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Equity Valuation: AstraZeneca, PLC

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Master in Finance

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BUSINESS
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Resumo

Esta dissertação tem como objetivo estimar o justo valor da ação da AstraZeneca, Plc (AZN) a 31 de dezembro de 2022. Após uma análise da empresa e do setor em que se insere, são apresentadas três abordagens para avaliar a empresa.

A AstraZeneca, é uma multinacional inglesa que opera no setor farmacêutico e teve um grande envolvimento na crise pandémica do Covid-19, através do desenvolvimento de vacinas contra o vírus, o que impulsionou as suas vendas durante 2021. A empresa é responsável por todo o processo de investigação, desenvolvimento, teste, produção, divulgação e venda de medicamentos próprios.

As duas primeiras análises são análises DCF com base nas demonstrações financeiras da AstraZeneca. A primeira análise – Firm Valuation- usa o WACC como taxa de desconto, enquanto que a segunda análise – Equity Valuation- utiliza o Custo do Capital Próprio como taxa de desconto. A última análise, que complementa as duas primeiras abordagens de avaliação, é uma avaliação relativa através do Método dos Múltiplos. De seguida é realizada uma análise de sensibilidade, com vista a compreender as suas possíveis variações.

Através da aplicação do primeiro método, o preço alvo por ação da AZN a 31 de dezembro 2022 foi estimado em $52.12, o que comparado com o preço por ação de $67.8 a que a ação fechou a 31 de dezembro 2022, conclui-se que esta se encontrava sobreavaliada em 23%, pelo que se recomenda a venda da mesma. Através do segundo método, a conclusão é também que a ação se encontrava sobreavaliada (em 14%), pelo que a recomendação é a venda da mesma. A avaliação relativa corrobora as conclusões dos dois primeiros métodos de avaliação.

Palavras-chave: AstraZeneca; Indústria Farmacêutica; Análise DCF; Justo Valor; Múltiplos

Sistema de Classificação JEL: G30 – General; G32 – Value of Firms

Abstract

This dissertation aims to present the estimation of the fair value of AstraZeneca,Plc (AZN) at the end of December 31, 2022. After a review of the company and its sector, three approached will be presented to value the company.

AstraZeneca is a British multinational company that operates in the pharmaceutical sector and it had a relevant position throughout the Covid-19 pandemic on 2020-21, through the development of the vaccines to prevent the virus to spread, which increased the company's revenue during 2021. The company is responsible for all the process of investigation, development, testing, production, advertising and selling of own medicines.

The two first analyses are DCF analyses based on the company's financial statements. The first one – Firm Valuation – uses the WACC as the discount rate, whereas the second one – Equity Valuation – uses the cost of equity as the discount rate. The third analysis, which complements the first two analyses, is a relative valuation using the Multiples Method. The share price is then submitted to a sensitivity analysis, in order to better understand the robustness of the assumptions made in the former valuations.

AstraZeneca valuation using the Firm Valuation pointed to a price target of $52.12 per share by the end of 2022, which comparing with the price of $67.8 per share in 2022, we can conclude that AZN's share price was overvalued by 23% and therefore, the recommendation is to sell. Equity Valuation pointed to the same conclusion, with AZN's share price being overvalued by 14%. Relative Valuation corroborated the findings of the above models.

Keywords: AstraZeneca; Pharmaceutical Industry; Discounted Cash Flow; Fair Value; Multiples

JEL Classification: G30 – General; G32 – Value of Firms

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Glossary of Acronyms

AI	Artificial Intelligence
APT	Arbitrage Pricing Theory
APV	Adjusted Present Value
AZN	AstraZeneca Plc
CAPEX	Capital Expenditure
CAPM	Capital Asset Pricing Model
CEO	Chief Executive Officer
CF	Cash Flow
CFO	Chief Financial Officer
CIS	Commonwealth of Independent States
COPD	Chronic Obstructive Pulmonary Disease
CPI	Consumer Price Index
CRP	Country Risk Premium
CVRM	Cardiovascular, Renal and Metabolism
D&A	Depreciation and Amortisation
DCF	Discounted Cash Flow
DDM	Dividend Discount Model
ECB	European Central Bank
EEA	European Economic Area
EG	Earnings
EMA	European Medicines Agency
ERP	Equity Risk Premium
EU	European Union
FCFF	Free Cash Flow to the Firm
FDA	US Food and Drug Administration
FY	Financial Year
GDP	Gross Domestic Product
IMF	International Monetary Fund
IT	Information Technology
M&A	Merger and Acquisitions
NASH	Non-Alcoholic SteatoHepatitis
NCDs	Non-Communicable Diseases
NME	New Molecular Entities
PESTEL	Political, Economic, Sociological, Technological, Environmental and Legal
PP&E	Property, Plant and Equipment
PV	Present Value
R&D	Research and Development
S&P	Standard & Poor
SEO	Senior Executive Team
WACC	Weighted Average Cost of Capital
WHO	Work Health Organisation

1. Introduction

The consequences of COVID-19 go far beyond public health and what had started to be a health crisis, quickly evolved into an economic crisis.

COVID-19, a dangerous virus which affects the respiratory system and may be fatal, was declared as a pandemic in early 2020 by the World Health Organization. The virus can be easily transmitted from one person to another and the fact that some people may be infected and not show any symptoms makes it difficult to stop the transmission of the virus. Therefore, COVID-19 easily spread across the globe infecting millions of people and forcing governments to apply lockdown measures in order to stop the transmission.

Almost all industries have been negatively impacted by the pandemic, namely industries relying on personal interactions and travel (including accommodation, hospitality, entertainment and restaurants). Disruptions were also seen in supply chains and price increases and/or shortages in raw materials, disturbing several industries.

However, for a few industries, as the pharmaceutical industry, the pandemic brought growth opportunities.

AstraZeneca Plc (AZN), was one of those companies within the pharmaceutical industry that was able to grow through the investment in the development and supply of a vaccine to prevent COVID-19.

AstraZeneca Plc is a global, science-led, patient-focused pharmaceutical company, headquartered in Cambridge, UK. In 2020 and 2021, the Company stood out as one of the Pharmaceuticals developing and supplying an effective vaccine to prevent the ongoing virus.

Therefore, the Company's stock price increased by 71% since the beginning of the pandemic (11th March 2020) to the 31st of December 2022.

Thus, the main goal of this project is to reach an estimate of the fair value of AstraZeneca PLC's share as of December 31, 2022, and infer if it is overvalued or not, and compare it with the company's main competitors.

To begin with, a literature review is performed in order to showcase the most used valuation approaches, their different methodologies, advantages and shortcuts in order to accurately decide which approaches should be used to valuate AZN.

Afterwards, a comprehensive overview of the company and industry is provided, including its competitors, which is crucial to understand how the sector can influence the company's performance.

Next, being the core of the subject of this project, it is presented the estimated price of AZN's share price by the end of December 31, 2022, computed through the chosen approaches – DCF Model and Multiple Method. To better understand the range between which the target price of AZN's share may fluctuate, a sensitivity analysis is performed.

Lastly, it is presented the main conclusion obtained from the computation of AZN's target share price by the end of December 31, 2022, using the different approaches and it is presented a reflection of the shortcuts that may be considered in the future when estimating AZN's fair share price target.

2. Literature Review

"Valuation lies at the heart of much of what we do in finance", states Damodaran (2006). Valuation, as the understanding not only of the value but also the sources of the value of an asset, is important in various areas of finance and can be used in a variety of frameworks, helping to make reliable and value-increasing financial decisions.

Noting that financial decisions may have to do with different frameworks, whether it is Corporate Finance and the best decision to increase firm value to Portfolio Management, Acquisition Analysis to even studying market efficiency, a big advantage of valuation is that the core principles for asset valuation remain the same (Damodaran, 2006).

However, there is uncertainty associated with valuation, arising not only from the asset being valued but also from the valuation methodology itself, given that the inputs of the methods leave a lot of room for individual subjective judgments. Thus, the final value obtained can be biased by the analyst's judgments (Damodaran 2006).

According to Damodaran 2002, there are three main approaches to valuation: 1) Discounted Cash Flow (DCF), 2) Relative Valuation and 3) Contingent Claim Valuation.

2.1 Valuation Approaches

2.1.1 The Discounted Cash Flow (DCF) Valuation Approach

The Discounted Cash Flow (DCF) Valuation Approach, relates the value of an asset to the present value of expected future cash flows on that asset (Damodaran 2006).

Although DCF models are only one of the three approaches to valuation suggested by Damodaran (2006), it is the foundation of on which the other two are built. Furthermore, DCF models are in historical terms the most widely used and reliable at measuring the value of an asset.

According to Damodaran (2012), DCF models are based on the proposition that the value of an asset is not what someone perceives it to be worth but rather the present value of the expected future cashflows generated by that asset.

Thus, in DCF models, the analyst must estimate the firm's future cash flows and discount them back at an estimated rate that reflects the riskiness of those cashflows.

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

Where,

n = life of the asset

CFt = Cashflow generated by the asset in period t

r = discount rate reflecting the riskiness of the expected cashflows

Within the DCF Models, Damodaran (2002) claims that there are three paths to discount cashflow valuation, differentiating among themselves through the different CF approaches and discounted rates:

a) Firm Valuation: Valuation of the entire business, including the value to all the claim holders.
b) Equity Valuation: Valuation of the equity stake of the firm, including only the value to equity holders.
c) Adjusted Present Value: Value the enterprise in different pieces, beginning with the assumption that the firm is only financed by equity and then adding the debt effects and subsequently other non-equity claims.

2.1.1.a) Firm Valuation

According to Damodaran (2012), Firm Valuation aims to value the firm as a whole, including all claim holders in the firm (stockholders, bondholders and preferred stockholders). The Firm Value is then obtained by discounting expected cashflows to the firm (FCFF) at the weighted average cost of capital (WACC). Thus, the value of the firm can be computed as follows:

$$Value\ of\ Firm = \sum_{i=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} \quad (2)$$

Where,

$FCFF_t$ = Free Cashflow to the firm in period t

WACC = Weighted Average Cost of Capital

Terminal Value

However, it is impossible to calculate cashflows forever, thus the FCFF is only estimated for a certain explicit period (until year n, or for n years) and then it must be computed a Terminal Value, reflecting the value of the firm at that point (Damodaran, 2012). The forecast period

tends to range between five to ten years, depending on the industry and company's characteristics.

As per Damodaran (2012), the Terminal Value can be estimated in one of three ways: 1) Assume the liquidation of the firm's asset in the terminal year to the highest bidders (Liquidation Value), 2) Apply a multiple to earnings, revenue or book value to estimate the value in the terminal year or 3) Assume that FCFF will grow at a constant rate forever.

The third approach is the most widely used, it considers that firms can reinvest some of their cash flows back into new assets and extend their lives, while the first approach assumes that the firm has a finite life and that it will be liquidated at the end of that life.

Thus, it can be assumed that FCFF, beyond the terminal year, will grow at a constant rate forever (the third approach), and the Terminal Value can be estimated using a perpetual growth model (Damodaran, 2002):

$$Terminal\ Value\ = \frac{FCFF_{n+1}}{(WACC - g_n)} = \frac{FCFF_n(1+g_n)}{(WACC - g_n)} \quad (3)$$

Where, g_n = the stable growth rate must be less than or equal to growth rate in the economy. This expression assumes that the growth rate for year n was already g_n

Therefore,

$$Value\ of\ Firm = \sum_{i=1}^{t=n} \frac{FCFF_t}{(1+WACC)^t} + \frac{Terminal\ Value}{(1+WACC)^n} \quad (4)$$

The Free Cashflow to the Firm (FCFF)

The FCFF is the sum of the cashflows to all claim holders in the firm, which according to Damodaran (2012) can be measured in two ways. The first one is to add up the cashflows to the claim holders (cash flows to equity, to lenders and to preferred stockholders). The other way is a simpler way, where we start to estimate the cash flows prior to any of these claims:

$$FCFF = EBIT\ (1 - Tax\ Rate) + Depreciation - Capital\ Expenditures - \Delta\ Working\ Capital \quad (5)$$

To note that the FCFF do not include any of the tax benefits due to the interest payments, given that those are already incorporated in the discount rate – WACC – addressed next (Damodaran, 2002).

Weighted Average Cost of Capital (WACC)

The WACC should be used to discount the FCFF according to Goedhart et al. (2010) as it "represents rates of returns required by the company's debt an equity holders blended together, and as such is the company's opportunity cost of funds".

The WACC considers the company's capital structure, this is, the proportion of debt and equity through which the company finances its operations. Thus, the WACC is the weighted average of two key inputs: cost of debt (k_d) and cost of equity (k_e), relative to their weight on the total firm's capital structure.

Furthermore, it is relevant to address that the WACC captures the tax benefits of debt (tax shield effect) since it is a tax-adjusted rate.

Additionally, Damodaran (2007) alerts to the high sensitivity of the model, as small changes in the WACC can lead to major differences in a company's value, while Luehrman (1997) states that discounting all future FCFF using the WACC is limited to companies whose capital structure remains constant at a target ratio of debt to equity.

$$WACC = k_e * \frac{E}{E+D} + k_d * (1 - t) * \frac{D}{E+D} \quad (6)$$

Where:

k_e = Cost of Equity

k_d = Cost of Debt

k_d*(1-t) = After-tax cost of debt

t = Company's effective tax rate

E = Market value of Equity

D = Market value of Debt

Cost of Debt (k_d):

The cost of debt represents the company's cost when financing its assets through a bank loan or by issuing a bond.

The **After-Tax Cost of Debt (k_d*(1-t))** can be achieved through the yield-to-maturity (YTM) or through Debt Ratings.

When the Company's debt ratio is not available, for simplifying purposes, Damodaran (2002) recommends the interest coverage ratio approach to estimate the Cost of Debt:

$$Interest\ Coverage\ Ratio = \frac{EBIT}{Interest\ Expenses} \quad (7)$$

The Company's Interest Coverage Ratio then relates to a synthetic rating, which is then accordingly linked to a default spread (Damodaran, 2022). The synthetic rating and the linked default spread can be consulted on the Damodaran Website (Damodaran, 2022b).

Then, the Pre-Tax Cost of Debt can be estimated by adding the Company's default spread to the risk-free rate (Damodaran, 2008):

$$Pre - Tax\ Cost\ of\ Debt = Default\ Spread + Risk\ Free\ Rate \quad (8)$$

The After-Tax Cost of Debt is computed as follows:

$$After - Tax\ Cost\ of\ Debt = Pre - Tax\ Cost\ of\ Debt\ (1 - Tax\ Rate) \quad (9)$$

The After-Tax Cost of Debt incorporates the tax benefits of debt, mentioned earlier, arising from interest payments and the company's contractual debt.

Cost of Equity (k_e):

The Cost of Equity represents the rate of return required by the company's shareholders.

The cost of equity tends to be higher than the cost of debt given the shareholders bear greater risk than lenders because the company usually has a contractual obligation to repay the debt back to its lenders.

There are several asset pricing models to estimate the cost of equity, as per Koller et al. (2020), like the Arbitrage Pricing Theory (APT), the Fama-French three-factor model and, the most commonly used and therefore the one preferred among all, the Capital Asset Pricing Model (CAPM).

In the CAPM model, the cost of equity is considered to be the sum of the risk-free rate (R_f) and a premium for bearing the stock's systematic risk (β_i*[E(R_m) - R_f]), as follows:

$$k_e = R_f + \beta_i * [E(R_m) - R_f] \quad (10)$$

Where,

R_f = risk-free rate

E(R_m) = Expected return of the Market

E(R_m) - R_f = Expected Market Risk Premium

β_i = Beta of investment i = Sensitivity of security i to changes in the market return

The **Risk-Free Rate (R_f)** is defined as the expected return on a risk-free asset which has no default risk. The yield on a default-free government debt instrument is commonly used as a

proxy, and, usually, the 10-year treasury yield rate is used as the risk-free rate. Nonetheless, it is important to note that not all governments are default free, which makes it difficult to estimate a risk-free rate in specific currencies (Damodaran, 2012).

The **Market Risk Premium ($E(R_m) - R_f$)** is defined as the excess return of the market compared to the risk-free assets return, i.e., the premium that investors demand for investing in a riskier market portfolio relative to an average-risk investment (Damodaran, 2012).

Damodaran (2012) states that there are three methods to estimate the market risk premium under the CAPM: 1) surveying large investors about their future expectations; 2) obtaining the premiums earned over a past period, through historical data and 3) extracting the implied premium from the current market data.

The **Equity Beta (β_i)** or leveraged beta, is the only company's element of the model. It is through Beta that CAPM adjusts for a Company's market risk, measuring how the Company's stock price reacts to the market's movements (Koller et al., 2020). The Company's stock price can move together with market or in the opposite direction (Goedhart et al., 2010).

There are three approaches to estimate the Beta: 1) Estimate the Beta from fundamentals, 2) Use historical data on market prices and 3) Use accounting data (Koller et al., 2020).

The first two approaches are commonly used due to several constraints associated with the Beta's estimation, being the second approach the most used among analysts.

Thus, to estimate Beta through historical data on market prices, the second approach uses a linear regression, where the stock's return is regressed against the market's return, as follows:

$$R_j = \alpha + \beta * R_m + \varepsilon \quad (11)$$

Where:

α = Intercept of the regression

β = Slope of the regression = $\frac{Cov\,(R_j, R_m)}{Var\,(R_m)}$ (12)

The slope of the regression corresponds to the Company's Beta. Stocks that are riskier than the market have a Beta higher than 1, while stocks that are less risky have a Beta lower than 1. Stocks that are riskless have a Beta of zero (Damodaran, 2002).

2.1.1.b) Equity Valuation

In Equity Valuation, in opposition to the Firm Valuation, it is only valued the equity stake in the business, only including equity holders. There are two different approached to Equity Valuation:

Free Cash Flow to Equity (FCFE)

According to Damodaran (2007), this approach consists in accounting for the residual cash flows available to equity holders after meeting the non-equity investors claims, all expenses, tax obligations and after part of these cash flows have been reinvested to sustain their forecasted growth.

Thus, we should start by determining the expected Free Cash Flow to Equity (FCFE), beginning with the Net Income and convert it to a cash flow by subtracting out a firm's reinvestment needs (including any net capital expenditures and increases in Working Capital) and adding the effect of changes in the levels of debt on their cash flows, resulting in:

$$\begin{aligned} FCFE = {} & Net\ Income - (Capital\ Expenditures - Depreciation) \\ & \pm (Change\ in\ Noncash\ Working\ Capital) \\ & + (New\ Debt\ Issued - Debt\ Repayments) \end{aligned} \quad (13)$$

After determining the FCFE we should discount them at the proper discount rate, which in this case should be the cost of equity (ke) – the minimum required rate of return by equity investors.

Therefore, the Equity Value can be computed as follows:

$$Equity\ Value = \sum_{i=1}^{t=n} \frac{FCFE_t}{(1+k_e)^t} + \frac{TV_n}{(1+k_e)^t} \quad (14)$$

Where TVn = Terminal Value of Equity = $\frac{FCFE_t}{k_e - g_n}$, where gn is the stable growth rate mentioned in the Firm Valuation approach above, which should not be higher than the economy's growth rate.

Dividend Discount Model

The Dividend Discount Model (DDM) is a special case of Equity Valuation, where the value of the equity is the present value of expected future dividends (Damodaran, 2012).

In this specific approach the only two cash flows that an investor receives are the dividend and the expected price at the end of the holding period, also determined by the future dividends (Damodaran, 2002).

DDM model has the same rationale as the Discount Cash Flow framework, where the value of the stocks expected to be its cash flows (in this case are the dividends) discounted at rate, which reflects their riskiness – in this case is the cost of equity (k_e).

Thus, the value of a stock can be written as the present value of dividends in perpetuity, as follows:

$$Value\ per\ share\ of\ stock = \sum_{t=1}^{t=\infty} \frac{E(DPS_t)}{(1+k_e)^t} \quad (15)$$

Where,

$E(DPS_t)$ = Expected dividends per share in period t

There are several versions of the DDM, being the Gordon Growth Model and the Two-Stage DDM the main ones:

The **Gordon Growth Model**, proposed by Gordon (1959) is the simplest and most straight-forward version of DDM, relating the value of a stock to three variables: 1) its expected dividends in the next time period, 2) the cost of equity and 3) the dividends' expected growth rate.

Although its simplistic form, the model has a main drawback related to the assumption that the expected dividends will grow at a fixed rate in perpetuity. Thus, the model it is not only applicable to companies which pay dividends, but which are also growing at a stable rate. Thus, the model is preferred to value firms that in the mature growth phase.

The Value of the Stock can then be computed as follows:

$$Value\ of\ Stock = \frac{DPS_1}{k_e - g} \quad (16)$$

Where,

g = dividends' growth rate in perpetuity

DPS_1 = Dividends per share in period 1

The **Two-Stage DDM** avoids the dividends' fixed growth rate problem posed in the previous approach by assuming two different growth stages. It is assumed that the growth rate in the short to mid-term is not constant and assumes a higher growth (g_s) but declines linearly over time, reaching a stable long-term growth rate (g_l).

Therefore, the Value of Stock can be written as:

$$P_0 = \sum_{t=1}^{t=n} \frac{D_0(1+g_s)^t}{(1+k_e)^t} + \frac{TV_n}{(1+k_e)^n} \quad (17)$$

Where,

D_0= Current Dividend per share

g_s =Short-term growth Rate

g_l =Long-term / stable growth Rate

TV_n = Terminal Value at time n = $\frac{DPS_{n+1}}{(k_e - g_l)}$

Given that analyzing all of the model's variables, which adapt to specific situations and different growth rates, the DDM approach will not be considered.

2.1.1.c) Adjusted Present Value

Although the Cost of Capital approach be useful in many circumstances, it fails to value a Company which does not present a constant capital structure.

The reality is that many companies opt to change their capital structure over time, leading to an understatement of expected tax shields. Furthermore, the WACC does not properly handle financial side effects (Luehrman, 1997b).

In such cases, the Adjusted Present Value (APV), introduced by Myers (1974), can be a better alternative relative to WACC.

The APV approach consists of valuing the Company as if it were financed only and entirely by equity – unleveraged value – thus, determining the enterprise value by discounting FCFF at the unleveraged cost of equity (k_u). The unleveraged cost of equity (k_u) is typically lower than the cost of equity (k_e) of a company with debt.

$$V_u = \sum_{i=1}^{t=n} \frac{FCFF_t}{(1+ k_u)^t} + \frac{TV_n}{(1+ k_u)^t} \quad (18)$$

Then, to the value of the firm unlevered (Vu) it should be added the present value of the interest tax shields and subtract the present value of the financing side effects (costs of financial distress, subsidies, hedges, issue costs and other financing costs (Luehrman, 1997b)), resulting in the following:

$$Enterprise\ Value = \sum_{i=1}^{t=n} \frac{FCFF_t}{(1+ k_u)^t} + \frac{TV_n}{(1+ k_u)^t} +$$

$$PV\ (Interest\ Tax\ Shields) - PV\ of\ Expected\ Bankruptcy\ Costs \quad (19)$$

Given the advantage of interest rates being tax deductible on the corporate tax return (Luehrman, 1997b), the present value of interest tax shield can be analyzed with the following equation:

$$PV\ (Interest\ Tax\ Shields) = \sum_{t=1}^{n} \frac{Debt \times k_d \times t}{(1+ k_d)^t} \quad (20)$$

The last step is to estimate the effect of the given level of debt on the default risk of the firm and on bankruptcy costs. Damodaran (2006), suggests the follow:

$$PV\ of\ Expected\ Bankruptcy\ Costs = Probability\ of\ Bankruptcy\ \times PV\ of\ Bankruptcy\ Cost \quad (21)$$

This last step poses the most significant estimation problem in the APV method, given that neither of the components of the PV (Expected Bankruptcy Costs) can be directly and easily estimated.

For that reason, the APV approach will not be used. Nevertheless, the Enterprise Value using the APV approach should lead to the same results as in the Cost of Capital approach.

2.1.2 Relative Valuation

The Relative Valuation estimates the value of an asset by looking at the pricing of 'comparable' assets relative to a common variable (Damodaran 2006), considering that ultimately the value of most assets that can be bought in the market is based upon what other similar assets are priced (Damodaran, 2002).

Thus, Relative Valuation values the value of an asset through the multiples' analysis, comparing a company's multiple with those of similar companies (Goedhart et al., 2010).

Damodaran (2012), therefore states that there are two fundamental components in Relative Valuation: 1) Prices must be standardized, which can be achieved by converting them into multiples of earnings and 2) Choose the right peer group before proceeding into the multiples' analysis.

Comparable Multiples

In the table below, there are some examples of the most popular multiples used, divided intro three groups, on which the multiples can be based, accordingly to Fernandez (2002).

Table 2.1: Multiples

Multiples based on Capitalization	P/E (Price to Earnings) P/S (Price to Sales) P/BV (Price to Book Value)
Multiples based on Company's Value	EV/EBITDA (Enterprise Value to EBITDA) EV/Sales (Enterprise Value to Sales) EV/FCF (Enterprise Value to Free Cash Flow)
Growth-referenced multiples	P/EG (Price to Earnings growth) EV/EG (Enterprise Value to EBITDA historic growth)

Peer Group

Choosing a right peer group is crucial for the multiples' analysis. Although there is no consensus on the right method to choose a peer group, is fundamental that the group is composed by a set of comparable firms operating in the same industry and with similar risk, growth and cash flow profiles (Damodaran, 2002).

However, this method leading to faster results and make financial forecasts more accurate, there are some criticisms pointed as for example:

i) Short-term bias, considering that it is based on historic or short term forecasted data;

ii) Static approach, ignoring the Company's dynamics and ongoing evolution, given that it captures the Company at a given specific time;

iii) It can only be used for mature and stable companies;

iv) Multiples may have a wide range of values, due to the different investors' expectations about each company's ability to create future value;

v) Using different multiples may suggest different conclusions.

Therefore, although it helps to better reflect the market mood, analyst should take those into account when using this valuation technique, being widely used as a complement to DCF models.

2.1.3 Contingent Claim Valuation

The Contingent Claim Valuation uses option pricing models to measure the value of assets that share option characteristics.

A contingent claim is a claim that pays off under certain circumstances, therefore, an asset can be valued as an option if the payoffs are a function of the value of an underlying asset.

An asset can be valued as a put option if it gains value, i.e., when the value of the underlying asset is less than a defined level. In opposition, an asset can be valued as a call option if the

value of the underlying asset surpasses a defined level, in which the asset is worth the differences.

This valuation approach, according to Vernimmen et al. (2018) is adequate for companies with high levels of uncertainty and investment flexibility.

There are two main models within this approach, according to Damodaran (2020): the Black-Scholes option pricing model and the binomial option pricing model.

This approach is the least used by analysts due to the limitations of using option pricing models such as valuing long-term options on non-traded assets. For that reason, it will not be considered.

3. Methodology

The approaches chosen to perform this valuation are the Discounted Cash Flow valuation, more specifically the Firm Valuation (Free Cash Flow to the Firm) an Equity Valuation (Free Cash Flow to the Equity), and Relative Valuation. Therefore, this paper will be divided as follows:

Company's Overview

To begin with, an overview of the company and its historical record in the stock market will be presented. Key indicators as the company's recent financial performance, its business model and business segments, its management board and overall strategy will be addressed.

Industry Overview

Next, a brief overview of the industry and macroeconomic environment is conducted to understand the profile of the sector and how the global macroeconomic environment can impact the company's performance. An outlook of the sector will also be provided. Peer analysis is included in this section. Lastly, it will be analysed AZN's position within the industry.

Assumptions

In this section, it will be addressed the general assumptions made to perform the valuation, including the general assumptions for historic and explicit period – the historical period considered was from 2018 to 2022 and explicit period of forecasts considered was 5 years (2023 to 2027, inclusive)- and growth rate. It will also be addressed the assumptions related to the forecast of revenues, operating costs, depreciation and amortization and Capex. Lastly, WACC inputs will be addressed and calculated.

Valuation

Afterwards, it is estimated AZN's fair price per share using the Firm Valuation approach. A sensitivity analysis is performed.

Next, AZN's fair price per share is estimated using the Equity Valuation approach.

Lastly, Relative Valuation is performed through the Multiples Valuation. The Peer Group is first presented, which are composed by companies in the same industry.

Main conclusions are addressed at the end.

4. AstraZeneca, Plc

4.1 Company Overview

AstraZeneca Plc("AZN") was founded in 1999 upon the merger of the Swedish company – Astra AB – and the British pharmaceutical - Zeneca Group Plc.

Astra AB, founded in 1913 in Sweden, was, at the time of the merger, a leading Swedish pharmaceutical company. Its pipeline included the production of penicillin, anaesthetics and cardiovascular medicines.

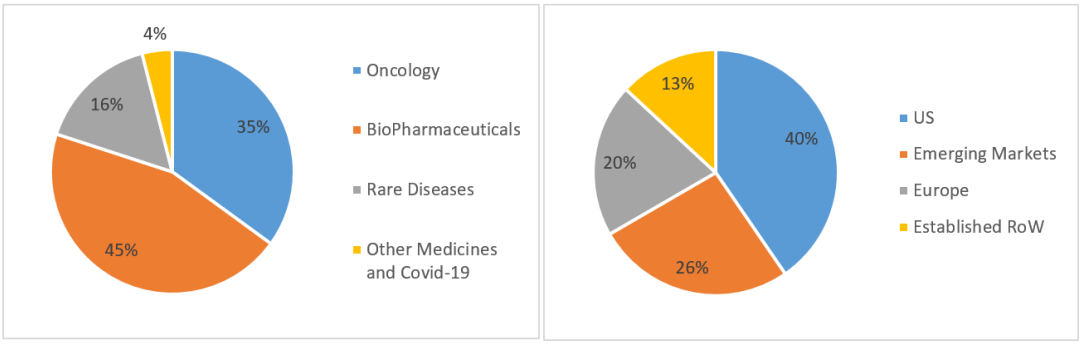
The British pharmaceutical – Zeneca Group Plc – was founded in 1993, by the spin-off of the pharmaceutical agrochemicals divisions of Imperial Chemical Industries – a British chemical company. Zeneca's business was mainly focused on the oncology and cardiovascular areas.

The merger of these two companies arose from their need to effectively face competition – Glaxo Wellcome and Merck – creating, this way, the world's fourth healthcare company. The merger was one of Europe's biggest deals at the time.

London was the chosen city for the Company headquarters and the R&D headquarters are in Sweden, with excellence centres in the UK and USA.

Currently, AstraZeneca Plc is a global pharmaceutical business with a science-led and patient-focused value proposition committed to excellence in the research, development and commercialisation of prescription medicines.

It employs 83,500 people in over 100 countries around the world, focusing on six main areas: 1) Oncology, 2) Biopharmaceuticals, 3) Cardiovascular, Renal and Metabolism, 4) Respiratory and Immunology, 5) Vaccines and Immune Therapies and 6) Rare Disease.



Source: AstraZeneca Annual Report, 2023

Figure 4.1:Total Revenue by Therapy Area in 2022 and Total Revenue by reporting region in 2022

4.2 The Board and Senior Executive Team

AstraZeneca's leadership, which includes their Board of Directors and Senior Executive Team, is accountable to their shareholders for the responsible conduct of the business and their long-term success.

The Company has a highly experienced Board and Senior Executive Team. The Board is responsible for the Group's corporate governance, sets the Group's strategy and policies, has overall responsibility for the oversight of risk and also monitors progress towards meeting its strategic objectives and annual plans. The Board also assesses whether or not, and to what extent, its obligations to the Company's shareholders and other stakeholders are understood and met. This includes regular reviews of the Group's financial performance and critical business issues.

In addition to the Board of Directors, the Senior Executive Team (SET) is the body through which the CEO exercises the authority delegated to him by the Board. The Company's CEO – Pascal Soriot – leads the SET and has executive responsibility for the management, development and performance of the business. The CEO, CFO -Aradhana Sarin – and SET also take the lead in developing the Group's strategy for review, constructive challenge and approval by the Board as part of AstraZeneca annual strategy review process.

4.3 Dividend Policy

The Board has adopted a progressive dividend policy, intending to maintain or grow the dividend each year.

The Board's aim is to continue to strike a balance between the interests of the business, financials creditors and the Company's shareholders.

Dividends will normally be paid twice a year, with a greater proportion paid as a second interim.

First interim: announced with second quarter and half year results and paid in September;

Second Interim: announced with fourth quarter and full year results and paid in March;

4.4 Share Price

The company is listed in the London Stock Exchange, in the Stockholm Stock Exchange and in the New York Stock Exchange. AstraZeneca stocks take part in the British FTSE 100 index and in the Swedish OMX 30 index.



Source: Yahoo Finance, 2023

Figure 4.2: AZN share performance from March 8, 2020 to December 31, 2022. Currency in USD. NasdaqGS.

Since early March 8, 2022 (the beginning of the pandemic) to the end of December 31, 2022, AZN's share price registered an appreciation of +60%.

4.5 AstraZeneca Credit Rating 2022

Table 4.1: External AZN Rating

Credit Rating		
Moody's	Rating	A3
	Outlook	STABLE
Standard & Poor's	Rating	A-
	Outlook	STABLE
Fitch	Rating	A-
	Outlook	STABLE

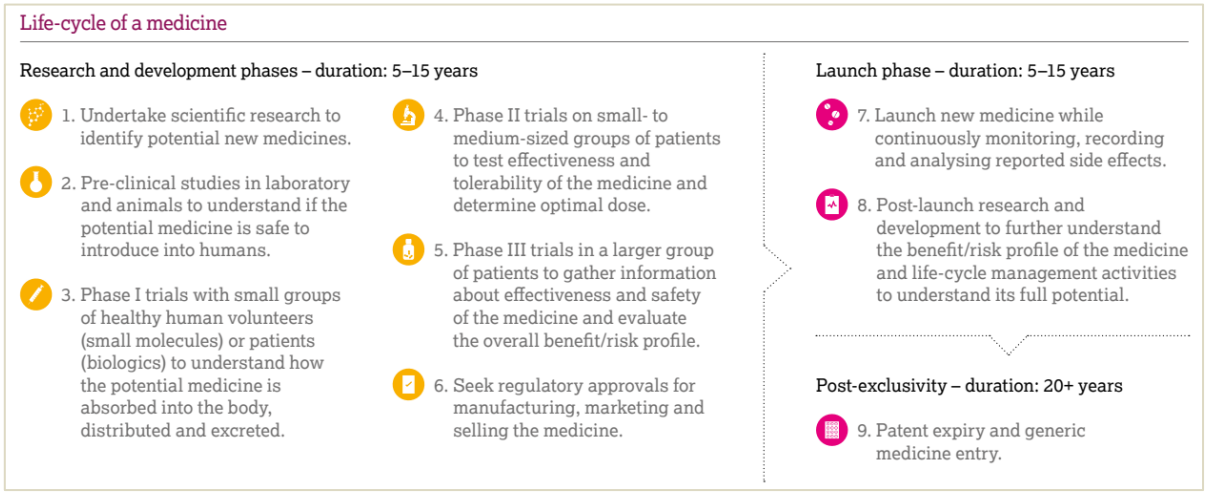
Source: Bloomberg

4.6 AstraZeneca's business model:

AstraZeneca's business activities span the entire life cycle of a medicine:

1) Investment: The Company invests in the discovery, development, manufacturing and commercialisation of their pipeline of innovative prescription medicines.
2) Revenue Generation: The Company generates revenue from Product Sales of their existing medicines and new medicines launches, as well as from their collaboration activities. The Company's focus is on creating medicines that facilitate profitable future revenue generation, while bringing benefits to patients.
3) Reinvestment: The Company reinvests in developing the next generation of innovative medicines and in its business to provide the platform for future sources of revenue in the face of losses of key patents. The Company also assesses opportunities to invest in value-enhancing additions to its portfolio.

AstraZeneca's medicines are approved in individual countries for specific uses and the information it provides for patients is governed by local regulations.



Source: AstraZeneca Annual Report, 2023

Figure 4.3: Life-cycle of a medicine

4.7 AstraZeneca's Therapy Areas

AZN's Therapy areas comprise:

1) **Oncology:** The Company focuses on some of the most hostile and hard-to-treat cancers - Lung, Breast, Ovarian, Blood, Prostate, Liver and Pancreatic cancers. The

Company aims to understand cancer and all its complexities to discover, develop and deliver life-changing treatments and increase the potential to save lives.

AstraZeneca's oncology strategic priorities are

a) Pioneering research across six scientific platforms: Tumour drivers and resistance, Immuno-oncology, DNA damage response, Antibody drug conjugates and Epigenetics and Cell therapies;

b) Advancing innovative clinical strategies to treat early stages of disease and relapsed or refractory patients;

c) Building expertise and leadership in the most prevalent and highest mortality rate tumour types; and

d) Delivering across the Company's global footprint.

2) Biopharmaceuticals: Through the work in this business segment, the Company aims to transform healthcare by stopping the progress of chronic diseases, which are often degenerative, debilitating and life-threatening. The Company is dedicated to enhancing disease understanding, broadening its therapeutic platforms, better predicting clinical outcomes and pioneering new approached in the clinic. All the Company's work in Biopharmaceuticals is underpinned and empowered by digital technologies, data and AI (Artificial Intelligence).

Biopharmaceuticals is responsible for the Company's key therapy areas of Cardiovascular, Renal and Metabolism, Respiratory and Immunology, and Vaccines and Immune Therapies.

3) Cardiovascular, Renal and Metabolism (CVRM): The Company's ambition is to stop, reverse and cure CVRM diseases by maximising their medicines, delivering innovative solutions and advancing their pipeline. To do this, the Company is unravelling the underlying causes of these diseases by identifying novel targets linked to disease biology to create the next generation of therapeutics.

The Company's disease areas under this business segment are: Chronic Kidney disease, Heart Failure, Metabolism and Cardiovascular disease.

The Company has more than 25 therapies and therapy combinations in their early-to-late-stage pipeline.

4) Respiratory and Immunology: With five decades of experience, AstraZeneca is an established leader in respiratory care and a disruptor in immunology. The Company is committed to transforming care for some of the most debilitating and chronic respiratory and immune-mediated diseases. The Company's approach involves

targeting the underlying biology and developing effective new drug modalities and combinations with the ultimate ambition of achieving disease modification and clinical remission.

The Company's disease areas under this business segment are: Asthma, Chronic Obstructive Pulmonary Disease (COPD), Other Chronic Respiratory Diseases, Lupus, Eosinophilic Inflammation and Epithelial Science.

5) Vaccines and Immune Therapies: The Company is committed to developing and delivering transformative vaccines and antibodies, providing long lasting immunity for millions of people. During the Covid-19 pandemic, AstraZeneca played an important role as part of a truly global effort to respond to a new and unprecedent challenge. To achieve their ambition, the Company is optimising the potential of both vaccines and antibodies while engineering next generation vaccines that have the potential to generate potent and long-lasting immune responses. At the same time, the Company is pioneering novel approaches to develop highly targeted, long-acting antibodies, optimised with their half-life extension technology. The Company focuses on a range of pathogens, including SARS-CoV-2.

6) Rare Diseases: The Company is committed to understanding patient's unique needs, in order to research and develop innovative medicines, support access and advocate for the rare disease community. AstraZeneca's rare disease strategy focuses on three core priorities: Creating smart and efficient strategies to speed access to the medicines, innovate by investing in science, platforms and capabilities, including using its own technology and research capabilities, and reach beyond and current geographic footprint to as many rare disease patients as possible.

The Company's disease areas under this business segment are: haematology, nephrology, neurology, metabolic and cardiology.

4.8 AstraZeneca's Strategy

The Company's future strategy is based on 3 pillars:

Accelerate Innovative Science:

The Company's prioritised initiatives are creating the next generation of therapeutics using an array of drug modalities while leading in convergence of science, data and technology.

The main focus of the Company for 2023 under this pillar is going to be: i) Drive innovation opportunities across their global R&D sites, ii) Continue transforming the way the Company discovers and develops medicines using AI and machine learning, and, iii) Continue attracting the brightest minds to create an environment in which science thrives.

Deliver Growth and Therapy Area Leadership:

The Company's prioritised initiatives are meeting their growth and profitability goals through successful innovation and commercial excellence.

The main focus of the Company for 2023 under this pillar is going to be: i) Deliver sustainable growth by seizing opportunities open to AZN in regions, markets and through targeted business development opportunities, ii) Continue to transform how the Company works and iii) Advance digital approaches to transform the patient experience.

Be a Great Place to Work:

The Company's prioritised initiatives are contributing to the enterprise and being a great place to work, with a focus on inclusion and diversity, as well as lifelong learning. The Company's also aims to contribute to society by improving access to healthcare, environmental protection, and ethics and transparency, as well as delivering their Ambition Zero Carbon programme.

The main focus of the Company for 2023 under this pillar is going to be: i) Maintain positive employee engagement; ii) Accelerate digital transformation and activities to drive productivity; and iii) Deliver targeted advances across sustainability priorities.

4.9 AZN Recent Acquisitions

Alexion Pharmaceuticals Acquisition

In July 2021, AstraZeneca completed the acquisition of Alexion Pharmaceuticals, Inc. (Alexion) through a cash-and-stock deal of around $39bn. The acquisition marks the Company's entry into medicines for rare diseases.

Alexion's is a global biopharmaceutical company focused on developing life-changing therapies for people living with rare diseases, headquartered in the US.

Through Alexion's innovative complement-biology platform and robust pipeline, AstraZeneca will continue to pioneer the discovery and development of medicines for patients with rare diseases, which represent a significant unmet medical need and becomes a high-growth opportunity for the Company.

The total consideration paid to the Alexion shareholders was approximately $13.3bn in cash and 236,321,411 new AstraZeneca shares.

CinCor Pharma acquisition

On 9th of Jan. 2023, AZN announced it had entered into a definitive agreement to acquire CinCor Pharma, a US-based clinical-stage biopharmaceutical company, focused on developing novel treatments for resistant and uncontrolled hypertension as well as chronic kidney disease. CinCor is focused on developing their lead clinical candidate, baxdrostat, for the treatment of hypertension and other cardio-renal diseases.

The baxdrostat development program included four Phase II clinical trials designed to evaluate baxdrostat in differing populations of patients, all of whom are hypertensive. CinCor recently completed their Phase 2 BrigHtn trial, for which key clinical data suggests impressive efficacy and meaningful dose dependency in the treatment of patients with resistant hypertension. Baxdrostat will enter Phase III clinical trials in H1-2023.

Under the terms of the agreement, AZN will initiate a tender offer to acquire all of CinCor's outstanding shares for a price of $26 per share in cash at closing (c. $1.3bn), plus a non-tradable contingent value right of $10 per share in cash payable upon a specified regulatory submission of a baxdrostat product (maximum of $1.8bn).

As part of the transaction, AstraZeneca will acquire the cash and marketable securities on CinCor's balance sheet, which totalled approximately $522m as of 30 September 2022.

The acquisition allows the company to access global rights to baxdrostat, bolstering AstraZeneca's cardio-renal pipeline by adding the candidate drug.

TeneoTwo, Inc. acquisition

On 11th August 2022, AstraZeneca has completed the acquisition of TeneoTwo, Inc., including its Phase I clinical CD19/CD3 T-cell engager, TNB-486, in a deal up to $1.27bn to bolster the haematological cancer pipeline.

TeneoTwo is a biotechnology firm that develops potential new medicine for B-cell hematologic malignancies, including diffuse large B-cell lymphoma located in the US.

AstraZeneca has acquired all outstanding equity of TeneoTwo in exchange for an upfront payment of $100m. Under the terms of the agreement, AstraZeneca will make additional contingent R&D related milestone payments. Internal $805m and additional contingent commercial related milestone payments of up to $360m to TeneoTwo's former equity holders.

Through the acquisition of TNB-486, AstraZeneca intends to advance the development of this new therapy for B-cell hematologic malignancies, including diffuse large B-cell lymphoma and follicular lymphoma.

TNB-486 is expected to further expand the haematology pipeline of AstraZeneca that covers various therapeutic modalities and mechanisms for addressing a wide range of blood cancers.

4.10 ANZ Clinical Research

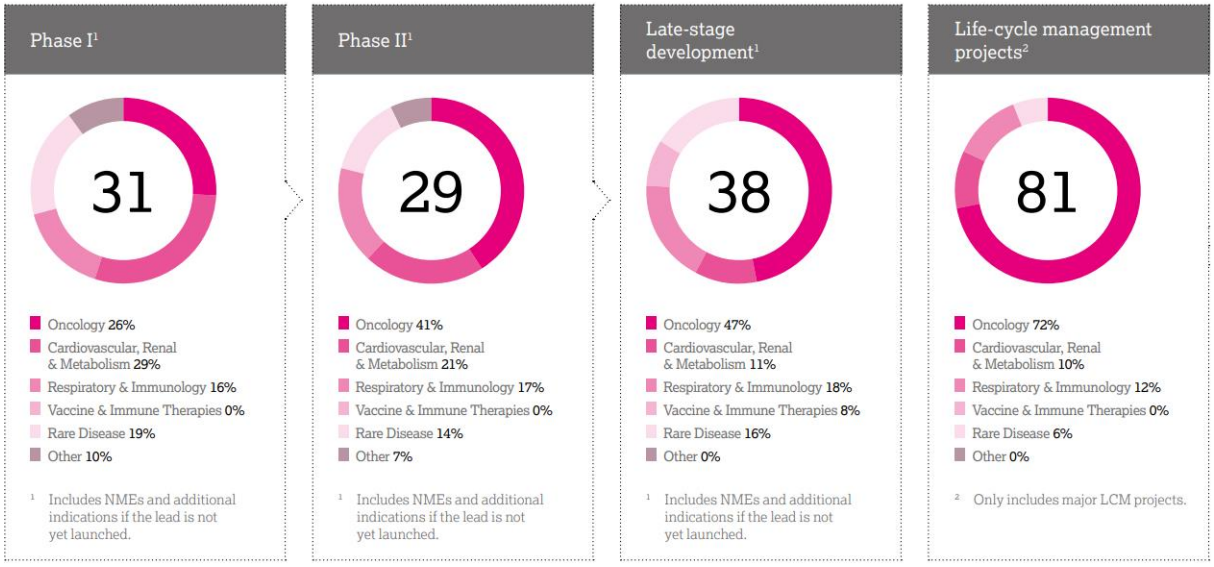
As a science-led biopharmaceutical company, AZN clinical research is crucial to the development of potentially innovative and life-changing medicines the Company aims to deliver.

The Company has a long-standing commitment to making information about their clinical research publicly available. The Company's vision is to be trusted for clinical trial transparency by regulators, investigators, participants and society.

In 2022, AZN registered 72 regulatory events, either submissions or approvals for its medicines in major markets, including two NME (New Molecular Entities) first approvals. That performance is backed by a healthy pipeline of high potential medicines, with a total of 29 pipeline progression events, either NME Phase II starts or Phase III investment decisions.

During 2022, the Company's pipeline comprised 179 projects, of which 155 are in the clinical phase of development.

Furthermore, it has 15 NME projects in pivotal trials or under regulatory review, compared with 10 at the end of 2020. Also in 20212, 20 NMEs progressed to their next phase of development and 27 projects were discontinued.



Source: AstraZeneca Annual Report, 2023

Figure 4.4:Medicines phase of development

4.11 Intellectual Property and R&D

Over the longer term, the success of AZN R&D is crucial, thus AZN devotes substantial resources to this area.

AZN R&D productivity, defined as progressing from candidate drug nomination to Phase III completion, increased to 19% in 2022 versus an industry average of 14%.

AZN R&D organisation comprises more than 13,000 employees working across their global sites. AZN currently has three global R&D centres, in the UK, US and Sweden, as well as several additional R&D sites. The acquisition of Alexion added a Rare Disease R&D Centre of Excellence in the US.

In 2022, R&D expenditure was $9.8bn (FY21: $9.7bn), including Core R&D costs of $9.5bn (FY21: $8bn). In addition, it was spent $2bn on acquiring product rights (such as licensing) vs. $27m in 2021 as of product rights as part of the Alexion acquisition.

AZN also invested $111m (FY21: $223m) on the implementation of their R&D restructuring strategy.

For AZN investments to be viable, the Company seeks to protect new medicines from being copied for a reasonable period of time through patent protection. Pursuing a strong patent strategy that builds robust patent estates to protect AZN pipeline and products.

Intellectual property is the biggest asset of "pure" pharmaceutical company, so the industry needs a clear and fair patent system.

Patent policy is different in every territory and it has limited duration. In most countries, after 20 years the patent expires and the company loses the right to exclusively produce and market the medicine. When this happens, generic versions start to be sold in the market. Patent expiration is usually associated with a negative impact on pharmaceutical companies' sales.

Considering that most part of the protected years are spent in clinical tests and regulatory requirements, some of the major markets have Patent Term Extensions. This extension varies from zero to five years deepen.

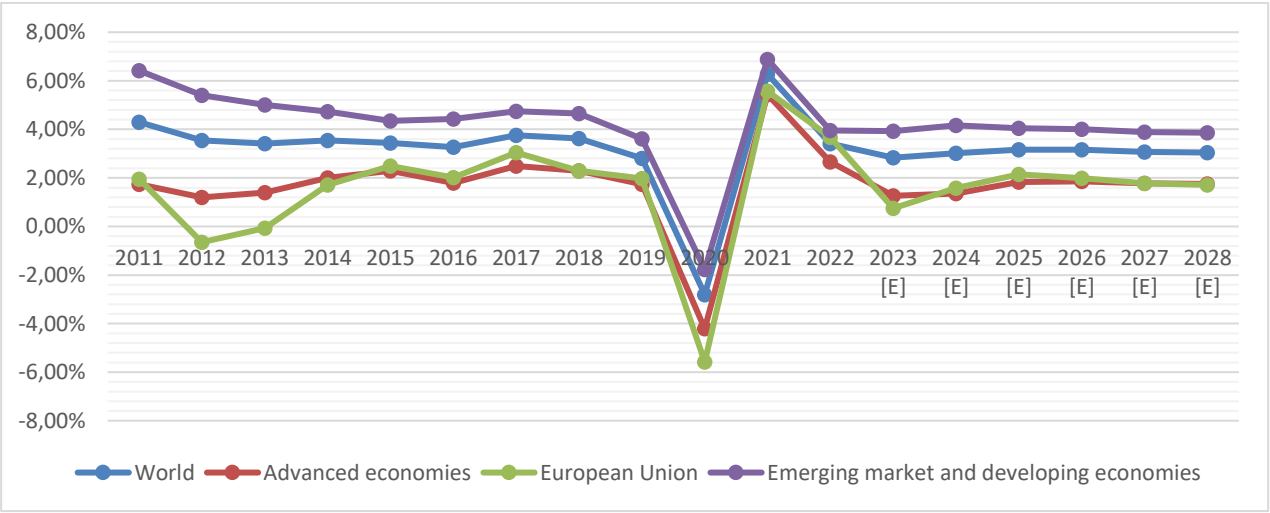
5. Industry

5.1 Economic Environment

5.1.1 Growth Domestic Product – GDP

According to the International Monetary Fund (IMF), as of April 2023, World's GDP growth, after a steep decline in 2020 followed by a peek in 2021, will remain quite stable between 2024 and 2028 after a strong reduction in 2023. However, GDP growth over the forecasted period is expected to be lower than in 2022.

- The IMF expects World's GDP average growth to be negative at 1.56% between 2023 and 2028, reaching a GDP growth of 3.05% in 2028 vs. 3.42% in 2022.
- The IMF expects Advanced Economies' GDP average growth to be negative at 2.36% between 2023 and 2028, reaching a GDP growth of 1.76% in 2028 vs. 2.66% in 2022.
- The IMF expects EU's GDP average growth of 7.59% between 2023 and 2028, reaching a GDP growth of 1.72% in 2028 vs. 3.68% in 2022. For the EU, the IMF expects strong fluctuations on the GDP growth over the period considered.
- The IMF expects Emerging Economies' GDP average growth to be negative at 0.37% between 2023 and 2028, reaching a GDP growth of 3.86% in 2028 vs. 3.96% in 2022.



Source: International Monetary Fund, World Economic Outlook Database, April 2023

Figure 5.1: GDP Growth 2011 – 2028 [E]

5.1.2 Inflation

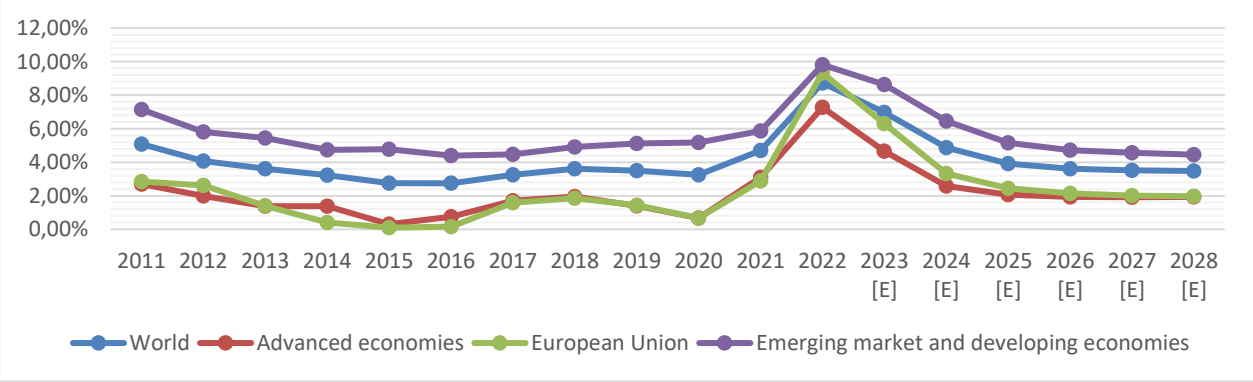
Persistently high prices of energy, food and other commodities remain at the heart of most countries' economic challenges. Russia's invasion Ukraine has compounded inflation problems, which initially emerged following the relaxation of pandemic restrictions when a strong goods demand recovery met supply challenges.

Headline and core inflation rates remain significantly above central bank targets in almost all advanced and emerging market countries.

There are strong reasons to believe, however, than headline inflation will peak or stabilize and then decline across countries through 2023, with further declines in 2024, barring another commodity price or supply chain shock. While inflation is high almost universally, the underlying causes differ by country.

With prices pressures already broadening to services, which make up a larger share of the core consumer price index (CPI) in most countries, inflation is expected to remain a persistent source of concern for central banks through 2023 and consequently it is expected monetary policy to remain restrictive in most large companies.

- The IMF expects World's Inflation Rate to decrease from 8.73% in 2022 to 3.47% in 2028.
- The IMF expects Advanced Economies' Inflation Rate to decrease from 7.27% in 2022 to 1.94% in 2028.
- The IMF expects EU's Inflation Rate to decrease from 9.32% in 2022 to 1.97% in 2028.
- The IMF expects Emerging Economies' Inflation Rate to decrease from 9.81% in 2022 to 4.44% in 2028.



Source: International Monetary Fund, World Economic Outlook Database, April 2023

Figure 5.2:Inflation Rate 2011 – 2028 [E]

5.1.3 Energy Prices

Energy market developments will remain highly unpredictable and at times turbulent over the next two years until a new equilibrium emerges. Efforts by EU countries to reduce on Russia as the largest supplier of natural gas and refining products have already lifted prices and reduced affordability of these essential commodities for other net energy importers, especially in Asia.

The direct economic disruption from the energy shock is particularly severe in Europe, and it is expected higher uncertainty about Europe gas suppliers after March 2023.

5.1.4 Europe's Outlook:

Moody's forecasts euro area real GDP to grow 3% in 2022, to contract 0.6% in 2023, and to return to growth at the rate of 1.6% in 2024.

Consumer and business confidence in Europe has plummeted since Russia's invasion of Ukraine.

Faced with already rising and broadening inflation pressures, Moody's expects the ECB to maintain a hawkish stance through 2023 and 2024. While headline inflation will decline with energy and food prices stabilizing, albeit at high levels, core inflation will persist.

In the UK, it is expected further monetary policy tightening by the Bank of England in light of the risk of more persistent inflation over the medium term and to ensure that long-term inflation expectations remain anchored amid the heightened volatility in financial markets.

It is expected economic activity to continue to deteriorate as high inflation, weaker external demand, and the rising cost of borrowing – exacerbated by volatile financial market condition.

5.2 Pharmaceuticals and Healthcare Industry

5.2.1 Medicine Development Process:

The development of new medicines is a long and difficult process. Only one or two medicines in 10,000 tested actually make it through to being licensed treatments. Overall, it may take 10 to 15 years for a new medicine to get from the test phase to the market.

The overall process, according to the FDA (US Food and Drug Administration), which it is the most closely followed by the analysts, can be described as follows:

Table 5.1:Medicine development process

Discovery	• The first step in the process is to discover a potential unmet target that a new medicine could act on and then develop it. • Many thousands of new chemical compounds are created and tested to identify those that have potential. There is a high drop out rate at this stage. • A new medicine that shows potential will be put through several laboratory tests. This step can take, on average, 2 to 5 years to complete.
Pre-Clinical	• Before testing a medicine in people, researchers must find out whether it has the potential to cause serious harm. Thus, medicines undergo laboratory and animal testing to answer basic questions about safety. • Usually, pre-clinical studies are not very large. However, these studies must provide detailed information on dosing and toxicity levels. After pre-clinicals testing, researchers review their findings and decide whether the drug should be tested in people. This step can take up to 1 year. • Furthermore, during pre-clinical tests, the companies start to seek for patent protection for the intellectual property.
Clinical Development	• Phase I: The development period begins with Phase I, which consists in testing the new medicine is a small number of healthy volunteers or people with the disease/condition (20 to 100). This phase aims to understand the dose required of the medicine and how the human body reacts to it, including side effects. This phase can take up to 1 year, and approximately 70% of medicines move to the next phase. • Phase II: In this phase, the medicine is tested in a larger group of people (100 to 300) who have the disease or the condition, for several months up to 2 years. The main purpose of this phase is to assess the efficacy and side effects. Approximately 33% of medicines move to the next phase. • Phase III: In phase III, the study group goes up to around 300 to 3,000 volunteers who have the disease or the condition and it lasts for around 1 to 4 years. The main purpose of this phase is to assess the efficacy and monitoring adverse reactions. Approximately 25-30% of medicines move to the next phase.
Regulatory Approval	• If the new medicine passes successfully through the 3 Phases of the Clinical Development, the Company looks for regulatory approval to start producing and launch the medicine in the market. The companies must file an application and submit all data related to the medicine tests proving the medicine's efficacy and safety. • On this stage, the regulator thoroughly examines all the submitted data related to the medicine or device and make a decision to approve it or not.
Market Launch	• If approved by the regulator, the medicine can be launched to the market and prescribed to patients. Considering all the above steps, it can take up to 10 years from the discovery of the medicine until its launch in the market. • During the medicines' life cycle, the companies have to continuously monitor it for possibly new side effects.

Source: U.S. Food and Drug Administration

5.2.2 Regulatory Entities

In America, the regulatory entity responsible for securing public health is the US Food and Drug Administration (FDA), ensuring the effectiveness and safeness of new medicines, by approving all medicines or therapeutic biologicals sold in the United States.

In the European Union, the regulatory system is more complex and it is not centralized in one entity, as in America. European Commission, Regulatory Authorities of EEA (European Economic Area) and the European Medicines Agency (EMA) operate jointly to ensure medicine safeness.

In the EU there are different ways for medicines to get approval for marketing in the EU.

For innovative medicines, it must be used the centralized way: A market authorization application must be submitted by the pharmaceutical company to EMA, which proceeds with clinical trials and scientific processes to conclude about the safeness and efficiency of the new medicine. After testing, EMA provides its opinion on whether the new medicine should be authorized to be sold in the EU or not. Then, if authorized by the European Commission, the medicine can be launch into the market.

When a company wants to sell a new medicine in more that one EU country it can follow two paths:

For medicines not yet authorized in any EU country, it must proceed the decentralised way: The company seeks approval to sell the medicine in several EU members states without the compulsory steps of the centralized way.

For medicines which have been already approved in one member state, the company should use the mutual recognition procedure, in which the company applies for the extension of the authorization to other EU member states. Countries rely on the scientific assessment of local regulatory authorities.

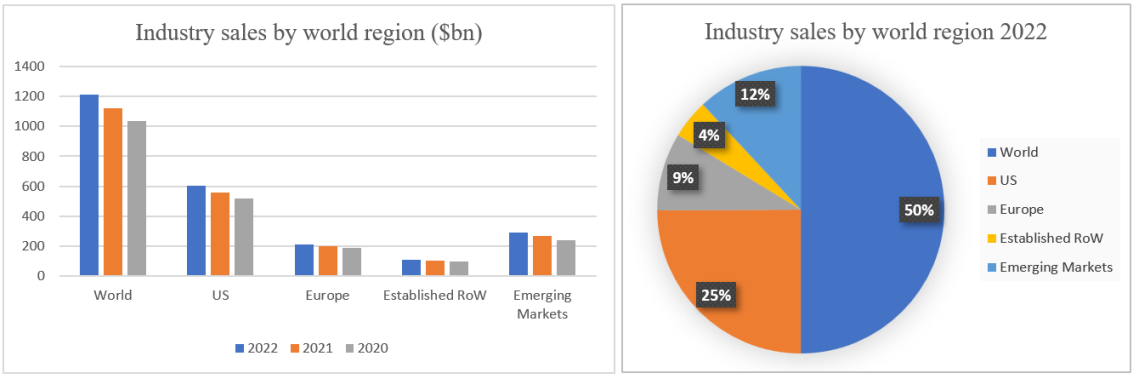
All EU member states regulatory authorities follow the same rules and procedures to examine medicines. After marketing approval, each member state considers the potential use of the medicine by the national health system and concludes about the pricing and refund.

Furthermore, in Japan there are the Pharmaceuticals and Medical Devices Agency, and in China there is the State Food and Drug Administration, which have their own criteria and clinical test requirements.

5.2.3 Pharmaceuticals and Healthcare Industry - Global

The pharmaceutical industry is one of the fastest growing economic sectors. Global trends continue to increase the demand for healthcare and as a result global pharmaceutical sales grew by 8.2% in 2022 and global healthcare spending is projected to increase at an annual rate of 5.7% from 2021 to 2026.

In 2022, Established Markets saw an average revenue increase of 8.4% and Emerging Markets revenue also grew at 8.4%. The US, Japan, China, Germany and France are the world's top five pharmaceutical markets by 2021 sales. In 2022, the US had 49.8% of global sales (2021: 49.7%).



Source: AstraZeneca 2023 Annual Report and IQVIA Market Prognosis Global 2022-2026
Figure 5.3:Industry Sales by world region in $bn and Industry sales by world region in 2022 (%)

According to IQVIA Market Prognosis Global 2022-2026, it is expected Developing Markets, including Africa, the Commonwealth of Independent States (CIS), the Indian subcontinent and Latin America, to fuel pharmaceutical growth.

Market growth in China is expected to remain below historical levels at a compound annual growth rate of 2.6%. This is due to the continued slowdown of the major hospital sector.

Estimated pharmaceutical sales and market growth to 2026, according to AstraZeneca 2023 Annual Report and IQVIA Market Prognosis Global 2022-2026 as follows:

Table 5.2:Estimated pharmaceutical sales and market growth to 2026

	Estimated pharmaceutical sales 2026	**Estimated pharmaceutical market growth 2022-2026**
North America	$774bn	4.5%
Latin America	$170bn	17.2%
EU	$295bn	5.4%
Africa	$34bn	6.2%
Middle East	$29bn	5.3%
Southeast Asia and East Asia	$267bn	3.8%
China	$189bn	2.6%
Japan	$74bn	0.2%

Source: AstraZeneca 2023 Annual Report and IQVIA Market Prognosis Global 2022-2026

5.2.4 Pharmaceuticals and Healthcare Industry – Europe

5.2.4.a) Healthcare Expenditure

In 2021, in the EU, 'health' expenditure remained the second largest item of general government expenditure, amounting to €1,179bn or 8.1% of GDP (Annex A).

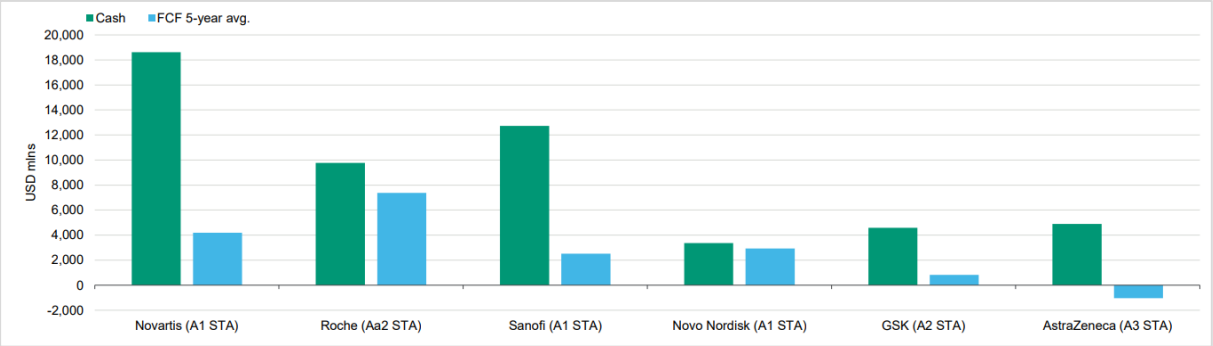
In 2021, the ratio to GDP increased by 0.1 percentage points as compared to 2020 resulting in the highest ratio in the available time series. The high amount reported in 2021 is due to increases in government expenditure on health (an increase of + C 103 billion compared to 2020), inter alia related to the COVID-19 pandemic.

5.2.4.b) Outlook

According to Moody's investors report as of February 2023, Moody's analysts expect investment-grade European pharma companies to be more acquisitive during 2023, after they executed small, bolt-on transactions in 2022. AstraZeneca will also remain acquisitive despite its solid growth outlook and rich pipeline.

For starters, lower market valuations driven by the higher interest rate environment are likely to spur M&A transactions by cash-flush investment-grade pharmaceutical companies. For some large pharmaceutical companies, upcoming patent expirations or the desire to reduce revenue concentration on a few products could be drivers. Drug pricing provisions in the US Inflation Reduction Act (IRA) relating to Medicare — the US government health insurance plan for people aged 65 and over — could also spur M&A by companies with exposure.

Investment-grade pharma companies tend to maintain large cash balances and generate strong free cash flow, which they can use to fund acquisitions.



Source: Moody's Financial Metrics, 2023

Figure 5.4:EMEA investment-grade pharma cash and short-term investment vs. five-year cash flow average

It is expected that European speculative-grade pharmaceutical companies will continue to grow organically in 2023, even though companies operating in segments with low or no reimbursement are exposed to reduced consumer purchasing power.

5.3 PESTEL Analysis

PESTEL analysis is a framework used to assess key external factors (Political, Economic, Sociological, Technological, Environmental and Legal) that influence a Company or organization.

Combined, the PESTEL factors can have a profound impact on risks and opportunities for firms. Thus, it is so important for analysists to recognise them in the financial analysis performed.

Following, is a PESTEL analysis for AstraZeneca:

Table 5.3:AstraZeneca PESTEL Analysis

Political -Greater geopolitical conflict
• Over the next two decades, the geopolitical environment is expected to become more contested, potentially reaching levels of intensity not seen since the Cold War. • Additionally, global geopolitical volatility has fundamentally altered the relationships and norms that have governed international economic partnerships and frameworks since the Second World War. For example, when the Russia/Ukraine conflict started in early 2022, it did not take long for the geopolitical consequences to be felt around the globe. • Responses to other global issues, such as climate change or the Covid-19 pandemic, are at risk of being derailed or undermined as a result. Geopolitical tensions also place increased pressure on supply chains and distribution networks.
Economic - Global economic downturn
• Since 2021, the global economy has experienced a slower recovery than expected, particularly in major economies such as the US, Europe, China and Russia. High governmental debt loads, a slowdown in global trade, increasing energy prices and labour shortages have all contributed to suppressing growth - a trend that can be observed across the globe. • In January 2023, the IMF upgraded its Global GDP growth forecasts for 2023 to 2.9%. This is an increase from its previous forecast of 2.7% but still below the historical annual average of 3.8% between 2000 and 2019. • In addition, inflationary pressures from the rise in energy prices, consequences of the pandemic and conflict between Russia and Ukraine have led to higher inflation and, with that, higher nominal interest rates that are expected to continue.
Social - Growing burden of chronic diseases
• According to Work Health Organisation (WHO), by 2040, non-communicable diseases (NCDs) could account for 80% of deaths in low-income countries, up from 25% in 1990. • NCDs, also known as chronic diseases, are the result of genetic, physiological, environmental and behavioural factors. Cardiovascular diseases account for most

NCD deaths annually (17.9m people), followed by cancers (9.3m), respiratory diseases (4.1m) and diabetes (1.5m). • Increasing demand for healthcare is putting pressure on healthcare budgets, which, exacerbated by the impact of the Covid-19 pandemic, is leading to downward pressure on pricing. • Together with national and regional healthcare services, pharmaceutical companies play a key role in prevention, diagnosis and treatment for patients with chronic diseases.
Technological - Artificial Intelligence (AI) becoming mainstream
• Artificial Intelligence (AI) is transformational and its broad use has significant potential to reshape societies, economies and industries. • Investment in AI-enabled drug discovery more than doubled in the past five years, exceeding $5.2m at the end of 2021. • AI will improve productivity in the workplace and challenge existing business models. At the same time, it will disrupt the labour force by creating new job fields while eliminating other. To harness the advantages of AI, countries and companies will need to focus on educating and upskilling their workforce.
Environmental - Climate Change accelerating
• Climate change, caused by growing human-produced concentrations of greenhouse gases in the atmosphere, is intensifying. • The impact of climate change - via rising temperatures and other extreme weather conditions, rising sea levels and declining biodiversity - will be felt across the globe, with the cost and related challenges disproportionately affecting developing economies. • When converging with environmental degradation, the risks to food security, access to water, public health and energy supply will intensify.
Legal - Regulatory Entities
• AstraZeneca, being one company that covers every step of medicine life cycle, i.e. research, develop, test, produce and sell off own medicines, it works together with regulatory entities to test and approve new medicines to be marketed. • To promote research and protect intellectual property, the large majority of countries protect the new discoveries by a patent policy. • The test and approvals part of the whole process are time consuming and expensive, as R&D expenses are a key factor for these companies' success. • Further in the paper, it is given a more detailed overview on regulatory entities and R&D expenses.

Source: AstraZeneca 2023 Annual Report

Outlook: While demand for healthcare is increasing and science is driving improvements in healthcare, risks remain for the sector.

During the pandemic, public trust in pharma rose to 31% in 2022, from 25% in 2018. But there is still room to improve.

At the same time as demographic and other changes are driving increased demand for healthcare, continued advances in science and digital technologies are driving innovation and improvements in healthcare. However, risks remain.

In the addition to the downward pressure on pricing, the sector also faces regulatory challenges and the loss of exclusivity and genericisation.

More generally, to be successful, pharmaceutical companies will need to be able to respond to pressures and demand made on them by patients and caregivers, health authorities, payers, policymakers and others, while earning their trust. They will also need to develop strategies for protecting themselves against harmful misinformation, which will require collaboration between businesses, policymakers and other stakeholders to tackle at scale.

5.4 Porter's Five Forces Analysis

Porter's Five Forces Analysis examines an industry and a company's strategic position within its industry. The analysis looks at five competitive forces that influence an industry.

Threat of New Entrants: The big payoffs available in the pharmaceutical industry lead to a steady flow of new companies being created within the industry, which can find venture capital funds eager to provide startup funding. However, these small companies pose no serious threat to big pharma, noting that one of the main exit strategies of these type of startups is to sell out to big pharma firms when new products are through the initial development phase, which carries high expenses and investment.

Power of Suppliers: The raw materials for manufacturing drugs are commodity products in the chemical industry, which are available from numerous sources. Suppliers usually offer multiple products to the manufacturer, which moderates pricing. Thus, suppliers have little power in the pharma industry.

Power of Buyers: The medical patient has an absolute lack of power regarding price, as well as the prescriber of the drugs – which does not profit from the sale of drugs – and the insurance companies. The only entities with any negotiating power are the pharmacies and medical institutions that fulfil the medical patients' prescription and even so they have little power, mainly, in new drugs protected by the patents.

Availability of Substitutes: Once a drug loses its patents, generic drug manufacturers are able to start selling similar versions at substantially lower prices than the original ones. Additionally, there is major international problem with counterfeit drugs, which hurts corporate profits.

Competitive Rivalry: The huge importance of intellectual property results in strong competition for high-level workers and leading researchers, all aiming for new patented drugs. Any potential new drug has its public information analysed for the possibility of creating a

similar drug to market as substitute. The industry shows a pattern of firms merging and larger firms buying smaller ones that have promising research or new drugs.

6. Valuation

The following chapter aims to valuate AstraZeneca's share as of December 31st, 2022. To do so, it will be used the Discounted Cash Flow approach, more specifically the Firm and Equity Valuation model, complemented by a Relative Valuation. Additionally, a sensitivity analysis will also be performed.

The recommendation criteria are to BUY, HOLD or SELL, according to the estimated upside or downside potential of the stock, taking into account the current stock price of $67.80 as of 31/12/2022.

Before proceeding to the Firm and Equity Valuation and respective sensitivity analysis, it is necessary to estimate a set of inputs to run each model:

6.1 General Assumptions

Historic and explicit period

First, we need to estimate the future cashflows of AstraZeneca. The explicit period of forecasts considered is five years, from 2023 to 2027, inclusive.

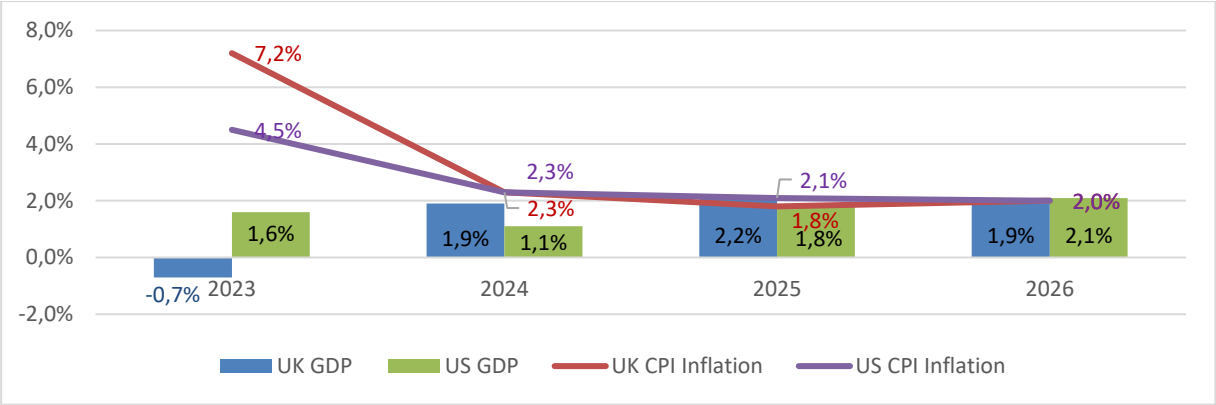
In order to estimate the future cashflows it is important to analyze the historical financial statements of AstraZeneca. Thus, data from 2018 to 2022 was considered, with 2022 being the last year with available historical information. Historical AstraZeneca's Balance Sheet and Income Statement can be consulted in Annex B and C.

Growth Rate (g_n)

The stable growth rate was assessed considering the forecasted values of the Gross Domestic Product (GDP) and Inflation of both the UK and the US, between 2023 and 2026.

Please note that the US was considered when assessing the AZN's growth rate given that the US represented 40% of AZN FY22'S Revenue, thus it was deemed relevant to consider it in the growth rate.

Thus, the stable growth rate considered was 60% of the UK's GDP and Inflation average and 40% of the US's GDP and Inflation average.



Source: Bank of England on its Monetary Policy Report as of May 2023; EY forecasts as of May 2023; IMF as of April 2023

Figure 6.1:UK and US GDP and Inflation Forecast (2023 [E] - 2026[E])

These values are the ones considered when assessing the stable growth (g_n), given that it is not reasonable for companies to grow above the economy in which they operate, as per Damodaran (2012). Therefore, the average of the forecasted GDP growth between 2023-2025 is around 2.3%, which will be considered as the growth rate (g_n) in 2027.

Tax Rate

At Spring Budget 2021, the government announced an increase in the Corporation Tax main rate from 19% to 25% for companies with profits over £250k, with effect from 1 April 2023. Thus, the tax rate assumed was 25% for the forecasting period.

6.2 Forecasts

Revenues

In order to forecast the revenues from 2023 to 20267, it was used the average growth rate of the Bloomberg Consensus Estimates[1]:

Table 6.1:Consensus' sales growth rate

FY23	**3.42%**
FY24	9.85%
FY25	7.42%
FY26	6.27%

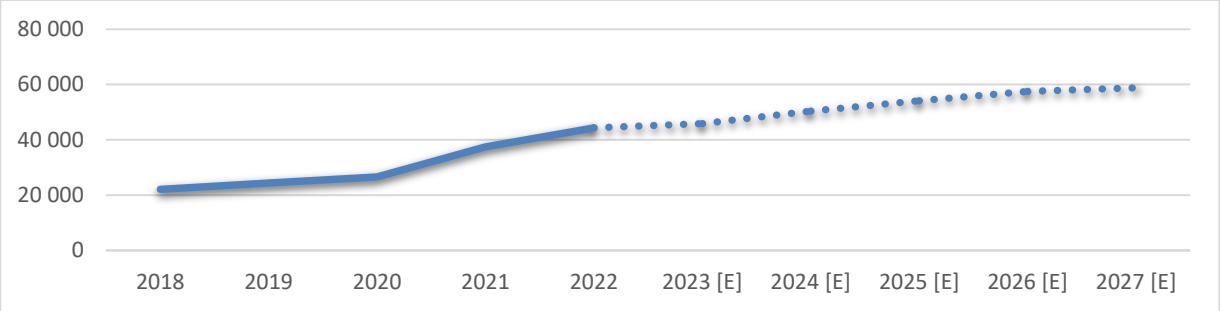
Source: Bloomberg Consensus Estimates

[1] Bloomberg consensus estimates cover all key income statement, balance sheet, and cash flow measures and are directly comparable to company reported results.

To compute the forecasted revenues, it was applied the above growth rates for each period – i.e., 3.42% to the 2022 revenues to achieve the 2023 revenues and so on until 2026.

Bloomberg Consensus expects a more conservative sales growth rate between 2023 and 2026, than the historical average of 13% between 2018 and 2022, excluding the year 2021, which reached 20% sales growth - exceptional year due to the Covid-19 pandemic and the development of the Covid-19 vaccine by the Company.

For 2027, it was considered a growth rate of 2.3% in line with the expected GDP growth.



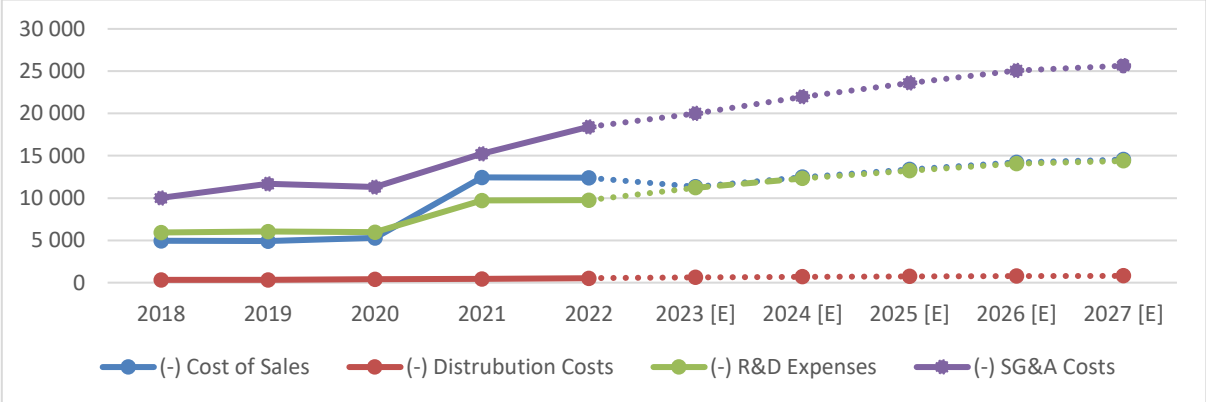
Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

Figure 6.2:Revenues (Historical and Forecasted) ($m)

Operating Costs

The operating costs were forecasted as a percentage of the revenues. The percentage benchmark to apply to the forecasted years was computed as the average percentage of revenues spent on operating costs in the historical period:

- Cost of Sales average percentage of the revenues: 25%;
- Distribution Costs average percentage of the revenues: 1%;
- R&D Expenses average percentage of the revenues: 24%;
- SG&A Expenses average percentage of the revenues: 44%;



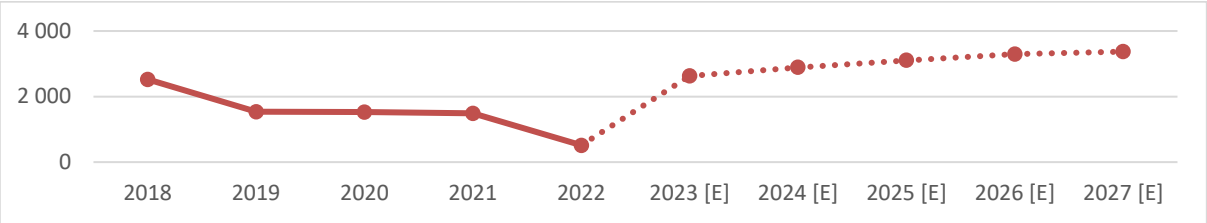
Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

Figure 6.3:Operating Costs (Historical and Forecasted) ($m)

Other Operating Income

Besides the Company revenue derived from its product sales, the Company has other Operating Income deriving from Royalties, Gains on Disposal of Intangible Assets and Investments in associates and joint ventures.

This income has been representing an average of 6% of revenues in the historical period. Thus, as it was performed for the previous items, it was applied the 6% of the forecasted revenues to the explicit forecast period (2023-2027).



Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

Figure 6.4: Other Operating Income (Historical and Forecasted) ($m)

Depreciation and Amortization

In order to forecast depreciation and amortization, it is important to first assess what type of assets are subject to depreciation and amortization. According to AstraZeneca Annual Report 2022 (AstraZeneca, 2023), depreciation and amortization apply to Property, Plant and Equipment (PP&E), Intangible Assets (except those related to IT) and Leases.

Taking this into consideration, it was assessed the total value of these assets in the historical period as well as the total value of Depreciation and Amortization, in order to compute the depreciation as a percentage of revenues.

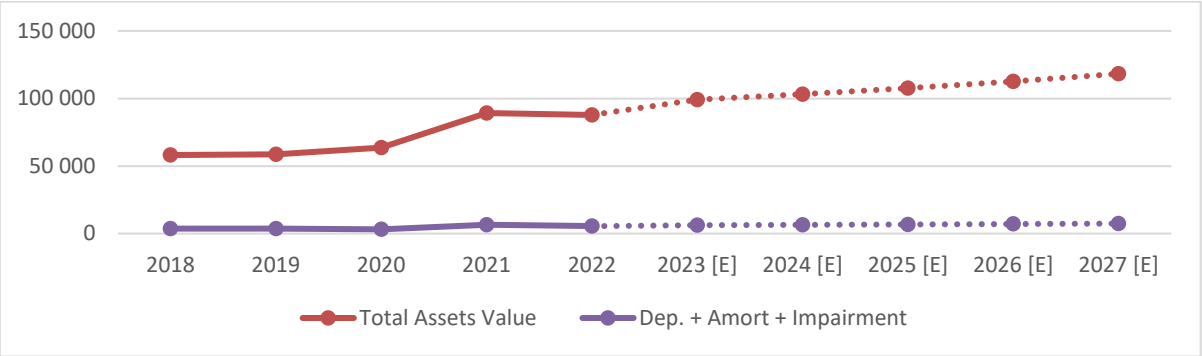
To forecast the value of PP&E, Intangible Assets and Leases in the explicit period, it was considered the average growth rate calculated in the historical period for each item. Although there was a significant investment in Intangible Assets in 2021, it is expected, by AstraZeneca, a more stable growth in the upcoming years. Thus, the average growth rate of Intangible Assets excludes the 2021 year, resulting in a more modest growth of 3.5% (vs. 15% when considering the 2021 growth).

Table 6.2: Historical PP&E, Intangible Asset, Leases and associated D&A

$m	**2018**	**2019**	**2020**	**2021**	**2022**
Total Tang. + Intang. Assets + Leases	58,140	58,626	63,717	89,128	87,814
Total Depreciation + Amortization	3,753	3,762	3,149	6,530	5,480
% of Revenue	17%	15%	12%	17%	12%
Average	15%				

Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

The average revenue percentage (15%) is then multiplied by the revenue to achieve the forecasted depreciation and amortization for the explicit period (2023-2027).



Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

Figure 6.5:ets subject to D&A and D&A (Historical and Forecasted ($m)

CAPEX (Capital Expenditure)

According to AstraZeneca Annual Report 2022 (AstraZeneca, 2023), capital expenditure (CAPEX) is mainly related to the 'Additions' and 'Capital Expenditure' movements on PP&E, Leases and Intangible Assets. Thus, the first thing to calculate was the total of Capex Expenditure in the historical years.

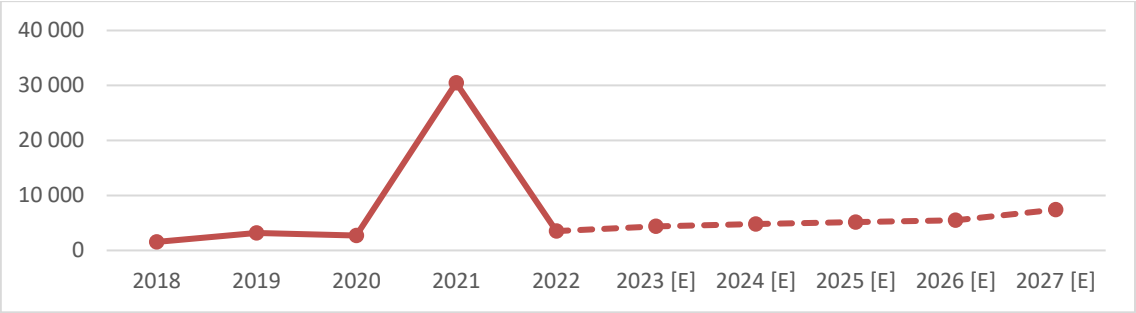
Given that the CAPEX is strongly correlated with the revenue levels it was considered the average percentage of CAPEX in relation to the revenues in the historical revenues (10%) as a benchmark for the forecasted years, as follows:

Table 6.3:Historical and Forecasted CAPEX

$m	**2018**	**2019**	**2020**	**2021**	**2022**	**2023 (E)**	**2024 (E)**	**2025 (E)**	**2026 (E)**	**2027 (E)**
Capital Expenditure										
PP&E	1,034	996	926	2,287	1,066					
Leases	0	173	191	508	239					
Intang. Assets	513	2,001	1,592	27,667	2,214					
Total CAPEX	1,547	3,170	2,709	30,462	3,519	**4,371**	**4,801**	**5,157**	**5,481**	**7,424***
% of Revenues	7%	13%	10%	81%	8%					
Average				**10%**						

Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

However, for 2027, it was considered that Total Capex would at least be at the same level as Depreciation and Amortization ($8,717m), given the perpetuity feature of the model, which should be considered. Thus, it would not be wise to consider that in perpetuity, Total Capex was going to be lower than Depreciation and Amortization.



Source: AstraZeneca, 2019, 2020, 2021, 2022, 2023 and own calculations

Figure 6.6:Historical and Forecasted Net CAPEX ($m)

Please note that we have excluded the 2021 year from the average calculation as it was an abnormal year given Alexion acquisition, which strongly increased the CAPEX investment.

At this point we can already conclude that D&A and CAPEX represent a high percentage of revenue, 15% and 10%, respectively, in comparison with the expected Growth in Revenue between FY23 and FY26 – an average of 6.74% for the following four years.

Weighted Average Cost of Capital

Considering the Discounted Cash Flow as the chosen method to evaluate the Company, it was calculated the Weighted Average Cost of Capital (WACC), which will be used to discount the free cash flow of firm.

$$\mathbf{WACC} = k_e * \frac{E}{E+D} + k_d * (1-t) * \frac{D}{E+D} \quad (22)$$

To compute the WACC, it is first necessary to calculate its components:

Cost of Equity ($k_e = R_f + \beta_i * [E(R_m) - R_f]$): The Cost of Equity is determined by the CAPM model. To use the CAPM model, three variables must be estimated first:

Risk-free rate (r_f): The reference for the risk-free rate was the UK 10-year government bond yield of 3.799%, as of December 31st, 2022 (Bank of England, n.d.).

Beta (β_i): The Beta was computed through a linear regression between the daily return on the AstraZeneca shares and the daily return of the FTSE 100 index (Annex D), between the 31st of December 2018 and the 31st of December of 2022. Data was retrieved from Bloomberg.

The Adjusted Beta achieved was 0.74, meaning that AstraZeneca (AZN) stock is positively correlated with FTSE 100, i.e. an investment in AZN shares represents less risk than an investment on the FTSE 100 index.

Market Risk Premium (E(Rm) = ERP + CRP): The Equity Risk Premium (ERP) considered was 6.97% with the addition of 1.03% accounting for the Country Risk Premium (CRP) of the UK. Given that 40% of FY22 AZN's revenue derived from the US and the remaining part from the UK, Europe and Other Markets, it was only considered 60% of the UK CRP. These values

are the ones considered by Damodaran (2023a) as of January 5th, 2023. All considered, market risk premium was set at 7%.

Therefore, Cost of Equity (k_e) amounted to 9%.

Cost of Debt (k_d): As suggested by Damodaran (2012), taking into consideration that AstraZeneca does not disclose a full breakdown of its obligations, the method used to compute the cost of debt was the interest coverage ratio, as follows:

$$Interest\ Coverage\ Ratio = \frac{EBIT\ 2022}{Interest\ Expenses\ 2022} = \frac{£3757m}{£1346m} = 2.79 \qquad (23)$$

Source: AZN Annual Report, 2023

According to Damodaran, the interest coverage ratio is then linked to a synthetic rating, which is consequently related to a default spread (Damodaran, 2023b) (referred in Annex E):

Table 6.4:Interest Coverage Ratio

Interest Coverage Ratio	2.79
Estimated Bond Rating	Baa2 / BBB
Estimated Default Spread	2.00%

Source: Damodaran, 2023b

However, external rating agencies rate AstraZeneca with a Credit Rating of A- (S&P) and A3 (Moody's), thus we decided to use them as a benchmark for the Bond Rating, instead of the Interest Coverage Ratio, which results in an Estimated Default Spread of 1.62%.

When the risk-free rate is added, the default spread yields the pre-tax cost of borrowing for a company, as follows:

$$Pre - Tax\ Cost\ of\ Debt = 1.62\% + 3.799\% = 5.4\% \quad (24)$$

Capital Structure:

AstraZeneca Annual Report 2022, states that it will maintain the capital structure unchanged.

Therefore, it was assumed the values of long-term and short-term debt presented in AstraZeneca's Annual Report 2022 would have little changes over the next 5 years. Thus, it was assumed that debt would increase at least in the same proportion as sales, i.e., considering the sales' growth rates estimated by Bloomberg Consensus, presented earlier.

The equity side was calculated using market value, by multiplying the number of outstanding shares (1,550 million shares) by the closing price as of 30th of December 2022 ($67.89), which resulted in an Equity Market Value of $105.09bn.

Table 6.5:Summary of WACC Inputs:

WACC	**7.93%**
k_e	9.00%
E	$105,090m
D	$29,232m
D+E	$134,322 m
k_d	5.42%
Tax Rate	25%
(1-t)	0.75

Source: Own calculations

6.3 Results:

6.3.1 Firm Valuation

Considering all the assumptions and computations made above, the FCFF results are as follows:

Table 6.6: Firm Valuation Results

Firm Valuation ($m)					
FCFF	**$ 14,601.51**	**$ 8,583.30**	**$ 8,840.92**	**$ 9,198.08**	**$ 5,562.91**
Terminal Value	**$ 100,550.92**				
PV Terminal Value	**$ 68,661.77**				
Enterprise Value	**$ 103,370.49**				
+ Non Oper. Assets	$ 6,642.00				
Firm Value	**$ 110,012.49**				
- Gross Debt	$ 29,232.00				
Equity Value	**$ 80,780.49**				
Fair price per share	**$ 52.12**				

Source: Own calculations

Discounting the estimated FCFF in 2027 by WACC minus the perpetuity growth rate, we reach to a Terminal Value of $100,550m, which translates into $68,661m as of today.

The Firm Value was calculated by adding the non-operating assets to the Enterprise Value, which results in a total Firm Value of $110,012m. By subtracting the current outstanding debt to the Firm Value, we reach to an Equity Value of $80,780m.

Therefore, we end up with a price target of $52.12 per share by the end of 2022, which comparing with the price of $67.8 per share in 2022, we can conclude that AZN's share price was overvalued by 23% and therefore, the recommendation is to sell.

For more detailed information on the calculation of the fair price target per share using the Firm Valuation please refer to Annex F.

6.3.2 Sensitivity Analysis

In the Firm Valuation model performed above, there are several assumptions and forecasts made which carry significant uncertainty. Therefore, it is important to understand that the value of a company calculated by this model depends on these assumptions and forecasts, and understand how slight differences in the variables considered may lead to considerable changes in the target price.

To understand how much the target price of AstraZeneca can change with the use of different scenarios, a sensitivity analysis was performed, accounting for slight changes in the perpetual growth rate and WACC, as follows:

Table 6.7:Sensitivity Analysis

		WACC				
		5.93%	6.93%	**7.93%**	8.93%	9.93%
	2.8%	$99.21	$73.68	$58.10	$47.53	$39.92
	2.55%	$91.41	$69.13	$55.13	$45.45	$38.38
gn	**2.3%**	$83.95	$64.63	**$52.12**	$43.30	$36.78
	2.05%	$78.85	$61.45	$49.95	$41.74	$35.61
	1.80%	$73.71	$58.17	$47.69	$40.09	$34.35

Source: Own calculations

The two variables considered to perform the sensitivity analysis – g_n and WACC – were chosen as these are two of the variables that affect the share's price the most.

Please note that all the other variables besides g_n and WACC remain unchanged as described above in the Firm Valuation model.

The recommendation for the target prices in yellow in the table above would be to Sell, to Hold for the target price in orange and to Buy for the target prices in green.

Furthermore, it was assessed a scenario of constant zero growth, with WACC at 7.93%, where the target price would reach a value of $35.63, which recommendation would be to Sell.

In conclusion, all considered, the modification of the growth rate and WACC could inflict a variation that goes from $38.09 to $89.99 for the share's price.

6.3.3 Equity Valuation

In opposition to the Firm Valuation, as stated earlier, in Equity Valuation it is only valued the equity stake in the business. Thus, instead of discounting the cash flows at the WACC, as the previous model, the cash flows will be discounted at the cost of equity (ke).

Table 6.8: Equity Valuation Results

Equity Valuation ($m)					
FCFE	**$ 14,372.50**	**$ 10,211.35**	**$ 9,855.15**	**$ 9,893.99**	**$ 4,847.67**
Terminal Value	**$ 73,636.00**				
PV Terminal Value	**$ 47,852.35**				
Enterprise Value	**$ 84,249.92**				
+ Non Oper. Assets	$ 6,642.00				
Equity Value	**$ 90,891.92**				
Fair price per share	**$58.64**				

Source: Own calculations

To reach the fair price per share using the Equity Valuation, it was first calculated the FCFE by subtracting debt repayments and adding new debt issued. Debt was considered to increase in the forecast period in the same proportion as revenues, i.e., 3.42% in FY23, 9.85% in FY24, 7.42% in FY25, 6.27$ in FY26 and 2.3% in FY27 as per the perpetuity growth considered.

Discounting the estimated FCFE in 2027 by cost of equity (ke =9%) minus the perpetuity growth rate (2.3%), we reach to a Terminal Value of $73,636m, which translates into $47,852m as of today.

The Equity Value was calculated by adding the non-operating assets to the Enterprise Value, which results in a total Equity Value of $90,891m.

Therefore, we end up with a price target of $58.64 per share by the end of 2022, which comparing with the price of $67.8 per share in 2022, we can conclude that AZN's share price was overvalued by 14% and therefore, the recommendation is to sell.

For more detailed information on the calculation of the fair price target per share using the Equity Valuation please refer to Annex G.

6.3.4 Relative Valuation:

In order to complement the above valuation made through the DCF Model, a Multiples valuation has also been performed. The objective of this analysis is to estimate AZN' share price through data obtained from its peer group, which is a set of companies operating in the same industry, under similar circumstances and resembling value drivers.

Peer Group:

For the selection of the peer group, we considered the six major European healthcare companies. It was considered relevant to add Moderna Inc. and Pfizer to the peer group, considering that 40% of AZN's sales were from the US in 2022. Please refer to Annex H for a detailed description of the peer group.

Table 6.9:Peer Group

Company	**Country**	**Current Market Cap**
AstraZeneca	UK	$234.24bn
Novo Nordisk	Denmark	$380.48bn
Sanofi	France	$136.79bn
Novartis	Switzerland	$233.5bn
GlaxoSmithKline	UK	$74.79bn
Roche	Switzerland	$259.22bn
Bayer AG	Germany	$56.8bn
Moderna Inc.	USA	$69bn
Pfizer Inc.	USA	$287bn

Source: Bloomberg

In the tables below it is possible to observe a comparison between the multiples of each company in the selected peer group:

Table 6.10:Multiples Comparison based on Capitalization

Multiples based on Capitalization - Full Year 2022			
	P /BV ratio	P/E ratio	Price / Sales ratio
AstraZeneca	5.68x	64.02x	4.74x
Novo Nordisk	25.28x	38.27x	12.01x
Sanofi	1.50x	13.43x	2.48x
Novartis	3.24x	28.42x	3.82x
GlaxoSmithKline	5.55x	12.97x	1.97x

Roche	8.29x	18.72x	3.67x
Bayer AG	1.22x	11.45x	0.94x
Moderna Inc.	3.62x	8.94x	3.67x
Pfizer Inc.	3.01x	8.27x	2.86x
Minimum	**1.22x**	**8.27x**	**0.94x**
Average	**6.46x**	**17.56x**	**3.93x**
Median	**3.43x**	**13.2x**	**3.27x**
Maximum	**25.28x**	**38.27x**	**12.01x**
Estimated Share Price in $	**82.0**	**28.04**	**93.4**

Source: Bloomberg and own computations

The **P/BV Ratio** of AZN is slightly higher than the median of the peers, which could be a sign that AZN's share might be relatively overvalued, since this ratio compares the company's market value to its book value.

However, AZN's **P/E Ratio** of AZN is significantly higher than the median of its peer group, which can indicate that investors expect higher growth from the company compared to the overall market.

Lastly, AZN's **P/S Ratio** is slightly above its peer group's median, which is positive for AZN, as it indicates the value that financial markets have placed on each unit of the company's revenue.

Table 6.11:Multiples Comparison based on Company's Value

Multiples based on Company's Value - Full Year 2022			
	EV / EBITDA ratio	EV / Sales ratio	Enterprise Value (USDm)
AstraZeneca	25.66x	5.26x	$ 233,180
Novo Nordisk	25.97x	11.94x	$304,298
Sanofi	8.44x	2.64x	$128,297
Novartis	12.13x	3.83x	$198,680
GlaxoSmithKline	8.32x	2.44x	$86,460
Roche	11.87x	4.00x	$274,392
Bayer AG	5.84x	1.56x	$84,545
Moderna Inc.	6.16x	3.14x	$ 60,452
Pfizer Inc.	7.48x	3.03x	$ 304,333

Minimum	**5.84x**	**1.56x**	
Average	**10.78x**	**4.07x**	
Median	**8.38x**	**3.09x**	
Maximum	**25.97x**	**11.94x**	
Estimated Share Price in $	**35.4**	**73.7**	

Source: Bloomberg and own computations

AZN's **EV/EBITDA Ratio** is significantly higher than the peer group's median, which can indicate it is relatively overvalued. Additionally, the EV/Sales ratio is above the median, which may suggest stronger future sales prospects.

7. Conclusions

The present project analyzes and evaluates AstraZeneca within the healthcare industry, considering all aspects of its business and the current economic environment, using valuation fundamentals, aiming to present a recommendation based on the calculated share price target on December 31st, 2022.

First of all, it was introduced the concept and methodology of the most used valuation models, including its assumptions, advantages and shortcomings. Considering AstraZeneca business model, it was carefully chosen the best valuation models to proceed with AstraZeneca valuation.

Hereupon, the main approach chosen was the Discounted Cash Flow (both Firm Valuation and Equity Valuation). It is important to note that the chosen valuation models have implicit a certain degree of subjectivity and uncertainty, given that the model's assumptions leave a lot of room for individual subjective judgments. Therefore, to perform the analysis according to each model, it was first assessed a set of inputs and forecasts, based on AstraZeneca 2019, 2020, 2021 and 2022 Annual Reports, which provided a clear view of the strategy and financial position of the company over these historical periods. Additionally, the chosen models also rely on significant assumptions about the company itself and the market, where these assumptions were made considering the most reliable and recent data available at the time of the analysis. Given the uncertainty of the future and forecasted assumptions, a sensitivity analysis was performed after achieving the AstraZeneca share price target with the chosen models. Lastly, it

was performed a relative valuation as a complementary valuation for the main approach, which allowed to confirm the results achieved in the Discounted Cash Flow Approach.

Therefore, the main conclusions were that:

- AstraZeneca valuation using the Firm Valuation pointed to a price target of $52.12 per share by the end of 2022, which comparing with the price of $67.8 per share in 2022, we can conclude that AZN's share price was overvalued by 23% and therefore, the recommendation should be to sell.
- AstraZeneca valuation using the Equity Valuation pointed a price target of $58.64 per share by the end of 2022, which comparing with the price of $67.8 per share in 2022, we can conclude that AZN's share price was overvalued by 14% and therefore, the recommendation is also to sell.
- Relative Valuation corroborated the findings of the above models.

It is important to address that current conditions at the time of this analysis were atypical, considering that it follows to the Covid-19 pandemic, which significantly drove the pharmaceutical and healthcare industry to the rise, with atypical high revenue and investment of the companies within the industry, which helped AstraZeneca to build an even more solid performance and balance sheet. To add to this, the pandemic reinforced how important it is to invest in the pharmaceutical and healthcare industry, showing a positive outlook for the industry in the following years. Furthermore, at the time of the analysis, the economic environment is very uncertain with strongly high inflation worldwide.

In conclusion, the current economic environment at the time of the valuation made it even more relevant to address the limitations to which the valuation is subject. The fact that the FCFF and FCFE approach rely on future estimates (which were made with a high degree of uncertainty, given the atypical economic environment and the repercussions of the health crisis – still to be fully assessed) together with the models' high sensitivity to changes in the WACC and growth rate, both represent limitations that can condition the results achieved in this work. Additionally, as already mentioned, the various assumptions considered in the models were retrieved from AstraZeneca's Annual Reports, which may be biased and subject to changes in the company's strategy and policies. Furthermore, as mentioned throughout the paper, the model has a higher level of subjectivity depending on the analyst, although the efforts to rely only on the best and reliable information available. It is then suggested that future valuations of AstraZeneca may address the previous limitations by producing estimates based on a wider historical period and that take into consideration the effects the recent years 2020-2022 may have in the estimation of the growth rate used for the following years.

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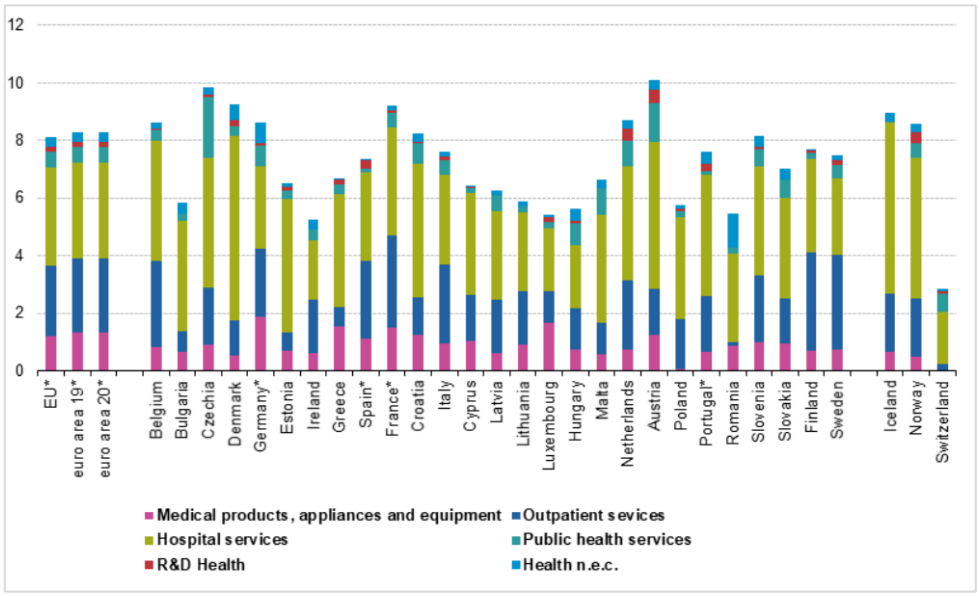
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9.Annexes

Annex A: Total general government expenditure on health, 2021 (% of GDP)



Source: Eurostat, 2023

Annex B: AstraZeneca Plc – Consolidated Balance Sheet Historical– 2018-2022 – USDm

Balance Sheet

$m	2018	2019	2020	2021	**2022**
ASSETS					
Non-Current Assets					
PP&E	7 421	7 688	8 251	9 183	8 507
Right-of-Use Assets	0	647	666	988	942
Goodwill	11 707	11 668	11 845	19 997	19 820
Intangible Assets	21 959	20 833	20 947	42 387	39 307
Investments in Associated and Joint Ventures	89	58	39	69	76
Other Investments	833	1 401	1 108	1 168	1 066
Derivative Financial Instruments	157	61	171	102	74
Other Receivables	515	740	720	895	835
Deferred Tax Assets	2 379	2 718	3 438	4 330	3 263
Total Non-Current Assets	45 060	45 814	47 185	79 119	73 890
Current Assets					
Inventories	2 890	3 193	4 024	8 983	4 699
Trade and Other Receivables	5 574	5 761	7 022	9 644	10 521
Other Investments	849	849	160	69	239
Derivative Financial Instruments	258	36	142	83	87
Intangible Assets	0	0	0	105	0
Income Tax Receivable	207	285	364	663	731
Cash and Cash Equivalents	4 831	5 369	7 832	6 329	6 166
Assets Held For Sale	982	70	0	368	150
Total Current Assets	15 591	15 563	19 544	26 244	22 593
Total Assets	60 651	61 377	66 729	105 363	96 483
Liabilities					
Non-Current Liabilities					
Interest-Bearing Loans and Borrowings	17 359	15 730	17 505	28 134	22 965
Lease Liabilities	0	487	489	754	725
Derivative Financial Instruments	4	18	2	45	164
Deferred Tax Liabilities	3 286	2 490	2 918	6 206	2 944
Retirements Benefit Obligations	2 511	2 807	3 202	2 454	1 168
Provisions	385	841	584	956	896
Other Payables	6 770	6 291	6 084	4 933	4 270
Total Non-Current Liabilities	30 315	28 664	30 784	43 482	33 132
Current Liabilities					
Interest-Bearing Loans and Borrowings	1 754	1 822	2 194	1 660	5 314
Lease Liabilities	0	188	192	233	228
Trade and Other Payables	12 841	13 987	15 785	18 938	19 040
Derivative Financial Instruments	27	36	33	79	93
Provisions	506	723	976	768	722
Income Tax Payable	1 164	1 361	1 127	916	896
Total Current Liabilities	16 292	18 117	20 307	22 594	26 293
Total Liabilities	46 607	46 781	51 091	66 076	59 425
Equity					
Share Capital	317	328	328	387	387
Share Premium Account	4 427	7 941	7 971	35 126	35 155
Capital Redemption Reserve	153	153	153	153	153
Meger Reserve	448	448	448	448	448
Other Reserves	1 440	1 445	1 423	1 444	1 468
Retained Eearnings	5 683	2 812	5 299	1 710	-574
Equity attributable to Equity Holders	12 468	13 127	15 622	39 268	37 037
Non-Controling Interests	1 576	1 469	16	19	21
Total Equity	14 044	14 596	15 638	39 287	37 058

Source: AZN, 2018, 2019, 2021, 2022 and own computations

Annex C: AstraZeneca Plc – Consolidated Income Statement Historical and Forecast – 2018-2027[E] - USDm

P&L

$m	2018	2019	2020	2021	2022	2023 [E]	2024 [E]	2025 [E]	2026 [E]	2027 [E]
Revenue	22 090	24 384	26 617	37 417	44 351	**45 868**	**50 386**	**54 124**	**57 518**	**58 824**
Growh Rate		*10%*	*9%*	*41%*	*18,53%*					
(-) Cost of Sales	4 936	4 921	5 299	12 437	12 391	**11 340**	**12 457**	**13 381**	**14 220**	**14 543**
% of Revenue	*22%*	*20%*	*20%*	*33%*	*28%*					
Gross Profit	17 154	19 463	21 318	24 980	31 960	**34 528**	**37 929**	**40 744**	**43 298**	**44 281**
(-) Distrubution Costs	331	339	399	446	536	**623**	**684**	**735**	**781**	**799**
% of Revenue	*1%*	*1%*	*1%*	*1%*	*1%*					
(-) R&D Expenses	5 932	6 059	5 991	9 736	9 762	**11 214**	**12 318**	**13 232**	**14 062**	**14 381**
% of Revenue	*27%*	*25%*	*23%*	*26%*	*22%*					
(-) SG&A Costs	10 031	11 682	11 294	15 234	18 419	**19 998**	**21 968**	**23 598**	**25 077**	**25 646**
% of Revenue	*45%*	*48%*	*42%*	*41%*	*42%*					
(+) Other Operating Income	2 527	1 541	1 528	1 492	514	**2 628**	**2 887**	**3 101**	**3 295**	**3 370**
% of Revenue	*11%*	*6%*	*6%*	*4%*	*1%*					
(+) Depreciation (Added-Back)	3 753	3 762	3 149	6 530	5 480	**6 222**	**6 476**	**6 756**	**7 069**	**7 424**
EBITDA	7 140	6 686	8 311	7 586	9 237	**11 544**	**12 322**	**13 036**	**13 742**	**14 249**
(-) Depreciation	3 753	3 762	3 149	6 530	5 480	6 222	6 476	6 756	7 069	7 424
EBIT	3 387	2 924	5 162	1 056	3 757	**5 322**	**5 846**	**6 280**	**6 673**	**6 825**
(+) Finance Income	138	172	87	43	95	182	200	215	228	234
% of Revenue	0,62%	0,71%	0,33%	0,11%	0,21%					
(-) Finance Expense	1419	1 432	1 306	1 300	1 346	**2 175**	**2 390**	**2 567**	**2 728**	**2 790**
% of Revenue	6,4%	5,9%	4,9%	3,5%	3,0%					
(-) Share of afer tax losses in associates and joint ventures	113	116	27	64	5	**117**	**128**	**138**	**146**	**150**
% of Revenue	0,51%	0,48%	0,10%	0,17%	0,01%					
EBT	1 993	1 548	3 916	-265	2 501	**3 212**	**3 528**	**3 790**	**4 028**	**4 119**
Taxation	57	-321	-772	380	792	**-402**	**-442**	**-475**	**-505**	**-516**
	3%	-21%	-20%	-143%	32%					
Net Income	2 050	1 227	3 144	115	3 293	**2 810**	**3 086**	**3 315**	**3 523**	**3 603**

Source: AZN, 2018, 2019, 2021, 2022 and own computations

Annex D: Beta Computation (Linear Regression of AZN stock vs FTSE100 Index)

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0,421460824
R Square	0,177629226
Adjusted R Square	0,17708569
Standard Error	0,014160796
Observations	1515

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	1	0,065533148	0,065533148	326,802737	2,71997E-66
Residual	1513	0,303399088	0,000200528		
Total	1514	0,368932236			

	Coefficients	*Standard Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95,0%*	*Upper 95,0%*
Intercept	0,000507012	0,000363843	1,393493606	0,163675236	-0,000206677	0,001220702	-0,000206677	0,001220702
X Variable 1	**0,622824291**	0,034452655	18,07768616	2,71997E-66	0,555244266	0,690404316	0,555244266	0,690404316

Source: Yahoo Finance and own computations

Annex E: Interest Coverage Ratio

>	≤ to	*Rating is*	*Spread is*
-100000	0.199999	D2/D	20.00%
0.2	0.649999	C2/C	17.50%
0.65	0.799999	Ca2/CC	15.78%
0.8	1.249999	Caa/CCC	11.57%
1.25	1.499999	B3/B-	7.37%
1.5	1.749999	B2/B	5.26%
1.75	1.999999	B1/B+	4.55%
2	2.2499999	Ba2/BB	3.13%
2.25	2.49999	Ba1/BB+	2.42%
2.5	2.999999	Baa2/BBB	2.00%
3	4.249999	A3/A-	1.62%
4.25	5.499999	A2/A	1.42%
5.5	6.499999	A1/A+	1.23%
6.5	8.499999	Aa2/AA	0.85%
8.50	100000	Aaa/AAA	0.69%

Source: Damodaran, 2023b

Annex F: Firm Valuation Results

Firm Valuation					
($m)	**2023 [E]**	**2024 [E]**	**2025 [E]**	**2026 [E]**	**2027 [E]**
EBIT*(1-t)	$ 3,991.26	$ 4,384.40	$ 4,709.73	$ 5,005.03	$ 5,118.64
+D&A	$ 6,793.61	$ 7,462.79	$ 8,016.52	$ 8,519.16	$ 8,712.55
- CAPEX	$ 4,370.70	$ 4,801.22	$ 5,157.47	$ 5,480.84	$ 8,712.55
+/-Δ WC	- $ 8,187.33	-$ 1,537.32	-$ 1,272.13	-$ 1,154.73	-$ 444.27
FCFF	**$ 14,601.51**	**$ 8,583.30**	**$ 8,840.92**	**$ 9,198.08**	**$ 5,562.91**

Terminal Value	**$ 100,550.92**
PV Terminal Value	**$ 68,661.77**
Enterprise Value	**$ 103,370.49**
+ Non Oper. Assets	$ 6,642.00
Firm Value	**$ 110,012.49**
- Gross Debt	$ 29,232.00
Equity Value	**$ 80,780.49**
Fair price per share	**$ 52.12**

Source: Own computations

Annex G: Equity Valuation Results

Equity Valuation					
($m)	**2023 [E]**	**2024 [E]**	**2025 [E]**	**2026 [E]**	**2027 [E]**
FCFF	$ 14,601.51	$ 8,583.30	$ 8,840.92	$ 9,198.08	$ 5,562.91
Debt	$ 30,231.73	$ 33,209.56	$ 35,673.71	$ 37,910.45	$ 38,771.02
(rd*debt)(1-t)	$ 1,228.74	$ 1,349.77	$ 1,449.92	$ 1,540.83	$ 1,575.81
Δ Debt	$ 999.73	$ 2,977.83	$ 2,464.15	$ 2,236.74	$ 860.57
FCFE	**$ 14,372.50**	**$ 10,211.35**	**$ 9,855.15**	**$ 9,893.99**	**$ 4,847.67**
Terminal Value	**$ 73,636.00**				
PV Terminal Value	**$ 47,852.35**				
Enterprise Value	**$ 84,249.92**				
+ Non Oper. Assets	$ 6,642.00				
Equity Value	**$ 90,891.92**				
Fair price per share	**$58.64**				

Source: Own computations

Annex H: Peers Description

The European healthcare industry counts with six major companies:

Novo Nordisk

Novo Nordisk is a global healthcare company, founded in 1923 and headquartered in Denmark. The Company's purpose is to drive change to defeat diabetes and other serious chronic diseases such as obesity and rare blood and rare endocrine diseases.

The Company employs more than 55,000 people in 80 offices around the world, and market their products in 170 countries.

The principal disease areas of the Company are: Type 1 and type 2 diabetes, obesity, growth disorders, haemophilia, sickle cell disease, rare diseases, non-alcoholic steatohepatitis (NASH), cardiovascular disease and Alzheimer's disease.

Sanofi

Sanofi is an innovative global healthcare company, which is driven to develop medicines and vaccines with the potential to improve people's live in six key therapeutic areas: Vaccines, Immunology & Inflammation, Oncology, Rare Blood Disorders, Rare Diseases and Neurology.

Novartis

Novartis is a multinational group of companies specializing in the research, development, manufacturing and marketing of a broad range of innovative pharmaceuticals and cost-saving generic medicines.

The businesses of Novartis are divided operationally on a worldwide basis into two identified reporting segments:

1. Innovative Medicines: innovative patent-protected prescription medicines;
2. Sandoz: generic pharmaceuticals and biosimilars.

The Company focuses on five therapeutic areas: Cardiovascular, Immunology, Neuroscience, Solid tumors and Hematology.

GlaxoSmithKline

GlaxoSmithKline is a global biopharma company aiming to positively impact the health of 2.5bn people over the next 10 years.

The Company prioritises innovation in vaccines and specialty medicines, maximising the increasing opportunities to prevent and treat disease. At the heart of this is the Company's R&D focus on the science of the immune system, human genetics and advanced technologies.

The Company focus on four therapeutic areas: infectious diseases, HIV, oncology and immunology.

Roche

A.F. Hoffmann – La Roche AG is a pioneer in healthcare growing to be one of the world's largest biotech companies, as well as a leading provider of in-vitro diagnostics and a global supplier of transformative innovative solutions across major disease areas.

The Company focuses on finding new medicines and diagnostics and establishing data-based insights that evolve the practice of medicine and help patients live longer and better lives.

The Company is an innovator across major disease areas as oncology, neurology, infectious diseases and ophthalmology.

Bayer AG

Bayer is a life science company with more than 150 year history and core competencies. The Bayer Group is managed as a life science company with three divisions – Pharmaceuticals, Consumer Health and Crop Science. As of December 2022, the Group consolidated 354 companies in 83 countries.

- The Pharmaceuticals division focuses on prescription products, especially for cardiology and women's healthcare and on specialty therapeutic in the areas of oncology, hematology and ophthalmology.
- The Consumer Health division markets mainly nonprescription products in the dermatology, nutritional supplement, analgesic, digestive health, cold, allergy, sinus and flu categories.
- The Crop Science division is world-leading agriculture enterprise with businesses in seeds, crop protection and nonagricultural pest control.

Furthermore, given the high AZN's sales percentage coming from the US, we considered the following two major healthcare companies in the US as AZN's peers as well.

Moderna Inc.

Headquartered in the USA, Moderna's mission is to deliver the greatest possible impact to people through mRNA medicines – messenger RNA – an essential component of all living organisms.

The Group is currently focusing on five therapeutic areas – infectious diseases, immune-oncology, rare diseases, cardiovascular diseases and autoimmune diseases.

Pfizer

Pfizer is one of the world's premier biopharmaceutical companies focusing on five therapeutic areas: Rare Disease, Inflammation & Immunology, Vaccines, Oncology and Anti Infectives.