimed at reducing structural costs, leading to the decrease of fixed costs and the increase in profit margins.

Considering instead the other sectors that the company is involved in, namely construction and power generation, the future looks positive for the former and uncertain for the latter. The signing of the 1.2 trillion dollars deal from the US for the renovation of its infrastructures (roads) is a factor that will inevitably contribute in a positive way to Caterpillar future expectations. Moreover, should the FED start cutting interest rates, this could lead to a revival of the real estate sector, further increasing the demand for construction equipment on the side of CAT.

For what concern the power generation sector instead, the future looks more uncertain than ever. Should the geo-political situation continue to worsen and the price of oil further increase, this could negatively impact Caterpillar in terms of transportation costs and operational costs. On the flip side, this could further increase the demand for Caterpillar's products, smoothing out the negative effect of increasing costs.

At the present time the future remains highly uncertain and very volatile rendering hard giving a certain and definitive opinion. The analysis of the company was performed using the Discounted Cash Flow method, the same Morningstar relied upon. Different assumptions (and length) concerning the explicit period have been the cause of different results for what concerns the final value reached for the company. In the specific, the main difference is to be found in the grow forecast for the explicit period. Morningstar expects the company to immediately profit from a potential favorable future and considerably better its position in the next 5 years. Personally, given all the reasons previously stated and the high degree of uncertainty concerning the immediate future, my approach has been more conservative. Nonetheless, the company enjoys a strong position and financial condition, paired with a role as market leader. This makes me confident in saying that, even if the near-term future should be rougher than expected, Caterpillar will be able to recover in the future and experience a good degree of long-term growth. For this reason, a long-term growth of 3% has been chosen, delivering a final valuation for CAT of **\$247** per share, substantially close to the result found by Morningstar (see Appendix for Morningstar Valuation Model Summary).

Being the market price of the company at the present date (26.04.2024) equal to \$344, the company results to be overvalued with a **Price/Fair Value Ratio** of **1.39**. For this reason, my final recommendation is: **sell**. Given the uncertainty lying in front of us and the overvalued level of the company, I consider it wiser to wait for this momentary uncertainty to end and then evaluate the effect it'll have had on Caterpillar Inc.

APPENDIX

Figure 23 Morningstar's Valuation

Morningstar Valuation Model Summary

Financials as of 31 Oct 2023

	Actual			Forecast				
	2020	2021	2022	2023	2024	2025	2026	2027
Fiscal Year, ends 31 Dec								
Revenue (USD Mil)	39,022	48,188	56,574	64,650	68,809	72,362	75,373	78,100
Operating Income (USD Mil)	4,321	6,363	8,358	12,494	12,365	12,099	11,665	11,195
EBITDA (USD Mil)	5,951	7,913	8,872	13,916	13,948	13,691	13,248	12,835
Adjusted EBITDA (USD Mil)	6,416	7,460	9,365	14,459	14,217	13,691	13,248	12,835
Net Income (USD Mil)	2,998	6,489	6,705	9,572	9,320	9,047	8,594	8,104
Adjusted Net Income (USD Mil)	3,600	5,932	7,339	10,272	9,670	9,047	8,594	8,104
Free Cash Flow To The Firm (USD Mil)	3,243	4,336	3,782	8,326	7,987	7,833	7,413	6,998

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